SYMONS'S

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THE SOUTHPORT MEETING OF THE BRITISH ASSOCIATION.

The 1903 meeting of the British Association for the Advancement of Science stands out from the seventy-two that have gone before it on account of the remarkable prominence given to Meteorology. This was largely due to the happy inspiration of holding the meeting of the International Meteorological Committee at the same time and place, and thereby securing the presence of official representatives of Meteorology from almost all civilised countries.

Southport proved a most attractive meeting place. Although the gale and torrential rain of the night of September 10th will not soon be forgotten by those exposed to them, the porous, sandy soil on which the town is built speedily absorbed all traces of the deluge.

The Fernley Observatory has been known by reputation to British meteorologists for many years, but the completeness and perfection of the meteorological equipment came as a surprise to most of the visitors. The utmost credit is due to Mr. Baxendell and his able assistant Mr. Halliwell for the sound scientific plan on which the observations are made and published, and many observers both private and official carried away valuable lessons as to what was possible and feasible. We hope to have a full account of this model observatory in an early number.

The town itself was bright and cheerful, shaded by trees in the day-time, the pavements of the principal streets sheltered from rain by glass arcades, and at night it was illuminated by innumerable coloured electric lights fitted up among the branches. The meeting rooms were commodious and conveniently arranged, and the meteorological exhibition occupied a prominent place.

In the descriptions of British Association meetings in these pages it has been usual to give as complete a list as possible of the meteorologists and observers present, but we have not space this year to print such a list in full. It must suffice to place on record those who took part in the Meteorologists' Breakfast, a gathering of early birds which on this occasion reached the unprecedented (though familiar) number of **62**. The Breakfast was held in the Queen's Hotel on Tuesday, September 15th, at the appropriate hour of 9 a.m.

All the members of the International Meteorological Committee then in Southport and the President of the Association, Sir Norman Lockyer, were present as guests. The following is a complete list, members of the International Committee being distinguished by small capitals:—

Ackroyd, W. T. (Halifax)
Amery, P. Fabyan S. (Ashburton)
Archibald, Douglas (London)
Aspland, W. G. (Newton Abbot)
Biggs, J. H. W. (Liverpool)
Black, Surg.-Maj. W. G. (Edinburgh)
Bolton, John (London)
Boltzmann, Prof. L. (Vienna)
Brodie, F. J. (London)
Buchan, Dr. A., F.R.S. (Edinburgh)
Creak, Capt. E. W., R.N., F.R.S. (London)
Crowley, F. (Ashdell, Alton)
Dines, W. H. (Oxshott)
Edmonds, F. B. (London)
Fream, Prof. W. (Salisbury)
Glazebrook, Dr. R. T., F.R.S. (Teddington)
Halliwell, F. L. (Southport)
Harmer, F. W. (Norwich)
Hardman, S. (Southport)
HELLMANN, PROF. G. (Berlin)
Herbertson, Dr. A. J. (Oxford)
HERGESELL, PROF. H. (Strasburg)
HILDEBRANDSSON, PROF. H. H. (Upsala)
Hinks, A. R. (Cambridge)
Hopkinson, John (Watford)
Hoyle, W. E. (Manchester)
Kitto, E. (Falmouth)
Larmor, Prof. J., F.R.S. (Cambridge)
Lempfert, R. G. K. (London)
Lockyer, Sir Norman, K.C.B., F.R.S. (London)
Lockyer, Dr. W. J. S. (London)
Lodge, Sir Oliver, F.R.S. (Birmingham)
Mackinder, H. J. (Oxford)
Marriott, W. (London)
MASCART, PROF. E. (Paris)
Mill, Dr. H. R. (London)
MOHN, PROF. H. (Christiania)
MOORE, PROF. WILLIS L. (Washington)
Morrison, G. J. (London)
Parker, Rev. Dr. Dunne (Stevenage)
PAULSEN, DR. A. (Copenhagen)
PERNTER, PROF. M. (Vienna)
Pircher, Dr. J. (Vienna)
Rotch, Dr. A. L. (Blue Hill Observatory, Massachusetts).
Russell, The Hon. Rollo (Haslemere)
RYKATCHEFF, GENERAL (St. Petersburg)
Sampson, R. A. (Durham)
Schuster, Prof., F.R.S. (Manchester)
SHAW, DR. W. N., F.R.S. (London)
Simpson, Dr. J. Y. (Edinburgh)
Smith, J. (Crathes)
Smyth, John (Banbridge)
SNELLEN, DR. M. (Utrecht)
Sopp, E. J. B. (Southport)
Southall, H. (Ross)
TEISSERENC DE BORT, M. L. (Paris)
Turner, Prof. H. H., F.R.S. (Oxford)
VAN BEBBER, DR. (Hamburg)
Warner, A. (Croydon)
Watts, Prof. W. W. (Birmingham)
Wilson, C. T. R. (Cambridge)
Whipple, R. S. (Cambridge)

Before the meal commenced, Dr. H. R. Mill explained that there was no chairman and no formality, for this was merely a spontaneous social gathering of students of the weather, but on this occasion the unofficial meteorologists of the British Isles were happy to have the opportunity of welcoming as guests the official meteorologists of the world. M. Mascart, of Paris, Chairman of the International Meteorological Committee, and Professor Willis Moore of the United States Weather Bureau expressed their appreciation of the courtesy done them, and Dr. W. N. Shaw, as the British representative on the International Committee, also said a few words. Mr. Marriott expressed the regret of Captain D. Wilson-Barker, President of the Royal Meteorological Society, and of Mr. Joseph Baxendell of the Fernley Observatory, at their inability to be present. A successful photograph of the party was taken while breakfast was in progress, and by the kindness of the photographer, Mr. J. A. Kay, of Southport, we hope to publish a reduction of it in an early issue.

A novel exhibition was given on the esplanade on two successive evenings by Professor Pernter of Vienna, who brought with him one of the great funnel-shaped cannons used in Austria and Italy for the purpose of discharging large vortex rings into the air with the expectation of averting hail. Professor Pernter did not exhibit the apparatus as a hail-preventer, but merely in order to show the production of large vortex rings. Unfortunately the only powder which could be procured did not produce enough smoke to make the rings clearly visible; but though not seen well they were heard very distinctly as they hurtled through the air, the gun being fired in a horizontal position.

We hope in our next number to give some account of the Meteorological Exhibition, and also an epitome of the meteorological papers read at the meeting. Meanwhile we have pleasure in reproducing the greater part of Dr. W. N. Shaw's admirable address as Chairman of the Sub-section of Section A devoted to Astronomy and Meteorology.

METHODS OF METEOROLOGICAL INVESTIGATION.

By W. N. Shaw, Sc.D., F.R.S.

In opening the proceedings of the Sub-section devoted to Cosmical Physics, which we may take to be the application of the methods and results of Mathematics and Physics to problems suggested by observations of the Earth, the air, or the sky, I desire permission to call your attention to some points of general interest in connection with that department which deals with the air. . . . .

But this is not the first occasion upon which the Address from the Chair of the Sub-section has been devoted to Meteorology. Many of you will recollect the trenchant manner in which a university professor, himself a meteorologist, an astronomer, a physicist, and a mathematician, dealt candidly with the present position of Meteorology. After that Address I am conscious that I have no claim to be called a meteorologist according to the scientific standard of Section A. Professor Schuster has explained—and I cannot deny it—that the responsible duty of an office from which I cannot dissociate myself is signing weather reports; and I could wish that the duty of making the next Address had been entrusted to one of my colleagues from across the sea. But as Professor Schuster has set forth the aspect of official meteorology as seen from the academic standpoint with a frankness and candour which I think worthy of imitation, I shall endeavour to put before you the aspect which the relation between Meteorology and academic science wears from the point of view of an official meteorologist whose experience is not long enough to have hardened into that most comfortable of all states of mind, a pessimistic contentment.

