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METEOROLOGICAL BIBLIOGRAPHY.

THIS subject is not altogether new to our readers, for although we have never devoted a special article to it, many direct expressions in support of it will be found scattered through our 157 issues, as we have ourselves, during the past 15 years, compiled for our own use a catalogue containing upwards of 10,000 titles of separate works upon Astronomy, Meteorology, and Terrestrial Magnetism. If we assume that two-thirds of these are astronomical, it still leaves more than 3,000 separate titles for individual meteorological and magnetical works.

This month we intended to make it the leading topic, in the hope that at the forthcoming Congress at Rome it might be fresh in the minds of the delegates, and that perhaps something might be done.

While arranging the materials upon which to base our appeal, the March number of our excellent contemporary, Dr. Hann's *Zeitschrift*, arrived, and therein we found an article by Dr. Hellmann, of Berlin, embodying almost exactly the views we were about to express. Although this necessarily involved an entirely different mode of treatment of the subject, we are extremely glad of the coincidence, because it not only proves that Dr. Hellmann shares our views as to the necessity of something being done, but it also implies that the Editor, Dr. Hann, does so too.

In these circumstances, we think that the best course is to print a translation of Dr. Hellmann's article, and then to conclude with some remarks embodying our own experience: these will be found on page 20.

ON THE PUBLICATION OF A METEOROLOGICAL BIBLIOGRAPHY.

BY DR. G. HELLMANN, OF BERLIN.

Paragraph 9 of the Joint Programme for the second International Meteorological Congress to be held in Rome in April, issued by the Permanent Committee at its last sitting at Utrecht in October, 1878, says: "The Committee proposes to have prepared at the general expense a catalogue of the published and unpublished meteorological observations of all countries." In addition to this proposition, to which individual central institutions have responded, I take the liberty of submitting to the Congress a second, no less important, and

which to some extent includes the former—to have published at the general expense a systematic catalogue of the books, pamphlets, and treatises referring to meteorology and terrestrial magnetism.*

Everyone who has elaborated or written a treatise must have felt the urgent necessity of becoming acquainted with all the existing literature on the subject to which it refers, in order not to repeat what has already been said about it, and for the purpose of comparing his own results with those of others, whereby in many cases he might be led to modify the whole of his work. The resources of meteorology available for such purposes have hitherto been quite insignificant and imperfect, and everyone must often have found that, after publication, he becomes quite accidentally aware of the existence of works treating of the same subject. According to the scientific character of individuals, as of whole nations, will the effort to become acquainted with the works of others in the same field of labour be necessarily very diverse; indeed, it may be said to be a characteristic of certain races to leave wholly unrecognised all thereto referring literature, especially if foreign—a circumstance which explains the frequently-recurring fact that things are published as new discoveries and results, which have long been known and commonly discussed elsewhere. It is also my belief that the necessity for a Meteorological Bibliography is one universally felt, and that the publication of such a work would indirectly tend to promote the advancement of science. The idea of such an undertaking in kindred branches of science is by no means new, for the very reason that its necessity is one which, in regard to a literature at all copious, has always been felt to be undeniable. As early as the end of the last century, Reuss wrote a universal Bibliography; La Lande his celebrated "Bibliographie Astronomique," &c., &c.; and in the present century such publications have been so frequent that their bare enumeration would occupy several pages. In the field of meteorology, as in that of terrestrial magnetism, nothing of this kind has as yet appeared. That the "Société Météorologique de France," once entertained a similar idea is to be gathered from the minutes of its former sittings; but it was never carried into execution for want of funds.†

Although the publication of a systematic catalogue of the Meteorological Libraries would be a great step in advance in this direction, the *Meteorological Society* has alone the merit of having published such a work.‡ But even if the central institutions of Vienna, St. Petersburg, Hamburg (the former "Dove" library), London, and Utrecht, which possess extensive special libraries, were to do the same, the requirement of a meteorological bibliography would by no means be met thereby, as none of them is so perfect, as—for example, in reference to astronomical subjects—that of the Observatory in Pulkowa, the catalogue§ of which affords the advantages of a universal astronomical bibliography.

The work would have to be begun over again, and made as comprehensive as possible, so that we might derive the full benefit of such an undertaking. Hence I consider the International Meteorological Congress best adapted for carrying such a task into execution at the general expense.

We must distinguish between separately published books and pamphlets on the one hand, and the much more numerous notices and observations in periodicals and the papers of learned societies on the other hand. The latter

* As both sciences will long continue to go as they have hitherto done, hand-in-hand, it is strongly advised that the works on terrestrial magnetism be included.

† Mr. Symons, of London, is, to my knowledge, diligently engaged in the collection of Bibliographical Notices on the subject of Meteorology. Mr. Cleveland Abbe, of Washington, has recently addressed to the Editor of this journal, among others, the following lines:—"Do you know of any one who is interested in or compiling a general Bibliography of Meteorology? I have begun one by copying and classifying about 23,000 titles from the Royal Society Index, Vol. I.—IV., which I estimate to be one-third of my work."

‡ From Brussels one may soon be expected. That compiled by Herr Kiefer, of the Tiflis Observatory, is unfortunately not systematically arranged, and consequently of little practical utility.

§ First edition, by W. Struve, in 1845; second, by O. Struve, in 1860; continuation to 1875 in the press.

are far more important, and the task of collecting them is by far the most difficult. In this respect, however, the chief part of the task for the present century has been performed for us by the publication of the Catalogue of scientific papers (1800-1863), compiled and published by the Royal Society of London, Vol. I.-IV. (1867-72), and the continuation of which for the period 1864-1873 (the first part A to H already published) is still in the press.

