

S Y M O N S ' S
M O N T H L Y
M E T E O R O L O G I C A L M A G A Z I N E .

CCCXCVII.]

FEBRUARY, 1899.

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M E T E O R O L O G I C A L O B S E R V A T I O N S A T C A M D E N
S Q U A R E , L O N D O N , N . W .

WE pointed out last year that only some features of the above record could be dealt with in the single page devoted to each month ; but (as we were not sure that we could carry it out) we did not refer to that which we have now arranged to do—namely, to give a second series of tables entirely different from the others, but which had to be prepared before the others could be drawn up.

The head lines of the following table are, we think, sufficiently explicit, but they have had to be stated so briefly that perhaps some persons would like them amplified a little. Of course, the arrangement and definitions will be identical in each of the twelve months.

RAINFALL.—1, Total depth ; 2, Total number of days with $\cdot 01$ in. ; 3, Maximum fall in any one day (the *date* had to be omitted for want of room) ; 4, Number of instances of a fall of 1 inch or more.

TEMPERATURE.—5, Mean of all the dry bulb temperatures at 9 a.m. and at 9 p.m. ; 6, Similar means for the wet bulb temperatures ; 7, Absolute, and 8, Average, max. temp. in shade ; 9, Absolute, and 10, Average, min. temp. in shade ; 11, 12, 13, 14, need no comment ; 15 is the mean of observations at 9 a.m. and at 9 p.m.

Many persons will miss a column giving mean temperature ; they are referred to the note on p. 3 of our last volume, and they will find that by using the figures given in columns 5, 8 and 10, they can compute it in any or all of the different ways there shown.

RESULTS OF METEOROLOGICAL OBSERVATIONS
AT
CAMDEN SQUARE FOR 40 YEARS, 1858-97.

JANUARY.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.	
	Total.		Max. Fall.	Falls of 1 in. or +	Dry Mean, 9a.&9p.	Wet Mean, 9a.&9p.	ShadeMax		Shade Min		Sun Max. Black.		Grass Min.			Aver
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14		15
	in.		in.												0-10	
1858..	.88	6	.43	0	37.0	35.6	52.2	43.8	23.1	30.8	..	..	..	..	4.8
1859..	.72	10	.20	0	40.1	38.8	52.6	44.8	27.0	34.2	..	..	..	..	6.2
1860..	1.97	21	.34	0	39.8	38.4	54.8	44.7	27.2	35.0	..	..	26.3	34.6	5.8
1861..	.43	7	.18	0	33.2	32.4	52.4	38.4	14.3	28.9	..	..	8.5	26.3	6.5
1862..	1.92	19	.38	0	39.2	37.7	55.3	43.5	18.1	33.7	..	..	13.3	30.0	7.3
1863..	2.80	15	.66	0	41.9	40.4	53.7	46.2	26.7	37.6	..	..	19.8	34.5	7.1
1864..	1.02	8	.32	0	36.5	35.7	53.8	41.0	15.1	32.5	..	..	8.8	28.3	7.1
1865..	3.90	13	1.12	1	36.4	35.3	50.8	40.9	18.0	31.5	..	..	14.3	28.8	7.0
1866..	3.90	23	1.20	1	42.5	40.7	54.2	47.6	22.7	38.3	..	..	9.3	34.1	5.5
1867..	2.81	17	.51	0	34.7	32.4	56.0	39.7	6.7	29.3	..	..	0.5	25.8	6.3
1868..	3.89	19	.79	0	38.1	36.9	53.0	41.5	23.4	33.0	..	..	20.5	30.9	8.2
1869..	2.76	15	.58	0	41.7	40.6	56.3	46.3	25.0	35.9	..	..	22.0	32.5	7.7
1870..	1.38	17	.24	0	38.3	37.3	51.7	43.4	21.2	34.4	77.4	56.0	17.9	30.7	5.9	
1871..	1.99	17	.42	0	33.8	33.1	45.2	37.4	19.7	29.5	71.1	48.6	20.8	27.4	8.4	
1872..	3.46	22	.47	0	41.4	40.1	52.8	46.1	27.4	36.3	77.3	58.9	24.6	32.9	6.1	
1873..	2.44	18	.44	0	42.1	40.4	53.9	46.7	28.4	38.3	76.9	61.5	23.6	35.0	6.7	
1874..	1.18	17	.33	0	41.7	40.5	55.4	47.4	28.0	35.9	85.6	61.6	24.6	33.7	6.3	
1875..	3.22	23	.42	0	43.7	42.8	53.8	48.2	20.7	39.2	83.2	60.8	20.6	36.4	7.1	
1876..	.94	11	.32	0	37.1	36.2	54.8	42.5	18.9	31.5	85.3	53.5	17.8	29.6	7.2	
1877..	4.74	25	.60	0	42.7	41.3	56.4	48.5	28.5	37.4	87.3	61.8	25.4	34.3	7.1	
1878..	1.31	15	.30	0	40.0	38.7	55.6	45.2	26.9	35.5	76.6	59.9	21.6	32.1	7.1	
1879..	2.87	12	1.12	1	31.8	31.1	51.0	35.8	19.2	28.7	63.5	44.1	18.3	26.9	7.2	
1880..	.31	5	.19	0	33.0	32.3	55.4	37.7	19.2	29.5	73.0	48.7	13.7	26.4	6.8	
1881..	1.85	8	1.08	1	31.2	30.6	48.4	36.7	11.8	26.1	79.8	50.0	0.6	21.9	7.2	
1882..	1.30	7	.56	0	40.5	39.5	53.4	45.4	27.4	36.1	74.4	51.4	21.3	31.8	7.9	
1883..	2.08	21	.34	0	41.1	39.7	55.3	46.3	28.8	36.9	73.9	55.7	24.5	33.1	7.5	
1884..	2.30	16	.55	0	43.8	42.2	55.6	48.8	32.2	39.2	72.8	57.1	28.6	35.6	7.2	
1885..	1.43	16	.31	0	36.9	35.7	53.3	41.0	22.8	32.2	67.1	45.6	16.8	28.4	8.1	
1886..	4.02	23	.52	0	35.9	34.8	51.3	41.4	20.8	31.6	67.6	53.6	8.3	26.7	6.5	
1887..	1.26	13	.34	0	36.0	35.3	52.2	40.3	14.5	30.6	68.3	46.4	11.0	27.7	7.4	
1888..	.90	9	.24	0	37.5	36.6	51.8	42.7	23.1	33.2	78.3	52.3	19.0	29.2	7.1	
1889..	.81	10	.19	0	37.3	36.3	53.1	41.8	22.0	32.4	76.8	49.6	16.4	28.1	7.3	
1890..	2.46	21	.35	0	43.2	41.7	55.6	48.9	26.1	37.9	83.1	61.7	18.3	33.5	7.4	
1891..	1.80	14	.35	0	34.0	33.1	53.0	39.4	16.9	28.9	78.2	52.8	12.5	24.9	6.6	
1892..	.50	13	.13	0	36.3	35.3	52.0	41.5	22.8	30.9	78.9	51.8	15.8	26.6	6.3	
1893..	1.44	17	.26	0	35.7	34.7	52.7	40.0	15.4	30.9	69.1	50.3	10.0	26.6	7.3	
1894..	2.87	25	.34	0	38.2	36.9	52.0	43.2	13.1	32.6	76.8	56.1	14.3	29.0	7.2	
1895..	1.96	16	.75	0	33.3	32.4	51.9	38.1	17.2	29.1	69.1	51.0	16.2	27.0	6.5	
1896..	.78	9	.22	0	40.3	39.1	52.7	45.4	28.0	36.5	72.6	53.1	24.3	33.2	8.0	
1897..	2.05	20	.83	0	35.1	34.5	47.0	39.8	23.4	31.7	69.0	50.6	16.6	28.2	7.3	
Mean ...	2.02	15	.47	0.1	38.1	36.9	53.1	43.0	21.8	33.3	75.5	53.7	17.0	30.1	7.0	
Ex- tremes {	4.74	25	1.20	1	43.8	42.8	56.4	48.9	32.2	39.2	87.3	61.8	28.6	36.4	8.4	
	.31	5	.13	0	31.2	30.6	45.2	35.8	6.7	26.1	63.5	44.1	0.5	21.9	4.8	

