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SNOW CRYSTALS.*

WHEN Dr. Hellmann writes upon a fresh subject, it may be taken for granted that we shall have a bibliography of it, superior to what any one else could give us—and the present volume confirms the reputation. It has generally been supposed that Olaus Magnus in 1555, was the first to mention the form of snow crystals as well as the first to engrave them. But Dr. Hellmann points out that Albertus Magnus, who lived 1193-1280, had called attention to the star-like form of snow and quotes the words (*figura stellæ*) as from Albertus's Meteorology, Book I., chapter 10. Book I., chapter 10, treats of comets—it should be Book II., chapter 10; and we think that it would have been well to quote also the fuller description given earlier in the same chapter.

In the edition of 1494 (the only printed one which we have), the words are :—

“Sed figura pruine est cut radii qdam ad vnû centrum reducti vel vnâ lineam ex vtraque parte circûstantes.”

Which may be roughly rendered :—

“The form of snow is that of a series of radii starting from a centre, or lines from a circumference meeting at a centre.”

On p. 53, Dr. Hellmann quotes Bierens de Haan's report of an edition of Engelman, dated 1743, and says, that perhaps there never was such a book. That is also our opinion. Engelman's edition of 1747, makes no reference to any earlier one, and his edition of 1771, is distinctly stated to be the second. We think that Bierens de Haan probably confused with Engelman's book another Dutch one, which was published in the year, he states, 1743, viz. : N. Duin's *Aanmerkingen en Aanteekeningen, van drie meer dan gemeene strenge Winters*. But though, of course, there are many references to snow, it is totally different from Engelman's work, and we have not seen a word in it as to the form of snow.

* *Schneekrystalle ; Beobachtungen und Studien*, von Prof. Dr. HELLMANN. Royal 8vo. R. Mückenberger, Berlin, 1893. 66 pages, numerous engravings, and 8 plates reproducing micro-photographs.

As regards engravings of snow crystals, Dr. Hellmann gives faithful reproductions from the works of—

Olaus Magnus	...	...	1555
Descartes	...	...	1637
E. Bartholinus	...	...	1660
Hooke	...	...	1665
Martens	...	...	1675
D. Rosetti	...	...	1681
Scoresby	...	...	1820
Glaisher	...	...	1855

With reference to some of the later ones he seems to think that they are rather too beautiful. The plan of drawing complicated patterns has usually been to draw accurately the branches from one of the six radii and subsequently to draw the other five radii with identical branches. This, of course, produces perfect symmetry, but Dr. Hellmann questions whether such perfect symmetry is usual.

The only direct photograph of snow which we had seen, prior to receiving Dr. Hellmann's book, was one taken by Mr. A. W. Clayden, and if we remember it aright, the majority of the crystals were imperfect. To us, however, that seems a probable fact, because both by contact with other crystals in their fall earthwise, and by contact with the surface on which they fall, such extremely delicate structures may suffer much injury. Moreover, there is the ever-present difficulty as to their melting; they must not merely be formed at a low temperature, but *all* the air strata through which they pass, must be below 32° F., and the air must not be very dry, or the crystals will lose some of their finer needles by evaporation, or very moist, or additional spiculæ may be irregularly attached. All this is evident, and it being so, we think that, at any rate in the state of knowledge when Engelman, Scoresby, and Glaisher brought out their exquisite engravings, they did wisely in representing perfect crystals.

Now that photography can be used, much more can be done, and doubtless before long will be. It is very nice to have the indisputable photographs which Dr. Neuhaus has taken, and we wish him much success. The chief difficulty appears to be to obtain a sufficiently strong light to illuminate the crystals and yet to avoid warming them.

We cannot find space for telling in detail the various inferences which Dr. Hellmann draws from the photographs, but his book is an epoch making one. He closes the period of geometrical perfection in the representation of snow crystals, and carries us a good way into the new period in which the photograph perpetuates their appearance, and enables us to study their life history, not in a garden, with the temperature at zero, but in the comfort of a study. Dr. Neuhaus must find out how to prevent the crystals thawing, and thereby complete the benefit he has conferred on meteorologists, for beautiful as were the geometrical figures, it will be still better to have the absolute facts.

The work may almost be called an *edition de luxe* so excellent are the paper, the printing, and the reproductions of the micro-photographs.

UNUSUAL SNOW CRYSTALS.

To the Editor of the Meteorological Magazine.

SIR,—When I left home at 8.30 this morning snow was falling in single crystals and small flakes, the flakes consisting as a rule of any number of crystals up to eight or ten; the fall continued, decreasing gradually till about 9.15 a.m., the temp. during this time being about 23°.

