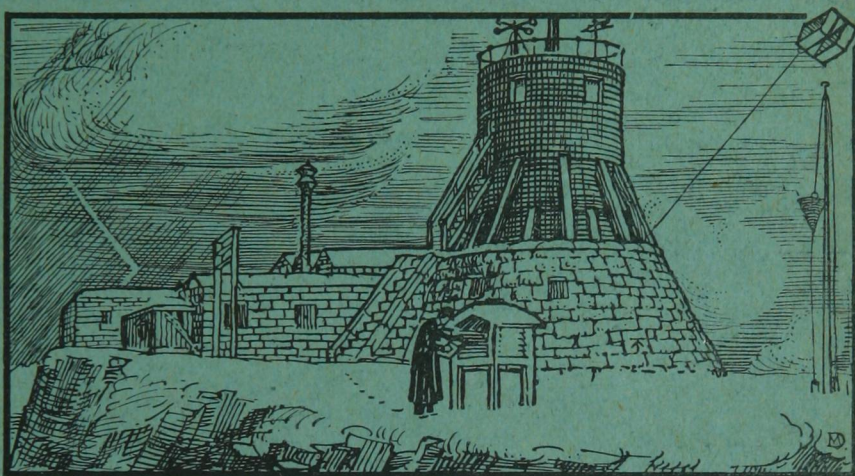


NO. 550 SYMONS'S VOL. 46
 METEOROLOGICAL
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 EDITED BY HUGH ROBERT MILL



NOVEMBER, 1911.

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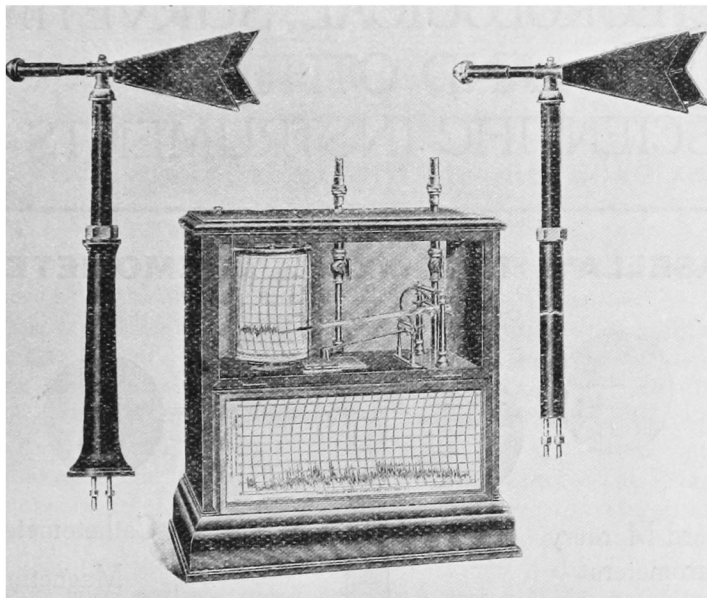
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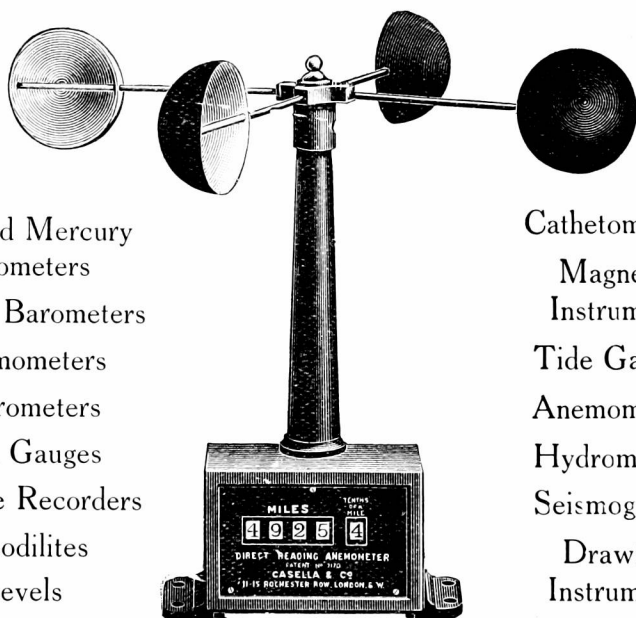
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NOVEMBER, 1911.

VOL. XLVI.

IS THE ZODIACAL LIGHT A METEOROLOGICAL PHENOMENON ?

By F. W. HENKEL, B.A., F.R.A.S.

THE true nature of the mysterious luminosity known as the Zodiacal Light is still a matter about which considerable uncertainty exists, so that although we may certainly class it amongst τὰ μετέωρα (the things above) it cannot be definitely asserted that it is an astronomical or cosmical phenomenon rather than a meteorological or terrestrial one. Singularly enough, this apparition appears to have escaped the notice of the ancients, and even of the keen-sighted Arab observers of mediæval times, though obscure references to the "Trabes" occur in Pliny's Natural History and other works, which have been considered by some to relate to the Zodiacal Light, though it seems, on the whole, more probable that the Aurora is intended, and, indeed, even in recent times considerable confusion between the two phenomena has existed. It is somewhat doubtful whether Kepler ever saw the light or recognised its existence, and the first undoubted mention occurs in Childrey's "Natural History of England" (1659) and his "Britannia Baconica" (1661), in which works he draws the attention of the curious to a singular light noticed by him in the early spring evenings, describing its course in much the same terms as later observers. But it was through the observations of Dominique Cassini, one of the illustrious dynasty of astronomers at the Paris Observatory, that the existence of the phenomenon became generally known to the scientific world. He first saw it in March, 1683, and in consequence of his observations published a theory not differing greatly from what is now regarded as, on the whole, the most probable view of its nature. In our latitudes the Zodiacal Light is a soft conical or lenticular beam extending upwards from the western horizon in spring evenings, and from the eastern horizon on autumn mornings before sunrise, being best seen at those times of the year because the portion of the ecliptic along which it lies is then most nearly perpendicular to the horizon, and the light has, consequently, its greatest upward extension. Its axis lies nearly along the ecliptic or, perhaps, more nearly in the plane of the sun's equator, its course being almost entirely confined

to the limits of the Zodiac, which is the broad belt extending about 8° north and south of the sun's apparent path in the sky, whence the name Zodiacal Light. At its base near the horizon the breadth varies from about 8° to 20° , occasionally exceeding the latter dimensions, but its edges are so ill-defined and faint that much difficulty is experienced in saying exactly how far it extends. The light sometimes does not extend more than 70° from the sun's place in the sky, but occasionally has been traced over more than 100° from that position, whilst, as we shall presently mention, the "Gegenschein" is at an angular distance of 180° from the sun. Its brilliancy is usually interior to that of the brighter parts of the Milky Way, and the base is often of a reddish hue, due, no doubt, to the superposition of twilight effects upon it. In tropical regions it is seen of much greater brilliancy, of a pure white colour, and has been said to extend sometimes right across the sky, forming a complete ring. Many observations were made by Humboldt, both in Europe and during his journeys through tropical South America. He particularly noticed the great contrast between its luminosity in our latitudes and more favoured regions, and also the remarkable variations in its brilliancy as seen at different times from the same place, partly, but not wholly, to be accounted for by varying atmospheric conditions.

In 1855 the Rev. G. Jones, after a two years' cruise of the U.S. frigate *Mississippi*, published a volume dealing very exhaustively with his observations on the Zodiacal Light and deductions therefrom. On two occasions, when in latitude $23\frac{1}{2}^{\circ}$ N. at the winter solstice, he saw the extraordinary spectacle of the Zodiacal Light simultaneously visible near both the eastern and western horizons from 11 p.m. to 1 a.m., for several successive nights. Humboldt relates that he, too, once saw a second light in the east contemporaneously with the principal beam in the west, which he then thought to be due to reflection. Brorsen was the first, however, definitely to detect another interesting feature in connection with this phenomenon. Watching the sky on moonless nights he several times noticed a large, feeble glow of very diffused light. This glow was of, roughly, circular shape, and from 10° to 15° in diameter. By a few nights' observations he found that this object was moving eastwards amongst the stars nightly, and that the position of its centre was almost exactly opposite to the sun's place in the sky, but perhaps slightly to the north of the ecliptic. An imaginary line drawn from the sun through the Earth's centre and prolonged into the sky would always pass near the centre of this object, which he accordingly named the Gegenschein or Counter-glow. The Gegenschein has since been carefully studied by Barnard in America, Backhouse in England, and others. It was well seen at Johannesburg during the autumn of 1910 by Mr. Innes and his assistants, and seems to have been especially distinct towards the end of September. In form it is usually seen rather as a somewhat elongated oval than circular, the centre about one degree north of the ecliptic and its

longitude approximately $179\frac{1}{2}^{\circ}$ from the sun's place (Backhouse), the longer axis parallel to the ecliptic, and about 7° in length. Mr. Maxwell Hall, of Jamaica, in the "Monthly Weather Review," March, 1906, gives some results of his observations for thirty years of the Zodiacal Light and Gegenschein. He found a breadth varying from 47° , at an angular distance of 30° from the sun's place, to 6° at 180° angular distance, and examined its spectrum by means of a small, direct vision spectroscope. All that he could gather from these observations "showed that the Zodiacal Light contained reflected light from the sun." He found the Gegenschein to be sometimes invisible, at other times very distinct, varying little from the usual 6° or 7° , in breadth, but as much as 30° in length at 180° from the sun's position.

Observations made by other observers give considerable divergencies as to the character of the spectrum. The late A. C. Ranyard and Father Secchi found, in 1870, that the Zodiacal Light is produced by matter reflecting the sun's light, and obtained nothing but a faint, continuous spectrum, whilst Angström at Upsala, and Acrimiz in Spain, found the spectrum to be mainly two bright lines, which they identified with those given by the Aurora. Serpieri of Urbino, Gronemann of Holland, and others look upon the phenomena as a purely terrestrial one, possibly of an electrical nature, whilst most astronomers incline to the views of Cassini, adopted without much modification from later discovery. Cassini considered that in the space between the sun and the Earth there circulates an immense number of small bodies, forming a ring, these particles reflecting the sunlight, though too small to be visible separately. Observations showing that the Zodiacal Light extends more than 90° away from the sun's position in the sky, it is evident that some part of the matter lies beyond the Earth's orbit, and accordingly it has been assumed that these countless small bodies form rather a kind of thin, flat sheet whose innermost edge may, perhaps, be continuous with the solar corona, and whose outer members lie far beyond the region travelled over by our planet. That the Earth encounters such objects is well known from the phenomena of meteoric stones, aerolites, and shooting stars, and, in addition, "empty space" must contain myriads of fragments of "cosmic dust," *débris* from comets' tails—in short, the matter of which the resisting medium is composed. Some of these bodies, moving in elongated elliptic orbits whose nearest point is close to the central body, by falling upon the sun may produce the appearances known as sun spots, and the equatorial acceleration of solar rotation. Mr. Jones, however, from his observations considered that they showed the existence of a "nebulous ring, with the Earth for its centre, lying within the orbit of the moon." Thus our own Earth, without our previously suspecting it, became endowed with a ring like the inner "crape ring" of Saturn. Commander Wilks, however, controverted Jones's views and regarded the Zodiacal Light as the result of the illumination of that portion

of the Earth's atmosphere upon which the rays of the sun fall vertically in tropical regions. He contrasted the tints of the evening and the morning Zodiacal Lights, describing the former as of a warm golden or purplish hue, the latter as being "cold and silvery," often in the tropics appearing as a bright brush of light, like a ray of the aurora, but without vacillating or pulsations.