CLIMATOLOGICAL RECORDS FOR THE BRITISH EMPIRE IN 1897.

The Annual Summary of the Climatological Returns for 1897, which should have appeared in September, 1898, has been crowded out by other matter which called for prompt publication.

It would be far too large a task to attempt to express an opinion as to the meteorology of the year in the individual colonies, but a comparison of the Summary of Extremes with the similar data for previous years reveals little that calls for special remark. Most of the extremes have occurred at the same stations in other years, and appear to be thoroughly normal. The chief exceptions are, the highest mean temp. and the least amount of cloud. The former, 82°·2 at Colombo, has not been exceeded in our tables since 1876, when the mean temp. at Madras was 83°·2, while the highest previous value for Colombo is 81°·9 in 1880. The latter, 2·5 at Grenada, is unprecedented in the 21 years; the nearest approach to it being 2·9 at Malta in 1885.

Grenada comes to the front, as it did last year, with four extremes—least total range, least mean daily range, greatest rainfall and least amount of cloud. The amount of cloud we have referred to above, but the three other values are far from remarkable. The returns from Trinidad are unfortunately not complete for the year, but in May a max. temp. in sun of 173°·0 was recorded, a higher reading than that quoted for Adelaide in the table.

SUMMARY.

Highest temp. in shade	... 110°·8 at Adelaide on Dec. 16th & 28th
Lowest " " "	... —41°·0 at Winnipeg on Feb. 25th.
Greatest range in year	... 133°·7 at Winnipeg.
Least " " "	... 20°·6 at Grenada.
Greatest mean daily range...	... 23°·6 at Winnipeg.
Least " " "	... 9°·7 at Grenada.
Highest mean temp.	... 82°·2 at Colombo, Ceylon.
Lowest " " "	... 34°·7 at Winnipeg.
Driest station	... Adelaide, mean humidity 59.
Dampest " "	... Esquimalt, " " 86.
Highest temp. in sun	... 166°·3 at Adelaide.
Lowest temp. on grass	... —11°·0 at Toronto.
Greatest rainfall	... 83·64 in. at Grenada.
Least " " "	... 14·22 in. at Malta.
Most cloudy station	... Esquimalt, average amount 6·7.
Least " " "	... Grenada, average amount 2·5.

The min. on grass is not recorded at the other Canadian stations.

FLOODS IN JANUARY, 1899.

DECEMBER, 1898, was rather wet in the west of England, and in Wales, with considerable falls of rain in the last week. January also was wet in the same districts; very wet at some of them, *e.g.*—it is stated that on the south side of the Brecknock Beacons the fall during December and up to January 24th, was not far short of *thirty inches*. It is, therefore, natural that there should have been considerable floods. We are not now going to give a complete account of them, but on the other hand it would not be desirable to let them pass without such comment as is at present possible.

In the THAMES the flooding seems to have been much less than on many recent occasions. A few houses were invaded at ETON, WINDSOR, and EGHAM, and boats went where carriages should have gone, but owing either to less rain, or to better river administration, the records indicate little damage compared with previous years. It is in Divisions VI. and XI. that the floods were most serious, and perhaps most so at HEREFORD. Unlike York (which, after letting its archives be damaged by a flood, erected a first-class recorder of the level of the Ouse), HEREFORD has often suffered by flood, but has kept only a miserably incomplete record of the flood of the Wye, and has waited until London proposes to take some of its flood waters, and now, at the 11 $\frac{3}{4}$ th hour, it *proposes* to begin a proper record. This, however, is by the way; but we fear that the lesson will not be taken to heart by any other city—each *will* buy its own experience.

To resume. We have not seen the scale of heights on the Wye bridge at HEREFORD, but as far as we can make out from the *Hereford Times* there is one on one of the piers, but, owing to the slope of the stream, the water on the scale stands at 16 ft. above datum, when the real level of the river is about 17 ft. above datum. But the writers upon the subject have confused it by (apparently) applying this correction to the present flood, but not to previous ones.