Meteorology occupies a peculiar position in this country. From the point of view of Mathematics and Physics, the problems which the subject presents are not devoid of interest, nor are they free from that difficulty which should stimulate scientific effort in academic minds. They afford a most ample field for the display of trained intellect, and even of genius, in devising and applying theoretical and experimental methods. And can we say that the work is unimportant? Look where you will over the countries which the British Association may be supposed to represent, either directly or indirectly, and say where a more satisfactory knowledge of the laws governing the weather would be unimportant from any point of view. Will you take the British Isles on the eastern shores of the Atlantic, the great meteorological laboratory of the world, with the far-reaching interests of their carrying trade; or India, where the phenomena of the monsoon show most conspicuously the effects of the irregular distribution of land, the second great meteorological cause, and where recurring famines still overstrain the resources of administration. Take the Australasian Colonies and the Cape, which, with the Argentine Republic, where Mr. Davis is developing so admirably the methods of the Weather Bureau, constitute the only land projections into the great southern ocean, the region of "planetary meteorology;" Australia, with its periods of paralysing drought; the Cape, where the adjustment of the crops to climate is a question of the hour; or take Canada, which owns at the same time a granary of enormous dimensions and a large portion of the Arctic Circle; or take the scattered islets of the Atlantic and Pacific, or the shipping that goes wherever ships can go. The merest glance will show that we stand to gain more by scientific knowledge, and lose more by unscientific ignorance of the weather, than any other country. The annual loss on account of the weather would work out at no inconsiderable sum per head of the population, and the merest fraction of success in the prevention of what science must regard as preventable loss would compensate for half a century of expenditure on meteorological offices. Or take a less selfish view and consider for a moment our responsibilities to the general community of nations, the advantages we possess as occupying the most important posts of observation. If the meteorology of the world were placed, as perhaps it ought to be, in the hands of an International Commission, it can be no exaggeration to say that a considerable majority of the selected sites for stations of observation would be on British soil or British ships. We cannot help being the most important agency for promoting or for obstructing the extension of meteorological science. I say this bluntly and perhaps crudely because I feel sure that ideas not dissimilar from these must occasionally suggest themselves to every meteorologist, British or foreign; and if they are to be expressed—and I think you will agree me that they ought to be—a British meteorologist ought to take the responsibility of expressing them.

And how does our academic organisation help us in this matter of more than parochial or even national importance? There was a time when Meteorology was a recognised member of the large physical family and shared the paternal affection of all professors of Physics; but when the poor nestling began to grow up and develop some individuality electricity developed simultaneously with the speed of a young cuckoo. The professors of Physics soon recognised that the nest was not large enough for both, and with a unanimity which is the more remarkable because in some of these academic circles utilitarianism is not a condition of existence, and pure science, not market value, might be the dominant consideration—with singular unanimity the science which bears in its left hand, if not in its right, sources of wealth beyond the dreams of avarice was recognised as a veritable Isaac, and the science wherein the fruits of discovery must be free for all the world, and in which there is not even the most distant prospect of making a fortune—that science was ejected as an Ishmael.

Electrical engineering has an abundance of academic representatives; brewing has its professorship and its corps of students, but the specialised physics of the atmosphere has ceased to share the academic hospitality. So far as I know the British universities are unanimous in dissembling their love for Meteorology as a science, and if they do not actually kick it downstairs they are at least content that it has no encouragement to go up. In none is there a professorship, a lectureship, or even a scholarship, to help to form the nucleus of that corps of students which may be regarded as the primary condition of scientific development.

Having cut the knot of their difficulties in this very human but not very humane method, the universities are, I think, disposed to adopt a method of justification which is not unusual in such cases; indications are not wanting which disclose an opinion that Meteorology is, after all, not a science. There are, I am aware, some notable exceptions; but do I exaggerate if I say that when university professors are kind enough to take an interest in the labours of meteorologists, who are doing their best amid many discouragements, it is generally to point out that their work is on the wrong lines; that they had better give it up and do something else? And the interest which the universities display in a general way is a good-humoured jest about the futility of weather prophecy, and the kindly suggestion that the improvement in the prediction of the next twenty-four hours' weather is a natural limit to the orbit of an Ishmaelite's ambition. . . . . . . It is quite possible that the unformulated opinion of the vast majority of people in this country who are only too familiar with the meteorological vagaries of the British Isles is that the weather does just as it pleases; that any day of the year may give you an August storm or a January summer's day; that there are no laws to be discovered, and that the further prosecution of so unsatisfactory a study is not worth the time and money already spent upon it. They forget that there are countries where, to judge by their languages, the weather has so nearly the regularity of "old time" that one word is sufficient to do duty for both ideas. They forget that our interests extend to many climates, and that the characteristics of the eastern shores of the North Atlantic are not appropriate to, say, western Tropical Africa. That may be a sufficient explanation of the attitude of the man in the street, but as regards the British universities dare I offer the difficulty of the subject as a reason for any want of encouragement? Or shall I say that the general ignorance on the part of the public of the scientific aspirations and aims of meteorologists and of the results already obtained is a reason for the universities to keep silence on the subject? With all respect I may say that the aspect which the matter presents to official meteorologists is that the universities are somewhat oblivious of their responsibilities and their opportunities.

I have no doubt that it will at once be said that Meteorology is supported by Government funds, and that alma mater must keep her maternal affection and her exiguous income for subjects that do not enjoy State support. I do not wish just now to discuss the complexities of alma mater's housekeeping. I know she does not adopt the same attitude with regard to astronomy, physics, geology, mineralogy, zoology, or botany, but let that pass. From the point of view of the advancement of science I should like to protest against the idea that the care of certain branches of science by the State and by the universities can be regarded as alternative. The advancement of science demands the co-operation of both in their appropriate ways. As regards Meteorology, in my experience, which I acknowledge is limited, the general attitude towards the department seems to be dictated by the consideration that it must be left severely alone in order to avoid the vicious precedent of doing what is, or perhaps what is thought to be, Government work without getting Government pay, and the result is an almost monastic isolation.

There is too much isolation of scientific agencies in this country. You have recently established a National Physical Laboratory the breath of whose life is its association with the working world of physics and engineering, and you have put it—where? At Cambridge, or anywhere else where young physicists and engineers are being trained? No; but in the peaceful seclusion of a palace in the country, almost equidistant from Cambridge, Oxford, London, and everywhere else. You have established a Meteorological Office, and you have put it in the academic seclusion of Victoria Street. What monastic isolation is good for I do not know. I am perfectly certain it is not good for the scientific progress of Meteorology. How can one hope for effective scientific development without some intimate association with the institutions of the country, which stand for intellectual development and the progress of science?

I could imagine an organisation which by association of the universities with a central office would enable this country, with its colonies and dependencies, to build up a system of meteorological investigation worthy of its unexampled opportunities. But the co-operation must be real and not one-sided. Meteorology, which depends upon the combination of observations of various kinds from all parts of the world, must be international, and a Government department in some form or other is indispensable. No university could do the work. But whatever form Government service takes it will always have some of those characteristics which, from the point of view of research, may be called bondage. On the other hand, research, to be productive, must be free with an academic freedom, free to succeed or fail, free to be remunerative or unremunerative, without regard to Government audits or House of Commons control. Research looks to the judgment of posterity with a faith which is not unworthy of the Churches, and which is not among those excellent moral qualities embodied in the Controller and Auditor General. *Die academische Freiheit* is not the characteristic of a Government department. The opportunity which gave to the world the "Philosophiæ Naturalis Principia" was not due to the State subvention of the Deputy Mastership of the Mint, but to the modest provision of a professorship by one Henry Lucas, of whose pious benefaction Cambridge has made such wonderful use in her Lucasian professors.

