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KEW AND ESKDALE MUIR OBSERVATORIES AND THE METEOROLOGICAL OFFICE.

By arrangements recently concluded between the Lords Commissioners of H.M. Treasury, the Royal Society, the National Physical Laboratory, and the Meteorological Office, the administration of the work of the Kew Observatory, in so far as it is concerned with observational and experimental work in meteorology and geophysics, will be transferred to the Meteorological Office as from 1st July, 1910. The Kew Observatory will be the Central Observatory for the Office. All communications respecting that side of the work of the Observatory should thenceforth be addressed to the Director of the Meteorological Office, Kew Observatory, Richmond, Surrey.

By another provision of the arrangement the administration of the Observatory at Eskdale Muir will be associated by the Royal Society with the Meteorological Office instead of as heretofore with the National Physical Laboratory.

In the conduct of the administration of the Observatories the Director of the Meteorological Office will have the assistance of an advisory Committee—the Gassiot Committee, appointed by the Royal Society to administer the funds of the Gassiot Trust, representing an endowment of £10,000, vested in the Royal Society in 1871 by Mr. J. P. Gassiot.

One of the provisions of the new scheme is that the Superintendents of the three Observatories—Kew, Eskdale Muir and Valencia—under the direction of the Meteorological Office shall be appointed by the Meteorological Committee upon the nomination of the Gassiot Committee. On this nomination the appointments of Dr. C. Chree, F.R.S., as Superintendent of the Central Observatory, and of Mr. G. W. Walker, M.A., of Eskdale Muir Observatory, have been continued by the Meteorological Committee. Dr. Chree has further been appointed Assistant-Director of Observatories for the Meteorological Office. Mr. J. E. Cullum remains Superintendent of Valencia Observatory.

The work of testing instruments now carried on at Kew Observatory by the National Physical Laboratory will be removed to Teddington as soon as the necessary provision for its transference can be made. The Laboratory will retain the well-known K.O. mark for

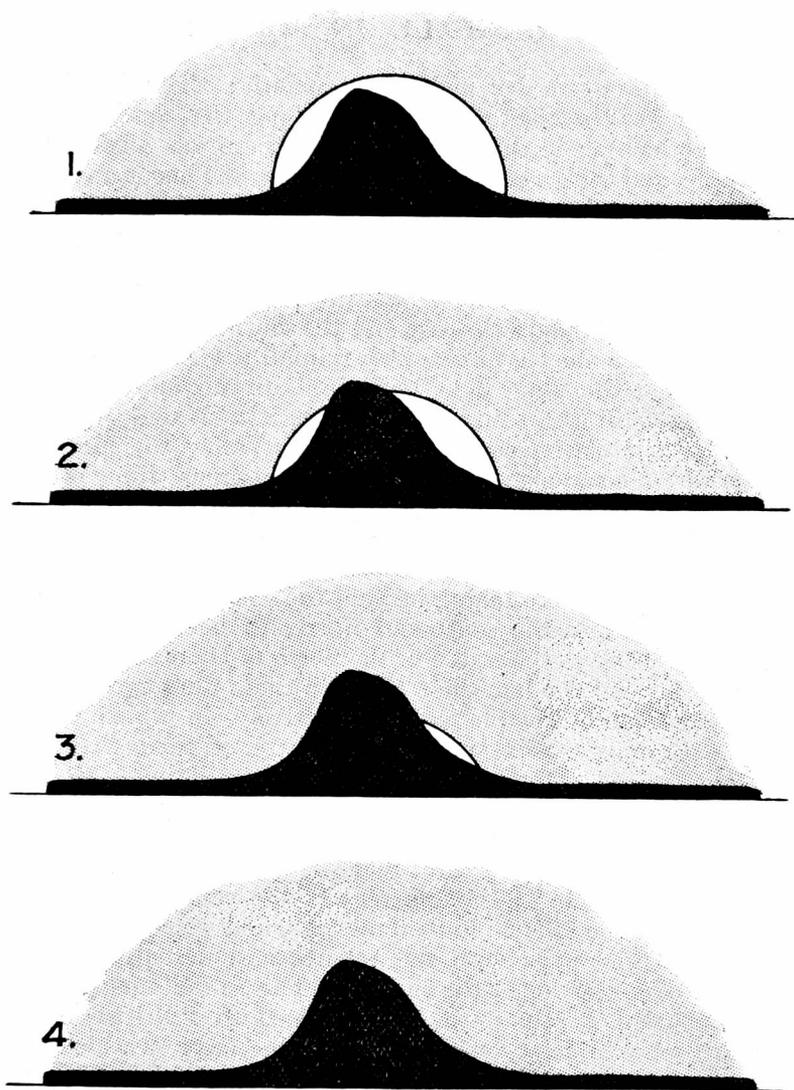
use with those classes of instruments which have hitherto been tested at the Kew Observatory. For the time being the work will be carried on at the Observatory as a department separate from the observational work, but under the superintendence of Dr. Chree. Communications respecting this side of the work should be addressed to the Director of the National Physical Laboratory, Observatory Department, Richmond, Surrey.



THREE GREEN RAYS IN ONE SUNSET.

By HUGH ROBERT MILL, D.Sc.

THE fascination of the rarely-seen phenomenon of the bluish-green colour of the last ray of light from the setting sun survives the full and satisfactory scientific explanation of the phenomenon given by Dr. Rambaut in these pages four years ago. (Vol. 41, pp. 21, 41.) It is so seldom that a clear horizon, free from cloud or haze, occurs in this country, so much more seldom that anyone is watching the sun when setting on such a horizon, that the observation is never likely to be a common one. The object of the present note is to emphasize the fact that a water-horizon is not essential to the production of the effect, but that any sharp bounding line is sufficient to cause it to appear, and that the appearance may be observed at one point while the sun's disc is still visible elsewhere. On the evening of June 22nd, 1910, I was in a rowing boat off Bunessan in Mull, and about 9.15 p.m. saw that the sun was to set not in the sea as I had hoped but behind the rocky islet known as the Dutchman's Cap. This islet was distant about $12\frac{1}{4}$ miles, bearing nearly north-west, and the central part of it behind which the sun disappeared is a pyramidal rock rising 284 feet above sea level, and subtending an angle, estimated from the disc of the sun behind it (Fig. 1), of something like $20'$. The effect was, that when the upper limb of the sun sank below the summit of the islet, a segment of the disc appeared on each side of the rock (Fig. 2), gradually diminishing in extent until the shoulders of the rock hid each in turn (Figs 3 and 4); there being thus three separate points of the sun's limb which successively passed behind the rock. When the summit of the rock nearly reached the upper portion of the sun's disc (a few seconds after the period of Fig. 1) the sun's limb near the rock assumed a yellowish-green colour changing as the last line of light vanished to the familiar clear blue-green, while the two segments visible over the shoulders of the rock (Fig. 2) retained their dull orange colour, the light of which was so reduced that there was no dazzling in looking at the sun through a Zeiss glass magnifying eight diameters. The segment on the left diminished rapidly and the vanishing thread of light turned yellowish-green and expired (Fig. 3) in greenish-blue. Then the segment on the right underwent the same changes, and in its green



ray the sun disappeared (Fig. 4) leaving the bright twilight which lingered in the sky all night. The triple effect recalls that described by Mr. Whitmill through the slits in the belfry of a Wesleyan Chapel (see Vol. 41 (1906), p. 44). The sea horizon has been shown to be unnecessary for the production of the effect on many previous occasions, and it would hardly be worth while to call attention to the fact again were it not that residents in inland places should be reminded that if they command a sharp horizon they may, on exceptionally clear evenings, enjoy watching a phenomenon, the reputed rareness of which is a striking proof of the unobservant habits of most people.

HEAVY RAINFALL IN JUNE 1910.

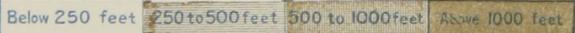
IN Scotland, June was a dry and sunny month; the rainfall along the east coast was less than an inch, that along the west coast was less than two inches; in the Inner Hebrides there was anxiety as to water supply, and the grass along the roadsides was burnt and brown. Only a few stations in central Scotland reported a rainfall of as much as 3 inches. The north of England also was remarkably dry, falls of 3 inches or over for the month being confined to the centre of the Lake District, southern Lancashire and the west of the West Riding of Yorkshire. The Midlands, the east and the south-east of England had on the whole a dry month, or one with rainfall not greatly exceeding the average, and the same held good in Cornwall and Devon and along the coast of the south of England. In Wales, Gloucester, Somerset and the central part of the Thames Valley the month was very wet, and in some places recalled the disastrous June of 1903. Almost the whole of Wales, except the coast, had more than five inches of rain, and a considerable area in the centre more than eight inches, while our map of the Thames Valley shows a rainfall exceeding four inches, stretching in from the south-west and reaching as far as Aldershot in the south and nearly to Berkhamsted in the north. A detached wet area lay in the north of Gloucestershire. In Wessex just beyond the border of the map there were two areas west of Wells and north of Templecombe respectively, in which the rain for the month exceeded six and in the centre of them even seven inches. In Ireland a large district round Dublin, normally the driest part of the country, had more than six inches of rain; but the rainfall diminished rapidly on all sides and in the extreme south-west and north-east was less than three inches.