The crystals were very varied, both in form and size, and exhibited some features which appeared to me worthy of record. They varied in diameter from $\ast \frac{2}{24}$ inch (2.12 millimetres), up to the largest size which it has been my good fortune to examine, one measuring exactly $\ast \frac{8}{24}$ inch (8.47 millimetres), and another $\ast \frac{7}{24}$ inch (7.41 millimetres.) Some half-dozen crystals, $\frac{1}{8}$ inch in diameter, were seen with the spiculæ radiating in all directions, and two of $\frac{3}{16}$ inch, the rays in the two larger specimens being of the usual arborescent pattern, whereas the rays of the smaller forms were simple needles—as in the case described in the *Met. Mag.* for January, 1893. These crystals might conveniently be called spherical snow crystals, and this name will enable me to describe as hemispherical five or six other crystals examined; they were similar in size and structure to the two larger spherical ones just described, but what may be called the main crystals, formed a flat base, on which were arranged two half-crystals on the same side. I endeavoured to count the number of rays in the spherical crystals, and although it was a rather severe test for the eyesight, I am satisfied that 14 is the correct number.

Another frequent form, was the ordinary crystal with additional spiculæ on both sides, at right angles to it. Although, during the three-quarters of an hour, I examined many hundred crystals, I did not see any of what may be described as “the axle and pair of wheels” pattern, or any hexagonal discs.

It may be worthy of remark that the temp. was comparatively near to that on January 1st, 1893, when I observed the spherical crystal before mentioned, as described in the *Met. Mag.*, January 1893.

Yours very truly,

H. SOWERBY WALLIS.

25, Northwood-road, Highgate, January 6th, 1894.

* These uncouth fractions are used because they are the graduations of the pocket scale with which the crystals were measured.

THE FROST OF JANUARY 5TH & 6TH.

THIS frost was not, we think, comparable with those of 1881, 1867, or 1860—in fact, except at isolated stations, we do not think that it was much worse than that of 1893 ; but recent events usually produce a strong impression, and we shall therefore be expected to say something about it.

In the first place, we reprint from the *Morning Post* a report as to the minimum at Greenwich Observatory :—

“The Astronomer Royal reports that at Greenwich Observatory the minimum was $12^{\circ}8$. In the previous 53 years during which meteorological observations have been recorded there, there have been only nine years in which the reading of the 5th was beaten, the actual values being :—

1894	.....	Jan. 5	.....	$12^{\circ}8$
1881	.....	„ 17	.....	$12^{\circ}7$
1878	.....	Dec. 25	.....	$12^{\circ}2$
1870	.....	„ 25	.....	$9^{\circ}8$
1867	.....	Jan. 5	.....	$6^{\circ}6$
1860	.....	Dec. 25	.....	$8^{\circ}0$
1855	.....	Feb. 19	.....	$11^{\circ}1$
1847	.....	„ 12	.....	$11^{\circ}2$
1845	.....	„ 12	.....	$7^{\circ}7$
1841	.....	Jan. 9	.....	$4^{\circ}0$

Prior to this date members of the staff registered temperatures in the neighbourhood, and in the Belville Journals there is an entry of a temperature of $3^{\circ}0$ at 9 a.m. on January 15th, 1820, the minimum being supposed to be zero. On January 20th, 1838, however, the lowest readings of the century were registered, all being below zero—at Blackheath, $-2\frac{1}{2}^{\circ}$; at Greenwich, -4° ; near Deptford Bridge, -5° ; at Lewisham, -6° ; and at Beckenham, -8° or -10° . This was known as “Murphy’s Winter,” from the almanack maker’s prediction that January 20th would be the coldest day.”

From this we may see that at Greenwich a similarly low temperature is reached about every six years.

The peculiarity of the recent frost was the coldness during the day-time on January 5th. In London, until evening, the temperature did not exceed $18\frac{1}{2}^{\circ}$, and similar or greater cold prevailed over the South of England. The temperature rose a little after 6 p.m., and the true max., as read at 9 p.m., was $19^{\circ}8$. This, in London, has been exceeded only once in 35 years, and that once was as far back as January 4th, 1867, when the max. was only $16^{\circ}9$. In corroboration of this we may refer to the letter from our regular correspondent at Weymouth (on p. 188) and to the following temperatures sent by Mr. R. H. Barnes from Parkstone, Dorset :—

	7 a.m.	min.	9 a.m.	Noon.	3 p.m.	6 p.m.	7 p.m.	9 p.m.
January 5th.....	$14^{\circ}6$	$13^{\circ}5$	$14^{\circ}1$	$14^{\circ}7$	$15^{\circ}7$	$16^{\circ}2$	$17^{\circ}0$	$15^{\circ}1$

FROST IN THE ISLE OF WIGHT.—Mr. C. Orchard, Bembridge, observes :—
“The weather here last week was very severe. On Thursday, January 4th, the N.E. wind was very piercing, blowing half a gale, with temperature about

26° all the day. On Thursday night some snow fell, and the wind kept up, while the thermometer fell to 15°, the frost, which penetrated dwelling houses and stores, as well as glass structures, freezing in places that have never been known before by the oldest inhabitant; in fact it seemed a perfect blizzard. The damage to plants and roots, such as potatoes in stores, cannot yet be estimated. Fires, lamps, and stoves entirely failed to keep the frost from the greengrocers' shops and stores in Ryde and the other towns in the island, the contents in most cases being frozen quite hard."—*Journal of Horticulture*.

