

SYMONS'S

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MARCH TO OCTOBER, 1893.

THE following article is the outcome of a spare half-hour devoted to a cursory examination of the Camden Square records for the past season, and is most discursive in character.

As far as observational records go, we may clear the ground by stating that it deals chiefly with the last 11 years, and that the instruments are practically, and we believe absolutely, identical in themselves, in position, in exposure, and in surroundings, except for the growth of distant trees and of our leviathan city. One apology should be added: in almost all cases where the word "mean" appears it is incorrectly used for "average"; this effects a considerable saving of space and does not obscure the meaning. The eight months, March to October, include the most striking characteristics, inasmuch as February and November were practically normal, except for the absence of fog in the latter month.

We have ignored, perhaps, the most striking feature of the season—rain—because it has been repeatedly discussed in the *Magazine* and will be further dealt with in *British Rainfall*; but records of max. in sun and in shade, and amount of cloud, if they are worth observing, should be worth discussing for such a season as we have just passed through, and they constitute a large part of what goes to make up weather.

To begin with a comparison of the monthly mean values:—

MEAN MAX. IN SHADE:

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Mean 1883-92...	47 ⁰ ·7	55 ⁰ ·9	63 ⁰ ·6	70 ⁰ ·6	72 ⁰ ·3	71 ⁰ ·8	66 ⁰ ·7	56 ⁰ ·2	... 63 ⁰ ·1
1893	56·6	65·6	70·2	74·9	74·5	77·1	67·9	59·3	... 68·3
Difference.....	+8·9	+9·7	+6·6	+4·3	+2·2	+5·3	+1·2	+3·1	... +5·2

MEAN MAX. IN SUN (black bulb in vacuo):

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Mths.
Mean 1883-92..	77 ⁰ ·1	92 ⁰ ·2	101 ⁰ ·2	111 ⁰ ·0	113 ⁰ ·8	111 ⁰ ·4	100 ⁰ ·5	80 ⁰ ·3...	98 ⁰ ·4
1893.....	86·9	101·9	112·0	116·4	115·6	117·8	105·4	88·2...	105·5
Difference	+9·8	+9·7	+10·8	+5·4	+1·8	+6·4	+4·9	+7·9...	+7·1

EXTREME MAX. IN SUN (black bulb in vacuo):

		Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
		1885	1892	1892	1887	1886&'87	1887	1889	1886	8 Months.
10 Years,	Year...	1885	1892	1892	1887	1886&'87	1887	1889	1886	
1883-92	{ Value	105.9	118.7	130.2	130.4	133.4	129.2	125.6	112.2	... 123.2
1893	.....	103.4	117.8	127.9	134.3	130.3	131.9	123.4	106.3	... 121.9
Difference	.....	-2.5	-9	-2.3	+3.9	-3.1	+2.7	-2.2	-5.9	... -1.3
Instances	{ exceeding									
1893		2	1	1	0	2	0	1	2	

The last two tables, at first sight, appear to indicate a gradual falling off, for the extreme shade maxima are unprecedented in only four months, and the extreme sun maxima in only two. This comparison, of course, is little guide to the character of a month, for it is judging it not by one day even, but by one single reading. But even by this comparison, taken for what it is worth, the season as a whole is unprecedented, for in no other year of the ten have unequalled shade max occurred in more than two months, or unequalled sun max. in more than one. 1887, so well remembered for its "Queen's weather," gives three instances of the highest reading in the preceding 10 years, viz., June, July, and August, so that before 1893 it was a "record" year, yet its max. are exceeded in two out of the three months—June and August.

We have already quoted the average shade and sun maxima for 1893 in comparing them with means of the previous ten years, but we repeat them for the sake of clearness in order to compare them with the extreme mean values of each month for the ten years 1883-92.