The future of Meteorology lies, I believe, in the association of the universities with a central department. I could imagine that Liverpool or Glasgow might take a special interest in the meteorology of the sea; they might even find the means of maintaining a floating observatory; and when I say that we know practically nothing of the distribution of rainfall over the sea, and we want to know everything about the air above the sea, you will agree with me that there is room for such an enterprise. Edinburgh might, from its association with Ben Nevis, be desirous of developing the investigation of the upper air over our land; in Cambridge might be found the author of a book, on the principles of atmospheric physics, worthy of its Latin predecessor: and for London I can assign no limited possibilities.

If such an association were established I should not need to reply to Professor Schuster's suggestion for the suppression of observations. The real requirement of the time is not fewer observations, but more men and women to interpret them. I have no doubt that the first expression of such an organisation would be one of recognition and acknowledgment of the patience, the care, the skill, and the public spirit—all of them sound scientific characteristics—which furnish at their own expense those multitudes of observations. The accumulated readings appal by their volume, it is true, but they are, and must be, the foundation upon which the scientific structure will be built. . . .

Yet with all these achievements it must be confessed that the progress made with the problems of general or dynamical Meteorology in the last thirty years has been disappointing. When we compare the position of the subject with that of other branches of Physics it must be allowed that it still lacks what astronomy found in Newton, sound in Newton and Chladni, light in Young or Fresnel, heat in Joule, Kelvin, Clausius, and Helmholtz, and electricity in Faraday and Maxwell. Above all, it lacks its Kepler. Let me make this clear. Kepler's contribution to physical astronomy was to formulate laws which no heavenly body actually obeys, but which enabled Newton to deduce the law of gravitation. The first great step in the development of any physical science is to substitute for the indescribably complex reality of nature an ideal system that is an effective equivalent for the purposes of theoretical computation. . . . . . When we look round the sciences each has its own peculiar ideals and its own physical quantities: astronomy has its orbits and its momentum, sound its longitudinal vibration, light its transverse vibration, heat its energy and entropy, electricity its "quantity" and its wave, but meteorology has not yet found a satisfactory ideal problem to substitute for the complexity of nature. I wish to consider the aspect of the science from this point of view and to recall some of the attempts made to arrive at a satisfactory modification of reality. I do not wish to refer to such special applications of physical reasoning as may be involved in the formation of cloud, the thermodynamics of a mixture of air and water vapour, the explanation of optical or electrical phenomena, nor even Helmholtz's application of the theory of gravitational waves to superposed layers of air of different density. These require only conventions which belong already to physics, and though they may furnish suggestions they do not themselves constitute a general meteorological theory.

The most direct efforts to create a general theory of atmospheric circulation are those which attempt to apply Newtonian dynamics, with its more recent developments on the lines of hydrodynamics and thermodynamics. Attempts have been made, mathematical or otherwise, to determine the general circulation of the atmosphere by the application of some form of calculation, assuming only the sun and a rotating earth, with an atmosphere, as the data of the problem. I confess that these attempts, interesting and ingenious as they are, seem to me to be somewhat premature. The "problem" is not sufficiently formulated. When Newton set to work to connect the motions of the heavenly bodies with their causes, he knew what the motions of the heavenly bodies were. Mathematics is an excellent engine for explaining and confirming what you know. It is very rarely a substitute for observation, and before we rely upon it for telling us what the nature of the general circulation of the atmosphere really is, it would be desirable to find out by observation or experiment what dynamical and elastic properties must be attributed to an extremely thin sheet of compressible fluid rotating about an axis with a velocity reaching 1000 miles an hour, and subject to periodic heating and cooling of a very complicated character. It would be more in consonance with the practice of other sciences to find out by observation what the general circulation is before using mathematics to explain it. What strikes one most about the mathematical treatises on the general circulation of the atmosphere is that what is true about the conclusions is what was previously known from observation. It is, I think, clear that that method has not given us the working ideal upon which to base our theory.

Consider next the attempts to regard atmospheric phenomena as periodic. Let me include with this the correlation of groups of atmospheric phenomena with each other or with those of the sun, when the periodicity is not necessarily regular, and the scientific process consists in identifying corresponding changes. This method has given some remarkable results by the comparison of the sequence of changes in the meteorological elements in the hands of Petterson and Meinardus, and by the comparison of the variation of pressure in different parts of the globe by Sir Norman Lockyer and Dr. W. J. S. Lockyer; as regards the Earth and the sun the subject has reached the stage of productive discussion.

For the purpose of dealing with periodicity in any form we substitute for nature an ideal system obtained by using mean values instead of individual values, and leaving out what, from this point of view, are called accidental elements. The simplification is perfectly legitimate. Passing on to the consideration of periodicity in the stricter sense the process which has been so effective in dealing with tides, the motions of the liquid layer, is very attractive as a means of attacking the problems of the atmosphere, because, in accordance with a principle in dynamics, to every periodic cause there must correspond an effect of the same period, although the relation of the magnitude of the effect to the cause is governed by the approximation of the natural period of the body to that of the cause.

There are two forms of the strict periodic method. One is to examine the generalised observations for periodicities of known length, whether it be that of the lunar rotations or of sunspot frequency, or of some longer or shorter period. In this connexion let me acknowledge a further obligation to Professor Schuster for tacking on to his Address of last year a development of his work on the detection of hidden periodicities by giving us a means of estimating numerically what I may call the reality of the periodicity. The other method is by harmonic analysis of a series of observations with the view of finding causes for the several harmonic components. I may say that the Meteorological Office, supported by the strong opinion of Lord Kelvin, has favoured that plan, and on that account has for many years issued the hourly results for its observatories in the form of five-day means as representing the smallest interval for which the harmonic analysis could be satisfactorily employed. Sir Richard Strachey has given some examples of its application, and the capabilities of the method are by no means exhausted, but as regards the general problem of dynamic meteorology harmonic analysis has not as yet led to the disclosure of the required generalisation.

I ought to mention here that Professor Karl Pearson, with the assistance of Miss Cave, has been making a most vigorous attempt to estimate the numerical value of the relationship, direct or inverse, between the barometric readings at different places on the earth's surface. The attempt is a most interesting one as an entirely new departure in the direction of reducing the complexity of atmospheric phenomena. If it were possible to find co-ordinates which showed a satisfactory correlation it might be possible to reduce the number of independent variables and refer the atmospheric changes to the variations of definite centres of action in a way that has already been approached by Hildebrandsson from the meteorological side.

Years ago, when Buys Ballot laid down as a first law of atmospheric motion that the direction of the wind was transverse to the barometric gradient and the force largely dependent upon the gradient, and when the examination of synchronous charts showed that the motion of air could be classified into cyclonic and anticyclonic rotation, it appeared that the meteorological Kepler was at hand, and the first step towards the identification of a working meteorological unit had been taken—the phenomena of weather might be accounted for by the motion and action of the cyclonic depression, the position of the ascending current, the barometric minimum. The individual readings over the area of the depression could be represented by a single symbol. By attributing certain weather conditions to certain parts of the cyclonic area and supposing that the depression travelled with more or less unchanged characteristics, the vagaries of weather changes can be accounted for. For thirty years or more the depression has been closely watched, and thousands of successful forecasts have been based upon a knowledge of its habits. But unfortunately the travelling depression cannot be said to preserve its identity in any sense to which quantitative reasoning can be applied. As long as we confine ourselves to a comparatively small region of the earth's surface the travelling depression is a real entity, but when we widen our area it is subject to such variations of path, of speed, of intensity, and of area, that its use as a meteorological unit is seriously impaired, and when we attempt to trace it to its source or follow it to its end it eludes us. Its origin, its behaviour, and its end are almost as capricious as the weather itself.

Nor if we examine other cases in which a veritable entity is transmitted can we expect that the simple barometric distribution should be free from inexplicable variations. We are familiar with ordinary motion, or, as I will call it, astronomical motion, wave motion, and vortex motion. Astronomical motion is the motion of matter, wave motion the motion of energy, vortex motion the motion of matter with energy, but the motion of a depression is merely the transmission of the locus of transformation of energy ; neither the matter nor the energy need accompany the depression in its motion. If other kinds of motion are subject to the laws of conservation of matter and conservation of energy, the motion of the depression must have regard also to the law of dissipation of energy. An atmospheric disturbance, with the production of rainfall and other thermal phenomena, must comply in some way with the condition of maximum entropy, and we cannot expect to account for its behaviour until we can have proper regard to the variations of entropy. But the conditions are not yet in a form suitable for mathematical calculation, and we have no simple rules to guide us. So far as Meteorology is concerned, Willard Gibbs unfortunately left his work unfinished.

