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BIBLIOGRAPHY OF METEOROLOGY.*

To most of our readers the last paragraph of the introduction to the second volume of the type-written edition of the "Bibliography of Meteorology" will prove a sad disappointment. It is as follows :—

> "It will be impracticable for this office to put forth any other part of this Bibliography; but possibly supplements to the subject of Part I., 'Temperature,' and Part II., 'Moisture,' may appear later."

That is to say, out of 32 sections and sub-sections two have been type-written, and the other 30 remain in manuscript in the library of the Signal Office.

We refuse to believe that a nation, wealthy and liberal in the highest degree, would consciously do so mean an action as first to invite the help of other countries in compiling a Bibliography, and by its responsible officer promise to publish it, and then, when it had received help from all quarters of the world, decline to carry out its promise, and keep the material so obtained for the use of its own officers.

We blame no one. It is the system, not any one man, who is in fault. We do not like putting ourselves in front, but we gave up something like a year of our own time towards preparing our share of that catalogue; the Royal Meteorological Society and the Royal Observatory, Greenwich, lent their MS. catalogues, and the Société Météorologique de France engaged a special assistant for many months to form a complete catalogue of its library, and sent it to England to be incorporated with the others, and for all this trouble and expenditure the result is—next to nothing.

Our readers will naturally ask—why? Because by the rules laid down, the Signal Office is not allowed to print such a work without

* *Bibliography of Meteorology*, prepared under the direction of Brigadier-General Greeley. Edited by Oliver L. Fassig, Bibliographer and Librarian to the Signal Office. Part II., "Moisture." Signal Office, Washington, 1889. 4to. Type-written, 478 pages.

the authority of Congress. General Hazen, when he promised to publish the Bibliography, never dreamed of there being any difficulty, but his successor, General Greely, although very desirous that it should be published, cannot break the laws which regulate his office. He has reported over and over again that it is desirable that it should be done, but a special vote by Congress is necessary, and we fear that few members of Congress are aware of the merits of the case.

It is really not a matter for which Europeans ought to plead strongly; it is for our friends in the States to examine the facts and act as they think worthy of their country. We are sure that if American scientists were once in possession of the merits of the question, they would soon lay the facts before the members of Congress, and that as soon as the members understood it all difficulty would be removed.

We could fill pages with resolutions and quotations from France, Germany, Belgium, and England, urging the importance of the publication, but we prefer to leave it entirely on its merits and entirely in the hands of our friends in the States.

We shall not refer to the subject again until we hear that the matter has been brought distinctly and definitely before Congress.

Turning now to Part II., we desire, in the first place, to record our appreciation of the immense labour which has been bestowed upon it in the Signal Office.

In the introduction General Greely intimates surprise or regret at the few errata and additions sent in with reference to Part I. Speaking only for ourselves, we not improbably speak for others also, when we say that the change from classification under authors to classification under subjects has thrown very great difficulties in the way of comparison and verification. The present part contains about 7,500 entries, and the only way by which we can check them is by cutting up two copies of the book (*i.e.*, one for each side of each page) and arranging the 7,000 or 8,000 slips alphabetically under authors, and not till that is done can the checking against our books and pamphlets be begun. Obviously it would take much less time to do this for all sections at once than to do it separately 32 times over. It would at the very least take one person a twelve-month to check the whole Bibliography, and hitherto we have not had such encouragement as to induce this further expenditure of time.

Even as it stands in its imperfect typography this is a wonderful book, but rather saddening on the whole, for it shows so plainly how much work has been done in duplicate. It shows how needful it is that we should have that for which we have so often pleaded in these pages, "more hard workers, more deep thinkers"; but in this world most men have to earn a livelihood, and there is a serious

mistake current with those who have money, they always want to "see something for it." They are ready enough to pay for instruments and apparatus, or for making observations, but if one man proposed to work up the subject of the composition of rain-water, and as a preliminary to devote his time to a thorough mastery of what has already been done, whereas another proposed to buy a lot of apparatus and begin *de novo*, ignoring the past, the latter would be sure to be chosen.

When one looks through this volume one cannot but think how grand an advance would be made were the mass of knowledge which is indexed in the whole Bibliography worked up by competent hands, and abstracted from the 30,000 or 40,000 volumes into 40 or 50. One cannot but believe that the present system, whereby nearly all Government money is spent, is correctly described by the words applied to it by Sir George Airy many many years ago: "Adding millions of useless observations to the millions which already exist." The popular saying that "Half the world does not know how the other half lives," is equally true of meteorologists; half of them do not know what the other half have done. This Bibliography, completed and worked up as above suggested, would annihilate this difficulty, and place the rising generation of meteorologists in a position analagous to that conferred on astronomers by the splendid work of Houzeau and Lancaster.

PRE-INSTRUMENTAL METEOROLOGY.*

IF one wishes to sueceed, the prime necessity is perseverance. Twenty one years since we inserted in this Magazine, a letter under the above title, in which a scheme was formulated for collecting and preserving the many notes as to weather, frosts, floods and other remarkable phenomena which are recorded in early literature, and in the county histories and parish registers in the British Isles. Nobody has ever disputed the desirability of this being done, but on the other hand nobody except Miss E. A. Ormerod, F.R.Met.Soc. has ever done anything towards it. She with her habitual energy and perseverance took up the idea, and as the result we have in the library of the Royal Meteorological Society, the MS. volume entitled, "Pre-instrumental Meteorology, contained in extracts from the Saxon Chronicle and Holinshed's Chronicles of England, Scotland and Ireland." But Miss Ormerod has other work on hand. Is there no one else who combines a taste for meteorology with one for archæology, and who has also a few hours a week that they could give to it? We should enjoy it ourselves, but are over-worked already, and therefore, dare not undertake to do more than to help any one, or all, who will take it up.

