

THE POCKY CLOUD, AS SEEN FROM ELTERWATER, MAY 7, 1874.

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METEOROLOGICAL OBSERVATIONS AT ROSSINIÈRE.

[Col. Ward, who has been passing the winter at Rossinière, having obtained a copy of Prof. Dufour's memoir, has translated it, converted all the values into English measures, and kindly placed it at our disposal; we have no doubt that our readers will agree with us that it is an interesting paper, worthy of translation and of the space which it occupies.—Ed.]

Summary of Meteorological Observations made at Rossinière, Canton Vaud, Switzerland, by MESSRS. HENCHOZ, between the years 1799 and 1850.

BY PROFESSOR CH. DUFOUR, of Morges.

If there be a Pastor who has left behind him a revered memory it is surely Mons. Henchoz, who was for more than half-a-century Pastor of Rossinière, in the "Oberland" of the Canton Vaud.

During this long space of time Mons. Henchoz occupied himself, not only in the care of his flock, but also in certain scientific studies, for which a solid education well fitted him. Amongst his labours we must notice his Meteorological Observations, made from March 1st, 1799, to December 31st, 1834, and continued by his nephew from that time till the end of 1850, that is to say nearly to the time of his death. There are only wanting the records of a few months of 1828, and of the year 1829; either the observations were not made, or the records are lost.

The registers of Mons. Henchoz, kept with great regularity, show the temperature three times daily, viz: sunrise, 1 or 2 p.m., and 10 p.m. They show also the height of the barometer (but without temperature of mercury), the state of the sky, and the direction of the wind. At the end of each month are several observations of periodical phenomena, such as the state of the crops, budding of trees, the appearance of certain birds, &c. These manuscripts contain more than two hundred thousand indications of various kinds.

With regard to the temperature, it is to be regretted that Mons. Henchoz's thermometer has not been preserved, for one knows that the graduation of these instruments is not so exact as not to require certain corrections to ascertain the true temperature. The observations, therefore, lose much of their value. At the same time they are useful for comparison between themselves, the whole having been made with one instrument. We can tell, for example, the moment of extreme heat and cold in the first half of the 19th century; they serve also to compare the temperature of one year with another, &c. Besides, before Meteorology made the progress it has of late, such care was not taken in the position and comparison of thermometers. Mons. Henchoz made his observations as De Luc made his at

Geneva, and as they were, doubtless, made in many other places. They are, too, not the less valuable as being, probably, the only ones made in Switzerland at that time. After all it is better to have the daily temperature of the air to within a few tenths of a degree than not to have it at all.

Rossinière is situated on the valley of the Sarine*, which there runs E. to W. in latitude 46°28' N., longitude 4°45' E. of Paris, or 7° 5' E. of Greenwich. Its height is 1886 feet above the Lake of Geneva, or 3117 feet above the sea.

TEMPERATURE.—The thermometer was placed outside a window on the N. side of the Parsonage, about 16 feet from the ground. I know well that *now* such a position would be criticised, but it must be remembered that at that time thermometers were generally so placed, and thus Mons. Henchoz's thermometer was under the same conditions as others of the period.

For want of time I have not been able to calculate the mean temp. of every day and every year from 1799 to 1850. I am compelled to limit myself to the means of five years, viz: 1814 to 1818. Taking as the mean temp. of the day the mean of the three temperatures before named, I have composed the following table :

Years.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.Mean.
1814.....	29·7	22·5	34·9	48·4	51·3	57·2	62·6	61·2	54·0	46·4	41·4	35·8	45·43
1815.	20·7	37·8	41·0	48·2	53·8	57·9	60·1	59·4	57·6	50·0	33·3	27·5	45·59
1816.....	28·6	29·1	37·2	44·1	51·6	54·9	57·0	57·2	55·2	51·8	35·4	28·8	44·24
1817.....	34·0	37·2	37·6	38·7	50·9	62·8	60·3	60·3	61·2	42·6	41·2	29·5	46·17
1818.....	33·3	35·4	39·4	48·9	54·7	60·2	65·5	62·1	56·7	48·9	44·1	30·6	48·30
Gen. Mean.	29·2	32·4	38·0	45·6	52·5	58·6	61·1	60·0	56·9	48·0	39·1	30·4	45·96 (say 46°)

The mean temperature, therefore, of Rossinière, from 5 years' observations, is 46°†. That of Geneva, according to Mons. Gauthier, in a memoir published in the "*Cahier de la Bibliothèque Universelle*," of January, 1843, is 49°; and only 48° according to a memoir published in 1851, by Mons. Plantamour, and entitled, "*Résumé des Observations Thermométriques et Barométriques faites à Genève et au Grand-St.-Bernard*."

Taking even the higher figure, namely, that of Mons. Gauthier, it results that the mean temp. of Rossinière is 3° less than that of Geneva, a difference which one would have expected to be greater considering the difference of altitude between the two localities. According to the above quoted memoir of Mons. Plantamour the temperature diminishes between Geneva and St. Bernard 1°·8 for each 623 feet of elevation. Adopting this law, the temperature of Geneva ought to be 5°·4 above that of Rossinière, or, in other words, the mean temp. of Rossinière ought to be 43° or 44° instead of 46°.

I admit that 46° cannot be considered perfectly exact as the mean temperature of Rossinière, in consequence of the uncertainty as to what correction should be applied to Mons. Henchoz's thermometer; and also that 5 years is too short a time to be able to ascertain correctly a mean temperature. It could well happen also that there is a difference between the *theoretical* and *real* temperature of Rossinière, and that it has a higher mean than could be supposed, judging from the observations at Geneva. In fact, situated in a valley opening E. and W., it is protected from the N. wind, which can only blow, as it were, *indirectly*, a circumstance which might contribute to make the climate milder. Again, the figures

* N.B.—The valley is from half to three quarters of a mile broad, the mountains on the N. being from 3 to 4000 feet high and those on the S. from 1 to 3000 feet. It is shut in at either end by a gorge, that on the E. being about 1 mile, that on the W. about 2 miles distant. The parsonage stands about 260 feet above the level of the Sarine, on its northern bank.—M. F. W.

† There is another point, which Prof. Dufour has overlooked, viz., the fact that a series of observations made at sunrise, 1 or 2 p.m., and 10 p.m., if averaged without correction for diurnal range give too low a temperature by about half a degree Fahrenheit. This brings the mean up to 46°·5, which is certainly high for so elevated a locality.—Ed.

given for Geneva are, perhaps, exceptionally low, for Mons. Plantamour found that, from observations made at Bâle and Turin, the temperature of Geneva should be 2° greater than that observed; and he does not hesitate to attribute this depression to the proximity of the lake, which raises by 2° the winter temperature and depresses that of the summer by 4° , causing a mean diminution of 2° .

At Rossinière, no such cause existing, that locality may in reality be warmer, notwithstanding its height above the Lake of Geneva.

According to Mons. Quetelet, the temperature of Brussels is $50^{\circ}36$, making, therefore, allowance for difference of altitude and latitude, the mean temperature of Rossinière should be $45^{\circ}68$, a figure coming very near to that obtained from the records of Mons. Henchoz.

From the foregoing remarks I think we may conclude that, notwithstanding its elevation, the mean temp. of Rossinière is hardly $2^{\circ}7$ or $3^{\circ}6$ lower than that of Geneva.

Whatever may be the opinion as to the exactitude of Mons. Henchoz's thermometer, it must be allowed that from his observations there can be ascertained the hottest and coldest days of each year, as well as the moment of extreme heat and cold during a period of half-a-century.