Mr. Pile, of Cranbrook, Kent, gives the max. as 23°, and says that the only lower one for 22 years was 22° on December 30th, 1890. This max. of 23° was probably at night, because Mr. Mace, of Tenterden, says: Max. *during the day* 19°, but rose to 21° between 7 and 10 p.m.

Mr. Padwick, of the Manor House, Horsham, gives the temperature at 11 a.m. as 13°.

At Ivedon, Honiton, Devon, Mr. Stanley had almost exactly the same temperatures as in London, viz. :—

	Min.		9 a.m.		Max. up to 6 p.m.
Ivedon.....	14°0	.....	15°0	.....	18°0
Camden Square.....	13°1	.....	14°3	.....	18°4

Much further to the North, the Rev. H. A. Boys, of Easton Mauduit, Northampton, gives :—

	9 a.m.	Noon.	Max.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	9 p.m.	Min.	10 p.m.
Jan. 5th...	17°5	18°5	18°8	17°5	18°2	17°5	16°0	10°5	10°3	13°0

At Addington, near Buckingham, Mr. Mathison says that the temp. did not reach 15° until nine o'clock at night. He gives :—

		4 p.m.		6 p.m.		9 p.m.
January 5th	11°0	.....	14°0	.....	15°0	

Still further North the min. fell much later, viz., on the 6th; but we do not think that the air temperature fell to zero in any part of England.

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this society was held on Wednesday evening, the 20th ultimo, at the Institution of Civil Engineers, 25, Great George-street, Westminster, Dr. C. Theodore Williams, President, in the chair.

Mr. C. Harding, F.R.Met.Soc., gave an account of the "Great Storm of November 16th to 20th, 1893." This storm was the most violent of recent years, and, as far as anemometrical records are concerned, the wind attained a greater velocity than has previously been recorded in the British Islands. The velocity of the wind was 96 miles in the hour from 8.30 to 9.30 p.m. Nov. 16th in the Orkneys, where the hurricane burst with such suddenness, that it is described as like the shot of a gun, and the wind afterwards maintained the very high rate of 90 miles and upwards in the hour, for five consecutive

hours. At Holyhead the storm was terrific, the anemometer recorded a wind velocity of 89 miles in the hour, and it was 80 miles or above for 11 hours; while the force of a whole gale, 65 miles an hour and upwards, was maintained for 31 hours, and for $4\frac{1}{2}$ days the mean hourly velocity was 54 miles. Many of the gusts were at the rate of 115 miles in the hour, and at Fleetwood a squall occurred, with the wind at the rate of 120 miles an hour. The storm was felt over the entire area of the United Kingdom, and the wreck returns show that disasters occurred with almost equal frequency on all coasts. Four weeks after the storm the official records gave the total loss of life on our coasts as 335, while there were 140 vessels which had been abandoned, or had foundered, stranded, or met with other severe casualty, involving either loss of life, or saving of life by some extraneous assistance. There were 600 lives saved on our coasts by aid of the Life-boat Institution and other means. The author has tracked the storm from the neighbourhood of the Bahamas on Nov. 7th, across the Atlantic and over the British Islands to central Europe on Nov. 20th.

The other papers read were—"Rainfall and Evaporation Observations at the Bombay Water Works," by Mr. S. Tomlinson, M.Inst.C.E.; and "On Changes in the Character of certain Months," by Mr. A. E. Watson, B.A., F.R.Met.Soc.

SOCIEDAD METEOROLOGICA URUGUAYA.

To the Editor of the Meteorological Magazine.

SIR,—I have read with interest in the number 333 for October, 1893, page 136 of your valuable magazine, the remarks which the perusal of our *Revista* suggested, especially that referring to the delay in the publication of meteorological *datos* obtained at the various stations established since January, 1890.

I would observe, however, that these delays are not due entirely as the reviewer seems to imply—to climate conditions of these parts, but directly to the want of the pecuniary resources, necessary for the extensive and regular publication of these data. It is only to the patriotism of a few citizens (so few indeed, that I am often called upon to provide out of my own pocket the necessary sums to attend to the "service") that we are able to publish the *Revista* and provide for the maintenance of the stations. Therefore the delay will not be a matter of surprise, bearing in mind that the Uruguayan Meteorological Society is purely a private undertaking, without any help or aid whatever from the Government of the country.

