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METEOROLOGICAL MAGAZINE.

CXXII.]

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AN ERRATUM.

It is not, perhaps, every one who, if obliged to acknowledge a serious error would do so in the most prominent manner possible. We, however, are not great worshippers of precedents; we are perfectly conscious that errors do and will creep into every human work, and though we dislike errors more than most people, we object still more to ignoring them, concealing them, or glossing them over.

Moreover, just as it is perfectly true that failures are often more instructive than successes, so are errata frequently useful as beacons to warn others off of places where their precursors have made shipwreck of their work.

We have to notify an error in every number of this Magazine for eight years past, and also in our last number. Ninety-seven errata at once is a sufficiently appalling announcement for a Magazine which prides itself on its accuracy. We are not going to defend ourselves, nor are we about to blame the valued correspondent whose extreme desire for accuracy has led to this catastrophe. We intend merely to state the precise facts, and finally to wind up our narrative, as tales used to do, with the moral—which we present to all, and it is by no means one to be neglected.

In December, 1850, Capt. Liddell, R.N., placed in his garden at Bodmin a contracted-float rain gauge, the receiving surface of which was 2ft. 6in. above the grass on which it was placed. From that time to the present that gauge has been read every day.

In the year 1866 he purchased an ordinary 5in. gauge, which he placed near the old one, but with its receiving surface only 1ft. above the ground. In 1868 we asked Captain Liddell, who was one of the earliest contributors to Mr. Symons' *British Rainfall* (Bodmin being one of the 167 stations quoted in the leaflet for 1860) to supply monthly returns for insertion in this Magazine; he consented, and has been one of our most punctual and accurate correspondents ever since.

Now, herein lies the source of our ninety-seven errata—Captain Liddell knowing that an altitude above ground of 1ft. was more usual than one of 2ft. 6in., and moreover that the contracted-float gauges were in less general use than his new gauge, sent the records of the latter. We, on the other hand, assumed that he was still using and sending

Rainfall at Bodmin, 1868-75, by 8 in. float rain gauge, compared with the average by the same gauge during the years 1860-65 inclusive.

Months.	1868		1869		1870		1871		1872		1873		1874		1875	
	Total fall.	Diff. from average.														
January.	6.48	+1.29	7.02	+1.83	4.16	-1.03	4.82	-.37	9.73	4.54	8.06	+2.87	5.70	+.51	10.84	+5.65
February	2.37	-.42	4.56	+1.77	5.37	+2.58	3.66	+.87	9.02	6.23	4.70	+1.91	5.22	+2.43	1.71	-1.08
March ...	3.38	+.37	2.76	-.99	2.79	-.96	1.80	-1.95	5.25	1.50	4.33	+.58	2.03	-1.72	1.80	-1.95
April ..	3.85	+2.15	1.49	-.21	.30	-1.40	5.64	+3.94	4.36	2.66	.64	-1.06	2.34	+.64	2.17	+.47
May	2.75	+.29	6.28	+3.82	2.67	+.21	.46	-2.00	3.01	.55	2.06	-.40	.94	-1.52	3.26	+.80
June.....	.82	-3.22	.54	-3.50	.89	-3.15	2.67	-1.37	3.01	1.03	2.22	-1.82	2.05	-1.99	3.53	+.51
July .....	.81	-2.30	.95	-2.16	2.10	-1.01	5.67	+2.56	3.12	.01	3.96	+.85	1.99	-1.12	3.57	+.46
August....	4.00	+.14	.76	-3.10	3.94	+.08	2.50	-1.36	2.18	1.68	6.25	+2.39	4.56	+.70	3.00	+.86
Sept.	6.19	+2.52	5.76	+2.09	2.14	-1.53	8.25	+4.58	4.79	1.12	3.99	+.32	6.55	+2.88	7.36	+3.69
October..	6.00	+.68	3.61	-1.71	7.56	+2.24	7.39	+2.07	7.75	2.43	4.37	+.95	5.33	+.01	8.81	+3.49
Nov.	7.80	+2.82	4.19	-.79	4.23	-.75	1.77	-3.21	7.42	2.44	5.82	+.84	4.73	-.25	7.20	+2.22
Dec.	9.40	+4.16	5.52	+.28	3.58	-1.66	4.49	-.75	9.19	3.95	1.26	-3.98	6.72	+1.48	2.86	-.238
Total ...	53.85	+7.74	43.44	-2.67	39.73	-6.38	49.12	+3.01	68.83	+22.72	47.66	+1.55	48.16	+2.05	56.11	+10.00

1876, January, 1.54 ; difference from average, —3.65.

he records of the float gauge, because it *alone* could properly be compared with the average 1860-5, the new gauge not having been started until afterwards. The printed forms used for the monthly returns do not require any particulars as to the gauge used, since it has been thought unnecessary to give the observers the trouble of filling in these details twelve times a year.

However, it is useless to discuss the past, but owing to this misunderstanding we have, for more than eight years, been comparing the actual fall by the 1ft. gauge with the average by the 2ft. 6in. gauge. Many people would think this a small matter, but it is not. During the past eight years the mean fall by the 2ft. 6in. gauge has been 50.40in., and by the 1ft. gauge 52.52in., an excess of 2.06in., or almost exactly 4 per cent.

The whole of the corrected values are given in the table on the previous page.

