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THE INDICATIONS OF THE SKY.

(Continued from page 84.)

In two previous articles we have urged the advisability of meteorological observers paying more attention to the colour and configuration of the clouds and to the tint of the sky than they have hitherto. The former requires nothing but a little of that patient continuance of observation which shepherds and nautical men find it to their interest to devote to it; the latter requires a good eye for colour, and, perhaps, the construction of a cyanometer by the method described on page 82.

Our last article concluded by pointing out that in that wonderfully powerful assistant of modern progress, the spectroscope, we probably have the successor to the cyanometer, and a key to stores of weather knowledge of which we at present know nothing. Spectroscopic observers have, hitherto, been mostly occupied with such fascinating subjects as the chemical constitution of the sun, the fixed stars, with occasional notes of meteors, lightning, and auroræ, so that the numerous absorption bands produced by the atmosphere have been looked upon simply as intruders. It is known that these bands vary with the sun's altitude, and an American writer has pointed out their connection with atmospheric moisture. This last matter, however, must not pass without attention being drawn to the fact that the bands are evidently the result of all the strata of the atmosphere from the earth's surface to its uttermost, indefinable, imponderable limit. Our transatlantic friend will, therefore, surely find that his hygrometric observations at the bottom of the atmosphere will not always agree with his spectroscopic determination of the water present throughout it.

The following abstract is so suggestive that we are sure our readers will approve its extraction from the *British Association Report* for 1868:—

OBSERVATIONS ON THE ATMOSPHERIC LINES OF THE SOLAR SPECTRUM IN HIGH LATITUDES. By GEORGE GLADSTONE, F.C.S., F.R.G.S.

“This paper was explanatory of some diagrams which the author had prepared of the atmospheric lines in the solar spectrum, from observations taken by him during a recent voyage along the north-west coast of Norway. The author stated that what are known by observers of the solar spectrum as the ‘atmospheric lines,’ are certain dark lines or bands, which make their appearance under certain conditions, and sometimes even attain a considerable development. These lines or

bands appear to be due to the presence of some substances in the earth's atmosphere, as they are always most prominent when observing the sun through a long reach of air (as at sunrise or sunset), while they are scarcely visible when the sun is high above the horizon. The observations, of which drawings were exhibited, were taken in the months of June and July last, from the deck of the vessel when off the coast near Stavanger, and at the entrances to the Trondhjem and Namsen fjords, the latter being in $64^{\circ} 30'$ north latitude, in which parallel the sun skirts the horizon for a long time, thus affording very favourable opportunities for observation. It appears that in those regions the red end of the spectrum is very brilliant, so that with the small portable spectroscope he distinctly recognized, on two occasions, the remarkable line A. The observations went to show that the atmospheric band grows in width and intensity as the sun approaches the horizon, and that what, in certain states of light, or of the atmosphere, appear to be bands of shade, are, under other circumstances, broken up into lines. Under some conditions the red rays suffer very little diminution of light up to a certain point, when they are suddenly cut off, while under others the obscuration takes place more gradually, and the visible spectrum is much longer. The length of the spectrum, however, in no case affects the width between the respective lines, which remains always the same, but is entirely due to more or less of the extremities being altogether lost in darkness."

When a subject is new there are generally two obstacles to its successful pursuit.

(1) The information upon it is entirely fragmentary, most difficult to obtain, and, usually, incomplete.

(2) The apparatus is difficult to obtain, costly, and liable to derangement.

Neither of these obstacles attend spectroscopic observations; the former is entirely removed by Professor Roscoe's excellent and copiously illustrated work,* and the latter by the snug little apparatus represented below, the name on which is sufficient recommendation to all acquainted with the subject.



No one can tell what secrets lie hid in these atmospheric lines, but to us it seems that, by their careful and systematic observation, the "message from the stars," which has taught us all so much, may be rivalled in practical importance by a "message from the sky."

THE BRITISH ASSOCIATION AT EXETER.

(Continued from page 119.)

Admiral Sir E. BELCHER read a long communication "*On the distribution of Heat on the Sea Surface throughout the Globe.*" The paper gave the results of certain observations taken by the gallant Admiral

* "Spectrum Analysis," by Professor H. E. Roscoe. London: 1869.

over a long period of years, and over every part of the Atlantic Ocean. He urged that notice should not be taken of the observations made by ignorant and irresponsible persons, and upon which the belief in the heat of the Gulf Stream had been founded. The object of his paper was to point out that the temperatures which prevail in the Atlantic equatorial currents do not differ much from those in the other or Pacific portion of the ocean, and that north or south, in the Pacific, Arctic, or Antarctic, we find the warmer temperatures prevail more than they do in those regions on our European course in the seas washing Norway and towards Nova Zembla. Taking certain squares similarly situated in various parts of the world, he thought that geographers had given too much importance to supposed warm currents, deduced too from the equatorial one running to the north-east into the Arctic seas.

Mr. A. G. FINDLAY next submitted a paper "*Upon the Supposed Influence of the Gulf Stream upon the Climate of N. W. Europe,*" in which he contended that to attribute the higher temperature of the West of England to the Gulf Stream would be to ignore the statistics thereof. The actual bulk of water which passes through the Florida Channel is from 294 to 330 cubic miles per day, and it receives no accession from the tropics. Fully one half of the stream passes eastward and southward from the banks of Newfoundland, and the northern half, cooled down and neutralized by the Arctic current, has, according to the ordinary theory, to cover the whole ocean, to raise its temperature, and that of this country. The known bulk of this stream will only give six inches per diem over this area. How was it possible then that such a minute film had any influence; and this, too, at from one or two years after it has left the Gulf of Florida as the true Gulf Stream. The further progress of this warmer water to and beyond Spitzbergen, and its effect on the north polar bason, are totally and absolutely incompatible with the now well known particulars of the Gulf Stream proper. How could they then account for our warmer winter climate? The reason seemed to him to be simple and obvious. The great belt of south-west winds, called the anti-trades or passage winds passes over the North Atlantic throughout its breadth, and drives slowly the whole surface of the water to the northward of an easterly course or towards the north-west shores of Europe. From the particular configuration of the land this north-east drift is allowed to pass into the polar area. This south-west wind infuses into high latitudes the temperature and moisture of much lower parallels, and by its greater rate of travelling passes over the warmer water to the southward, and thus brings to Exeter in one day the warmth of the centre of France. By its variation from westward to eastward of a southerly direction we find all the variations and moisture which were induced by this wind passing over land or sea. In conclusion, he hoped that the subject would receive much more attention than it had hitherto done. The excellent observations made in the expedition from the Royal Society, under Dr. Carpenter and Dr. Wyville Thompson, will,

he had no doubt, throw great light on this obscure N.E. current, which should not be called the Gulf Stream, but possess a specific term.

