

# Symons's Meteorological Magazine.

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## THE OCEANOGRAPHICAL MUSEUM AT MONACO.

THE Prince of Monaco has for many years taken a deep interest in the study of oceanic phenomena, and first in the sailing yacht *Hirondelle*, and later in the steam yachts *Princesse Alice I.* and *Princesse Alice II.*, he has carried out extensive observations in the North Atlantic and neighbouring seas. His work at first was mainly concerned with establishing the direction and velocity of the Gulf Stream Drift, but it was soon supplemented so as to take account of the temperature of the water at various depths, the sediments which cover the bottom, and the life both animal and vegetable which abounds in the water at all depths. In the course of these researches, the Prince, aided by a highly competent scientific staff, has elaborated a number of new methods, invented and improved apparatus, and has made enormous collections in various departments of natural history. It is impossible to study oceanography without taking account also of meteorological conditions, and during frequent cruises in polar waters the Prince has studied the phenomena of sea ice, and, assisted by Professor Hergesell, he has carried on at sea an important series of researches into the conditions of the upper air. Far as the upper limit of the atmosphere is removed from the bed of the sea, there is nothing wonderful in the union of the two studies, for the problems of upper air research are curiously similar to those of research in the deep sea.

More than ten years ago the Prince resolved to establish a laboratory for the study and a museum for the exhibition of the specimens he collected and of the apparatus he employed; and he has now completed and equipped the most beautiful Palace of Science ever built, on the southern face of the rocky peninsula of Monaco. The museum has just been inaugurated in the presence of a gathering of oceanographers and representatives of scientific societies and institutions, together with delegates of most of the great maritime Powers of Europe, the festivities extending over the four days from March 28th to April 2nd, during which time the visitors were the guests of the Prince.

Space would not permit of it, nor are these pages the proper place

for an adequate account of the splendid fêtes with which the inauguration was accompanied. The close bearing of oceanography on meteorology, however, is a sufficient justification for offering our readers some description of the gifts to science made, not only at the personal cost but by the personal labours of the Prince of Monaco. Apart from the brilliant group of representatives of the Navies and Governments of France, Germany, Italy, Spain and Portugal, there were gathered together several hundred representatives of scientific societies, and individual men of science from all the countries of Europe. The British representatives included Mr. J. Y. Buchanan for the Royal Society, Dr. H. R. Mill for the Royal Society of Edinburgh, Dr. J. Scott Keltie for the Royal Geographical Society, Dr. G. H. Fowler for the Challenger Society, Mr. W. E. Archer, Assistant Secretary to the Board of Agriculture and Fisheries and President of the International Council for the Study of the Sea, and Professor W. A. Herdman, of Liverpool.

The inauguration of the Museum took place on the 28th of March, in one of the four great halls which constitute the main portion of the building, and the Prince delivered an address, in which he stated that he was now opening on Monegasque territory a proud temple dedicated to the new Divinity who reigns over the intellect. He had lent all the powers of his mind, his conscience and his sovereignty to the extension of scientific truth, the only ground on which it was possible to found the elements of a stable civilization guaranteed against the inconstancy of human laws. Oceanography was rapidly developing because it was associated with all the sciences, and standing before the immensity of the work which extends from one pole to another, through all longitudes, in all depths, throughout all time, he had desired to bring together all the intellectual forces of all civilized countries to consolidate a basis and guide the growth of the advancing science. For this purpose he had collected the specimens, which the Museum, the first part of the Oceanographical Institute, was that day thrown open to receive, and to them he hoped would be added similar riches to be accumulated in the future. The other part of the Institute, which would soon be opened at Paris, was to be a centre of instruction in Oceanography in the heart of the University, but completely independent under the control of a French Council, supported by an International Committee, including the most distinguished Oceanographers of all countries. He thanked the delegates and scientific men present for proving by their approval that he had not induced the workers who were following him to enter upon an uncertain road, and that he had, with their assistance, been able to increase a little the light which drew us onwards in the progress of human dignity. He expressed his pleasure also at seeing present a group of workmen representing those who had laboured at the construction of the building, whom he thanked warmly for the admirable manner in which they had carried out the work.

Speeches of acknowledgment were made by M. Pichon, the French

Minister for Foreign Affairs, by Admiral of the Fleet von Koester, who represented the German Emperor, by Vice-Admiral Grenete representing the King of Italy, by the Portuguese Minister in Paris, who referred feelingly to the deep and practical interest which the late King Carlos of Portugal took in Oceanography, and by others. A cantata composed for the occasion, and entitled "Le nef Triomphale," was then rendered, in which the music expressed the voyage of a ship in fair weather and storm, passing through a terrific tempest but bringing its cargo safe to port triumphant over the elements. Short addresses were given by the three Professors already appointed to the Oceanographical Institute in Paris, MM. Berget, Portier and Joubin.

On the following day a banquet was given by the Prince in the Museum to about 300 guests and the toasts expressed in eloquent language the feelings of the official and scientific world in recognition of the magnificent gifts to science and the noble hospitality of the Prince. Particular interest attaches to the speech of Professor Hergesell of which the following is a translation from the report in the official journal of the Principality "Le Petit Monegasque":—

"Ex abyssis ad alta," he commenced, is the proud device engraved upon the plaques which were presented to the friends and collaborators of the Prince on the occasion of the solemn inauguration of this beautiful building. It is to him in particular that this device applies. To him who joins the study of the abysses of the ocean, to those of the heights of the atmosphere, making the two one in maritime Meteorology. The Prince has been the initiator of these conjoined researches by the expeditions of the Princesse Alice. The science of Oceanography thus becomes a science of the world. The speaker referred in high terms to the Pleiad of brilliant investigators with whom the Prince had surrounded himself in the Oceanographical Institute. The aim and the highest object of the Council for perfecting this Institute would always be to preserve to it the noble character of Internationality which the Prince had impressed upon it. No science is more appropriate than Oceanography for furnishing a common field of work for all noble minds, and he was sure that the members of the International Committee would do all in their power to follow in the Prince's footsteps and would make the motto of the Institute their rule of conduct.

On two of the following days meetings were held of four International Committees respectively for Oceanographical research in the Mediterranean Sea and the Atlantic Ocean, for perfecting the Oceanographical Institute and for the preparation of a new edition of the Prince's great bathymetrical chart of the world. Over all these, although their deliberations sometimes extended for more than three hours at a stretch, the Prince presided personally and showed qualities of patience and resourcefulness as a Chairman which are not always displayed on similar occasions. On one of the evenings, Lieut. Bourrée exhibited in the Theatre of the Beaux Arts at Monte

Carlo, an interesting collection of coloured photographs by the lantern, and a unique and extraordinary set of cinematograph films illustrating the use of the various oceanographical instruments on board the *Princesse Alice*, which enabled those present to see the difficulties of the work, and to appreciate the handiness of the sailors in manipulating the enormously bulky and weighty pieces of apparatus in a heavy sea.

The museum is not only a splendid architectural monument externally, no less striking though more reserved and dignified in style than the gorgeous buildings which crown the neighbouring height of Monte Carlo, but internally every detail of the fitting up and decoration of the rooms shows an intelligent and sympathetic application of scientific methods to the arrangement of a museum and of scientific subjects to the art of decoration. The floors are laid in mosaics representing faithfully some of the eccentric forms of deep-sea fishes and invertebrates, while the lights are enclosed in lanterns reproducing in large the forms of microscopic shells familiar to the oceanographer as radiolarians. The larger clusters of electric lights in the centre of the Hall are modelled after various species of medusa, or represent groups of seaweed and shells, amongst which the electric lights gleam like pearls. The entrance hall contains a marble statue, presented by some of the European monarchs, representing the Prince in yachting costume leaning on the bridge of his yacht, a remarkably life-like and unconventional portrait.

Never before have we seen so perfect an exposition of the ideals and attainments of a life of strenuous devotion to scientific work materialized in so splendid a form as this Oceanographical Institute, and its existence must make Monaco in the future a goal of scientific pilgrimage. The laboratories and aquarium on the lower floors of the Museum are sure to produce a continual output of scientific work. The roof of the building also is fitted up as a Meteorological Observatory.