The monthly totals, although remarkable enough, are far less interesting than the falls on individual days, and we could have filled this magazine twice over with the reports and newspaper extracts which have been sent us on the subject. The full discussion of the daily distribution of rain must be postponed to "British Rainfall, 1910," but we may refer here to two of the days on which severe thunderstorms affected parts of the country. On June 7th more than an inch fell along a narrow track from Odiham to Windsor, the heaviest fall in which was 2.52 in. at Old Windsor; more than an inch fell also over nearly the whole of the Thames Valley west of Abingdon, and at Stow-on-the-Wold the exceptionally heavy fall of 3.55 in. was recorded; but we must pass these by to give the little space at our disposal to the more remarkable occurrences of June 9th. This was a day of terrific thunderstorms and deluges of rain and hail in the Thames Valley. The rainfalls were by the nature of the weather very erratic, some places having less than an inch while others a few miles away had four or five inches. There were two points of maximum intensity, both in Oxfordshire from which we have received details of so remarkable a kind that we must subject

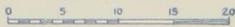
RAINFALL OF THAMES VALLEY JUNE, 1910.



ALTITUDE SCALE



SCALE OF MILES



Symons's Meteorological Magazines.

Watershed of River Thames above Taddington, and River Lee above Feltes Weir.

Isolythets
Stations reporting

them to further examination before we consider it safe to place them at the head of all records for intensity of thunderstorm rain in the Thames Valley. Mr. Higgins, Schoolmaster at Kidmore End, about four miles north-west of Reading, recorded 3·23 in. between 12·30 and 1·30 p.m. and the reading for the 24 hours amounted to **5·51 in.** The rain gauge was, unfortunately, not of standard pattern, and we are not sure whether it was impossible for rain to find its way into the receiver by running down the outside of the funnel; but Mr. C. M. Powell, F.R. Met. Soc., sent us some important notes derived from an inspection of the gauge and he is of opinion that the figure will stand.

At Wheatley, about six miles east of Oxford, the Schoolmaster, Mr. Leyshon, records that the storm broke at 12·42, and at 1·20 p.m. he emptied the gauge and found that 2·68 in. had fallen in 48 minutes; at 1·40 p.m., 1·66 in. more was measured as the result of 20 minutes, making 4·34 in. in 68 minutes. At 6 p.m., ·86 in. more was measured, and at 9 a.m. on the 10th, ·29 in., making the total for the rainfall day of June 9th, **5·49 in.** Terrific hail as well as rain made up the deluge and the village street became a rushing torrent. It so happens that we have received no records of the day's rainfall in the straight line between Wheatley and Kidmore End; but if we can judge from stations a little to the east and west the rainfall on the 9th did not exceed 2 inches at some points between the two places.

Were it not for the enlightened action of the Oxfordshire Education Committee in encouraging rainfall observations at the village schools these most important records might never have been made.

THE POST OFFICE AND MONTHLY MAGAZINES.

THE Editor of the *Agricultural Economist* has raised the vexed question of the unfair discrimination on the part of the Post Office in favour of weekly as against monthly journals. A weekly journal may travel by post for one halfpenny irrespective of weight, but a monthly journal requires to pay at the rate of a halfpenny for every two ounces of its weight. Thus we cannot add six pages to our little Magazine without raising its weight a fraction over 2 oz. and doubling its postage, whereas a weekly paper can, and often does, circulate a pound weight of advertisements and some ounces of literary matter for half the price. A paper like ours, on which there is no profit, is seriously crippled by the financial necessity of keeping the weight below 2 oz., and we cordially agree with our contemporary, whose case is harder than our own, in wishing that common sense might be allowed to whisper reasonableness to the Post Office. Nearly a thousand monthly journals are in the same position, and each has probably before now brought its own ineffectual protest before the unresponsive rulers of the Post Office; but we will gladly join in any new appeal, for by continual coming perchance we may weary them.

THE WEATHER OF JUNE.

By FRED. J. BRODIE.

THE weather of June varied considerably from time to time, and in different parts of the country.

At the commencement of the month nearly all districts were affected by small shallow depressions appearing as secondaries to larger disturbances which passed from Iceland to Scandinavia. With these conditions the winds were light and variable, and more or less rain fell in all places (while thunderstorms occurred in the North of England), the thermometer being fairly high in the daytime, but low at night. On the 2nd and 3rd the daily maxima were slightly above 70° in many parts of England, and on the latter date Greenwich touched 75° . Several places, however, recorded night maxima below 40° , and in a few isolated spots the thermometer on the grass fell slightly below the freezing point.

After the 4th, an anticyclone was formed to the northward of these islands, and for some few days Scotland experienced a spell of exceedingly fine weather, the total duration of sunshine for the week ending the 11th amounting to over 70 hours in many places, to over 80 hours at Aberdeen, and to as many as 87 hours at Stornoway. Notwithstanding the prevalence of so clear an atmosphere the day temperatures were at first of moderate height, and, with much terrestrial radiation, the nights remained cold, the thermometer even in the screen falling to 33° at Balmoral early on the 5th, and to 34° at Wick on the morning of the 7th. Over England and Ireland the weather at this time was of a very different character, the extension of a large and complex area of low barometrical pressure from France and Southern Europe being accompanied by frequent thunderstorms, and in many places by torrential falls of rain and hail. Little bright sunshine was experienced (in London the total for the week ending the 11th was less than one fourth of that recorded at Stornoway), but the air was warm and close, and in the South and South-East of England the night temperatures were unusually high. Between the 7th and 9th the thermometer rose generally, maximum readings of 75° and upwards being recorded over a large portion of Great Britain, and a reading of 80° at Greenwich.

After the 11th the low pressure system passed away to the eastward, while an anticyclone extended north-eastwards from the southern portion of the North Atlantic, the area of highest pressure being situated on the 15th and 16th directly over the United Kingdom. Fine, dry weather now set in generally, and continued for rather more than a week. A good deal of fog prevailed round the English and Irish coasts and kept the thermometer low in places, but over the country as a whole the temperature rose to a seasonable level, the shade maxima of the 19th–21st being slightly above 80° in several English districts—the highest level yet reached during the present year. At Hillington and Raunds the thermometer, on the 19th,

touched 83°. A large area of low pressure was at this time beginning to spread in from the Atlantic, and between the 21st and 24th unsettled thundery weather became general. Temperature remained at first a little above the average, but on the 25th, when the low pressure system passed eastwards to the continent, a cool wind swept down from the northward, and for the remainder of the month the thermometer was decidedly low for the time of the year. In the closing week the weather was influenced by a new low pressure area which hung off our northern coasts between the Faëroes and the west of Norway, the wind in these islands being brisk from the westward, with frequent showers and thunderstorms in many English districts.

The mean temperature of June was above the average over nearly the whole of England, and also in the west of Scotland, but the excess was nowhere large. Over Scotland as a whole, and in the west and north of Ireland and some portions of the south-west of England, the mean values were slightly below the average. Bright sunshine was nearly everywhere deficient, a large excess being, however, reported in the Hebrides where the early part of the month was so extremely fine. At Westminster the total duration, 156 hours, was 11 hours below the average of the 25 years, 1881-1905.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

HISTORICAL CLIMATOLOGICAL RECORDS—A FROST IN 1607.

The following account of a frost in the English Lake District shows that there are old entries relating to weather to be found for searching. The Rumney's and Castelhowe's are still landowners in the parish, and the use of the word "carried" as meaning conducted still survives in Cumberland.

It is difficult to see how the information in registers relating to meteorology could be collected as the registers are all over the country, and often in most inaccessible places. There exists a Society, I believe, for printing Parish Registers, but whether they would copy and make public entries relating to weather I do not know. It would be most interesting if it could be done.

RICHARD COOKE.

The Croft, Detling, Maidstone, May 2nd, 1910.

THE *Journal* of the British Archæological Association recently quoted the following quaint extract from the Watermillock Register, published by Titus Wilson, Kendal in 1908:—

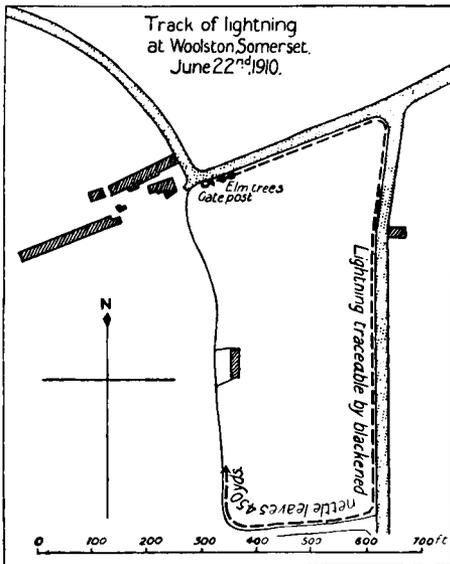
"In this yeare of our Lord God, 1607, was a marveillous great frost wch continued from the first day of December until the xvth day of February

after. Viles water was frozen ower and so contynued from the vjth day of December untill the xxijnd day of February followinge. So stronge that men in great companies made a common way vp the same from John Bartons dore to Fewsdaille Wyke. And men of Martindaill carried shepe vp the same on at Barton's and of at Sharrowsande. Men went vp the same water and over yt wth horses loaden with corne. Vpon the vjth day of January the younge folkes of Sowlby went unto the mydst of the same water and had a Minstrell with them and there daanced all the after Noone. On Shrovetuesday, being the ixth day of February, at Weathermeallock was a Boone fire builded on the Ise and matches of Shotinges Shott, and a pott wth aill drunke thereupon by Edward Willson of Benethead, Anthony Rumpney, Francis Rumney, John Castelhowe and others, ect."