Now for the moral. Accurate comparisons for the determination of seasonal change can only be made under three conditions—

- (1.) Between records similarly kept, of one gauge, in one position.
- (2.) Between records similarly kept, of two gauges, both tested and found correct, and in the same position.
- (3.) Between records similarly kept, of two gauges, or two positions, provided that Rule II. has been observed and the records carefully differentiated. Condition No. (1) is, however, far the safest.

THE BAROMETRICAL DEPRESSION OF MARCH 12TH.

[We think it better to give the following facts verbatim than in any other form. The depression seems to have passed nearly over the metropolis; the wind, however, was not so violent as on the 14th.—Ed.]

Sea Level Pressure, Camden Square, March 12th, 1876.

Time.	Pressure.	Time.	Pressure.	Time.	Pressure.
9.0 a.m.	28.706	0.15 p.m.	28.457	3.30 p.m.	28.848
10.5	.615	.30	.447	.45	.902
.20	.592	.45	.459	4.0	28.940
.30	.577	1.0	.460	4.30	29.006
.45	.561	.15	.462	5.0	.047
11.0	.545	2.0	.551	6.0	.086
.15	.531	.30	.659	7.0	.146
.30	.509	.45	.703	9.0 p.m.	29.234
.45	.491	3.0	.763		
Noon	28.473	3.15 p.m.	28.813		

REMARKS.—The noticeable feature in this depression was the rapid rise between 2 and 3.45 p.m., viz., 0.351 in., or 0.200 in. per hour. A rise of half-an-inch occurred between 2 p.m. and 5.10 p.m., or in 3 hours and 10 minutes.

G. J. SYMONS.

To the Editor of the Meteorological Magazine.

SIR,—I hasten to inform you of the terrific snowstorm experienced here to-day; the early morning showed us a white mantle over the earth, and snow still falling in a calm, with, at 9 a.m., a temperature about freezing, and 0·46 in. rainfall or snowfall; at 10 a.m. wind shifted from S.E., to which it had backed from W. yesterday, to N.E., and sprang up to a terrific gale or hurricane, with an immense snowfall, which lasted till 3 p.m., and then calmed down into much less wind and a smiling sky, promising a cold night. Temperature rose from 32° to 34° and 36°, then fell to 32°, and rose again to 34° at 5 p.m.

I fear the results of such a storm in other districts.

Yours faithfully,

HENRY ST. JOHN JOYNER.

Northwick House, Harrow, Sunday, March 12th, 1876, 8 p.m.

SIR,—We were visited yesterday by a most tremendous snowstorm. Snow commenced early in the morning, and continued very heavily till about 8 a.m.; from 9 a.m. to 0.15 p.m. there was a thick fine rain at times. At 0.30 p.m. a second storm commenced; the wind shifted to N.E., and blew with terrific force, accompanied by a fall of snow, so dense that it was impossible to see more than 50 yards; this continued till 2.30 p.m., when the wind shifted to N.W. the snow ceased, and the gale rapidly subsided. The snow melted almost as rapidly as it fell, so that it was not more than 4 in. in depth. The rain gauge yielded 1·18 in., which would give a depth of 14 ins.

The barometer fell very rapidly till 1.43 p.m., when a rapid rise commenced. The following are the readings:—

8th, 9 a.m.	29·46 in.	12th, 9 a.m.	28·47 in.
9 p.m.	28·77 ,,	0.30 p.m.	28·35 ,,
9th, 9 a.m.	28·62 ,,	1.43 ,,	28·29 ,,
9 p.m.	28·47 ,,	2.30 ,,	28·40 ,,
10th, 9 a.m.	28·48 ,,	4.30 ,,	28·75 ,,
9 p.m.	28·57 ,,	9 p.m.	28·97 ,,
11th, 9 a.m.	28·80 ,,	13th, 9 a.m.	29·33 ,,
9 p.m.	29·00 ,,		

Yours truly,

THOS. PAULIN.

Enfield, 13th March, 1876.

SURBITON.—At 11 a.m. the wind on ground was due E.; a good weathercock, 160 ft. above ground, showed the wind was S. by E., the clouds, not very high, were coming from W. by S., the wind strong, both below and above. My barometer, not a standard—no correction applied—was at 1 p.m., when the wind changed to N., 28·34, at 5 p.m. it was 28·94, a rise of six-tenths! in four hours—all carefully noticed.

G. D.

SIR,—Barometer at 1.30 p.m. to-day, corrected for temperature, but not reduced to sea level, 28·356 [28·524 at Sea Level], had risen at 10 p.m. to 29·15. Melted snow and rain fallen to-day, between 7 a.m. and 10 p.m. 0·627 in. A fine calm night, barometer rising, and external thermometer in air 34°.

Yours sincerely,

WM. FRED. HARRISON.

Bartropps, Weybridge, March 12th, 1876.

P.S.—Just this weather in 1870, day for day.

SIR,—As the barometer has been so extraordinarily low for the last few days, I send some barometrical readings, corrected and reduced to Sea Level—

8th, 9 a.m.	29·724	12 noon	28·736
9th, ,,	28·876	0.30 p.m.	·724
10.55 a.m.	·843	1 ,,	·710
12 noon	·823	1.30 ,,	·706
1.30 p.m.	·810	3 ,,	·708
4.30 ,,	·779	4 ,,	·715
5.30 ,,	·775	5 ,,	·741
6.30 ,,	·743	6 ,,	28·763
11.30 ,,	·675 min.	11th, 9 a.m.	29·070
10th, 8.15 a.m.	·798	9 p.m.	29·253 max.
9 ,,	·700	12th, 9 a.m.	28·686
10.30 ,,	·687	1.30 p.m.	28·437 min.
11 ,,	·720	3.15 ,,	28·762
11.30 ,,	28·722	13th, 9 a.m.	29·619

Two large trees blown down in the Rectory Grounds yesterday, and one in Kelsey Park.—Yours truly,

C. O. F. CATOR.

The Hall, Beckenham, 13/3/76.