A special performance of the Monte Carlo Opera occupied one evening, during which an Ode to Thought, specially composed for the occasion, was recited by Madame Bartet, one of the most accomplished French elocutionists, and on another evening the harbour of Monaco was illuminated and a marine pageant displayed the arrival of the mythical Hercules, who gave his name to the port, amid a display of fireworks which was pronounced unrivalled by all the visitors. On the last evening the Prince received all who took part in the inauguration in his ancient palace at a grand reception. The pleasant memories of a delightful fête of Science were marred on one or two occasions by wet and cold weather with leaden skies and snow wreathed hills, below which the palm trees shivered uneasily, and to us also by the fact that there were no British official representatives to offer on the part of the Government the national congratulations on the accomplishment of so great a piece of scientific work, especially as the Prince truly observed in his inaugural address the foundation

of Oceanography as a science had been laid by British men of science ; and among the exploring ships whose names decorate the façade of the new building, that of the Challenger deservedly holds the highest place. The French and Italian Navies were both represented by the newest type of torpedo boat destroyers, but the British flag only appeared in the harbour on a group of pleasure yachts.

## CORRELATION OF CLIMATIC CHANGES.

By R. C. MOSSMAN.

(Of the Argentine Meteorological Office.)

THE important contribution to world-wide meteorology contained in M. Arctowski's memoir, "L'Enchaînement des Variations Climatiques," a review of which appears in the January number, suggests some further comments, more especially with reference to the promised extension of the investigation so as to embrace monthly in addition to the annual means. The value of monthly maps is rendered obvious in order to explain the simultaneous occurrence of widely different phenomena in antipodean regions. Abnormal conditions are of frequent occurrence, indeed in the January number there are two notices of this nature which call for remark. Mr. MacDowall, in his note on "Compensation in Weather," points out that for nearly thirty years there has been a progressive rise of temperature in the month of November at Greenwich. This rise, as will appear from the following table, was more marked over western than in eastern Europe, and would appear to be due to a deepening of the low pressure minimum at Iceland, associated with an increase of pressure at the Azores, the result being an unusual prevalence of mild, wet, south-west winds over north-western Europe, as shown by the records at Edinburgh and Copenhagen.

### *November Temperature Departures from normal (1856-1905).*

5-Year Period.	Edinburgh.	Greenwich.	Copen- hagen.	Stockholm.	Vienna.	Buenos Ayres.
1856-1860 .....	-0°8	-1°1	-1°3	-4°0	-2°3	+0°9
1861-1865 ...	-1°5	-0°6	+0°6	+0°9	+1°1	+1°9
1866-1870 ...	-0°7	-0°8	-0°8	+0°9	-1°4	-0°3
1871-1875 .....	-1°1	-0°5	-0°3	+0°2	-0°5	+0°5
1876-1880 .....	-1°5	-1°2	-0°2	-0°7	-0°4	-1°1
1881-1885 .....	+0°3	+1°0	-0°3	+0°2	-0°5	+0°5
1886-1890 .....	+0°9	+0°6	+0°8	+0°4	+1°4	-1°0
1891-1895 .....	+1°1	+1°4	+0°6	-0°4	+1°1	-0°8
1896-1900 .....	+2°3	+2°0	+1°4	+2°5	+2°5	0°0
1901-1905 .....	+1°1	-0°5	-0°2	0°0	-0°4	-0°5

It will be seen that Buenos Ayres, on the other hand, has been favoured with cool Novembers at the same time that western

Europe has had abnormally mild Novembers, and this condition would appear to have extended at least as far south as latitude  $52^{\circ}$  S, as shown by the short record at Punta Arenas which began in 1888, and to have embraced the north of South America as far as Rio de Janeiro. To take more recent occurrences, it may be noted that during December while Switzerland was suffering from unusual warmth, Punta Arenas was experiencing the coldest December in the 22 years covered by the record. Since this year began we have had great floods in France, gales in Britain, unusual snowstorms and heat waves in the United States, and in nearly every instance the Argentine weather maps have shown most pronounced abnormalities. It is in throwing light on points like these, and many others, that M. Arctowski's promised monthly maps will be of the greatest utility. Daily weather maps for the globe would be even more interesting in helping to throw light on abnormal weather in far distant regions. For example, on 13th February all previous records of summer heat in that part of the Argentine Republic known as the Pampa Central were broken with shade temperatures of more than  $104^{\circ}$ , this being associated with the advance of a low pressure area. On the 17th an anticyclone of unusual intensity appeared off Cape Horn, the barometer standing at 30.34 inches, a phenomenal summer reading for this region; on the 20th of the month, as this high pressure area moved north, low minimum temperatures were recorded, the thermometer in Buenos Ayres falling to  $39^{\circ} \cdot 2$ , or  $6^{\circ} \cdot 3$  lower than the previous lowest February reading during the last 50 years. Further south, in the Province of Buenos Ayres, the thermometer at places near sea level fell to freezing point. During the days covered by these specified phenomena a four days' gale of great severity raged in Britain, and that these widely separated phenomena stood in intimate relation to each other is to me quite evident, but daily weather maps of the globe are required to demonstrate the inter-connection.

To render such maps thoroughly effective, more stations would have to be established in arctic and particularly antarctic regions, as it is obviously impossible to give world-wide maps without adequate representation in Polar regions, where, as Hildebrandsson has shown, the principal "centres of action" are located. The establishment of such stations and the immediate application of the data for practical purposes will probably not be realised for some time. While the present situation leaves much to be desired, it is a matter of satisfaction and for congratulation that workers such as M. Arctowski from time to time furnish memoirs which would do credit to the combined strength of a government department, and which show the desirability of the prompt utilisation of world-wide data from a strictly utilitarian standpoint.











## THE WEATHER OF MARCH.

By FRED. J. BRODIE.

THE changeable weather which had prevailed throughout the greater part of last winter continued in a modified degree until about the middle of March. At the beginning of the month the conditions over England were, it is true, mostly fine; and between the 5th and 7th, when a mild breeze from the southward prevailed over the country generally, the thermometer rose slightly above  $55^{\circ}$  in several parts of England and Ireland. The United Kingdom then lay about midway between an anticyclone, which covered the northern and central parts of the continent, and a large Atlantic depression, the influence of the latter system being sufficient to cause rather frequent falls of rain in all our more western districts. Towards the end of the first week the continental high pressure system passed away to the eastward, and for some few days the weather over the entire kingdom was influenced by the oceanic disturbance which advanced slowly eastward, its centre passing across Scotland between the 9th and 10th when rain occurred very generally. In the rear of the depression a cold wind sprang up from the northward, and on the nights of the 10th and 11th a sharp ground frost occurred in all but the south-eastern district, the exposed thermometer falling to  $25^{\circ}$  or less in several places, to  $20^{\circ}$  at Hereford, and to  $16^{\circ}$  at Llangammarch Wells. A small cyclonic system which advanced northwards from the Bay of Biscay between the 10th and 12th, occasioned a considerable fall of rain along the south coast of England, and a still heavier fall on the other side of the Channel; the disturbance ultimately passing away towards the western Mediterranean, where it appears to have gradually dispersed. Between the 14th and 16th a continuation of changeable weather was produced by a large depression which moved from Iceland to the north of Scandinavia, the thermometer being fairly high in the daytime, but low at night, with sharp frosts in most inland districts. Over England and the east of Scotland the maximum readings were in some places a trifle above  $55^{\circ}$ , but at night the thermometer, even in the shelter of the screen, fell several degrees below freezing, the minima at some time between the 15th and 18th being as low as  $20^{\circ}$  at Sumburgh Head,  $22^{\circ}$  at Llangammarch Wells, and  $24^{\circ}$  at Balmoral and Cirencester. On the grass the thermometer fell below  $20^{\circ}$  in several places, a reading as low as  $17^{\circ}$  being recorded at Hereford, and a reading of  $15^{\circ}$  at Cambridge and Llangammarch Wells. On the 17th and 18th, as the large depression in the far north continued to move eastward, a strong current of wind from the northward again extended over the whole kingdom, and sharp squalls of snow were experienced in nearly all parts of Great Britain.

During the remainder of the month the distribution of pressure was almost continuously anticyclonic, and over nearly the whole of central and southern England an entire absence of rain was ex-

perienced after the 18th. In most of the western and northern districts, however, a temporary break in the weather occurred at Easter (on the 26th and 27th), the interval between the passage of two distinct anticyclones across the country being marked by the extension of a low pressure system from the Atlantic. Excepting on our east and south-east coasts, where a good deal of fog prevailed, the weather was, with the exception just noted, exceedingly fine, but temperature seldom rose to any very high level even in the daytime, and at night frosts were experienced rather commonly, especially over England. The warmest weather of the month occurred between the 28th and 30th, when the thermometer nearly succeeded in touching  $60^{\circ}$  in many districts, and passed that level at a few central stations in England and Scotland, and also at Killarney. In many places almost equally high readings were recorded at some time between the 20th and 23rd, when  $60^{\circ}$  was touched at Aberdeen, at several places in the north of England, and at Killarney. The sharpest frosts occurred between the 27th and 31st, when the sheltered thermometer fell below  $25^{\circ}$  in many parts of the kingdom, and reached  $20^{\circ}$  at Llangammarch Wells. On the grass the minima were in several instances below  $20^{\circ}$ , the exposed thermometer falling to  $11^{\circ}$  at Llangammarch Wells, and to  $16^{\circ}$  at Southport, Burnley, Cambridge and West Linton.