Mr. TRELAWNY SAUNDERS hoped that the study of meteorological subjects would receive greater attention. The effect of the sun on the earth had not received sufficient study, and he questioned whether the zone of the greatest heat was at the equator.

"On the best means of determining the true Evaporation from a Surface of Water," by G. J. Symons and R. Field. The authors commence by pointing out the very inconsistent statements of even able meteorologists, and quoted returns in proof of their position; thus, for the same year one observer gives the evaporation as 11 inches and another gives it as 48 inches. They then quoted the meteorological essays of the late Professor Daniell, to show how strongly he condemned the existing form of evaporators, and proceeded to criticize the mode proposed by Professor Daniell of computing the quantity of evaporation from hygrometric observations, as a substitute for quantitative measurement. After a few words on what the authors believe to be the great source of error in all existing forms of evaporators—namely, undue heating of the water experimented upon—they described a series of experiments at Dijon and other places on the canal of Burgundy, in which the evaporation was measured in large tanks, and was found to be only about half what was generally assumed to be the amount. Reference was then made to a very ingenious and accurate instrument used by the authors for measuring the depth of water, and this instrument (called a Hook gauge) was exhibited. Large drawings illustrated the apparatus that Messrs. Symons and Field have hitherto employed, and a number of tables were "taken as read." The authors epitomized the results of their experiments, showing what very erroneous measurements (even to the extent of 100 per cent. of error) were yielded by the best of ordinary evaporators; and concluded with a strong plea for further investigation by quoting the words of M. Vallés (the French engineer who first called attention to the great inconsistency of existing experiments):—"We do not understand how in a country like ours, and with reference to one of the most important hydraulic data, we can rest content with only knowing that the numerical value to be assigned to this datum lies between two limits, one of which is double the other."

"On a Self-setting Type Machine recording the Horizontal Motion of the Air," by C. J. Woodward.—The author called attention to the uncertainty arising from the present mode of reading off the traces of self-recording anemometers, and exhibited two tables, containing the velocity as read off from one record sheet by two separate persons. There were several instances in which the values assigned by them differed by one or two miles, but in the aggregate the difference was inconsiderable—not one per cent. Mr. Woodward proposed to remove this liability to error by attaching to the spindle of Robinson's cup anemometer a self-setting type machine, which would print off the

exact hourly values, and exhibited a model which apparently proved the practicability of the plan. It was questioned whether the additional labour thrown upon the cups, by having to drive this apparatus, would not lead to error in their indications, but Mr. Woodward thought not.

“*Description of a new Self-recording Aneroid Barometer,*” by J. Martin. This instrument consists of an eight-day clock, a large aneroid with an eight-inch dial, and a paper-covered cylinder 4 inches in diameter. The vacuum box of the aneroid, in addition to turning the hand in the usual way, has to move a chain, which passes over three or four pulleys to the recording pencil. The clock turns the before-mentioned cylinder at such a rate that one paper lasts a week. Mr. Symons called attention to the fact, that similar instruments had long been in use by Admiral FitzRoy and others, with the exception that a mercurial column was used instead of the aneroid, the former giving by far the most accurate results. Mr. Follet Osler concurred in the superiority of the mercurial column as the motive power, and added some remarks on the desirability of dealing with simultaneous observations over very large areas. A gentleman present pointed out that the aneroid was more portable than the mercurial column.

“*On the Best Form of Numerical Figures for Scientific Instruments, and on a proposed mode of Engraving them,*” by Col. Strange, F.R.S. Colonel Strange called attention to certain tables of numerals hanging on the wall, and to certain others which he placed in juxtaposition; the space occupied by the two varieties being equal, the superior clearness of those suggested by the Colonel was immediately evident. The two following lines will give an *idea* of the comparison instituted, but the figures drawn and exhibited by Colonel Strange are far clearer than even the Egyptian ones we have taken as an illustration. Any one who is aware of the frequency with which several pairs of figures (such as 1 and 4, 3 and 8) are confounded, will welcome and wish good speed to Colonel Strange’s suggestion :—

1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9

The “*Report of the Rainfall Committee,*” read by Mr. Symons, the Secretary, stated that the attention of the Committee, during last year, had been to a great extent devoted to various details calculated to secure increased accuracy among the observers; the personal inspection of the gauges at work having proved very beneficial, has been extended as far as possible, and a code of rules has been drawn up to ensure uniformity of practice among the observers. A very simple instrument, made by Pastorelli of Piccadilly, called a Storm Rain Gauge, was exhibited, the object of which is to enable observers to determine accurately and without inconvenience the rate at which rain falls minute by minute, or indeed, every ten seconds if required. Then followed a series of elaborate tables, containing the results of experiments made during the last six years to determine the relative indications of rain gauges of different sizes; the result appears to be that

the difference does not exceed one per cent., unless the gauge is unusually large or small, all of the usual sizes, 5, 6, 8, or 12 inches in diameter, seem to give nearly identical results.

The Committee then proceed to report the results of a careful examination of the positions of the rain gauges now at work, and point out that there are many important districts in which the observations are insufficient, and the Committee earnestly desire to rectify this state of things. As an illustration, a large map of the south-west of England was exhibited, and it was pointed out that though populous places, like Exeter, Bath, &c., had several observers, large tracts of land, like Dartmoor and Exmoor, are almost wholly neglected. It was further requested that anyone who might be observing, or intend to do so, would communicate with Mr. Symons.

THE PREDICTED DROUGHT OF THE PAST SUMMER.

To the Editor of the Meteorological Magazine.