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* *Meteorological Magazine*, Vol. iv. (1869) p. 38; xii. (1877) p. 179; xiii. 1878) p. 6, and xx. (1885) p. 160.

As the above references show, we have persistently tried to find a labourer for this field, we are sure that he (or she) would reap a good harvest, and we believe that a notice in some of the leading literary journals, that a centre existed where such notices would be acceptable would bring in much information with little trouble.

Just as an illustration we may refer to the *Athenæum* of March 29th, 1890, where, in a review of *The Register Booke of Inglebye juxta Greenhow, since the yeare of our Lord*, 1539. Edited by John Blackburne, Curate, we find the following :—

"It has been suggested more than once that if the information were brought together a considerable amount of weather knowledge might be gleaned from old parish registers. An instance of this kind occurs under March 14th, 1666, when we find that a widow called Anna Bland 'tempestate venti, nivis et frigoris extincta.'"

Is it too much to ask that those of our readers who are Clergy of the Church of England, and as such, custodians of the records of probably 100 or 200 parishes, shall each examine the records which he has and copy out all references to frosts, snows, storms, floods and other meteorological phenomena? Failing any better mode of publication, we are ready to insert them in these pages.

ROYAL METEOROLOGICAL SOCIETY.

THE usual monthly meeting of this Society was held on February the 19th at the Institution of Civil Engineers, 25, Great George Street, Westminster; Mr. H. F. Blanford, F.R.S., vice-president, in the chair.

Mr. D. Balfour, M.Inst.C.E., Mr. W. Belk, M.Inst.C.E., Capt. G. A. Chaddock, Mr. W. S. Crimp, Assoc.M.Inst.C.E., Mr. G. Fellows, Dr. A. E. Garrod, M.A., M.R.C.P., and Capt. H. E. Rawson, R.E., were elected Fellows of the Society.

The following papers were read :—

1. "A Brief Notice respecting Photography in relation to Meteorological Work," by Mr. G. M. Whipple, B.Sc., F.R.A.S. The first person to use photography for obtaining meteorological records was Mr. T. B. Jordan, of Falmouth, in 1838. Some years later, Sir F. Ronalds and Mr. C. Brooke devised more complete and elaborate apparatus; the arrangement of the former being now in use at the observatories of the Meteorological Office, and that of the latter at the Royal Observatory, Greenwich. Reference was also made to Mr. J. B. Jordan's form of sunshine-recorder, and to Capt. Abney's photo-nephograph. The various photographic processes which have been employed in connection with these instruments were fully described.

2. "Application of Photography to Meteorological Phenomena," by Mr. W. Marriott, F.R.Met.Soc. The author showed how photography could be most usefully employed for the advancement

of meteorological knowledge. Much valuable information had been recently obtained from photographs of lightning and clouds. An interesting collection of such photographs was shown on the screen, together with others illustrating floods, whirlwinds, tornados, hail-storms, frost, snow, &c.

After the reading of these papers the meeting was adjourned to allow the Fellows to inspect the Exhibition of Instruments, &c., illustrating the application of photography to meteorology. Not only were specimens or drawings of nearly every photographic meteorological instrument and records from the same shown, but also a most valuable and interesting collection of photographs of clouds and other meteorological phenomena. The photographs of clouds taken by Mons. P. Garnier, of Boulogne-sur-Seine, were exceptionally fine. New meteorological instruments were also shown, as well as an ingenious working model, devised by Mr. A. W. Clayden for showing the connection between the monsoons and the currents of the Arabian Sea and the Bay of Bengal.

WHIRLWIND AT FULFORD, NEAR YORK, MARCH 8TH.

A very sudden and severe storm prevailed in the vicinity of York at about half-past two on Saturday afternoon. The sky rapidly darkened and vivid flashes of forked lightning were followed by loud peals of thunder and a heavy downfall of hail and rain. The storm was of short duration, and soon after three o'clock the sun again broke out and fine weather was experienced for awhile. Sudden gusts and showers took place at intervals. The storm seems to have touched the city lightly as compared with the devastation it created at Fulford. About half-past three a whirlwind of extraordinary violence visited Fulford, and the damage which it wrought in a short space of time is, at the lowest computation, estimated to be £100. Fulford Hall, the residence of Captain Key, and the home farm immediately adjoining, occupied by Mr. Harrison, appear to have suffered most from the violence of the storm, which was only at its height for something like a minute, and was confined to an area of about 200 square yards. The gale completely rooted up, and carried several yards, a number of very large trees, both oak and elm, and some crows which had taken refuge in their branches, were killed, the birds in some instances being dashed to pieces. A Dutch barn which is of about 96 feet in length, on Mr. Harrison's farm, was blown entirely from its foundations, carried over a hedge, and finally deposited 5 or 6 yards on the other side of the fence. Half a dozen large stacks were overturned, and some other stacks a short distance away rocked to and fro, and were all but upset. The windows of Fulford Hall bear testimony to the violence of the gale, and in some parts the slates have been torn off the roof, and other damage done. The roofs of the out-houses and dwellings in close proximity to Ful-

ford Hall have been damaged to a very great extent, whilst two bye lanes have been completely blocked by uprooted trees, hedges, and other *debris*. A notable fact is that some trees which stood just outside the area covered by the whirl-wind have scarcely been touched at all. A gentleman who witnessed the development of the whirl-wind says that it appears to have formed in the direction of Bishopthorpe, and after spending the worst of its violence at Fulford, it passed on to Heslington, where we understand considerable damage was done.—*York Herald*, March 10th, 1890.