We infer that the facts for HEREFORD are approximately—

		ft.	in.
Absolutely highest flood on record,	Feb. 11th, 1795	.....	20 0
Subsequent floods.....	{	Feb. 6th, 1852	..... 18 4
		Nov. 15th, 1894	..... 16 9
		Jan. 22nd, 1899	..... 17 3

Another statement gives 1899 as exactly 3 ft. below 1795. Therefore the recent flood has been exceeded only once in a century, and then only by about 1 foot.

The city engineer of Hereford should do as his brother officer at York has done: hunt up all trustworthy records, reduce them to Ordnance Datum, and, in one or more places in the city, erect cast iron plates with the levels marked upon them from 1795 downwards.

For ROSS a list of flood levels was given by Mr. H. Southall, F.R.Met.Soc., in the *Quar. Jour. R. Met. Soc.* Vol. XXI. p. 38, from which we select the following, making, upon Mr. Southall's authority, two small corrections, and adding the recent flood :—

		ft.	in.
Absolutely highest flood on record,	Feb. 12th, 1795	.....	17 9
	Jan. 27th, 1809	.....	17 3
	Nov. 24th, 1824	.....	17 3
	Feb. 10th, 1831	.....	17 3
Subsequent floods.....	Feb. 8th, 1852	.....	16 10
	Nov. 12th, "	.....	16 5
	Nov. 15th, 1894	.....	14 5
	Jan. 23rd, 1899	.....	14 7

At BRIDGNORTH the flood is said to have been exceeded as recently as 1886.

For SHREWSBURY no heights are given, merely the statement that the height had not been equalled since 1869.

For WORCESTER details are given by Messrs. Marriott and Gaster (*Quar. Jour. R. Met. Soc.* Vol. XII. p. 280), whence we get—

		ft.	in.
Absolutely highest flood on record,	Nov. 18th, 1770	.....	17 7
	Feb. 11th, 1795	.....	16 11
Subsequent floods.....	May 15th, 1886	.....	17 1
	Nov. 16th, 1894	.....	12 10
	Jan. 23rd, 1899	.....	14 0

At YORK the automatic recorder showed that the flood rose to 12 ft. 10 in., being the highest since the apparatus was erected after the great flood of 1892.

At MONMOUTH the floods are said to have been higher than since 1852, but no measures are given.

At ABERGAVERNAY also no heights are given, merely the statement that they were higher than in 1894.

At RHYL there is only the vague statement that "they have not been equalled since 1879."

FROST AND ANTICYCLONES.

IN our last number, on page 179, we mentioned the paper upon the above subject which was read before the Roy. Met. Soc., on Dec. 21st, by Mr. W. H. Dines.

Our attention has since been called to the fact that the subject had been considered in the early part of 1895 by M. A. Lancaster in his paper, *Sur la période de froid du 27 Janvier au 17 Février, 1895*, published in the *Bulletins de l'Académie royale de Belgique*.

As the paper is not accessible to all our readers, we give a free translation of the concluding paragraph and the (rather long) footnote to it, converting the measures into English units :—

"It is, then, an error to consider, as is frequently done, that the

severity of a winter is in distinct relation to the height of the barometer during it.* The error is especially obvious when it refers to December, in which we often have high pressures with mild misty weather. Then it is that we have fogs lasting sometimes a fortnight, and gradually changing to a drizzling rain."

We see that there is a note upon the subject by M. Lancaster in the last number of *Ciel et Terre*.

ROYAL METEOROLOGICAL SOCIETY.

THE Annual Meeting of this Society was held on January 18th, at the Institution of Civil Engineers, Great George Street, Westminster; Mr. F. Campbell Bayard, LL.M., President, in the chair.

The Council, in their Report, stated that, owing to the premises now occupied by the Society, at 22, Great George Street, being required by the Government, they had been obliged to seek accommodation elsewhere; but not being able to secure offices in the immediate neighbourhood, they had taken a suite of rooms at 70, Victoria Street.

GOVERNMENT METEOROLOGICAL ORGANIZATIONS.

Mr. Bayard, in his presidential address, gave an account of the Government meteorological organisations in various parts of the world. He first briefly described the founding of each system, and mentioned the names of the various directors, and then stated the number of observing stations associated with each organisation. In most countries forecasts of the weather are issued, and Mr. Bayard gave some interesting particulars as to the success attained by each office. The amount of money voted by the various Governments for the support of meteorology showed what a very small portion of the revenue of the different countries goes towards the promotion of this science. In the British Isles it is only about one-third of a farthing per head of the population.

The address was illustrated by a large number of lantern photographs of the various observatories and portraits of the directors.

Mr. Bayard was re-elected President for the ensuing year.

* * If we examine the table of monthly mean pressure at Brussels from 1833 to 1895, we find that for December the 7 highest had a mean of 766 mm. (30·158 in.) at 57 m. (187 ft.); that of them only 1 had a temperature below the mean, the other 6 were all above it—on the average 1°·2 C. (2°·2 F.)

"For February, the 7 with the highest barometric pressure averaged 765·4 mm. (30·134 in.); of these, also, only 1 was colder than the mean, 1887, by 1°·1 C. (2°·0 F.), and the other 6 were all above it by, on the average, the same amount, 1°·1 C.

"Finally, the 8 months of January with the highest mean pressures, about 765 mm. (30·118 in.), have had temperatures below the mean by 1°·2 C. (2°·2 F.); but this is little compared with what we observe when with a lower barometer our country is under the influence of an anticyclone. Thus, the 11 coldest Januaries, with an average temperature of 4° C. (7°·2 F.) below the mean, have had as their mean barometric height 758 mm. (29·843 in.)

TEMPERATURE REVERSAL.

To the Editor of the Meteorological Magazine.