Between 1799 and 1850 the thermometer once reached $91^{\circ}0$, July 14th, 1824, a day on which, however, no extraordinary heat was experienced in other places. At Geneva in that year the maximum was 86° , on July 25th. After that of July 14th, 1824, the highest temperatures are $90^{\circ}0$, August 3rd, 1827; $88^{\circ}7$, July 6th, 1819; and $88^{\circ}2$, July 2nd, 1804, July 13th and August 27th, 1807, and July 20th, 1825.

The moment of extreme cold happened February 2nd, 1830 — $9^{\circ}6$, showing a range between the two extremes of $100^{\circ}6$.

After that of February 2nd, 1830, the lowest temperatures are — $7^{\circ}4$, January 21st, 1815; — $6^{\circ}9$, February 22nd, 1810; — $6^{\circ}7$, January 1st, 1812; — $6^{\circ}3$, February 23rd, 1814, and January 31st, 1831; — $4^{\circ}5$, January 2nd, 1811, and December 29th, 1836. On the 15th January, 1838, the minimum at Geneva was — $13^{\circ}5$, the lowest registered in that town since regular observations have been made. The same day at Rossinière the minimum was — 4° .

With regard to the time of year when these extremes have been noticed, I find that the hottest day has never occurred after August 28th, viz., in 1815, with a maximum of $77^{\circ}9$; whilst in 1811, May 31st, and July 19th, were the hottest days of the year, the maximum in each case being $85^{\circ}6$. With the exception of 1811, the hottest day never took place in the month of May. It occurred 15 times in August, 18 times in July, 7 times in June.

In 1807 the moment of greatest cold was on December 10th, $1^{\circ}4$; in 1828 it was on March 8th, $5^{\circ}7$. In the other years it ranged between these extreme limits.

The coldest days occurred 11 times in December, 27 times in January, 10 times in February, and *once* in March.

The coolest summers were 1815 (max. $77^{\circ}9$, August 27th and 28th), 1816 (max. $77^{\circ}9$, August 13th), and 1843 (max. $78^{\circ}8$, July 5th).

The least cold winters were 1818 (min. $15^{\circ}3$, December 30th), 1822 (min. 14° , January 8th), and 1831 (min. $10^{\circ}9$, December 28th, 29th and 31st).

An element interesting to know, to enable us to determine the climate of a locality, is the number of days on which it freezes, and the number of days on which it "freezes all day" in the course of a year. In this respect there is a remarkable approximation between Rossinière and Geneva.

At Rossinière from March 1st, 1799, to December 31st, 1850, (leaving out the months of October, November, and December, 1828, and the whole year 1829, for which the registers are wanting), I find a total of 4834 days during which the thermometer of Mons. Henchoz *has been seen* below 32° , giving a mean of 97 days per year. At Geneva the corresponding figure is 93, but one may be sure this difference of 4 days is too small, Mons. Henchoz's thermometer not being a minimum, and the days taken as days of frost are only those when *at sunrise* the thermometer was below 32° . It is true that, as a general rule, this is the coldest time in the 24 hours, but it happens often when the sky is clear during the night and overcast towards morning that the moment of greatest cold does not take place at sunrise; consequently all the minima which have occurred in this way,

between 10 p.m. and sunrise, could not be ascertained from Mons. Henchoz's thermometer, and 97 cannot be taken as the true number of days of frost at Rossinière. M. Henchoz has ascertained the greatest number of frosty days to have been

128	in the winter of 1837-38,
127	" " 1834-35,
124	" " 1836-37,
121	" " 1816-17,

and the least number to have been

67	in the winter of 1845-46,
68	" " 1839-40,
72	" " 1825-26,
77	" " 1804-05.

The winter of 1845-46 is also that in which at Geneva the number of frosty days was the smallest.

If it be not a matter of wonder that at Rossinière it should freeze oftener than at Geneva, one would, perhaps, be surprised to learn that the number of days on which it "freezes all day" there is small.

At Geneva there is a mean of 23 days per year when the temperature remains all day below 32° . At Rossinière the mean of 50 years gives only 17.6 as the corresponding mean, and had there been a maximum thermometer this mean would probably have been diminished. In short, when Mons. Henchoz saw his thermometer above 32° it is a proof that during that day it thawed; and even if during other days the mercury has risen above 32° between the hours of observation and again fallen below 32° towards one or two o'clock—this fact could not be ascertained by Mons. Henchoz, and the day would be wrongly entered as a day when it "froze all day." Consequently it may be assumed that at Rossinière there are at the utmost 17 days during which the thermometer does not go above 32° *

The anomaly which appears to exist between these observations and those at Geneva is easily explained. On the border of the lake the days on which it does not thaw are ordinarily those when the sky is overcast with clouds. These clouds, however, do not extend to any great height, and while in the plain there exists a great cold under a leaden sky, there is, on the contrary, above the clouds a brilliant sun, and during the day a temperature which reminds you of spring.†

I remember amongst others a winter during which I lived at Orbe. There had been a thick fall of snow when the fog covered the plain. During 10 or 12 days we never saw the sun, and it did not thaw, while at a little higher elevation, such as Romainmôtier and Vallorbes they had magnificent days, and the snow disappeared rapidly. When the fog cleared we saw snow still on the summits of the of the Jura while the intermediate country had none, and presented a zone of curious aspect between two banks of snow. One can comprehend thus that the number of days on which the thermometer does not reach 32° may be less at Rossinière than at Geneva.

To complete my remarks on the temperature it only remains for me to say a few words on the extreme limits of frosty days. Mons. Henchoz never saw his thermometer reach 32° before Sept. 26th,—this occurred in 1812 and 1837; nor after May 28th—this occurred in 1821. The other dates of late frosts were May 17th, 1802 ($25^{\circ}2$)—May 17th, 1803 ($31^{\circ}5$)—May 1st, 1814 ($27^{\circ}5$), and May 12th, 1837 ($25^{\circ}2$).

The frost of May 17th, 1802, is likely to be long remembered by agriculturists. That day nearly all the vines were frozen on the borders of the lake, where so late a frost had not occurred in the memory of man. Some days later the vines budded again, and still gave a sufficiently abundant crop, but of a bad quality. The frost of May 1st, 1826, which was so grievous for the vines of Montreux, was accompanied at Rossinière by a fall of snow. In the morning the sky was overcast, and at sunrise the thermometer stood at $34^{\circ}2$.

* My observations this winter, which was considered here less cold than usual, showed 40 days on which it did not reach 32° between 1st of November and 1st of March.—M. F. W.

† This is certainly the case, having seen here, between 1st November and 31st March, 99 absolutely cloudless days against 49 on the lake.—M. F. W.

I have designedly pointed out the preceding dates as those on which the thermometer was seen below 32°, for it often happens that the temperature on the ground is many degrees lower than that 3 or 6 feet above the ground. It frequently happens, also, that plants are frozen near the earth, although a thermometer suspended at a certain height does not reach 32°.

In the journal of Mons. Henchoz I find notices of many frosts in June, and one on August, 22nd, 1839. The month of July is the only month in which a frost has not occurred during the space of 50 years.

	Days on which it froze during 24 hours.	Days on which it froze all day.
January	23·4	8·4
February	19·1	2·2
March	15·3	0·4
April	5·6 .....	...
May	0·2 .....	...
September	0·1 .....	...
October	2·2 .....	...
November	10·5	0·7
December	20·3	5·9
Annual total	96·7	17·6

It must be observed also that during 50 years observation the number of days when it "froze all day" varied enormously one winter with another, although the number of frosty mornings deviated much less from the general mean.