This universally known and valued catalogue contains, it may be stated, in alphabetical order of the authors' names,* as well as the titles of all treatises, papers, and dissertations, which have appeared in the domain of the exact and natural sciences during the present century.† The systematic "extraction" of these eight quarto volumes of about 8,000 pages would constitute the chief labour. For the preceding century the same course would have to be pursued with individual *special journals* and minutes of academy proceedings, a task of course of much smaller importance, as it is only during the present century that meteorological science has become independent, and consequently more productive. For the part borne by the larger books, pamphlets, &c., in the last and preceding centuries, the already existing bibliographies, notably those of Astronomy as the mother of Meteorology, suffice, and likewise Poggenдорff's "Biographical Literary Dictionary." In the present century the yearly catalogues of the book trade amply supply the necessary material. In any case it would be advisable in the publication of such a work to secure the co-operation of experienced booksellers and antiquaries.

The process of "extraction" of the "Royal Society Catalogue" I presume to be simply that a person versed in the subject, capable of taking a general view of the whole domain, and possessing at the same time the requisite knowledge of languages, should examine page by page each individual volume, and mark with a red pencil the titles which refer to the special science. Then several careful copyists make copies of the said marked titles just as they stand in the catalogue, upon previously prepared cardboard tickets, about 3 by 4½ inches in size, which finally are systematically arranged with the others. A certain limitation of the domain and of the mode of procedure in cataloguing would of course be necessary, although it would be better to err on the side of excess rather than that of scantiness. The corresponding task for previous centuries would be greatly simplified if the directors of the various central institutions would undertake the preparation of the ticket catalogue for their respective countries, as they would have the readiest access to the necessary documents.

Within three years the catalogue could be ready for the Press. According to the bulk of the catalogues of the "Royal Society" and that of the Pulkowa Library, it would make a quarto volume of about 800 pages. The countries interested, through whose pecuniary and intellectual assistance it had been published, would, of course, be entitled to a certain number of copies free of cost. The remaining copies might, like those of the Roy. Soc. Cat., be sold at cost price. The sum realised by the sale could be applied to the furtherance of the undertaking, as about every 10 years a continuation of the Bibliography should appear. The difference of languages need occasion no difficulty, as the brief introduction and headings could be given in the three principal languages or in Latin. I should estimate the probable cost at about 30,000 marks, so that the participation in the undertaking of Europe, America, and India being presupposed, the proportion of expense to each of the 24 states would be a sum of 1,250 marks—£62 5s. 0d.—1,563 francs. Any further detailed statement of

* Treatises written in Russian appear to be wholly wanting. They are as yet a vanishing fraction as compared with the literature of the nations of the Germanic and Romanic dialects.

† It is not, however, to be wholly depended upon. It was not, for instance, possible to find in this catalogue that Bravais and Martins published their hourly observations on the Faulhorn, 1841, 1842, and 1844, in the second year's issue of *L'Annuaire de la Soc. Météor. de la France*, and in like manner no mention is made of Carlos Aquirres' meteorological observations at Antisana, according to the report in the *Comptes rendus*. Kämtz's Repertorium is also not mentioned. These omissions I have only accidentally discovered during the last few months that I have had the book in my possession.—*J. Hann*.

the undertaking, as of the joint international action in the matter, must necessarily be reserved for a commission of the Congress appointed *ad hoc*.*

In the first place it is necessary to consider what is desirable, and what is possible.

It would be a priceless boon to investigators if they could have a *classified index* of every notice of a meteorological phenomenon or investigation. It would save much time and much labour. We may give an illustration which has occurred within the last few months.

About two years ago, Mr. Dines, whose house at Hersham has a tall square tower, placed at one corner of it a rain gauge. Then he thought it would be interesting to see whether the fall at each corner of the tower was similar and bore the same ratio to that on the ground. He procured extra gauges, observed them for some time, and wrote a description of the results, which was published in *British Rainfall*, 1877. Mr. Rogers Field took up these figures, and in an elaborate letter in this magazine showed that the catch of each gauge depended on the direction of the wind at the time. We followed it with a short note, of which the opening sentence was—

“We think that experiments somewhat resembling those of Mr. Dines, with four gauges at the top of one tower, were tried about twenty years since, either in Denmark or the United States. We have entirely forgotten the results, and have but a very dim recollection of the circumstance; anyone who can give full particulars will be rendering a service to all students of the subject.”

Not knowing the author, or the country, the search for the above was sufficiently hopeless, but by chance we have found the full particulars. The experiments were made at Philadelphia, in 1833, by Prof. Bache, and are described in the “Report of the British Association for 1838.” They were almost identical with Mr. Dines’s (except that Prof. Bache had a much higher tower), and led to the same conclusions.

A classified index would have saved all Mr. Dines’s work, and time and thought, Mr. Field’s time, and our space, and this of course is but one instance.

A complete subject index would be an enormous work to undertake, but we should be sorry to accept Dr. Hellmann’s view that it “must ever remain something to be wished for.” It is a curious fact, which is more a problem for physiologists than for ourselves,

* The view has been propounded to me that a Bibliography would not suffice, and that it should be followed by a Table of Contents of the respective books. It will, however, be evident on consideration that this must ever remain simply something to be wished for; as, apart from the partially impracticable nature of the proposition, that it would demand altogether unreasonable sacrifices, both in intellectual labour and material resources. On the other hand, the same object could in future be obtained by an annual issue of a “Report of the progress of Meteorology and Magnetism during the year —,” in which every paper would be analysed as minutely as possible. The publication of such a report would be a fitting task for the contemplated “International Bureau,” to which, for that purpose, everything written on the subject would have to be sent, as would willingly be done by everyone.

that nineteen men out of twenty who take up meteorology decline to study the subject, and immediately begin to make a lot of fresh observations. And most unfortunately this weakness in the individual human brain extends to the directors of our national systems, who nearly all seem to consider the erection of costly recording apparatus, and the publication of hourly values, the end and goal of their responsibilities. But surely it is of little use making observations if they are not fully discussed, and can they be fully discussed without perfect knowledge of what our predecessors have done, and what our contemporaries are doing?

It is the old, old story; it is one more sermon upon the words, "The observing is out of all proportion to the thinking strength in Meteorology."