[In order to avoid duplicate printing, this subject has been taken up by Mr. J. Edmund Clark, B.Sc., of York, whose account will be read at the meeting of the Royal Met. Soc., on April 16th, and subsequently printed in the *Quarterly Journal R. Met. Soc.*—ED.]

REVIEWS.

The Summary of a Meteorological Journal. Kept by C. LEESON PRINCE, F.R.A.S., F.R.Met.Soc., at his observatory, Crowborough, Sussex, 1889. Fcap. fol. Privately printed.

THERE are two special features in Mr. Prince's report for 1889. He draws attention to the great excess of N.E. winds in his records for the last few years. Abstracting his tables we have

			N.E.	S.W.	Excess of S.W
Average frequency,	1843-89	47 years	63	91	+28
,, ,,	1859-83	25 ,,	63	99	+36
Frequency	1884		75	72	— 3
Average frequency,	1885-89	5 ,,	102	72	—30

Mr. Prince very naturally remarks:—"It seems difficult to assign any physical cause for this sudden and great change in the direction of our two most prevalent winds, but it may be interesting to draw attention to the fact in the event of some comparative observations being elicited." We hope that some will be forthcoming, for it is a puzzle at present—unless indeed the large addition to Mr. Prince's house has affected the indication of his vane. Evidently the subject should be investigated in two ways—(1) by examining other records for the S.E. of England—(2) by Mr. Prince checking the indications of his vane by that of another, by low clouds, and by smoke.

The other fact which is certainly exceptional for this country, is one for which Mr. Prince gives the authority, viz., that "After the thunderstorm of June 7th, 1889, Mr. Young, of Barden Mill, Tunbridge Wells, picked up a hailstone weighing nearly or quite half-a-pound." The table in *Met.Mag.*, Vol. xiv., p. 116, shows that it must have been 3 inches in diameter, or 9½ inches in circumference.

Berliner Zweigverein der Deutschen Meteorologischen Gesellschaft. Siebentes Vereinsjahr, 1890. Privately printed, Berlin, 1890.

WE refer to this paper because it contains two notes, which we desire to bring before our readers. Like all the previous reports

it is drawn up by Dr. Hellmann, and that gives weight to the statements.

(1). A thunderstorm occurred near Berlin, on May 16th, 1889, accompanied by what is described as a rain of "unusual intensity." Prof. Dr. Petersilie having measured 22·5 mm. (·89 in.) in 20 minutes between midnight and 0·22 a.m. on 16th. Dr. Hellmann says that no equally heavy rain had previously been recorded in Berlin, and he gives the nearest approach, the entries being—

Date.	Place.	Duration.	Amount.	Rate per hour.
1883, October 6	Berlin	15 min.	·65 in.	2·60 in.
1889, May 16	Friedenau near Berlin	20 min.	·89 in.	2·67 in.

The rainfall of Berlin is not very much less than that of London (say 23½ in. against 26 in.) and yet these two rains are scarcely more than half what we have had in London, and are equalled or surpassed at dry English stations almost every year, as will be seen from the article on, "Heavy rains in short periods," in any recent volume of *British Rainfall*. Are our thunderstorms more intense than those of Berlin? Surely not, but perhaps equal electrical intensity occurring in a drier atmosphere cannot cause an equal volume of rain.

(2). Dr. Hellmann takes up the subject dealt with first by M. Lancaster, of Brussels, and investigated in the *Meteorological Magazine* for March, June and November, 1889, and gives the following interesting note:—

THE COLD PERIOD.

"The cold weather which has prevailed over West and Central Europe since the summer of 1885, has (with the exception of four months) continued throughout 1889, as is shown by the following table:—

Difference between the temperature at Berlin and the average.

	1885.	1886.	1887.	1888.	1889.
January	...	−0·2	−3·8	0·0	− 3·4
February	...	−8·1	−1·3	−6·1	− 4·5
March	...	−5·9	−1·6	−5·6	− 3·6
April	...	+1·8	0·0	−3·4	+ 0·5
May	...	+1·8	−2·2	+0·5	+10·8
June	...	−2·9	−3·2	−0·2	+ 7·6
July	...	−1·8	+1·8	−4·1	− 1·3
August	−5·6	+0·9	−1·6	−2·0	− 1·4
September	−2·5	+3·2	−0·9	−0·4	− 4·1
October	−2·5	0·0	−4·9	−2·5	− 0·4
November	−2·9	+4·0	+1·8	+0·2	+ 0·9
December	−0·4	+1·3	+0·4	+2·0	− 1·1
Year	...	−0·5	−1·3	−1·8	0·0

"Therefore, May and June, 1889, were so remarkably warm as to neutralize all the deficiencies in the other months of that year. Since the commencement of observations in Berlin, in 1719, there is no case of a warmer May and June; 1756 is the only warmer June. The immediate sequence of two such hot months is very rare—probably hardly occurs once in a century."

Cyclones of Drought and Good Seasons in South Africa. By D. E. HUTCHINS, Conservator of Forests, Knysna, with Cyclical Diagrams. *Times* Office, Wynberg, 1889. London: W. Wesley and Son. Sm. 8vo., 137 pages, 4 plates.

THIS is a remarkable little book, a review of which could be more easily written in 1900 than in 1890, as the author is so sure that he has found a perfect rule as to South African rainfall, that he predicts the character of each year from 1889 to 1938 inclusive, not in a vague general way, but in detail, and not merely for the whole Colony, but for different districts in it.