The mean temperature of the month was above the average in all parts of the United Kingdom, but in the southern districts the excess was small. In the north of Scotland the month was the warmest March since that of 1893. Ireland and the west of Scotland received less than the average amount of bright sunshine, but in all other parts of the country there was an excess. At Westminster the total of 110 hours was 41 hours more than the average and was, with three exceptions, the largest recorded in March since the observations commenced in 1883. In 1893 the total amounted to 113 hours, in 1894 to 140 hours, and in 1907 to as many as 152 hours.



## ROYAL METEOROLOGICAL SOCIETY.

For many years past it has been the custom to arrange for the March Meeting of this Society to be of a more popular character than the other meetings of the session. At the meeting on the 16th ult., Capt. H. G. Lyons, F.R.S., who was until last year Director of the Egyptian Survey Department, delivered an instructive and interesting Lecture on "Climatic Influences in Egypt and the Sudan," which he illustrated by a large number of lantern slides. Mr. H. Mellish, President, occupied the chair.

Captain Lyons began by pointing out that from early times the ancient Greeks recognised the marked difference between the climate of the Mediterranean and that of Africa, and that Aristotle indicated correctly the rain of Ethiopia as the cause of the annual flood of the

Nile. Travellers have supplemented our knowledge from time to time, but only within the last ten years has a network of meteorological stations given precision to our views and furnished a basis for further investigation. The comparatively low relief of the country, which lies as a vast land area in low latitudes, combined with the effect of the North-easterly trade winds which sweep over it produce the hot and dry conditions which are so characteristic of north-eastern Africa. Modified somewhat in the north by the warm waters of the Mediterranean, and in the south by the rains of the monsoon in summer, the highest temperatures and most arid conditions are reached between Wadi Halfa and Dongola, where Northerly winds, clear skies, and a great range of temperature prevail throughout the year.

The lecturer showed that the important rains are those falling in Uganda, the southern plains of the Sudan, and on the table-land of Abyssinia, since they not only provide the whole supply of the Nile and its tributaries, but largely control their regimen. Fed by the South-easterly air currents blowing in from the Indian Ocean, these monsoon rains supply the equatorial lakes and the tributaries of the Nile, though these lose much of their water in the lakes and marshy valleys through which they flow. The dense tropical forests of Uganda are due to the same rainfall, which, however, falls off rapidly to the northwards, and park land, thorn forest, and savannah successively herald the approach of the true desert which extends from near Khartum to the shores of the Mediterranean. But it is the Abyssinian table-land, with its heavy summer rainfall which is most effective, since it furnishes the whole of the Nile flood and enables the Nile to maintain itself through 1,500 miles of desert.

As the sole source of the flood, the variation of these rains directly determines the abundance or deficiency of Egypt's supply, so that this climatic problem is of immense practical importance. Hardly less important in these days of intensive cultivation of cotton, is the study of the winter storms which occasionally break in the Sudan and Abyssinia, raising the level of the rivers and increasing the supply of the Nile appreciably at a time when the normal supply is inadequate. The climate of the region not only influences the water supply, but the great range of temperature rapidly disintegrates the rocks and the wind removes the finer portion of the material. In this way the deserts are being constantly modified and vast ranges of sand dunes are piled up. The distribution of vegetation is very markedly influenced both by the moisture and by the physical character of the country; and in them the explanation of the tropical forest of Uganda, the rank growth of the marshes of the Upper Nile, which forms the "sadd" of that region, the thorn forest, and the savannah of Kordofan and the Gezira whence large supplies of gum are obtained, is to be found.

Captain Lyons stated that man has been affected also to a great extent, and in the ancient civilization of the Egyptians we see clear

evidence of the influence on him of the climatic conditions of his own country and the lands to the south. His calendar, his agricultural operations, his architecture, his general character, and even his adoption of the process of mummification for the artificial preservation of the bodies of the dead, are all the direct consequences of the climatic conditions among which he lived.

On the motion of Dr. Theodore Williams, seconded by Colonel H. E. Rawson, a very cordial vote of thanks was passed to Captain Lyons for his Lecture.

Mr. Roberto Irizar was elected a Fellow of the Society.

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## INSPECTION OF THE NATIONAL PHYSICAL LABORATORY.

ON the occasion of the inspection of the National Physical Laboratory, on March 18th, when a large number of men of science assembled at the Laboratory wild gusts of bitter wind, accompanied by frequent showers of snow, detracted somewhat from the enjoyment of the visitors. The whole of the Laboratory, situated in the grounds of Bushey House, was thrown open, and despite the weather many persons interested in the scientific and engineering work of the Institution took advantage of the opportunity afforded of being personally conducted through the various departments.

The work of the Laboratory, apart from the Kew Observatory branch, touches only at a few points on meteorology, being chiefly concerned with the testing of instruments and apparatus for electrical and general engineering purposes, but promising results from a meteorological point of view may be expected on the completion of the two newly erected towers for testing wind-force with a special view to the application of the information thus obtained to aeronautical science. Unfortunately the comparatively low altitude of the platforms on which the resistance plates are situated, being only sixty feet above ground, fails to secure them completely from obstruction by the surrounding trees and buildings, and the indications can only be looked upon as satisfactory when the experiments are made with the wind in a particular quarter. Experiments are also being made to ascertain the action of steady winds and gusts upon model aeroplanes. Laboratory work on this subject is made possible by the use of a large whirling table.

The testing of thermometers is carried on in a special department, but in practically all cases the instruments designed for use in meteorological work are tested at the long established Observatory at Kew which is in its present organization a special branch of the National Physical Laboratory.

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## Correspondence.

*To the Editor of Symons's Meteorological Magazine.*

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### ATMOSPHERIC TIDES.

It is certainly strange that the lunar atmospheric tide is so small that it is hardly, if at all, apparent in our barometric records. If we lived at the bottom of one of the deep oceans we should hardly be conscious of the tides, for the rise and fall in deep water is very small, and at a depth of 30,000 feet the change of pressure would be less than one ten-thousandth part of the whole, and would be inappreciable, just as a barometric change of .002 or .003 inches is inappreciable. Still the analogy is not a good one, for the free play of the water is restricted by land masses, notably by North and South America, whereas there is very little hindrance in comparison to the free play of the air.

But is it so certain that the double daily oscillation of the barometer is not due to a solar tide? This oscillation remains unexplained, excepting that it is fairly certain that the atmosphere as a whole has a natural period of oscillation of about twelve hours. A series of very small impulses, provided they are exactly timed, and long continued, will set a person swinging in an ordinary swing, just as one clock will set going another clock placed near it if the two pendulums oscillate exactly together. Similarly if the natural period of the atmosphere should chance to be very close to twelve hours, the tide producing power of the sun, with a period which is always within a minute of twelve hours, must inevitably produce some such tide as we see in the double daily barometric oscillation. That there is no lunar effect corresponding to the spring and neap tides of the sea may be because the time during which the sun and moon act together (the spring tides of the sea) is too short to produce an appreciable effect on the magnitude of the oscillation.

W. H. DINES.

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IN your March issue Mr. Philpotts asks why the effects of atmospheric tides are not perceptible in the variations of the barometer.

In reality these effects are so small that they must be masked by changes due to other causes. It can readily be seen that they must be very small by considering the analogous case of the variations of pressure at the bottom of a hypothetical ocean whose depth is comparable with the height of the atmosphere, *e.g.*, the pressure due to a tide of 20 ft. would only increase the pressure at a depth of 40 miles by one ten-thousandth part, and it is barometric variations of this order that we should expect to find. The effect of the compressibility of the air would be to decrease these effects.

The idea that the lesser density of the air as compared with water

would increase the height of the atmospheric tides is erroneous, as is M. Arago's explanation that the increase of height is compensated by a decrease of weight due to the attraction of the tide-producing body.

May not the small diurnal variation of the barometer be at least partly due to the effects of the solar tide?

M. LANGDON.

*2, Matford Avenue, Exeter, April 6th, 1910.*

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## RECORDS OF METEORS.

MAY I suggest that meteorological observers should always register the dates, times, and apparent positions and directions of such conspicuous meteors as casually come under their notice? Meteors, though undoubtedly of cosmic or astronomical origin, belong to the phenomena of our atmosphere, since they are rendered luminous only when traversing it, and owe their visible existence and dispersion entirely to its action.