SIR,—Without re-opening the discussion on lunar influence, may I say a few words with regard to the summer drought which I predicted should commence at the end of May, 1869? From the end of that month to the beginning of September the weather was drier than during the corresponding period of any other year this century, except 1818 and 1864. Between May 28 and July 28 the rainfall at Greenwich was 1·29 in., and between August 10 and Sept. 10 it was 0·76 in. In each case it was considerably less than half the average. In many places, after August 13 not a drop of rain fell for more than three weeks. This was in accordance with my prediction of “fine weather for harvest to set in a few days after the 9th of August.”

I am, &c.,

G. D. BRUMHAM.

P.S.—When the moon's positions in declination have been the same as they will be in the coming *winter*, we have *always* had an unusually low temperature. I have, however, no “pet theories” about lunar influence; I believe in the laws, because, so far as I have been able to ascertain, they have never failed, but if remarkably severe frost does not occur, I shall be the first to give up the notion of lunar influence on temperature.

THE THUNDERSTORM OF SEPTEMBER 10TH.

To the Editor of the Meteorological Magazine.

SIR,—We were visited on Friday morning last, the 10th of September, by one of the severest thunderstorms that has occurred in this neighbourhood during the whole of the summer. Throughout the night, from 11 p.m. of the 9th, there was constant and unusually brilliant sheet lightning, but no thunder was heard until about 5 o'clock in the morning of the 10th, and the storm was at its height at 6 o'clock, at which hour the lightning was incessant and very vivid and the claps of thunder remarkably loud, accompanied by a deluge of rain. Thunder occurred at intervals during the rest of the morning, and in the afternoon it cleared up and blew a gale of wind from the S.S.W. Since the above storm, which came up from the S.E., the weather has

become unsettled, with rain and high winds. We had a slight thunderstorm here in the afternoon of Sunday, September 5th, which I see was very severe in Yorkshire and other northern counties.

I am, Sir, yours very truly,

ARCHDALL E. BUTTEMER.

Sydenham, S.E., Sept. 13th, 1869.

To the Editor of the Meteorological Magazine.

SIR,—A very violent thunderstorm occurred here during last night and this morning. Lightning was first seen about 10.30 p.m., and by 11 p.m. was almost incessant in S., S.E., and E., with distant thunder; the storm passed to the westward soon after midnight, though distant lightning was seen throughout the night. 5.30 a.m., frequent flashes of lightning and incessant thunder in S. From 5.45 to 6.30 a.m. the storm was right overhead, the lightning being very vivid and frequent and the thunder incessant. Very heavy falls of rain at 5.50 and 6.30 a.m., total fall '44 inch; the thunder ceased about 7.30.

Another heavy storm passed to the eastward between 10.30 a.m. and mid-day. The thunder was loud and frequent, though never very near. The barometer stood at 29.58 at 9 a.m., having fallen three-tenths during the night.—Yours truly,

THOMAS PAULIN.

Winchmore Hill, 10th Sept., 1869.

THUNDERSTORMS OF SEPTEMBER 29TH AND 30TH, AS SEEN AT CIRENCESTER.

There had been distant thunder heard early in the morning of the 29th, and the day broke with thunder heat; temperature at 8 a.m., 59°. It was cold the previous day, and a stream of heated air, charged with electricity, had come from the S.E. during the night of the 28th, but no appearance of a storm until 5 p.m. on the 29th, when heavy clouds gathered in the S. horizon; at 5.45 lightning was first seen, and at 6 thunder was heard. In this, *the first* storm, the lightning was clearly defined, looped and forked, at considerable intervals, and the thunder heavy, rolling, and long continued. It passed away to the N., and we thought all was over. In less than an hour heavy clouds were again seen in the S., and in this second storm its character was totally altered. It apparently took the same course as the first storm, from S. to N., being distant, but the thunder was rumbling and constant, and the lightning was in sheets of great brilliancy; it might be called almost constant—"one" could not always be counted between the flashes—it might be called a stream of electricity made visible. In each of these storms, a quarter of an inch only of rain fell, but about 20 miles E. of this place, the focus of both storms, there was not only rain, but hail and a violent wind. The third storm was on Thursday, the 30th; the day broke as on Wednesday with thunder heat, and a temperature of 59° at 8 a.m., the wind S.E., and the storm began at 2.30 with torrents of rain without thunder; we concluded the electricity had been exhausted in the previous storms, and that we should have rain only, but at 3 p.m. lightning was seen and distant

thunder heard, and at length became low, rumbling, and constant, whilst the lightning was faint and seldom. It might be supposed that the electrical discharges in this storm were above the clouds, and therefore indistinctly seen or heard. The rain was steady and heavy, 1.30 in. falling in about an hour, and 2.10 in. altogether from 4 p.m. to about midnight. The barometer was little or nothing affected by these storms. The course of the storms was almost exactly alike, commencing in the south and passing to the north. Those of Wednesday did not occur in London.

THOMAS C. BROWN.

Further Barton, Cirencester.

HERSCHELL'S WEATHER TABLE.

To the Editor of the Meteorological Magazine.

SIR,—I have come upon the enclosed table, and should be very glad to have a competent opinion upon its value; also to know whose authority it has, and the probable date of its first appearance. It cannot, I suppose, have ever been intended to be true of any country beyond Great Britain.—Yours, &c.,

R. H. FAWCETT.

Portsmouth, August 18th, 1869.

If the new moon, the first quarter, the full moon, or the last quarter happens	In Summer.	In Winter.
Between mid. and 2 in morning	Fair	Hard frost unless wind be S. or W.
" 2 " 4 "	Cold, frequent showers	Snow and stormy.
" 4 " 6 "	Rain	Rain.
" 6 " 8 "	Wind and Rain	Stormy.
" 8 " 10 "	Changeable	Cold rain if wind be W. snow if E.
" 10 " 12 "	Frequent showers.	Cold and high wind.
" 12 noon " 2 p.m.	Very rainy	Snow or rain.
" 2 " 4 p.m.	Changeable	Fair and mild.
" 4 " 6 p.m.	Fair	Fair.
" 6 " 8 p.m.	{ Fair if wind N. W.	Fair & frosty if wind N. or N. E.
" 8 " 10 p.m.	{ Rainy if S. or S. W.	Rain or snow if S. or S. W.
" 10 " midnight.	Ditto	Ditto.
	Fair	Fair and frosty.

OBSERVATIONS.—The nearer the time of the moon's change to noon or midnight the more nearly will the result accord with the prediction.