The author's calculations are primarily based on sun-spot frequency, but he complains of the sun-spots as too irregular (though he occasionally uses them), and says that Wolf's average of 11·11 years is better, but we do not see where he states from what date he begins to take this 11·11, nor what becomes of the fractions which necessarily result from it. Then he has allowances for retardation, or lagging, of one, two or three years, and cycles of all sorts of lengths, *e.g.*, 9·5 years on p. 74, 9 or 10 years p. 78, and 12·7 or probably $12\frac{1}{2}$ years on p. 82. With such a variety one can of course explain anything, and we, therefore, leave his theories to the best possible test—that of the fulfilment of his predictions. We hope that they will be; we long to be able to bring to the notice of our readers some one who can win the blue riband of meteorology, and if the *Meteorological Magazine* is in existence in 1900, and we have any share in its direction, and Mr. Hutchins can bring up evidence of 10 years' success, we will do all in our power to ensure him the honour he will merit. But he must be careful; we are sure that it is accidental, not intentional, but on p. 125, he has taken 9·5 from 1831, and obtained 1822·5 = July 1st, 1822, which is what is wanted to support the theory—evidently it should be 1821·5, which makes it one year wrong.

As regards the predictions, we leave them to the future; but we ought not to omit to say that the work contains abstracts of many long registers, and much useful and interesting matter.

NOT AN EARTHQUAKE.

THERE was a report that an earthquake was felt at several places near Chelmsford on January 7th, 1890, at 0.30 and at 1.25 p.m.

Mr. Davison, of Birmingham, is at present studying British earthquakes, and therefore devoted attention to this statement, and has finally proved, beyond all dispute, that it was a mistake, the real cause of the noise, vibration, &c., being the firing of charges from one of the great 110-ton guns at Woolwich.

We had not quoted the report in these pages, but, as errors are notoriously difficult to correct, we insert this note for the benefit of future investigators.

"AREAS OF RAREFACTION" OR "DEPRESSIONS."

To the Editor of the Meteorological Magazine.

SIR,—In replying to the Rev. Mr. Ryves' letter (page 23), I take for granted that he, in common with every other F.R.Met.Soc. knows and acknowledges that the winds around a cyclone, however extensive, curve somewhat inwards towards the centre round which they whirl. That being so, the inblowing winds will tend to displace the more central portion. And as the latter cannot get downwards into the ground nor outwards into the in-pressing winds, these winds will eject it upwards and then as this process goes steadily on for days, each portion of the incurving air as it approximates near to the centre will be treated in the same fashion by the winds arriving later and get ejected upwards also. The large amount of air thus sent upwards will be forcibly compelled to go up and up till it surmounts the neighbouring anti-cyclone areas; over which it will flow, and possibly, some of it go down, there to renew the same course of action as before.

This being the only way in which the central air of a cyclone can be conceived to get ejected by the denser air around forcing its way inwards, I am unable to picture to myself the formation of a hollow cup-like depression facing skywards like that of a liquid whirlpool.

As to the liquid whirlpool, Mr. Ryves seems to forget that the water in the whirl is driven earthwards, not heavenwards as the air in the cyclone is. And it appears to me that if ever there be any cup-like hollow formed, at all, in the latter, it must be at the bottom of the atmosphere, and not at the top where he and the general public are given to place it.

I used the phrase "general public," because I have been under the impression (how generated I know not) that the meteorological authorities in using the term "depression," meant depression of the mercury in the barometer; but that the general public would naturally take it to mean a depression in the atmosphere. And now I find that my general public includes, at least, one F.R.Met.Soc.

In conclusion, I beg to thank Mr. Ryves for ventilating this subject, so that he, or I, or both of us may be put right.

HENRY MUIRHEAD, M.D.

Cambuslang, 19th March.

WHAT IS A DEPRESSION?

To the Editor of the Meteorological Magazine.

SIR,—Dr. Muirhead, in objecting to the use of the term "depression," assumes that meteorologists mean by it a depression of the *air*, and Mr. Ryves, in criticising Dr. Muirhead's views, seems to adopt the same assumption. But is this quite correct?

In its origin, at all events, the term "depression" must surely have been used by meteorologists as an abbreviated form of

"barometric depression"—that is to say, a depression of the mercurial column in the barometer; and this, I suspect, is what the term still means to most persons, although when we read of a depression "deepening" or "filling up," we do, no doubt, picture to ourselves what we conceive to be the actual state of things in the upper regions of the atmosphere.

It may be that the theoretical idea which modern meteorology seems to have infused into the word "depression" has to some extent supplanted the original idea, but so long as depressions are measured by the height of the mercurial column it is hardly possible that the original idea of the word, which I take to have been simply descriptive, can be entirely lost.

GEORGE F. BURDER, M.D.

Clifton, March 19th, 1890.

SHOWER OF SOFT HAIL.

To the Editor of the Meteorological Magazine.

SIR,—A remarkable shower of soft hail occurred here shortly before 1 p.m. on Tuesday last (April 8th). The masses of hail (they were neither "stones" nor "balls") were of irregular shape, in some cases half an inch in diameter, and appeared to be made up of small plates of ice adhering like the petals of a double marigold. The last form, on melting, was an irregular disc of ice. A noticeable point was the facility with which the masses adhered on being brought into contact, so that by merely putting them together on a sheet of paper you could get a layer three inches or more in diameter. They must have been in a peculiarly favourable condition for regelation. The shower lasted only a few minutes. There was a little rain with it, a good deal of wind, and there were two claps of thunder. We had no more during the day, but one or two violent squalls in the afternoon. In these the sky became very dark, and a sort of dark mist came on, blurring the tree outlines as a slight Scotch mist would. In one of them I was on the top of the heath, and saw this dark mist sweeping down on the more or less distant landscape from the clouds, as the squall passed over it. I imagine that it was due to the rain-drops being broken up by the violent wind. But it was unusual, as was the soft hail squall described. All came from the north, or a little west of it.—Yours truly,

B. WOODD SMITH.

Branch Hill Lodge, Hampstead Heath, N.W., April 11th, 1890.