BAROMETER.—I do not mention the barometric observations of Mons. Henchoz because his instrument, in addition to not indicating the temperature of the mercury, was otherwise not sufficiently perfect to enable conclusive results to be drawn.

WIND.—As would be expected, the prevailing winds at Rossinière are those which blow in the direction of the valley—viz., N.E. and S.W. The duration of these winds have, however, surprised me. Often during an entire month the same wind is constantly noted at all the hours of observation.

RAIN.—The number of rainy days is not clearly indicated, except from 1834 to 1850. During this period of 16 years there were 2,560 days on which rain or snow fell. These days were distributed as follows:—

Year.	Days.	Year.	Days.
1835	150	1843	158
1836	157	1844	157
1837	146	1845	182
1838	156	1846	170
1839	164	1847	150
1840	153	1848	156
1841	165	1849	157
1842	158	1850	181

Mean of 16 years = 160 days per year.*

At Geneva the corresponding figure is only 117·7 days, and at the Gt. St. Bernard 128·9.

The following table shows how the days of rain are distributed in the different months at Geneva, Rossinière, and the Great St. Bernard:—

	Rossinière.	Geneva.	Gt St. Bernard		Rossinière.	Geneva.	Gt St. Bernard
January...	11·8	9·9	14·4	July ..	14·6	8·9	7·7
February	10·4	8·1	9·9	August...	15·9	9·8	8·0
March...	12·4	9·3	12·5	Sept. ..	13·3	11·6	10·1
April ...	14·8	9·3	11·2	Oct. ...	12·8	10·3	12·7
May ...	16·7	11·2	12·0	Nov. ...	11·4	10·8	12·5
June ...	16·8	9·5	7·9	Dec. ...	9·1	9·0	10·0
Yearly total ..	160·0	117·7	128·9				

* In the half-year beginning 1st October, 1873, and ending March 31st, 1874, there were 38 days on which rain or snow fell.—M. F. W.

The difference between the number of wet days at Rossinière and Geneva does not surprise me, considering the number of times during the year one sees (from the lake) rain or snow falling on the mountains, although in the plain the sky is overcast without rain falling. It appears that the relative number of rainy days at St. Bernard would be in contradiction of the fact I have just quoted; but it must be observed that I have only spoken of places in the vicinity of the lake, and that St. Bernard, situated on a high pass, exposed to other winds than those of the plains, finds itself under very different meteorological circumstances, and, therefore, one cannot make a comparison. It is much to be regretted that Mons. Henchoz had not a rain gauge, so as to have indicated the amount of rainfall as well as the number of days.

THUNDER.—During the same period, 1834 to 1850, there were 354 days on which thunder was heard.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total,
1835	2	9	8	9	.	.	.	.	28
1836	1	6	1	6	2	1	.	.	17
1837	1	2	6	4	9	1	.	.	.	23
1838	9	8	2	2	1	.	.	.	22
1839	6	3	4	3	.	.	.	.	16
1840	2	1	7	4	6	1	.	.	.	21
1841	1	5	3	4	5	1	1	.	.	20
1842	4	6	5	7	9	1	.	.	.	32
1843	2	2	.	2	5	2	.	.	.	13
1844	2	2	4	1	7	2	1	.	.	19
1845	1	3	6	2	3	1	.	.	16
1846	2	.	1	18	6	6	6	.	.	.	39
1847	2	.	5	4	8	9	.	.	.	.	28
1848	1	.	.	5	2	3	4	3	.	.	.	18
1849	3	6	4	4	5	2	.	.	24
1850	1	.	.	2	2	7	5	.	.	.	1?	18
Total	2	4	12	53	86	71	91	28	6	.	1?	354
Mean	0.1	0.25	0.75	3.3	5.4	4.4	5.7	1.75	0.4	.	0.1	22.1

From this table it results—

1st. That from 1834 to 1850 thunder has never been heard in January or November. In December there was only Dec. 17th, 1850, when Mons. Henchoz remarked "They say thunder was heard in the night."

2ndly, June, 1846, shows a really extraordinary number of days on which it thundered.

3rdly, From 1834 to 1850, May, June, July, and August never passed without thunder, June, 1843, being the sole exception.

From 1799 to 1850 lightning has only struck 3 times in or near Rossinière, and then it did little damage.

Hailstorms were tolerably frequent.

VARIOUS OBSERVATIONS.—As I have already said, at the end of each month Mons. Henchoz made notes of the principal meteorological phenomena, which he had remarked, and which did not come in his ordinary list of observations.

It is here that one finds the budding and fruiting of plants, the appearance and disappearance of certain animals, etc. If, instead of giving only *many* observations of this kind Mons. Henchoz had given *all*, he would have left a magnificent and valuable series of periodical observations, such as Mons. Quetelet has urged for many years, and which would probably have given important results for the natural philosophy of the earth.

In the manuscripts of Mons. Henchoz I have found from 1799 to 1850 records of five earthquakes, viz.:—

Marth 11th, 1817	..... ..	9.30 p.m.
Dec. 22nd, 1817	..... ..	5.0 p.m.
Feb. 19th, 1822	..... ..	9.0 a.m.
Oct. 24th, 1824	... ..	7.45 p.m.
July 12th, 1847	..... ..	during the night

Under date August 24th, 1802 Mons. Henchoz writes.—

“All the Oberland of Vaud, Gruyère, and part of the Bernese Oberland, were enveloped in a species of fog of a peculiar nature, and which was generally attributed to the burning of a large forest near Sierre, in Canton Valais—a forest which was consumed during the night of 22—23rd August.”

I attach importance to this entry because, during the dry fogs which covered a great part of Europe in 1831, and particularly in 1783, many people thought the earth was passing through the tail of a comet. It was soon discovered, however, that this theory was inadmissible, and it is thought that these fogs were caused by the gases proceeding from the earth's centre, and by the smoke of volcanoes during earthquakes, as well as volcanic eruptions which took place at these two periods. However, it seemed difficult to admit that the smoke of a few volcanoes could cover a whole continent. Nevertheless, we see here, that the burning of a forest which only lasted one night was sufficient to cover with smoke a considerable district, comprising perhaps an area of 1,550 square miles. Much more then would the smoke of a volcano cause fogs equally extensive as those of 1783 and 1831.

Finally Mons. Henchoz remarks that during the autumn of 1811 all root crops were ravaged by myriads of black caterpillars of a species hitherto unknown.

A similar pest appeared in 1853, and the larvæ were made the subject of a communication by Mons. Alexis Forel in June, 1854.

In 1812, as in 1854, there was no trace of the creatures which had done so much mischief the preceding year. I draw no conclusion from this fact. I merely wish to call the attention of those who took up and interested themselves in the question of the black caterpillars of 1853, to their appearance also in 1811.

OBSERVATIONS OF THE AURORA BOREALIS AND THE ZODIACAL LIGHT MADE AT BIRR CASTLE IN THE YEARS 1873 and 1874, by MR. RALPH COPELAND, Assistant Astronomer.

(Communicated by the Right Hon. the EARL OF ROSSE, F.R.S., &c.)