SIR,—One morning in January about 14 years ago we woke up surrounded by a white world, with about an inch of snow ; but the curious thing was, that the higher you looked up the hills the less snow there was. At 1,200 ft. high there was practically no snow, and none above this limit ; the Clees, reaching 1,800 ft., were quite green above about 1,000 ft. They must have had the storm, because the tops of the hills to our west, 1,200 ft. high, had just a trace of snow, while the Clees, being to the N.E. and much higher, the phenomenon was more marked on them. At Church Stretton, 16 miles N.N.W., the case was similar---the valleys were white, while the hills on each side, rising to 1,500 and 1,600 ft., were bare. At 11 a.m. there was a sharp snowstorm ; when it reached the Clees it brought down a thick cloud, so I thought that surely they would be white when it lifted ; but no, they were as green as before. About 4 p.m. the Clees had another storm of a more snowy character---they were white over in a minute or two, and thus the country regained a normal aspect. Up till 4 p.m. the sight was most peculiar ; instead of snow-clad hills and green valleys, the case was reversed, and there were white valleys and green hills, and on every hill there was little or no snow over 1,000 ft.

The snow must have been *snow* on the hills, as it could not have formed between the height of the hills and the valleys ; but somehow the air above 1,000 ft. must have been very much warmer, not only here but over at least half of Shropshire, as shown by the same state of things at Church Stretton. The wind was W. to W.N.W. There was a frost early, as far as I remember ; but after 10 a.m. the temperature was slightly above 32°.

I trust that you will be able to give space in your Magazine for this, as it may elicit some useful remarks.—Yours very truly,

RICHD. P. DANSEY.

The Sheet, Ludlow, Oct. 26th, 1898.

 GODFRIDUS—THE BOOK OF KNOWLEDGE.

[OUR suggested emendation of “grazing” for “gazing” does not seem acceptable. We at once withdraw it, as country observers are infinitely more likely to be right than we are ; but if we might be permitted one remark it would be that, as cattle normally stand on the grass and graze on it, we think that that is grazing from below ; but what was running in our mind was the idea that in bad weather cattle remained in the valleys, and therefore grazed from below—

i.e., not from the top of the hills. However, we do not know, and we thank our correspondents for helping us.—ED. *M.M.*]

“I should be rather disinclined to accept your conjectured emendation in the *Met. Mag.*, p. 181. Surely cattle when they bellow lift up their heads in a way that might well be described as ‘gazing from below.’ But although they graze below, I do not see that they graze *from* below.”

REV. W. C. PLENDERLEATH, *Mamhead Rectory, Exeter.*

“In p. 181 of *Met. Mag.* you put a ? to ‘gazing from below.’ May I suggest whether it is not right? I have heard it said, ‘It will be fine, the cattle are on the *tops* of the hills;’ so, if wet, they would be down below—gazing from below.

“I merely throw out this suggestion.

“A shepherd tells me that rooks lighting on *dead wood*—*i.e.*, hurdles—are a sign of rain; also, thunderstorms come up *with* the wind before midsummer, and *against* it after midsummer.”

REV. J. CROSS, *Bailie House, Wimborne.*

REVIEWS.

Traité élémentaire de Météorologie, par ALFRED ANGOT. Gauthier-Villars, Paris, 1899. Royal 8vo, vi.-418 pages, 4 plates and about 100 engravings.

WE think that Dr. Angot has been rather severe upon his own work in giving to it the designation “elementary,” for it is much more than that—it is a thoroughly well-considered, well-written work. The author has wisely recognised that everything need not be put in every book, and has, therefore, left all who want to learn the manipulation of instruments to seek descriptions of them in the numerous “Instructions” which are accessible, and those who need statistics and tabular matter, to look for it in other works; and he has (inasmuch as this work is designed specially for tuition) given very little history. The almost complete exclusion of these three subjects has given him ample room to treat fully pressure, temperature, vapour, storms, halos, weather forecasting, &c.

The whole book is remarkably uniform in style and treatment. No one subject is unduly prominent or unduly neglected, but each is calmly considered and explained by reference to the physical laws which bear upon it.

It is not very often that Dr. Angot gives details of actual phenomena, but when he does the cases are usually very striking. Here is a specimen, he is speaking of *Verglas*, which in England we call a “silver thaw” :—

“This phenomenon is sometimes intense, and prevails over a large area. Such was the case with the noteworthy *verglas* of January

22nd and 23rd, 1879, which covered nearly one-quarter of the surface of France—from Epernay to Nantes, and from Mézidon to Parthenay and Romorantin. At Vendôme the rain, at a temperature below 32° , lasted 30 hours, and amounted to 1.26 in., and formed, on flat or convex surfaces exposed to the free air, a coat of ice 0.98 in. thick. Exposed ropes were surrounded eccentrically by a layer of ice $\frac{3}{4}$ -inch in diameter. Naturally, telegraph wires, twigs, branches and even entire trees, being incapable of bearing the weight of this mass of ice, were broken. At Fontainebleau the telegraph wires were surrounded by a coat of ice 1.49 in. in diameter; trees, with trunks $27\frac{1}{2}$ inches in diameter, were broken, others were so bent over that their tops reached the ground.”

We have noticed only two omissions. In diagram Fig. 75 the vertical circle through the sun is not shown. Engravings of portions of it are given in *Met. Mag.*, Vol. VI., p. 56 and 96; IX., p. 76, and an explanation is given by Mr. Cherrill in the second paragraph on p. 69 of Vol. XXVI. It is the simultaneous presence of this and of the parhelic circle (intersecting at an angle of 90° at the sun) which explains the records by old writers, and, even recently, one Good Friday, of “the sun in a perfect cross.”

Ozone is another subject on which we have seen no remarks. We admit that this is on the debateable land between chemistry and meteorology; but chemists have no observations to make daily at a fixed hour, and it would therefore be much better left to the meteorologist to make the observations, if the chemist would but tell him exactly how, and what, to observe. It is a fact that country air after passing over a city is materially changed. We think that some method should be devised to show this; and while admitting the force of the criticisms which chemists have passed upon the methods employed by meteorologists, we think that in addition to destructive criticism, they should instruct us as to the path we should follow. Of course, we are not for a moment suggesting that Dr. Angot should have done this; all that we say regarding his book is, that in his 400 pages half of one might have been devoted to ozone.