When the cyclonic depression was reluctantly recognised as too unstable a creature to carry the structure of a general theory, Mr. Galton's anticyclones, the areas of high pressure and descending currents, claimed consideration as being more permanent. Professor Köppen and Dr. van Bebber have watched their behaviour with the utmost assiduity and sought to find therein a unit by which the atmospheric changes can be classified; but I am afraid that even Dr. van Bebber must allow that his success is statistical and not dynamical. "High pressures" follow laws on the average, and the quantity we seek is not an average but an individual.

The question arises, whether the knowledge of the sequence of weather changes must elude us altogether, or will yield to further search. Is the man in the street right after all? But consider how limited our real knowledge of the facts of atmospheric phenomena really is. It may very well be that observations on the surface will never tell us enough to establish a meteorological entity that will be subject to mathematical treatment; it may be that we can only acquire a knowledge of the general circulation of the atmosphere by the study of the upper air, and must wait until Professor Hergesell has carried his international organisation so far that we can form some working idea therefrom of general meteorological processes. But let us consider whether we have even attempted for surface meteorology what the patience of astronomers from Copernicus to Kepler did for astronomy.

Do we yet fully comprehend the kinematics of the travelling depression; and if not, are we in a satisfactory position for dealing with its dynamics? I have lately examined minutely the kinematics of a travelling storm, and the results have certainly surprised me and have made it clear that the travelling depressions are not all of one kinematical type. We are at present hampered by the want of really satisfactory self-recording instruments. I have sometimes thought of appealing to my friends the professors of physics who have laboratories where the reading of the barometer to the thousandth of an inch belongs to the work of the "elementary class," and of asking them to arrange for an occasional orgy of simultaneous readings of the barometer all over the country with corresponding weather observations for twenty-four consecutive hours, so that we might really know the relation between pressure, rainfall, and temperature of the travelling depressions; but I fear the area covered would even then hardly be large enough, and we must improve our self-recording instruments.

Then, again, have we arrived at the extremity of our knowledge of the surface circulation of the atmosphere? We know a great deal about the average monthly distribution, but we know little about the instantaneous distribution. It may be that by taking averages we are hiding the very points which we want to disclose.

Let me remind you again that the thickness of the atmosphere in proportion to the Earth's surface is not unsatisfactorily represented by a sheet of paper. Now it is obvious that currents of air in such a thin layer must react upon each other horizontally, and therefore we cannot *à priori* regard one part of the area of the Earth's surface as meteorologically independent of any other part. We have daily synoptic charts for various small parts of the globe, and the Weather Bureau extended these over the northern hemisphere for the years 1875 to 1879; but who can say that the meteorology of the northern hemisphere is independent of that of the southern? To settle that primary question we want a synchronous chart for the globe. As long as we are unable to watch the changes in the globe we are to a certain extent groping in the dark, A great part of the world is already mapped every day, and the time has now arrived when it is worth while to consider what contributions we can make towards identifying the distribution of pressure over the globe. We may idealise a little by disregarding the local peculiarities without sacrificing the general application. I have put in the exhibition a series of maps showing what approximation can be made to an isochronous chart of the globe without special effort. We are gradually extending the possibility of acquiring a knowledge of the facts in that as in other directions. With a little additional enterprise a serviceable map could be compiled ; and when that has been reached, and when we have added to that what the clouds can tell us, and when the work of the Aëronautical Committee has so far progressed that we can connect the motion of the upper atmosphere with the conditions at the surface, when we know the real kinematics of the vertical and horizontal motion of the various parts of a travelling storm, we shall, if the universities will help us, be able to give some rational explanation of those periodic relations which our solar physics friends are identifying for us, and to classify our phenomena in a way that the inheritors of Kepler's achievements associated with us in this Section may be not unwilling to recognise as scientific.

Correspondence.

SUN PILLAR.

To the Editor of Symons's Meteorological Magazine.

It may interest your readers to know that I saw a sun pillar on Thursday, the 17th instant, at 6.20 p.m., when travelling by train between Waterloo and Wimbledon. The sky was nearly covered with high stratus cloud. The sun itself was not visible, but the pillar was seen as a vertical shaft of light of a pale pink colour through a gap in the cloud just above the sun. The phenomenon lasted about fifteen minutes.

FRANCIS DRUCE.

65, Cadogan Square, S. W., 28th September, 1903.

THE GALE OF SEPTEMBER 10TH.

To the Editor of Symons's Meteorological Magazine.

In case you should be collecting any particulars with respect to the recent severe gale, I write to say that judging from the amount of rain I recorded here at 9 a.m. on 11th inst., the centre of the disturbance must have passed almost directly over the north-west coast of Anglesey. The amount in question was 2·07 in., as against 1·56 in. recorded at Holyhead, which is the maximum fall I have seen returned. No less than ·82 in. fell here between 5 and 7 p.m. on 10th, at which latter hour the barometer stood at 28·83 in., and at 8 p.m., when a rise had commenced, the direction of the wind, which blew with almost hurricane force, was about N.N.E.

BOSTON,

Lligwy, Moelfre, Anglesey, 13th September, 1903.

To the Editor of Symons's Meteorological Magazine.

THOUGH the force of the gale on Thursday, September 10th, was only moderate in this district, the fall of the barometer was extremely rapid, and is worthy of note :—

From 4 p.m. to 10 p.m., Sept. 10th, the fall was 0·645 in.

The most rapid portions of this fall were :—

From 4 to 5 p.m..................	0·185 in.
From 7.55 to 8.5 p.m.	0·065 ,,
From 9.30 to 10 p.m...............	0·150 ,,

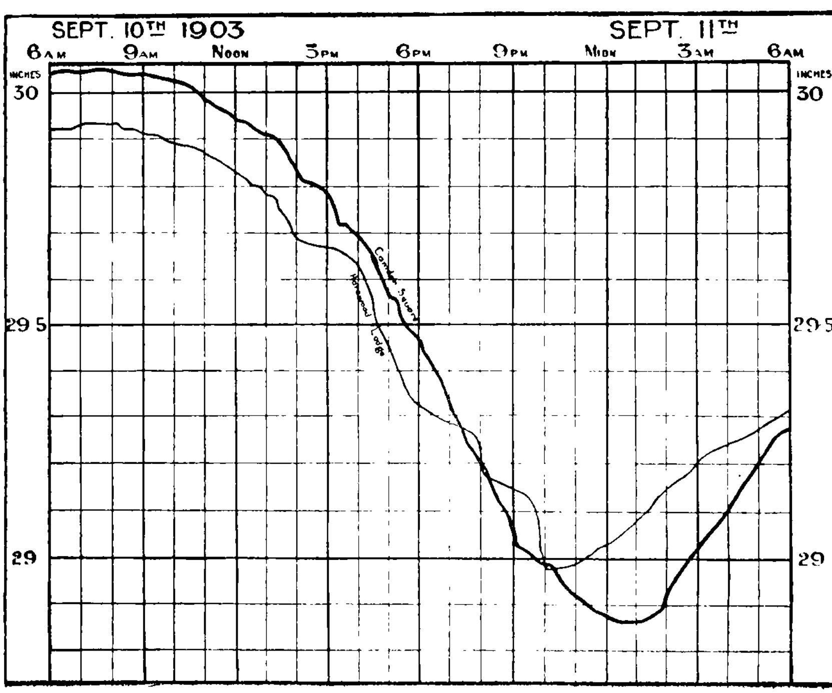
I have nothing which approaches these rates in a nearly complete twelve-year record, 1890-1901, from my Redier barograph. The nearest I can find are :—

1891, October 13th, 2 to 3 p.m., a fall of	0·155 in.
1896, September 25th, in five hours	0·510 ,,

I send you a copy of the trace of my Redier barograph for September 10th, 1903. The lowest point shown on diagram, 28·980, is probably not quite low enough, as the barograph is rather sluggish, but the actual fall cannot have been less rapid, and may have been a little more rapid.