Several separate attempts at forming such a classified index have been made. Prof. Poey has many thousand entries, Prof. Cleveland Abbe (ante p. 18) has 23,000, and lastly, in the *Athenæum*, of March 16th, 1879, we find the following:—

At the meeting of the Library Association on Friday, the 7th inst., Mr. Garnett read a paper on "Subject-Indexes to the Transactions of Learned Societies," in which he pointed out that by the sacrifice of two, or at most three, copies of the Royal Society's Catalogue of Transactions, a series of slips can be easily made, which, after a rough classification, might be submitted to competent men of science for accurate and minute subdivision. The classes, when completed, should be printed in separate volumes, so that every student and specialist might obtain his own subject on moderate terms. The work might thus be made remunerative, and the Association would distinguish itself by undertaking the publication.

If any difficulty is raised on the score of cost, we do hope that some German statist will ascertain the total amount annually spent in the world upon the making and printing of meteorological observations, so that we may be able to compare the amount spent upon the observing, and upon the thinking, branches of meteorology.

We must, however, take both things and men as we find them, and the question remains not what is theoretically desirable, but what is practicable and expedient.

Having had the privilege of assisting in compiling the catalogue which alone meets Dr. Hellmann's approval, and having the materials for a far better one in MS. on our own shelves, we are tolerably familiar with the subject, and our first caution would be, Do not be frightened at its imaginary magnitude.

We think that the first step should be to urge the Director of each Central Institute to print a catalogue of its own library. If they could be induced to do so in duplicate, *i.e.*, both grouped in subjects and under authors, so much the better; but at any rate under subjects. It is difficult to believe that this can be refused. It may also be hoped that the *Société Météorologique de France* and the *Scottish Meteorological Society* will follow the lead of the *Meteorological Society*. The Society of Telegraph Engineers have in the press the catalogue of the celebrated Ronalds Library (Electricity, Magnetism,

and Meteorology). We should thus obtain about a score of catalogues, each very useful in its own country, and collectively containing probably 90 per cent. of the titles of all meteorological works ever written. The compilation from these of one general catalogue of meteorological books and memoirs would be very easy, and the cost insignificant.

Another step which we think would be extremely useful is a development of the rule adopted by the Meteorological Committee, a rule so good that we regret that other national establishments have not copied it. We refer to the practice which Mr. Scott has uniformly followed, of giving, on the cover of each publication issued by his department, a list of all its previous publications. If he would kindly print it as a fly-leaf, which could be cut out and mounted, he would render a further service. The Smithsonian Institution also publish a list, but it is printed on both sides. Authors and directors could easily compile such lists, and if printed only on one side they would, when cut up and mounted, form capital catalogues. We trust that it will not be falsely attributed to vanity that we issue with this article a list of our own publications as a specimen of what we ask for from others.

THE LATE WINTER.

To the Editor of the Meteorological Magazine.

SIR,—I send some results of my thermometrical observations during this extraordinary winter, taken at the Vicarage, 660 feet above sea level :—

	1878.			1879.		Four months Nov. to Feb.
	Nov.	Dec.	Jan.	Feb.	Nov. to Feb.	
Extreme max. ...	47°·6	48°·0	45°·0	47°·3	48°·0	48°·0
	on 10th.	on 31st.	on 1st.	on 9th.	Dec. 31st.	
Ditto in sun ...	92°·0	88°·0	86°·0	117°·0	117°·0	117°·0
	on 24th.	on 29th.	on 26th.	on 24th.	Feb. 24th.	
Extreme min. ...	26°·0	7°·2	10°·6	20°·0	7°·2	7°·2
	on 11th & 21st.	on 13th.	on 27th.	on 23rd & 25th.	Dec. 13th.	
Ditto on grass ...	15°·0	—0°·5	1°·0	13°·0	—0°·5	—0°·5
	on 20th.	on 13th.	on 27th.	on 25th.	Dec. 13th.	
Mean temp. of air ...	36°·1	29°·5	28°·7	33°·2	31°·9	31°·9
[9 a.m. & 9 p.m., max. & min.]						
Mean daily max. ...	40·7	34·7	33·6	36·8	36·4	36·4
Mean daily min. ...	32·0	24·1	23·9	29·6	27·4	27·4
No. of minima at or below 32° ...	15	26	30	20	91	91
Ditto on grass ...	27	31	31	25	114	114

Snow fell slightly on 2nd November ; on the 5th it snowed on the hills ; on the 8th we had a heavy fall here, which proved the commencement of winter, and was followed on the 12th by a snowstorm of great violence, many sheep being "over blown" on the hills.

There was a heavy rainfall on the 15th, but frost and snow soon returned, and continued with intermissions to the 5th December, when severe frost set in, and, with two intermissions (of three last days in December, and 13th and 14th January), continued nine weeks. Our water supply pipe, placed 1 foot under ground, became frozen on the 13th December, and continued frozen till the evening of the 27th February. There was a week of mild weather in February, but from the 13th to the 26th the max. did not exceed 36°, and much snow fell. When the sun came out its glare was almost intolerable, especially on the 24th. There was little snow from the 5th to the 18th December, and none from the 1st to the 11th January. At the middle of January the frost had in many places penetrated 2 feet into the ground. This was ascertained by two hours' digging with a pick. I had holes made with a crowbar on the 13th January, and found the ground soft at the following depths, and placing thermometers in the holes and covering the openings, I found the following temperatures:—

	Air temp.	Loose soil. 20 in.	Garden soil. 17 in.	Upper lawn. 12 in.	Lower lawn. 12 in.	Meadow. 8 in.
Jan. 13	... 42°	... 33°·0	... 33°·5	... 33°·0	... 33°·5	... 33°·8
„ 16	... 28	... 32°·5	... 33°·8	... 33°·0	... 33°·1	... 33°·2
„ 17	... 27	... 32°·3	... 33°·6	... 33°·5	... 32°·9	... 33°·0
„ 27	... 25	... 31°·7	...	... 33°·3	... 32°·7	} lost under snow.
Feb. 6	... 39	... 31°·6 33°·5	} frozen into hole		} 31°·5
„ 8	... 39	... 31°·7 33°·5		... ditto
„ 10	... 40	... 31°·8	... 32°·5	... 35°·5	... ditto	...
„ 11	... 38	... 32°·0	... 33°·0	... 36°·5	... ditto	...
„ 12	... 33	... 31°·8	... 32°·9	... 35°·5	... ditto	...
„ 13	... 33	... 31°·8	... 32°·8	... 35°·5	... ditto	...
„ 27	... 40	... 31°·9	... 33°·5	... 34°·0	... 33°·7	...
„ 28	... 40	... 32°·0	... 34°·5	... 36°·5	... 35°·0	...
Mar. 1	... 36	... 32°·0	... 35°·5	... 36°·0	... 35°·5	...