Fewsdail Wyke is now generally known as Howtown Bay, and Sharrow is about midway between it and the foot of the lake.

REMARKABLE LIGHTNING FLASH.

DURING the thunderstorm of June 22nd, 1910, at Woolston, one mile east of North Cadbury, two elm trees standing close together were struck by lightning. From these trees the lightning ran along a



wire fence both ways, as shown on the accompanying tracing, reduced from an Ordnance Survey 25 inch map. In one direction (westward) the lightning only went a few yards to a gate-post, which was split to bits, throwing the iron hooks to some distance and cutting one of them in two. In the other direction it ran 450 yards, at first splitting the small posts which held the wire, and blackening the nettle leaves which it left stingless all the 450 yards, along more than three sides of the orchard. A cloud of smoke passed over the field after the flash. There were eight people in and about

the farmhouse close by. One of them described to me the appearance of a ball of fire "as big as a loaf," moving slowly horizontally. Another corroborated this in very vague language. The shock to all those in the farm-house was terrible.

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

WAVE OF HEAT.

THE temperature here on the morning of Tuesday, the 7th inst., at 9.30 was 85° ; at 12 o'clock noon, 94° ; and at 5 p.m., 80° . On reference, I find these are the highest records for over 50 years at Braystones. The early temperature (85° at 9.30 a.m.) is, as far as I know, unprecedented in the North of England, if not elsewhere in this country.

W. H. WATSON, F.G.S., F.C.S.

Braystones, Cumberland, June 9th, 1910.

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### INTERNATIONAL BALLOON ASCENTS, FEBRUARY 6th, 1908.

WITH the exception of Pyrton Hill, where, however, the ascent was made the previous evening, the height of the upper inversion was very uniform, and rather above the average. The temperatures also were very uniform, but distinctly below the average. In the southern part of the area a steady N.E. current of air prevailed, drawing into N. and N.W. in the northern part. A high pressure area lay in the West and South-West, and a depression was moving from the North-West of Scandinavia to Russia over the North of Europe.

*February 6th, 1908.*

| Starting Point. | Lat. |       | Long. |       | A     | B      | C    | D      | E    | F      | G          |
|-----------------|------|-------|-------|-------|-------|--------|------|--------|------|--------|------------|
|                 | °    | '     | °     | '     | in.   | miles. | ° F. | miles. | ° F. | miles. |            |
| Manchester .... | 53   | 30 N. | 2     | 14 W. | 30.95 | 6.9    | -83  | 7.0    | -83  | 85     | S.S.E.     |
| Pyrton Hill* .. | 51   | 48 N. | 1     | 0 W.  | 30.55 | 8.8    | -80  | 9.2    | -78  | 40     | S. 19° W.  |
| Uccle.....      | 50   | 51 N. | 4     | 22 E. | 30.63 | 7.0    | -94  | 9.8    | -78  | 44     | S.         |
| Hamburg .....   | ..   | ..    | ..    | ..    | 30.47 | 7.2    | -94  | 9.8    | -74  | 98     | S.E.       |
| Lindenberg .... | 50   | 15 N. | 14    | 10 E. | 30.36 | ..     | ..   | 6.9    | -67  | 63     | S.E. by E. |
| Paris .....     | ..   | ..    | ..    | ..    | 30.63 | 7.2    | -76  | 9.3    | -70  | 84     | S.W.       |
| Strassburg .... | 48   | 36 N. | 7     | 42 E. | 30.67 | 7.3    | -87  | 7.8    | -67  | 49     | S.W. by S. |
| Munich .....    | 48   | 9 N.  | 11    | 37 E. | 30.63 | 7.5    | -85  | 10.0   | -74  | 42     | S.W. by S. |
| Vienna .....    | 48   | 12 N. | 16    | 23 E. | 30.51 | 7.5    | -94  | 8.1    | -83  | 93     | S.W. by S. |
| Kuchino .....   | ..   | ..    | ..    | ..    | 29.73 | 7.2    | -85  | 7.5    | -76  | 57     | E. by S.   |

\* At 4.30 p.m. on Feb. 5th. The balloon of Feb. 6th was not found.

A=Approximate barometric pressure reduced to sea-level.

B=Height in miles of commencement of isothermal column.

C=Temperature,  $F^{\circ}$ ., at bottom of column.

D=Greatest height of reliable record in miles.

E=Temperature,  $F^{\circ}$ ., at greatest height.

F=Distance in miles of point where balloon fell.

G=Bearing of falling point from starting point.

## PROFESSOR BJERKNES ON THE SYNOPTICAL REPRESENTATION OF ATMOSPHERIC MOTIONS.

In a lecture before the University of London, on May 27th, Professor Victor Bjerknes, of Christiania, brought forward a new suggestion for the development of research in dynamical meteorology which promises to throw fresh light on some of its problems.

No difficulty has hitherto been found, said Professor Bjerknes, in representing synoptically elements of a scalar nature (such as pressure, temperature, etc.), but no attempt has so far been made to include in that representation the vector element of velocity. The latter is the most important of all factors from the dynamic point of view, and as such requires the more care in treatment if the charting of meteorological phenomena is to lead to any useful result.

The method followed by the lecturer in attempting to meet this want has been as follows:—a map is constructed showing simultaneous wind observations expressed in the usual manner by means of arrows pointing in the direction of the current, and feathered to indicate velocity; this map is converted by joining the arrows in such a way as to produce continuous lines of flow showing the horizontal paths of the wind over the surface. The velocity is expressed by a separate set of lines crossing the lines of flow at right angles and indicating the speed of the wind by their comparative proximity one to the other. The resulting chart shows clearly the lines of convergence and divergence and also the centres of cyclonic or anticyclonic action. These may be used as indicative of areas in which ascending or descending movements are taking place, but the chart does not otherwise give any representation of the vertical component in the atmospheric circulation.

On drawing these lines of flow on a map showing contours of altitude it is possible to deduce mathematically the vertical movement due to the land slope, in millimetres per second, and it is convenient to express this on another chart. In order to emphasise the points upon which weather forecasts would depend, the areas in which descending currents are indicated are shaded, whilst those in which ascending currents are indicated are left unshaded. Thus ascending currents are obviously to be expected on the windward slopes of rising land, and, unless the downward current due to convergence is too powerful, descending currents occur on leeward slopes. On comparing charts thus obtained with those showing the actual precipitation which has occurred simultaneously with the conditions of air circulation which have been mapped a remarkable correspondence is demonstrated, the heaviest rainfall coinciding with the areas of most pronounced upward motion and the rainless areas with those of descending currents.

Excellent illustrations of this method and its results were exhibited in maps of India giving the wind values and the total rainfall for a month during the south-west monsoon period; and also for a shorter

period by maps of the storm of November 28th, 1905, in the United States. An interesting point to which we never remember to have seen attention drawn before was clearly shown by the latter series. This is the fact that, owing to the far greater velocity in a horizontal than in a vertical direction, the lines of wind-flow prefer, when the obstacle presented by rising land is of considerable magnitude, to travel round rather than over the obstruction, provided, of course, there is a possibility of their doing so. This is a point which should prove of value in the study of problems of rainfall distribution in connection with specific types of atmospheric circulation.

If a number of charts are drawn in the manner described above, showing the conditions existing over the same area at successive intervals of time, say three hours, certain resemblances become obvious, and it is possible to trace the causes to which the change from one map to the next must be attributed. The practical question arises as to whether it is possible from the earlier map with no further data than can be made available immediately on its production, to construct that for the later time. If this can be done with a reasonable degree of certainty, a step will have been taken in the direction of weather forecasting by dynamical methods. This question Professor Bjerknæs answered in the affirmative, since we do actually possess the information which is necessary to link together the maps of the conditions at two successive time intervals, and he has actually demonstrated the possibility of producing such a map from the data available at an antecedent time. The prediction of the probable distribution of precipitation by the methods described follows as a natural corollary. There are, however, certain practical difficulties. The chart for the time being concerns itself with the lower strata of the atmosphere only, and, unless an allowance is made for changes in the upper air, there is the possibility that an unknown factor may be introduced. The effect which may result from movements in the upper strata may be brought about by (1) pressure, (2) friction, and (3) interchange of masses of air between upper and lower levels; but these effects can be shown to be very slow in operation, and, except in cases when the upper air is moving with a velocity greatly different from that of the lower air, the influence exerted is so small that we can afford to ignore it when dealing with so short a time interval as three hours. If upper air observations can be utilized in the process of construction of future maps for forecasting purposes the difficulty will be to a large extent eliminated, since pressure is the only one of these factors likely to be of importance.