In any case, the publication of the data would involve delay, owing to various causes, as it happens with other publications of greater importance than ours, possessing the necessary elements. For example:—*The Monthly Bulletin of the Central Magnetic and Meteorological Observatory of Mexico*, whose April number of 1890 was

published only recently in 1892; also the Bulletin of the Italian Meteorological Society, published in the September number of the year, the observations of July, 1892.

Thanking the reviewer for his good wishes for the prosperity of the institution, which I have the honour of directing, and reciprocating the same to yourself,

I am,

Yours very respectfully,

F. A. LANZA, Director.

*Sociedad Meteorologica Uruguay, Calle Sarandi, 190,
Montevideo, Uruguay, November 25th, 1893.*

EXCEPTIONAL FROST FORMATION.

To the Editor of the Meteorological Magazine.

SIR,—In the sharp frost that occurred on 2nd and 3rd of this month, I noticed in a wood in Surrey, a very peculiar frost formation.

Patches of ground, about eighteen inches in diameter, were covered with little vertical columns of ice that had the appearance of having exuded from the ground, and in general form reminding one of the columnar basalt of Fingal's Cave in miniature. Some of the columns in the middle of the patch measured 2 inches high; they all came up to about the same level but decreased slightly in height to the edges of the patch. The soil is light, gravelly sandstone, and some of the soil, and small stones, measuring three-quarters of an inch, were supported here and there on the tops of the little columns.

The ice was clear but in structure was composed of bundles of fibres, like rock asbestos, the sides of each column being parallel, not tapering either at the top or the bottom. The diameter of the columns was about a quarter-of-an-inch, and the distance between them varied from 0 to half-an-inch, but in many cases they were closely related, forming rows about two or three inches long. Nearly all of them had a joint or interruption about two-thirds from the top, as if they had been caused by the action of two successive frosts. In some cases the lower portion was missing, the column being supported by those adjacent, and on the lower end where the joint would have been, was a bunch of rime spikes, like little rootlets, about three-quarters of an inch above the ground.

The few patches that I observed, were situated on the side of banks, where water could not have accumulated as a puddle.

Yours faithfully,

E. WHITE WALLIS.

49, Clifton Hill, N. W., 13th December, 1893.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1893.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London	90·7	7	47·3	15b	74·5	55·2	53·0	70	100·3	43·0	2·46	17	6·0
Malta.....	96·1	14	65·7	20	87·0	70·8	66·8	70	146·9	60·8	·00	0	1·7
Cape of Good Hope ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mauritius.....	74·8	10	59·0	13	73·1	62·9	58·6	74	120·2	48·3	3·35	20	5·5
Calcutta.....	90·5	27	75·2	4, 5	87·0	78·5	79·0	88	154·6	74·9	10·97	16	8·5
Bombay.....	87·3	12	74·3	3	84·8	76·9	75·8	85	136·7	71·8	16·14	31	8·6
Ceylon, Colombo	86·9	15	73·4	3	84·1	77·2	70·9	77	156·0	70·0	2·20	11	7·7
Melbourne.....	60·0	23	31·0	28	54·8	41·8	43·3	83	111·5	24·9	2·32	17	5·9
Adelaide	63·6	23	35·7	3	58·2	44·2	43·9	76	129·0	26·1	2·00	15	...
Sydney	71·2	24	38·7	4	59·6	46·2	44·3	83	114·0	24·0	4·45	15	4·2
Wellington	60·0	14a	35·0	19	55·2	44·3	42·8	79	102·0	24·0	7·31	18	5·4
Auckland	64·0	6, 31	39·0	20	58·7	48·3	48·2	81	124·0	31·0	5·34	25	6·7
Jamaica, Kingston.....	92·9	4	69·8	10	87·8	72·2	71·3	74	...	...	5·94	14	6·5
Trinidad	93·0	12	65·0	17c	87·6	69·3	73·3	85	145·0	62·0	13·28	25	...
Toronto	93·3	25	45·0	24	79·1	57·5	58·5	72	...	41·0	2·27	14	4·0
New Brunswick, Fredericton.....	85·2	21	45·0	10	75·9	52·5	59·6	69	...	...	3·68	12	4·0
Manitoba, Winnipeg...	88·3	20	40·0	8	77·8	55·4	...	...	...	...	5·42	12	5·0
British Columbia, Esquimalt.....	71·4	30	45·2	19d	66·9	51·2	52·8	84	...	...	·95	11	5·0

a And 25, 31. b And 28. c And 18. d And 20.