On the whole it has been a pleasant winter—December and a part of January being remarkably sunny, and both months dry throughout, but November and February were wet.

At Penrith the mean temp. was as low as 25°·9 in December, and the mean min. for thirteen consecutive days (13th–25th), 8°. The extreme was —2°·5 on December 23rd. Here I observed it 1° in the valley about 9 a.m. on the 13th December, after the ther. had risen 4° from the min. at the Vicarage, and 0° was registered on the 27th January, while an exposed minimum thermometer indicated —7°. The minima in the valley agreed closely with those at Penrith fifty miles off, but were greatly below those at the Vicarage, a quarter of a mile off, but 200 feet higher.

FENWICK W. STOW.

Aysgarth Vicarage, Bedale, March 1st, 1879.

To the Editor of the Meteorological Magazine.

SIR,—Your correspondent, Mr. Bicknell, writing on the severe weather, says, "It will have rid our agriculturalists of many insect pests." I hope it has. There is one very great pest to the agriculturist which it is generally believed the frost kills—and that is the common slug. Nothing can be a greater mistake. This winter, the moment the frost relaxed its hold, I saw the ground—and particularly gravel paths—covered, hundreds, aye, thousands of them, and seemingly nothing the worse for the cold weather.

I confess I hardly know what pests to the farm or garden are destroyed by frost. One thing, everybody will find that a great many valuable shrubs have been destroyed, and among vegetables I never saw such destruction.

Excuse my simply referring to that one article in the *Meteorological Magazine*.—I am, Sir, yours truly,

JOHN MATHISON.

Addington, 18th February, 1879.

THE SHAPE OF RAIN DROPS.

To the Editor of the Meteorological Magazine.

SIR,—In the last number of the *Meteorological Magazine* there is a letter from Mr. Sawyer on the shape of rain-drops, accompanied by what I may perhaps be allowed to call a very remarkable sketch. As the letter only refers to the shape of rain-drops when falling through a calm atmosphere, it is unnecessary to consider the effect of wind, which, however, would, I believe, have no influence on their shape.

In his reasoning Mr. Sawyer apparently does not take into account cohesion, which has more influence on the shape of rain-drops than any other force, and would cause them to become spherical, and as a sphere presents less surface than an equal amount of matter in any other form, and therefore displaces a smaller quantity of air, it is natural to conclude that rain-drops are spherical.

All parts of a drop having an equal tendency to fall, there is no reason to presume that its shape would alter, but if, as suggested, the centre did begin to fall quicker than the sides, it would continue to fall quicker, and would ultimately fall out and form a separate drop. Anyone acquainted with the properties of water would at once see that if it were forced into the shape represented by the middle row of figures in Mr. Sawyer's sketch, cohesion would immediately draw in the ends and the drop become spherical.

As a presumptive proof of the shape of rain-drops, I may instance shot, which assume their form in falling through air, and as lead in a

liquid state bears a close analogy to water, I think we may justly infer that rain-drops are like shot, truly spherical.

I am, Sir, yours faithfully,

H. SOWERBY WALLIS, F.M.S.

1, *Springfield Road, St. John's Wood,*
Feb. 20th, 1879.

To the Editor of the Meteorological Magazine.

SIR,—Mr. F. E. Sawyer does not seem to have remembered that we have in the rainbow a means of learning something of the shape of rain-drops. According to theory, the drops must be spherical to produce a rainbow; and any departure from sphericity, at least in those portions of the drop which are concerned in its production, will render the bow less perfect. Now, the top of a rainbow is always the most definite part, the colours being most often repeated there, although as a rule it is the faintest part. This seems to prove that either the lower drops are less spherical than the upper, or else their vertical sections are more circular than their horizontal. The latter seems very improbable, and therefore we are driven to the former alternative, which appears the more likely when we consider that the upper drops must be smaller than the lower. If we examine the bows in single dew-drops, we find that the smallest drops give, as a rule, the most perfect bows, the solar spectrum frequently being visible 10 or 12 times repeated in them; while in the larger drops there are not so many repetitions, though the bows are very much brighter. I gather from this that the larger drops of dew are less perfectly spherical than the smaller, and therefore it is not surprising that the same should be the case with rain; but that rainbows should be as bright and definite as they are, proves that the irregularities in the majority of the drops must be very slight. The circumstance that the colors are much less often repeated in a rainbow than in a dew-drop (I never saw more than four contiguous spectra in the primary arc of a rainbow), may be an indication that the individual rain-drops deviate in different ways from sphericity, unless it is merely owing to the wideness of the spaces between the drops. These considerations do not at all show what form the irregularities in rain-drops take; I do not know whether any observations have ever been made as to whether rainbows are perfectly circular; this might throw some light on the question.

THOS. WM. BACKHOUSE.

Sunderland, February 21st, 1879.

To the Editor of the Meteorological Magazine.

SIR,—Surely Mr. Sawyer must have completely forgotten Newton's second law of motion and the theory of gravitation, when he propounded his extraordinary theory of the shape of rain-drops (*Met. Mag.*, No. CLVII. p. 6), or he would never have assumed that the external particles of a drop would fall faster than those at the centre.

The force of gravity acts equally on all the atoms of water forming the falling drop, producing in each a velocity proportional to the time of its descent, hence there can be no force to oppose that of molecular attraction, which necessarily in the case of fluids must produce spheres. Therefore rain-drops must always possess this form.