SWARRATON RECTORY, ALRESFORD.—March 12th, 10.20 a.m. ; Kew Standard Barometer, corrected and reduced to sea level, 28·56 ; lowest observed. W. E.

SIR,—We have just had a severe snowstorm. It began about 5 a.m. yesterday, March 12th, and continued till 3 p.m. ; there was also another fall last night. During the storm there was a violent N.E. wind, which drifted the snow in places to 1½ ft. deep or more.

Fall by gauge, 9 a.m., 12th	.. ..	0·25 in.
,, ,, ,, 13th	.. ..	0·72 in.

As it was thawing all the time, it was impossible to tell the true depth of the snow.

The barometer (aneroid) has been very low for the last 5 days, the lowest readings being at 9 p.m. (9th) 28·215, and at noon yesterday (12th) 28·250, uncorrected.—Yours truly,

EDWARD C. MORRELL.

Broughton Lodge, Banbury, March 13th.

SIR,—We have had such extraordinary weather and barometrical changes here that they deserve to be put on record.

On Thursday morning, the 9th, the barometer had fallen eight-tenths of an inch, and at 11 in the forenoon of Friday, so dense a cloud, of apparently London yellow fog, came on, that we were obliged to light the gas for about a quarter of an hour. On the 10th, 11th, and 12th the mercury continued to fall, till on Sunday evening it reached 28·2. It has now (9 o'clock on Monday) risen an inch.

0·62 of an inch of snow has fallen, with a cutting N.E. wind all yesterday, which has now veered to N.W. and W. Such weather has not been remembered “by the oldest inhabitant” at this season of year.

The thermometer showed 3 degrees of frost, four feet from the surface, last night, but the temperature is rising rapidly. 1·64 of rain and snow has already fallen this month, during which there has been only one rainless day

This state of things is materially affecting agricultural pursuits, as but little barley has been sown, and the earth is so saturated with wet that some time must elapse before the land can be prepared.

Last month 2·35 in. rain fell in 18 days, but in January only ·89 in 9 days.

We have had very strong gales for the last week, from all quarters of the compass.—Yours truly,

H. EDEN COCKAYNE.

Dunmow, March 13th, 1876.

UNDERGROUND THERMOMETERS.

SIR,—In December last I resolved to commence the new year with a record of the earth temperature, and having considered the three important points to be settled—viz., (1) the depth at which it seemed most desirable that it should be taken; (2) the most convenient method of taking it; and (3) the best means of securing isolation from the air temperature, I devised the following plan; but the arrival of your January number of the *Meteorological Magazine*, containing an article upon the subject induced me to wait and think over the matter a little longer before finally adopting it. After some consideration, I could see no reason for altering it, and I send it for your opinion, in case you may recommend any modification. I have a square open wooden tube of $\frac{3}{4}$ in. deal, about 2ft. long, at the bottom of which is a continuation in zinc 1 foot long; the size of the tube is just sufficient to receive a glass quart bottle (filled with water and corked); the cap which covers the top of the tube is attached to a piece of deal quartering, filling the tube easily but pretty closely, and descending to within an inch of the gork of the bottle; a piece of copper wire fastened to the neck of the

bottle and brought up under the cap serves to draw up the bottle when the temperature is to be taken, which I do by means of an unmounted thermometer with a long stem. When the whole is in position, the square wooden cap of inch deal is four inches below the surface of the ground, and is covered with soil to that depth, and I place a square 7in. stone tile over all to mark the spot. The bottom of the bottle is just 3ft. below the surface. The position chosen is an open part of the kitchen garden. It appeared to me that the great capacity of water for heat is a circumstance to be taken advantage of as being likely to give a more trustworthy reading than a sensitive thermometer drawn up from below, not easily read in an instant, and almost sure to take up the air temperature more or less as it is drawn up. The plan seems too simple to stand in need of an explanatory diagram.

I am, Sir, yours faithfully,

HENRY COOPER KEY.

Stretton Rectory, March 3rd, 1876.

[We have much pleasure in placing Mr. Key's letter before our readers, and as he asks our opinion, we add a few remarks, although we trust that no weight will be attached to them except that which they may intrinsically possess. The subject is one well worthy of consideration, and we trust that neither Mr. Key's remarks nor our own will be looked upon as settling the best method of observation. The first step is, perhaps, to discuss the subject; the next to try those methods which appear most promising; then two or more of the selected methods should be tried by the same observer, and after the best plan has been decided upon, we must try to secure precisely similar methods being adopted in all parts of the world.]

Before making any remarks upon Mr. Key's letter, we may quote the original note as to the water-bottle method from the *Report of the Committee [of the Royal Society] on Physics, including Meteorology*, 8vo., London, 1840, p. 60:—

“The temperature of the soil at different depths is a point of considerable importance. For this purpose excavations should be made in a dry, sheltered situation 3, 6, and 9 feet deep, and lined with brick or earthenware tubes. In the bottom of these excavations earthenware quart bottles may be carefully placed, filled with water, spirit or brine, and corked. They must be carefully covered with tow or cotton, and drawn up on the days of horary observation, and their temperature taken by an accurate thermometer.”