The main obstacle confronting the meteorologist who would utilize Professor Bjerknæs's methods is one which it would be possible to overcome by means of co-operation. This is the difficulty which arises from the difference in existing methods of tabulating the meteorological data upon which it is necessary to draw for the purpose of rapid plotting. To produce a forecast, even for so short a period

as three hours hence, would indeed, under present conditions, involve the labour of a far greater period of time, but although this precludes any probability of practical utility for the present it does not in any way compromise the theoretical value of the method nor the hope of practical utility resulting in the future. To meet this hope Professor Bjerknes outlined a suggestion for the grouping of meteorological observations which would in no way interfere with their value for climatological purposes, but which would have the effect of rendering them convenient for utilization in the work of constructing synoptic dynamical charts. He suggested the necessity of strictly synchronous hourly observations the results of which would be arranged in such a way that all information relating to each particular hour from all stations observing should appear together. For this purpose Greenwich time should be universally adopted. Upper air observations would be required at slightly longer intervals, and should be grouped in the same manner. He foresaw that the development of aeronautics will, in the near future, create a demand for a more rational co-operation with the object of increasing the utility and availability of meteorological data, and it is to be hoped that with the realization of the practical necessity will come the called for re-organization.

Although Professor Bjerknes's method of attacking the problems of dynamical meteorology can hardly be said to have emerged from the laboratory stage, it seems to open out a rich field for research in this direction, and to illuminate from a new point of view some of the most difficult, but at the same time some of the most vital, problems with which modern meteorology is concerned. The lines along which Dr. W. N. Shaw and his colleagues have been moving point towards similar goals, and we look forward to seeing in the not very distant future these lines converging to a common point with those which Professor Bjerknes has been following. As Dr. Shaw has remarked, if the conclusions arrived at by the two separate methods of reasoning are identical the conclusions will thereby be proved to be true.

C. S.

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### ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session was held on Wednesday afternoon, June 15th, in the Society's Rooms, Mr. H. Mellish, President, in the chair.

A paper was read from Mr. J. I. Craig, of the Egyptian Survey Department, Cairo, entitled: "England—Abyssinia—The South Atlantic; a Meteorological Triangle." The idea that there may be an organic connection between the annual or seasonal total of rainfall in Western Europe, and the amount of the Nile flood, is no new one, for in 1882, Prof. Balfour Stewart gave reasons for claiming such a connection between the flood of the Nile and the flow in the Thames. More recently Colonel H. E. Rawson has indicated a connection between the weather in South Africa and that in Africa north of the

equator, and in particular the Nile flood. Dr. G. T. Walker has found a connection between the monsoon rainfall in India and pressure six months previously in Argentina, and Sir Norman Lockyer has proved the existence of an inverse barometric relationship between India and Argentina. Dr. W. N. Shaw has also drawn attention to certain correspondences between the velocity of the wind at St. Helena and the intensity of rainfall in the South of England, and pointed out that in the steady current of the south-east trade wind we may expect to find evidence of the throbbing of the aerial pulse consequent on the greater or smaller supply of solar radiation that reaches the Earth and is transformed into kinetic energy.

Another and much more efficient index of the same supply of energy and its transformation is afforded by the evaporation of moisture into the atmosphere, and since we may take it that the total amount of moisture in the air is fairly constant, increased evaporation in one place will mean increased rainfall in another. Thus the intensity of rainfall may reasonably become a measure of the rate at which energy is reaching ocean level, and so there are general reasons for expecting an underlying connection between atmospheric circulation, which we gauge by the south-east trade wind, and precipitation; and to test the relationship, Dr. Shaw has compared the former with the latter as measured by the rainfall in South England. His general conclusion is, that a strong case may be made out, but that further investigation is desirable.

Consideration of this suggestion of Dr. Shaw's led Mr. Craig to think that there might be a possibility of a connecting link between the velocity of the south-east trade wind and the rainfall in England. If, as it really appears, the two are correlated, this may be through direct dependence on some cause of world-wide operation, or through direct dependence of the rainfall on the trade wind. The latter seems to him the more likely and simple of the two suppositions, and if the association is direct, it must almost necessarily be due to the action of some atmospheric current.

Within the last ten years an organized Meteorological Service has been started in Egypt and the Sudan, and the results since obtained have enabled Mr. Craig to carry out this investigation more closely. He finds that there is a distinct tendency for the south-east trade wind of the South Atlantic to divide into two branches, the first continuing the general northward movement, and the second turning to the right, and moving across into the interior of Africa. He concludes that the moisture for the Nile flood comes from the South Atlantic, and that an increase in the velocity of the current will show itself in a proportional increase of the flood. There are too many gaps in the velocity records for the summer months to allow of a statistical test being applied, but it is not improbable that an intensification of the trans-African air-current is connected with a similar intensification of the south-east trade wind of the Atlantic, which again, as Dr. Shaw has shown, is not improbably connected with an

increase of rainfall in the South of England. Mr. Craig says that we may, therefore, expect to find some connection between the Nile flood and rainfall in the South of England during the summer months.

An interesting discussion followed the reading of this paper.

Mr. J. H. Casartelli was elected a Fellow of the Society.

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### REVIEWS.

*Meteorology, Practical and Applied.* By SIR JOHN MOORE, M.A., M.D., &c. Second revised and enlarged edition. London, Rebman, Limited, 1910. Size  $9 \times 5\frac{1}{2}$ . Pp. xxviii + 492. Price 10s. 6d. net.

WE welcome the new edition of this well-known work by the leading authority on meteorology in Ireland. In noticing it we need not repeat what is applicable to the new edition in our review of the first edition which appeared in 1894. But we have pleasure in seeing that the changes made have reduced the disparity in the treatment of the chief meteorological systems of the world, though the absence of reference to the Indian Meteorological Service and those of the continent of Europe is observable. The chapters which have not been re-written have been brought up to date, and several new illustrations have been introduced, while a new chapter on the Upper Atmosphere does justice to the latest developments of meteorological observing. The most valuable part of the book is undoubtedly Part IV., which deals with the influence of season and of weather on disease, and our only regret concerning it is that it has not been developed farther. We wish the new edition every success, and we hope that it will do good work in increasing the interest taken in meteorology amongst all English-speaking people, and most of all in Ireland where additional observing stations would be of great value.

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*Die Winde in Deutschland.* Im Auftrage der Motorluftschiff-Studien-gesellschaft in Berlin, bearbeitet von RICHARD ASSMANN, in Linden-berg. [The Winds in Germany. Prepared by Richard Assmann, in connection with the Berlin Research Society for Air-ships.] Braunschweig, Friedrich Vieweg & Sohn, 1910. Size  $13 \times 10$ . Pp. 62. Price 5 marks.

THE coming of aërial navigation has led to sudden demands being made on meteorologists which they are not always able to meet. For the public must learn that definite observations of a special kind cannot be obtained at a moment's notice; and it is just those people who most object to spending money on things of no practical utility to-day, who are loudest in their outcry at the want of foresight which prevented the accumulation of data which seemed useless yesterday but are now vital in the interests of practical developments. The experiments in Germany with lighter-than-air flying machines has created a general desire to know more about the winds to which the

destinies of these frail craft must be committed. Professor Assmann has discussed a great mass of data which were available—though when they were compiled they must have seemed useless enough to the airmen of to-day, then uninitiated—and got out average values for the frequency in different parts of Germany of winds from each direction and of five different forces. These are (1) from 0 to 2 metres per second, light winds in which an airship can exercise its full powers unhindered. (2) Moderate winds from 2 to 5 metres per second, in which a well found airship can be manœuvred without serious difficulty. (3) Fresh winds from 5 to 10 metres per second, by which all airships hitherto built would have their efficiency notably reduced. (4) Strong winds from 10 to 15 metres per second, which could only be met by an airship of exceptional power, and (5) storm winds exceeding 15 metres per second, which no airship yet built could face. To prepare this discussion 1,104,469 individual observations were dealt with, and 2,550 hours of work required to complete the volume before us. The result is a series of tables and diagrammatic wind-roses for winter, spring, summer, autumn and the year, at each of 49 stations in Germany, the average period being about 20 years at each. Tables are also given for wind frequencies at various heights in the free air.

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*Das Klima von Bergen.* I. Teil, Niederschläge. [The Climate of Bergen. Part I., Precipitation.] Von N. J. FÖRN. Bergen, John Greig, 1910. Size 9 × 6. Pp. 60.

A DISCUSSION of the rainfall of the town of Bergen, in which the records of several rainfall stations are worked up. Monthly values are given for the years 1765-70, and for every year from 1861 to 1908. The average annual rainfall comes out as 77·09 in. ; the year of greatest rainfall was 1887 (the driest year on record in the British Isles) with 111·58 in. ; the year with least rainfall was 1870, with 44·49 in. The average rainfall of the wettest month, October, is 9·02 in. ; of the driest month, April, 3·78 in. ; the greatest rainfall in any month was 19·76 in. in September, 1892, the least was ·28 in. in March, 1865. The heaviest fall in 24 hours was 4·69 in. on 27th September, 1901.

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*Basis of Evaporation. Temperature of the Sea around the British Islands. Notes on the Climate of Ireland.* By RICHARD STRACHAN, F.R.Met.Soc. London, Williams & Strachan, 1910. Size 8½ × 5½. Pp. 70. Price 4s.