Dr. Gronemann asserted that the connection between the morning and evening cones of light is not definitely established, and there is no evidence of their participation in the diurnal motion, so that, in his opinion, it is a purely terrestrial phenomenon, as already stated, "probably of an electrical nature." On the other hand, evidence is not wanting of its change of appearance in the course of the year, and during a single night, its rising and setting, whilst these, as well as its position along the ecliptic rather than along the equator (the plane of the Earth's orbital motion, not that of the diurnal motion), are all in favour of the theory of its extra-terrestrial origin.

The late Sir William Huggins, who was inclined to regard the solar corona as probably due to the continual outflow of very minute particles from the sun, considered that the Zodiacal Light is a result of the yet further extension of these bodies. Dr. Veeder, of Rochester, New York, draws attention to changes in magnetic phenomena, and the varying presentment of the Earth and sun, as all having their influence on the peculiarities of the Zodiacal Light. That some part at least of the differences of opinion already outlined arises from the confusion between distinct phenomena is fairly evident. A phenomenon, which he called the Lunar Zodiacal Light, was described by the Rev. G. Jones as being a short, oblique cone lying nearly in the plane of the ecliptic, and in the immediate vicinity of the moon, but has not been noticed by others. On occasions comet-like tails have been seen extending on each side of the moon to a distance of eight to ten times its diameter. The *horizon light* is another phenomenon occasionally seen. It is a faint white band, with parallel sides, lying all round and parallel to the horizon, separated from it by a dark interval. It is brightest and sharpest at its lower edge, which is usually at an altitude of about 5° , whilst the upper and fainter edge has usually an altitude of about 20° . At times it is as bright as the Milky Way, at others fainter than the Gegenschein. It appears to be caused by reflected starlight. Of the Gegenschein a number of different theories have been proposed. One of the most recent is that suggested by Mr. Innes, director of the Transvaal Observatory, in a letter to *Nature* (June 16th, 1910). The Earth is bombarded by meteorites which are continually throwing off corpuscles; these are repelled by the Earth and sun, thus producing in the part of the sky opposite the latter a faint tail, less extensive than that of a comet, but bright enough to be visible on a dark night as the Gegenschein. Professor Gylden has suggested that there are numerous small bodies moving in somewhat unstable orbits about the Earth, and more concentrated about the

region nearly opposite the sun's place. Professor E. E. Barnard, who had not previously heard of its existence, in 1883 independently discovered it, and watched its changes of form. He found it to be invisible in June and December, most round and conspicuous in March and September, like the Zodiacal Light, with which it is intimately connected. Nevertheless, though observations made simultaneously in North America and at Arequipa, in Peru, showed the absence of any large parallax (or displacement due to change of position on the Earth's surface), seeming to indicate that its distance is much greater than that of the moon, Professor Barnard is inclined to the view that it is an atmospheric phenomenon. He says, "When well seen the 'Gegenschein' always appears to be not far off, rather an illumination of our own atmosphere than a distinct celestial body." ("Popular Astronomy," No. 64.) Another view connects it with the asteroidal zone. A vast number of minute planetoids, when opposite the sun's place would shine with "full" disc, and would be collectively seen as a luminous patch. Away from this position less of their illuminated hemispheres would be turned towards us, and the particles would be further off from our planet, so that the light would rapidly diminish. Thus we should have, what is observed, a maximum of light opposite the sun, due to full illumination and comparative proximity, whilst the particles in other positions would be almost, if not quite, invisible. Professor Searle, of Harvard, who reviewed and discussed most of the previous observations, though not absolutely accepting any theory of the Zodiacal Light and Gegenschein, was inclined, on the whole, to regard the meteoric theory as the most probable.

Further observations as to all the peculiarities of these phenomena are still desirable. Unfortunately, the neighbourhood of cities and the populous "haunts of men" are not well suited for such researches, though Flammarion has recorded that even in Paris he once saw the Zodiacal Light with remarkable brilliancy during the month of February, 1871; but this was at a time shortly after the siege, when that city was without gas, and there was little artificial illumination to interfere with its visibility. A series of concerted observations from meteorological and astronomical observatories within the tropics, carried out for a number of years consecutively, seems alone likely to afford the means of discriminating between the various conflicting views as to its nature or, perhaps, of furnishing a more reliable theory. It is somewhat remarkable that our knowledge of these phenomena, which require no instrumental equipment for their observation, is but little greater than was possessed by the first discoverers, notwithstanding the great development of science in almost every other direction. The application of photography may be possible, but favourable opportunities for such work are somewhat rare. So far a complete and satisfactory answer to the question with which we commenced this paper cannot be given.

THE WEATHER OF OCTOBER.

By FRED. J. BRODIE.

AFTER the stirring performances of the three preceding months, the meteorological history of October may be regarded as tame and uneventful. There were no great extremes either of heat or cold ; the rainfall over the country generally, did not differ very materially from the average ; and, with the exception of a violent outburst at the commencement of the month (bequeathed by September) wind storms were rare, and seldom of any great severity. One of the most interesting features was, perhaps, the frequent appearance of heavy rain around the south-east coast of England.

At the opening of the month the weather over England remained under the influence of the deep cyclonic disturbance which had passed across the United Kingdom on September 30th, a cool northerly wind still blowing with the force of a gale on our east and south-east coasts. On the 2nd and 3rd, when the depression moved in a dilatory and irregular fashion over Denmark and the Baltic, small secondary disturbances were developed over Great Britain and the North Sea, the weather remaining in a cool, changeable condition. On the 4th a large anticyclone began to extend over the country from the northern part of the Atlantic, and improving weather was experienced in all but our eastern and south-eastern districts, where thunderstorms occurred on the 5th, with heavy rain on the coasts of Kent and Sussex. Two days later, a shallow barometrical depression which moved north eastwards from the Bay of Biscay across the south-east of England to the North Sea and Denmark, occasioned another heavy fall in the same locality, but after this, the Atlantic anticyclone extended over the whole of Western Europe, and fair, but misty weather became general. The day temperatures at this time were slightly above the average, but the clear skies favoured the progress of terrestrial radiations, and between the 7th and 10th, night frosts occurred in most places. It was only in central Scotland that the thermometer fell much below the normal, but on the surface of the grass from 8 to 10 degrees of frost were registered in several parts of the Kingdom. At Balmoral the exposed thermometer fell to a minimum of 20°, at Hampstead to 19°, and at Llangammarch Wells to 17°. After the 11th, the anticyclone withdrew to the eastward, and on the 12th and 13th, when a depression moved in a south-easterly direction outside our south-west coasts, a mild breeze from the south-eastward set in, the thermometer rising slightly above 65° in many parts of England and Wales, and touching 68° at Greenwich, Manchester, Cullompton and Bettws-y-coed. Thunderstorms and heavy rain occurred on the 13th at several of the south coast stations. The disappearance of the south-western depression was followed by a temporary extension of the Continental anticyclone over all our more northern districts, the wind being easterly and the weather fair, but misty or foggy in many localities. After the 17th, a large cyclonic

THAMES VALLEY RAINFALL OCTOBER, 1911.



ALTITUDE SCALE Below 250 feet 250 to 500 feet 500 to 1000 feet Above 1000 feet

SCALE OF MILES 0 5 10 15 20

disturbance began to spread in very gradually from the Atlantic, the mild south-easterly winds in the front of the system resulting in a rise of the thermometer on the 18th and 19th to 65° or a trifle above it in many parts of England, Wales and Ireland and to 68° at Guernsey. On the 21st and 22nd, the centre of the oceanic depression moved eastwards across the United Kingdom to the northern portions of the Continent. Fresh disturbances soon arrived however, off our western and northern coasts, and for the remainder of the month the weather was in a rough, unsettled state, with occasional gales from between south-west and north-west, and frequent heavy falls of rain. Temperature was usually above the average in England and Ireland, but below it in Scotland, with snow in several places on the 25th and 26th. On the nights of the 25th to 28th, sharp frosts occurred very generally, the sheltered thermometer falling early on the 29th to 25° or less in many parts of the country, to 20° at Nairn and Llangammarch Wells, 18° at West Linton, and 15° at Balmoral. On the surface of the grass the readings were as low as 8° at Llangammarch Wells, 13° at Balmoral, and 15° at Birmingham.

The mean temperature of the month was below the average in the east of Scotland and the north-east of England, but above it elsewhere, the excess being greatest in our eastern and south-eastern counties. In the north the absence of warmth was rather striking; at Leith, the thermometer, for the first time in October since 1892, failed to rise above 59° . The duration of bright sunshine varied considerably, but was, as a rule, not far removed from the average.

METEOROLOGY AT THE BRITISH ASSOCIATION.

SECOND PAPER.

By E. GOLD, M.A.

IMMEDIATELY after the President's Address in Section A, Dr. W. J. Humphreys contributed a paper on "The Earth as a Radiator." From the results obtained by registering balloons for the temperature of the stratosphere in different latitudes, the author found approximate values for the radiation from the Earth (mainly from the atmosphere) in different latitudes. The results showed that this outward radiation was least near the equator, where the inward radiation is greatest, and greatest in temperate latitudes, a secondary minimum at the pole being indicated by the ascents in high latitudes. In the discussion it was pointed out that the results depend largely on the assumption that the atmosphere acts as a "gray" body, an assumption difficult to reconcile both with laboratory experiments and with the circulation of the atmosphere. The values might be subject to considerable correction for irregularities in the absorbing power for different parts of the spectrum.

Dr. Shaw made the most interesting and effective contribution on the part of Section A to the joint discussion on Aeronautics. His

comparison of an aeroplane in a variable wind to a bicycle on a bumpy road was peculiarly happy and suggestive. In the course of his remarks he stated that the aviator had discovered what was rather loosely described as "a hole in the air." The phenomenon might be associated with the eddy caused by a solid obstruction such as a cliff, or it might arise from some hitherto unknown peculiarity in local atmospheric circulation, or it might be the result of the action on the aeroplane of known phenomena which had not been considered in this connection. Mr. Berriman, in opening the discussion, had assumed a uniform wind, but the fact was that there was no such thing as a uniform wind in the atmosphere in which aviation was practised. An average wind of twenty miles per hour would oscillate between ten and thirty miles per hour. The effect of this was to produce variations of pressure on the aeroplane which might be compared to the variations of the forces in the vertical plane through the direction of motion produced on a bicycle by a bumpy road. There were, however, simultaneous oscillations of direction, and to complete the analogy it would be necessary to imagine something which would produce pushes on the bicycle from the side. It might be that the two oscillations together would account for the effects experienced by aviators.