It is also said that less dependence is to be placed on the table in winter than in summer.

[The table is rather old, but we cannot give its precise origin. A copy (almost verbatim) of the above is given in the *European Magazine* for 1803, vol. lx., page 24. It is generally known as "Dr. Herschell's Weather Table," but it has been publicly disavowed by his son, Sir John Herschell. We do not know whether it was ever submitted to careful examination by an unprejudiced person. It seems to us impossible that *any* words in the second and third columns can be correct except by accident, but if any of our readers like to test it, we shall be glad to hear the result.—Ed.]

HEAVY RAIN AT TRENT.

To the Editor of the Meteorological Magazine.

SIR,—I write to mention to you what I conceive to be a most unusual fall of rain for the Midlands. Rain commenced to fall at 4.5 p.m. on the 18th, and ceased about 6 a.m. on the 19th. At 9 a.m. on the latter day I found 1.87 in. in the gauge. This is double the amount of any previous one day's rain since September last, in which month I commenced to record here. September this year has given so far 3.35 inches on 13 days. I dare say many other correspondents will write to you of the fall on the 18th.

Believe me, yours sincerely, C. U. TRIPP.

Trent College, Nottingham, Sept. 20th, 1869.

Rainfall at Trent College, 1869.

January	2.68 in. on 16 days.	June	1.06 in. on 10 days.
February	1.73 in. ,, 16 ,,	July	0.41 in. ,, 5 ,,
March	2.29 in. ,, 17 ,,	August	1.34 in. ,, 14 ,,
April	1.77 in. ,, 12 ,,	Sept. (to 20th)...	3.35 in. ,, 13 ,,
May	4.08 in. ,, 17 ,,		

A METEORIC STONE SHOWER AT WOLVERHAMPTON?

At the conclusion of the thunderstorm at Wolverhampton on Tuesday evening, several persons noticed a large number of small dark stones lying upon the streets and roads, the drive of the London and North-Western Railway Station, Queen Street, Queen Square, and Waterloo Road being especially strewn with them. From the peculiar character of the stones, bearing resemblance to nothing with which the roads are paved, or any stones found in the district, it was concluded, even by the uninitiated, that they were meteoric stones, and must have fallen in a shower during the heaviest and most alarming period of the storm. A considerable number was gathered that night, and more the next morning. Our correspondent has some in his possession, and has shown them to several gentlemen, one of whom saw the last shower of meteoric stones that fell at Birmingham in June last, and stated that those that have fallen at Wolverhampton were precisely of the same character. They appear, however, to have been a little larger, for the record states that those which fell in Birmingham were from one-eighth of an inch to three-eighths of an inch, and about half those dimensions in thickness, while some of those picked up in Wolverhampton were three-quarters of an inch in length, and five-eighths of an inch in thickness. Like the stones in Birmingham, too, they have something like the appearance of Rowley rag, but on breaking them up the difference of character is at once apparent. A chemist in the town found that, by judging from mere surface examination, they resembled iron pyrites. The matter is exciting a very general attention, and there are a great many searchers gathering up the remains of this strange shower from the heavens. It is believed that they fell towards the close of the storm, when it was peculiarly heavy, and in some places the lightning

was seen to rebound from the earth like the glare from the bursting of a shell. The rain was so heavy that many low-lying places in the suburbs were quickly under water, and the water rushed with such force from the racecourse through an opening in the wall into Clifford Street, Whitmore Reans, as to wash away part of the footpath. In addition to the house struck in Monmore Green, and slightly damaged, the chimney of a house situate in Little Berry Street was struck by the lightning and knocked down, and rendered the rest of the house in a dangerous state.—*Birmingham Gazette*.

[We regret that the above, which appeared in the *Morning Advertiser* of May 28th, has only just come to our notice. We hope it is not too late for our Wolverhampton correspondents to explain this mysterious story.—Ed.]

REVIEWS.

Results of Meteorological Observations made at the Radcliffe Observatory, Oxford, in the year 1866, under the superintendence of the REV. R. MAIN, M.A., Radcliffe Observer.—Oxford: J. Parker & Co., 8vo, 67 pages.

IN most respects this is similar to several preceding annual volumes; one noticeable departure therefrom is the insertion of an account of some experiments with ozone papers during the latter half of the year 1866. The only details given are as under:—

“On May 5th, 1866, experiments were commenced, and continued till September 30th, to test the quantity near the ground with that at the top of the tower (105 feet) by exposing a paper for 24 hours in both positions, in addition to the ordinary paper exposed for 12 hours only. The amount of discoloration was the same in both positions in nearly every instance.

“From September 1st to September 30th, a paper was placed in a glass tube painted black on the outside and exposed for 24 hours, and compared with that in the unblackened tube exposed for the same length of time, to test the effect of light upon the paper. In the majority of cases, that protected from the light was less discolored than the other, some times considerably so.

“On October 1st, the glass tubes containing the papers were placed inside leaden tubes, blackened inside and outside.

“On October 2nd, a fresh supply of paper was obtained from Negretti and Zambra, and a more systematic series of experiments commenced, and continued till the end of the year.”

Then follow the daily values during two months, whereof the averages are as under:—

Glass tube in lead	1·3
Lead tube blackened	1·4
Open plain glass tube	6·0
Closed „ „ „	6·7
Wire gauze cage, Schonbein	2·4
„ „ „ Moffat ...	2·3
Black tube on the tower ...	2·1

“It appearing from these experiments that the paper was considerably more acted upon by light than by ozone, it was returned, and a fresh supply, *in boxes*, obtained from Negretti and Zambra on December 2nd, with much more satisfactory results as the following comparison will show. The closed glass tube was discontinued from this time.”

The means of this second series are :—

Glass tube in lead tube	2·2
Lead tube blackened	3·1
Open plain glass tube	4·5
Wire gauze cage, Schonbein	4·3
" " " Moffat ...	3·7

We think the general utility of these experiments would have been increased had they been described in greater detail ; *e.g.*, the "closed" glass tube, was it corked, stoppered, or hermetically sealed? Again, the papers in both series were more discolored in the "Lead tube blackened" than in the "Glass tube in lead tube;" were both lead tubes of the same diameter? because if so, the internal addition of the glass tube would diminish the volume of air passing over the paper, and thus perhaps explain the cause of the difference recorded. Of the chemistry of the atmosphere as indicated by the discoloration of these test papers hardly anything is known ; everyone, therefore, who clearly demonstrates a single fact in connection therewith is a benefactor, but demonstration can only be accepted when accompanied by the most copious details and the most ample proof. If we can at present get no further than the determination of the circumstances under which most discoloration takes place, we shall have advanced one important step, and by that time perhaps the chemists will be able to tell us to what the discoloration is due.