[At Camden Square the notes on the shower are as follows:—"11 a.m.: Heavy shower of soft hail (apparently fragments of spheres), about half an inch in diameter; this lasted about five minutes. 0·50 p.m.: Three claps of thunder and some more soft hail, some of it nearly half an inch across, and very soft."—ED.]

MR. MARRIOTT ON THUNDERSTORMS.

To the Editor of the Meteorological Magazine.

SIR,—There seems to be something wrong about the statistics in the summary you give (vol. xxiv., p. 170) of Mr. Marriott's paper on "The Distribution of Thunderstorms. . . . ." It states that thunderstorms are most numerous in the south of England, yet they are given as fewest for Middlesex. It looks as though no account has been taken of the number of observers in each district, which must be done if correct proportionate numbers of thunderstorms are to be arrived at.

T. W. BACKHOUSE.

Sunderland, February 19th, 1890.

FINE METEOR ON MARCH 21ST.

To the Editor of the Meteorological Magazine.

SIR,—You may like to have an account of the splendid meteor seen by myself and many others last evening, about 9.5 p.m., to compare with other reports.

I was standing by my drive gate at that time when the road became illuminated suddenly, so that I could see every stone upon it.

Instantly looking up I saw an intensely bright meteor traverse a small portion of the sky between Ursa Major and Bootes, bursting in a shower of sparks near Arcturus.

After an interval of some three to four minutes a dull boom, more like the discharge of a piece of heavy artillery at twenty miles distance than what some people took it to be—a distant thunder peal, was distinctly heard. Whether this had any connection with the meteor I must leave to others.

I ought to say, that one man said he saw a flash of lightning in the S.W., a few minutes *afterwards*, which I did not observe, although from the low barometer, 29·2, I thought it was not improbable.

Yours very truly,

R. J. W. PURDY.

Woodgate House, Aylsham, March 22nd, 1890.

P.S. Two other persons I have just seen, who witnessed the sight declare that they heard a slight rustling sound when the meteor exploded, but I am inclined to believe that the rocket-like discharge of the body led them to imagine that they heard a sound such as usually accompanies pyrotechnic displays.

THE FROST OF THE FIRST WEEK OF MARCH.

Mr. C. HARDING, F.R.Met.Soc., having undertaken to prepare a paper upon this subject, developing and completing the notes given in our last, we refer our readers to the *Quar. Jour.* R. Met. Soc. for the full details.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPT., 1889.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		TotalRain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0–100	°	°	inches		0–10
England, London	80·3	11	35·1	23	65·6	48·9	48·2	75	125·6	28·4	1·77	10	5·6
Malta	93·3	3	61·7	21	83·5	67·6	65·8	76	141·7	55·6	2·21	6	2·7
Cape of Good Hope.	...	...	...	...	...	...	...	...	...	...	...	...	...
Mauritius	77·0	28*a*	59·2	27	75·1	64·2	59·8	74	128·9	50·0	1·53	18	5·3
Calcutta	91·4	30	73·7	8	87·6	77·5	78·1	86	155·7	72·6	4·76	15	6·3
Bombay	89·5	22	75·9	2	87·1	78·2	76·4	82	145·8	71·9	2·71	13	7·0
Ceylon, Colombo	87·0	28	71·6	9	84·8	76·5	72·1	79	151·0	70·2	25·08	22	7·8
Melbourne	74·5	26	32·1	3	61·4	43·1	42·3	69	129·8	25·3	1·51	14	5·1
Adelaide	76·7	7	38·5	2	63·2	47·2	45·0	69	132·7	32·1	1·50	16	5·7
Wellington	65·5	26	39·0	1	59·6	46·6	46·3	77	130·0	28·0	4·78	17	4·0
Auckland	71·0	30	44·0	23	62·0	51·2	50·4	80	130·0	38·0	5·82	19	6·5
Jamaica, Kingston	93·4	29	68·2	24	90·5	72·7	74·0	79	...	...	4·55	...	...
Trinidad	92·0	26	63·0	11	88·0	70·0	73·1	79	157·0	58·0	3·76	20	...
Toronto	81·9	3	35·3	29	68·2	52·0	54·3	78	...	29·8	2·08	14	5·1
New Brunswick, Fredericton	85·7	2	24·9	30	71·6	49·7	55·4	78	...	...	2·52	10	7·8
Manitoba, Winnipeg	94·0	1	29·0	21	61·2	39·3	41·1	74	...	...	2·57	14	6·0
British Columbia, Victoria	73·0	6, 26	34·0	12	64·8	42·9	...	...	...	...	2·33	8	...

a And 30.

REMARKS, SEPTEMBER, 1889.

MALTA.—Mean temp. 74°·3; mean hourly velocity of wind 5·9 miles. Sea temp. fell to 75°·5. TSS on 3 days, L on 4 days. J. SCOLES.

Mauritius.—Mean temp. of air 0°·9 below, dew point equal to, and R ·06 in. above, their respective averages. Mean hourly velocity of wind 11·4 miles, or 0·7 mile below average; extremes 25·4 on 19th, and 1·7 on 14th and 27th. Prevailing direction E.S.E. C. MELDRUM, F.R.S.

CALCUTTA.—The south-west monsoon has been very light, most noticeable in the unusually light winds accompanying depressions forming in the bay. The R has not generally been below the average. C. LITTLE.