Luke Howard included a few interesting accounts of meteors in his "Climate of London," and present-day observers will do well to emulate his example. This is the more necessary from the circumstance that brilliant meteoric fireballs often make their apparition at times when regular astronomical students are not watching for them. They may appear in a partially clouded sky, in moonlight or twilight—in fact, a particularly favourable hour for viewing these attractive objects is in the strong twilight of early evening.

Meteorologists while watching cloud scenery, looking for changes of wind or noting the variable aspects of the sky, often have their attention momentarily diverted by the passage of bright meteors. If suitable allusion to these were preserved in meteorological registers and published the material would be of value to those investigating the subject. The most important features in such records are the position and direction of the luminous flights. These should be described according to the stars near them, or the cardinal points given together with estimated altitude of the beginning and end of the observed trajectory. Better still, perhaps, is the plan of marking the meteor's course upon a star chart or celestial globe, and reading off the right ascension and declination of the extremities of the flight; but a little astronomical knowledge is required in this process.

For data regarding splendid fireballs we have often to rely upon mere newspaper descriptions by unskilled spectators who know nothing of the features which it is essential to record. Hence, meteorological observers, who frequently possess some knowledge of the constellations and are practised in suitably recording atmospheric occurrences, might materially aid our knowledge by taking notes of such bright meteors as may chance to present themselves during their observations.

W. F. DENNING.

*Bristol.*

## THE "GREEN FLASH" AT SUNSET.

LAST evening, midway between Marseilles and the Strait of Bonifacio, the sky was perfectly clear, after a cloudless day, with little wind, about S.S.E. As the sun approached the horizon, the line 'twixt sea and sky for about  $45^{\circ}$  each side of the sun became suffused with a rich dull rose pink, and the waves reflected a marvellous ruby shade on their surfaces facing the sunset, whilst the other faces were an opalescent blue or green from the upper sky. The two colours flashed and changed in a marvellous way, such intensity of colouring had never been seen by those on board.

I saw in the Salon at Düsseldorf last year an impressionist oil painting which showed the same effect, and I remember remarking it was surely an exaggeration; but here was Nature giving it far more beautifully in her power of chromo-illustration.

The sun set clean into the sea, and about ten (or less) seconds after it had disappeared a bright green single flash, just like a railway signal lamp, but brighter far, met our view and rewarded our watching for it.

GEORGE H. BAINES.

*R.M.S. Dunottar Castle, at sea, 5th March, 1910.*

## AN UNUSUAL LUNAR RAINBOW.

I VENTURE to send you news of an uncommon phenomenon which appeared in the sky here the other evening, believing it to be worthy of record in your Magazine.

At half-past eight, on the 25th instant, when the moon was a few degrees above the horizon, in an almost cloudless sky, rain began to fall from overhead. As a result, a perfect rainbow was thrown on to the western sky, appearing as a faintly luminous arc of light, without, of course, the ordinary rainbow colours. This is the first time I have observed such a formation, as, I believe, the circumstances must be very rarely favourable for producing it.

A. B. WEEKES,

*Met. Observer.*

*Kroonstad, Orange River Colony, February 28th, 1910.*

## HEAVY RAINFALLS IN THE SOUTH-EAST OF ENGLAND, AND ANTICYCLONIC PERIODS.

MAY I venture to draw your attention to a somewhat remarkable phenomenon which has just recently been repeated, and incidentally ask a question of your readers more learned in the subject than I?

Last month at Tunbridge Wells we experienced two isolated but very heavy rainfalls, viz., 9th, 1.16 in., and 11th, 1.00 in., the rest of the precipitation of the month amounting to only .27 in., and thereafter we only had four slight falls to the end of the month.



Now these rainfalls at my Clapham Park station are only represented by .35 in. and .32 in. respectively, and at Stow-on-the-Wold by .28 in. and .10 in.

The idea I wish to put forward is this, that if my memory serves me well, heavy *isolated* falls of rain in the south-east of England are nearly always, and especially in the spring months, followed by a lengthy period of anticyclonic weather; and it occurred to me that those having access to the Camden Square or Greenwich records might like to follow the matter up further. The assumption is, that granting this to be as I have suggested, that we should be about to enjoy a very fine spring and early summer.

D. W. HORNER, F.R.Met.Soc.

*Tunbridge Wells, 5th April, 1910.*

[Heavy isolated falls of rain are usually associated with thunderstorms, line squalls, or small secondary cyclones, the first-named being more frequent in summer than in spring. All cases in which the rainfall appreciably exceeds one inch are investigated at Camden Square, and discussed in the section on Heavy Rains on Rainfall Days in "British Rainfall," usually with the aid of a map. We cannot, however, say that we have observed any relation between isolated heavy rains and the subsequent weather.—Ed., *S.M.M.*]

## REVIEWS.

*Weather Forecasting by Simple Methods.* By FRANCIS S. GRANGER. Nottingham: Henry B. Saxton, 1909. Size  $8\frac{1}{2} \times 5\frac{1}{2}$ . Pp. xii + 122. Price 2s. 6d. net.

MR. GRANGER has devoted much attention to the signs of the sky, and we have no doubt that he is able to predict local changes of weather with a fair degree of success. We are sorry, however, that we cannot recommend his book as likely to assist other observers. The descriptions are not always very clear; essential and accidental appearances are rarely distinguished, and the author has but an imperfect appreciation of the fundamental facts of meteorology. It is painful to be obliged to refer to an absolutely honest and sincere effort in this way; but it is a duty we owe to our readers all the same. As an observer, Mr. Granger has, we are sure, derived much pleasure from his observations of clouds and the colour of the sky, but it is a difficult art to communicate one's impressions in such a way as to assist others to follow in one's steps.

*Zur Meteorologie von Peru* (On the Meteorology of Peru) von J. HANN. [Sitzungsber. k. Akad. Wiss. Math.-Naturw. Klasse. Bd. 118, Abt. IIa. November, 1909]. Wien, 1909, Size  $10 \times 6\frac{1}{2}$ , Pp. 90.

IN this impressive memoir Prof. Hann discusses the meteorological data accumulated at the Arequipa Observatory and auxiliary stations,

which were published without discussion in the Annals of the Astronomical Observatory at Harvard College, between 1899 and 1908. Prof. Hann had already dealt in the *Meteorologische Zeitschrift* with the purely climatological results of some of these volumes; he now attacks the meteorological considerations especially with regard to the annual and diurnal periodicity of the various elements.

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*Nouvelle Méthode de Prévission du Temps* (New Method of Weather Prediction), par GABRIEL GUILBERT. Avec une Préface, par BERNARD BRUNHES, Directeur de l'Observatoire du Puy de Dôme. Paris, Gauthier-Villars, 1909. Size  $10 \times 6\frac{1}{2}$ , pp. xxxviii + 344. Plates.

A BOOK of such originality and importance as this is a rare planet in the meteorological sky, and the matter with which it deals ought to be the subject of a long article rather than a short notice. The name of M. Guilbert as a student of weather forecasts has been known in France for eighteen years; but official forecasters not unnaturally fight shy of amateurs with original methods. A competition in weather forecasting, arranged at Liège in 1905, gave M. Guilbert an opportunity of demonstrating the practicability of his system; and he has now set it forth in detail with numerous examples in the volume before us. The preface by M. Brunhes, who was one of the judges who awarded M. Guilbert the prize for the contest at Liège, gives a resumé of the method with critical remarks which are the more convincing because they do not accept all the author's explanations, nor approve all his modes of expression.

Put briefly the "new method" is to view the depression or cyclone as the essential factor in weather-making, and to regard the drawing of the isobaric chart of to-morrow as the immediate object of the forecaster. In order to ascertain which way, and how far, the depression will move, and whether it will deepen or fill up on the way, M. Guilbert makes use of the principle of the normal wind to be expected in a given arrangement of isobars. If the wind actually blowing is in excess or defect of the normal force, or different to the normal direction, he takes it as a sign of external influences affecting the movement of the depression as a whole, and he expects the system to move in the direction of least resistance as indicated by the deviation of the actual winds from the normal. Only experience and a fair trial can show whether the new method is to prove successful in official forecasts; but there can be no doubt that local forecasts can be greatly improved by attention to the rules as regards actual winds. The criticisms of various distinguished meteorologists are recorded and considered; and the author discusses the question with great moderation and a thoroughly scientific openness of mind.