As in previous years, the rainfall measurements are succinctly tabulated, the actual fall at four elevations being given, and the ratio of the amount collected in each gauge to that collected on the ground. We hope on a future occasion to give an abstract of these values for several years.

Notes on the Summer of 1868, particularly of the Temperature as observed in Bath, and compared with that of Greenwich and some other places. By REV. L. JENYNS, M.A., F.L.S., F.G.S.—[Proceedings of the Bath Naturalists' Field Club.]—Bath: Hayward, 8vo, 28 pages.

THOSE of our readers who are versed in the literature of meteorology, will gladly recognize in the writer of the above the able author of "Observations in Meteorology," and they will comprehend the difficulty of giving in a few lines any fair idea of what it requires 28 pages for Mr. Jenyns to state. He opens with a judicious protest against hasty determinations of meteorological elements, passes on to the influence of wind on the seasons, thence to careful comparison of temperatures in 1868 (wherein a little more detailed description of the position and mounting of the instruments would have been expedient), thence to the irregular distribution of rainfall, the paucity of thunderstorms, the influence of icebergs, and Mr. Glaisher's investigations of the secular variation of temperature, concluding with the following paragraph, which may be taken as a type of the whole :—

"Whether this slight secular change is due to the same causes continuing slowly to operate which brought about such far greater changes of climate

formerly, or to some independent agency not yet discoverable, the circumstance is not one that need much alarm us. Geologists tell us that climates were very different ages back; that land and sea have perhaps more than once changed places, causing, by their altered relative position, a dis-arrangement of the meteorological conditions of whole latitudes. In this way countries once arctic have become warmer, those that were once tropical have become temperate. But these changes date back to a period very remote, probably long before the appearance of man on this earth. If the same changes are still going on, they advance by such slow degrees as to be only perceptible after the closest looking into all the phenomena by which they are accompanied. Before our climate can again experience a complete reversal of its present character man may have run his course. He must not fear, therefore, any interruption of those operations in the field which he looks to as the main sources, not merely of his daily sustenance, but of his health and prosperity. He may continue to 'plough in hope.' If now and then he has a bad season to contend with, he has a good one another year to set against it; or if the yield be deficient in one country it is met by more abundant supplies elsewhere. He may trust the existing order of things. He has the promise that 'while the earth remaineth,' so long at least as it is needed for man in his present state and circumstances, 'seed-time and harvest, and cold and heat, and summer and winter, and day and night shall not cease.'

Meteorological Tables for 1868. Edited by Dr. BARHAM.—*Catalogue of Natural Periodic Phenomena kept at Bodmin.* By T. Q. COUCH. [From Journal Royal Inst., Cornwall.]—8vo, 11 and 5 pages.

THE observations at the Royal Institution of Truro have (although we believe the position of the instruments is not what could be wished), long held a high rank as trustworthy standards. Long may they remain so. We hope, however, that the observer will be careful with his 9 p.m. barometer observations, for either he has an indifferent light, and consequently makes a constant slight error in the readings, or the diurnal range is different there to what it is in other places. The photographic records from Falmouth will soon decide which is the true explanation. We are sorry to miss the rain returns from Scilly, for which we have generally had to fall back upon the tables under notice. Surely some one in those Isles could be induced to keep a record. We have not noticed one misprint or error in these tables, but the return of rainfall at St. Agnes differs by 0.10 in. from that published by Mr. Symons; he gives 42.37, Dr. Barham gives 42.27—this must be cleared up.

The Naturalists' Calendar is a good one, and ably introduced by the following paragraph:—

"Each step in the development of the meanest insect is dependent on the vital processes of the plant which feeds it, and the latter in its turn is influenced by solar and atmospheric agencies. Indeed it is impossible strictly to say how far the mutual co-relation extends. This inter-dependence, which is observable throughout nature, furnishes us with an ever-changing and never-ending object of study. We must not be restrained from the pursuit because the causes of the palpable oscillations of the balance of natural order seem, to the isolated observer, far to seek, and even impossible to find. In course of time, a circle of students may amass such a number of facts as to permit some great generalizer to educe from effects their certain causes. It is for this reason that I record any marked plenty or scarcity of certain animals and plants, and, indeed, any noticeable departure from the general order and due proportion in the manifestations of organic life."