In the course of the same discussion, Mr. J. S. Dines pointed out that the variability of the wind was most marked near the earth's surface, and that it would not be possible to overcome the difficulties by a mere increase of speed, because the speed would need to be greatest near the surface where the plane was started or stopped.

On Monday Dr. Shaw showed slides illustrating the changes which occurred during the thunderstorm and squall on Friday, July 28th, 1911, when the wind at South Kensington rose suddenly to 56 miles per hour, and rain fell at the rate of an inch in ten minutes nearly. This squall was comparatively local, but on the next day a similar squall crossed the country from the south-west of Ireland to Scotland, and remarkable dust storms in South Wales were associated with it.

On Tuesday the first meteorological paper was Commander Campbell Hepworth's discussion of the effect of the Labrador current upon the surface temperature of the North Atlantic, and of the latter upon the air temperature and barometric pressure over the British Isles. The purpose of the paper was to show the importance of the Labrador current in modifying the influence of the Gulf Stream. The discussion covered the five years 1903-7, and showed that an increase in the current was followed by a decrease in the temperature of the water in a zone stretching from Florida Strait to Valencia. Unfortunately Commander Hepworth was unable to be present, and the short abstract gave only the general conclusions. Dr. Dickson expressed his pleasure at the completion of such an important piece of work, and looked forward to the full publication of the discussion, which appeared to confirm certain results which he had found from a consideration of two years' observations.

Dr. Shaw showed models representing air currents up to heights of 10 kilometres, which had been obtained from the observations of pilot balloons, made at Ditcham Park by Mr. Cave. The models were instructive to those unfamiliar with the details of upper air observations and suggestive to those bent upon unravelling the mysteries of atmospheric circulation.

Dr. Humphreys read a short paper on the water vapour in the atmosphere on clear days, as determined from the observations made by registering and manned balloons. The thickness of the layer of water which would be formed if all the vapour were condensed, was found to be $2e$ millimetres, where e is the vapour pressure at the earth's surface in millimetres of mercury. The value found by Hann, as the average of all days, was $2.3e$.

Mr. Gold gave a brief account of the results obtained from the ascents in Ireland, undertaken by the Committee for the Investigation of the Upper Atmosphere. These successful ascents had been made from Mungret College, Limerick, in the present year, and on July 6th, values for the temperature had been obtained up to 21km.

Dr. Dickson put forward the suggestion that the treatment of general atmospheric circulation might be simplified by taking the equatorial circulation to form a system by itself, with little interchange with the circulation in higher latitudes. Mr. Gold repeated Mr. W. H. Dines's objections to a similar suggestion which he had made in a Report read at Winnipeg in 1909. The fact that the winds in the equatorial regions have a persistent easterly component, make it essential that there should be interchange with the air from regions where the motion is from the west, in order to prevent the frictional forces from destroying the relative westerly momentum in the region of the equatorial circulation. He added, that even partial interchange would be insufficient, and that there must be complete transference, from one region to another, of the air in the troposphere, if the frictional effects are mixed throughout the troposphere in their respective regions.

On Wednesday, Dr. Ball and Mr. J. I. Craig communicated a paper, read by Mr. Craig, on the Use of Diagrams in the Classification of Climates. The diagrams dealt with temperature and humidity and showed the annual course of these elements by a single closed figure for each of a selection of places from different parts of the world. The diagrams proved very suggestive, and Mr. Craig pointed out how they could be used, not only by the man who was considering his health, but also in connection with such problems as cotton growing. The facility with which the similarity or the differences between climates of different places can be exhibited by the diagrams, ought to make them of great practical use.

On Saturday many of the meteorologists present had the pleasure of listening to Dr. Mill's interesting evening lecture on "Rain." It was refreshing to hear him emphasize the fundamental importance of convection as the rain-maker.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

May 5th, 1909.

| Starting Point. | Country. | A miles. | B ° F. | C miles. | D ° F. | E miles. | F |
|------------------|--------------|-------------|-----------|-------------|-----------|-------------|----------|
| Petersfield | England | 6·9 | —82 | 9·3 | —76 | 59 | W. |
| Brussels | Belgium | 7·6 | —81 | 8·4 | —79 | 81 | W. |
| Lindenberg.... | Germany.... | 7·1 | —89 | 10·6 | —74 | 31 | W. by S. |
| Paris | France | 7·4 | —69 | 8·9 | —62 | 44 | W.S.W. |
| Strassburg | Germany.... | — | — | 6·6 | —74 | 31 | W. by S. |
| Munich..... | „ | 6·8 | —63 | 8·6 | —47 | 49 | W.S.W. |
| Pavlovsk | Russia | 5·8 | —54 | 9·1 | —51 | 94 | E.S.E. |

May 6th.

| | | | | | | | |
|-------------------|--------------|-----|-----|------|-----|----|-----------|
| Pyrton Hill.... | England | 7·1 | —85 | 9·8 | —63 | 34 | N.W.by W. |
| Petersfield | „ | 8·1 | —84 | 11·9 | —76 | 51 | N.W.by W. |
| Brussels | Belgium | 8·2 | —72 | 10·1 | —59 | 40 | W. |
| Lindenberg.... | Germany.... | 6·8 | —77 | 10·2 | ? | 75 | S. by W. |
| Paris | France | 6·9 | —53 | 8·5 | —53 | 34 | S.S.W. |
| Strassburg | Germany.... | 7·2 | —80 | 9·8 | —62 | 35 | S.W.by W. |
| Munich | „ | 7·2 | —73 | 12·8 | ? | 31 | S.W. |
| Vienna | Austria..... | 8·3 | —73 | 11·1 | ? | 53 | S.S.W. |
| Nizhni Olchadaeff | Russia | 6·1 | —50 | 9·5 | —36 | 31 | N.E. |

May 7th.

| | | | | | | | |
|------------------|--------------|-----|-----|------|-----|----|----------|
| Manchester.... | England | 7·5 | —64 | 11·3 | —57 | 16 | W.S.W. |
| Pyrton Hill.... | „ | 7·9 | —67 | 9·7 | —54 | 24 | W. |
| Petersfield | „ | 7·5 | —79 | 10·3 | —62 | 29 | W. |
| Brussels | Belgium | 7·3 | —87 | 7·6 | —85 | 36 | S.W. |
| Hamburg..... | Germany.... | 7·3 | —77 | 10·9 | —58 | 62 | S. by W. |
| Paris | France | ? | ? | 10·1 | —83 | 39 | W.S.W. |
| Strassburg | Germany.... | 7·4 | —81 | 9·6 | —66 | 44 | S. by W. |
| Munich..... | „ | 7·8 | —74 | 17·0 | —53 | 82 | S. |
| Vienna | Austria | 5·6 | —61 | 8·1 | —56 | 31 | S. |
| Pavlovsk | Russia | 5·1 | —52 | 9·3 | —50 | 17 | S.S.W. |

A=Height in miles of commencement of isothermal column.

B=Temperature, F°, at bottom of column.

C=Greatest height of reliable record in miles.

D=Temperature, F°, at greatest height.

E=Distance in miles of point where balloon fell.

F Bearing of falling point from starting point.

The weather throughout the three days was dominated by an extensive high pressure area which lay over the north of Europe, a fact which appears from the unusual westerly drift of nearly all the balloons.

The temperature at Paris, on May 6th, seems rather high, but otherwise the values seem to follow the distribution of the surface pressure according to the usual rule.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

TEMPERATURE OF RAIN.

Is there any record of the temperature of rain? If so, what is the highest temperature recorded—(a) for these islands; (b) for the world?

A. F.

THE OCTOBER RAINFALL.

I THINK the rainfall at Tunbridge Wells during the past six months has been so remarkable that it will be worthy of a note in your Magazine. I here place beside one another the 5 months—May to September, and the five “weekly periods,” of which October may be said to be made up.

| Month. | in. | Week of October. | in. |
|----------------|------|------------------|------|
| May..... | 1·09 | 1st..... | 1·93 |
| June .. | 2·41 | 2nd..... | ·32 |
| July..... | ·38 | 3rd..... | 1·53 |
| August | ·97 | 4th..... | 1·86 |
| September..... | 1·52 | 5th..... | ·60 |
| Total 5 Months | 6·37 | Total October | 6·24 |

It will be seen from this that nearly as much rain fell in October as in the previous five months. If, indeed, we add the rainfall of the opening days of November, which amounts to ·59 in., thus making a full fifth week, we get the extraordinary total for the period between the 1st October and the 4th November, of 6·83 inches.

D. W. HORNER,

Haukenbury, Tunbridge Wells, November 4th, 1911.

F.R.Met.Soc.

THE Rainfall in the week ending at 9 a.m. on November 5th, was so extraordinary, even for this rainy district, that I am sending it to you. At 10.45 p.m. on October 29th it began to rain, and—

| | | | |
|------------------------|------|-------|-------------|
| At 9 a.m. on Oct. 30th | 4·17 | in. | had fallen. |
| “ “ “ Oct. 31st | ·92 | “ “ “ | |
| “ “ “ Nov. 1st | ·18 | “ “ “ | |
| “ “ “ Nov. 2nd | 1·31 | “ “ “ | |
| “ “ “ Nov. 3rd | ·17 | “ “ “ | |
| “ “ “ Nov. 4th | 2·00 | “ “ “ | |
| “ “ “ Nov. 5th | 1·43 | “ “ “ | |

This made a total of 10·18 inches in 7 days, of which nearly 5 inches fell in 24 hours (between mid-day on October 29th and mid-day on October 30th); most of this 10 inches fell at night—Wednesday and Saturday last being nice, bright days till evening.

RALPH FLETCHER.

Rydal Farm, Ambleside, 6th November, 1911.