REMARKS.

MALTA.—On 29th, at 10.30 a.m., a few heavy drops of rain fell, but not enough to measure. Mean temp. 77°·6; mean hourly velocity of wind 8·2 miles. J. SCOLES.

Mauritius.—Mean temp. of air 1°·1 below, dew point 0°·7 below, and rainfall ·96 in. above, their respective averages. Mean hourly velocity of wind 12·3 miles, or 0·4 mile above the average; extremes, 27·1 on 14th, and 2·1 on 19th; prevailing direction, E.S.E. C. MELDRUM, F.R.S.

Melbourne.—Fog on the 8th, 18th, 28th and 29th; frost on the 2nd, 8th, 28th and 29th; hail on the 1st and 25th; lightning on the 9th, 12th, 13th, 14th and 22nd. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 0°·4 below the average of 36 years. Rainfall ·63 in. below the average. C. TODD, F.R.S.

Sydney.—Mean temp. 0°·3 above, humidity 7 above, and rainfall ·04 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally showery weather, with a few fine days; heavy rain in the early part and at the end of the month. Prevailing winds S.E. and N.W., frequently fresh, but very strong only on 14th and 30th, from N.W. Mean temp. 2°·1, and rainfall ·98 in., above their averages. R. B. GORE.

Auckland.—A stormy, wet and disagreeable month, rain falling on 25 days out of 31. Total rainfall nearly ·75 in. in excess. Barometrical pressure and mean temp. both considerably above the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Thunderstorms, with much rain and squalls. Rainfall nearly three times the average. Mean hourly velocity of wind 3·8 miles. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
 DECEMBER, 1893.

[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.			
II.	Dorking, Abinger Hall.	3·23	XI.	Builth, Abergwessin Vic.	9·44
„	Birchington, Thor	2·07	„	Rhayader, Nantgwillt..	8·37
„	Brighton Prestonville Rd ..	...	„	Corwen, Rhug .....	...
„	Hailsham	3·12	„	Carnarvon, Cocksidia ...	5·85
„	Ryde, Thornbrough	3·51	„	I. of Man, Douglas	5·50
„	Alton, Ashdell	3·85	XII.	Stoneykirk, Ardwell Ho.	3·41
III.	Oxford, Magdalen Col...	1·54	„	New Galloway, Glenlee	8·60
„	Banbury, Bloxham	2·60	„	Melrose, Abbey Gate ...	3·51
„	Northampton, Sedgebrook	2·06	XIII.	N. Esk Res. [Penicuik]	4·40
„	Alconbury	1·24	„	Edinburgh, Blacket Pl..	2·50
„	Wisbech, Bank House..	1·36	XIV.	Glasgow, Queen's Park.	4·57
IV.	Southend	1·42	XV.	Islay, Gruinart School..	4·66
„	Harlow, Sheering	1·76	XVI.	Dollar	4·82
„	Colchester, Lexden	1·48	„	Balquhider, Stronvar..	10·68
„	Rendlesham Hall	1·41	„	Coupar Angus Station..	2·55
„	Diss	1·72	„	Dunkeld, Inver Braan..	3·54
„	Swaffham	1·39	„	Dalnaspidal H.R.S. ...	10·06
V.	Salisbury, Alderbury ...	3·79	XVII.	Keith H.R.S.	2·15
„	Bishop's Cannings	2·97	„	Forres H.R.S.	1·20
„	Blandford, Whatcombe.	3·97	XVIII.	Fearn, Lower Pitkerrie.	1·80
„	Ashburton, Holne Vic....	6·95	„	Loch Shiel, Glenaladale	22·20
„	Okehampton, Oaklands.	7·16	„	N. Uist. Loch Maddy ...	7·47
„	Hartland Abbey	5·11	„	Invergarry	14·80
„	Lynmouth, Glenthorne.	7·12	„	Aviemore H.R.S.	3·51
„	Probus, Lamellyn	5·23	„	Loch Ness, Drumnadrochit	5·84
„	Wincanton, Stowell Rec.	3·66	XIX.	Invershin	2·40
„	Weston-super-Mare .....	...	„	Scourie	7·12
VI.	Clifton, Pembroke Road	2·86	„	Watten H.R.S.	1·67
„	Ross, The Graig	3·45	XX.	Dunmanway, Coolkelure	9·23
„	Wem, Clive Vicarage ...	2·90	„	Fermoy, Gas Works ...	4·61
„	Cheadle, The Heath Ho.	3·10	„	Killarney, Woodlawn ...	7·80
„	Worcester, Diglis Lock	2·59	„	Tipperary, Henry Street	3·80
„	Coventry, Coundon	2·83	„	Limerick, Kilcornan ...	3·56
VII.	Ketton Hall [Stamford]	1·34	„	Ennis	5·33
„	Grantham, Stainby	1·82	„	Miltown Malbay	5·28
„	Horncastle, Bucknall ...	1·87	XXI.	Gorey, Courtown House	3·36
„	Worksop, Hodsck Priory	2·84	„	Mullingar, Belvedere...	3·11
VIII.	Neston, Hinderton	2·99	„	Athlone, Twyford	4·19
„	Knutsford, Heathside...	3·41	„	Longford, Currygrane...	3·74
„	Lancaster, Rose Bank...	3·36	XXII.	Galway, Queen's Coll...	5·03
„	Broughton-in-Furness..	6·62	„	Crossmolina, Enniscoe..	8·39
IX.	Ripon, Mickley	3·39	„	Collooney, Markree Obs.	4·78
„	Scarborough, South Cliff	2·08	„	Ballinamore, Lawderdale	3·88
„	East Layton [Darlington]	2·88	XXIII.	Lough Sheelin, Arley ..	3·29
„	Middleton, Mickleton...	2·96	„	Warrenpoint	4·01
X.	Haltwhistle, Unthank..	3·02	„	Seaforde	3·65
„	Bamburgh	1·15	„	Belfast, Springfield	4·44
„	Newton Reigny	4·61	„	Bushmills, Dundarave...	3·55
XI.	Llanfrehfa Grange	5·46	„	Stewartstown	3·21
„	Llandovery	6·05	„	Buncrana	4·78
„	Castle Malgwyn	5·97	„	Lough Swilly, Carrablagh	5·52