SEPTEMBER, 1869.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which -01 or more fell.	TEMPERATURE.				No. of nights below 32° on grass
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth	Date	Deg.		Date.	Deg.	Date		
I.	Camden Town	inches 3·56	+ 1·30	in. ·84	18	14	76·0	29	41·2	21	0	
II.	Staplehurst (Linton Park) ...	3·81	+ 1·59	·80	10	13	77·0	4	43·0	21	0	
III.	Selborne (The Wakes).....	6·39	+ 3·95	1·09	18	15	73·0	5	34·6	1	2	
IV.	Hitchen	3·12	+ 1·26	·74	9	13	72·0	5	43·0	1, 20	0	
V.	Banbury	3·87	+ 1·50	·71	11	17	72·0	5	35·5	1	0	
VI.	Bury St. Edmunds (Culford). 3·58	+ 1·97	·73	10	11	77·0	5	37·0	2	0		
VII.	Bridport	3·92	+ 1·60	·50	11*	17	72·0	4	38·0	2	0	
VIII.	Barnstaple	6·75	+ 2·99	1·12	19	25	73·0	6	43·0	2	...	
IX.	Bodmin	5·87	+ 2·20	1·13	11	23	70·0	6	46·0	1	0	
X.	Cirencester	6·55	+ 3·69	2·05	30	19	...	...	...	...	...
XI.	Shifnall (Haughton Hall) ...	4·76	+ 2·81	1·06	10	17	73·0	6	39·0	1	0	
XII.	Tenbury (Orleton)	5·51	+ 2·83	1·45	18	17	72·3	8	35·0	2	0	
XIII.	Leicester (Wigston)	2·43	+ ·22	·49	19	13	78·0	4 & 8	39·0	1, 20	0	
XIV.	Boston	3·22	+ 1·65	·65	10	16	75·4	8	44·0	2, 21	0	
XV.	Grimsby (Killingholme)	3·18	..	·88	18	21	70·5	9	44·0	22	0	
XVI.	Derby.....	5·31	+ 2·97	1·61	18	20	73·0	8	40·0	1	0	
XVII.	Manchester	6·32	+ 2·63	·77	29	26	75·0	5	35·0	1	0	
XVIII.	York	3·91	+ 1·58	·62	5	21	72·0	8	40·0	30	0	
XIX.	Skipton (Arncliffe)	11·64	+ 6·68	1·55	15	27	69·0	1	37·0	22	0	
XX.	North Shields	2·82	+ 1·12	·53	12	21	69·5	25	43·0	22	0	
XXI.	Borrowdale (Seathwaite).....	24·09	+10·88	3·75	20	27	...	...	...	...	...
XXII.	Cardiff (Town Hall).....	6·82	..	1·24	18	23	...	...	...	...	...
XXIII.	Haverfordwest	8·52	+ 4·81	2·01	11	17	71·8	5	41·0	2	...	
XXIV.	Rhayader (Cefnfaes).....	7·52	+ 3·68	1·03	30	22	72·0	...	36·0	...	...
XXV.	Llandudno.....	6·50	+ 4·16	1·55	11	21	79·4	5	45·6	4	...	
XXVI.	Dumfries	5·87	+ 3·14	·87	14	21	69·0	5	41·0	13	0	
XXVII.	Hawick (Silverbut Hall) ...	5·28	..	1·08	10	23	...	...	...	...	0
XXVIII.	Ayr (Auchendrane House) ...	6·38	+ 2·65	1·34	22	23	74·0	26	35·0	3	2	
XXIX.	Castle Toward	7·73	+ 3·11	1·39	22	26	70·0	5	32·0	2	1	
XXX.	Leven (Nookton)	5·09	+ 2·61	1·26	12	18	66·0	4 & 9	36·0	13	0	
XXXI.	Stirling (Deanston)	6·90	+ 3·75	·91	22	23	68·0	9	33·8	13	0	
XXXII.	Logierait	4·12	..	·64	12	19	...	...	...	...	...
XXXIII.	Ballater	3·43	..	·90	12	18	70·0	5	32·0	13	1	
XXXIV.	Aberdeen	5·24	..	1·57	12	21	71·6	6	38·2	27	1	
XXXV.	Inverness (Culloden)	3·77	..	·73	29	...	67·2	9	42·2	13	0	
XXXVI.	Fort William .....	..	..	..	..	..	..	..	..	..	..
XXXVII.	Portree	10·32	- ·45	1·52	25	20	...	...	...	...	...
XXXVIII.	Loch Broom	6·17	..	1·10	19	23	...	...	...	...	...
XXXIX.	Helmsdale	5·12	..	·97	24	23	...	...	...	...	...
XL.	Sandwick	6·60	+ 2·94	·96	12	23	62·1	9	40·6	17	...	
XLI.	Cork	5·05	..	·64	17+	20	...	...	...	...	...
XLII.	Waterford	5·98	+ 2·85	1·57	28	20	65·0	9	46·0	3, 20	...	
XLIII.	Killaloe	8·88	+ 4·71	1·39	30	26	72·5	5	38·0	20	0	
XLIV.	Portarlington	3·88	+ ·60	·67	29	26	70·0	24	40·0	19	...	
XLV.	Monkstown	4·73	+ 2·74	1·21	30	20	74·0	25	37·0	3	...	
XLVI.	Galway	8·46	..	1·25	13	26	70·0	4	37·0	20+	...	
XLVII.	Bunninadden (Doo Castle) ...	4·07	..	·38	7	26	66·0	9	35·0	14	0	
XLVIII.	Bawnboy (Owendoon).....	5·59	..	·73	7	25	71·0	4 & 9	39·0	18§	0	
XLIX.	Waringstown	3·57	..	·65	11	19	72·0	6	40·0	2	0	
L.	Strabane (Leckpatrick)	4·49	..	·73	7	26	71·0	9	33·0	20	0	

* And 12th. † And 28th. ‡ And 22nd & 30th. § And 19th.

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

METEOROLOGICAL NOTES ON SEPTEMBER.

ABBREVIATIONS.—Bar for Barometer; Ther. for Thermometer; 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.

CAMDEN TOWN.—TS 11.30 p.m. 9th and 5.45 a.m. on 10th. L from dusk till 9 p.m. on 29th.

LINTON PARK.—High, destructive wind on 12th and 13th; distant T on 5th and 30th, and more near on 10th; prevailing winds S. and S.W. Bar. very low on morning of 12th (28.39 at 7 a.m.) and unsteady for some time. Heavy R on 10th, 12th, and 30th; but except for the wind alluded to, damaging the crops and fruit, the month may be considered a favorable one.

SELBORNE.—T at 3 a.m. on 6th, and at 10 p.m. on 11th with violent wind S.E. to S.W. and rain; the storm continued during the 11th, 12th, and till evening of 13th; several trees were blown down; TS from 6 till 10 a.m. on 10th, and another TS beginning at 6 p.m. on 29th in W., and passing on to N., the T a continuous roar and continuing faintly till the morning of the 30th; L in evening of 30th. The max. temp. on the 20th was as low as the min. of the 18th, 56°. Bar. on the whole very equable; lowest on the 12th, 28.73, highest on 1st, 29.91.

CULFORD.—Very high winds prevailed about the middle of the month; quite a gale on the 13th, which did considerable damage in many instances, such as blowing down park trees, unroofing buildings, &c., and in very many instances entirely divesting fruit trees, such as apples and pears, of their crop. The latter part of the month, however, was remarkably fine, even warmer than the average. T on 5th, 6th, and 10th.

BRIDPORT.—Heavy westerly gale on 11th and 14th, on each of which days there was a fall of .50 in. of R. Bar. on 11th at 10 p.m., 29.10. T and L on 11th, 28th, 29th.