The formation of drops under different conditions has already been fully investigated by many physicists—Savart, Matteucci, Plateau and others (v. Daguin, *Traité de Physique*, tome I. chap. 2.) who have proved experimentally that theory is correct, and that drops of all fluids when falling freely are invariably perfect spheres.

A most interesting paper, by Mr. Worthington, on the figures produced by drops striking a flat surface, has recently appeared in the Proceedings of the Royal Society, which is well worthy the perusal of all concerned in the measurement of rainfall.

One word more, as I am much engaged in the application of photography to scientific registration, I should be glad to be referred, if Mr. Sawyer would kindly assist me, to a notice of a photographic process which would enable me to obtain a picture of an object moving at the rate of 150 feet a second, the approximate velocity of a rain-drop fallen from clouds 1000 feet high, on its reaching the earth's surface.

G. M. WHIPPLE.

Richmond, March 6th, 1879.

THE WEATHER IN FEBRUARY.

THE weather during the first week of this month was in a changeable state. A small depression appeared on the S.W. coasts on the morning of the 2nd; the wind became S. in the south, and S.E. to E. in the east and north. Temperature rose quickly in the S., cold rain began to fall, and the frost to disappear. During the 3rd the disturbance passed away south-eastwards over the Channel and France. The wind blew from the E. to N.E. generally, and an area of high pressure was formed on our W. and N. coasts. This anti-cyclone travelled slowly in a S.E. direction during the following day (the temperature falling briskly in the S.E. meanwhile), and was succeeded by a rapid fall of the barometer on our W. and N.W. coasts. The wind at the same time became southerly and increased in force. From this day to the end of the week pressure was highest over France, lowest in the W. and N.W., and numerous depressions passed north-eastwards over or near these Islands, causing fresh to strong S.W. winds or gales on all coasts.

Numerous depressions affected the weather over these Islands and their neighbourhood during the second week. At first the course of these disturbances was from S.W. to N.E., and strong S.W. to W. winds were felt in the south, light E. in the north, the weather at the time being mostly dull, wet, and unsettled. On the 11th, however, a depression passed S.E. from the South of Ireland across the Channel and France, and the wind backed from W. through S. to N., and on the day following the weather improved as the barometer rose. This increase of pressure was of very short duration, for on the evening of the same day (12th) the mercury began to fall in the South-West of Ireland, and on the 13th a fresh and deep depression appeared on our S.W. coasts with strong S. to S.E. winds. This disturbance likewise passed

in a S.E. direction to France, and S.E. winds again became general, with rain in the E. On the 14th the barometer rose, but on the 15th a new depression appeared in the N.W. and travelled across the Irish Sea towards Central England. This fall continued, and became general throughout Western Europe on the 16th and 17th.

During the third week the weather was again very unsettled, though no disturbance bringing general and severe gales approached these Islands. The chief feature of the distribution of pressure was the establishment of regions of high pressure, one over Lapland and over the Peninsula with a "trough" of low readings between them extending from S.W. to N.E. across the British Isles. This distribution was interrupted on the 19th, when the W. to N.W. winds which had prevailed in the S., and E. to S. winds in the north gave place to general W. to S.W. breezes for a while, but on the next day depressions again advanced from N.W. towards S.E., and the former distribution was really re-established and lasted to the close of the week. A brisk rise of the barometer then occurred in the W. and N.W., and pointed to the formation of high pressures to the N. and N.W. of these Islands accompanied by N. winds.

The wind during this week (16th-22nd) was strong at times on most coasts, and on the night of the 20th a severe gale was experienced in the S.W. with thunder, lightning, and hail. The sky was mostly cloudy except over North Britain, and showers of snow and rain fell on all days. The fall of snow in London on the morning of the 21st was exceedingly sudden and heavy, 0·87 in. being measured.

The weather during the last week of February was characterised by a very important change from N.E. winds and cold weather to W. winds and mild weather. On the 23rd readings were highest off the W. coast of Ireland, low over the North Sea, and in the South-East of France, so that N. breezes prevailed generally with cold cloudy weather. On the 23rd and 24th pressure rose decidedly in the N.W. of these Islands; a rather deep depression appeared over the South-East of France, and moved north-eastwards towards Germany and the Baltic, so that the wind veered, and N.E. breezes were reported from most coasts and blew hard in the S.E. The weather was cloudy and unsettled; sharp snow and hail showers occurred in the S.E. On the 26th a fall of the barometer took place in the North of Scotland, so that while N.E. breezes continued in the S., S.W. winds appeared in the N. From this time till the end of the week pressure was high in the S. or S.W., and W. to S.W. winds—for the most part light or moderate in force—prevailed. The weather meanwhile was rendered unsettled by the passage across our Islands of several small local depressions.

At the former part of the month temperature was rather above the average, but as the month advanced it decreased, and during the second week oscillated a good deal. During the third week it was considerably below the average, and the oscillations of the thermometer in the North of Scotland were very curious. Cloudy skies were very general throughout the month, and rain and snow fell on many days.

H. E. M.

SUPPLEMENTARY TABLE OF RAINFALL IN FEB., 1879.