CEYLON, COLOMBO.—TS occurred on 6 days. J. C. H. CLARKE, Lt.-Col. R.A.

Melbourne.—Mean temp. of air 1°·0, of dew point 1°·3, humidity 2, amount of cloud 0·9, and R ·76 in. below the average. Prevailing wind N., strong on 9 days. Heavy dew on 9 days; hoar frost on 4 days; hail on the 1st.

R. L. J. ELLERY, F.R.S.

Adelaide.—Rainfall slightly below the average of 32 years, but the total since January 1 is still in advance of any previous record. Pressure about, and temp. nearly 2° below, the mean. C. TODD, F.R.S.

Wellington.—Showery up to the 18th, with wind chiefly from N.W., and strong; from 19th to 24th fine pleasant weather, with light variable wind; from 25th to the end showery. Mean temp. 2°·2, and R ·52 in. above the average. R. B. GORE.

Auckland.—A stormy, wet, disagreeable month. Pressure close to the average of 22 years. Mean temp. 2° and R 2·50 in. above the average.

T. F. CHEESEMAN.

SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1890.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in			in.
II.	Dorking, Abinger Hall.	2·51	XI.	Castle Malgwyn	2·57
,,	Margate, Birchington...	2·66	,,	Builth(Llanwrtyd Wells)	4·31
,,	Littlehampton	1·13	,,	Rhayader, Nantgwillt..	4·58
,,	Hailsham	2·07	,,	Carno, Tybrith	3·37
,,	Ryde, Thornbrough	1·29	,,	Corwen, Rhug	2·15
,,	Alton, Ashdell.....	1·93	,,	I. of Man, Douglas	3·05
III.	Oxford, Magdalen Col...	·72	XII.	Stoneykirk, Ardwell Ho.	1·89
,,	Banbury, Bloxham	·99	,,	New Galloway, Glenlee	3·87
,,	Northampton	1·39	,,	Melrose, Abbey Gate...	1·97
,,	Cambridge, Fulbourne..	3·52	XIII.	N. Esk Res. [Penicuick]	3·75
,,	Wisbech, Bank House..	2·34	XIV.	Ballantrae, Glendrishaig	2·78
IV.	Southend	1·70	,,	Glasgow, Queen's Park.	2·41
,,	Harlow, Sheering	1·52	XV.	Islay, Gruinart School..	3·67
,,	Rendlesham Hall	2·56	XVI.	Dollar.....	2·58
,,	Diss	3·18	,,	Balquhidder, Stronvar..	6·36
,,	Swaffham	2·52	,,	Dunkeld, Inver Braan..	2·89
V.	Salisbury, Alderbury...	1·21	,,	Dalnaspidal H.R.S. ...	6·57
,,	Warminster	1·11	,,	Arbroath Cemetery.....	..
,,	Bishop's Cannings	1·26	XVII.	Keith H.R.S.	2·14
,,	Ashburton, Holne Vic....	3·31	,,	Forres H.R.S.	2·00
,,	Hatherleigh, Winsford.	·39	XVIII.	Fearn, Lower Pitkerrie.	2·08
,,	Lynmouth, Glenthorne.	1·74	,,	Loch Shiel, Glenaladale	14·49
,,	Probus, Lamellyn	1·97	,,	N. Uist. Loch Maddy ...	5·21
,,	Launceston, S. Petherwin	1·73	,,	Invergarry	7·48
,,	Wincanton, Stowell Rec.	1·66	,,	Aviemore H.R.S.	3·24
,,	Taunton, Lydeard Ho...	1·19	,,	Loch Ness, Drumnadrochit	3·41
,,	Wells, Westbury.....	1·54	XIX.	Lairg H.R.S.	...
VI.	Bristol, Clifton	1·11	,,	Scourie	5·16
,,	Ross	·91	,,	Watten H.R.S.	2·01
,,	Wem, Clive Vicarage ...	1·13	XX.	Dunmanway, Coolkelure	5·86
,,	Cheadle, The Heath Ho.	1·53	,,	Fermoy, Gas Works ...	3·91
,,	Worcester, Diglis Lock	·92	,,	Tipperary, Henry Street	3·88
,,	Coventry, Coundon	1·64	,,	Limerick, Kilcornan ...	2·16
VII.	Ketton Hall [Stamford]	2·23	,,	Miltown Malbay.....	3·63
,,	Grantham, Stainby	2·46	XXI.	Gorey, Courtown House	2·84
,,	Horncastle, Bucknall ...	1·54	,,	Navan, Balrath	2·85
,,	Mansfield	...	,,	Mullingar, Belvedere...	3·73
VIII.	Neston, Hinderton	1·50	,,	Athlone, Twyford	3·57
,,	Knutsford, Heathside ...	2·52	,,	Longford, Currygrane...	3·14
,,	Lancaster, South Road.	4·21	XXII.	Galway, Queen's Coll...	2·64
,,	Broughton-in-Furness ..	6·19	,,	Clifden, Kylemore	3·53
IX.	Wakefield Prison	1·30	,,	Crossmolina, Enniscoe..	3·82
,,	Ripon, Mickley	2·47	,,	Collooney, Markree Obs.	2·55
,,	Scarborough, West Bank	1·96	,,	Ballinamore, Lawderdale	..
,,	East Layton [Darlington]	1·69	XXIII.	Warrenpoint	3·59
,,	Middleton, Mickleton..	2·71	,,	Seaforde	2·35
X.	Haltwhistle, Unthank..	3·02	,,	Belfast, New Barnsley..	2·84
,,	Shap, Copy Hill	2·99	,,	Bushmills, Dundarave...	2·88
XI.	Llanfrechfa Grange	1·23	,,	Stewartstown	2·38
,,	Llandovery	3·82	,,	Buncrana	2·47