From Mr. Key's letter it almost appears that he is not aware of the above paragraph; if so, it is another proof of the difficulty of proposing anything absolutely new; this, however, is an unimportant point.

It appears to us that the principal objections to Mr. Key's method are (1), The covering of soil and stone is doubtless very effectual, but it can hardly be pleasant to have to disinter the bottle for each observation. (2). It does not appear certain that rain water may not penetrate to the level of the bottle faster by the side of the tube than in other parts of the garden; this is one of the greatest difficulties with underground thermometers. (3). The addition of a wrap of dry flannel round

the bottle is most desirable. (4). The thermometer employed must be a very sensitive one, or it must be left in the bottle a considerable time.* (5). If "the *bottom* of the bottle is just 3 ft. below the surface," we should regard the temperature of the bottle of water as that due to its middle, say 2 ft. 6 in.

With respect to Mr. Key's remarks upon the method described in our January number, we ought to point out that we have purposely used a sluggish spirit thermometer, very easily read, and buried in non-conducting material for the express purpose of guarding against change during raising and reading.

At present we regard the modifications of the German method proposed in our January number, and (for great depths) Mr. Wallis's improvement of it, as both accurate and luxurious; but we are very glad of such criticism as Mr. Key's, and hope that it will lead to the uniform adoption of some *one* method—for uniformity is even more important than accuracy.]

REVIEW.

Storms: their Nature, Classification and Laws, with the means of predicting them by their embodiments, the Clouds. By WILLIAM BLASIUS, formerly Professor of the Natural Sciences in the Lyceum of Hanover. Philadelphia: Porter, and Coates. London: Lockwood & Co.

PROFESSOR BLASIUS has made a big book; and as to whether it is good, bad or indifferent there will not be much difference of opinion. Some books, wrote the great Lord Bacon, are to be read wholly, others in part only, and some few are to be chewed and digested. Sydney Smith asserted that the art of reading consisted in judicious skipping. The reviewer would have liked to skip much of this book, but he actually did endeavour conscientiously to digest it. The result having been mental dyspepsia, he would advise none but the strongest minded meteorologists to make the like attempt. He can safely inform the rest of his readers that they will not find the Professor's style very perspicuous, his logic very convincing, his facts very numerous or very consistently used, his nomenclature very appropriate, or his theory very clearly propounded. With many of the sentences the greater the endeavour fully to comprehend them, the greater the mysticism which they appear to evolve. However, an attempt has been made to arrive at the simplest possible conception of the author's theory, and this is its summation:—

1. A storm is the result of a warm wind blowing *into* a cold one; or all storms come against the prevailing wind, and, as he says at p. 199, "a mutual displacement takes place, which is the basis of our whole system."

* Quarterly Journal, Met. Soc. Vol. II., p. 123,

2. In winter storms, a warm current flowing to north-east doubles up, or pushes back, a cold wind blowing to S.W.
3. In summer storms, a cold current from N.E. or N.W. pushes the warm S.W. current before it.
4. At the "plane of meeting" of the two winds there is calm, with a *low* barometer.
5. In winter the warm wind tops far over the cold one, so that the plane of meeting is oblique. In summer the plane of meeting is steeper, because the cold wind banks up against the warm one, but cannot top it. "The tendency of the plane of meeting to incline, corresponds with the declination of the sun's rays." (p. 200).
6. The district of rain is under the slope of the plane of meeting.
7. The signs of storms, the Professor assures us, are to be found *in nubibus*. There are no storms without clouds. The cirrus is the precursor of winter storms; the cumulus of summer storms.
8. Storms, we learn for the first time, pass over us and then come back again.
9. The origin of tornadoes is to be sought in the configuration of the ground, or the warm currents of the ocean. A tornado moves in a diagonal of two conflicting winds, oscillates to right and left, and whirls at intervals! It *gains* strength the *rougher* the ground, and disappears over plains. At sea it favours the Gulf Stream and the Black Stream. "The tornado follows entirely different laws in its motion and appearance from those of storms generally, and therefore cannot be made the base of universal storm theories." "There are different kinds of storms—different in their origin, motions, effects, and appearances."

Of course the Professor thinks that meteorology is at present in a state of transition. Most writers on Meteorology make this gratuitous assertion. Few, however, will agree with him that meteorologists have hitherto mistaken *effect* for *cause*, or that "the science has been almost at a standstill for the last quarter of a century." During all this time, fortunately, the Professor has been incubating his theory, which is to complete the transition, make Meteorology a perfect science, and the world wiser for ever!

It was in 1851 that the Professor examined the ravages made by a tornado at West Cambridge, U.S. He failed to explain the positions of the prostrated objects, either by the rotatory theory as developed by Redfield, or by the inblowing theory as propounded by Espy. Brooding over the matter, now and again, during this great length of time, he has at last imagined, satisfactorily to his own ideas, a reformed theory of storms, which, while combining something from all other theories of winds and storms, has certainly superadded much that is novel and ingenious, although perhaps it may be fanciful and speculative. Without resorting to the millions of meteorological observations tabulated before and greatly increased since his tornado investigation, **without indeed using any facts to support his doctrine, he finds in his**

own mental resources all the materials for his aerial scheme. And this scheme he offers to the world in a good sized book, with geometrical diagrams of storms and gloomy illustrations of clouds.