C. L. BROOK.

Harewood Lodge, Meltham, September 12th, 1903.



[To Mr. Brook's tracing of the movements of his Redier barograph at Meltham we add a copy of the curve given by the Redier barograph at Camden Square for the same period. It will be noticed that the range of pressure was greater and the minimum occurred later in London than in Yorkshire. The fall at Camden Square was from 30·008 in. at 9 a.m. on September 10th to 28·830 in. at 1 a.m. on the 11th, a fall of no less than 1·178 in. in sixteen hours. The recovery of pressure was somewhat more rapid than at Meltham. The storm was a peculiarly violent one, and yielded heavy falls of rain over a large part of England.—ED. *S.M.M.*]

To the Editor of Symons's Meteorological Magazine.

YOU will have plenty of reports of Thursday night's gale, but it may be of interest to note the effect on trees and hedges and almost all vegetation in this district. Everything is scorched brown; even the nettles and brambles are blackened, and the foliage of the large trees (what remains to them) is curled and shrivelled up, and this even at Studland and places on the lee side of the downs.

The wind was from S.W., and I hardly thought salt spray could have been carried so far across the land, and so much rain fell too in the night. It was very cold, and if it had been a hard frost there could hardly have been more havoc. In the lanes one is ankle-deep in green leaves torn off. I think I never saw such wholesale destruction in so short a time—trees, of course, and large branches down everywhere.

LOUISA M. S. PASLEY.

The Chestnuts, Swanage, 9th September, 1903.

[Mr. D. W. Horner sends us specimens of oak leaves from near Ilfracombe which were blasted by the same storm, the effects of which upon vegetation reached, he says, as far inland as Exeter. Other observers have described similar devastation extending inland from Weston-super-Mare to beyond Cheddar; and it would appear that the force of the gale on the night of September 10th was very exceptional all over the Devon-Cornwall peninsula.—ED. *S.M.M.*]

HEAVY FALL OF RAIN.

To the Editor of Symons's Meteorological Magazine.

DURING a violent thunderstorm here this afternoon, though we were apparently on the western edge, I measured ·82 in. in 19 minutes, from 3.48 to 4.7; the total fall was 1·07 in. in about 1½ hour.

CHARLES P. HOOKER.

Dollarward, Cirencester, September 24th, 1903.

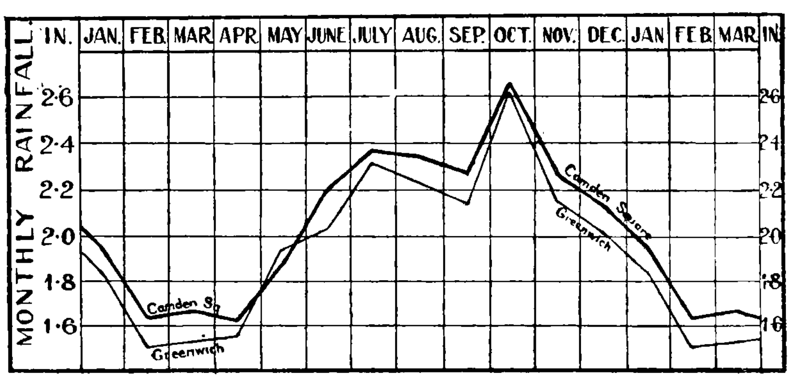
MEAN RAINFALL.

To the Editor of Symons's Meteorological Magazine.

In an interesting paper appearing in the annual volume of *British Rainfall*, 1902, Mr. Sowerby Wallis has collected some long-period records of rainfall, the mean monthly values of which are also graphically represented in curves. One record is that for Camden Square for the 45 years 1858 to 1902; another is that for Greenwich for the 60 years 1840 to 1899. Considering that 42 out of the 45 years at Camden Square are included in, and indeed form the greater part of, the Greenwich period, the resulting annual curves (given in *British Rainfall*, but scarcely necessary here to repeat) show for these places differences greater than might have been expected. I was thus induced to form mean monthly values at Greenwich for the shorter period 1858 to 1902, and make a more direct comparison. The new Greenwich values for each month of the year are respectively—

1·84 1·50 1·52 1·56 1·92 2·02 2·30 2·23 2·13 2·62 2·17 2·02 in.

Reproducing here Mr. Wallis's 45 years' curve for Camden Square, and adding thereto the curve for the similar period at Greenwich, it is seen that the two curves are not dissimilar, but, on the contrary, in very fair agreement. It seemed to me to be of interest thus to point out how an apparent discrepancy disappears when the period compared is at both places the same.



Again, I have the Greenwich results collected for the 62 years 1841 to 1902. Dividing these into two groups of 31 years each, I find great differences in the annual distribution of rainfall, the mean monthly values in the two series differing in each of the months of January, May, September and December by more than 0·25 in. It is thus difficult to say how long a period is really sufficient to obtain satisfactory mean values.

WILLIAM ELLIS.

September, 1903.

THE NINE MONTHS' RAINFALL OF 1903.

Aggregate Rainfall for January—September, 1903.

Stations.	Diff. from Aver.	Per cent. of Aver	Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	+12·88	180	Arncliffe	+16·34	138	Braemar	+9·77	141
Tenterden	+4·98	127	Hull	+3·49	120	Aberdeen	+6·90	131
Hartley Wintney	+9·52	154	Newcastle	+2·95	116	Cawdor	+3·72	117
Hitchin	+11·46	170	Seathwaite	+28·42	131	Glencarron	+14·59	123
Winslow	+9·09	155	Cardiff	+9·23	134	Dunrobin	+5·42	126
Westley	+4·75	126	Haverfordwest	+9·79	134	Darrynane	+4·83	143
Brundall	+4·25	124	Gogerddan	+10·28	135	Waterford	+8·08	130
Alderbury	+7·56	141	Llandudno	+6·16	130	Broadford	+9·45	140
Ashburton	+11·28	135	Dumfries	+12·89	143	Carlow	+11·18	147
Polapit Tamar	+8·16	133	Lilliesleaf	+9·06	143	Dublin	+5·90	130
Stroud	+10·43	155	Colmonell	+4·14	114	Mullingar	+11·92	145
Woolstaston	+11·28	156	Glasgow	+17·01	167	Ballinasloe	+10·56	141
Boston	+6·83	147	Inveraray	+13·23	127	Clifden	+7·76	114
Hesley Hall	+4·49	130	Islay	+7·39	124	Crossmolina	+11·66	133
Derby	+6·29	138	Mull	+8·18	121	Seaforde	+9·17	136
Bolton	+5·28	118	Loch Leven	+14·78	159	Londonderry	+4·13	114
Wetherby	+8·86	152	Dundee	+6·83	136	Omagh	+12·20	143

September has proved the driest month of the year, except February, though most stations record a fall considerably in excess of the average, and the falls for the nine months vary from 14 to 80 per cent. in excess, the average for the British Isles being probably about 37 per cent. or fully one-third more than the normal fall.

REVIEW.

Instructions to Observers of the Indian Meteorological Department. By J. ELIOT, M.A., F.R.S., &c. Second edition. Calcutta, 1902. Size 10 x 6. Pp. iv. + 120.