DECEMBER, 1893.

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 1880-9.	Greatest Fall in 24 hours		Deg.	Date		Deg.	Date	In shade.	On grass.		
				Dpth	Date									
		inches.	inches.	in.										
I.	London (Camden Square) ...	2.23	+ .16	.44	8	14	57.8	13	20.1	3	0	19		
II.	Maidstone (Hunton Court)...	1.75	— .49	.43	12	13	...	...	...	...	...	...
III.	Strathfield Turgiss	3.80	+ 1.79	.67	12	22	54.2	13	16.5	3	13	27		
	Hitchin	1.90	— .13	.48	20	15	55.0	13	19.0	2	9	...		
	Winslow (Addington)	1.44	— 1.01	.30	12	19	56.0	13	15.0	3	10	22		
IV.	Bury St. Edmunds (Westley)	1.94	— .30	.29	12	14	54.0	13	18.0	30	...	...
	Norwich (Cossey)	1.90	— .33	.54	20	12	...	...	...	...	...	...
V.	Weymouth (Langton Herring)	3.04	— .06	.57	19	14	54.0	13	22.0	3	5	...		
"	Torquay (Cary Green)	4.97	...	1.23	12	16	55.5	13	24.8	3	4	10		
	Bodmin (Fore Street) .....	...	...	...	...	...	...	...	...	...	...	...
VI.	Stroud (Upfield)	2.76	+ .31	.66	12	21	53.0	13	20.0	2	11	...		
"	Churchstretton (Woolstaston)	4.52	+ 1.47	.91	12	23	52.0	13	20.0	2	10	17		
	Tenbury (Orleton) .....	...	...	...	...	...	...	...	...	...	...	...
VII.	Leicester (Barkby)	1.80	— .34	.41	20	19	55.0	13	13.0	1	15	26		
"	Boston	1.36	— .49	.25	20	15	55.0	13	19.0	2	...	...
"	Hesley Hall [Tickhill]	2.65	+ .67	.89	12	20	53.0	13 ^a	21.0	2	16	...		
VIII.	Manchester (Plymouth Grove)	3.57	+ .13	.73	12	21	54.0	13	18.0	1	6	12		
IX.	Wetherby (Ribston Hall) ...	2.59	+ .15	.79	13	11	...	...	...	...	...	...
"	Skipton (Arncliffe)	6.94	+ .13	1.38	13	23	...	...	...	...	...	...
"	Hull (Pearson Park)	2.01	— .26	.77	20	15	55.0	13	22.0	2	11	17		
X.	Newcastle (Town Moor)	1.36	— .94	.33	12	16	...	...	...	...	...	...
	Borrowdale (Seathwaite)	22.53	+ 7.72	3.71	24	27	...	...	...	...	...	...
XI.	Cardiff (Ely)	4.88	+ .33	1.06	12	17	...	...	...	...	...	...
"	Haverfordwest	6.05	+ 1.06	.73	12	23	55.7	23	20.1	3	8	13		
"	Aberystwith, Gogerddan	4.61	— .27	.60	12	19	51.0	13	18.0	1, 2	...	...
XII.	Llandudno	3.57	+ .61	.60	12	19	55.0	24	32.4	2	0	...		
"	Cargen [Dumfries]	6.72	+ 2.70	.96	13	22	53.0	16	17.8	2	...	...
XIV.	Jedburgh (Sunnyside)	2.52	+ .32	.85	13	11	53.0	15	23.0	2	9	...		
XV.	Old Cumnock	5.49	+ .42	.96	24	25	...	...	...	...	...	...
"	Lochgilphhead (Kilmory)	7.96	+ .59	.73	2	29	...	...	19.0	1	8	...	
"	Morvern (Drimnin)	10.34	...	1.00	2	30	...	...	...	...	...	...
"	Mull (Quinish)	8.55	+ .98	.75	6	30	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3.80	+ .49	.70	25	15	...	...	...	...	...	...
"	Dundee (Eastern Necropolis)	2.05	— .03	.70	24	19	53.0	16	24.1	1	7	...		
XVII.	Braemar	3.82	+ 1.35	.73	10	25	50.2	16	20.0	1	12	20		
"	Aberdeen (Cranford)	2.07	...	.50	24	22	52.0	6	22.0	1	10	...	
XVIII.	Strome Ferry .....	...	...	...	...	...	...	...	...	...	...	...
"	Cawdor [Nairn]	2.19	— .27	.30	6, 8	23	...	...	...	...	...	...
XIX.	Dunrobin	3.11	— .26	.54	2	17	56.0	6	22.5	1	12	...		
"	S. Ronaldsay (Roeberry)	3.31	— .35	.35	8	28	51.0	6, 15	31.0	10	3	...		
XX.	Darrynane Abbey	6.64	...	.83	27	23	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	4.33	+ .69	1.09	19	20	52.0	16	24.5	2	8	...		
"	O'Briensbridge (Ross)	5.45	...	.58	12	23	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	3.55	+ .43	.56	24	24	...	...	...	...	...	...
"	Dublin (Fitz William Square)	2.48	+ .32	.50	24	19	56.7	15	28.3	2	3	16		
XXII.	Ballinasloe	4.23	+ .81	.61	12	23	51.0	28	29.0	31	8	...		
"	Clifden (Kylemore)	11.48	...	1.53	18	24	...	...	...	...	...	...
XXIII.	Waringstown	3.00	— .04	.40	24	20	55.0	27	23.0	1	14	18		
"	Londonderry (Creggan Res.) ..	3.95	— .26	.41	6	28	...	...	...	...	...	...
"	Omagh (Edenfel)	4.85	+ 1.17	.66	27	26	53.0	24	22.0	1	14	19		