On page 357 there are three charming and unique diagrams—two from the vicinity of Paris, and one from Little Rock, Arkansas, U.S.A., giving, on the natural scale, the depression shown by recording aneroids during the passage of whirlwinds very near to them. In each case the duration of passage is so short that it is not possible to distinguish between the down and the upstroke of the pen, and the amounts are about 0.3 in. When we remember (1) that these instruments were indoors, where friction would prevent the full diminution of pressure being felt; (2) that, considering the rapidity of transit of the depression, inertia and friction would prevent the pen going its full distance; (3) that there is no evidence that any one of these barometers was even momentarily at the true centre of the depression, we therefore conclude that out of doors a frictionless barometer would, in the centre of a depression, show a

diminution at least two or three times that above shown. Take it at only twice, and we get a difference of pressure of about 40 lbs. per square yard. Is it any wonder that buildings are burst open by the expansion of the contained air ?

Among the many good sections of this book it is not easy to say that any one is the best ; but we recommend all who treat themselves to a copy, to read the section upon *Orages de dépressions* (summer thunderstorms) ; it is excellent.

Seismology, by JOHN MILNE, F.R.S., F.G.S., &c. Kegan Paul, Trench & Co., London, 1898. Crown 8vo, xvi.-320 pages and 53 engravings.

QUITE recently we reviewed Prof. Milne's "Earthquakes" (same publishers), and knowing that the present work was to follow, we were much puzzled to know what boundary line could be laid down between the two subjects. As we expected, the author has not been able to draw one ; and this is virtually an account of recent researches on the measurements of earthquakes (with a delicacy still quite unrealised by the general public), on the principles of construction best suited for countries where earth movements are large, and on the study of flexures of the earth's crust which produce no structural damage, but which cause trouble to astronomers by disturbing the level of their instruments. In fact, except from a publisher's view, we can see no reason why this should not have been called "Earthquakes, Part II."

The book, like all those written by Prof. Milne, is crammed with facts, illustrations and suggestions—so full indeed that sometimes one could wish for a little more narrative and consecutive argument instead of illustrative facts. All who have heard Prof. Milne lecture know how fascinatingly he runs on, conveying an enormous amount of information with apparently no fatigue either to lecturer or listener. It seems to us that when he has to write a book he feels more responsibility, regards it as a serious matter, and backs up every suggestion with an unassailable array of facts. He is perfectly safe inside the fortress thus constructed, and as in a volume of the International Scientific Series probably no joke is admitted, that fact also doubtless had a depressing influence upon the author. We can hardly give a better illustration of Prof. Milne's promptitude and of the delicacy of his instruments than by adding that the same issue of *The Times* which announced the recent earthquake in Greece, contained a telegram from Prof. Milne to the effect that that shock was duly recorded at his house in the Isle of Wight.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1898.

STATIONS. <i>(Those in italics are South of the Equator.)</i>	Absolute.				Average.				Absolute.		Total Rain.			Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.	
	Temp.	Date.	Temp.	Date.										
England, London	87·9	22	45·9	8	76·1	55·9	54·6	71	99·1	42·2	1·13	10	5·3	
Malta.....	92·3	3	67·0	1	85·7	73·1	68·1	75	151·5	61·0	·00	0	1·2	
<i>Cape of Good Hope</i> ...	89·0	25	41·1	1	66·6	51·0	50·3	83	...	...	1·37	5	2·4
<i>Mauritius</i>	76·6	20 ^a	59·2	6	74·8	64·1	60·0	75	126·2	52·5	6·61	16	6·0	
Calcutta.....	90·4	1	75·1	30	86·5	78·3	77·9	88	157·2	73·9	17·68	19	8·9	
Bombay.....	86·5	26	75·0	11	84·6	77·3	75·6	84	135·3	73·2	5·28	27	8·6	
Ceylon, Colombo	88·1	10	75·0	23	86·3	77·7	73·1	79	150·0	71·5	·97	7	5·0	
<i>Melbourne</i>	69·1	26	32·8	3	60·1	44·4	44·5	76	127·2	25·5	·89	10	5·6	
<i>Adelaide</i>	74·4	26	36·4	17	63·6	46·9	46·2	73	133·6	29·5	2·15	13	5·5	
<i>Sydney</i>	72·4	28	42·7	18	61·7	48·4	48·2	81	125·8	33·2	3·89	17	4·8	
<i>Wellington</i>	62·0	28	31·9	1	53·1	42·1	38·1	71	92·0	19·0	5·76	18	5·0	
<i>Auckland</i>	61·0	19	41·0	1	57·9	47·2	44·1	74	122·0	37·0	5·94	23	5·7	
Jamaica, Kingston.....	91·8	9	71·1	1	88·1	73·4	70·9	76	...	...	1·86	12	...
Trinidad	90·0	1, 22	68·0	3	86·6	70·3	72·3	84	171·0	67·0	10·55	23	...	
Grenada.....	85·0	24	68·4	17	82·6	73·5	71·6	80	150·0	...	19·11	23	3·6	
Toronto	96·0	31	46·5	28	81·8	59·8	59·9	71	113·0	42·5	1·08	8	5·2	
New Brunswick, Fredericton	81·7	9	45·0	29	73·7	55·8	56·1	70	...	...	4·66	13	6·1
Manitoba, Winnipeg ...	88·2	19	39·8	13	74·8	51·1	...	...	...	...	2·15	8	5·9
British Columbia, Esquimalt	88·0	10	45·2	29	72·3	51·2	...	...	...	...	·27	2	4·7

a—and 21, 29.

REMARKS.

MALTA.—Mean temp. 77°·5, or 0°·6 below the average. Mean hourly velocity of wind 7·3 miles. Mean temp. of sea 78°·8. L on 18th, 27th, 28th and 29th.

Mauritius.—Mean temp. of air equal to, dew point 0°·7 above, and rainfall 4·19 in. above, the average. Mean hourly velocity of wind 12·0 miles, or 0·4 below average; extremes, 30·4 on 4th and 1·8 on 19th; prevailing direction E.S.E. and E. by S. The wettest August on record in 24 years.

CEYLON, COLOMBO.—Mean temp. of air 81°·3, or 0°·7 above, of dew point 0°·1 above, and rainfall 2·90 in. below, the average. Mean hourly velocity of wind 8·6 miles; prevailing direction S.W. L on 16th and 25th.