THE observations were made in the following manner: if the sky was tolerably clear and the moon below the horizon, the 6 ft. telescope was used for examining the nebulae, and the observer had a good opportunity of detecting any aurora from the galleries of that instrument. Under other circumstances the sky was casually looked at during the course of the evening, a thorough examination being made at midnight (Greenwich time)* a record being made then, or on finally closing the observatory for the night. If any aurora was seen it is recorded by the insertion of the letter (A) in the following table at the correspond-

* The observations are, however, referred to Dublin time.

ing date, the brightness of the aurora being occasionally modified by an appended (f) faint, and this again by (v) very, or (e) excessively. If the sky had been, at least occasionally, sufficiently free from cloud to permit of a fair examination, and no aurora was seen, the fact is shown by an (n) in the table; the letters (cl) denoting, on the other hand, that the sky was completely obscured by clouds or dense haze. The disturbing presence of the moon is indicated by a (☾). On three occasions no observation was made. Particulars of some of the auroræ and occasionally of the zodiacal light are given in the notes below, which are referred to by the small figures. It will be seen from the summary that more or less aurora was detected on thirty out of one hundred and fifty one nights on which observation was possible, or on one night in every five.

Table of Auroræ.

1873.						1874.				
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April	May.
1	...	n	n	(n	cl	cl	(cl	(cl	(cl	(n
2	...	n	cl	(A ¹⁴	cl	cl	(n	(cl	(n	(n
3	..	(n	cl	(n	cl	(n	n ²²	(cl	(n	A ³⁵
4	...	(n	(n	cl	cl	(n	A ²³	(cl	(n	cl
5	...	(n	(n	cl	cl	(n	A ²⁴	(cl	n	cl
6	..	cl	(n	cl	cl	(n	cl	n ²⁷	n	A ³⁶
7	...	cl	(n	cl	(n	cl	n	A ²⁸	A ³²	n
8	...	cl	cl	(n	cl	n	n	n	cl	n
9	...	n	cl	n	(f A ¹⁵	n	n	A ²⁹	A ³³	n ³⁷
10	...	n	n	cl	n	n	cl	n ³⁰	n	n
11	...	n	A ¹⁰	n	n	cl	cl	cl	n	n
12	...	n	A ¹¹	cl	cl	A ¹⁷	n	n	cl	n
13	...	cl	n	cl	cl	n	n	n	cl	n
14	...	cl	n	cl	cl	cl	n	cl	e f A ³⁴	cl
15	A ¹	A ⁶	cl	n	cl	cl	n	cl	cl	cl
16	n	cl	cl	n	cl	A ¹⁸	cl	cl	n	cl
17	cl	n	cl	cl	cl	cl ¹⁹	A ²⁵	n	cl	n
18	n	n	f A ¹²	cl	n	cl	f A ²⁶ ?	A ³¹	cl	...
19	cl	cl	cl	cl	n	cl	cl	no obs	cl	...
20	n	A ⁷	n	cl	n	n	cl	no obs	cl	...
21	v f A ²	A ⁸	cl	cl	cl	cl	n	no obs	(n	...
22	f A ³	n	n	cl	n	cl	n	n	(n	..
23	e f A ⁴	n	n bef ⁸	cl	n	cl	(n	cl	(n	...
24	cl	n	n	n	cl	cl ²⁰	(cl	n	(cl	...
25	cl	cl	n	cl	n	cl ²¹	(cl	n	cl	...
26	cl	n	cl	n	A ¹⁶	cl	(n	cl	n	...
27	n	cl	n	n	n	cl	(n	n	(cl	...
28	n	n	n	cl	(n	cl	(n	cl	(cl	...
29	n	A ⁹	cl	(n	(n	(cl	..	(cl	(n	...
30	cl	cl	A ¹³	(n	(n	(cl	...	cl	(n	...
31	A ⁵	...	cl	...	(n	(cl	...	(n	...	...

Summary.

	1873.					1874.					Totals.
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May.	
	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.
cl	6	10	12	17	15	20	9	14	13	5	121
A	5	4	4	1	2	2	4	3	3	2	30
n	6	16	15	12	14	9	15	11	14	10	122
No obs	...	...	...	..	...	...	...	3	...	...	3
Days..	17	30	31	30	31	31	28	31	30	17	276

NOTES.

Aug. 15th. (1.) Shortly after midnight a bright aurora was seen through a gap in the clouds near the horizon in the N.N.W.

Aug. 21st. (2.) Very faint aurora in N.N.W.

Aug. 22nd. (3.) Faint aurora in N.N.W.

Aug. 23rd. (4.) Excessively faint aurora in N.N.W., N., and N.N.E. about midnight. A streamer under δ Ursæ majoris at 13h. Dublin time.

Aug. 31st. (5.) Strong auroral gleam through a gap in the clouds in the N.W.

Sept. 15th. (6.) A few auroral rays about 11 p.m. in N.N.W.

Sept. 20th. (7.) At 12h. much auroral light in N.W. b. N. ; a dark segment some 4° high in azimuth N. 34° W. Ill-defined streamers nearly vertical from horizon towards η and ζ Ursæ majoris. Aurora almost entirely gone by 12½h.

Sept. 21st. (8.) 9½h., bright aurora ; low dark segment 3° to 4° high ; a few streamers 14° to 15° long in N.W. The aurora disappeared and came on again about midnight. At 15½h. the zodiacal light was very bright.

Sept. 29th. (9.) Moderately bright aurora low down in N.W.

Oct. 11th. (10.) Faint aurora ; a faint vertical ray at 8 p.m.

Oct. 12th. (11.) Faint aurora.

Oct. 18th. (12.) Aurora low down in N.W.

Oct. 30th. (13.) Bright aurora low in N.N.E. at midnight.

Nov. 2nd. (14.) Moonlight ; there seemed to be a considerable amount of aurora low down in N.W.

Dec. 9th. (15.) Some faint aurora low in N.N.W.

Dec. 26th. (16.) Faint but decided aurora at 12h. in N.N.W.

Jan. 12th, 1874. (17.) Bright auroral light, very low down in N.N.W. from 9½h. to 11½h.

Jan. 16th. (18.) Aurora in N.W., low down over a permanent, irregular-outlined, very dark cloud ; very bright at 13h., but without rays.

Jan. 17th. (19.) Sky clear for a short time after sunset. The zodiacal light extended nearly to α Arietis (long. 36° , lat. $+10^\circ$) between Mars and ζ Aquarii. The sun's long. was $297\frac{1}{2}^\circ$, whence the zodiacal light extended nearly $98\frac{1}{2}^\circ$ from the sun.

Jan. 24th. (20.) Clear evening, followed by dense clouds ; no aurora seen.

Jan. 25th. (21.) Ditto, ditto.

Feb. 3rd. (22.) Diffused zodiacal light seen.

Feb. 4th. (23.) Aurora seen in twilight as diffused cloudy masses. 6h. 26m. Dublin time. Aurora extends from east to west, a little south of the zenith, through Pegasus, the head of Aries, the Pleiades and the middle of Gemini in diffused masses. 6h. 30m. Straight streamers in N.E. and N.W. 6h. 36m. Formed a very symmetrical figure like a cusped gothic arch ; the segment east of Procyon rose immediately, and at 6h. 39m. the same figure was repeated, with the central segment rising up to Auriga. 6h. 49m. Intense streamers. 7h. 16m. 20s. A brilliant corona was formed to the north of a convergence point, which was 1°

west of α Aurigæ. Hence altitude of convergence-point, $68^{\circ} 55'$; azimuth S. $20^{\circ} 40' E$. Aurora of an intense red. 7h. 17m. 20s. Convergence point 1° north of α Aurigæ or altitude $69^{\circ} 40'$; azimuth S. $23^{\circ} 34' E$. 7h. 27m. 9s. Intense dancing rays, making about five pulsations per second, with one quiet patch near the convergence point, through which α Aurigæ shone with intense brilliancy, reminding one of Arcturus seen through the tail of Donati's comet. The aurora remained more or less visible until between 9 and 10 o'clock.