[It is interesting to notice that the rainfall at Seathwaite on October 29th, read at 9 a.m. on the 30th, was 7·00 in., a figure which has very rarely been exceeded.—ED. *S.M.M.*]

DOUBTLESS you will receive much information as to the shortness of rainfall this year. The following fact may interest you ; possibly it is almost exceptional. At this west end of the Isle of Wight, each individual month so far this year is short of the average. I notice that in 1896 the first eight months had a total rainfall less than the first eight months of the present year. Now that we have completed nine months, I find that not one previous year gave us so small a total as 1911 for the first three-quarters of the year. I give the figures since they are remarkable. I have taken meteorological readings here for a quarter of a century.

| | Previous lowest, 1898. | | 1911. | | Average Year. |
|-----------------|---------------------------|-------|------------|-------|---------------|
| January | ·60 | | 1·16 | | 2·15 |
| February | 2·56 | | 1·40 | | 1·82 |
| March | ·35 | | 1·91 | | 2·00 |
| April | 1·36 | | 1·45 | | 1·78 |
| May | 3·59 | | 1·18 | | 1·62 |
| June | 1·26 | | 1·48 | | 1·91 |
| July | ·44 | | ·15 | | 1·91 |
| August | 1·43 | | ·50 | | 2·33 |
| September | 1·11 | | 1·22 | | 2·00 |
| Totals | 12·70 | | 10·45 | | 17·52 |

The driest quarter before this year was April, May, June in 1893, which only gave us 1·94 inches of rain. The driest half-year I have known here, was January to June, 1892, with a total of 5·99 inches. The driest year was 1908, with a total of 21·68 inches.

Our average rainfall here for the year amounts to 27·66 inches.

JOHN DOVER.

Aston House, Totland Bay, Isle of Wight, 2nd October, 1911.

HOW OUR HOTTEST SUMMER ON RECORD WOULD APPEAR IN THE SOUTH OF EUROPE.

I HAVE read with much interest Mr. Bonacina's letter in the October number of the Magazine, on "How our hottest summer would appear in the South of Europe," especially in view of your statement in *The Times* of August 10th, that a shade temperature of 97°·1 had never been reached in Colombo, as you believed. I do not know what the maximum was at the place where I was staying on August 9th, but I found it very unpleasant to go near the garden door on the S. side of the house, as it felt like approaching an oven. Of course Mr. Bonacina is speaking of the mean temperature, but I hope he or others will give us some more comparisons, as it is very interesting for home-keeping people to realise the conditions of other countries in temperature and weather.

E. M. TAWNEY.

Oxford, October 25th, 1911.

CUMULUS CLOUDS ON OCTOBER 21st.

THE mighty chain of cumulus which bounded London's eastern horizon on the afternoon of October 21st, the day previous to the destructive gale on the south coast, appeared to mark the line of the trough of a cyclonic depression, for the chain appeared about 3 p.m., immediately after a smart shower and stiff squall, followed by clearing sky and some reduction of temperature.

I happened to be on Hampstead Heath that afternoon, looking towards Highgate, and have never seen a line of cumulus more strikingly endowed with all the mystery, power and majesty of the high mountains than that which adorned that Essex horizon. As I watched those snowy radiant peaks, sharp-edged and cut in to the green-blue of the heavens, those gloomy cloud caverns, those huge flanking buttresses, each a mountain in itself, with the dark encircling vapour wreaths, I saw in an instant, by analogy, the root of that ennobling influence so powerfully described by Ruskin, which hallows the simple lives of the few who dwell among the high mountains. It was of the cumulus more than any other cloud-form that the Psalmist was thinking when he wrote "Thy truth reacheth unto the clouds" (*Ps. cviii. 4*), and let us discern the inner meaning of these words every time our skies break and the clouds dispose themselves in a sublime chain of lofty summits.

L. C. W. BONACINA.

Hampstead, N. W., October 27th, 1911.

GREAT HEAT IN A THUNDER SQUALL.

It may interest you to know that at 9 p.m., on the 20th September, a thunder cloud approached from the west, bringing with it a squall of wind that caused the temperature to rise in a few minutes to 110° F. By 9.45 p.m. it had fallen again to 67°, which I expect was about the temperature before the squall. I do not think my thermometer responded quick enough to register the highest point, but it is safe to say it rose 40° in five minutes.

F. B. PARKINSON.

Madibi Mines, Kimberley, South Africa, 1st October, 1911.

HEAVY RAIN IN SNOWDONIA.

NEARLY half the rain of October fell in the last three days. On the 29th it commenced at 10 a.m., and continued all day. The wind, which had force 5 in the morning, increased to a good gale at night; 3.03 in. rain fell at Pen y Gwryd. On the 30th very heavy rain caused large floods, the Glaslyn and Gwryd rose faster than I have seen them rise before. 1.21 in. of rain fell. At Llydau, for the two days 29th—30th, 4.95 in. fell at No. 10 gauge, and 5.82 in. at No. 9.

For the week, October 29th to November 4th inclusive, 9.52 in. of rain fell at Pen y Gwryd, and 12.99 in. at Llyn Llydau No. 9.

A. LOCKWOOD, F.R.Met.Soc.

Pen y Gwryd, November 8th, 1911.

A LECTURE AND THE NEWSPAPERS.

PRESS-CUTTING agencies are always providing surprises for their clients, and nothing has struck us more as a result of their efforts than the amount of currency reports of scientific proceedings of minor importance receive, and the small public notice that is taken of the more valuable scientific news.

We have before us a mass of cuttings relating to the lecture on "Rain," delivered in Portsmouth on September 2nd, by Dr. H. R. Mill, which we have sorted out into 58 cuttings containing substantially a report, and 34 cuttings containing editorial comments.

As regards reports : space is of course never available for a verbatim report ; but a lecturer is frequently asked for an abstract of his lecture beforehand. Such an abstract is rarely printed completely, or in such a way as to preserve the proper proportions of the various parts of the subject, so that in the best circumstances the public rarely receive what the lecturer believes to be a fair abstract of his discourse, but only such portions of it as an editor considers most likely to interest his readers. In circumstances which are not the best, a reporter either modifies the lecturer's abstract or selects extracts from his own shorthand report, of a character which he thinks likely to attract, and after editorial revision and curtailment this is printed. As regards comments, they are made in practically all cases on the reports as printed, and if the reports are misleading the value of the comments is small, though as we shall show, their manner may be amusing. A lecture, such as that under discussion, which is continuously illustrated by maps, diagrams and photographs thrown on the screen, appeals simultaneously both to eye and ear, and would be at best but a poor exposition to a blind man who heard it all, or to a deaf man who saw it all. A verbatim reporter would from this point of view be a blind man, and the only way of giving a fair idea of such a lecture would be to follow it with both eye and ear, and take occasional notes as memoranda. A lecturer of experience does not occupy his time in reciting information, every word of which it is essential to remember ; in this respect a lecture differs entirely from a chapter in a text book. The utmost that can be hoped for is—(1) that no fairly attentive auditor can carry away a positive error supposing that it is truth ; (2) that every attentive auditor can follow the course of reasoning without fatigue, and retain a clear general impression of the whole. To secure as near an approach to this as possible, the lecturer must suit his manner of presentation to his audience, endeavouring to address the average member of it, in such a way as not to make the more instructed feel that what is said is infantile, and not to make the less instructed feel that it is beyond hope of comprehension. To an audience of advanced students in the special subject, technical terms are permissible without circumlocution, and are necessary to convey the most precise information ; to an educated

audience accustomed to apply their minds to new ideas, a few technical terms may fairly be used if they are clearly defined at the first time of using ; but to an audience unversed in the subject, and unaccustomed to receive new ideas, the presentation must be entirely devoid of technicality, and it will be found in practise that the description of a technical idea in every-day language requires the use of so many words that the idea is brought gradually into the mind and the shock of novelty may be largely overcome, so that it is received almost as something familiar and is not alarming. The use of many simple words instead of one technical term acts as an automatic brake on the lecturer, preventing him from presenting ideas unfamiliar to his audience so rapidly as to be hopelessly confusing ; but in any case, close attention on the part of the audience is required to follow the unfamiliar ideas as they are presented, and their meaning developed. The moment that overstrained attention produces weariness, the lecture is over so far as any good it can do is concerned ; but the slightest relaxation of attention on the part of an audience is instantaneously perceptible by the lecturer even in the dark, and it is his duty then to allow the audience rest by the relief of a laugh if a touch of humour can be introduced, or to spur the flagging attention by a totally unexpected application of the line of reasoning to something of general interest, or, should necessity arise, to sacrifice altogether what may even be his own favourite part of the subject and go on to something easier. Should the audience see the purpose of the laugh, or the thrill, or the change of subject, it is likely to fail of its effect, so that whatever happens, the continuity of the discourse must never appear to fail if the general impression of the lecture as a whole is to be produced. This introductory statement is required because unless a critic knows the audience to which a lecture is addressed, and the purpose of allowing a gleam of humour to flicker at one point or another, he is very apt to mistake the manner of presentation for the lecturer's ideal of the best way of expounding his subject, and to look on the humour as an end aimed at, instead of as an aid brought in to meet an emergency.

We cannot attempt to analyze the various reports which varied in length from nearly a column to about five lines, and followed one or other of about four original reports which were copied, modified, or selected from by the various newspapers ; but there was a tendency to pepper even the shorter notices with "(laughter)" at frequent intervals. As a matter of fact all the statements which were introduced to relieve tension by a laugh, could have been made in five minutes, while the serious side of the subject occupied seventy minutes.

The following is the lecturer's abstract of the lecture as delivered, the number of minutes devoted to each part of the subject being stated in brackets, and the various illustrative facts adduced being omitted :—

A very common idea of Rain is that it is a nuisance, spoiling pleasure out of doors, and stopping work. Starting from this we may look at the measures

adopted for abating the nuisance, for example by farmers in drying hay and architects in designing houses (10 mins.). The nature and habits of rain must be studied by the scientific method, which depends in the first place on accurate measurement, which for some comparative purposes may be indirect, like the records of the height of the Nile in Egypt, but for most purposes must be direct by means of rain gauges. The standard rain gauge of the present day is the result of successive simplifications of the earlier designs (5 mins.). To measure accurately one-hundredth of an inch of rain involves the use of a glass so much narrower than the surface which catches the rain that the amount which corresponds to one-hundredth of an inch on the larger surface stands high enough to be easily seen. All rain gauges should be of uniform pattern, exposed in the same way in similar surroundings, the amount of rain read at the same hour, and the record kept legibly and correctly, so as to avoid the common errors which are made by hundreds of observers every year (10 mins.). The existence of a number of rain gauges separated by short intervals of space makes it possible to correct many errors by careful comparison, and the best form of comparison is to enter the readings of the various rain gauges on a map. The 5,000 rain gauges at work in the British Isles enable this to be done in most cases, but some districts are still poorly represented. Rainfall maps are made most expressive by drawing lines of equal rainfall, and tinting the areas of higher fall (7 mins.). The study of rainfall maps for days of heavy rainfall enables two types of storm rain to be distinguished, both of which in this country are apparently independent of the form of the ground and dependent only on up-rising air-masses set in motion by causes residing in the atmosphere. Whatever causes air to rise causes rain to fall, and the study of thunder-storm rains shows that as much as 4 inches of rain may occur in a single afternoon in any part of the British Isles, such falls inevitably producing great damage. The long-continued heavy rains accompanying the passage of an area of low pressure across the country may produce an equally great amount, though usually distributed over a whole day or several days, and the area of heaviest fall is usually situated to the left of the track of the centre in whatever direction the storm travels (17 mins.). Such exceptionally heavy rains form but a small proportion of the total rain for a year, most of which falls with wind which is moving nearly horizontally and rises only when it meets the upward slope of hills; on rising the air is chilled and more rain falls from it. Thus in every locality and for the country as a whole the average annual rainfall varies, other things being equal, with the height of the land; and a map of the average rainfall closely resembles a map of the elevation of the ground (5 mins.). The rainfall of every year differs from the average, but to a different degree and often in a different direction in various parts of the country. When the total rainfall for the whole country in each year of a long series is compared one sees that there are sometimes spells of years all with more than the average rainfall, and sometimes spells of years all with less than the average rainfall; but usually wet and dry years alternate at shorter intervals, for instance from 1889 to 1907 there was a continuous succession of two dry years followed by one wet. This order broke down in 1908, and it appears as if it were altering into an order in which for a time the number of wet years would be greater than the number of dry years (6 mins.). Having viewed rain as a nuisance and as

a subject of scientific study, it remains to show its supreme importance in the economy of the world in supplying rivers, shaping scenery and regulating the luxuriance of vegetation, also its supreme utility to mankind as the only source of water supply, and a valuable means of producing work in rapids and waterfalls. Seen in its true position rain is only one phase of the grand circulation of water in Nature, when after being raised by the heat of the sun as vapour from the sea, and wafted by the wind to the land, it condenses in clouds whence rain descends on the high ground, gathers into streams, and flows as rivers back into the sea, transforming the world whose work it does on the way (15 mins.).