The theory unhesitatingly assumes that two large portions of the atmosphere, on the same level but of different temperatures, can and actually do blow directly against each other. This, however, is contrary to the laws which regulate the direction of winds. It never happens in nature, therefore the theory cannot group together, under any relation of cause and effect, aerial phenomena. The notions of the plane of meeting, of its inclining from the perpendicular into positions more and more oblique, and of its returning to the perpendicular, with the progress and retrogression of storms, are all fantastical and without analogy in nature.

According to the theory there cannot be a polar air current above an equatorial surface current, which alone is quite enough to show its incompetency. Have not aeronauts found again and again strong polar currents over strong equatorial surface winds? Then what becomes of the theory? There is scarcely anything really sound to be found in it, but it is not worth space and time to refute absurd geometrical speculations, and jargon about plane of meeting, line of lowest barometer, oscillation of storms, &c.

The phenomena of latent heat, clouds, and precipitation are explained by old established physical principles, and, of course, are easily lugged into any theory. Thus, with a little cleverness, the theory gets the credit of explaining phenomena for which in truth it cannot possibly account. A perusal of the work and a study of the U.S. synchronous weather charts for one month would be convincing that the theory is incompatible with the operations of nature in winds and storms. In fact, the work does not describe the nature of storms; nor does it classify them; it neither expounds their laws nor does it teach the means of predicting them. The Professor has failed to grasp the significance of areas of high, as well as of low pressure, their relation, the circuits of isobars, and the relation of winds to them. Asserting "I am satisfied that it is the true explanation," and asseverating to the like effect, do not hasten conviction in the thinking reader. They only serve to indicate the doubts lurking in the mind of the writer himself, who, having laboriously spun out page after page of futile reasoning, sees that this is no thorny logic, but mere windy talk, and dismisses it with an afflatus derived from his own despairing desire to make that which is not convincing convey the simulation of conviction.

The Professor attributes to the phenomena of clouds a precision of approach, formation, passage, and recession over the visible firmament, such as the reviewer has never perceived the faintest indication of, during a long series of years as an observer. Others may have been more fortunate, but the scheme seems very idealistic. To describe a series of stripes of clouds marching over the horizon from the S.W., extending when over the zenith from N.W. to S.E., and disappearing

in the N.E., while a N.E. gale of wind is blowing below, until the plane of meeting arrives from the S.W., bringing calm and low barometer; then being succeeded by a S.W. gale, with winds veering from N.E. to E. and S.W. on the S.E. extremity of the *straight line* where the plane of meeting strikes the earth, and from N.E. to W. and S.W. on the N.W. extremity, with concomitant phases of weather; and then a backward repetition of all this, or an oscillation of the storm; is all matter of mere moonshine, the reasoning of an idealist, of a dreamer. All these kinds of sequences are described through many pages for the so-called N.E. storm. Then a second set of aerial quadrilles are arranged for S.E. or S.W. storms, equally fantastical. Put in the configuration of the land, and on favourable occasions you have the tornado waltz, when—stand clear!

Such works as this may tend to make mariners distrustful of the laws of storms, which have proved so useful to the security of navigation. They are, therefore, to be regretted, for the laws of storms have been developed by infinitely more pains and labour than any refuter of them has yet brought to his task. To set at nought the laws of storms, which half a century's experience has only tended to confirm and render more acceptable, is no light task to be undertaken by any individual; and he who does so should come armed with irresistible facts and proofs. Otherwise his labours are worse than useless, they are mischievous; but of this we may feel sure that neither Blasius's account of the nature, his classification nor his laws of storms will meet with general acceptance. The manner in which he presses into his support such meteorologists as Mohn, Hildebrandsson, Loomis, and others, is scarcely intelligible. He describes phenomena which take place beyond mortal ken with a rashness which is surprising. For instance, he gives a wonderful account of the formation of hailstones, pp. 140-1, which, like the work generally may be accepted with his own advice "obscure and complicated explanations are always to be regarded with suspicion."

At p. 44, "*par le vent d'est*" he translates "with a *west* wind. At p. 57, the lengths of quadrants of the parallels are given as the lengths of their *circles*. At p. 111, we are told that Otto von Guericke invented the barometer. At p. 211, we learn that Dover, England, is 2,000ft. above the sea, and the author's argument is based on this idea, although the facts apply to Dovre, in Norway. He conceives the barometrical gradient to be identical with "the plane of meeting," showing that he does not understand what is meant by the gradient, see p. 252. The trade winds, he says, at p. 259, "preserve a constant serenity and, a cloudless sky." Such are some of the qualifications for a propounder of a new theory of storms, working without facts, using second-hand information, and drawing largely upon the imagination. He says, "I am convinced that the existing theories of the nature and laws of changes of weather are intrinsically erroneous," and the writer of this review is equally convinced that a *less* "nearer approximation to the truth will be found in this volume."

E. I. L. A. C. E.

AURORA, FEBRUARY 21st.

To the Editor of the Meteorological Magazine.

SIR,—On Saturday evening, the 19th inst., an aurora was observed here, the record of which may not be without interest, for comparison with the notes made by other observers, which may probably appear in the *Meteorological Magazine*.

During the whole of the day a strong cold north wind blew until near 6 o'clock in the evening, when it suddenly became calm. At 7 o'clock I observed an auroral light in the northern part of the sky, but was told that it had existed half-an-hour previous. The following is a copy of notes taken occasionally during the evening. The barometer registered 29·25, and the thermometer 39° Fahr.