Feb. 5th. (24.) Faint aurora in N.N.W. at $11\frac{1}{2}$ h.

Feb. 17th. (25.) Auroral light about midnight—low.

Feb. 18th. (26.) Brilliant zodiacal light, Mars, lat. 0° , in the axis. The point was beyond α Arietis, but about 8° to the south, say lat. $+2^{\circ}$, long. 37° . The sun's long. $=330^{\circ}$, whence the zodiacal light extended about 67° from the sun. No very decided aurora; perhaps a gleam of light on the horizon in N.

Mar. 6th. (27.) Very bright zodiacal light extending to half-way between α Tauri and the Pleiades, lat, $+3^{\circ}$, long. 59° . The sun's long. being 346° , the light reached 73° from the sun.

Mar. 7th. (28.) Very bright aurora from about 8h. until 13h. Time fully occupied in observing nebulae.

Mar. 9th. (29.) An aurora, consisting of a low segment and arch, seen at $14\frac{1}{2}$ h. Zodiacal light seen in the evening.

Mar. 10th. (30.) Bright zodiacal light seen.

Mar. 18th. (31.) Very faint aurora at midnight.

Apr. 7th. (32.) Aurora; dark segment. At 12h. 35m. the azimuth of the centre of the arch was N. $24^{\circ} 2' W$., while its altitude was $23\frac{1}{4}^{\circ}$. The aurora was seen as early as half-past 9 to 10, by the amanuensis Mitchell, with rays shooting upwards, one of which moved round in the direction of increasing right ascension.

Apr. 9th. (33.) Faint aurora at 9h. 20m. p.m.

Apr. 14th. (34.) Scarcely perceptible aurora.

May 3rd. (35.) Equable auroral light in N.N.W.

May 6th. (36.) Much light in the north at midnight; it was thought at the time to be twilight, but as the sun was $20^{\circ} 12'$ below the horizon it must have been aurora.

May 9th. (37.) Sky clear; no twilight or aurora at midnight; see preceding note.

ATMOSPHERIC ELECTRICITY.

To the Editor of the Meteorological Magazine.

SIR,—Allow me to offer to your readers a remark or two on *one* point in Mr. Stow's admirable essay on "Scotch Mist," in *British Rainfall* for 1873. In describing the Polar rains the author speaks of the two bodies of air, the Equatorial and Polar currents, rapidly mixing and producing violent precipitation, "while the opposite electrical states of the contending bodies of air frequently give rise to thunder and lightning." I am not quite clear as to whether the two portions of *air*, arriving from different parts of the atmosphere warmer and colder, are in differently electrified states. Both streams contain aqueous vapour, that in the equatorial current approaching the state of maximum density at its then temperature; and that in the polar being most probably considerably below this point. The [dry] air in both streams being a non-conductor and a most perfect insulator, the particles of vapour are ready to receive a positive electric charge immediately on their passing from the gaseous state into that of condensed vapour as dew, cloud, rain, or snow. It is at this moment that the earth in a superlative degree, or the neighbouring clouds by induction, exhibit the

opposite charge, and when the process is greatly exalted thunder and lightning occur. To me it appears that so soon as the cold heavy polar current streams down and mixes with the intensely heated and moist equatorial current, condensation is rapidly induced, and an exalted electric tension of the condensed particles is the result, the dry air of the polar current completely insulating them and preventing the escape of the electricity to the earth. This view restricts the production of electrical phenomena in the atmosphere to the condensation of aqueous vapour irrespective of the distinction of the aerial currents containing it. Polar currents almost invariably exhibit high electrical tension, the annual maximum occurring in January. It is, however, in the summer, about the time of minimum tension, that thunderstorms are most frequent, when, as stated by Mr. Stow, the cold dry air of the polar current streams down, insulating the charged particles and preventing a restoration of the equilibrium until a discharge takes place.

I cannot conclude without expressing my great admiration of Mr. Stow's most valuable essay. There can be no question that the subject of rainfall is daily increasing in interest, and papers such as Mr. Stow's cannot fail of enlarging our knowledge of so important a branch of meteorology.

Yours truly,

W. R. BIRT.

Walthamstow, May 19th.

THE POCKY CLOUD.

To the Editor of the Meteorological Magazine.

SIR,—I have the pleasure of enclosing to you a slight sketch of a most remarkable form of clouds which I saw here on the 7th of May. The view is taken as seen from Woodlands, looking over Elterwater Tarn, with Oxenfell in the distance. The time was 5 p.m., and the engraving [*See frontispiece*] represents the south-eastern sky, in which direction the clouds proceeded from the north-west. A small quantity of rain fell, and there was a muttering of thunder. The following are the instrumental readings for the 6th, 7th, and 8th of May, and remarks :—

Wednesday, 6th.—A cloudy day with few slight showers of R. Wind, W. and veering to W.N.W.

Bar.	Att. Ther.	Dry Bulb.	Wet Bulb.	Air Min.	Grass Min.	8 a.m. in shade.	Max. in shade.	Rain.
29.60	54°	48°	44°	38°	34°	48°	57°	—

Thursday, 7th.—A shower of H at 10 a.m., and T in the afternoon at 5 p.m. with R. Wind, N.W.

Bar.	Att. Ther.	Dry Bulb.	Wet Bulb.	Air Min.	Grass Min.	8 a.m. in shade.	Max. in shade.	Rain.
29.46	53°	47°	44°	39°	34°	47°	54°	.02

Friday, 8th.—Snowballs, showers and a little sleet and R. Wind, North-West.

Bar.	Att. Ther.	Dry Bulb.	Wet Bulb.	Air Min.	Grass Min.	8 a.m. in shade.	Max. in shade.	Rain.
29.47	53°	45°	40°	30°	27°	45°	52°	.02

The clouds presented to my eye very much the appearance of so

many balloons inflated to the fullest extent. I quite expected to see something like a water-spout every moment, but all the clouds passed over without anything of the kind occurring that I am aware of.

Yours truly,

E. TUCKER, JUNR.

Woodlands, Elterwater, Ambleside, June 2nd.

[We regard this letter and sketch with considerable interest as an entirely independent description and illustration of the cloud to which the name given by Dr. Clouston (who was the first to observe and describe it) will, we presume, always be attached. The present sketch should be compared by all our readers with that given in Dr. Clouston's *Explanation of the Popular Weather Prognostics of Scotland*, (Longman's), and if they will also refer to Vol. III., p. 81, of this Magazine, they will find some further particulars.—Ed.]

SOLAR HALOS AND PARHELIA.

To the Editor of the Meteorological Magazine.

SIR,—On Sunday evening, 17th May, 1874, at six o'clock, I noticed a very distinct circular ring of light round the sun, having a diameter of about 40° ; the sky within the ring seemed somewhat darker than that beyond it; the sky was cloudless, but on the circle due right and left of the sun, on either side, was a parhelion, and the prismatic colours were very distinct in the arcs of the circle which crossed the two parhelia. These were at times well defined, but occasionally appeared elongated into elliptical white images of the sun.

The circle was very well defined all round the sun, except near the horizon, which was somewhat hazy.