AVERAGE SHADE MAX.:

		Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN
		1884	1892	1892	1887	1887	1884	1890	1886	8 Months.
Highest	Year.....	1884	1892	1892	1887	1887	1884	1890	1886	
1883-92	{ Value ...	52.7	59.6	66.4	73.8	78.9	77.1	70.1	60.3	... 67.4
1893	.....	56.6	65.6	70.2	74.9	74.5	77.1	67.9	59.3	... 68.3
Difference	.....	+3.9	+6.0	+3.8	+1.1	-4.4	0	-2.2	-1.0	... +0.9

Only three of the months of 1893 have been exceeded by any corresponding month in ten years; no other year has more than one unequalled month, and 1887 is again surpassed.

AVERAGE SUN MAX. (black bulb in vacuo):

										MEAN
										8 Months.
		Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	
Year.....		1890	1892	1890	1892	1887	1886	1890	1891	
Highest	{ Value ...	81.7	100.4	106.6	115.4	123.1	114.6	104.4	83.3	... 103.7
1883-92		86.9	101.9	112.0	116.4	115.6	117.8	105.4	88.2	... 105.5
1893										
Difference.....		+5.2	+1.5	+5.4	+1.0	-7.5	+3.2	+1.0	+4.9	... +1.8

Seven out of the eight months are shown to be unprecedented in ten years. In other words, out of the 11 years dealt with, there is

only one year which exceeds 1893 in any month, and this is July, 1887, a month which stands alone; for whereas July, 1887, was the best month of that year, July may be safely characterized as the worst month of the summer of 1893.

MEAN AMOUNT OF CLOUD (mean of the 9 a.m. and 9 p.m. observations):

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Lowest Year...1883 & 85	1883	1885	1892	1890	1887	1887	1884	1886 & 91	1890
1883-92 { Value ...	5.4	3.2	4.8	4.6	4.0	3.6	4.6	5.1	... 4.4
1893	3.1	3.1	4.3	4.4	6.0	4.9	4.7	5.0	... 4.4
Difference.....	-2.3	-1	-5	-2	+2.0	+1.3	+1	-1	... 0

Here six out of the eight months of 1893 are unprecedented for cloudlessness, and curiously the average for 1893 corresponds exactly with that of the least cloudy corresponding months in ten years. July, 1887, again shows great superiority over July, 1893.

We have, thus far, confined ourselves to maximum temperatures, and confess to a feeling that these are a truer guide to the character of the past season than mean temperatures, at any rate, for ordinary mortals who spend their nights in bed, and we are not sure that it is not the same as regards the crops, though that is a question for botanists; but we fancy that vegetation is not so much checked by low temperature at night, due to radiation (frosts of course excepted), as it is advanced by the greater duration of sunshine by day. Nevertheless, we have extracted the mean temperature in similar form.

MEAN TEMPERATURE (mean of shade max. and min.):

	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Average 1883-92 ...	40.7	47.0	54.2	60.7	62.9	62.5	58.4	49.3	... 54.4
1893.....	46.4	53.0	58.8	63.2	64.8	66.7	58.5	52.1	... 57.9
Difference	+5.7	+6.0	+4.6	+2.5	+1.9	+4.2	+0.1	+2.8	... +3.5

Here, again, every month shows a considerable excess over the average.

MEAN TEMPERATURE (mean of shade max. and min.):

	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Highest Year ...	1884	1885	1889	1889	1887	1884	1890	1886	
1883-92 { Value ...	45.1	49.0	57.8	63.1	67.3	65.8	60.7	54.1	... 57.9
1893	46.4	53.0	58.8	63.2	64.8	66.7	58.5	52.1	... 57.9
Difference.....	+1.4	+4.0	+1.0	+0.1	-2.5	+0.9	-2.2	-2.0	... -0.1

Five months—March, April, May, June, and August—are unprecedented, but July, 1887, again is unapproached. The final mean is curious, and looks as if our arithmetic were faulty; the exact figures are $57^{\circ}.94$ and $57^{\circ}.87$, diff. $0^{\circ}.07$, so that reduced to one place of decimals, they are as in the table. Here again the mean

of the eight months of 1893 is curiously near to the mean of the most favourable corresponding months in the ten years.