- 7.0. Bright light from W.N.W. to N.N.E.
- 7.15. A few gray streamers N.N.E. ; thick black clouds rising in the west.
- 7.20. Light diffused : no streamers.
- 7.25. Bright gray streamers N.N.W. ; a shower of rain with wind.
- 7.30. No streamers ; rain continues to fall.
- 7.33. Bright band from N.W. to N.N.E.
- 7.40. Streamers N.N.W., N., and N.N.E.
- 7.50. No streamers ; light diffused.
- 7.55. Light diffused and much less intense.
- 7.56. Bright meteor, shooting downwards at N.N.W., from an elevation of about 30°.
- 8.0. Light still diffused, but extending farther east.

The light continued to be diffused without any streamers being visible up to near 11 o'clock, when my observations of the aurora ceased.

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

Braystones, near Whitehaven, Feb. 21st, 1876.

P.S.—I have since found that a friend residing only about a mile from here, observed the aurora between 12 and 3.30 on the morning of the 20th, and describes it as splendid—crimson and gray streamers being almost constantly visible.

 BOOKS RECEIVED.

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- Llandudno as a Watering Place. (From the Report of the Sanitary Record). 16mo. Llandudno, 1875.
- Magnetical and Meteorological Observations. Greenwich. 4to. 1873.
- MAIN, Rev. R., M.A. Result of Meteorological Observations made at Radcliffe Observatory, 1873. 8vo. Oxford: Parker, 1875.
- NICOL, J., Esq., M.D. Report on the Sanitary Condition of Llandudno for the year ending 31st December, 1874. 8vo.
- READE, T. MELLAND, C.E. Papers on Glacial Geology. (From the Proceedings of the Liverpool Geological Society). 8vo. Liverpool, 1875.
- TAYLOR, R. The Weather in the Isle of Wight during the year 1874. Single sheet folio.
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SUPPLEMENTARY TABLE OF RAINFALL IN FEB., 1876.

[For the Counties, Divisions, Latitudes, and Longitudes of these Stations, see Met. Mag., Vol. XI., p. 28.]

Station.	Total Rain.	Station.	Total Rain.
	in.		in.
Acol	2·03	Llanfrechfa	7·85
Hailsham	2·83	Castle Malgwyn	3·71
Andover	3·06	Heyope .....	...
Strathfield Turgiss	2·03	Rhug, Corwen	4·65
Addington Manor	2·54	Port Madoc	5·57
Oxford	2·81	Melrose	4·60
Cambridge	2·21	Cessnock, Glasgow	5·14
Sheering	2·37	Gruinart	3·78
Ipswich	2·38	Keith	4·69
Diss	2·94	Strathconan	5·57
Swaffham	3·48	Springfield, Tain	3·77
Compton Bassett	3·53	Skibbereen	5·21
Dartmoor	9·64	Glenville, Fermoy	5·41
Teignmouth	3·58	Tralee	4·99
Torrington	5·73	Newcastle, W. Limerick	4·39
Trevarrick, St. Austell..	5·08	Kilrush .....	...
Taunton	3·56	Kilkenny	4·63
Bristol .....	...	Kilsallaghan	3·95
Sansaw	2·20	Twyford, Athlone	4·45
Cheadle	3·46	Ballinasloe .....	...
Ashby-de-la-Zouch	2·86	Kylemore	9·85
Coston, Melton Mowbray	2·22	Bangor	6·37
Bucknall	1·99	Carrick on Shannon	5·52
Walton, Liverpool	3·03	Roekcorry	4·48
Broughton-in-Furness ..	6·18	Warrenpoint	5·18
Stanley, Wakefield	2·27	Bushmills	3·47
Gainford	1·89	Buncrana	4·01
Shap	7·05		