BODMIN.—The unexampled drought of fifteen weeks ceased on the 3rd; a tremendous gale on the 11th; bar. on 11th, 28.65.

CIRENCESTER.—L on night of 9th; gale on 12th from W., and of extreme violence on 13th. The rainfall on the 30th two-thirds of the average for the whole month; TSS on 29th and 30th.

SHIFFNAL.—Wasps and butterflies so scarce before now (3rd) increase. 7th, potatoes "ackerspriet" as last year, but not so badly. The R which came with T on the 8th continued daily till the 19th; turnips, which were greatly mildewed, benefitted and grow again; mushrooms most abundant on 16th. The lady-birds, which were very numerous, have gradually disappeared; they were evidently bred here, their pupæ being found on the garden herbs. Potatoes cut down by the cold of the 1st. TS at 2 p.m. on 5th; TS with heavy rain at 6 p.m. on 10th; gale from N.W. on 12th, from S.W. on 13th, and again from S.W. on 19th; T with heavy R and incessant L on night of 29th. Unusually warm from the 24th to the end of the month.

ORLETON.—On evening of 18th 1.45 in. of R fell, without T or L. On 29th, at night, a grand display of vivid L, with distant T, passed to the E. of us from S. to N., the flashes being continuous and generally white, frequently four or five in a minute. About 5 p.m. on 30th another heavy TS passed to the S.W. of us from S.E. to W., when 1.28 in. of R fell between 4 p.m. and midnight. On 5th, L in N. in evening. Violent wind on 12th and 13th.

WIGSTON.—An extraordinary discharge of electricity on the evening of the 29th, which continued from 7 p.m. until after midnight, keeping the heavens one continued blaze of light; no T heard here.

KILLINGHOLME.—The wheat is reported to yield badly in most places; we have not much reason to complain in this respect. The month was remarkable for a succession of high winds from the S. and S.W., and they could not be called "ill winds," inasmuch as they allowed the farmers to get in their corn in good condition, although 2.86 in. of R fell in ten successive days from the 9th to the 18th. L on 5th, 8th, 9th, 29th, and 30th. TS at 9.30 a.m. on 10th; heavy TS at 4.30 p.m. on 13th. Aurora on 16th. Redbreast whistling on 17th; first woodcock seen on 27th.

DERBY.—Equinoctial gales unusually early and violent ; both temp. and rainfall above the average, the latter more than double ; grass and all vegetation growing, notwithstanding the time of the year.

MANCHESTER.—T S on 10th and 29th ; stormy on 16th and 18th.

ARNCLIFFE.—Rainfall considerably more than double the average ; E on every day after the 3rd.

SEATHWAITE.—Nine days on which there fell more than one inch of rain ; four on which more than 2 in. fell, and one on which the fall was 3·75 ; the total for the month being 24·09 in. (about the same as the *annual* fall in London.)

NORTH SHIELDS.—T S on 5th.

W A L E S.

HAVERFORDWEST.—The month commenced fine, with high bar. and cool temp., but changed on 3rd, and rain began on 5th, from which time to the end of the month, with some intermissions, rain, wind, and weather of the wildest and stormiest character prevailed ; one of the wettest and stormiest months for the last 20 years ; never very warm, but mild throughout ; the late harvest much damaged by the great storm of the 13th, literally scattering the stacks to the winds and blowing the ricks in the hay yards to the ground. A gale commenced before midnight on the 11th, and continued to increase in violence till 2 a.m. on 13th, when it raged with awful fury, uprooting trees and unroofing houses, accompanied by dashing rain ; seldom has such a storm swept over this locality.

CEFNFAES.—The month has been generally cold and wet ; high winds with heavy rain (chiefly from S.W.) from 13th to 19th. On 29th a fearful storm of T and L, most violent between 7 and 8 p.m.

LIANDUDNO.—15th, stormy day with L in evening. 26th, a beautiful meteor at 7 p.m. in N.E., color a light straw ; 27th, a slight appearance of aurora at 8.30 ; sea slightly phosphorescent ; shooting stars ; T S from 8 to 9 p.m. on 29th.

S C O T L A N D.

DUMFRIES.—The first three days dry, and from the 4th to the close E nearly every day ; at the beginning of the month the soil dry and parched, and although the rainfall was heavy, it was near the close of the month before the streams were much increased by the rains, as the thirsty earth retained nearly all the rain that fell for two weeks ; the total fall in the month is more than double the average. The max. day temp. was lower than that of August, but the night temp. 1^o·3 higher.

HAWICK.—After the first three days, which were hot and droughty, rain fell copiously and it has given all the green crops a most luxuriant appearance. Potatoes keep almost clear of the rancid enemy, and the cereals have been (for the most part) secured under "thack and rope" in the very best order. There was one very loud thunder clap, with much L, on the night of the 27th. The latter half of the month generally squally, and on the 19th, 25th, and 26th, there were perfect hurricanes.

AUCHENDRANE.—This September has been a month of severe equinoctial gales, surcharged with heat and vapour, which was rapidly condensed by the greater cold of our northern latitudes ; the rains began on the 6th, but such was the dryness of the soil and exhausted state of the springs, that not before the 20th (after an almost continuous rain of 14 days, amounting to more than 3 inches) did the water rise to the standard height on the gauge on the river. No observer could have witnessed this September overflowing of the rivers, and the dried-up state of the river-beds throughout the summer, without coming to the conclusion that the sequel of the extensive agricultural drainage must be the formation of reservoirs at the sources of our rivers, as the only method of mitigating those severe "water famines," which deprive both towns and rural districts of their proper supply of one of the greatest necessities of civilized life.

CASTLE TOWARD.—Warm and dry to the 5th, and has since been mild but wet, E falling on every day to the close. The rain came just in time to save the turnip crop (which is now good) ; still some grain out ; potatoes getting diseased ; peas, kidney beans, and cauliflowers plentiful ; flower garden and ribbon borders quite gay, being safe as yet from frost.

DEANSTON.—Bright and fine first week, but very wet and mild the rest of the month. Gales of wind on 19th and 25th from S.W. T and vivid L at 7 p.m. on 29th; R more than double the average.

LOGIERAIT.—Very heavy rainfall almost daily from the 7th. Strong gales, with occasional T.