MR. STRACHAN has produced a thoroughly readable little book full of individuality and a wealth of references which shows a mind devoted to much reading and revelling in freedom from official modes of thought and expression. We wish that we had, and regret that we have not, space to enter at some length into the subject of evaporation, which is the main theme of these articles, and on which Mr. Strachan has much to say that deserves attention.

## RAINFALL TABLE FOR JUNE, 1910.

| STATION.                       | COUNTY.           | Lat.<br>N.<br>° / | Long.<br>W.<br>[°E.]<br>° / | Height<br>above<br>Sea.<br>ft. | RAINFALL<br>OF MONTH.          |              |
|--------------------------------|-------------------|-------------------|-----------------------------|--------------------------------|--------------------------------|--------------|
|                                |                   |                   |                             |                                | Aver.<br>1875—<br>1909.<br>in. | 1910.<br>in. |
| Camden Square.....             | London.....       | 51 32             | 0 8                         | 111                            | 2'28                           | 2'17         |
| Tenterden.....                 | Kent.....         | 51 4              | *0 41                       | 190                            | 2'03                           | 1'88         |
| Steyning.....                  | Sussex.....       | 50 53             | 0 20                        | 80                             | 2'23                           | 3'61         |
| Southampton (Cadland) ..       | Hampshire.....    | 50 50             | 1 22                        | 52                             | 2'17                           | 2'42         |
| Hitchin.....                   | Hertfordshire ..  | 51 57             | 0 17                        | 238                            | 2'20                           | 1'84         |
| Oxford (Magdalen College).     | Oxfordshire.....  | 51 45             | 1 15                        | 186                            | 2'27                           | 2'83         |
| Bury St. Edmunds(Westley)      | Suffolk.....      | 52 15             | *0 40                       | 226                            | 2'21                           | 2'27         |
| Geldeston [Beccles].....       | Norfolk.....      | 52 27             | *1 31                       | 38                             | 1'77                           | 3'13         |
| Polapit Tamar [Launceston]     | Devon.....        | 50 40             | 4 22                        | 315                            | 2'18                           | 1'76         |
| Rousdon [Lyme Regis].....      | ".....            | 50 41             | 3 0                         | 516                            | 2'18                           | 2'08         |
| Stroud (Upfield).....          | Gloucestershire.. | 51 44             | 2 13                        | 226                            | 2'43                           | 3'73         |
| Church Stretton (Wolstaston).. | Shropshire.....   | 52 35             | 2 48                        | 800                            | 2'59                           | 2'54         |
| Coventry (Kingswood).....      | Warwickshire ..   | 52 24             | 1 30                        | 340                            | 2'52                           | 1'60         |
| Market Overton.....            | Rutland.....      | 52 44             | 0 41                        | 475                            | 2'07                           | 1'38         |
| Boston.....                    | Lincolnshire..... | 52 58             | 0 1                         | 25                             | 1'95                           | 1'47         |
| Worksop (Hodsock Priory).      | Nottinghamshire   | 53 22             | 1 5                         | 56                             | 2'06                           | 2'00         |
| Macclesfield.....              | Cheshire.....     | 53 15             | 2 7                         | 501                            | 2'85                           | 2'14         |
| Southport (Hesketh Park)..     | Lancashire.....   | 53 38             | 2 59                        | 38                             | 2'26                           | 2'95         |
| Wetherby (Ribston Hall) ...    | Yorkshire, W.R.   | 53 59             | 1 24                        | 130                            | 2'17                           | 2'40         |
| Arncliffe Vicarage.....        | ".....            | 54 8              | 2 6                         | 732                            | 3'63                           | 3'00         |
| Hull (Pearson Park).....       | "..... E.R.       | 53 45             | 0 20                        | 6                              | 2'09                           | 3'02         |
| Newcastle (Town Moor) ...      | Northumberland    | 54 59             | 1 38                        | 201                            | 2'04                           | 1'65         |
| Borrowdale (Seathwaite) ...    | Cumberland.....   | 54 30             | 3 10                        | 423                            | 6'94                           | 3'05         |
| Cardiff (Ely).....             | Glamorgan.....    | 51 29             | 3 13                        | 53                             | 2'55                           | 4'53         |
| Haverfordwest(High Street)     | Pembrokeshire ..  | 51 48             | 4 58                        | 95                             | 2'74                           | 3'16         |
| Aberystwyth (Gogerddan)..      | Cardigan.....     | 52 26             | 4 1                         | 83                             | 2'97                           | 6'58         |
| Llandudno.....                 | Carnarvon.....    | 53 20             | 3 50                        | 72                             | 1'97                           | 2'37         |
| Cargen [Dumfries].....         | Kirkcudbright...  | 55 2              | 3 37                        | 80                             | 2'84                           | 2'90         |
| Marchmont House.....           | Berwick.....      | 55 44             | 2 24                        | 498                            | 2'38                           | '85          |
| Girvan (Pinnore).....          | Ayr.....          | 55 10             | 4 49                        | 207                            | 3'05                           | 2'96         |
| Glasgow (Queen's Park) ...     | Renfrew.....      | 55 53             | 4 18                        | 144                            | 2'41                           | 1'73         |
| Inveraray (Newtown).....       | Argyll.....       | 56 14             | 5 4                         | 17                             | 3'64                           | 2'35         |
| Mull (Quinish).....            | ".....            | 56 36             | 6 13                        | 35                             | 3'30                           | 1'92         |
| Dundee (Eastern Necropolis)    | Forfar.....       | 56 28             | 2 57                        | 199                            | 2'06                           | 1'35         |
| Braemar.....                   | Aberdeen.....     | 57 0              | 3 24                        | 114                            | 2'18                           | 2'42         |
| Aberdeen (Cranford).....       | ".....            | 57 8              | 2 7                         | 120                            | 2'02                           | '70          |
| Cawdor.....                    | Nairn.....        | 57 31             | 3 57                        | 250                            | 2'13                           | 1'97         |
| Fort Augustus(S. Benedict's)   | E. Inverness ..   | 57 9              | 4 41                        | 68                             | 2'07                           | 1'27         |
| Loch Torridon (Bendamph)       | W. Ross.....      | 57 32             | 5 32                        | 20                             | 4'07                           | 2'83         |
| Dunrobin Castle.....           | Sutherland.....   | 57 59             | 3 56                        | 14                             | 2'10                           | '75          |
| Wick.....                      | Caithness.....    | 58 26             | 3 6                         | 77                             | 1'83                           | '94          |
| Killarney (District Asylum)    | Kerry.....        | 52 4              | 9 31                        | 178                            | 2'92                           | 4'46         |
| Waterford (Brook Lodge)...     | Waterford.....    | 52 15             | 7 7                         | 104                            | 2'79                           | 3'88         |
| Nenagh (Castle Lough).....     | Tipperary.....    | 52 54             | 8 24                        | 120                            | 2'70                           | 3'38         |
| Miltown Malbay.....            | Clare.....        | 52 52             | 9 26                        | 400                            | 3'12                           | 3'33         |
| Gorey (Courtown House) ..      | Wexford.....      | 52 40             | 6 13                        | 80                             | 2'59                           | 4'66         |
| Abbey Leix (Blandsfort)....    | Queen's County..  | 52 56             | 7 17                        | 532                            | 2'58                           | 5'58         |
| Dublin(Fitz William Square)    | Dublin.....       | 53 21             | 6 14                        | 54                             | 2'00                           | 6'21         |
| Mullingar (Belvedere).....     | Westmeath.....    | 53 29             | 7 22                        | 367                            | 2'72                           | 5'00         |
| Ballinasloe.....               | Galway.....       | 53 20             | 8 15                        | 160                            | 2'69                           | 3'80         |
| Crossmolina (Enniscoo).....    | Mayo.....         | 54 4              | 9 18                        | 74                             | 3'17                           | 5'20         |
| Collooney (Markree Obsy.)..    | Sligo.....        | 54 11             | 8 27                        | 127                            | 3'11                           | 5'52         |
| Seaforde.....                  | Down.....         | 54 19             | 5 50                        | 180                            | 2'88                           | 3'29         |
| Bushmills (Dundarave).....     | Antrim.....       | 55 12             | 6 30                        | 162                            | 2'56                           | 2'83         |
| Omagh (Edenfel).....           | Tyrone.....       | 54 36             | 7 18                        | 280                            | 2'82                           | 3'98         |