It continued more or less defined till sunset.

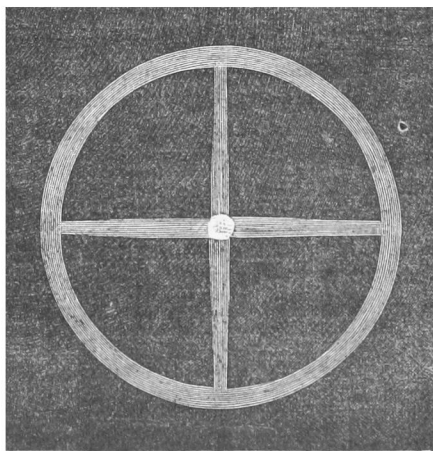
B. STREET.

Barnetby Vicarage.

LUNAR HALO.

To the Editor of the Meteorological Magazine.

SIR,—On the evening of May 1st, about nine o'clock, George Harrap, pupil of Mr. J. H. Beale, of this town, while standing on the lawn in front of the latter's house, noticed a faint haze spread over



the moon, in which an ill-defined luminous circle, about 4° in diameter soon became visible, connected with the moon by vertical and horizontal radii. Soon afterwards a brilliant *mock moon* made its appearance about 12° to the N.E. of the true moon, and at an elevation of 30° above the horizon. At first it was somewhat elongated in a horizontal, afterwards in a vertical, direction, and finally became circular; and it showed bright prismatic colours—the violet towards the moon. Mr. Beale, and his son, Mr. Harold Beale, coming out, also saw the halo and the mock moon, and were particularly struck by the brilliancy of the whole phenomenon, which was visible for ten minutes.

Yours, &c.

T. BEESLEY, F.C.S.

Analytical Laboratory, 5, High-street, Banbury.

RAIN GAUGES AND THE VIENNA CONFERENCE.

We are very glad to find that the views enunciated in *British Rainfall*, 1873, have independently the support of our excellent contemporary *Nature*, in which the following paragraph appeared after the writing, but before the publication, of the note in *British Rainfall*.

We may also mention that a very high continental authority has expressed in strong terms his conviction that the decision must be rescinded. The following is the able paragraph in *Nature* :—

“As regards rain-gauges, the Congress adopted as the best form for the receiver of the rain-gauge the circular one, with a diameter of 14 in., and at a height of 3 ft., or better $4\frac{1}{2}$ ft., above the ground, a decision which was agreed to by all the delegates except Mr. Buchan, who lodged his protest against it. We have taken the trouble of looking over Mr. Symons' *British Rainfall*, 1872, and observe that there are not more than half a dozen gauges in the British Isles of this dimension. The readers of *Nature* are no doubt aware of the extensive experiments and observations made on this subject in England for some years past, and published annually in the *British Rainfall*, from which it has been experimentally proved that gauges of all sizes from 3 in. to 24 in. inclusive collect amounts not differing more than two per cent. from each other. We have had a communication from Mr. Scott, by which we are glad to learn that the Meteorological Office has resolved to retain at its stations the 8 in. gauges hitherto in use. This decision as to the size of the gauge a future Congress will no doubt rescind. Equally in error is the decision as regards height of gauge above the ground, especially large gauges. It is certain from numerous observations made on the subject, that gauges placed at from 3 ft. to $4\frac{1}{2}$ ft. above the ground will not indicate with sufficient correctness the amount of the rain which falls at the place of observation in cases where wind accompanies the rain, owing to the disturbance caused by the obstruction offered by the gauge itself, and by the eddies generated within the funnel. Now owing to the enormous dragging influence of the earth's surface of the wind, these disturbing effects are reduced several fold at the surface and at one foot above it as compared with 3 to $4\frac{1}{2}$ ft. high. On these grounds we cannot recommend British Meteorologists to follow the decision of the Congress. Owing to the extreme variableness of the rainfall, particularly in such countries as Great Britain, where the surface is so uneven, the proper observation of the rainfall requires twenty times more observers than are required to observe any of the other meteorological elements. It is, therefore, well that a cheap gauge is also a good one, since it facilitates an adequate observation, through numerous observers, of the rainfall, which from its practical and scientific bearings it is so important to know.”

MAY, 1874.

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.	Difference from average 1860-5	Greatest Fall in 24 hours.		Max.		Min.				
				Dpth.	Date.			Deg.	Date.			
		inches	inches.	in.			Deg.	Date.	Deg.	Date.	In shade	
I.	Camden Town	1.14	— 1.26	.66	25	7	73.9	27	33.3	9	0	
II.	Maidstone (Linton Park)	1.21	— 1.03	.25	8	11	82.0	22	28.0	10	8	
III.	Selborne (The Wakes) .....	.42	— 2.06	.14	22	5	69.2	28	27.5	10	10
III.	Hitchin .....	.62	— 1.31	.14	25	10	68.0	22*	29.0	1,10	10
IV.	Banbury	1.76	— .46	.43	25	10	70.5	27	29.0	9	4	
IV.	Bury St. Edmunds (Culford) .....	.49	— 1.67	.15	14	10	74.0	31	24.0	16	15
V.	Bridport .....	.65	— 1.38	.24	3	9	73.0	25	28.5	9	6
"	Barnstaple .....	.70	— 1.74	.19	21	8	71.0	31	34.0	10	0
"	Bodmin	1.06	— 1.40	.50	21	12	69.0	31	34.0	11	0	
VI.	Cirencester	1.01	— 1.27	.26	3	10	...	...	...	...	...
"	Shifnal (Haughton Hall)	1.98	— .28	1.01	23	13	68.0	27+	32.0	2,16	2	
"	Tenbury (Orleton)	2.05	— .83	.83	22	10	70.2	27	28.5	10	7	
VII.	Leicester (Wigston)	1.24	— .88	.39	23	15	73.0	31	29.0	1,8	5	
"	Boston .....	.85	— 1.09	.20	3	12	73.0	26	32.0	10	1
"	Grimsby (Killingholme)	1.41	...	.31	8	16	68.0	31	34.0	2,4+	0
"	Derby	1.33	— .83	.35	8	12	70.0	27	31.0	8	1	
VIII.	Manchester	1.40	— 1.26	.43	24	17	70.3	26	29.0	9	2	
IX.	York	1.96	+ .01	.43	23	15	65.0	27	32.0	17	1	
X.	Skipton (Arncliffe)	2.52	— .83	.39	7	20	66.0	31	28.0	16	...	
"	North Shields	2.30	— .34	.73	23	15	...	...	...	...	...
"	Borrowdale (Seathwaite)	2.82	— 6.72	.53	29	13	...	...	...	...	...
XI.	Cardiff (Ely)	1.35	— 1.25	.72	26	6	...	...	...	...	...
"	Haverfordwest .....	.97	— 1.75	.30	14	9	67.1	30	30.0	10	4
"	Rhayader (Cefnfaes) .....	.90	— 1.95	.26	23	6	69.0	...	31.0	...	...
"	Llandudno	2.68	+ .30	1.03	28	11	65.8	31	36.6	2	0	
XII.	Dumfries	1.35	— 1.04	.42	14	15	69.0	18	30.5	16	1	
"	Hawick (Silverbut Hall)	1.72	...	.32	24	15	...	...	...	...	...
XIV.	Kilmarnock (Annanhill)	2.17	...	.24	14	10	62.4	19	30.0	16	4
XV.	Castle Toward	2.63	— .76	.47	28*	8	...	...	...	...	1
XVI.	Leven (Nookton)	1.74	— .26	.55	24	14	66.0	31	30.0	16	3	
"	Stirling (Deanston) .....	...	...	...	...	...	...	...	...	...	...
"	Logierait	1.02	...	.24	29	10	78.0	17	29.0	15	8
XVII.	Braemar	1.20	— .60	.31	14	12	62.3	17	28.1	11	5	
"	Aberdeen	1.56	...	.33	24	15	66.3	30	31.7	16	1
XVIII.	Portree	5.04	— .61	1.21	30	19	...	...	...	...	...
"	Loch Broom	1.45	...	.22	10	15	...	...	...	...	...
"	Inverness (Culloden)	1.59	+ .03	.41	15	14	62.6	17	30.5	16	1	
XIX.	Helmsdale	2.03	...	...	...	...	...	...	...	...	...
"	Sandwick	1.41	— .85	.35	26	14	58.8	31	35.3	15	0	
XX.	Caherciveen Darrynane Abbey	1.20	...	.21	10	17	...	...	...	...	...
"	Cork .....	.18	...	.10	30	5	...	...	...	...	...
"	Waterford .....	.52	— 1.73	.17	22	13	69.0	19	26.0	9	1
"	Killaloe	1.60	— 1.58	.55	28	15	75.0	23	30.0	10	2	
XXI.	Portarlington	1.48	— 1.72	.40	29	18	67.5	18	30.0	2	4	
"	Monkstown, Dublin	1.38	— .53	.60	28	10	71.0	16	29.0	3	8	
XXII.	Galway	3.09	...	.58	17	14	72.0	20	32.0	11	1
"	Ballyshannon	1.50	...	.36	29	19	...	...	...	...	...
XXIII.	Waringstown .....	.75	...	.19	28	11	75.0	19	28.0	3,9	2
"	Edenfell (Omagh)	1.93	...	.83	29	16	67.0	23	28.0	9	4