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## RAINFALL TABLE FOR MARCH, 1910.

| STATION.                      | COUNTY.            | Lat.<br>N. | Long.<br>W.<br>[°E.] | 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                            | 1'70                           | '97          |
| Tenterden.....                | Kent.....          | 51 4       | *0 41                | 190                            | 1'95                           | 1'51         |
| Steyning.....                 | Sussex.....        | 50 53      | 0 20                 | 80                             | 2'25                           | 1'63         |
| Southampton (Cadland) ...     | Hampshire.....     | 50 50      | 1 22                 | 52                             | 2'17                           | '97          |
| Hitchin.....                  | Hertfordshire..... | 51 57      | 0 17                 | 238                            | 1'69                           | '95          |
| Oxford (Magdalen College)..   | Oxfordshire.....   | 51 45      | 1 15                 | 186                            | 1'45                           | '54          |
| Bury St. Edmunds (Westley)    | Suffolk.....       | 52 15      | *0 40                | 226                            | 1'71                           | 1'07         |
| Geldeston [Beccles].....      | Norfolk.....       | 52 27      | *1 31                | 38                             | 1'57                           | '95          |
| Polapit Tamar [Launceston]    | Devon.....         | 50 40      | 4 22                 | 315                            | 2'74                           | 1'03         |
| Rousdon [Lyme Regis].....     | „.....             | 50 41      | 3 0                  | 510                            | 2'30                           | '77          |
| Stroud (Upfield).....         | Gloucestershire..  | 51 44      | 2 13                 | 226                            | 2'01                           | '69          |
| Church Stretton (Wolaston)..  | Shropshire.....    | 52 35      | 2 48                 | 800                            | 2'19                           | '81          |
| Coventry (Kingswood).....     | Warwickshire.....  | 52 24      | 1 30                 | 340                            | 1'89                           | '84          |
| Market Overton.....           | Rutland.....       | 52 44      | 0 41                 | 475                            | 1'69                           | 1'04         |
| Boston.....                   | Lincolnshire.....  | 52 58      | 0 1                  | 25                             | 1'47                           | '65          |
| Workshop (Hodsock Priory).    | Nottinghamshire    | 53 22      | 1 5                  | 56                             | 1'70                           | '54          |
| Macclesfield.....             | Cheshire.....      | 53 15      | 2 7                  | 501                            | 2'50                           | '80          |
| Southport (Hesketh Park)..    | Lancashire.....    | 53 38      | 2 59                 | 38                             | 2'11                           | 1'03         |
| Wetherby (Ribston Hall)...    | Yorkshire, W.R.    | 53 59      | 1 24                 | 130                            | 1'92                           | '84          |
| Arncliffe Vicarage.....       | „.....             | 54 8       | 2 6                  | 732                            | 5'17                           | 2'29         |
| Hull (Pearson Park).....      | „..... E.R.        | 53 45      | 0 20                 | 6                              | 1'84                           | '76          |
| Newcastle (Town Moor) ...     | Northumberland     | 54 59      | 1 38                 | 201                            | 2'10                           | '43          |
| Borrowdale (Seathwaite)...    | Cumberland.....    | 54 30      | 3 10                 | 423                            | 10'63                          | 9'76         |
| Cardiff (Ely).....            | Glamorgan.....     | 51 29      | 3 13                 | 53                             | 2'89                           | 1'24         |
| Haverfordwest (High Street)   | Pembroke.....      | 51 48      | 4 58                 | 95                             | 3'16                           | 1'71         |
| Aberystwyth (Gogerddan)..     | Cardigan.....      | 52 26      | 4 1                  | 83                             | 3'04                           | 1'66         |
| Llandudno.....                | Carnarvon.....     | 53 20      | 3 50                 | 72                             | 2'13                           | '92          |
| Cargen [Dumfries].....        | Kirkcudbright...   | 55 2       | 3 37                 | 80                             | 3'33                           | 4'58         |
| Marchmont House.....          | Berwick.....       | 55 44      | 2 24                 | 498                            | 2'64                           | 1'09         |
| Girvan (Pinmore).....         | Ayr.....           | 55 10      | 4 49                 | 207                            | 3'62                           | 2'98         |
| Glasgow (Queen's Park) ...    | Renfrew.....       | 55 53      | 4 18                 | 144                            | 2'61                           | 2'02         |
| Inveraray (Newtown).....      | Argyll.....        | 56 14      | 5 4                  | 17                             | 5'41                           | 3'48         |
| Mull (Quinish).....           | „.....             | 56 36      | 6 13                 | 35                             | 4'28                           | 3'64         |
| Dundee (Eastern Necropolis)   | Forfar.....        | 56 28      | 2 57                 | 199                            | 2'06                           | 1'09         |
| Braemar.....                  | Aberdeen.....      | 57 0       | 3 24                 | 1114                           | 2'87                           | 2'73         |
| Aberdeen (Cranford).....      | „.....             | 57 8       | 2 7                  | 120                            | 2'65                           | 1'55         |
| Cawdor.....                   | Nairn.....         | 57 31      | 3 57                 | 250                            | 2'35                           | 1'44         |
| Fort Augustus (S. Benedict's) | E. Inverness.....  | 57 9       | 4 41                 | 68                             | 3'79                           | 2'72         |
| Loch Torridon (Bendamph)      | W. Ross.....       | 57 32      | 5 32                 | 20                             | 7'29                           | 8'60         |
| Dunrobin Castle.....          | Sutherland.....    | 57 59      | 3 56                 | 14                             | 2'64                           | 1'01         |
| Wick.....                     | Caithness.....     | 58 26      | 3 6                  | 77                             | 2'24                           | 1'43         |
| Killarney (District Asylum)   | Kerry.....         | 52 4       | 9 31                 | 178                            | 4'51                           | 6'76         |
| Waterford (Brook Lodge)...    | Waterford.....     | 52 15      | 7 7                  | 104                            | 2'64                           | 2'05         |
| Nenagh (Castle Lough).....    | Tipperary.....     | 52 54      | 8 24                 | 120                            | 2'99                           | 2'86         |
| Miltown Malbay.....           | Clare.....         | 52 52      | 9 26                 | 400                            | 3'11                           | 3'02         |
| Gorey (Courtown House) ..     | Wexford.....       | 52 40      | 6 13                 | 80                             | 2'28                           | 2'12         |
| Abbey Leix (Blandsfort)...    | Queen's County..   | 52 56      | 7 17                 | 532                            | 2'59                           | 2'16         |
| Dublin (FitzWilliam Square)   | Dublin.....        | 53 21      | 6 14                 | 54                             | 1'98                           | '92          |
| Mullingar (Belvedere).....    | Westmeath.....     | 53 29      | 7 22                 | 367                            | 2'64                           | 1'67         |
| Ballinasloe.....              | Galway.....        | 53 20      | 8 15                 | 160                            | 2'66                           | 2'36         |
| Crossmolina (Enniscoe).....   | Mayo.....          | 54 4       | 9 18                 | 74                             | 4'36                           | 3'69         |
| Collooney (Markree Obsy.)..   | Sligo.....         | 54 11      | 8 27                 | 127                            | 3'33                           | 3'75         |
| Seaforde.....                 | Down.....          | 54 19      | 5 50                 | 180                            | 2'84                           | 1'98         |
| Bushmills (Dundarave).....    | Antrim.....        | 55 12      | 6 30                 | 162                            | 2'73                           | 2'48         |
| Omagh (Edenfel).....          | Tyrone.....        | 54 36      | 7 18                 | 280                            | 2'98                           | 2'20         |