RAINFALL TABLE FOR JUNE, 1910—*continued.*

| RAINFALL OF MONTH (con.) |            |                   |        |             | RAINFALL FROM JAN. 1. |       |                      |            | Mean Annual 1875-1909. | STATION.        |
|--------------------------|------------|-------------------|--------|-------------|-----------------------|-------|----------------------|------------|------------------------|-----------------|
| Diff. from Av. in.       | o/o of Av. | Max. in 24 hours. |        | No. of Days | Aver. 1875-1909.      | 1910. | Diff. from Aver. in. | o/o of Av. |                        |                 |
|                          |            | in.               | Date.  |             | in.                   |       |                      |            | in.                    |                 |
| - .11                    | 95         | .63               | 25     | 13          | 10.96                 | 12.13 | +1.17                | 111        | 25.11                  | Camden Square   |
| - .15                    | 93         | .59               | 9      | 15          | 11.44                 | 13.91 | +2.47                | 122        | 27.64                  | Tenterden       |
| +1.38                    | 162        | 1.09              | 6      | 13          | 13.84                 | 19.96 | +6.12                | 144        | 33.58                  | Steyning        |
| + .25                    | 112        | .83               | 5      | 13          | 13.31                 | 14.19 | + .88                | 107        | 31.87                  | Cadland         |
| - .36                    | 84         | .53               | 30     | 14          | 10.81                 | 11.99 | +1.18                | 111        | 25.16                  | Hitchin         |
| + .56                    | 125        | 1.00              | 9      | 14          | 10.60                 | 11.21 | + .61                | 106        | 24.58                  | Oxford          |
| + .06                    | 103        | .46               | 24     | 11          | 10.76                 | 12.62 | +1.86                | 117        | 25.40                  | Westley         |
| +1.36                    | 177        | .68               | 25     | 13          | 9.61                  | 13.49 | +3.88                | 140        | 23.73                  | Geldeston       |
| - .42                    | 81         | .30               | 9      | 17          | 15.88                 | 21.39 | +5.51                | 135        | 38.27                  | Polapit Tamar   |
| - .10                    | 95         | .46               | 9      | 16          | 14.33                 | 14.66 | + .33                | 102        | 33.54                  | Rousdon         |
| +1.30                    | 153        | .90               | 7      | 14          | 13.08                 | 14.27 | +1.19                | 109        | 29.81                  | Stroud          |
| - .05                    | 98         | .42               | 4      | 18          | 14.30                 | 13.50 | - .80                | 94         | 32.41                  | Wolstaston      |
| - .92                    | 64         | .35               | 25     | 8           | 12.75                 | 11.17 | -1.58                | 88         | 28.98                  | Coventry        |
| - .69                    | 67         | .36               | 25     | 13          | 11.49                 | 12.21 | + .72                | 106        | 27.10                  | Market Overton  |
| - .48                    | 75         | .34               | 24, 27 | 9           | 9.86                  | 10.59 | + .73                | 107        | 23.35                  | Boston          |
| - .06                    | 97         | .46               | 7      | 13          | 10.80                 | 9.93  | - .87                | 92         | 24.46                  | Hodsock Priory  |
| - .71                    | 75         | .46               | 28     | 13          | 14.76                 | 15.49 | + .73                | 105        | 34.73                  | Macclesfield    |
| + .69                    | 130        | .69               | 29     | 15          | 12.96                 | 15.20 | +2.24                | 117        | 32.70                  | Southport       |
| + .23                    | 111        | .61               | 30     | 12          | 11.63                 | 15.29 | +3.66                | 131        | 26.87                  | Ribston Hall    |
| - .63                    | 83         | .81               | 27     | 14          | 27.22                 | 34.60 | +7.38                | 127        | 61.49                  | Arncliffe       |
| + .93                    | 144        | 1.48              | 24     | 13          | 11.08                 | 11.26 | + .18                | 102        | 26.42                  | Hull            |
| - .39                    | 81         | .37               | 2      | 14          | 11.55                 | 12.86 | +1.31                | 111        | 27.94                  | Newcastle       |
| -3.89                    | 44         | .98               | 27     | 9           | 56.38                 | 67.58 | +11.20               | 130        | 129.48                 | Seathwaite      |
| +1.98                    | 178        | 1.56              | 5      | 16          | 17.22                 | 23.59 | +6.37                | 137        | 42.28                  | Cardiff         |
| + .42                    | 115        | .52               | 24     | 18          | 19.45                 | 18.69 | - .76                | 96         | 46.82                  | Haverfordwest   |
| +3.61                    | 221        | 1.55              | 5      | 17          | 18.12                 | 24.82 | +6.70                | 137        | 45.46                  | Gogerddan       |
| + .40                    | 120        | .37               | 29     | 15          | 12.37                 | 16.23 | +3.86                | 131        | 30.36                  | Llandudno       |
| + .06                    | 102        | 1.06              | 8      | 7           | 19.06                 | 25.29 | +6.23                | 133        | 43.47                  | Cargen          |
| -1.53                    | 36         | .17               | 2      | 11          | 14.38                 | 10.83 | -3.55                | 75         | 33.76                  | Marchmont       |
| - .09                    | 97         | 1.60              | 20     | 15          | 21.10                 | 26.80 | +5.70                | 127        | 49.77                  | Girvan          |
| + .68                    | 72         | .42               | 24     | 11          | 15.51                 | 17.81 | +2.30                | 115        | 35.97                  | Glasgow         |
| -1.29                    | 65         | .75               | 21     | 15          | 29.32                 | 34.98 | +5.66                | 119        | 68.67                  | Inveraray       |
| -1.38                    | 58         | .54               | 21     | 17          | 23.55                 | 25.96 | +2.41                | 110        | 56.57                  | Quinish         |
| - .71                    | 65         | .55               | 28     | 10          | 12.02                 | 9.54  | -2.48                | 79         | 28.64                  | Dundee          |
| + .24                    | 111        | ...               | ...    | ...         | 15.15                 | 18.73 | +3.58                | 124        | 34.93                  | Braemar         |
| -1.32                    | 35         | .17               | 22     | 11          | 14.02                 | 12.47 | -1.55                | 89         | 32.73                  | Aberdeen        |
| - .16                    | 93         | .52               | 29     | 11          | 12.51                 | 14.96 | +2.45                | 120        | 29.33                  | Cawdor          |
| - .80                    | 61         | .29               | 20     | 12          | 20.22                 | 25.26 | +5.04                | 125        | 44.53                  | Fort Augustus   |
| -1.24                    | 70         | .48               | 30     | 10          | 37.39                 | 47.46 | +10.07               | 127        | 83.61                  | Bendamph        |
| -1.35                    | 36         | .19               | 29     | 12          | 14.28                 | 12.66 | -1.62                | 89         | 31.90                  | Dunrobin Castle |
| - .89                    | 51         | .25               | 29     | 13          | 12.71                 | 12.75 | + .04                | 100        | 29.88                  | Wick            |
| +1.54                    | 153        | 1.12              | 26     | 19          | 24.87                 | 32.85 | +7.98                | 132        | 54.81                  | Killarney       |
| +1.09                    | 139        | .90               | 1      | 17          | 17.40                 | 16.49 | - .91                | 95         | 39.57                  | Waterford       |
| + .68                    | 125        | .82               | 20     | 18          | 17.51                 | 23.27 | +5.76                | 133        | 39.43                  | Castle Lough    |
| + .21                    | 107        | .50               | 20     | 23          | 18.71                 | 22.47 | +3.76                | 120        | 45.11                  | Miltown Malbay  |
| +2.07                    | 180        | 1.51              | 1      | 15          | 15.42                 | 16.02 | + .60                | 104        | 34.99                  | Courtown Ho.    |
| +3.00                    | 216        | 1.27              | 20     | 21          | 15.84                 | 22.25 | +6.41                | 141        | 35.92                  | Abbey Leix      |
| +4.21                    | 311        | 1.26              | 5      | 19          | 12.15                 | 18.63 | +6.48                | 153        | 27.68                  | Dublin          |
| +2.28                    | 184        | 1.70              | 20     | 20          | 16.01                 | 20.88 | +4.87                | 130        | 36.14                  | Mullingar.      |
| +1.11                    | 141        | .77               | 5      | 21          | 16.15                 | 19.44 | +3.29                | 120        | 36.64                  | Ballinasloe     |
| +2.03                    | 164        | 1.18              | 20     | 20          | 23.38                 | 30.29 | +6.99                | 130        | 52.87                  | Enniscoie       |
| +2.41                    | 177        | .75               | 8      | 20          | 18.83                 | 28.23 | +9.40                | 150        | 42.71                  | Markree         |
| + .41                    | 114        | .58               | 14     | 16          | 17.42                 | 16.75 | - .67                | 96         | 38.91                  | Seaforde        |
| + .27                    | 111        | 1.11              | 21     | 14          | 15.49                 | 19.68 | +4.19                | 127        | 37.56                  | Dundarave       |
| +1.16                    | 141        | 1.25              | 20     | 18          | 17.10                 | 21.73 | +4.63                | 127        | 39.38                  | Omagh           |