[For the Counties, Latitudes, and Longitudes of most of these Stations,
see *Met. Mag.*, Vol. XIV., pp. 11 & 10.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Margate, Acol	2·40	XI.	Port Madoc	5·68
"	Littlehampton	4·19	"	Douglas	4·27
"	Horsham, Swallowfield. ...	...	XII.	Carsphairn	3·45
"	Hastings, Manor House	3·80	"	Melrose, Abbey Gate...	2·76
"	Hailsham	4·01	XIV.	Lanark, Baronald .....	...
"	I. of W., St. Lawrence.	3·79	XV.	Islay, Gruinart School..	2·74
"	Strathfield Turgiss	3·07	XVI.	St. Andrew's, Cambo...	2·27
III.	Great Missenden	4·27	"	Aberfeldy H.R.S.	1·41
"	Winslow, Addington ...	3·10	XVII.	Tomintoul.....	1·64
"	Oxford, Magdalen Col...	3·08	"	Keith H.R.S.	·80
"	Northampton	2·77	"	Forres H.R.S.	·30
"	Cambridge, Merton Vil.	2·70	XVIII.	Strome Ferry H.R.S....	2·75
IV.	Harlow, Sheering	3·01	"	Lochbroom	1·42
"	Diss	3·13	"	Auchnasheen H.R.S. ...	·67
"	Swaffham	2·42	"	Tain, Springfield.....	·96
"	Hindringham	2·16	"	Loch Shiel, Glenfinnan.	4·30
V.	Salisbury, Alderbury ...	3·93	"	Dalwhinnie H.R.S.....	1·99
"	Calne, Compton Bassett	3·94	XIX.	Lairg H.R.S. ....	...
"	Beaminster Vicarage	5·51	"	Altnabreac H.R.S.	1·17
"	Dartmoor Prison	10·29	"	Watten H.R.S.	1·05
"	Langtree Wick	5·21	XX.	Fermoy, Glenville	6·45
"	Lynmouth, Glenthorne.	6·62	"	Tralee, Godfrey Place...	5·28
"	St. Austell, Cosgarne ...	6·09	"	Cahir, Tubrid	4·30
"	Taunton	3·34	"	Tipperary, Henry St....	4·71
VI.	Bristol, Ashleydown ...	3·76	"	Newcastle West	5·32
"	Wem, Sansaw Hall.....	2·17	"	Kilrush	3·99
"	Cheadle,|The Heath Ho. ...	4·09	"	Corofin	4·09
"	Bickenhill Vicarage ...	...	XXI.	Kilkenny, Butler House	...
VII.	Melton Mowbray	1·87	"	Ballymore, Eustace ...	...
"	Horncastle, Bucknall ...	2·79	"	Kilsallaghan.....	3·74
VIII.	Walton-on-the-Hill....	2·84	"	Navan, Balrath	2·47
"	Broughton-in-Furness ..	4·27	"	Athlone, Twyford	3·17
IX.	Wakefield, Stanley Vic.	2·57	"	Mullingar, Belvedere ...	3·01
"	Ripon, Mickley	4·29	XXII.	Ballinasloe, Kilconnell.	3·09
X.	Gainford	3·68	"	Clifden, Kylemore	8·31
"	Haltwhistle, Unthank..	...	"	Crossmolina, Enniscooe..	...
"	Shap, Copy Hill	4·30	"	Carrick-on-Shannon ...	2·46
XI.	Llanfrechfa Grange	8·85	"	Dowra	2·82
"	Llandoverly	3·70	XXIII.	Rockcorry.....	1·83
"	Solva	4·80	"	Warrenpoint	3·79
"	Castle Malgwyn	4·56	"	Newtownards	2·64
"	Rhayader, Nantgwilt..	7·05	"	Larne, Carnlough	2·71
"	Carno, Tybrielle	5·04	"	Bushmills	1·41
"	Corwen, Rhug	2·73	"	Buncrana, Rockfort ...	1·69

FEBRUARY, 1879.