Erratum in February Table:—

Coventry (Kingswood) should read .....|| 2'52

## RAINFALL TABLE FOR MARCH, 1910—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.      | 1910. | Diff. from Aver. in. | % of Av. |                        |                 |
| in.                      | Av.      | in.               | Date.       | Days | in.                   | in.   | in.                  | Av.      | in.                    |                 |
| — .73                    | 57       | .40               | 9           | 9    | 5.19                  | 5.50  | + .31                | 106      | 25.11                  | Camden Square   |
| — .44                    | 77       | .87               | 9           | 12   | 5.99                  | 8.19  | +2.20                | 137      | 27.64                  | Tenterden       |
| — .62                    | 72       | .91               | 9           | 7    | 7.75                  | 11.42 | +3.67                | 147      | 33.58                  | Steyning        |
| — 1.20                   | 45       | .52               | 9           | 8    | 7.20                  | 7.87  | + .67                | 109      | 31.86                  | Cadland         |
| — .74                    | 56       | .42               | 9           | 7    | 5.01                  | 5.38  | + .37                | 107      | 25.16                  | Hitchin         |
| — .91                    | 37       | .22               | 9           | 8    | 4.85                  | 4.47  | — .38                | 92       | 24.58                  | Oxford          |
| — .64                    | 63       | .37               | 9           | 10   | 5.00                  | 4.83  | — .17                | 97       | 25.40                  | Westley         |
| — .62                    | 60       | .35               | 9           | 11   | 4.51                  | 4.79  | + .28                | 106      | 23.73                  | Geldeston       |
| — 1.71                   | 38       | .28               | 6           | 11   | 9.28                  | 14.30 | +5.02                | 154      | 38.27                  | Polapit Tamar   |
| — 1.53                   | 34       | .25               | 9           | 8    | 7.74                  | 7.71  | — .03                | 100      | 33.54                  | Roundon         |
| — 1.32                   | 34       | .27               | 9           | 11   | 6.46                  | 6.75  | + .29                | 104      | 29.81                  | Stroud          |
| — 1.38                   | 37       | .36               | 8           | 10   | 6.87                  | 6.20  | — .67                | 90       | 32.41                  | Wolstaston      |
| — 1.05                   | 44       | .22               | 8           | 9    | 6.12                  | 5.73  | — .39                | 94       | 28.98                  | Coventry        |
| — .65                    | 62       | .22               | 9           | 17   | 5.42                  | 5.70  | + .28                | 105      | 27.10                  | Market Overton  |
| — .82                    | 44       | .15               | 9           | 10   | 4.54                  | 4.39  | — .15                | 97       | 23.35                  | Boston          |
| — 1.16                   | 32       | .17               | 7           | 7    | 5.04                  | 4.25  | — .79                | 84       | 24.46                  | Hodsock Priory  |
| — 1.70                   | 32       | .28               | 8           | 10   | 7.46                  | 6.65  | — .81                | 89       | 34.73                  | Macclesfield    |
| — 1.08                   | 49       | .16               | 8, 9        | 9    | 6.73                  | 7.73  | +1.00                | 115      | 32.70                  | Southport       |
| — 1.08                   | 44       | .30               | 8           | 12   | 5.52                  | 7.66  | +2.14                | 139      | 26.87                  | Ribston Hall    |
| — 2.88                   | 44       | .60               | 8           | 11   | 10.31                 | 24.17 | +7.86                | 148      | 61.49                  | Arncliffe       |
| — 1.08                   | 41       | .30               | 8           | 14   | 5.32                  | 4.26  | — 1.06               | 80       | 26.42                  | Hull            |
| — 1.67                   | 20       | .18               | 8           | 8    | 5.63                  | 6.37  | + .74                | 113      | 27.94                  | Newcastle       |
| — .87                    | 92       | 3.74              | 1           | 13   | 35.03                 | 47.25 | +12.22               | 135      | 129.48                 | Seathwaite      |
| — 1.65                   | 43       | .40               | 7           | 8    | 9.61                  | 12.39 | +2.78                | 129      | 42.28                  | Cardiff         |
| — 1.45                   | 54       | .38               | 8           | 12   | 11.27                 | 10.88 | — .39                | 97       | 46.82                  | Haverfordwest   |
| — 1.38                   | 55       | .50               | 9           | 14   | 10.04                 | 11.31 | +1.27                | 113      | 45.46                  | Gogerddan       |
| — 1.21                   | 43       | .32               | 9           | 15   | 6.75                  | 8.22  | +1.47                | 122      | 30.36                  | Llandudno       |
| + 1.25                   | 138      | 1.80              | 1           | 10   | 10.85                 | 15.46 | +4.61                | 142      | 43.47                  | Cargen          |
| — 1.55                   | 41       | .23               | 9           | 10   | 7.19                  | 5.74  | — 1.45               | 80       | 33.76                  | Marchmont       |
| — .64                    | 82       | .85               | 2           | 16   | 12.27                 | 17.35 | +5.08                | 141      | 49.77                  | Girvan          |
| — .59                    | 77       | .62               | 1           | 12   | 8.84                  | 9.80  | + .96                | 111      | 35.97                  | Glasgow         |
| — 1.93                   | 64       | .61               | 9           | 18   | 18.46                 | 22.20 | +3.74                | 120      | 68.67                  | Inveraray       |
| — .64                    | 85       | .66               | 3           | 19   | 14.28                 | 16.18 | +1.90                | 113      | 56.57                  | Quinish         |
| — .97                    | 53       | .39               | 9           | 11   | 5.98                  | 4.75  | — 1.23               | 79       | 28.64                  | Dundee          |
| — 1.14                   | 95       | ...               | ...         | ...  | 8.34                  | 11.36 | +3.02                | 136      | 34.93                  | Braemar         |
| — 1.10                   | 58       | .27               | 9           | 14   | 7.37                  | 6.15  | — 1.22               | 83       | 32.73                  | Aberdeen        |
| — .91                    | 61       | .38               | 16          | 7    | 6.69                  | 5.81  | — .88                | 87       | 29.33                  | Cawdor          |
| — 1.07                   | 72       | .56               | 9           | 15   | 13.57                 | 14.32 | + .75                | 106      | 44.53                  | Fort Augustus   |
| + 1.31                   | 118      | 1.37              | 11          | 21   | 24.08                 | 30.79 | +6.71                | 128      | 83.61                  | Bendampf        |
| — 1.63                   | 38       | .36               | 9           | 10   | 7.97                  | 5.70  | — 2.27               | 71       | 31.90                  | Dunrobin Castle |
| — .81                    | 64       | .27               | 18          | 17   | 6.95                  | 5.30  | — 1.65               | 76       | 29.88                  | Wick            |
| + 2.25                   | 150      | 2.50              | 1           | 19   | 15.44                 | 21.88 | +6.44                | 142      | 54.81                  | Killarney       |
| — .59                    | 78       | .58               | 1           | 10   | 9.60                  | 8.41  | — 1.19               | 88       | 39.57                  | Waterford       |
| — .13                    | 96       | .98               | 1           | 12   | 9.76                  | 14.52 | +4.76                | 149      | 39.43                  | Castle Lough    |
| — .09                    | 97       | .81               | 9           | 18   | 10.33                 | 12.80 | +2.47                | 124      | 45.11                  | Miltown Malbay  |
| — .16                    | 93       | .71               | 1           | 10   | 8.22                  | 7.35  | — .87                | 89       | 34.99                  | Courtown Ho.    |
| — .43                    | 83       | .60               | 1           | 13   | 8.29                  | 10.71 | +2.42                | 129      | 35.92                  | Abbey Leix      |
| — 1.06                   | 46       | .40               | 1           | 11   | 6.05                  | 7.67  | +1.62                | 127      | 27.68                  | Dublin          |
| — .97                    | 63       | .40               | 9           | 7    | 8.41                  | 10.94 | +2.53                | 130      | 36.14                  | Mullingar.      |
| — .30                    | 89       | .74               | 1           | 16   | 8.51                  | 10.98 | +2.47                | 129      | 36.64                  | Ballinasloe     |
| — .67                    | 85       | 1.08              | 2           | 17   | 13.91                 | 19.52 | +5.61                | 140      | 52.87                  | Enniscoie       |
| + .42                    | 113      | 1.31              | 9           | 18   | 10.40                 | 16.17 | +5.77                | 155      | 42.71                  | Markree         |
| — .86                    | 70       | .68               | 8           | 9    | 9.06                  | 9.32  | + .26                | 103      | 38.91                  | Seaforde        |
| — .25                    | 91       | .92               | 9           | 16   | 8.48                  | 11.65 | +3.17                | 137      | 37.56                  | Dundarave       |
| — .78                    | 74       | .67               | 9           | 15   | 9.12                  | 12.64 | +3.52                | 139      | 39.38                  | Omagh           |