## SUPPLEMENTARY RAINFALL, JUNE, 1910.

| Div.  | STATION.                     | Rain<br>inches | Div.   | STATION.                     | Rain-<br>inches |
|-------|------------------------------|----------------|--------|------------------------------|-----------------|
| II.   | Warlingham, Redvers Road     | 2.43           | XI.    | Llangyhanfal, Plâs Draw....  | 3.58            |
| „     | Ramsgate .....               | 3.41           | „      | Dolgelly, Bryntirion .....   | 5.48            |
| „     | Hailsham .....               | 1.89           | „      | Bettws-y-Coed, Tyn-y-bryn    | 3.31            |
| „     | Totland Bay, Aston House.    | 3.29           | „      | Lligwy .....                 | 2.10            |
| „     | Stockbridge, Ashley .....    | 2.93           | „      | Douglas, Woodville .....     | ...             |
| „     | Grayshott .....              | 3.40           | XII.   | Stoneykirk, Ardwell House    | 1.39            |
| „     | Reading, Calcot Place.....   | 3.29           | „      | Dalry, The Old Garroch ...   | 2.11            |
| III.  | Harrow Weald, Hill House.    | 2.87           | „      | Langholm, Drove Road.....    | 2.05            |
| „     | Pitsford, Sedgebrook .....   | 1.07           | „      | Moniaive, Maxwellton House   | 2.10            |
| „     | Huntingdon, Brampton.....    | 1.28           | XIII.  | St Mary's Loch, Cramilt Ldge | 2.61            |
| „     | Woburn, Milton Bryant.....   | 2.42           | „      | Edinburgh, Royal Obsvtry.    | 1.13            |
| „     | Wisbech, Monica Road.....    | 1.02           | XIV.   | Maybole, Knockdon Farm..     | 2.35            |
| IV.   | Southend Water Works.....    | 2.39           | XV.    | Campbeltown, Witchburn...    | 2.18            |
| „     | Colchester, Lexden.....      | 1.40           | „      | Glenreadell Mains.....       | 2.10            |
| „     | Newport .....                | 1.36           | „      | Ballachulish House.....      | 1.66            |
| „     | Rendlesham .....             | 1.63           | „      | Islay, Eallabus .....        | 1.68            |
| „     | Swaffham .....               | 2.32           | XVI.   | Dollar Academy .....         | .95             |
| „     | Blakeney .....               | 2.15           | „      | Balquhider, Stronvar .....   | 3.50            |
| V.    | Bishops Cannings .....       | 3.87           | „      | Coupar Angus .....           | 2.04            |
| „     | Winterbourne Steepleton ...  | 2.38           | „      | Blair Atholl.....            | 2.69            |
| „     | Ashburton, Druid House ...   | 2.11           | „      | Montrose, Sunnyside Asylum   | 1.07            |
| „     | Honiton, Combe Raleigh ...   | 2.65           | XVII.  | Alford, Lynturk Manse ...    | .93             |
| „     | Okehampton, Oaklands.....    | 3.40           | „      | Keith Station .....          | 1.96            |
| „     | Hartland Abbey .....         | 2.91           | XVIII. | Glenuoich, Laon .....        | 3.20            |
| „     | Lynmouth, Rock House ...     | 3.36           | „      | Skye, Dunvegan.....          | 1.73            |
| „     | Probus, Lamellyn .....       | 2.53           | „      | N. Uist, Lochmaddy .....     | 1.80            |
| „     | North Cadbury Rectory ...    | 6.38           | „      | Alvey Manse .....            | 2.19            |
| VI.   | Clifton, Pembroke Road ...   | 5.43           | „      | Loch Ness, Drumnadrochit.    | 2.25            |
| „     | Ross, The Graig .....        | 3.66           | „      | Glencarron Lodge .....       | 2.51            |
| „     | Shifnal, Hatton Grange.....  | 1.92           | „      | Fearn, Lower Pitkerrie.....  | 1.62            |
| „     | Blockley, Upton Wold .....   | 4.14           | XIX.   | Invershin .....              | 1.72            |
| „     | Worcester, Boughton Park.    | 3.20           | „      | Altnaharra .....             | 1.41            |
| VII.  | Market Rasen .....           | 2.67           | „      | Bettyhill .....              | 1.11            |
| „     | Bawtry, Hesley Hall.....     | 2.13           | XX.    | Dunmanway, The Rectory..     | 2.79            |
| „     | Derby, Midland Railway ...   | 1.58           | „      | Cork .....                   | 3.93            |
| „     | Buxton.....                  | 2.74           | „      | Mitchelstown Castle .....    | 4.43            |
| VIII. | Nantwich, Dorfold Hall.....  | 2.04           | „      | Darrynane Abbey .....        | 3.37            |
| „     | Liscard .....                | 3.94           | „      | Glenam [Clonmel] .....       | 4.35            |
| „     | Chatburn, Middlewood .....   | 2.64           | „      | Nenagh, Traverston .....     | 3.58            |
| „     | Cartmel, Flookburgh .....    | 2.18           | „      | Newmarket-on-Fergus, Fenloe  | ...             |
| IX.   | Langsett Moor, Up. Midhope   | 3.65           | XXI.   | Laragh, Glendalough .....    | 4.51            |
| „     | Scarborough, Scalby .....    | 1.89           | „      | Moynalty, Westland .....     | 6.42            |
| „     | Ingleby Greenhow .....       | 1.90           | „      | Athlone, Twyford .....       | 4.57            |
| „     | Mickleton.....               | 1.17           | XXII.  | Woodlawn .....               | 4.58            |
| X.    | Bardon Mill, Beltingham ...  | 1.61           | „      | Westport, St. Helens .....   | 4.70            |
| „     | Ilderton, Lilburn Cottage... | 1.67           | „      | Achill Island, Dugort .....  | 5.26            |
| „     | Keswick, The Bank .....      | 1.91           | „      | Mohill .....                 | 4.49            |
| XI.   | Llanfrefcha Grange.....      | ...            | XXIII. | Enniskillen, Portora .....   | 4.97            |
| „     | Treherbert, Tyn-y-waun ...   | 7.58           | „      | Dartrey [Cootehill].....     | 4.64            |
| „     | Carmarthen, The Friary.....  | 4.13           | „      | Warrenpoint, Manor House     | 4.23            |
| „     | Castle Malgwyn [Llechryd].   | 3.66           | „      | Banbridge, Milltown .....    | 4.32            |
| „     | Plynlimon.....               | 10.50          | „      | Belfast, Springfield .....   | 3.47            |
| „     | Crickhowell, Ffordlas.....   | 8.50           | „      | Glenarm Castle.....          | 4.29            |
| „     | New Radnor, Ednol .....      | 6.16           | „      | Londonderry, Creggan. Res.   | 4.60            |
| „     | Rhayader, Tyrmynydd .....    | 8.43           | „      | Killybegs .....              | 4.77            |
| „     | Lake Vyrnwy .....            | 4.57           | „      | Horn Head .....              | 4.13            |

## METEOROLOGICAL NOTES ON JUNE, 1910.

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.—Unsettled conditions with fluctuating temp., and frequent though not severe TSS, prevailed in the first half. Fine, sunny and hot weather set in on 14th lasting until 21st, after which the weather was of a showery and changeable nature. Duration of sunshine, 159·4\* hours, and of R 28·0 hours. Mean temp. 61°·8, or 1°·5 above the average. Shade max. 84°·3 on 20th, the highest shade temp. since 15th August, 1909; min. 45°·5 on 27th F 0, f 0.

TENTERDEN.—A fairly pleasant summer month with no extreme heat; showery in last week and very windy from 28th to 30th. Duration of sunshine, 197·0† hours. Shade max. 78°·0 on 20th; min. 44°·0 on 15th and 30th. F 0, f 0.

TOTLAND BAY.—There was an unusual number of TSS, and two buildings were struck. Duration of sunshine, 211·3\* hours. Shade max. 72°·1 on 5th; min 46°·8 on 4th. F 0, f 0.

PITSFORD.—R ·88 in. below the average. Mean temp. 59°·5. Shade max. 81°·4 on 20th; min. 42°·0 on 15th. F 0.

NORTH CADBURY.—The wettest month in 14 years record excepting October, 1903. Torrential R and unprecedented continuance of TSS from 5th to 10th with 3·85 in. of R in the 6 days. Four casualties were due to L. Shade max. 83°·0 on 19th; min. 41°·5 on 4th. F 0, f 0.

ROSS.—Heavy TSS with R amounting to 2·77 in. occurred from 5th to 10th, followed by 10 days of fine, warm weather. Towards the close the weather was very unsettled and haymaking was stopped. Shade max. 81°·5 on 20th; min. 40°·0 on 17th. F 0, f 0.

HODSOCK PRIORY.—At 1 30 a.m. on 8th, ·30 in. of R fell in 6 minutes. Shade max. 80°·1 on 19th; min. 38°·4 on 17th. F 0, f 0.

SOUTHPORT.—Duration of sunshine 216·7\* hours, and of R 43·9 hours. Mean temp. 57°·8, or 0°·9 above the average. Shade max. 77°·9 on 7th; min. 46°·2 on 17th. F 0, f 0.

HULL.—Generally fine, but often very cloudy to 21st; frequent TSS afterwards. Shade max. 79°·0 on 21st; min. 44°·0 on 14th. F 0, f 0.

HAVERFORDWEST.—Cold at first, but fine and warm from 7th to 21st. Duration of sunshine, 187·4\* hours. Shade max. 72°·5 on 8th; min. 40°·6 on 17th. F 0, f 0.

LLANDUDNO.—Shade max. 81°·0 on 20th; min. 47°·0 on 14th. F 0, f 0.

CARGEN.—Favourable weather for agricultural interests; crops of all kinds promise well. Shade max. 79°·0 on 10th; min. 42°·0 on 3rd and 15th. F 0.

EDINBURGH.—Shade max. 71°·2 on 12th; min. 42°·4 on 15th. F 0, f 0.

COUPAR ANGUS.—The month opened cold and unseasonable, but after 6th a period of dry warm days set in lasting two weeks when TSS brought about a lower temp. Mean temp. 56°·4, or 1°·5 above the average. Shade max. 80°·5 on 12th; min. 34°·0 on 5th and 6th. F 0, f 2.