THESE instructions apply to the special circumstance of meteorological observers in India, and they bear evidence of being based on experience. The use of a minimum wet-bulb thermometer is recommended, and this is an instance of different conditions making it possible to use an instrument which could not be satisfactorily employed in this country, at least not in winter. The one point which we are inclined to criticise is the recommendation to set the rain gauge, which is provided with a wide foot, in a bed of cement. It would serve the purpose better to use a plain cylindrical gauge which could readily be lifted out of a hollow in a cement block so as to empty the outer can in case of overflow. The method recommended is to break out the wide-based gauge from its cement bed, and reset it when emptied. A simpler plan still would be to use a metal inner can, as in the Snowdon gauge, which could readily be withdrawn in case of the bottle overflowing, but the arrangement is perhaps designed to discourage thieves.

RAINFALL AND TEMPERATURE, SEPTEMBER, 1903.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1890-9.		Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date	No. of Nights below 32°. In shade.	On grass.
			inches.		inches.	in.								
I.	ENGLAND.	London (Camden Square)	2·64	+	·57	1·06	4	13	83·7	2	38·1	17	0	0
II.		Tenterden	2·37	—	·02	·50	10	17	81·5	2	38·0	12	0	1
,,		Hartley Wintney	2·27	+	·07	·59	10	11	80·0	1, 2	35·0	11*e*	0	2
III.		Hitchin	2·02	—	·11	·60	10	16	80·0	2	38·0	12	0	..
,,		Winslow (Addington)	1·73	—	·53	·52	10	13	77·0	1	35·0	13*e*	0	2
IV.		Bury St. Edmunds (Westley)	3·31	+	·82	1·12	10	17	83·0	2	38·0	12	0	...
,,		Norwich (Brundall)	3·69	+	1·24	1·95	10	20	83·0	2	38·2	18	0	0
V.		Winterborne Steepleton	3·99		...	1·05	28	15	73·6	1	34·5	13	0	6
,,		Torquay	3·28		...	·60	24	14	71·9	1	42·2	15	0	0
,,		Polapit Tamar [Launceston]	4·43	+	1·13	·90	1	20	69·5	1	29·9	15	1	1
VI.		Stroud (Upfield)	2·58	+	·14	·60	28	16	71·0	1*a*	39·0	14*f*	0	...
,,		Church Stretton (Woolstaston)	3·98	+	1·57	·83	10	24	69·0	1	38·5	15	0	...
,,		Worcester (Diglis Lock)	2·95	+	1·13	·52	29	20	...	...	...	...	...	...
VII.		Boston	3·03	+	1·05	·95	10	13	77·0	2	39·0	16	0	...
,,		Hesley Hall [Tickhill]	3·02	+	1·13	1·25	10	16	72·0	1	36·0	13*g*	0	...
,,		Derby (Midland Railway)	2·70	+	·69	·90	10	17	75·0	1	35·0	16	0	...
VIII.		Bolton (The Park)	5·81	+	1·65	1·67	10	20	68·5	23	36·1	16	0	5
IX.		Wetherby (Ribston Hall)	4·01	+	1·79	1·20	10	22	...	...	...	...	...	...
,,		Arncliffe Vicarage	6·44	+	1·26	1·91	8	18	...	...	...	...	...	...
,,		Hull (Pearson Park)	3·13	+	·90	1·26	10	16	73·0	1	32·0	18	1	5
X.		Newcastle (Town Moor)	2·35	+	·17	·84	2	16	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)	10·81	—	2·07	3·16	9	19	...	...	31·3	16	2	...
XI.	WALES.	Cardiff (Ely)	4·34	+	·59	·83	24	18	...	...	...	...	...	...
,,		Haverfordwest	4·87	+	1·07	·80	1	19	69·3	20	34·0	15	0	2
,,		Aberystwith (Gogerddan)	5·73	+	1·66	1·26	8	15	75·0	24	28·0	14	4	...
,,		Llandudno	4·07	+	1·20	1·14	10	17	69·0	21*a*	39·0	15	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·80	+	·05	·93	2	15	67·0	18*a*	30·0	15	2	...
XIII.		Edinburgh (Royal Observatory)	2·03		...	·77	2	14	66·2	1	37·1	14	0	4
XIV.		Colmonell	3·46	—	·53	·76	4	14	69·0	21	32·0	12*h*	2	...
XV.		Tighnabruaich	4·05		...	·81	7	15	62·0	18	36·0	13	0	...
,,		Mull (Quinish)	3·22	—	1·90	·52	4	16	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·04	+	·13	·72	3	15	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·30	+	·07	·75	2	20	66·0	26	34·0	15	0	...
XVII.		Braemar	2·65	—	·47	·53	2	16	65·7	23	27·0	15	2	4
,,		Aberdeen (Cranford)	3·47	+	·74	·94	2	23	67·0	26	28·0	14	2	...
,,		Cawdor (Budgate)	1·95	—	1·14	·48	8	15	...	..	...	...	...	...
XVIII		Strathconan [Beauly]	2·78	—	1·70	·53	8	9	...	...	...	...	...	...
,,		Glencarron Lodge	5·39	—	3·14	·73	11	16	68·5	24	33·0	14	0	...
XIX.		Dunrobin	2·31	—	·28	·50	11	13	61·5	6	32·0	14	1	...
,,		Castletown	2·72		...	·56	12	21	67·0	25	35·0	15	0	1
XX.	IRELAND.	Darrynane Abbey	3·48	—	·69	·42	17	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge)	3·36	+	·23	·66	29	16	67·0	1	36·0	15*g*	0	...
,,		Broadford (Hurdlestown)	3·77	+	·90	·58	10	21	62·0	6*b*	36·0	13	0	...
XXI.		Carlow (Browne's Hill)	3·45	+	·72	·90	10	18	...	...	..	...	...	...
,,		Dublin (FitzWilliam Square)	3·40	+	1·28	·97	10	17	67·2	1	37·8	15	0	0
XXII.		Ballinasloe	4·30	+	1·16	1·69	10	23	65·0	22*c*	32·0	14	1	...
,,		Clifden (Kylemore)	10·12	+	3·28	2·10	10	21	...	...	...	...	...	...
XXIII		Seaforde	4·48	+	1·33	1·33	10	20	68·0	1	33·0	14*f*	0	2
,,		Londonderry (Creggan Res.)	2·85	—	1·02	·74	10	16	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·89	+	·18	1·10	10	17	65·0	20*d*	36·0	14	0	...

+ Shows that the fall was above the average ; — that it was below it.

a and 23. *b* and 18, 20, 24. *c* and 25. *d* and 23, 25. *e* and 17. *f* and 15. *g* and 16. *h* and 13.