+ .51 | 125 | .35 | 20 | 24 || 4.23 | 4.89 | + .66 | 116 || 28.98 ||

**Symons's Meteorological Magazine.**

**SUPPLEMENTARY RAINFALL, MARCH, 1910.**

| Div.  | STATION.                    | Rain<br>inches | Div.   | STATION.                     | Rain.<br>inches |
|-------|-----------------------------|----------------|--------|------------------------------|-----------------|
| II.   | Warlingham, Redvers Road    | 1·54           | XI.    | Llangyhanfal, Plâs Draw....  | 1·04            |
| „     | Ramsgate .....              | 1·37           | „      | Dolgelly Bryntirion .....    | 2·61            |
| „     | Hailsham .....              | 1·78           | „      | Bettws-y-Coed, Tyn-y-bryn    | 2·78            |
| „     | Totland Bay, Aston House.   | 1·18           | „      | Lligwy .....                 | 1·50            |
| „     | Stockbridge, Ashley .....   | ·89            | „      | Douglas, Woodville .....     | 1·94            |
| „     | Grayshott .....             | 1·57           | XII.   | Stoneykirk, Ardwell House    | 1·77            |
| „     | Reading, Calcot Place.....  | ·99            | „      | Dalry, The Old Garroch ...   | 5·35            |
| III.  | Harrow Weald, Hill House.   | 1·03           | „      | Langholm, Drove Road.....    | 3·86            |
| „     | Pitsford, Sedgbrook .....   | ·54            | „      | Moniaive, Maxwellton House   | 4·19            |
| „     | Huntingdon, Brampton .....  | ·86            | XIII.  | St Mary's Loch, Cramilt Ldge | 4·37            |
| „     | Woburn, Milton Bryant.....  | ·86            | „      | Edinburgh, Royal Observty.   | ·85             |
| „     | Wisbech, Monica Road.....   | ·59            | XIV.   | Maybole, Knockdon Farm..     | 1·71            |
| IV.   | Southend Water Works.....   | 1·17           | XV.    | Campbeltown, Witchburn...    | 2·33            |
| „     | Colchester, Lexden .....    | ·88            | „      | Glenreasdell Mains .....     | 2·23            |
| „     | Newport .....               | ·79            | „      | Ballachulish House.....      | 5·89            |
| „     | Rendlesham .....            | 1·19           | „      | Islay, Fallabus .....        | 2·40            |
| „     | Swaffham .....              | ·81            | XVI.   | Dollar Academy .....         | 1·19            |
| „     | Blakeney .....              | ·57            | „      | Balquhiddy, Stronvar .....   | 5·42            |
| V.    | Bishops Cannings .....      | ·85            | „      | Coupar Angus .....           | 1·63            |
| „     | Winterbourne Steepleton ..  | 1·00           | „      | Blair Atholl.....            | 2·00            |
| „     | Ashburton, Druid House ..   | 1·39           | „      | Montrose, Sunnyside Asylum   | 1·35            |
| „     | Honiton, Combe Raleigh ...  | ·85            | XVII.  | Alford, Lynturk Manse ...    | 1·90            |
| „     | Okehampton, Oaklands.....   | 1·09           | „      | Keith Station .....          | 1·44            |
| „     | Hartland Abbey .....        | ·62            | XVIII. | Glenquoich, Laon .....       | 14·50           |
| „     | Lynmouth, Rock House ...    | ·91            | „      | Skye, Dunvegan.....          | 5·24            |
| „     | Probosc, Lamellyn .....     | ·88            | „      | N. Uist, Lochmaddy .....     | ...             |
| „     | North Cadbury Rectory ..    | ·74            | „      | Alvey Manse .....            | 1·80            |
| VI.   | Clifton, Pembroke Road ...  | ·67            | „      | Loch Ness, Drumnadrochit.    | 1·80            |
| „     | Ross, The Graig .....       | ·91            | „      | Glencarron Lodge .....       | 6·17            |
| „     | Shifnal, Hatton Grange ..   | ·42            | „      | Fearn, Lower Pitkerrie.....  | ·71             |
| „     | Blockley, Upton Wold .....  | ·73            | XIX.   | Invershin .....              | 1·49            |
| „     | Worcester, Boughton Park.   | ·79            | „      | Altnaharra .....             | 1·89            |
| VII.  | Market Rasen .....          | ·66            | „      | Bettyhill .....              | 1·90            |
| „     | Bawtry, Hesley Hall.....    | ·58            | XX.    | Dunmanway, The Rectory..     | 3·76            |
| „     | Derby, Midland Railway ...  | ·52            | „      | Cork .....                   | 2·49            |
| „     | Buxton.....                 | 1·36           | „      | Mitchelstown Castle .....    | 2·83            |
| VIII. | Nantwich, Dorfold Hall..... | ·73            | „      | Darrynane Abbey .....        | 4·20            |
| „     | Liscard .....               | ·75            | „      | Glenam [Clonmel] .....       | 2·99            |
| „     | Chatburn, Middlewood .....  | ·69            | „      | Nenagh, Traverston .....     | 3·24            |
| „     | Cartmel, Flookburgh .....   | 1·77           | „      | Newmarket-on-Fergus, Fenloe  | 2·12            |
| IX.   | Langsett Moor, Up. Midhope  | 1·02           | XXI.   | Laragh, Glendalough .....    | 4·59            |
| „     | Scarborough, Scalby .....   | ·84            | „      | Moynalty, Westland .....     | 2·13            |
| „     | Ingleby Greenhow .....      | ·96            | „      | Athlone, Twyford .....       | 2·29            |
| „     | Mickleton.....              | ·88            | XXII.  | Woodlawn .....               | 2·15            |
| X.    | Bardon Mill, Beltingham ... | ·87            | „      | Westport, St. Helens .....   | 3·92            |
| „     | Ilderton, Lilburn Cottage.. | ·73            | „      | Achill Island, Dugort .....  | 6·20            |
| „     | Keswick, The Bank .....     | 4·90           | „      | Mohill .....                 | 2·55            |
| XI.   | Llanfrechfa Grange.....     | 2·10           | XXIII. | Enniskillen, Portora .....   | ...             |
| „     | Treherbert, Tyn-y-waun ...  | 3·30           | „      | Dartrey [Cootehill].....     | 2·70            |
| „     | Carmarthen, The Friary..... | 2·29           | „      | Warrenpoint, Manor House     | 2·13            |
| „     | Castle Malgwyn [Lechryd].   | 2·96           | „      | Banbridge, Milltown .....    | 1·38            |
| „     | Plynlimon .....             | 3·00           | „      | Belfast, Springfield .....   | 1·67            |
| „     | Crickhowell, Ffordlas.....  | 1·50           | „      | Glenarm Castle.....          | 2·69            |
| „     | New Radnor, Ednol .....     | 1·43           | „      | Londonderry, Creggan. Res.   | 2·54            |
| „     | Rhayader, Tyrmynydd .....   | 2·61           | „      | Killybegs .....              | 3·25            |
| „     | Lake Vyrnwy .....           | 1·87           | „      | Horn Head .....              | 2·43            |

## METEOROLOGICAL NOTES ON MARCH, 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.—Dry, sunny and springlike with moderate temp. A little S fell on 18th accompanied by N.W. squalls, but from that date to the close there was no precipitation. Duration of sunshine, 120·4\* hours, and of R 23·3 hours. Mean temp. 43°·2 or 0°·9 above the average of 50 years. Shade max. 58°·2 on 30th; min. 27°·3 on 20th. F 9, f 23.

TENTERDEN.—A complete contrast to February, the first 5 days being fine and warm with S.E. winds and the latter part fine and dry, but with N.W. and N.E. winds. Duration of sunshine, 187·0† hours. Shade max. 58°·5 on 27th; min. 29°·0 on 19th and 21st. F 9, f 17.

TOTLAND BAY.—Duration of sunshine, 188·1\* hours, or 57·8 hours above the average. Shade max. 56°·2 on 30th; min. 30°·6 on 15th and 20th. F 5, f 17.

PITSFORD.—R 1·16 in. below the average. Mean temp. 42°·1. Shade max. 58°·6 on 27th; min. 26°·4 on 29th. F 13.

NORTH CADBURY.—Dry, sunny and seasonable and very welcome after the R of the winter. The ground dried well, much to the benefit of farms and gardens. Shade max. 64°·2 on 28th; min. 27°·0 on 16th. F 9, f 20.

ROSS.—Shade max. 60°·8 on 30th; min. 27°·0 on 16th. F 14, f 21.

HODSOCK PRIORY.—The smallest R since 1894. Shade max. 60°·7 on 30th; min. 25°·2 on 29th. F 14, f 23.

SOUTHPORT.—Duration of sunshine 144·6\* hours, or 17·0 hours above the average. Duration of R 25·1 hours. Mean temp. 43°·9 or 2°·4 above the average. The mean amount of cloud at 9 a.m. was the smallest for March in 39 years. Shade max. 57°·0 on 29th; min. 32°·2 on 29th. F 0, f 16.

HULL.—Fine and mild at the beginning and end, but cold in the middle with light falls of S and sleet. Shade max. 57°·0 on 21st and 27th; min. 30°·0 on 29th. F 2, f 17.

HAVERFORDWEST.—Duration of sunshine 145·1\* hours. Shade max. 56°·1 on 30th; min. 27°·1 on 16th. F 6, f 13.

LLANDUDNO.—Shade max. 56°·5 on 26th; min. 32°·5 on 18th. F 0.

DOUGLAS.—The cold, stormy weather of the previous months continued to 18th when a great change occurred and the rest of the month was very fine. Some days of brilliant sunshine increased vegetation, and fruit blossom was not backward.

CARGEN.—Of the total R, 2·98 in. fell on 2 days, the 1st and 9th. A splendid seed time occurred in the latter half, and vegetation of all kinds was in a forward condition. Shade max. 60°·0 on 30th; min. 29°·0 on 18th and 29th. F 9.

EDINBURGH.—Shade max. 56°·6 on 29th; min. 29°·0 on 18th. F 3, f 11.