MARCH, 1890.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average. 1880–9	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE Max Deg	Max Date	Min. Deg.	Min. Date	No. of Nights below 32a In shade.	No. of Nights below 32a On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·76	+ ·15	·48	19	14	66·2	28	15·6	4	7	15
II.		Maidstone (Hunton Court)...	2·59	+ 1·09	1·29	19	15	...	...	...	...	...	...
,,		Strathfield Turgiss	1·28	— ·31	·27	24	19	64·1	29	13·8	4	10	21
III.		Hitchin	2·52	+ 1·18	·93	19	13	62·0	28	15·0	3	6	...
,,		Winslow (Addington)	1·56	— ·16	·36	19	16	62·0	28	14·0	4	12	18
IV.		Bury St. Edmunds (Westley)	3·17	+ 1·62	1·30	19	11	...	...	...	...	...	...
,,		Norwich (Cossey)	2·79	+ 1·37	·68	19	16	...	...	...	...	...	...
V.		Weymouth(LangtonHerring)	1·02	— ·88	·28	24	12	58·0	29	20·0	4	7	...
,,		Barnstaple	1·66	— ·83	·43	21	10	59·0	31	18·0	4	...	..
,,		Bodmin (Fore Street)	2·94	— ·84	·62	24	17	..	...	...	...	.	...
VI.		Stroud (Upfield)	·94	— 1·25	·23	24	13	63·0	27*b*	19·0	3	6	...
,,		ChurchStretton(Woolstaston)	1·49	— ·64	·32	16	19	59·5	28	21·0	3	8	15
,,		Tenbury (Orleton)	1·57	— ·51	·42	24	14	60·8	26	14·8	4	13	16
VII.		Leicester (Barkby)	2·12	+ ·41	·84	19	21	65·0	23	12·0	3	11	22
,,		Boston	1·49	— ·04	·82	22	10	64·0	22	19·0	4	9	...
,,		Hesley Hall [Tickhill].....	1·50	— ·40	·45	19	10	63·0	28	21·0	4	11	...
VIII.		Manchester(PlymouthGrove)	3·00	+ ·78	·56	9	19	61·0	28	24·0	3	8	12
IX.		Wetherby (Ribston Hall) ...	1·56	— ·50	·62	20	7	...	...	...	...	...	...
,,		Skipton (Arncliffe)	5·16	+ ·06	·70	9	22	...	...	...	...	...	...
,,		Hull (People's Park)	1·57	— ·48	·55	19	17	...	...	...	...	...	...
X.		North Shields	1·91	— ·52	·42	20*a*	15	61·5	12*b*	26·0	4	8	11
,,		Borrowdale (Seathwaite).....	12·73	+ 2·23	1·77	9	24	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)..	1·75	— 1·23	·28	24	13	...	...	...	...	...	...
,,		Haverfordwest	2·44	— ·80	·68	24	11	55·0	30*d*	18·3	3	6	14
,,		Plinlimmon (Cwmsymlog) ...	4·89	...	·80	16	14	...	...	...	...	...	...
,,		Llandudno.....	1·71	— ·37	·33	9	16	57·0	20	25·4	4	3	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·59	— ·71	·46	28	17	56·8	10*e*	22·6	3	7	...
,,		Jedburgh (Sunnyside).....	1·43	— ·53	·40	20*b*	12	59·0	16*f*	25·0	5	9	...
XIV.		Old Cumnock	3·07	— ·06	·42	16	23	60·0	31	16·0	2	11	...
XV.		Lochgilphead (Kilmory)	6·35	+ 1·89	1·31	15	24	...	...	...	...	...	...
,,		Oban (Craigvarren)	7·38	...	1·35	15	26	53·0	28	27·0	9	5	...
,,		Mull (Quinish).....	6·87	+ 3·03	1·40	15	25	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·40	— ·57	·50	9, 25	12	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·90	— ·50	·65	24	9	59·3	11	21·9	9	7	...
XVII.		Braemar	...	...	...	...	...	...	...	...	..	...	...
,,		Aberdeen (Cranford)	2·80	...	·77	20	19	61·0	12	22·0	8	9	...
XVIII		Strome Ferry.....	6·94	+ 2·31	1·10	15	26	52·0	15*g*	26·0	1	3	...
,,		Culloden	2·57	+ 1·03	...	...	..	57·0	12	21·0	9	10	24
XIX.		Dunrobin	4·78	+ 2·53	1·25	10	15	60·0	12*h*	23·0	9	9	...
,,		S. Ronaldsay (Roeberry).....	...	...	...	...	...	...	...	...	...	...	...
XX.	IRELAND.	Cork (Blackrock)	4·51	+ ·95	1·87	15	17	63·0	22	28·0	16	8	...
,,		Dromore Castle	5·21	+ ·79	·60	17*c*	18	60·0	25	27·0	2	...	...
,,		Waterford (Brook Lodge) ...	3·82	+ ·92	1·40	15	18	60·0	11	25·0	4	12	...
,,		O'Briensbridge (Ross)	...	...	...	..	...	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	4·17	+ 1·80	1·34	15	18	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·69	+ 1·68	·98	24	17	59·6	12	31·2	3, 9	4	16
XXII.		Ballinasloe	2·66	+ ·03	·68	15	22	55·0	10	21·0	3	14	...
XXIII		Waringstown	2·64	+ ·29	1·16	15	19	59·0	27	24·0	1, 2	15	16
,,		Londonderry (Creggan Res.).	2·62	— ·11	·91	15	22	..	...	...	...	...	...
,,		Omagh (Edenfel)	2·93	+ ·42	·99	15	25	54·0	27	23·0	1	7	15

a And 24. *b* And 28. *c* And 26. *d* And 31. *e* And 15. *f* And 29. *g* And 30, 31. *h* 14.