SUPPLEMENTARY RAINFALL, SEPTEMBER, 1903.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	...	XI.	Llandefaelog-fach.........	4·74
II.	Dorking, Abinger Hall .	3·97	,,	New Radnor, Ednol......	4·70
,,	Sheppey, Leysdown......	2·46	,,	Rhayader, Nantgwillt...	6·52
,,	Hailsham	2·87	,,	Lake Vyrnwy	7·62
,,	Crowborough..............	2·62	,,	Ruthin, Plâs Drâw	4·85
,,	Ryde, Beldornie Tower..	...	,,	Criccieth, Talarvor	5·57
,,	Bournemouth, Kempsey	2·25	,,	I. of Anglesey, Lligwy..	5·71
,,	Emsworth, Redlands ...	3·94	,,	Douglas, Woodville......	6·17
,,	Alton, Ashdell...........	2·84	XII.	Stoneykirk, Ardwell Ho.	3·19
,,	Newbury, Welford Park	2·27	,,	Dalry, Old Garroch	6·24
III.	Oxford, Magdalen Coll..	1·60	,,	Moniaive, Maxwelton Ho.	5·01
,,	Banbury, Bloxham	2·07	,,	Lilliesleaf, Riddell	3·07
,,	Pitsford, Sedgebrook ...	2·73	XIII.	N. Esk Res. [Penicuick]	2·70
,,	Huntingdon, Brampton.	1·68	XIV.	Dalry, Blair	4·12
,,	Wisbech, Bank House...	2·93	,,	Glasgow, Queen's Park..	3·32
IV.	Southend	1·52	XV.	Inveraray, Newtown ...	4·61
,,	Colchester, Lexden	2·04	,,	Ballachulish, Ardsheal...	6·09
,,	Saffron Waldon, Newport	3·14	,,	Campbeltown, Redknowe	2·86
,,	Rendlesham Hall	2·23	,,	Islay, Eallabus...........	3·98
,,	Swaffham	4·23	XVI.	Dollar.......................	4·11
V.	Salisbury, Alderbury ...	1·87	,,	Balquhidder, Stronvar...	5·44
,,	Bishop's Cannings	2·50	,,	Coupar Angus Station...	2·57
,,	Ashburton, Druid House	5·70	,,	Blair Atholl	2·98
,,	Okehampton, Oaklands.	5·04	,,	Montrose, Sunnyside ...	2·89
,,	Hartland Abbey	3·54	XVII.	Alford, Lynturk Manse..	2·44
,,	Lynmouth, Rock House	4·03	,,	Keith H.R.S...............	2·74
,,	Probus, Lamellyn	3·42	XVIII.	Fearn, Lower Pitkerrie..	1·32
,,	Wellington, The Avenue	3·68	,,	S. Uist, Askernish	2·19
,,	North Cadbury Rectory	2·39	,,	Invergarry................	4·61
VI.	Clifton, Pembroke Road	3·33	,,	Aviemore, Alvie Manse.	2·88
,,	Ross, The Graig	3·04	,,	Loch Ness, Drumnadrochit	2·85
,,	Shifnal, Hatton Grange	3·68	XIX.	Invershin	2·30
,,	Wem Rectory	3·85	,,	Bettyhill	2·03
,,	Cheadle, The Heath Ho.	6·08	,,	Watten H.R.S............	2·72
,,	Coventry, Kingswood ...	1·97	XX.	Cork, Wellesley Terrace	4·07
VII.	Market Overton	3·30	,,	Killarney, District Asyl.	5·62
,,	Grantham, Stainby	3·21	,,	Glenam [Clonmel]	3·94
,,	Horncastle, Bucknall ...	2·73	,,	Ballingarry, Hazelfort...	3·00
,,	Worksop, Hodsck Priory	2·84	,,	Miltown Malbay	5·52
VIII.	Neston, Hinderton	4·07	XXI.	Gorey, Courtown House	2·32
,,	Southport, Hesketh Park	5·26	,,	Moynalty, Westland ...	4·43
,,	Chatburn, Middlewood.	6·47	,,	Athlone, Twyford	3·93
,,	Duddon Val., Seathwaite Vic.	9·27	,,	Mullingar, Belvedere ...	4·50
IX.	Langsett Moor, Up. Midhope	5·62	XXII.	Woodlawn	4·32
,,	Baldersby	3·51	,,	Westport, Murrisk Abbey	7·10
,,	Scalby, Silverdale	3·27	,,	Crossmolina, Enniscoe ..	5·74
,,	Ingleby Greenhow Vic..	3·50	,,	Collooney, Markree Obs.	4·70
,,	Middleton, Mickleton ...	4·47	XXIII.	Enniskillen, Portora ...	3·60
X.	Beltingham	3·33	,,	Warrenpoint..............	4·04
,,	Bamburgh	2·53	,,	Banbridge, Milltown ...	3·89
,,	Keswick, The Bank......	5·74	,,	Belfast, Springfield	3·69
,,	Melmerby Rectory	4·33	,,	Bushmills, Dundarave..	2·14
XI.	Llanfrechfa Grange	4·02	,,	Stewartstown	3·79
,,	Treherbert, Tyn-y-waun	8·89	,,	Killybegs	3·35
,,	Castle Malgwyn	5·86	,,	Horn Head	2·51

METEOROLOGICAL NOTES ON SEPTEMBER, 1903.

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.

ENGLAND.

LONDON, CAMDEN SQUARE.—On the whole finer than any of the summer months, and there was no persistently wet or cold weather. A TS of considerable severity occurred on the evening of the 4th, lasting for over 3 hours, with T, L and R. There was a little fog in the last week. Mean temp. 58°·4, or 0°·7 above the average.

ABINGER HALL.—A month of sharp contrasts, with a remarkably heavy fall on 4th. All green crops were growing more than in August. Two severe frosts.

TENTERDEN.—There were two hot days to begin with, then showery with TSS on 2nd and 4th, and a violent gale on the night of the 10th. Duration of sunshine 177 hours.

SHEPPEY, LEYSDOWN.—Unsettled and showery. During a TS on 4th ·92 in. of R fell in about an hour. Terrific gale on the night of the 10th.

CROWBOROUGH.—Warm and not unpleasant, with a mean temp. of 56°·3. Gale on 8th and a severe one on 10th. R ·60 in. below the average of 27 years.

EMSWORTH, REDLANDS.—R 1·65 in. in excess of the average of 19 years. TSS on 4th and 2·21 in. of R, the heaviest fall in 24 hours ever recorded here.

HARTLEY WINTNEY.—The first month of the year with R below the average. Mild throughout. A terrific S.W. gale on the night of the 10th, doing damage to trees only. Ozone on 9 days with a mean of 2·2. TS on 4th.

BURY ST. EDMUNDS, WESTLEY.—Very wet for harvest, with ten wet days in succession. Cold in the middle, very mild at the beginning and end. TS on 4th.

TORQUAY, CARY GREEN.—R ·89 in. above the average. Duration of sunshine 155·2 hours, being 9·1 hours below the average. Mean amount of ozone 4·5; max. 7·5 on 20th with S.E. wind, min. 1·5 on 2nd with E.S.E. wind and on 25th with W. wind.

HARTLAND ABBEY.—On 10th there was a very severe storm from S.W., W. and N.W., and all vegetation was very much scorched. The general opinion was that the wind was very strongly charged with salt, as it was seen on the windows on the morning of the 11th. Many trees were blown down.

LYNMOUTH, ROCK HOUSE.—A warm month, excepting a cold spell between 9th and 16th, but there were no extremely hot days. A mock moon was seen at 9.5 p.m. on 6th. Violent S.W. to N.W. gale on 10th.

NORTH CADBURY RECTORY.—Much nearer to normal conditions than any of the summer months. It was rather wet and very damp. The last 11 nights were most abnormally warm. The great gale of the 10th did much damage. Every road was blocked with limbs or trunks of trees. The fury of the gale began about 4 p.m. from S. and was worst from 5 to 6 p.m. and from 10 p.m. to 1 a.m. Hedges and trees were browned on the windward side.

CLIFTON, PEMBROKE ROAD.—Unsettled and rainy till 12th and from 23rd to the end. A dry period intervened with N. and E. winds, cold at first and warm after. The gale of the 10th was one of the most violent ever known here and caused enormous damage to the "sea defences" of the upper part of the Bristol Channel, and the destruction of a great number of trees.

ROSS, THE GRAIG.—Rather more than the average amount of R on about the usual number of days. It was warm on 1st and from 20th to the end, the remainder being very cold for the season. The gale of the 10th was very severe, many trees being blown down.

BOLTON, THE PARK.—Unsettled until 12th, 1·20 in. of R falling on 8th and 1·67 in. on 10th, the total to the 12th being 5·01 in. Floods occurred on the evening of the 10th, but very slight damage was done. This was succeeded by anticyclonic conditions with warm and humid atmosphere till near the close, affording farmers an opportunity of harvesting. Bright sunshine was recorded on 25 days, amounting to 91 hrs. 10 mins.

WALES AND THE ISLANDS.

LLANFRECHFA GRANGE.—Very wet. The harvest was much hindered and damaged by the storm on 10th, during which many trees were blown down.

HAVERFORDWEST.—The first 13 days were wet; on 10th a heavy storm occurred, the bar. falling an inch between 4 a.m. and 6.40 p.m. The force of the wind was tremendous and roofs were stripped and trees snapped off or uprooted. Foliage except evergreens was blasted as if by fire in a way never seen before. Sharp TS on the night of the 26th. Duration of sunshine 133·7 hours.