ABERDEEN.—Shade max. 60°·0 on 20th; min. 28°·0 on 17th. F 9, f 12.

FORT AUGUSTUS.—Shade max. 60°·1 on 30th; min. 28°·0 on 18th. F 7.

WATERFORD.—Shade max. 57°·0 on 30th; min. 27°·5 on 29th. F 3.

DUBLIN.—A quiet, fine and dry month with only ·01 in. of R after 17th. Mean temp. 44°·8. Shade max. 55°·2 on 20th; min. 33°·9 on 13th and 29th. F 0, f 11.

MARKREE.—Shade max. 58°·8 on 29th; min. 26°·3 on 13th. F 9, f 14.

WARRENPOINT.—Fairly dry and mild, with high winds at the commencement, but light airs and calms in the latter part. Shade max. 58°·0 on 28th; min. 36°·0 on 11th, F 0, f 10.

\* Campbell-Stokes.

† Jordan.

## Climatological Table for the British Empire, October, 1909.

| STATIONS.<br><br>(Those in italics are<br>South of the Equator.) | Absolute. |       |          |       | Average. |      |               |           | Absolute.       |                   | Total Rain |       | Aver.<br>Cloud. |
|------------------------------------------------------------------|-----------|-------|----------|-------|----------|------|---------------|-----------|-----------------|-------------------|------------|-------|-----------------|
|                                                                  | Maximum.  |       | Minimum. |       | Max.     | Min. | Dew<br>Point. | Humidity. | Max. in<br>Sun. | Min. on<br>Grass. | Depth.     | Days. |                 |
|                                                                  | Temp.     | Date. | Temp.    | Date. |          |      |               |           |                 |                   |            |       |                 |
| London, Camden Square                                            | 67°1      | 5     | 29°1     | 30    | 59°1     | 47°8 | 49°4          | 88        | 105°9           | 24°1              | 4·16       | 23    | 7·1             |
| Malta ... ..                                                     | 81°3      | 7     | 59°5     | 24    | 73°9     | 65°2 | 60°4          | 76        | 140°2           | ...               | 9·32       | 8     | 4·0             |
| Lagos ... ..                                                     | 89°0      | 29*   | 71°0     | 1, 2  | 86°3     | 74°1 | 75°0          | 78        | 159°0           | 69°0              | 5·80       | 15    | 8·3             |
| Cape Town ... ..                                                 | 82°7      | 21    | 41°2     | 1     | 67°0     | 52°2 | 51°2          | 73        | ...             | ...               | 2·30       | 9     | 5·4             |
| Durban, Natal ... ..                                             | 88°0      | 12    | 52°9     | 14    | 76°2     | 61°1 | ...           | ...       | 142°3           | ...               | 2·11       | 14    | 5·9             |
| Johannesburg ... ..                                              | 82°8      | 27    | 39°2     | 15    | 72°2     | 49°4 | 45°5          | 62        | 140°1           | 37°4              | 1·37       | 7     | 2·6             |
| Mauritius ... ..                                                 | 81°3      | 16†   | 59°5     | 28    | 79°0     | 63°3 | 59°7          | 70        | 155°0           | 50°5              | 1·39       | 17    | 6·5             |
| Calcutta... ..                                                   | 91°7      | 6, 7  | 65°8     | 24    | 88°4     | 74°1 | 73°3          | 79        | 156°5           | 62°5              | 3·77       | 4     | 3·9             |
| Bombay... ..                                                     | 91°7      | 15    | 72°0     | 26    | 88°1     | 75°7 | 73°9          | 80        | 137°2           | 65°9              | ·00        | 0     | 2·1             |
| Madras ... ..                                                    | 98°1      | 6     | 68°7     | 27    | 93°3     | 75°2 | 74°3          | 78        | 149°6           | 65°2              | ·61        | 4     | 3·2             |
| Kodaikanal ... ..                                                | 66°7      | 2     | 45°9     | 28    | 61°9     | 51°3 | 51°8          | 88        | 132°5           | 34°8              | 11·23      | 21    | 7·0             |
| Colombo, Ceylon ... ..                                           | 88°7      | 8     | 70°8     | 28    | 85°9     | 75°3 | 74°1          | 81        | 158°0           | 67°1              | 16·27      | 21    | 7·7             |
| Hongkong ... ..                                                  | 90°5      | 18    | 65°3     | 30    | 81°5     | 74°0 | 70°2          | 77        | 139°2           | ...               | 23·99      | 17    | 8·0             |
| Melbourne ... ..                                                 | 81°3      | 23    | 39°5     | 8     | 67°8     | 48°2 | 46°0          | 65        | 142°4           | 35°4              | 1·61       | 11    | 5·2             |
| Adelaide ... ..                                                  | 91°1      | 23    | 42°8     | 4     | 71°3     | 50°9 | 48°6          | 62        | 151°9           | 34°1              | 2·17       | 10    | 3·7             |
| Coolgardie ... ..                                                | 96°0      | 14    | 37°0     | 1     | 75°9     | 50°3 | 45°0          | 51        | 160°0           | 35°0              | 2·89       | 9     | 3·1             |
| Perth ... ..                                                     | 73°0      | 17‡   | 43°0     | 1     | 67°0     | 51°6 | 52°3          | 77        | 136°4           | 39°4              | 2·30       | 15    | 4·8             |
| Sydney ... ..                                                    | 94°0      | 10    | 46°9     | 5     | 72°0     | 56°8 | 50°7          | 62        | 128°0           | 37°0              | 1·68       | 20    | 5·2             |
| Wellington ... ..                                                | 66°0      | 11    | 40°0     | 18    | 55°8     | 49°5 | 46°7          | 75        | 116°0           | 31°0              | 2·75       | 15    | 7·3             |
| Auckland ... ..                                                  | 68°5      | 12    | 44°5     | 17    | 63°4     | 50°5 | 49°8          | 77        | 143°0           | 42°0              | 3·68       | 16    | 6°0             |
| Jamaica, Kingston ... ..                                         | 91°7      | 5     | 70°7     | 31    | 87°5     | 72°8 | 72°1          | 80        | ...             | ...               | 11·74      | 14    | ...             |
| Grenada ... ..                                                   | 87°0      | 1     | 73°0     | 15    | 84°0     | 75°1 | 72°6          | 79        | 154°2           | ...               | 11·84      | 23    | 5·5             |
| Toronto ... ..                                                   | 77°0      | 10    | 21°0     | 30    | 56°0     | 37°0 | ...           | ...       | 97°0            | 15°0              | 1·18       | 11    | ...             |
| Fredericton ... ..                                               | 78°0      | 9     | 25°0     | 31    | 55°0     | 40°0 | ...           | 80        | ...             | ...               | 5·58       | 10    | 5·6             |
| St. John's, N.B. ... ..                                          | 73°0      | 9     | 29°0     | 31    | 55°0     | 43°0 | ...           | ...       | ...             | ...               | 4·37       | 14    | 5·4             |
| Victoria, B.C. ... ..                                            | 69°0      | 11    | 37°0     | 30    | 57°0     | 44°0 | ...           | 85        | ...             | ...               | 2·31       | 15    | 8·0             |
| Dawson ... ..                                                    | 54°0      | 11    | —1°0     | 22    | 30°0     | 18°0 | ...           | ...       | ...             | ...               | ·96        | 14    | 7·5             |

\* 30 and 31. † and 31. ‡ and 18. || and 19.

MALTA.—Mean temp. of air 68°·9. Average bright sunshine 6·7 hours.

Johannesburg.—Bright sunshine 299·7 hours.

Mauritius.—Mean temp. of air 1°·6 below, of dew point 1°·9 and R 24 in. below averages. Mean hourly velocity of wind 10·7 miles or 0·3 below average.

KODAIKANAL.—Bright sunshine 130 hours.

COLOMBO.—Mean temp. of air 78°·1 or 1°·9 below, of dew point 1°·0 above, and R 1·75 in. above, averages. Mean hourly velocity of wind 5·8 miles. TS on 4 days.

HONGKONG.—Mean temp. of air 77°·8, or 1°·5 above, bright sunshine 137·5 hours, or 74·8 below, mean hourly velocity of wind 16·8 miles, or 2·2 above, R 19·42 in. above, averages. Typhoons nearly all the month.

Melbourne.—Mean temp. of air 0°·5 above, and R 1·07 in. below, averages.

Adelaide.—Bright sunshine 49·5 hours above, and R 3·38 in. above, averages.

Sydney.—Mean temp. of air 0°·9 above, and R 1·16 in. below, averages.

Wellington.—Bright sunshine 211·4 hours..

Auckland.—Rainfall slightly above average of previous 44 years. Mean temp. of air slightly below average.