a And 16.

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

METEOROLOGICAL NOTES ON DECEMBER, 1893.

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.—Taken altogether, December was a mild month, with a short snap of cold at the beginning and the end. The fluctuations of the bar. about the 17th were most remarkable. It fell from 30·469 in. to 28·464 in. in 48 hours. Heavy gale from N.W. on the 8th, and on the 12th a very severe gale, far exceeding any previous storm this winter; much damage was done to trees, and the celebrated oak over "Copenhagen's" grave in Strathfieldsaye Park was very seriously damaged. A large block of buildings was blown down at Aldershot. Gales again on the 19th and 20th. Grass min. on 3rd, 10°·5. Slight S on 1st.

HITCHIN.—The lowest barometer for many years occurred on the 20th, and the highest since February, 1887, on the 30th.

ADDINGTON.—Very sharp frosts occurred on the 2nd and 3rd, and again on the 30th and 31st, but there were no very low temperatures between those dates. R fell on many days, but in no great quantity, that registered on the 31st being partly fog, which was very dense all day, covering the trees with thick rime. Wind very strong at times. Much L at night on the 8th. Corrected bar. at 9 a.m. on 20th 28·902 in., and on the 29th 30·660 in.

BURY ST. EDMUNDS.—A mild month, with frequent R in small quantities, but no S. Violent oscillation of the bar. between 20th and 29th.

LANGTON HERRING.—The first and last weeks of the month were fine, and also from the 14th to the 18th, but the rest of the month was very unsettled, with great storms on the 12th and 20th. The storm on the 12th did considerable damage, blowing down tiles, slates, and coping stones in all directions, and uprooting many trees. The worst storm for many years. Mean temp. at 9 a.m. (42°·4), 3°·9 above the average, and 0°·8 above that of November. L on the 8th; H on the 9th; T on 11th and 12th. Solar halo on the 11th. Lunar halo on the 20th.

TORQUAY, CARY GREEN.—Heavy gale till 1.30 p.m. on 12th. R from 9 a.m. to 1 p.m., ·96 in.

STROUD, UPFIELD.—S.W. gales on 7th and 8th, with L on the latter day. S.E. gale on 10th, and S.W. gales on 11th and 13th. Violent storm of R and S at 4 p.m. on the 20th.