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°	
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.			Max.		Min.		In shade.	On grass.
				Dpth	Date.		Deg.	Date.	Deg.	Date.		
I.	Camden Square.....	3·77	+ 2·55	·76	10	24	53·8	9	25·2	24	11	18
II.	Maidstone (Hunton Court)...	2·97	+ 1·75	·58	10	18	...	...	...	...	...	...
III.	Selborne (The Wakes).....	4·71	+ 3·00	·76	8	22	49·5	7,8	19·5	24	15	21
IV.	Hitchen.....	2·65	+ 1·39	·46	10	22	50·0	9	18·0	23	17	...
V.	Banbury.....	2·89	+ 1·46	·38	8	23	52·8	9	22·0	23	...	17
VI.	Bury St. Edmunds (Culford).	3·23	+ 1·81	·94	10	20	55·0	9	20·0	23	15	21
VII.	Norwich (Sprowston).....	3·01	...	·64	10	20	...	...	...	...	...	...
VIII.	Bridport.....	4·41	+ 2·35	·57	8	22	...	...	...	...	...	...
IX.	Barnstaple.....	6·37	+ 4·29	·85	25	25	56·0	10	24·0	25	...	...
X.	Bodmin.....	6·27	+ 3·48	·69	1§	25	52·0	9	23·0	25	8	13
XI.	Cirencester.....	5·16	+ 3·55	·66	8	22	...	...	...	...	...	...
XII.	Shifnal (Haughton Hall) ...	2·26	+ 2·37	·35	8	17	50·0	9	21·0	20	18	21
XIII.	Tenbury (Orleton).....	3·35	+ 1·78	·45	8	22	54·8	9	15·0	25	15	18
XIV.	Leicester (Town Museum) ...	1·96	...	·30	8	22	54·8	9	23·6	24	10	21
XV.	Boston.....	2·25	+ 1·04	·78	8	12	55·0	9	23·0	24	11	...
XVI.	Grimsby (Killingholme).....	2·91	...	·43	8	23	53·0	9	27·0	22	10	...
XVII.	Mansfield.....	3·01	...	·54	13	20	52·1	9	19·0	24	15	16
XVIII.	Manchester (Ardwick).....	...	...	...	...	...	...	...	...	...	...	...
XIX.	York.....	2·22	+ ·84	·43	15	17	48·0	6	25·0	25	...	...
XX.	Skipton (Arncliffe).....	3·21	— ·46	·66	5	21	...	...	...	...	...	...
XXI.	North Shields.....	3·05	+ 1·52	·41	16	25	45·6	6	24·8	22	14	14
XXII.	Borrowdale (Seathwaite).....	7·93	— 3·45	1·49	6	18	...	...	...	...	...	...
XXIII.	Cardiff (Crockherbtown).....	5·95	...	·86	20	23	53·2	9	24·8	23	11	...
XXIV.	Haverfordwest.....	6·65	+ 3·79	·91	8	22	52·5	11	23·0	24	10	13
XXV.	Aberdovey.....	...	...	...	...	...	...	...	...	...	...	...
XXVI.	Llandudno.....	3·19	+ 1·84	·78	15	16	50·8	10	28·2	1	6	...
XXVII.	Cargen.....	2·99	+ ·40	·72	15	13	49·6	7	23·0	22	15	...
XXVIII.	Hawick (Silverbut Hall).....	2·19	...	·26	2	21	...	...	...	...	...	...
XXIX.	Annanhill.....	1·52	...	·25	16	17	48·1	8	19·0	20	18	23
XXX.	Kilmory.....	1·97	...	·35	4	14	...	...	21·0	26	18	...
XXXI.	Mull (Quinish).....	2·90	...	·68	7	12	45·0	27	30·0	22	9	...
XXXII.	Loch Leven.....	4·60	+ 2·30	1·00	17	14	...	...	...	...	...	...
XXXIII.	Tyndrum (Ewick).....	...	...	...	...	...	...	...	...	...	...	...
XXXIV.	Arbroath.....	3·40	+ 1·55	·72	18	15	45·0	7	15·0	20	14	...
XXXV.	Braemar.....	1·62	— ·36	·38	16	19	46·2	27	4·5	22	11	27
XXXVI.	Aberdeen.....	...	...	...	...	...	...	...	...	...	...	...
XXXVII.	Portree.....	2·67	— 7·56	·51	5	16	...	...	...	...	...	...
XXXVIII.	Inverness (Culloden).....	·44	— 1·41	...	...	11	50·9	7	19·0	22	13	28
XXXIX.	Dunrobin.....	1·15	— 1·37	·41	16	12	50·2	7	22·0	22	17	...
XL.	Sandwick.....	1·25	— 1·23	·21	16*	21	47·7	27	24·3	19	13	22
XLI.	Cork.....	3·80	...	1·27	2	19	...	...	...	...	...	...
XLII.	Caherciveen DarrynaneAbbey	6·40	...	·64	8	23	...	...	...	...	...	...
XLIII.	Waterford.....	5·15	+ 3·12	1·08	1	24	54·0	27	28·0	26	10	...
XLIV.	Killaloe.....	5·40	+ 2·50	·75	5	22	55·0	13	26·0	21+	11	...
XLV.	Portarlington.....	3·12	+ 1·09	·54	8	25	51·0	5	27·5	25	14	...
XLVI.	Monkstown, Dublin.....	3·17	+ 1·53	·86	1	15	...	...	...	...	...	...
XLVII.	Galway.....	4·05	...	·66	1	21	52·0	13+	27·0	22	11	...
XLVIII.	Waringstown.....	1·68	...	·21	8	23	52·0	7	21·0	25	16	22
XLIX.	Edenfel (Omagh).....	1·82	...	·28	13	17	49·0	5†	22·0	25	17	...
L.	Ballyshannon.....	...	...	...	...	...	...	...	...	...	...	...

* And 26. † And 14. ‡ And 26. § And 10. || And 15. ¶ And 27.
 + 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.

SELBORNE.—The mean atmospheric pressure of the month was lower than I have ever before recorded. Very cloudy; the sun only appeared twice during the whole month, and then very imperfectly. Dense fogs in the early part of the month.

SPROWSTON.—The wettest February known in Norfolk with the exception of February, 1866. A very cold month; more or less frost for the past twelve or thirteen weeks.

BODMIN.—Mean barometric pressure 29.56 in., the lowest recorded for many years; mean temp. 42°·2; H on the 17th, 18th, and 20th.

SHIFNAL.—Another cold wintery month, the sun being scarcely visible throughout. Max. temp. only once reached 50°, and the min. was below 32° on 18 nights. R or S almost daily till 9th, when the ther. rose, accompanied by a great and sudden fall of the bar., which was not followed either by wind or R. Very destructive to vegetation, many tender plants being killed, but *Laurestinus* was scarcely touched. Snowdrops up on 4th; Catkins out on 12th. A few starlings came back, and one or two throistles appeared; blackbirds have escaped.

LEICESTER.—Seven inches of S on the 23rd.

KILLINGHOLME.—The wettest February for many years. Absence of sunshine remarkable throughout the whole winter. Bees abroad and thrush singing on 8th. L at midnight on 20th. Shade temp. at noon on 22nd, 33° while the sun was shining brightly.

SEATHWAITE.—Severe frost and S during the month.

WALES.

HAVERFORDWEST.—This has been the wettest February (6.65 in.) I have recorded in the last 30 years, slightly exceeding February, 1872 (6.62 in.) S fell heavily on six days, covering the whole country from the 16th to the end. Wind pretty equally divided between W.N.W. and E.S.E., last four days N.E. Three notable depressions of the bar., 10th, 17th (9 a.m. 28.976), and 20th. Floods on 7th and 8th. Violent squalls on 5th. S on 21st 7 to 8 in. deep.

LLANDUDNO.—Notwithstanding about eight very fine days, the month was, as a whole, stormy and inclement, and the mean temp. was more than 4°·5 below the average, although the temp. never fell below 28°·2. Rainfall greatly above the average.

SCOTLAND.

CARGEN.—Easterly winds prevailed during 20 days—a very unusual amount. Mean temp. 36°·1, 3°·8 below the average.

HAWICK.—A most severe winter. Throistles disappeared at the beginning of December, and were not seen again till February 26th. Farm and garden work are far in arrear, and nearly all garden vegetables have been killed by frost. A great winter in the annals of skating and curling.

ARBROATH.—Rainfall 1.53 in. above the average of 37 years.

PORTREE.—A month of severe frost and S showers. Rainfall 7.96 in. below the average of 12 years. A very fine lunar halo on 4th.

DUNROBIN.—Frosty and cold; ground in most places covered with S nearly all the month. Outdoor work very much behind. Stock on sheep farms has suffered greatly in consequence of the protracted S.