We cannot attempt to summarize the reports as printed; a few were well done touching on most of the essential features, but the greater number simply seized on an illustration, often disregarding the thing illustrated, and noted the "laughter" without a hint that it was merely an expression of relief after close attention to a stiff bit of reasoning. Twenty-eight of the headings fastened on the probability of the impending preponderance of wet years over dry; but every one gave it a far more definite form than in the lecture; thus "Wet Weather ahead—gloomy forecast," "Succession of rainy years," "Many Wet years in the near future," "Wet Years to come—Doleful prophecy," "A miserable weather prediction," "Prospect of wet seasons," "Wet cycle predicted," and, without any justification in the lecture, "Wet summers foretold." Seven papers made a head-line describing the lecture as "amusing," or cited "Humours of Rain Observing," "The amusing side of wet weather," and half a dozen others made prominent notices of trivial anecdotes of no value save as illustrations of facts that the notice did not refer to.

This being the case with the reports it is not surprising that some of the comments were beside the mark. Of these, many were kindly, some showed quaint, but interesting view-points, and a few were so far misled by the ill-balanced report as to be fairly ridiculous. For instance, an Irish journal of high repute produced the following—our comments are interspersed in italics within brackets:—

Dr. Mill gave a popular lecture on "rain" to his colleagues of the British Association (*untrue: it was given to the working men of Portsmouth*) on Saturday. It is a subject in which we all take an interest, but he does not seem to have advanced our knowledge of it. He began, unfortunately, by telling us that we are fast approaching a series of years that will be uniformly wet (*untrue: he began quite differently, and towards the end of the lecture mentioned the probability of wet years predominating over dry years*). It is the amiable British custom to pray for rain if they have three consecutive fine days in any summer. (*A month later in both Protestant and Roman Catholic churches in Ireland prayers for rain were offered.*) In spite of the ungrateful complaints with which the regular appearance of the sun this year has been received, no one really wants wet seasons. (*The water-works authorities of several Irish towns hold very different views.*) Having thus alienated the sympathies of his audience (*a fact to which none of the reports were unkind enough to refer*), Dr. Mill was compelled to resort to humour to restore its equanimity. Scientific people usually have a rather restricted idea of humour, and, unless the telegraphic summary

does him grave injustice (*surely this canniness is not native to Erin*) Dr. Mill's jests suggest (*the pun is noted*) not only scientific attainments but Scottish ancestry. (*After one of his lectures Dr. Mill was hailed by an Irish working man as a compatriot, and could not convince his interlocutor that the Irish strain in his ancestry came in some centuries back: "Are you sure you're certain?" said Pat.*) As a matter of fact the weather generally arouses the worst instincts of the scientific mind. It defies all calculation and restraint. The meteorologists have devised elaborate methods of expressing their ignorance, but, beyond this indispensable preliminary to research, they have not advanced very far. (*The journalist then leaves the subject of the lecture, and expresses his own opinion as to various problems of climatic changes, which he appears to assume to have occurred in historic times.*)

We have quoted and annotated the above because it shows in a delightfully exaggerated form the danger of generalizing and criticizing from the data supplied by inaccurate abstracts of incomplete reports. Half a dozen other Irish journalists gave clear summaries of the same lecture, and made remarks the generosity of which would make the lecturer glad to believe them just.

REVIEWS.

Characteristics of Existing Glaciers. By WILLIAM HERBERT HOBBS, Professor of Geology in the University of Michigan, New York. The Macmillan Company, 1911. Size 9 x 6. Pp. xxiv. + 302.

IN the study of glaciers geology and meteorology meet, for glacier ice, though it is one of the forms in which atmospheric precipitation is restored to the sea, is at the same time of sufficient stability to be a powerful agent in geological work, and in extreme conditions may even be viewed as a geological formation. Professor Hobbs while naturally approaching the subject from the geological side does full justice to the climatic element, and from our point of view this is the characteristic feature of the able and comprehensive work before us. He lays stress in the Introduction on the very small fall in mean temperature which may suffice to change a temperate region into an abode of snow, whence glaciers take their origin; and he divides his subject boldly into the discussion of mountain glaciers, where only a small area of land is exposed to a frigid climate, and polar glaciers (arctic and antarctic), where a vast region has a climate sufficiently severe to produce a continuous covering of snow or glacier ice. The method of formation of this inland ice is dealt with most completely in the account of south polar conditions, all the recent expeditions being laid under contribution for the data. At a time when our knowledge of the climate of the Antarctic is being rapidly extended, we are inclined to be cautious in generalising about it, for the facts now being accumulated may modify our provisional opinions materially; but we must allow that Professor Hobbs has made good use of his authorities, combining the results for, so far as we are aware, the first time. He strongly supports the theory of polar anticyclones, attributing the accumulation of snow on the Antarctic

high plateau to the condensation of moisture from the upper currents descending in the centre of the high pressure area, the small ice-needles, perhaps derived from cirrus cloud, being melted by adiabatic heating and re-frozen on coming within reach of the influence of the extremely cold surface of the snow. The thorough grasp of the problem taken by Professor Hobbs, and the way in which he has marshalled the facts collected from many sources, cannot fail to command the admiration of the reader, and we feel that his work is a very valuable summary of our knowledge of ice in Nature.

Sixth Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury, for the year ended 31st March, 1911 (the Fifty-sixth year of the Meteorological Office), London, H.M. Stationery Office. To be purchased from Wyman & Sons Ltd., Fetter Lane, E.C., 1911. Size $9 \times 7\frac{1}{2}$. Pp. 164. Price 2s. 3d.

THIS report is a record of progress, marking a new era in the history of the Meteorological Office. The removal to worthy premises in South Kensington, the extension of the powers of the Office to include the administration of the Kew Physical Observatory, and the Magnetic Observatory on Eskdalemuir, and various improvements in the plan and the production of the Weather Reports are each in their way facts of outstanding importance, involving a great amount of organizing work on the part of the Director, Dr. Shaw. The Report contains photographs of the new building at South Kensington, of the meteorological observatory on the roof, and of some of the rooms, and also of the Observatories at Kew, Eskdalemuir and Valencia. The work done in all departments of the great institute of geo-physics into which the Meteorological Office has grown, is naturally very great and varied, so that it is hopeless to attempt a summary of it in the limited space at our disposal; but we recommend our readers to procure and study this Report.

METEOROLOGICAL NEWS AND NOTES.

THE METEOROLOGICAL OFFICE has informed us of the following appointments:—MR. G. I. TAYLOR, Fellow of Trinity College, Cambridge, Smith's Prizeman, 1910, has been appointed Schuster Reader in Dynamical Meteorology for three years from 1st January, 1912. MR. L. SOUTHERNS, B.A., B.Sc., of Emmanuel College, has been appointed Special Assistant at Eskdale Observatory. MR. G. DOBSON, B.A., Research Student of Gonville and Caius College, has been appointed Graduate Assistant for Research in Atmospheric Electricity for one year from 1st October, 1911.

DR. ARTHUR SCHUSTER, F.R.S., has presented to the Eskdale Observatory an instrument made in St. Petersburg, from designs by Prince Boris Galitzine, for the registration of the vertical component of seismic movements. Dr. Schuster had previously presented corresponding instruments for registering the horizontal component, so that all three components are now the subject of continuous registration.

RAINFALL TABLE FOR OCTOBER, 1911.