* And 30.

† 28 & 30.

‡ 9 & 18.

§ And 16.

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

METEOROLOGICAL NOTES ON MAY.

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

ENGLAND.

LINTON PARK.—First 21 days very cold, with frequent frosts, after that it was more mild. T on 8th, 23rd, and 25th, the last-named day very severe, killing two men and injuring several others in a cricket field four miles from here; R at the time very moderate. Only 0·16 frosts on 8 nights, that on the 10th so severe that a basin of water standing on the grass near the house was frozen sufficiently hard to be turned upside down without the water coming out. Winds (never high) mostly N. and N.E., except during the last ten days. May has been a dry, ungenial month, with a greater number of frosty nights than any previous one at this place for upwards of 20 years. There were indications of frosts on 4 other nights besides the 8 above mentioned.

CULFORD.—An exceedingly dry and cold month, the min. temp. falling under 32 deg. during every night for the first 11 days. The mean temp. of the month below that of April. Slight H storms on 3rd, 5th, 7th, 8th, and 9th. T heard on 23rd and 24th, but no rain fell. Easterly winds on 8 days and Westerly on 23 days.

BRIDPORT.—This month has been noticeable for the high temp. and fine weather almost the entire month; small amount of R; the frosts were severe, and cut most of the potatoes; ice on the 9th.

SHIFNAL.—An unusually cold May till the 25th, when the temp. rose 7 deg., from 60 deg. to 67 deg., and continued high to the close. Occasional showers till the 15th, when distant T was heard, and cumuli clouds denoted it for many days more. Copious R set in on the 21st, followed by a great fall (1·01 in.) next day, which greatly relieved the dried up ground; frequent frosts at night till the 18th, and on the 16th so sharp that in the lower grounds potatoes were cut down, and the young leaves of ash and walnut quite killed. Prevailing winds from N.W. to N.E.; bar. very equable throughout. Cuckoos and white butterflies numerous, queen wasps few, swallows first seen here on the 2nd, orange-tipped black fly on 25th, grey flycatcher (very late) on 27th; oak in full leaf on 12th, ash in leaf on 30th (very late).

BOSTON.—Early potatoes cut off by the frosts; fruit not much injured, the weather being very dry. Grass being very scarce and backward, wheat and other crops looking well. Chesnuts in flower on 8th, may on the 10th, oak in leaf on 20th, ash not in leaf at the end of the month.

GRIMSBY.—The month was cold up to the 27th; the corn crops looking well, and a prospect of a good crop of apples; springs, streams, and ponds very low. One clap of T on the 6th at 1 p.m. Horse chesnut began to flower on 1st; monthly rose began to flower on 24th; purple beech leafing on 2nd; potatoe crop cut by frost on 17th; lesser white throat heard on 8th; spotted flycatcher seen on the 30th.

MANCHESTER.—H on 7th and 8th; S on 8th.

ARNCLIFFE.—A forward season; rainfall below the average of May; an unusual prevalence of N. and N.E. winds till the last week.

SEATHWAITE.—The greatest fall was considerably under an inch, and the total fall nearly 6½ in. below the average.

WALES.

CEFNFAES.—The month unusually cold and dry, with frosts at night; wind generally N.E. or N.W.

LLANDUDNO.—Mountain ash in flower on 8th, hedge rose gathered on 11th, landrail heard on 12th; S on the distant hills from 9th to 13th inclusive; H on 8th, 9th, 10th, and 11th; TS on 9th.

SCOTLAND.

DUMFRIES.—Although north-easterly and easterly winds have prevailed during the month, the weather has not been quite so dry as the May of last year; but little R during first two weeks; heavy E on 14th, then dry for a week, and last week refreshing showers. S on the 9th; frost on several nights, but except on morning of 16th did no injury. Night temp. nearly 3 deg. higher than May, 1873, but during the day very little difference, mean of the month being only 1°·5 higher. Rainfall 0·71 in. under the average of five years. Great display of fruit blossom, and also of hawthorn and wild fruits. Little injury done by frost; pastures luxuriant, and crops looking well.

HAWICK.—Frost on 1st, 3rd, 4th, 6th, 10th, and 15th; S on the hills on the 3rd and 4th. The month has been remarkable for cold east winds and heavy H showers. The hay crop will not bulk heavily in this quarter this season.

CASTLE TOWARD.—This month in general being a favourable one for the employment of all classes, having little or no R, and beautiful sunshiny weather; the latter part of the month chilly Easterly winds, but well adapted for clearing and preparing the soil for the reception of turnip seed, &c., many fields of swedes and others being sown. A copious R having fallen the last few days has moistened the earth, and caused everything to look fresh and healthy. The appearance of fruit scanty for the amount of blossom. Cuckoo first heard, and swallow first seen on the 5th.

BRAEMAR.—A fine month; but, towards the end, rather dry. Grub-worm causing considerable damage to young braird.

ABERDEEN.—Bar. pressure and prevalence of N.E. winds above the average of the last 17 years; the temp., rainfall, and estimated pressure below the average. A month of cold, dry weather, with much easterly wind.

PORTREE.—The month was very cold, with S showers during the day, and frosts at night up to the 23rd, when the wind from N.E. to S. and S.W.; the 30th and 31st were two fearfully wet days, upwards of an inch of rain falling on each of these days.

SANDWICK.—May is generally our driest month, and this year it has been about the average. It has been remarkably free from meteorological phenomena and none were noted. During the first 12 days northerly winds prevailed with a low temperature, never exceeding 49°·1 in the shade; during the last 11 days southerly winds prevailed, and the temperature in the shade rose to 59°.

IRELAND.