SANDWICK.—Very cold, but rainfall only half the average. The ice formed on the Lochs in November remained till February 16th, and new ice was formed on the 18th. Gales of 40 miles an hour on 15th, 16th, and 17th. Large lunar halo on 4th.

IRELAND.

KILLALOE.—Mean temp. 40°·6, being below the average. Sharp frost on several nights. Vegetation very backward.

MONKSTOWN.—The month commenced with heavy S, which, however, soon melted, and was followed by heavy R; then milder weather with a good deal of R at night and fair days. S fell heavily on 19th, but quickly melted, and was succeeded by hard frost. The end of the month was fine and mild, with occasional slight frosts at night. Scarcely any progress in vegetation except crocuses and snowdrops.

WARINGSTOWN.—Cold and damp, but the R, though frequent, fell in small quantities.

EXTRAORDINARY METEOR.

[Occurring at the normal hour of sleep, observations of this splendid meteor are so scarce that we gather all the scraps we can.—ED.]

To the Editor of the Eastern Morning News.

SIR,—As I had the privilege of witnessing the passage of the meteor which was visible here on Monday morning, I beg to supply the following details for the information of your readers:—Standing at my front door at 2.52 a.m. I was startled by the road becoming suddenly illumined. On turning round, I saw a large luminous circular body of primrose-coloured flame at an elevation of about 60 deg. towards east by north. It slowly travelled towards the west, giving me the impression that it followed a course from E. by N. to W. by S. As it approached the horizon it began to lengthen, but never seemed to be more than about four times the length of its diameter, which was somewhat less than that of the full moon, and as it lengthened its hinder portion assumed some of the colours of the rainbow—red and green—but lacking brilliancy. When about 20 degrees from the horizon it suddenly disappeared. After I lost sight of the meteor I supposed all the wonder was at an end, but when rather more than two minutes had elapsed I heard a thud, as of a falling body, and then a reverberating sound. The thud was accompanied by a rattling noise as if the house were being shaken, and the thud seemed at first like the noise which would be made by a child falling on its head on the floor, but it was softened down, and it and the reverberation were evidently mellowed by distance; and I, not venturing at the time to ascribe them to the meteor, likened them to the sound of a somewhat heavy gun fired about twelve miles up the river. It struck me at the time that the prismatic colours exhibited were due to the passage of the meteor behind a veil of snow clouds, gradually becoming denser until at length—near the horizon—they hid the light altogether.

Obediently yours,

S. WALLIKER.

Newington, near Hull, 25th February, 1879.

The following account is given by the Liverpool correspondent of the *Times*:—“About twelve minutes to three o'clock this (Monday) morning an exceptionally brilliant meteor shot across the sky in a south-easterly direction. It did not appear to move with the customary speed, for even in streets whence only a circumscribed view of the heavens is obtainable there was time for the first observers of the meteor to call the attention of others to its passage, though the bright reflection was of itself sufficient to attract the notice of even the least observant.”

The *York Herald* of yesterday says that shortly before three a.m. on the 24th, many of the citizens were aroused from their slumbers by hearing what appeared to be a heavy peal of thunder, accompanied by the shaking of windows and, as some supposed, the movement of their beds. From what we have been able to gather from the police and others who were out at the time, the sound was preceded by the appearance of a pear-shaped ball of fire in the northern heavens, which travelled slowly downwards towards the horizon, and emitting scintillations and a light of great brilliancy, almost equal to that of day—so great, indeed, that it is said the smallest print could have been read.

SUGGESTED RAINFALL ZONES.

To the Editor of the *Meteorological Magazine*.

SIR,—An article appeared in the number of *Nature* of January 30th last, respecting the "Rainfall of the World," and suggesting the probability of the existence of five zones of the prevalence of rainfall. It may be mentioned to your readers that a similar proposition was advanced by myself in treating of "Rainfall at Sea" in a communication to the Meteorological Society of London, on March 20th, 1878. It was then suggested to recognise an *equatorial* belt, north and south *tropical* ones, and north and south *temperate* ones. The spaces of latitudes in the north and south hemispheres would be thus divided into five wet and four dry regions. There were no materials available for the rainfall in the Pacific Ocean, away from the surrounding continents, and therefore the above scheme is not intended to apply to it, but only to the Atlantic, Indian, Chinese, and Australian Seas. Indeed, I learn from naval officers that there is great paucity of rain about the equatorial regions in the Pacific Ocean, so that the existence of a rain belt there is hardly to be conjectured yet, though some such may hold further south.—I remain, your obedient servant,

W. J. BLACK.

Edinburgh, February, 1879.

A METEOROLOGICAL POST CARD.

We reprint in fac-simile one of the neatest summaries we have yet seen. If Mr. Peele had written British Columbia instead of B.C., and had added the latitude ($49^{\circ} 10' N$), longitude ($123^{\circ} 0' W$), and altitude, it is not easy to see how to improve upon it.

Meteorological Observations taken at New Westminster, B. C.

A. PEELE, Observer.

1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Synopsis.
Mean Temperature.....	37.0	42.3	44.9	49.9	54.5	58.4	63.7	63.0	54.8	49.1	43.4	39.9	50.7 mean.
Maximum.....	54.0	57.0	57.0	72.0	79.0	77.0	91.0	84.0	81.5	68.0	55.0	57.0	91.0 highest.
Minimum.....	20.0	27.0	25.0	31.0	41.0	46.0	48.0	47.0	57.0	30.0	30.5	24.0	20.0 lowest.
Rain Fall.....	7.35	4.95	7.47	1.55	1.62	2.65	1.03	2.78	6.15	4.65	9.96	5.81	55.97 inches.
Number days Rain....	15	13	13	7	12	13	8	8	17	10	24	20	160 in the year.
Greatest days fall ..	1.15	0.99	1.95	0.73	0.60	0.86	0.38	0.90	1.23	1.95	1.96	1.53	1.96 in 24 hours.
Number days Snow... ..	3		1										4 in the year.
Amount of Snow.....	8.50		0.50										9.00 in the year.
Greatest days fall ...	6.00		0.50										6.00 in 24 hours.