| STATION. | COUNTY. | Lat. N. | Long. W. [*E.] | Height above Sea. ft. | RAINFALL OF MONTH. | |
|----------------------------------|---------------------------|------------|----------------------|--------------------------------|--------------------------------|--------------|
| | | | | | Aver. 1875— 1909. in. | 1911. in. |
| Camden Square..... | <i>London</i> | 51 32 | 0 8 | 111 | 2'72 | 3'12 |
| Tenterden..... | <i>Kent</i> | 51 4 | *0 41 | 190 | 3'48 | 4'99 |
| Arundel (Patching)..... | <i>Sussex</i> | 50 51 | 0 27 | 130 | 4'01 | 5'13 |
| Southampton (Cadland) ... | <i>Hampshire</i> | 50 50 | 1 22 | 52 | 4'07 | 4'26 |
| Oxford (Magdalen College). | <i>Oxfordshire</i> ... | 51 45 | 1 15 | 186 | 2'82 | 2'19 |
| Wellingborough (Croyland Abbey). | <i>Northampton</i> ... | 52 18 | 0 41 | 174 | 2'61 | 2'08 |
| Shoeburyness..... | <i>Essex</i> | 51 31 | *0 48 | 13 | 2'31 | 2'44 |
| Bury St. Edmunds (Westley) | <i>Suffolk</i> | 52 15 | *0 40 | 226 | 2'72 | 2'94 |
| Geldeston [Beccles]..... | <i>Norfolk</i> | 52 27 | *1 31 | 38 | 2'84 | 2'12 |
| Polapit Tamar [Launceston] | <i>Devon</i> | 50 40 | 4 22 | 315 | 4'84 | 3'87 |
| Rousdon [Lyme Regis]..... | "..... | 50 41 | 3 0 | 516 | 3'81 | 3'76 |
| Stroud (Upfield)..... | <i>Gloucestershire</i> .. | 51 44 | 2 13 | 226 | 3'21 | 2'41 |
| Church Stretton (Wolstaston).. | <i>Shropshire</i> | 52 35 | 2 48 | 800 | 3'77 | 3'35 |
| Coventry (Kingswood)..... | <i>Warwickshire</i> ... | 52 24 | 1 30 | 340 | 3'20 | 2'53 |
| Boston..... | <i>Lincolnshire</i> | 52 58 | 0 1 | 25 | 2'75 | 2'77 |
| Workshop (Hodsock Priory). | <i>Nottinghamshire</i> | 53 22 | 1 5 | 56 | 2'77 | 2'05 |
| Macclesfield..... | <i>Cheshire</i> | 53 15 | 2 7 | 501 | 3'53 | 2'75 |
| Southport (Hesketh Park).. | <i>Lancashire</i> | 53 38 | 2 59 | 38 | 3'74 | 2'40 |
| Wetherby (Ribston Hall) ... | <i>Yorkshire, W.R.</i> | 53 59 | 1 24 | 130 | 3'18 | 2'71 |
| Arncliffe Vicarage..... | "..... | 54 8 | 2 6 | 732 | 6'48 | 6'57 |
| Hull (Pearson Park)..... | "..... <i>E.R.</i> | 53 45 | 0 20 | 6 | 3'19 | 1'88 |
| Newcastle (Town Moor) ... | <i>Northumberland</i> | 54 59 | 1 38 | 201 | 3'20 | 2'49 |
| Borrowdale (Seathwaite) ... | <i>Cumberland</i> | 54 30 | 3 10 | 423 | 12'71 | 13'16 |
| Cardiff (Ely)..... | <i>Glamorgan</i> | 51 29 | 3 13 | 53 | 4'87 | 3'96 |
| Haverfordwest..... | <i>Pembroke</i> | 51 48 | 4 58 | 95 | 5'51 | 6'35 |
| Aberystwyth (Gogerddan).. | <i>Cardigan</i> | 52 26 | 4 1 | 83 | 5'38 | 5'45 |
| Llandudno..... | <i>Carnarvon</i> | 53 20 | 3 50 | 72 | 3'78 | 3'70 |
| Cargen [Dumtries]..... | <i>Kirkcudbright</i> ... | 55 2 | 3 37 | 80 | 4'45 | 3'79 |
| Marchmont House..... | <i>Berwick</i> | 55 44 | 2 24 | 498 | 3'83 | 4'02 |
| Girvan (Pinmore)..... | <i>Ayr</i> | 55 10 | 4 49 | 207 | 5'38 | 5'01 |
| Glasgow (Queen's Park) ... | <i>Renfrew</i> | 55 53 | 4 18 | 144 | 3'36 | 3'20 |
| Inveraray (Newtown)..... | <i>Argyll</i> | 56 14 | 5 4 | 17 | 6'50 | 4'50 |
| Mull (Quinish)..... | "..... | 56 34 | 6 13 | 35 | 5'87 | 3'50 |
| Dundee (Eastern Necropolis) | <i>Forfar</i> | 56 28 | 2 57 | 199 | 2'81 | 1'37 |
| Braemar..... | <i>Aberdeen</i> | 57 0 | 3 24 | 1114 | 3'88 | 2'48 |
| Aberdeen (Cranford)..... | "..... | 57 8 | 2 7 | 120 | 3'23 | 3'11 |
| Cawdor..... | <i>Nairn</i> | 57 31 | 3 57 | 250 | 2'95 | 2'65 |
| Fort Augustus (S. Benedict's) | <i>E. Inverness</i> ... | 57 9 | 4 41 | 68 | 4'14 | 2'21 |
| Loch Torridon (Bendamph) | <i>W. Ross</i> | 57 32 | 5 32 | 20 | 8'38 | 2'86 |
| Dunrobin Castle..... | <i>Sutherland</i> | 57 59 | 3 56 | 14 | 3'15 | 1'86 |
| Wick..... | <i>Caithness</i> | 58 26 | 3 6 | 77 | 3'14 | 1'72 |
| Killarney (District Asylum) | <i>Kerry</i> | 52 4 | 9 31 | 178 | 5'59 | 5'27 |
| Waterford (Brook Lodge)... | <i>Waterford</i> | 52 15 | 7 7 | 104 | 4'00 | 4'35 |
| Nenagh (Castle Lough)..... | <i>Tipperary</i> | 52 54 | 8 24 | 120 | 3'48 | 4'02 |
| Miltown Malbay..... | <i>Clare</i> | 52 52 | 9 26 | 400 | 4'31 | 4'42 |
| Gorey (Courtown House) ... | <i>Wexford</i> | 52 40 | 6 13 | 80 | 3'75 | 4'45 |
| Abbey Leix (Blandsfort)... | <i>Queen's County</i> .. | 52 56 | 7 17 | 532 | 3'53 | 3'48 |
| Dublin (Fitz William Square) | <i>Dublin</i> | 53 21 | 6 14 | 54 | 2'88 | 3'79 |
| Mullingar (Belvedere)..... | <i>Westmeath</i> | 53 29 | 7 22 | 367 | 3'19 | 4'57 |
| Ballinasloe..... | <i>Galway</i> | 53 20 | 8 15 | 160 | 3'19 | 4'53 |
| Crossmolina (Enniscoe)..... | <i>Mayo</i> | 54 4 | 9 18 | 74 | 5'27 | 5'11 |
| Collooney (Markree Obsy.). | <i>Sligo</i> | 54 11 | 8 27 | 127 | 4'21 | 3'94 |
| Seaforde..... | <i>Down</i> | 54 19 | 5 50 | 180 | 3'65 | 4'41 |
| Bushmills (Dundarave)..... | <i>Antrim</i> | 55 12 | 6 30 | 162 | 3'60 | 2'72 |
| Omagh (Edenfel)..... | <i>Tyrone</i> | 54 36 | 7 18 | 280 | 3'76 | 3'39 |

RAINFALL TABLE FOR OCTOBER, 1911—continued.

| RAINFALL OF MONTH (con.) | | | | | RAINFALL FROM JAN. 1. | | | | Mean Annual 1875-1909. | STATION. |
|--------------------------|----------|-------------------|--------|-------------|-----------------------|--------|----------------------|----------|------------------------|-----------------|
| Diff. from Av. in. | % of Av. | Max. in 24 hours. | | No. of Days | Aver. 1875-1909. | 1911. | Diff. from Aver. in. | % of Av. | | |
| | | in. | Date. | | in. | in. | | | in. | |
| + .40 | 115 | 1.10 | 24 | 14 | 20.64 | 16.97 | -3.67 | 82 | 25.11 | Camden Square |
| +1.51 | 143 | .79 | 7 | 20 | 21.80 | 17.47 | -4.33 | 80 | 27.64 | Tenterden |
| +1.12 | 128 | 1.14 | 21 | 15 | 24.03 | 18.54 | -5.49 | 77 | 30.48 | Patching |
| + .19 | 105 | 1.16 | 24 | 14 | 25.25 | 17.22 | -8.03 | 68 | 31.87 | Cadland |
| - .63 | 78 | .51 | 4 | 16 | 20.27 | 12.58 | -7.69 | 62 | 24.58 | Oxford |
| - .53 | 80 | .48 | 24 | 19 | 20.81 | 13.94 | -6.87 | 67 | 25.17 | Croyland Abbey |
| + .13 | 106 | .55 | 4 | 15 | 15.48 | 12.33 | -3.15 | 80 | 19.28 | Shoeburyness |
| + .22 | 108 | .80 | 13 | 18 | 20.86 | 17.01 | -3.85 | 81 | 25.40 | Westley |
| - .72 | 75 | .45 | 24 | 19 | 19.17 | 14.32 | -4.85 | 75 | 23.73 | Geldeston |
| - .97 | 80 | .70 | 20 | 18 | 29.74 | 22.54 | -7.20 | 76 | 38.27 | Polapit Tamar |
| - .05 | 99 | .94 | 27 | 20 | 26.35 | 15.55 | -10.80 | 59 | 33.54 | Rousdon |
| - .80 | 75 | .38 | 20 | 15 | 24.33 | 15.91 | -8.42 | 65 | 29.81 | Stroud |
| - .42 | 89 | .58 | 21 | 17 | 26.48 | 18.41 | -8.07 | 70 | 32.41 | Wolstaston |
| - .67 | 79 | .75 | 24 | 15 | 23.71 | 13.76 | -9.95 | 58 | 28.98 | Coventry |
| + .02 | 101 | .57 | 4 | 25 | 19.42 | 16.11 | -3.31 | 83 | 23.35 | Boston |
| - .72 | 74 | .32 | 21 | 17 | 20.31 | 12.15 | -8.16 | 60 | 24.46 | Hodsock Priory |
| - .78 | 78 | .43 | 29. 30 | 16 | 28.38 | 22.26 | -6.12 | 78 | 34.73 | Macclesfield |
| -1.34 | 64 | .74 | 29 | 15 | 26.44 | 22.16 | -4.28 | 84 | 32.70 | Southport |
| - .47 | 85 | .76 | 22 | 18 | 22.26 | 18.17 | -4.09 | 82 | 26.87 | Ribston Hall |
| + .09 | 101 | 1.92 | 29 | 14 | 48.62 | 51.31 | +2.69 | 106 | 61.49 | Arneliffe |
| -1.31 | 59 | .29 | 26 | 20 | 21.76 | 18.03 | -3.73 | 83 | 26.42 | Hull |
| - .71 | 78 | .81 | 26 | 22 | 22.85 | 20.91 | -1.94 | 92 | 27.94 | Newcastle |
| + .45 | 104 | 7.00 | 29 | 12 | 100.75 | 103.06 | +2.31 | 102 | 129.48 | Seathwaite |
| - .91 | 81 | .70 | 29 | 16 | 33.50 | 24.56 | -8.94 | 73 | 42.28 | Cardiff |
| + .84 | 115 | 1.00 | 20 | 22 | 36.47 | 31.16 | -5.31 | 85 | 46.81 | Haverfordwest |
| + .07 | 101 | .90 | 29 | 16 | 36.30 | 33.20 | -3.10 | 91 | 45.46 | Gogerddan |
| - .08 | 98 | .63 | 2 | 17 | 24.33 | 22.66 | -1.67 | 93 | 30.36 | Llandudno |
| - .66 | 85 | 1.38 | 29 | 11 | 34.28 | 32.69 | -1.59 | 95 | 43.47 | Cargen |
| + .19 | 105 | .78 | 26 | 19 | 27.72 | 21.48 | -6.24 | 77 | 33.76 | Marchmont |
| - .37 | 93 | 1.95 | 29 | 14 | 39.05 | 34.74 | -4.31 | 89 | 49.77 | Girvan |
| - .16 | 95 | 1.24 | 29 | 13 | 28.39 | 26.55 | -1.84 | 94 | 35.97 | Glasgow |
| -2.00 | 69 | 2.11 | 29 | 11 | 52.71 | 60.84 | +8.13 | 115 | 68.67 | Inveraray |
| -2.37 | 60 | 1.19 | 29 | 16 | 43.74 | 42.32 | -1.42 | 97 | 56.57 | Quinish |
| -1.44 | 49 | .49 | 24 | 12 | 23.35 | 9.88 | -13.47 | 42 | 28.64 | Dundee |
| -1.40 | 64 | ... | ... | ... | 28.04 | 18.91 | -9.13 | 67 | 34.93 | Braemar |
| - .12 | 96 | 1.24 | 23 | 17 | 26.01 | 17.64 | -8.37 | 68 | 32.73 | Aberdeen |
| - .30 | 90 | .53 | 24 | 12 | 24.20 | 19.95 | -4.25 | 82 | 29.33 | Cawdor |
| -1.93 | 53 | .53 | 31 | 16 | 34.40 | 30.39 | -4.01 | 88 | 44.53 | Fort Augustus |
| -5.52 | 34 | .72 | 29 | 15 | 65.01 | 70.86 | +5.85 | 109 | 83.61 | Bendamph |
| -1.29 | 59 | .59 | 23 | 13 | 25.56 | 19.27 | -6.29 | 75 | 31.90 | Dunrobin Castle |
| -1.42 | 55 | .32 | 29 | 17 | 23.82 | 21.13 | -2.69 | 89 | 29.88 | Wick |
| - .32 | 94 | 1.46 | 29 | 19 | 42.35 | 36.60 | -5.75 | 86 | 54.81 | Killarney |
| + .35 | 109 | .93 | 20 | 19 | 31.45 | 28.68 | -2.77 | 91 | 39.57 | Waterford |
| + .54 | 115 | 1.60 | 29 | 17 | 31.21 | 27.47 | -3.74 | 88 | 39.43 | Castle Lough |
| + .11 | 103 | 1.20 | 29 | 17 | 35.77 | 29.43 | -6.34 | 82 | 45.11 | Miltown Malbay |
| + .70 | 119 | 1.44 | 20 | 21 | 28.16 | 22.31 | -5.85 | 79 | 34.99 | Courtown Ho. |
| - .05 | 99 | .67 | 20 | 20 | 29.23 | 25.93 | -3.30 | 89 | 35.92 | Abbey Leix |
| + .91 | 132 | .83 | 20 | 20 | 22.77 | 16.39 | -6.38 | 72 | 27.68 | Dublin |
| +1.38 | 143 | 1.70 | 29 | 17 | 29.38 | 27.06 | -2.32 | 92 | 36.15 | Mullingar |
| +1.34 | 142 | 1.43 | 29 | 17 | 29.36 | 27.43 | -1.93 | 93 | 36.64 | Ballinasloe |
| - .16 | 97 | 1.08 | 29 | 23 | 41.01 | 34.58 | -6.43 | 84 | 52.87 | Ennisceoe |
| - .27 | 94 | 1.35 | 29 | 19 | 34.35 | 29.21 | -5.14 | 85 | 42.71 | Markree |
| + .76 | 121 | .78 | 26 | 15 | 31.28 | 22.30 | -8.98 | 71 | 38.91 | Seaforde |
| - .88 | 76 | .56 | 29 | 13 | 29.92 | 22.04 | -7.88 | 74 | 37.56 | Dundarave |
| - .37 | 90 | 1.05 | 29 | 18 | 31.81 | 27.72 | -4.09 | 87 | 39.38 | Omagh |