DARRYNANE.—The driest May since I have kept a gauge; in fact, the rainfall was less than in any month since I began in 1870. First week, moderate northerly winds and cold; from 10th to 26th, light variable winds and fine weather; last four days, S.W. wind and broken changeable weather. H on 3rd, 4th, and 7th.

WATERFORD.—Prevalence of N. and N.E. winds during great part of the month, the change to the S. during the last few days being attended with but little rain, but almost continuous strong winds.

BALLYSHANNON.—The month has been a fine one, and free from storms. The potatoe crop has progressed favourably, and vegetation in general has made good growth.

RAINFALL IN NORTH-WESTERN EUROPE, NOVEMBER, 1873, TO JUNE, 1874, AND ITS RELATION TO THE AVERAGE.

	FRANCE.																		BELGIUM.						HOLLAND.					
	Carcassonne (Aude). Lat. 43°12' Lon. 2°20' E.			Marcenx (Landes). Lat. 44°0' Lon. 0°50' W.			Vals (Ardèche). Lat. 44°25' Lon. 4°27' E.			Jardin Botanique, Bordeaux. Lat. 44°50' Lon. 0°34' W.			Les Settons, Morvan. Lat. 47°15' Lon. 4°5' E.			St. Martin, Sens. Lat. 48°12' Lon. 3°17' E.			La Villette, Paris. Lat. 48°50' Lon. 2°20' E.			Brussels. Lat. 50°51' Lon. 0°17' E.			Ostend. Lat. 51°13' Lon. 2°55' E.			Utrecht. Lat. 52°6' Lon. 5°5' E.		
	Average for 22 yrs 1849-70.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs. 1865-73.	Actual 1873-74.	Ratio average = 100.	Average for 7 yrs. 1867-73.	Actual 1873-74.	Ratio average = 100.	Average for 9 yrs. 1865-73.	Actual 1873-74.	Ratio average = 100.	Average for 10 yrs. 1859-68.	Actual 1873-74.	Ratio average = 100.	Average for 10 yrs. 1859-68.	Actual 1873-74.	Ratio average = 100.	Average for 10 yrs. 1859-68.	Actual 1873-74.	Ratio average = 100.	Average for 10 yrs. 1861-70.	Actual 1873-74.	Ratio average = 100.	Average for 5 yrs. 1862-66.	Actual 1873-74.	Ratio average = 100.	Average for 26 yrs 1873-74.	Actual 1873-74.	Ratio average = 100.
November	2·61	5·55	213	5·68	5·29	93	5·72	8·27	144	2·81	5·44	193	6·77	6·85	101	1·65	1·26	76	1·61	1·65	103	2·27	1·22	54	2·24	1·13	50	2·15	1·06	49
December	2·37	·39	16	3·16	·59	19	5·02	1·38	27	2·49	·38	15	7·05	2·60	37	1·73	·35	20	1·65	·35	21	2·16	·90	42	1·31	·65	50	2·35	·56	24
January	2·57	·28	11	6·93	1·74	25	3·21	3·35	109	4·11	·91	22	7·91	2·52	32	1·81	·87	48	1·61	1·30	81	2·13	2·25	106	2·13	2·08	98	1·93	1·96	101
February	2·35	1·18	50	3·10	1·96	63	2·47	3·11	126	2·52	1·60	63	5·32	2·44	46	1·30	·95	73	1·22	·75	61	1·70	1·35	79	1·50	·58	39	1·72	1·36	79
March	2·99	·63	21	3·39	1·32	39	2·77	·75	27	2·28	·83	36	5·87	2·48	42	2·13	·35	16	1·81	·47	26	2·04	1·87	92	1·87	2·00	107	1·63	2·48	152
April	2·55	3·35	131	2·44	2·56	105	2·15	1·54	71	2·13	2·10	99	4·29	2·95	69	1·30	·47	36	1·50	·87	58	1·32	·93	71	1·05	·60	57	1·62	·35	22
May	3·57	1·89	53	3·92	1·96	50	3·28	2·40	73	2·50	1·69	68	4·33	3·70	85	2·01	1·02	51	2·24	·87	39	2·67	1·65	62	1·34	1·75	131	1·93	3·17	163
June	2·34	...	...	3·06	...	...	1·14	...	...	2·32	5·75	247	7·05	5·16	73	2·28	1·26	55	2·21	2·05	93	1·94	1·53	79	1·96	1·09	56	2·09	1·65	79

	HOLLAND—con.						BRITISH ISLES.																							
	Helder. Lat. 52°57' Lon. 4°45' E.			Groningen. Lat. 51°37' Lon. 5°57' E.			London. Lat. 51°32' Lon. 0°8' W.			Bodmin. Lat. 50°28' Lon. 4°45' W.			Orleton. Lat. 52°18' Lon. 2°45' W.			N. Shields. Lat. 55°0' Lon. 1°25' W.			Braemar. Lat. 57°0' Lon. 3°25' W.			Sandwick. Lat. 59°6' Lon. 3°22' W.			Killaloe. Lat. 52°48' Lon. 8°25' W.			Dublin. Lat. 53°23' Lon. 6°20' W.		
	Average for 30 yrs 1873-74.	Actual 1873-74.	Ratio average = 100.	Average for 30 yrs 1873-74.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs 1860-65.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs. 1860-65.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs 1860-65.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs. 1860-65.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs. 1860-65.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs 1860-65.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs 1860-65.	Actual 1873-74.	Ratio average = 100.	Average for 6 yrs. 1860-65.	Actual 1873-74.	Ratio average = 100.
November	2·43	1·28	52	2·26	·89	39	2·41	1·87	78	4·98	6·06	122	2·47	1·59	64	2·70	1·30	48	2·82	4·82	171	4·00	4·69	117	4·89	3·19	65	2·89	1·85	64
December	2·33	·83	36	2·05	1·10	54	1·50	·48	32	5·24	1·32	25	2·46	·62	25	2·20	·29	13	3·77	3·16	84	3·97	4·29	108	3·49	2·52	72	2·62	·71	27
January	1·87	2·13	114	1·85	1·39	75	1·95	1·18	65	5·19	6·12	118	2·53	2·51	99	2·11	1·50	71	3·13	2·91	93	3·29	3·98	121	4·86	4·35	89	3·39	2·19	65
February	1·48	·94	63	1·70	·91	53	1·22	·91	75	2·79	5·40	193	1·57	3·06	190	1·53	·96	63	1·98	2·54	128	2·48	1·39	56	2·90	2·43	84	1·64	3·22	196
March	1·49	2·46	165	1·59	2·14	135	2·08	·39	19	3·75	2·08	55	2·42	1·04	43	2·35	1·04	44	2·21	2·32	105	3·33	3·46	104	4·32	3·25	75	2·58	·78	30
April	1·47	·54	37	1·63	·59	36	1·13	1·26	111	1·70	2·56	151	1·54	1·59	103	1·31	·72	55	1·40	2·42	173	1·74	2·10	121	2·13	3·46	162	1·64	1·11	68
May	1·41	1·41	100	1·89	1·75	92	2·40	1·14	48	2·46	1·06	43	2·88	2·05	71	2·64	2·30	87	1·80	1·20	67	2·26	1·41	62	3·18	1·60	50	1·91	1·38	72
June	1·41	·97	69	2·35	1·81	77	3·05	2·05	67	4·04	2·15	53	3·52	1·15	33	2·74	1·00	37	3·44	2·45	71	1·54	1·67	109	3·63	1·48	41	2·61	·82	31