FEBRUARY, 1876.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1860-5	Greatest Fall in 24 hours.		Days on which .01 or more fell.	Max.		Min.		In shade	On grass
				Dpth	Date.		Deg.	Date.	Deg.	Date.		
		inches.	inches.	in.								
I.	Camden Town	1·97	+ ·75	·36	20	18	58·6	29	23·0	12	11	8 14
II.	Maidstone (Linton Park).....	2·94	+ 1·43	·47	15	20	60·0	18	18·0	11	10	10...
	Selborne (The Wakes).....	3·87	+ 2·16	·65	14	20	55·0	23*	19·0	12	7	10
III.	Hitchin.....	2·38	+ 1·12	·34	14	23	55·0	29	22·0	9, 11	14	...
	Banbury	2·28	+ ·85	·27	14	22	56·0	29	18·5	12	11	...
IV.	Bury St. Edmunds (Culford).....	2·59	+ 1·17	·51	5	18	58·0	29	20·0	11	13	16
V.	Sproston	2·80	...	·37	14	22	...	...	...	...	...	...
	Bridport	3·49	+ 1·43	·53	16	20	56·0	27	22·0	12	16	...
	Barnstaple.....	3·90	+ 1·82	·65	16	19	57·0	23	29·0	12	...	...
	Bodmin	4·91	+ 2·12	·83	16	23	56·0	26	30·0	10	3	4
VI.	Cirencester	4·14	+ 2·53	·52	16	17	...	...	...	...	...	...
	Shifnal (Haughton Hall) ...	3·20	+ 2·31	·48	13	17	54·0	18†	12·0	12	15	17
	Tenbury (Orleton)	2·90	+ 1·33	·36	18	22	58·3	28	18·3	12	7	15
VII.	Leicester (Belmont Villas) ...	2·78	...	·38	14	22	59·0	29	20·5	12	8	...
	Boston	2·13	+ ·92	·39	14	19	58·0	18*	24·0	11	10	...
	Grimsby (Killingholme)	2·40	...	·36	14	24	56·0	29	24·0	10	7	...
	Mansfield	3·03	...	·46	14	21	56·8	29	18·1	10	14	14
VIII.	Manchester	3·98	+ 2·03	...	...	...	...	...	...	...	...	...
IX.	York	2·15	+ ·77	·34	13	21	55·0	2	23·5	9	12	...
	Skipton (Arncliffe)	3·47	+ 4·80	1·52	21	22	...	...	...	...	...	...
X.	North Shields	2·42	+ ·89	·40	28	24	52·4	29	25·0	13	11	20
	Borrowdale (Seathwaite).....	16·21	+ 4·83	2·96	20	...	...	...	...	...	...	...
XI.	Cardiff (Ely).....	6·20	+ 4·13	·93	14	23	...	...	...	...	...	...
	Haverfordwest	5·04	+ 2·18	·88	14	14?	52·0	var.	27·0	11	10	14
	Machynlleth	9·23	...	1·83	17	19	51·0	29	19·0	11	9	...
	Llandudno.....	3·01	+ 1·66	·56	17	21	57·0	28	25·0	11	4	...
XII.	Dumfries (Crichton Asylum).....	5·09	+ 2·76	·77	21	16	51·0	23	22·2	11	17	19
	Hawick (Silverbut Hall).....	4·74	...	·67	2	19	...	...	...	...	...	...
XIV.	Kilmarnock (Annanhill).....	3·96	...	·70	27	18	50·7	23	21·7	11	16	18
XV.	Castle Toward	5·49	+ 1·75	1·11	19	15	48·0	1	20·0	11	18	...
XVI.	Quinish .....	...	...	...	...	...	...	...	...	...	...	...
	Leven (Nookton).....	...	...	...	...	...	...	...	...	...	...	...
	Grandtully.....	3·46	...	·65	14	14	...	...	...	...	...	...
XVII.	Braemar	2·49	+ ·51	·50	18	19	49·0	1	16·3	20	20	26
	Aberdeen	4·41	...	·74	26	26	51·5	22	25·1	10	11	24
XVIII.	Loch Broom	4·58	+ ·84	·63	4	17	...	...	...	...	...	...
	Portree	6·07	+ 4·16	·89	1	17	...	...	...	...	...	...
	Inverness (Culloden)	2·08	+ ·20	·63	28	21	52·8	1	21·2	14	14	25
XIX.	Helmsdale	4·49	...	·70	28	26	...	...	...	...	...	...
	Sandwick	3·58	+ 1·10	·58	18	22	49·9	1	23·2	21	12	19
XX.	Caherciveen Darrynane Abbey .....	...	...	...	...	...	...	...	...	...	...	...
	Cork	4·36	...	·50	13¶	24	...	...	...	...	...	...
	Waterford	6·20	+ 4·17	·78	12	24	58·0	17†	28·0	6	5	...
	Killaloe	5·28	+ 2·38	·63	14	24	57·0	28	27·0	6	...	...
XXI.	Portarlington	3·67	+ 1·64	·75	10	25	54·0	17	27·0	5	12	...
	Monkstown, Dublin	3·46	+ 1·82	1·02	12	19	...	...	...	...	...	...
XXII.	Galway	5·31	...	·53	17	25	55·0	27	24·0	6	5	...
	Ballyshannon	4·60	...	·60	3	20	...	...	...	...	...	...
XXIII.	Waringstown	3·83	...	·63	17	24	56·0	28*	18·0	11	15	17
	Edenfel (Omagh)	4·08	...	·49	3	22	50·0	21§	20·0	11	16	...

* And 29. † 28 & 29. ‡ 18. § 28. || 13. ¶ 17.
 † Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON FEBRUARY.

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.

LINTON.—Wintry from 6th to 14th, the ground being mostly covered with S during that time, the rest of the month very mild, but wet and dirty; winds (never high) mostly S., S.W. and W. Bar. generally unsteady. With the exception of 1856 and 1869, it has been the wettest February for upwards of 20 years, while on the other hand, it has been an unusually mild one.

SELBORNE.—Prevailing winds after the 13th, S.W. An extremely wet month R much above the 12 years' average for February; S and sleet in the early part of the month; fog daily from 9th to 21st inclusive. Much wind on the 23rd.

BANBURY.—High wind on 3rd, 15th, 21st, 26th and 28th.

CULFORD.—February has this year been much milder than is usual in this part of the country, the mean temp. having been 40°·3, and easterly winds less prevalent, having been from that quarter only on five days; vegetation is, consequently very forward, apricot trees being already in full bloom. S fell on 4th to 7th inclusive, and again on the 13th.

SPROUSTON.—A very wet month. It has been "February fill-dyke" this year, having been about 1½ in. above the average. Like December and January it was cold at the beginning, and mild in the latter half.

BODMIN.—S on 10th and 11th.

CIRENCESTER.—S on 13th.

HAUGHTON HALL, SHIFNAL.—The first half of the month exceedingly cold, frost every night (but the 1st) till the 16th; on the night of the 13th about 6 in. of S fell, which was washed away the next night by heavy R; from this date to the close (with the exception of the 19th, 21st, 22nd, and 27th) the R fell daily; the fall 3·20 in. more than 2·25 in. above the average, and the wettest February during 41 years, the next greatest fall was in 1837, when 3·15 in. was registered. Sleet daily from 3rd to 10th, followed on the 11th by dense fog all day. The prevailing winds were W. and S.W., amounting to storms on the 15th, 16th, and 21st.