Adelaide.—Mean temp. 1°·3 above, and rainfall ·22 in. below, the average for 41 years.

Sydney.—Temp. equal to, humidity 8° above, and rainfall 1·01 in. above, the average. Rains not so good as those in July.

Wellington.—Cold and generally showery, with prevailing S.E. winds, and some very cold, frosty nights; finer weather towards the end. Earthquake on 7th. Mean temp. 0°·4 below, and rainfall ·56 in. above, the average.

Auckland.—The early part and middle of the month were unusually wet and stormy; the end dry, or with slight showers only. Mean temp. slightly, and rainfall 1·75 in., above the average.

TRINIDAD.—Rainfall ·23 in. above the average of 30 years.

J. F. DOBSON.

T. F. CLAXTON.

H. O. BARNARD.

C. TODD, F.R.S.

H. C. RUSSELL, F.R.S.

R. B. GORE.

T. F. CHEESEMAN.

J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,
JANUARY, 1899.

[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.
I.	Uxbridge, Harefield Pk..	2·53	XI.	Builth, Abergwesyn Vic.	14·61
II.	Dorking, Abinger Hall..	3·14		Rhayader, Nantgwilt ...	11·55
	„ Birchington, Thor	2·27		„ Lake Vyrnwy	10·22
	„ Hailsham	3·06		„ Corwen, Rhug	7·05
	„ Ryde, Thornbrough	3·81		„ Crickieth, Talarvor	5·76
	„ Emsworth, Redlands ...	3·20		„ I. of Man, Douglas	6·60
	„ Alton, Ashdell	4·18	XII.	Stoneykirk, Ardwell Ho.	4·40
III.	Oxford, Magdalen Col..	2·59		„ New Galloway, Glenlee	7·96
	„ Banbury, Bloxham	3·20		„ Moniaive, Maxwelton Ho.	7·09
	„ Northampton, Sedgebrook	2·99		„ Lilliesleaf, Riddell	3·57
	„ Stamford, Duddington..	2·57	XIII.	N. Esk Res. [Penicuick]	6·40
	„ Alconbury	1·84	XIV.	Glasgow, Queen's Park..	5·61
	„ Wisbech, Bank House...	2·09	XV.	Inverary, Newtown .....	...
IV.	Southend	2·37		„ Ballachulish, Ardsheal...	7·02
	„ Harlow, Sheering.....	2·04		„ Islay, Gruinart School ...	1·62
	„ Colchester, Lexden	1·80	XVI.	Dollar.....	6·78
	„ Rendlesham Hall	2·15		„ Balquhiddier, Stronvar...	9·63
	„ Scole Rectory	2·12		„ Coupar Angus Station...	3·57
	„ Swaffham	2·06		„ Dalnaspidal H. R. S. ....	...
V.	Salisbury, Alderbury ...	3·38	XVII.	Keith H. R. S.	4·08
	„ Bishop's Cannings	4·63		„ Forres H. R. S. ...	2·56
	„ Blandford, Whatcombe.	4·90	XVIII.	Fearn, Lower Pitkerrie..	2·99
	„ Ashburton, Holne Vic...	8·83		„ S. Uist, Askernish	7·18
	„ Okehampton, Oaklands..	9·23		„ Invergarry	6·56
	„ Hartland Abbey	6·00		„ Aviemore H. R. S. ....	...
	„ Lynton, Glenthorne ...	9·48		„ Loch Ness, Drumnadrochit	3·91
	„ Probus, Lamellyn	6·06	XIX.	Invershin	4·08
	„ Wellington, The Avenue	6·00		„ Durness	4·96
	„ North Cadbury Rectory	3·73		„ Watten H. R. S.	3·15
VI.	Clifton, Pembroke Road	5·17	XX.	Dunmanway, Coolkelure	12·06
	„ Ross, The Graig	3·88		„ Cork, Wellesley Terrace	5·05
	„ Wem, Clive Vicarage ...	3·08		„ Killarney, Woodlawn ...	9·32
	„ Wolverhampton, Tettenhall	3·31		„ Caher, Duneske	5·05
	„ Cheadle, The Heath Ho.	3·95		„ Ballingarry, Hazelfort...	3·65
	„ Coventry, Priory Row ..	3·82		„ Limerick, Kilcornan ...	2·29
VII.	Grantham, Stainby	2·75		„ Broadford, Hurdlestown	3·86
	„ Horncastle, Bucknall ...	2·28		„ Miltown Malbay	5·35
	„ Worksop, Hodsck Priory	1·90	XXI.	Gorey, Courtown House	4·48
VIII.	Neston, Hinderton	3·22		„ Moynalty, Westland ...	4·31
	„ Southport, Hesketh Park	3·73		„ Athlone, Twyford	3·92
	„ Chatburn, Middlewood.	7·39		„ Mullingar, Belvedere ...	4·02
	„ Duddon Val., Seathwaite Vic.	12·58	XXII.	Woodlawn	4·37
IX.	Melmerby, Baldersby ...	2·87		„ Crossmolina, Enniscoo ..	5·88
	„ Scarborough, Observat'y	3·08		„ Collooney, Markree Obs.	4·15
	„ Middleton, Mickleton ...	5·85		„ Ballinamore, Lawderdale	3·84
X.	Haltwhistle, Unthank...	3·60	XXIII.	Warrenpoint.....	4·59
	„ Bamburgh	2·22		„ Seaford	5·38
	„ Keswick, The Bank	10·26		„ Belfast, Springfield	4·63
XI.	Llanfrechfa Grange	7·11		„ Bushmills, Dundarave..	3·51
	„ Llandovery	7·95		„ Stewartstown	3·58
	„ Castle Malgwyn	8·56		„ Killybegs	6·55
	„ Brecknock, The Barracks	6·40		„ Horn Head	6·12