SUPPLEMENTARY RAINFALL, OCTOBER, 1911.

| Div. | STATION. | Rain inches | Div. | STATION. | Rain inches. |
|-------|------------------------------|----------------|--------|------------------------------|-----------------|
| II. | Warlingham, Redvers Road | 5.04 | XI. | Lligwy | 3.15 |
| „ | Ramsgate | 5.66 | „ | Douglas..... | ... |
| „ | Hailsham | 6.05 | XII. | Stoneykirk, Ardwell House | 3.13 |
| „ | Totland Bay, Aston House. | 5.21 | „ | Dalry, The Old Garroch ... | 6.50 |
| „ | Stockbridge, Ashley | 2.64 | „ | Langholm, Drove Road..... | 4.50 |
| „ | Grayshott..... | 5.27 | „ | Beattock, Kinnelhead..... | 5.59 |
| „ | Reading, Calcot Place..... | 2.49 | XIII. | St Mary's Loch, Cramilt Edge | 4.18 |
| III. | Harrow Weald, Hill House. | 2.61 | „ | North Berwick Reservoir ... | 2.47 |
| „ | Pitsford, Sedgebrook | 1.98 | „ | Edinburgh, Royal Observty. | 3.26 |
| „ | Woburn, Milton Bryant..... | 2.20 | XIV. | Maybole, Knockdon Farm.. | 3.96 |
| „ | Chatteris, The Priory | 1.97 | XV. | Campbeltown, Witchburn... | 4.54 |
| IV. | Colchester, Lexden..... | 2.30 | „ | Glenreadell Mains..... | 3.55 |
| „ | Newport | 3.30 | „ | Holy Loch, Ardnadam..... | 7.10 |
| „ | Rendlesham | 2.61 | „ | Ballachulish House..... | 4.78 |
| „ | Swaffham | 2.39 | „ | Islay, Eallabus | 4.19 |
| „ | Blakeney | 2.43 | XVI. | Dollar Academy | 4.13 |
| V. | Bishops Cannings | 1.99 | „ | Balquhider, Stronvar | 5.15 |
| „ | Winterbourne Steepleton .. | 5.25 | „ | Coupar Angus | 1.71 |
| „ | Ashburton, Druid House .. | 6.01 | „ | Glenlyon, Meggernie Castle. | 4.39 |
| „ | Okehampton, Oaklands..... | 5.10 | „ | Blair Atholl..... | 2.64 |
| „ | Cullompton | 4.37 | „ | Montrose, Sunnyside Asylum | 2.26 |
| „ | Hartland Abbey | 3.41 | XVII. | Alford, Lynturk Manse ... | 2.30 |
| „ | Lynmouth, Rock House ... | 4.58 | „ | Fyvie Castle..... | 2.83 |
| „ | Probus, Lamellyn | 3.85 | „ | Keith Station | 2.93 |
| „ | North Cadbury Rectory .. | 3.08 | XVIII. | Glenquoich, Loan | 11.50 |
| VI. | Clifton, Pembroke Road .. | 2.89 | „ | Skye, Dunvegan..... | 4.34 |
| „ | Ross, The Graig | 1.77 | „ | N. Uist, Lochmaddy | 3.37 |
| „ | Shifnal, Hatton Grange..... | 1.86 | „ | Alvey Manse | 2.42 |
| „ | Blockley, Upton Wold | 2.62 | „ | Loch Ness, Drumnadrochit. | 2.20 |
| „ | Droitwich | 1.68 | „ | Glencarron Lodge | 3.20 |
| VII. | Market Overton..... | 2.82 | XIX. | Invershin | 1.99 |
| „ | Market Rasen | 2.45 | „ | Loch Stack, Ardchullin..... | 3.22 |
| „ | Bawtry, Hesley Hall..... | 1.67 | „ | Melvich..... | 2.88 |
| „ | Derby, Midland Railway ... | 2.12 | XX. | Skibbereen Rectory..... | 5.08 |
| „ | Buxton..... | 3.35 | „ | Dunmanway, The Rectory.. | 6.45 |
| VIII. | Nantwich, Dorfold Hall..... | 2.43 | „ | Cork | 4.50 |
| „ | Chatburn, Middlewood | 3.86 | „ | Mitchelstown Castle | 4.33 |
| „ | Cartmel, Flookburgh | 5.63 | „ | Darrynane Abbey | 6.25 |
| IX. | Langsett Moor, Up. Midhope | 3.74 | „ | Glenam [Clonmel] | ... |
| „ | Scarborough, Scalby | 3.11 | „ | Newmarket-on-Fergus, Fenloe | 3.75 |
| „ | Ingleby Greenhow | 2.63 | XXI. | Laragh, Glendalough | 7.36 |
| „ | Mickleton..... | 3.13 | „ | Balbriggan, Ardgillan..... | 3.75 |
| X. | Bellingham, High Green Manor | 4.09 | „ | Moynalty, Westland | 4.33 |
| „ | Ilderton, Lilburn Cottage... | 3.94 | XXII. | Cong, The Glebe | 4.02 |
| „ | Keswick, The Bank | 6.10 | „ | Westport, St. Helens | 4.41 |
| XI. | Llanfrechfa Grange..... | 4.34 | „ | Achill Island, Dugort | 5.22 |
| „ | Treherbert, Tyn-y-waun ... | 5.98 | „ | Mohill, The Rectory | 3.04 |
| „ | Carmarthen, The Friary..... | 4.82 | XXIII. | Enniskillen, Portora | 3.19 |
| „ | Castle Malgwyn [Llechryd]. | 4.50 | „ | Dartrey [Cootehill]..... | 3.36 |
| „ | Plynlimon..... | 8.20 | „ | Warrenpoint, Manor House | 5.78 |
| „ | New Radnor, Ednol | 3.95 | „ | Banbridge, Milltown | 2.71 |
| „ | Rhayader, Tyrmynydd | 6.35 | „ | Belfast, Cave Hill Road..... | 3.70 |
| „ | Lake Vyrnwy | ... | „ | Glenarm Castle..... | 5.23 |
| „ | Llangyhanfal, Plâs Draw.... | 2.41 | „ | Londonderry, Creggan. Res. | 2.43 |
| „ | Dolgelly, Bryntirion | 4.64 | „ | Killybegs | 5.04 |
| „ | Bettws-y-Coed, Tyn-y-bryn | 5.17 | „ | Horn Head ... | 2.97 |

METEOROLOGICAL NOTES ON OCTOBER, 1911.

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

LONDON, CAMDEN SQUARE.—The conditions throughout were of an unsettled type, fine, sunny days alternating with days of gloom and overcast skies. A sharp TS with L and R occurred on the morning of 22nd. Mean temp. $50^{\circ}4$, or $0^{\circ}3$ above the average. Duration of sunshine, $77^{\circ}8^*$ hours, and of R $39^{\circ}8$ hours. Evaporation $\cdot 64$ in. Shade max. $63^{\circ}2$ on 18th; min. $28^{\circ}5$ on 29th. F 1, f 4.

TENTERDEN.—Cold at first but warm in the middle of the month; wet after 18th. Duration of sunshine, $121^{\circ}5^{\dagger}$ hours. Shade max. $64^{\circ}5$ on 18th and 19th; min. $31^{\circ}5$ on 29th. F 1, f 4.

TOTLAND BAY.—R $\cdot 72$ in. above the average, and the first month in excess after nine consecutive months with deficient R. Duration of sunshine, $116^{\circ}2^*$ hours. Shade max. $63^{\circ}7$ on 12th; min. $31^{\circ}6$ on 29th. F 1, f 4.

PITSFORD.—R $1^{\circ}10$ in. below the average. Mean temp. $48^{\circ}7$. Shade max. $62^{\circ}4$ on 13th; min. $25^{\circ}6$ on 29th. F 3.