ABERDEEN.—A mild but wet month (both temp. and rainfall above the average, the latter nearly double), very unfavourable for the harvest, much of the grain being still "out" in the upland districts. Auroræ on 2nd, 8th, 11th, 14th, 16th, 26th and 27th.

PORTREE.—Very wet and stormy from the 8th to the end, which has greatly retarded the harvest operations; the crops are mostly uncut, so that we are again at the mercy of the Highlanders' harvest, October. L during the whole of the night of the 17th. A fine lunar rainbow on 21st, visible from 10 to 12 p.m.

LOCHBROOM.—It was beautiful harvest weather till the 10th, after which date until the end of the month, we have had the most wretched weather imaginable; not one dry day to the 30th; it has injured all manner of crops, and rendered harvesting very late.

SANDWICK.—This is the wettest September during the whole time of observation (29 years); this has retarded the ripening and reaping of the grain, so that only about half of it is cut down yet. Auroræ on 2nd, 8th (lasting all night, with coruscations reaching to the zenith), 9th, 11th, 14th, 15th, 27th (covering the N. and part of the S. hemisphere), and on 30th.

I R E L A N D.

KILLALOE.—As August had the smallest rainfall in 24 years, September had the largest fall in the same period, the nearest to this being Sept. 1861, 7·57 in.

DOO CASTLE.—Inclement month; R on every day from the 4th. Equinoctial gales set in early this month, and as a rule continued to the end; they were particularly fierce on the 10th, 14th, 18th, and 19th. Oats which had not been secured were seriously injured. T on 5th, the commencement of the "break."

OWENDOON.—Only one dry day after the 4th; much of the hay still left out, and it is a pity to see the loss it has sustained, and some of the oats in the mountain district have been damaged.

WARINGSTOWN.—This month was remarkable chiefly for the continuous S. to W. winds and frequent heavy gales, during which the wind occasionally veered to N.W. R heavy and pretty equally distributed over the latter weeks, but fell principally at night. Potatoe crop very fine, showing no disease.

LECKPATRICK.—Very stormy, wet month, the latter part of it most unfavourable for the harvest; much damage done to the oats on mountainous and late lands. Wettest September for the last seven years, except 1863, 5·46 in.

THE HEAT IN AUGUST.

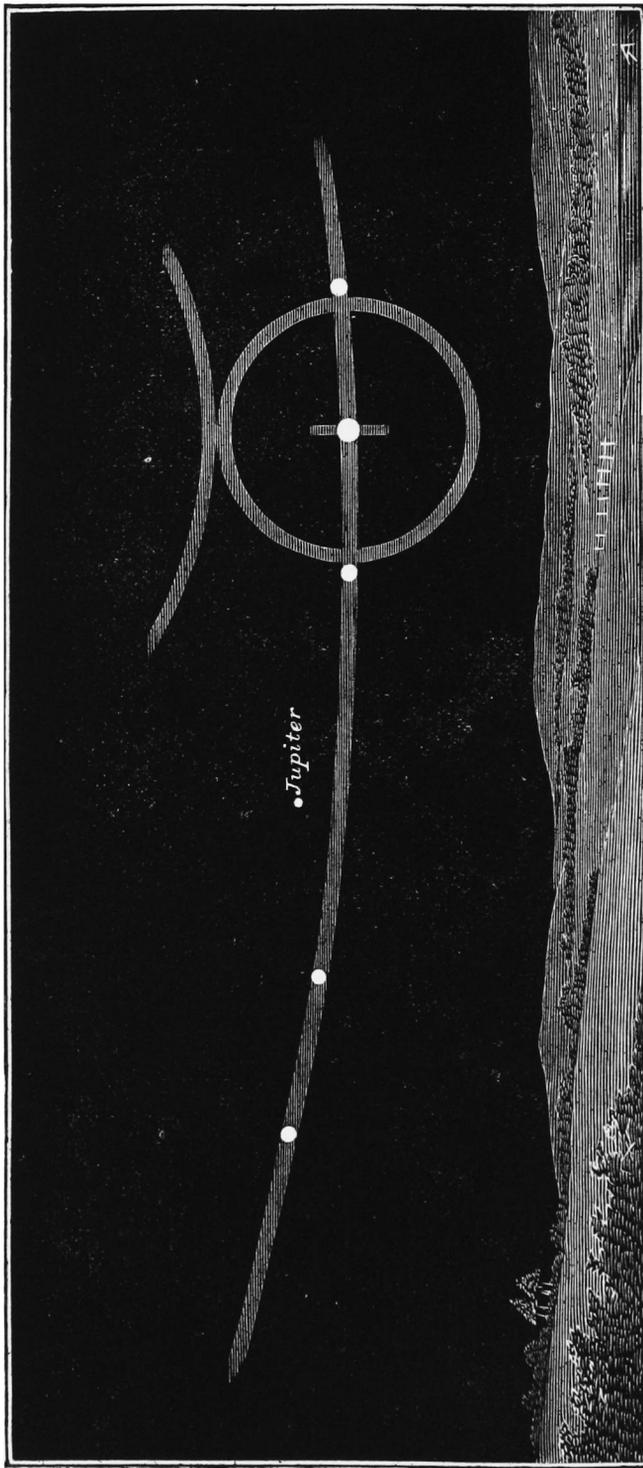
To the Editor of the Meteorological Magazine.

SIR,—At page 120 of the *Meteorological Magazine* for this month, I find it stated by Mr. E. J. Lowe that the thermometer on 28th Aug. at the Highfield House Observatory, reached 94°·6 in the shade and 110°·2 in sunshine. I presume this solar thermometer did not fulfil the requirements of that class of instrument in having *the bulb and one inch of the stem blackened*, and being placed *in vacuo* in a glass tube—the tube being situated *on grass*. On the same day, at Malvern, the maximum shade temperature was 90°, the solar 145°; at my own residence, 87°·8 and 132°·7, these solar thermometers fulfilling the conditions stated. On 29th August the maximum shade temperature by my own thermometer was 62°, a difference in 24 hours of 25°·3.

Faithfully yours,

C. S. BARTER, M.B.

27, *The Paragon, Bath, 17th Sept., 1869.*



PARASELENÆ AND HALOS SEEN AT HAWSKER, NEAR WHITBY, YORKSHIRE, AT 9.45. P.M. OCTOBER 17TH, 1869.