JANUARY, 1899.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°.	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which 0.1 or more fell.	Max.		Min.		In shade.	On grass.
				Dpth	Date		Deg.	Date	Deg.	Date.		
I.	London (Camden Square) ...	2.52	+ .90	.46	15	20	56.2	21	28.1	25	6	18
II.	Tenterden	2.10	+ .20	.36	15	19	54.0	4	30.0	31	3	16
III.	Hartley Wintney	3.04	...	.60	12	21	54.0	21	24.0	25	11	16
IV.	Hitchin	2.46	+ .92	.48	15	19	53.0	15 ^a	24.0	24	12	...
V.	Winslow (Addington)	2.54	+ .72	.45	20	20	53.0	c	24.0	25	9	17
VI.	Bury St. Edmunds (Westley)	2.09	+ .62	.35	15	20	54.0	20	20.0	25	...	...
VII.	Norwich (Brundall)	2.24	...	.41	11	22	56.0	21	24.6	6	5	21
VIII.	Winterbourne Steepleton ...	5.59	...	1.11	20	23	53.0	13	23.3	25	11	20
IX.	Torquay (Cary Green)	5.49	...	1.10	20	19	54.9	13	30.0	29	2	10
X.	Polapit Tamar [Launceston]..	6.73	+ 3.71	1.03	1	22	57.8	12	25.7	24	8	13
XI.	Stroud (Upfield)	3.93	+ 1.73	.57	20	24	53.0	20	25.0	25	9	...
XII.	Churchstretton (Woolstaston) ..	4.27	+ 2.11	.75	20	21	53.0	15	24.0	26	10	20
XIII.	Worcester (Diglis Lock)	3.39	+ 1.59	.69	21	22	...	..	...	...	...	...
XIV.	Boston	2.03	+ .64	.40	11	18	55.0	22	28.0	25	10	...
XV.	Hesley Hall [Tickhill].....	2.14	+ .37	.36	15	22	57.0	21	20.0	26	13	...
XVI.	Breadsall Priory	3.31	...	.42	15	21	58.0	20	24.0	25	13	22
XVII.	Manchester (Plymouth Grove) ..	...	...	...	...	...	...	...	...	...	...	...
XVIII.	Wetherby (Ribston Hall)	3.68	+ 1.79	.47	15	19	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	12.40	+ 6.76	2.75	18	25	...	...	...	...	...	...
XX.	Hull (Pearson Park)	1.68	- .09	.23	1	19	56.0	21	23.0	25	13	17
XXI.	Newcastle (Town Moor)	2.72	+ .91	.45	2	19	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	21.35	+ 9.17	4.78	18	20	...	...	...	...	...	...
XXIII.	Cardiff (Ely).....	6.64	+ 3.35	1.18	20	25	...	...	...	...	...	...
XXIV.	Haverfordwest	8.26	+ 3.84	1.62	20	21	53.9	13	25.3	29	7	16
XXV.	Aberystwith (Gogerddan)	6.28	+ 2.75	1.30	20	20	50.0	4 ^d	...	...	...	...
XXVI.	Llandudno	4.58	+ 2.30	.73	18	20	56.0	18	25.5	28	5	...
XXVII.	Cargen [Dumfries]	7.06	+ 3.29	.98	18	18	51.0	4 ^a	18.0	27	13	...
XXVIII.	Edinburgh (Blacket Place)...	3.69	...	.62	20	21	51.5	19	22.0	27	9	15
XXIX.	Colmonell	5.21	...	.63	18	20	52.0	18	18.0	27	...	...
XXX.	Tighnabruaich	7.46	...	.92	18	21	45.0	18 ^e	25.0	27	14	...
XXXI.	Mull (Quinish).....	5.74	+ .07	.88	17	21	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	6.20	+ 3.30	.90	16 ^a	18	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis) ..	3.40	+ 1.43	.45	20	20	47.1	19	19.8	25	14	...
XXXIV.	Braemar	2.68	- .01	.75	21	21	49.0	5	9.5	27	25	31
XXXV.	Aberdeen (Cranford)	4.02	...	.56	2	26	46.0	17	13.0	24	20	...
XXXVI.	Cawdor (Budgate)	3.77	+ 1.60	.60	20	18	...	...	...	...	...	...
XXXVII.	Strathconan [Beaul]	3.79	- 1.09	.80	19	...	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge.....	7.70	...	1.83	18	21	51.7	9	20.0	25	14	...
XXXIX.	Dunrobin	4.24	+ 1.78	1.30	21	15	49.0	28	25.5	27	15	...
XL.	S. Ronaldshay (Roeberry) ...	5.46	+ 2.51	1.07	18	24	46.0	9,10	26.0	16	8	...
XLI.	Darrynane Abbey.....	6.69	...	.58	20	22	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	5.67	+ 2.11	.93	20	23	54.5	15	24.0	24	11	...
XLIII.	O'Briensbridge (Ross) .....	...	...	...	...	...	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill)	4.42	+ 1.52	.65	20	23	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square) ..	2.48	+ .62	.47	6	24	55.7	4	28.3	24	4	16
XLVI.	Ballinasloe	4.43	+ 1.35	.59	11	23	54.0	3	27.0	27 ^g	14	...
XLVII.	Clifden (Kylemore)	8.15	...	.75	5,21	21	...	...	...	...	...	...
XLVIII.	Waringstown	3.16	+ .51	.65	17	19	54.0	19	19.0	28	18	21
XLIX.	Londonderry (Creggan Res.) ..	3.90	+ .48	.50	17 ^b	23	...	...	...	...	...	...
L.	Omagh (Edenfel)	4.74	+ 1.72	.82	18	22	51.0	4,20	22.0	27 ^h	15	23

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

a—and 19. b—and 18. c—Various. d—and 8, 21. e—and 21. f—and 25. g—and 28, 29. h—and 28.

METEOROLOGICAL NOTES ON JANUARY, 1899.

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.

TENTERDEN.—Another warm month, with temp. above 50° on 14 days, but there were five brilliant days from 24th to 28th, with E. wind, and a colder feeling and more ice than the temp. seemed to warrant. Much wind, the worst gales being, from N.W. on 2nd and 3rd, W. on 12th, and S.W. on 20th and 21st. Duration of sunshine 86 hours. Mean temp. 42°·6. Wells rose a little, some considerably; others still very low. L in S. on 16th, followed by high wind.