NORTH CADBURY.—The first week and the last five days were cold, but the intervening period was warm. The first 18 days were dry, except for a local TS on 13th, but from 19th to the close the month was distinctly wet. Shade max. $71^{\circ}5$ on 13th; min. $28^{\circ}5$ on 29th. F 1, f 7.

ROSS.—Shade max $65^{\circ}0$ on 13th; min. $25^{\circ}6$ on 29th.

HODSOCK PRIORY.—Shade max. $69^{\circ}6$ on 8th; min. $27^{\circ}3$ on 29th. F 2, f 12.

SOUTHPORT.—An exceptionally easterly October. Fine, calm and dry to 18th. Duration of sunshine $111^{\circ}2^*$ hours, or $15^{\circ}1$ hours above the average. Duration of R $45^{\circ}4$ hours. Mean temp. $49^{\circ}0$, or $0^{\circ}4$ above the average. Shade max. $62^{\circ}9$ on the 18th; min. $31^{\circ}2$ on 29th. F 1, f 7.

HULL.—Unsettled and showery weather generally to 9th, then finer to 18th, when the weather became unsettled again, with frequent R to the end. Shade max. $60^{\circ}0$ on 4 days; min. $29^{\circ}0$ on 29th. F 1, f 6.

HAVERFORDWEST.—Duration of sunshine, $122^{\circ}4^*$ hours. Shade max. $64^{\circ}8$ on 19th; min. $32^{\circ}5$ on 28th. F 0, f 0.

LLANDUDNO.—Shade max. $64^{\circ}0$ on 13th; min. $34^{\circ}5$ on 29th.

CARGEN.—Fine weather prevailed until 19th, but thereafter there were only three days without R. Pastures very green. Shade max. $62^{\circ}3$ on 13th; min. $22^{\circ}8$ on 29th. F 4.

EDINBURGH.—Shade max. $56^{\circ}2$ on 30th; min. $31^{\circ}2$ on 28th. F 1, f 5.

COUPAR ANGUS.—A month of ideal weather and the tenth successive month with deficient R. Shade max. $59^{\circ}0$ on 11th; min. $19^{\circ}0$ on 29th.

FORT AUGUSTUS.—Shade max. $60^{\circ}2$ on 17th; min. $21^{\circ}0$ on 28th. F 6.

LOCH STACK.—Duration of sunshine, $80^{\circ}7$ hours.

CORK.—R $1^{\circ}20$ in. above the average. Mean temp. $1^{\circ}7$ below the average. Shade max. $57^{\circ}0$ on 19th; min. $31^{\circ}0$ on 25th. F 1, f 4.

DUBLIN.—Cold and changeable at first, but very fine from 6th to 12th. Unsettled with abundant R from 19th almost to the close. Mean temp. $50^{\circ}8$. Shade max. $61^{\circ}4$ on 18th; min. $33^{\circ}2$ on 29th. F 0, f 3.

MARKREE.—Fine generally until 17th but stormy afterwards, with heavy rain and frequent frosts. Shade max. $64^{\circ}9$ on 18th; min. $25^{\circ}9$ on 28th. F 6, f 11.

WARRENPOINT.—The first half was fine, but the latter half was very wet. Shade max. $59^{\circ}0$ on 19th; min. $36^{\circ}0$ on 28th. F 0, f 0.

* Campbell-Stokes.

† Jordan.

Climatological Table for the British Empire, May, 1911.

| STATIONS (Those in <i>italics</i> are South of the Equator.) | Absolute. | | | | Average. | | | | Absolute. | | Total Rain | | Aver. |
|--|-----------|-------|----------|-------|----------|-------|---------------|-----------|-----------------|-------------------|------------|-------|--------|
| | Maximum. | | Minimum. | | Max. | Min. | Dew Point. | Humidity. | Max. in Sun. | Min. on Grass. | Depth. | Days. | |
| | Temp. | Date. | Temp. | Date. | | | | | | | | | Cloud. |
| | | | | | | | | 0-100 | | | inches | | |
| London, Camden Square | 81°·7 | 31 | 38°·1 | 7 | 69°·2 | 47°·9 | 49°·5 | 76 | 127°·4 | 32°·3 | 1°·80 | 10 | 5·8 |
| Lagos | 89°·0 | 1 | 71°·0 | 8 | 84°·8 | 74°·0 | 74°·1 | 79 | 151°·0 | 68°·3 | 21°·12 | 26 | ... |
| Cape Town | 90°·0 | 14 | 41°·5 | 27 | 70°·0 | 51°·6 | 51°·9 | 70 | ... | ... | 5°·20 | 8 | 4°·0 |
| Johannesburg | 70°·7 | 4 | 36°·3 | 28 | 59°·7 | 42°·7 | 35°·3 | 64 | 127°·8 | 33°·1 | 3°·86 | 10 | 4°·7 |
| Mauritius | 80°·6 | 5 | 55°·2 | 19 | 77°·7 | 64°·8 | 62°·7 | 77 | 145°·9 | 43°·9 | 1°·15 | 6 | 4°·3 |
| Calcutta... .. | 99°·0 | 12 | 72°·4 | 9 | 95°·1 | 79°·0 | 76°·3 | 73 | ... | 69°·9 | 3°·09 | 5 | 3°·3 |
| Bombay... .. | 94°·2 | 29 | 78°·4 | 1 | 91°·4 | 80°·8 | 76°·5 | 75 | 134°·9 | 73°·5 | °·04 | 2 | 3°·8 |
| Madras | 105°·5 | 25 | 77°·7 | 30 | 97°·8 | 82°·0 | 74°·2 | 70 | 144°·3 | 76°·4 | °·01 | 1 | 2°·0 |
| Kodaikanal | 74°·4 | 4 | 50°·8 | 28 | 70°·2 | 54°·8 | 51°·3 | 71 | 137°·2 | 37°·8 | 9°·70 | 20 | 5°·1 |
| Colombo, Ceylon | 93°·4 | 13 | 70°·4 | 27 | 87°·9 | 76°·7 | 75°·3 | 81 | 140°·0 | 68°·6 | 6°·46 | 16 | 5°·9 |
| Hongkong | 86°·9 | 30 | 68°·1 | 16 | 78°·8 | 72°·8 | 72°·5 | 90 | 139°·5 | ... | 22°·15 | 26 | 8°·9 |
| Sydney | 74°·1 | 5 | 41°·2 | 30 | 66°·3 | 52°·5 | 51°·4 | 79 | 122°·0 | 32°·1 | 1°·43 | 22 | 5°·0 |
| Melbourne | 77°·2 | 6 | 37°·6 | 28 | 61°·2 | 49°·4 | 47°·3 | 75 | 116°·2 | 30°·5 | 3°·35 | 18 | 6°·6 |
| Adelaide | 85°·9 | 6 | 39°·8 | 30 | 65°·8 | 50°·3 | 48°·5 | 73 | 139°·5 | 30°·8 | 1°·89 | 19 | 6°·4 |
| Perth | 74°·4 | 12 | 42°·5 | 18 | 66°·1 | 50°·5 | 49°·5 | 74 | 129°·8 | 34°·2 | 1°·73 | 13 | 5°·1 |
| Coolgardie | 80°·0 | 3 | 37°·4 | 7 | 67°·1 | 45°·1 | 42°·9 | 66 | 143°·2 | 31°·0 | 2°·00 | 6 | 3°·8 |
| Hobart, Tasmania | 66°·9 | 6 | 35°·0 | 29 | 58°·3 | 45°·8 | 43°·9 | 75 | 116°·3 | 32°·3 | 4°·09 | 21 | 6°·5 |
| Wellington | 65°·2 | 10 | 38°·6 | 23 | 59°·6 | 48°·3 | 45°·5 | 73 | 106°·0 | 30°·0 | 2°·21 | 15 | 6°·4 |
| Auckland | 69°·0 | 1 | 41°·0 | 21 | 63°·8 | 51°·7 | 51°·7 | 81 | 128°·0 | 37°·0 | 5°·52 | 20 | 7°·2 |
| Jamaica, Kingston .. | 91°·3 | 30 | 68°·8 | 14 | 87°·3 | 71°·7 | 70°·3 | 79 | ... | ... | 1°·92 | 8 | 5°·9 |
| Grenada | 90°·0 | 25 | 72°·0 | 12† | 85°·5 | 74°·5 | ... | 73 | 142°·0 | ... | 3°·41 | 19 | 4°·0 |
| Toronto | 90°·8 | 28 | 28°·5 | 3 | 73°·5 | 49°·0 | ... | ... | 106°·6 | 23°·6 | 2°·01 | 8 | 3°·7 |
| Fredericton | 91°·5 | 21 | 24°·0 | 5 | 71°·3 | 41°·9 | ... | 60 | ... | ... | °·68 | 4 | 5°·1 |
| St. John, N.B. | 72°·0 | 22 | 31°·0 | 4 | 58°·7 | 43°·0 | ... | ... | ... | ... | °·36 | 7 | 4°·7 |
| Victoria, B.C. | 72°·4 | 31 | 37°·5 | 11 | 60°·3 | 44°·4 | ... | 72 | ... | ... | 1°·80 | 10 | 6°·0 |
| Dawson | 66°·0 | 2* | 23°·0 | 13 | 56°·5 | 35°·8 | ... | ... | ... | ... | 1°·63 | 17 | 8°·1 |

* 25, 28 and 29.

† 13, 14 and 16.

Johannesburg.—Bright sunshine, 214·8 hours.

Mauritius.—Mean temp. of air 1°·4, dew point 1°·8, and R 2·12 in., below averages. Mean hourly velocity of wind 9·8 miles, or 0·7 above average.

KODAIKANAL.—Bright sunshine, 209·0 hours.

COLOMBO.—Mean temp. of air 79°·8, or 2°·4, of dew point 0°·1, and R 4·47 in., below averages. Mean hourly velocity of wind 7·1 miles. TSS on 4 days.

HONGKONG.—Mean temp. of air 75°·5, or 1°·3 below, R 9·85 in. above, and bright sunshine 86·1 hours, or 68 hours below, averages. Mean hourly velocity of wind 14·2 miles.

Sydney.—Mean temp. of air 0°·9 above, and R 3·52 in. below, averages.

Melbourne.—Mean temp. of air 1°·2 above, and R 1·24 in. above, averages.

Adelaide.—Rainfall, ·90 in. below average.

Perth.—Mean temp. of air 2°·3 below, and R 3·30 in. below, averages.

Coolgardie.—Mean temp. of air 1°·5 below, and R 1·35 in. above, averages.

Hobart, Tasmania.—Mean temp. of air 1°·4 above, and R 2·29 in. above, averages.

Wellington.—Mean temp. of air 1°·1 above, and R 2·64 in. below, averages. Bright sunshine 144·1 hours.

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