ORLETON.—The first half of the month was cold and generally cloudy, with frequent frosts and a mean temp. very much below the average. On the 11th there was a severe frost and very dense fog in the valleys all day, leaving a beautiful rime on all the trees, &c.; another severe frost on 12th, followed by S on the 13th. On the 14th a rapid thaw set in, and the remainder of the month was very warm, though stormy. Between 1.30 and 2.30 a.m. on 16th, a heavy TS with H and R passed over from W. to E., which was scarcely felt to the S. of this place, but was much heavier to the N. Faint distant T again heard on the 18th. Wind very rough on 23rd and 29th. The mean temp. of the whole month rather more than 1° above the average.

LEICESTER.—On the whole a mild month, temp. on 10 days exceeded 50°. Only three nights of sharp frost. Mean temp. of month 40°·5. Heavy S on night of 13th, 3 in. deep, which had all melted by the night of 14th.

BOSTON.—S on 14th and 25th, T and L on 16th.

GRIMSBY.—A very wet month, having a rainfall (2·40) exceeding that of the two preceding Februaries put together, and slightly exceeding February, 1872. Bar. seldom above 30 in. Snowdrops and crocuses beginning to flower on 2nd; pilewort and pyrus japonica began flowering on 18th, and hazel catkins shedding pollen on 19th; rooks building on 26th; old moon in the arms of new on 27th; lunar corona at 5.30 on 3rd.

MANSFIELD.—February, as a whole, has been a pleasant month, the weather, though severe at the beginning, was fine and bright, and in the latter part was very bright and sunny, with showers, though often wet nights. TS, with heavy H on 16th.

NORTH SHIELDS.—S almost daily to the 14th, and on the 20th and 25th, aurora on 19th.

WALES.

HAVERFORDWEST.—The wettest February for many years past ; from the 4th to the 13th very cold. S fell for the first time this winter on the 10th, melting as it fell, except on the mountainous parts of the country and the higher lands. The remainder of the month stormy, mild and wet. A very variable month, prevailing winds during first fortnight E. and S.E., the rest of the month W. and S.W.

MACHYNLETH.—A changeable month, with heavy fogs and rough winds, and very wet from 13th to the end of the month ; the ground covered with S on 9th ; T on the night of 15th.

LLANDUDNO.—A month of changeable weather, both as regards temp. and B. A heavy fall of S on 13th and 14th, but all had disappeared by the morning of the 15th ; frost every night from 11th to 14th inclusive. Temp. slightly above the average, and the rainfall very greatly above it. Two peals of T with L and H, at 5 p.m. on 3rd. S on the distant hills to the 25th.

SCOTLAND.

DUMFRIES.—Rainfall more than double the average ; month generally wet and stormy, except in the early part, when there was upwards of a week of fine frosty weather. S fell heavily twice, but melted rapidly. Fine aurora on 19th. Mean temp. 39°·7.

HAWICK.—A very wet month, keeping back gardening and farming operations. S 6 in. deep on 25th.

ANNANHILL.—Frequent frost in the middle of the month. On the afternoon of 3rd mirage of Arran, Holy Isle, and Pladda being distinctly raised up. Sea seen below. T and L on 22nd. The heaviest fall of S this year fell on the 26th. Gales on the 2nd, 3rd, 19th, and 22nd.

CASTLE TOWARD.—The weather has been very changeable ; one or two days fine ; then R and wind, but not wind strong enough (as it has been in this month in former years) to blow down the trees. There has been little progress in vegetation this month, nor has it been suitable for out of door labour. The frost lasted longer than any we have had this winter, and was so severe that we filled our ice-house and got ice 3 in. thick.

ABERDEEN.—A very disagreeable month ; wet, with frequent showers of S, lying here 2 in. deep, inland on the moors it was very much deeper. Mean temp. 37°·3, or 0°·6 below average (19 years). Rainfall considerably above it, and exceeded only once (1872) in the last 19 years.

LOCHBROOM.—A very severe month. Frost, S, sleet, and storms rapidly following each other. R heavy for such a cold frosty month. Agricultural progress much retarded by the severity of the weather.

PORTREE.—A cold month. T and L with heavy H on 1st and 2nd at noon. T and L, at 8 p.m., on 15th ; very severe black frost from 3rd till the 10th. S on 12th, 23rd, and 24th ; squally from 25th to the end, and cold, with H and sleet showers. Cattle and sheep healthy.

CULLODEN.—Frequent S and H ; intense frost on night of 14th. Thrushes first seen on 11th and singing on 29th ; chaffinches on 26th, and larks on 28th.

SANDWICK.—A cold month. T and L, at 5 a.m., on 3rd. Bright aurora coruscating to zenith on 19th. There were two falls of S which remained for four or five days respectively.

IRELAND.

WATERFORD.—Several flashes of L on 15th.

GALWAY.—T and L on 22nd, 28th, and 29th. Aurora, between 9 and 11 p.m., on 19th.

BALLYSHANNON.—The month has been wet and stormy throughout, the rainfall exceeds that of February 1875 by 3·19 in. River Erne much swollen by constant heavy rain ; the ground is so wet that little or no seed has yet been sown.

WARINGSTOWN.—Hard frost in the early part of the month, and much rain in the latter part.

OMAGH.—Weather pretty fine to the 11th ; remainder of the month rainy and unsettled, but generally mild.