WOOLSTASTON.—A stormy month, with a succession of gales from the 8th to the 13th. S fell on the 19th and 20th.

LEICESTER, BARKBY.—A mild, open month; only a little S on the 1st and 20th. Water still very short. Mean temp. 38°·2.

MANCHESTER.—A very fine month; many days bright and sunny, more like spring. Mean temp. 40°·5. T and L on the 25th. Slight H showers on the 7th and 21st. Thick fog all day on 2nd. Thick fog and wet mist on the 29th, 30th, and 31st.

HULL, PEARSON PARK.—Squally, with showers of S on the 1st. Fog on the 5th, 28th, 29th, 30th, and 31st.

SEATHWAITE.—Falls of R exceeding an inch occurred on 8 days, exceeding 2·00 in. on 2 days, and exceeding 3·00 in. on one day. Hard frost on 1st and 2nd. H showers on the 7th and 21st.

WALES.

HAVERFORDWEST.—On the whole a mild December, although the first three days were very wintry, the Precelly range covered with S, and severe frost. Milder weather and fine, until the 8th, when a very stormy, wet, and at times very cold period set in, lasting seven days, the force of the wind being greater and the storm from the S.S.E. to E. greater than any gale since December, 1886. Stormy weather occurred several times afterwards, scarcely a day without R or S. About the 29th dense fog prevailed, the month ending with

hard frost. One of the wettest months of the whole year. Prevailing wind S.W., S.S.E., and N.E.

GOGERDDAN.—Very stormy and mild throughout and scarcely any sun.

SCOTLAND.

CARGEN.—Gales on the 8th and 10th; L on the 8th and 9th; S, sleet and R on the 12th and 13th; lunar halo on the 20th.

JEDBURGH.—The weather during the month was mild for the season. Snow-drops appeared above ground on 4th; primroses were in bloom after the 2nd. The S and frost never lasted beyond the day they occurred. Masons' work hardly got a check, and out-door work was never interrupted. S on the 7th, 8th and 13th. High wind on the 8th and 10th.

ROEBERRY.—A very unsettled month.

IRELAND.

DARRYNANE ABBEY.—The wettest month of the year, but mild.

WATERFORD, BROOK LODGE.—Fresh S on the Comeraghs on the 1st. Several heavy gales during the month. Mean temperature $42^{\circ} \cdot 5$.

O'BRIENSBRIDGE, ROSS.—This month exhibited the greatest rainfall of the year, with strong winds, mostly from S.E., especially on 17th. A marked rise of temp. occurred in the last week. Dense fog on 31st.

DUBLIN.—A generally open, rainy, squally month. Several serious gales were felt, but calms, with fog, prevailed during the closing days of the month, accompanied by an abrupt fall of temp. Mean temp. $43^{\circ} \cdot 5$, $2 \cdot 2$ above the average. Lunar halos appeared on the 14th and 18th. High winds were noted on 17 days, and attained the force of a gale on 5 occasions. The atmosphere was more or less foggy on 7 days. Neither S nor sleet fell in Dublin, although the mountains were covered with S on the 18th and 20th. H fell on the 13th; T and L occurred on the 8th.

BALLINASLOE.—Gales on 6th, 7th and 18th; high winds on the 8th, 9th, 10th and 15th; thick fog on 31st.

CLIFDEN, KYLEMORE.—Stormy and wet throughout.

WARINGSTOWN.—A very mild and open month, especially the latter half.

OMAGH, EDENFEL.—The month was ushered in with light S and sharp frost, which speedily gave way to mild and unsettled weather, with an extremely low and fluctuating bar., after the 27th, dry and cold with N.E. wind.

A COLD DAY IN DORSET.

To the Editor of the Meteorological Magazine.

SIR,—The temp. here to-day has been so exceptional that I send you a note of it for comparison with that of other places.

Last evening, at 9 o'clock, I set my thermometer, the temp. being then 20° ; it fell to 15° by 9 a.m. and to 14° by 10 a.m.; it rose to 16° by noon and to 17° by 2 p.m. On only 12 days in the last 22 years, has the temperature fallen below 20° , and on only four days in that time has the temperature at 9 a.m. been below 20° , namely:—

At 9 a.m.					At 9 a.m.				
		Min.	Max.			Min.	Max.		
Jan. 22nd, 1881	...	14	13	26	Jan. 19th, 1891	...	19	17	31
„ 25th, „	..	17	16	20	„ 5th, 1894	...	15	14	17

by which it will be seen, that here, this day has been the coldest day in the last 22 years.

Yours truly,

CLEMENT H. GOSSET.

Langton Herring, Weymouth, January 5th, 1894.