FORT AUGUSTUS.—Shade max. 74°·2 on 18th; min. 36°·8 on 2nd. F 0.

WATERFORD.—No R fell from 9th to 19th inclusive. Shade max. 69°·0 on 20th; min. 45°·0 on 1st and 14th. F 0.

ABBEY LEIX.—The wettest June in 37 years.

DUBLIN.—Frequent torrential R establishing a record measurement. Remarkable successions of TSS from 7th to 9th, and from 20th to 24th. Mean temp. 57°·6. Temp. reached 70° on only 3 days. Shade max. 73°·6 on 20th; min. 42°·9 on 1st. F 0, f 0.

MARKREE.—The wettest June on record. Shade max. 74°·8 on 7th; min. 35°·3 on 3rd. F 0, f 1.

WARRENPOINT.—Although the R was heavy, there were many fine days. There was a good deal of T and vivid L, and the wind was E. for the greater part. Shade max. 71°·0 on 19th; min. 45°·0 on 13th. F 0, f 0.

\* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, January, 1910.

| STATIONS.<br><br><i>(Those in italics are South of the Equator.)</i> | Absolute. |       |          |       | Average. |        |            |           | Absolute.    |                | Total Rain |       | Aver.<br>Cloud. |
|----------------------------------------------------------------------|-----------|-------|----------|-------|----------|--------|------------|-----------|--------------|----------------|------------|-------|-----------------|
|                                                                      | Maximum.  |       | Minimum. |       | Max.     | Min.   | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth.     | Days. |                 |
|                                                                      | Temp.     | Date. | Temp.    | Date. |          |        |            |           |              |                |            |       |                 |
| London, Camden Square                                                | 55°·7     | 2     | 19°·6    | 27    | 45°·1    | 34°·6  | 36°·9      | 89        | 78°·2        | 14°·5          | 1·57       | 14    | 6·5             |
| Malta ... ..                                                         | 64°·6     | 12    | 42°·2    | 24    | 58°·3    | 51°·2  | 47°·5      | 77        | 131°·4       | ...            | 4·79       | 14    | 5·3             |
| Lagos ... ..                                                         | 90°·0     | 20    | 65°·0    | 14    | 86°·9    | 72°·2  | 67°·3      | 63        | 141°·0       | 61°·0          | ·38        | 1     | 8·2             |
| Cape Town ... ..                                                     | 93°·0     | 23    | 53°·3    | 1     | 79°·5    | 61°·7  | 58°·3      | 66        | ...          | ...            | ·01        | ...   | 2·0             |
| Durban, Natal ... ..                                                 | 88°·4     | 9     | 63°·2    | 16    | 81°·6    | 67°·2  | ...        | ...       | 148°·3       | ...            | 3·99       | 16    | 5·1             |
| Johannesburg ... ..                                                  | 83°·2     | 7     | 48°·4    | 22    | 73°·9    | 54°·0  | 54°·2      | 77        | 143°·1       | 47°·5          | 4·94       | 16    | 4·3             |
| Mauritius ... ..                                                     | 90°·2     | 4     | 68°·1    | 3     | 85°·7    | 73°·9  | 71°·0      | 77        | 158°·8       | 62°·6          | 7·13       | 21    | 6·8             |
| Calcutta... ..                                                       | 60°·5     | 31    | 49°·8    | 30    | 75°·7    | 56°·1  | 55°·4      | 69        | ...          | 44°·4          | 1·67       | 2     | 2°·0            |
| Bombay... ..                                                         | 88°·6     | 28    | 60°·3    | 18    | 83°·7    | 67°·3  | 63°·6      | 69        | 135°·6       | 55°·9          | ·00        | 0     | 0·7             |
| Madras ... ..                                                        | 87°·2     | 27    | 63°·8    | 17    | 86°·0    | 67°·2  | 67°·5      | 76        | 136°·8       | 60°·4          | ·20        | 4     | 3·2             |
| Kodaikanal ... ..                                                    | 68°·9     | 21    | 42°·9    | 22    | 62°·9    | 46°·3  | 38°·9      | 56        | 122°·7       | 23°·9          | 1·77       | 5     | 3·5             |
| Colombo, Ceylon ... ..                                               | 94°·2     | 30    | 68°·7    | 16    | 87°·5    | 71°·6  | 70°·6      | 76        | 167°·8       | 64°·3          | ·95        | 4     | 5·7             |
| Hongkong ... ..                                                      | 77°·8     | 9     | 44°·2    | 25    | 66°·5    | 57°·8  | 55°·0      | 76        | 128°·9       | ...            | ·89        | 7     | 7·3             |
| Melbourne ... ..                                                     | 104°·4    | 25    | 49°·5    | 1     | 79°·2    | 58°·6  | 54°·7      | 60        | 156°·6       | 43°·7          | ·98        | 11    | 5·3             |
| Adelaide ... ..                                                      | 105°·1    | 25    | 50°·5    | 17    | 88°·8    | 64°·3  | 53°·6      | 45        | 168°·9       | 42°·2          | ·02        | 1     | 3·4             |
| Coolgardie ... ..                                                    | 113°·0    | 24    | 52°·0    | 18    | 94°·8    | 63°·1  | 50°·4      | 37        | 179°·0       | 50°·0          | ·00        | 0     | 1·6             |
| Perth ... ..                                                         | 100°·1    | 12    | 53°·1    | 30    | 83°·6    | 63°·4  | 57°·0      | 57        | 158°·3       | 47°·0          | ·77        | 6     | 2·9             |
| Sydney ... ..                                                        | 91°·8     | 16    | 57°·1    | 1     | 78°·3    | 65°·2  | 62°·0      | 72        | ...          | 45°·7          | 5·30       | 21    | 6°·0            |
| Wellington ... ..                                                    | 75°·0     | 11*   | 49°·2    | 6     | 68°·6    | 57°·4  | 55°·3      | 76        | 129°·0       | 41°·0          | 6·00       | 13    | 7·7             |
| Auckland ... ..                                                      | 80°·0     | 26    | 54°·0    | 6     | 74°·9    | 62°·3  | 62°·5      | 82        | 100°·0       | 51°·0          | 4·52       | 15    | 5·7             |
| Jamaica, Kingston ... ..                                             | 88°·6     | 7     | 59°·7    | 27    | 83°·9    | 65°·5  | 63°·6      | 72        | ...          | ...            | 2·10       | 7     | 4°·5            |
| Grenada ... ..                                                       | 85°·6     | 23    | 70°·0    | 7, 9‡ | 81°·9    | 72°·3  | 68°·3      | 73        | 141°·0       | ...            | 4·68       | 18    | 4°·0            |
| Toronto ... ..                                                       | 41°·2     | 18*   | -7°·0    | 4     | 31°·9    | 19°·0  | ...        | 87        | 48°·7        | -9°·3          | ...        | ...   | ...             |
| Fredericton ... ..                                                   | 55°·3     | 22    | -20°·0   | 15    | 29°·3    | 10°·0  | ...        | 87        | ...          | ...            | 4·60       | 8     | 5·8             |
| St. John's, N.B. ... ..                                              | 52°·5     | 22    | -7°·7    | 5     | 33°·9    | 20°·1  | ...        | 81        | ...          | ...            | 5·41       | 13    | 6°·3            |
| Victoria, B.C. ... ..                                                | 51°·2     | 23    | 23°·8    | 3     | 42°·6    | 34°·9  | ...        | 86        | ...          | ...            | 4·54       | 18    | 8°·0            |
| Dawson ... ..                                                        | 29°·0     | 28‡   | -54°·0   | 11    | -12°·5   | -28°·4 | ...        | ...       | ...          | ...            | 1·31       | 11    | 6°·2            |

\* and 20. † and 29. ‡ 18 and 24. § and 10.

MALTA.—Mean temp. of air 54°·2. Average bright sunshine 5·8 hours per day.

Johannesburg.—Bright sunshine 261·8 hours.

Mauritius.—Mean temp. of air 0°·1 below, of dew point 0°·8 above, and R ·82 in. below, averages. Mean hourly velocity of wind 12·0 miles, or 1·0 above average.

KODAIKANAL.—Bright sunshine 248 hours.

COLOMBO.—Mean temp. of air 77°·3, or 1°·8 below, of dew point 0°·5 above, and R 2·47 in. below, averages. Mean hourly velocity of wind 9·0 miles.

HONGKONG.—Mean temp. of air 61°·8, or 1°·7 above, and R ·60 in. below, averages. Bright sunshine 141·1 hours. Mean hourly velocity of wind 12·7 miles.

Melbourne.—Mean temp. of air 1°·5 above, and R ·92 in. below, averages.

Adelaide.—Rainfall ·80 in. below average.

Coolgardie.—Mean temp. of air 2°·0 above average.

Sydney.—Mean temp. of air 0°·2 above, and R 1·86 in. above, averages.

Wellington.—Mean temp. of air 0°·3, and R 2·78 in., above averages.

Auckland.—Mean temp. slightly above, and R considerably above, averages.

GRENADA.—Slight shocks of earthquakes on 23rd and 27th.