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

METEOROLOGICAL NOTES ON MARCH, 1890.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—A fine, healthy month, with a sharp of frost on the 4th. Thus far, a very favourable season for vegetation of all kinds. Grass min. on 4th, 12°·4. Humble bee first seen on 15th; brimstone butterfly on 26th.

ADDINGTON.—The first four days of the month were very cold, but after the 4th, although occasional frosts occurred, they were not severe. The R, though in no great quantity, hindered work on heavy land.

BURY ST. EDMUNDS, WESTLEY.—March came in like a lion and went out like a lamb. This old saying has been very true this year. Casella's min. thermometer exposed 1 ft. from the ground registered on the 3rd, 3°; on the 4th, 6°; and on the 28th, in the shade, 61°. On the 19th, 1·30 in. of S and R fell, which caused great floods in Suffolk; spring sowing is very backward.

LANGTON HERRING.—Another dry month, the deficit for the month being 44 per cent. Notwithstanding the cold of the first four days, the temp. of the month was above the average for March for 18 years. The excess at 9 a.m. being 1°·5. The temp. on the nights of the 2nd and 3rd are the lowest recorded in March in 19 years. Solar halos were frequently observed; fogs prevailed on the 26th, 27th and 28th. The last three days of the month were very fine.

BODMIN, FORE STREET.—An exceptionally fine month. Hard frost on the 2nd, 3rd, and 4th, and frost also on 17th, 19th, 21st, and 30th. H on the 17th. Occasional high winds, very mild and fine, from 25th to 31st.

STROUD, UPFIELD.—Lunar rainbow on the 1st. Slight S on 1st and 9th.

ORLETON.—The month commenced with intense frost, the thermometer on the grass registering 11° on the 4th. The weather then changed and was warm and pleasant till the end of the month, with occasional sharp frosts. The mean temp. of the month was 2°·8 above the average of the last 29 years. Snow on the 1st 3rd, 4th, and 9th; distant T on the 17th. Damson and plum trees beginning to come out on the 26th; willow wren heard on the 29th.

WOOLSTASTON.—The month opened with severe frost, and S fell heavily on the 8th. The remainder of the month was very seasonable. Mean temp. 42°·7.

MANCHESTER, PLYMOUTH GROVE.—S fell on the 1st and 2nd, and a severe S storm occurred on the 9th, commencing at 9 a.m. and lasting about an hour. The first nine days were cold and winterly. E. winds blew on 8 days; W. on 23 days Fine, bright, and sunny on 12th, 16th, 17th, 22nd, 26th, 29th, 30th, and 31st. Mean temp. 44°·5.

HULL.—The weather during the month was nearly equally divided between fine and showery days. Generally the falls of R were not heavy, or of long duration, leaving longer periods of fine weather than is usual with such a number of days on which R fell.

WALES.

HAVERFORDWEST.—The month commenced with fine, but very cold, weather, severe N.E. winds prevailing and sharp frost, the min. on 3rd being the lowest in March since 1886; the mean temp. of the day was 26°·5; on the grass the temp. fell to 8°. This wave of cold was, however, evanescent, the temp. rising rapidly, and the rest of the month was warmer than the average. Strong westerly winds, at times reaching the force of a gale, prevailed about the 7th and 8th, 14th and 15th. A stormy, wet period from the 22nd to 24th. Prevailing winds W.N.W. and S.W.

SCOTLAND.

CARGEN.—The mean temp. of the month (43°·1) was 2°·4 above the average. Sunshine somewhat below the average. Vegetation generally very advanced; many flowering shrubs, rhododendrons, &c., in bloom at least a month earlier than usual. S on 8th, T on 16th at 1 p.m.

JEDBURGH.—Though cold and ungenial, the month on the whole was fine. The land was in fine order, and it is rarely that the seed gets such a dry bed. Vegetation progressed steadily.

CULLODEN.—The month generally was fine; frost not severe enough to injure garden produce. No S. Farm work well advanced.

IRELAND.

CORK—Generally fine, but cold, with showers. A gale in the night of the 15th, with a R of 1·87 in. Mean temp. (46°·4) 2°·4 above the average of 14 years.

WATERFORD, BROOK LODGE.—S showers on the 1st and 2nd. H on the 8th. S.W. gale on the 15th.

DUBLIN.—March was a month of contrasts. As in 1889, it opened with severe weather; warm and cold spells then succeeded each other to the close of the month, heavy falls of R occurring at times. On the whole, there was a mean temp. of 2°·0 above the average, and the R was largely in excess. Fog on the 19th, 20th, and 27th; high winds on 15 days, reaching the force of a gale on 4 days, the 7th, 8th, 10th, and 24th; S or sleet fell on the 1st, 2nd, 9th, 16th, 18th, and 23rd; H fell on 1st, 2nd, and 8th. The temp. exceeded 50° in the screen on 19 days, compared with only 2 days in February, and 17 in January, while it fell to below 32° on 4 days, compared with 5 in February, and 1 in January. On two days the thermometer did not rise to 40° in the screen. The last two days were fine, quiet, cool, and dry, the month going out "like a lamb," as it had come in "like a lion."

OMAGH, EDENFEL.—Till the end of the month, when the conditions became very favourable, there was a generally constant, though not excessive, R, and none of the trying easterly winds typical of March. The min. temp. on the 1st was the lowest of the winter.