ABERYSTWITH, GOGERDDAN.—Another bad month. Much R till 11th, and a fearful storm of wind on 9th and 10th, uprooting trees. From 12th to 23rd was ideal weather with a little frost. The remainder was wet and cold.

DOUGLAS, WOODVILLE.—Only twice (since 1873), in 1883 and 1891, has the R of September exceeded this month's fall of 6·17 in., of which 4·41 in. fell in the first 12 days. From 12th to 21st was fine and dry, with strong, cold N.E. winds; afterwards very mild, with daily R to the end. Violent W.N.W. gale on 9th, and S.E. gale on 21st, when all steamers had to leave Douglas Harbour for shelter elsewhere.

SCOTLAND.

CARGEN [DUMFRIES].—Most unfortunate for harvest operations. A dry spell from 12th to 21st allowed of finishing the work in earlier districts, but the greater part of the oats was still in the fields at the end and suffered much from the wet, "muggy" weather. Frost on 15th did much damage in gardens.

LILLIESLEAF, RIDDELL.—September was very much like its predecessors, but with less wind. It was thus difficult to get in the corn which in the high ground was all out on the last day of the month.

TIGHNABRUAICH.—The R was not excessive and its effect on the cut grain was minimised by the high wind.

BALLACHULISH, ARDSHEAL.—The almost constant R of August continued till September 11th, followed by 10 dry days, which in turn was succeeded by slight daily showers till 29th, when heavy R began again.

STRONVAR.—The most backward September for 31 years. A considerable amount of hay was still out at the end and corn was not all cut. On 7th 1·08 in. of R fell in 8 hours and on 23rd 1·43 in. in 8 hours.

COUPAR ANGUS.—The noteworthy features were—the excess of wet days rather than heavy falls, and the high night temp. of the last 10 days.

ALFORD, LYNTURK MANSE.—Cold and wet to 20th, like the summer since the end of May; afterwards it was dry with slight exceptions, the 7 successive days from 20th to 26th being the longest dry period since the end of May. The night frosts were dangerous for oat crops, which were not yet ripened.

WATTEN.—The first half was wet, dull and cold; the second, mild, dry and fine, with slight frosts, heavy fogs and some T.

IRELAND.

CORK, WELLESLEY TERRACE.—R 1·37 in. above the average. The mean temp. was the lowest in September for 21 years. The storm on 10th was most disastrous and was accompanied by a fall of bar. of ·76 in. in 7 hours.

MILTOWN MALBAY.—Boisterous winds from S.E. to S.W., often approaching the force of a gale, prevailed throughout, with a hurricane on 10th, which lasted with damaging force for a quarter of an hour. All crops were damaged and much hay left uncut.

DUBLIN, FITZWILLIAM SQUARE.—A fitting sequel to the summer months of 1903. A cold spell followed a disastrous storm on 10th, and lasted until the 16th inclusive. Subsequently the temp. recovered under the influence of S. winds and remained high to the end, and the mean temp. (56°) was 0°·1 above the average. A redeeming feature was the amount of bright sunshine, the duration of which was 166 hours, or 44 per cent. of the possible duration.

OMAGH, EDENFEL.—Up to the 12th the weather was no improvement on that of August, but from 13th to 26th a comparatively fine period went some way in redressing the effects of that disastrous month. There was, however, at the end much grain and even hay still in the fields. The temp. of the last fortnight was over 5° above the average.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1903.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	61·1	29	27·8	18	53·6	37·1	46·4	74	108·4	21·2	2·14	13	5·6
Malta	76·2	30	47·4	25	64·2	52·7	49·2	75	126·5	40·9	·98	6	3·8
Lagos, W. Africa	92·0	3	70·0	20	89·3	78·6	76·8	79	142·0	...	7·39	8	...
Cape Town	86·8	4, 5	41·1	24	70·0	53·9	51·4	70	...	...	2·18	6	4·8
Durban, Natal	86·2	19	55·8	29	78·7	62·8	...	...	141·8	...	5·97	18	5·3
Mauritius	84·6	10	62·8	7	81·6	70·4	69·8	83	147·5	54·6	6·18	22	5·9
Calcutta	107·6	29	68·0	6	98·6	75·1	69·4	60	159·0	63·8	1·71	2	1·3
Bombay	93·3	23	68·6	2	88·5	76·1	71·9	72	136·7	59·3	·00	0	1·4
Madras	98·0	1	72·6	16	93·0	76·7	74·0	75	142·8	69·0	·00	0	2·2
Kodaikanal	74·3	22	50·5	8	69·3	53·4	46·8	63	145·8	41·2	4·07	5	4·4
Colombo, Ceylon	93·0	22	72·8	11	90·8	76·3	77·0	84	148·8	72·0	7·62	18	5·1
Hongkong	83·5	22	62·0	4	76·8	68·7	66·7	83	135·7	...	4·73	10	7·7
Melbourne	88·5	10	44·4	16	67·0	51·3	48·5	72	141·8	33·0	3·76	16	7·3
Adelaide	92·9	9	45·8	13	71·3	54·9	50·2	65	142·4	41·8	2·78	14	6·2
Coolgardie	93·8	8	37·8	25	72·6	51·3	47·5	59	156·2	26·3	1·03	3	5·2
Sydney	85·9	5	51·3	27	71·5	58·8	54·0	75	118·3	44·0	1·73	17	5·3
Wellington	70·0	14	40·0	26	61·9	48·8	47·2	75	118·0	30 0	4·51	12	6·5
Auckland	71·5	13	47·0	26	63·6	53·4	50·2	74	135·0	45·0	2·66	15	4·6
Jamaica, Negril Point	90·1	28	66·8	21	85·8	71·2	69·6	72	...	...	·64	4	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	92·4	30	71·2	5	86·5	74·6	68·6	69	150·6	...	·65	7	2·1
Toronto	76·2	29	14·4	5	52·7	35·0	33·1	67	91·2	18·0	3·74	...	5·6
Fredericton, N.B.	73·8	29	12·2	6	51·2	28·8	25·5	52	...	...	2·82	10	6·4
Winnipeg	71·3	26	15·0	29	52·6	27·4	...	...	...	...	·54	8	4·4
Victoria, B.C.	61·3	28	31·2	11	52·7	40·3	...	...	...	...	1·39	14	7·6
Dawson	52·8	30	—18·4	9	36·1	11·8	...	...	...	...	·60	3	3·5

MALTA.—Mean temp. of air 57°·4, or 2°·3 below; mean hourly velocity of wind 12·9 or 1·4 above, averages. Mean temp. of sea 63°·0. TS on 1st.

Mauritius.—Mean temp. of air equal to, dew point 1°·0, and R ·98 in. above averages. Mean hourly velocity of wind 0·2 miles below average; extremes 23·3 on 22nd, and 1·7 on 10th; prevailing direction E.S.E. L on 2 days; L and T on 5 days.

MADRAS.—Bright sunshine 235·5 hours.

KODAIKANAL.—Mean temp. of air 59°·7. Mean velocity of wind 317 miles per day. Bright sunshine 208 hours.

COLOMBO.—Mean temp. of air 83°·2, or 0°·7 above, of dew point 2°·5 above, and R 3·62 in. below, averages. Mean hourly velocity of wind 5·2 miles, prevailing direction S.W. TSS on 13 days, L on 12 other days.

HONGKONG.—Mean temp. of air 72°·4 or 2°·5 above average. Sunshine 87 hours. Mean hourly velocity of wind 13·2 miles; prevailing direction E. by S.

Adelaide.—Mean temp. of air 63°·1, or 0°·9 below average. Splendid rains.

Sydney.—Mean temp. of air 0°·6 above, humidity 3°·4 below, and R 3·74 in. below, averages.

Wellington.—Mean temp. of air 3°·3 above, and R ·98 in. above, averages.

Auckland.—Mean temp. of air 3° below, and R one inch below averages.