HARTLEY WINTNEY.—An abnormally mild and wet month. Rough and stormy, with strong S.W. winds for the first three weeks, and heavy gales on 20th, 21st, and 22nd. Keen dry N.E. winds and frosts during the last week. Springs rapidly rising. Fog on 29th and 31st. Ozone on 22 days. Snowdrop and primrose in flower on 15th; crocus on 22nd.

ADDINGTON.—The greatest rainfall in January since 1886. The month was generally mild, with frequent high wind, and although frost was registered on nine nights, it was not severe, and the ponds were never quite covered with ice. The brook was much flooded on 20th and 21st.

WESTLEY, BURY ST. EDMUNDS.—A mild, windy month, with R in small quantities on many days.

NORWICH, BRUNDALL.—A very mild month, though the mean temp. (41°·7) is 1°·4 lower than that of January, 1898. Heavy gales occurred at times, principally from S.W., and the weather was generally unsettled and very mild till 23rd, after which N. winds were prevalent, with lower temp. but no severe frost. L on 16th. S on 2nd; sleet and H on 23rd and 24th.

WINTERBOURNE STEEPLTON.—The features of the month were the great rainfall and high temp. for the first three weeks, and after that a succession of cold and bright days. By the 20th all the springs in the valley of Winterbourne were running over. Mean temp. 42°·0, but the mean of the first three weeks was 44°·5. S on 2nd. Fog on hills on 6th and 15th.

TORQUAY, CARY GREEN.—R 2·38 in. above the average; mean temp. 44°·8, or 3°·0 above the average. Duration of sunshine 50 hours 5 mins., or 12 hours 55 mins. below the average; 8 sunless days.

POLAPIT TAMAR [LAUNCESTON].—The wettest January in 19 years. The middle third of the month was remarkably wet and stormy, accompanied by unusually high temp. H on 1st, 2nd, 11th and 12th. Gales from N.W. on 2nd, W.S.W. on 12th, S.W. on 13th and S.S.W. on 21st. L and T on 2nd and 16th; T on 11th.

STROUD, UPFIELD.—N.W. gale on 2nd; S.W. gales on 12th, 20th and 22nd. Slight S on 2nd.

WOOLSTASTON.—A wild, wet month, with constant gales of great violence—that on 12th being especially furious, and accompanied by H and T. The continuous R caused sudden and extensive floods throughout the valley of the Severn, and much damage was done. On 24th, a sharp frost set in, and continued to the end of the month. Mean temp. 38°·7. T on 16th; a little S on 1st.

BREADSALL PRIORY.—Very wet and mild in the first part of the month, followed by several sharp frosts.

ARNCLIFFE VICARAGE.—The heaviest rainfall ever recorded in one month here. In the seven days 15th to 21st, 7·88 in. fell.

WALES.

HAVERFORDWEST.—January was characterised by excessive R and mildness, and from 9th to 23rd atmospheric conditions of the most disturbed character prevailed. On the night of the 23rd, after two days of unprecedented R, which produced enormous floods, exceeding anything experienced since 1869, the wind suddenly changed to N.E., and a severe frost set in, which lasted till the 29th, when a partial thaw occurred, followed by frost again.

GOGERDDAN.—The first three weeks were very wet, with strong winds, mostly from S. and S.W.

SCOTLAND.

CARGEN [DUMFRIES].—Wet, unsettled weather prevailed during the first three weeks; excessive R, high temp., and almost entire absence of sunshine characterising the period. Although the mean temp., $38^{\circ}2$, closely approximates the average, unwonted warmth characterised the first three weeks; the mean temp. of the first 22 days being $41^{\circ}4$, and of the last 9 only $30^{\circ}0$. Rainfall is the heaviest in January since 1882, when 7.54 in. fell. Gale from W. on 12th. S on 17th. H on 16th. Lunar halos on 27th and 28th. Vegetation very forward until checked by the frost.

EDINBURGH, BLACKET PLACE.—Very mild till 22nd, with strong S.W. winds and much R. The last 9 days cold and dry. Temp. $1^{\circ}3$, and rainfall 52 per cent., above the average. S on 12th and 16th. Sleet on 12th. Fog on 25th and 28th. Solar halo on 31st.

COLMONELL.—R .74 in., and temp. $2^{\circ}4$, above the average of 22 years. L on 11th.

TIGHNABRUAICH.—For the first two-thirds of the month the weather was excessively wet; for the remainder, frosty. S on 17th.

MULL, QUINISH.—The wet and stormy weather of December, 1898, continued without intermission till January 23rd, when it suddenly cleared up, and fine weather with slight frost prevailed till the end of the month.

ABERDEEN, CRANFORD.—Very little S, but many gales of wind and much R.

S. RONALDSHAY, ROEBERRY.—Very wet and changeable, and the wettest January in 32 years. Mean temp. 38° , or $0^{\circ}3$ below the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—The first three weeks were very wet, mild and close, but from 23rd to the end was very cold and dry, with E. wind and frost from 27th to 29th. From December 22nd to January 22nd inclusive there was no day without R, the total fall being 9.41 in.

WATERFORD, BROOK LODGE.—All the early part of the month was very wet and stormy, also very mild. East winds prevailed during the last week. S on 2nd. S on the Comeraghs on 1st and 11th. Fog on 29th.

DUBLIN, FITZWILLIAM SQUARE.—Cloudy, rainy and generally open. R fell on each of the first 22 days, followed by a dry, cold period. Mean temp. $42^{\circ}7$, or $1^{\circ}3$ above the average. Fog on 10 days. High winds on 13 days, reaching the force of a gale on 8. S and sleet fell on 2nd, 11th, and 17th; H on 2nd. The temp. in shade exceeded 50° on 13 days.

OMAGH, EDENFEL.—Up to the 22nd the weather was made up of strong gales, heavy R and mild temp. From 23rd calm, clear and frosty weather prevailed, which was of much benefit to the country. From 1.30 to 2.30 p.m. on 12th there was a violent hurricane, doing an amount of damage to roofs, windows and trees, which, had the gale been prolonged, would have been almost unprecedented.