One more comparison we have made, that of the difference between the readings of the black bulb in vacuo and the bright bulb in vacuo, which we are told gives the best value for the heating power of the sun's rays.

EXCESS OF BLACK BULB SUN MAX. OVER BRIGHT BULB SUN MAX.:

	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	MEAN 8 Months.
Average 1882-93	21.3	26.1	26.8	28.6	29.5	28.2	24.2	17.6	25.3
1893	22.3	25.8	30.2	29.4	29.3	29.0	26.8	21.2	26.8
Difference... ..	+1.0	-0.3	+3.4	+0.8	-0.2	+0.8	+2.6	+3.6	+1.5
Highest Year...	1883	1892	1885	1892	1887	1886 & '91	1887	1887	
1883-92 \ Value ..	25.9	29.2	29.5	32.4	31.7	30.1	26.3	19.7	28.1
1893	22.3	25.8	30.2	29.4	29.3	29.0	26.8	21.2	26.8
Difference.....	-3.6	-3.4	+0.7	-3.0	-2.4	-1.1	+0.5	+1.5	-1.3

It is not easy at first sight to grasp the meaning of this table, for it must be remembered that it contains not positive results for the various months, but the difference between two sets of readings for the same month, so that a month might have a very high mean shade temp. and a very high mean sun temp., and yet, owing to slight haze (the natural resultant of hot and dry weather), exhibit a low value. We are not sure that it would not be best described as a table of the diathermancy of the air, but this, after all, is only the complement of the solar radiation.

The table shows excesses in six months, and unprecedented values in three, but appears to indicate that although in several months the sun heat was great, the warmth of the period as a whole was due rather to prolonged sunshine than to excessive solar radiation.

We may sum up by saying that the eight months as a whole were altogether unprecedented in the ten preceding years, and that the abnormal conditions were much accentuated in the first half of the period, though well marked in the second half. The first four months may also be safely quoted as individually unprecedented in the ten years, though some one element may have given a higher extreme value in other years. July, 1893, is so clearly inferior to July, 1887, that it may be of interest to compare the two :—

	July, 1887.	July, 1893.
Mean shade temp.	67.3	64.8
„ „ max.....	78.9	74.5
„ sun „	123.1	115.6
Absolute shade max.	88.8	90.7
„ sun „	133.4	130.3
Mean amount of cloud	4.0	6.0

It will be seen that the only item which shows superiority in 1893 is the absolute max. in shade.

August, 1893, is quite unparalleled in the ten years, and in some particulars in 36 years. The shade temp. at 9 a.m. on the 18th,

84°·3, was 3°·5 higher than any other 9 a.m. reading; the shade max. on 16th, 17th and 18th were 90°·7, 92°·7 and 93°·6 respectively, this being the only instance of 90° being reached on three consecutive days; while the summer as a whole yields the only instance of five days with shade maxima exceeding 90°.

September and October though exceptional, were not unprecedented, for the first was slightly inferior to September, 1890, and the latter decidedly inferior to October, 1886.

We have heard it suggested that, going back further than the ten years dealt with, we should find a very near parallel to 1893 in 1878; we therefore give the mean values for the eight months, March to October, of that year:—

	Mean shade temp.		Mean shade max.		Mean sun max.		Absolute shade max.		Absolute sun max.		Mean amount of cloud.
1878.....	56·5	...	65·1	...	103·9	...	75·4	...	120·0	...	6·0
1893.....	57·9	...	68·3	...	105·5	...	80·9	...	121·9	...	4·4
Difference ...	+1·4	...	+3·2	...	+1·6	...	+5·5	...	+1·9	...	—1·6

1893 shows superiority in every instance.

THE MINIMUM IN WINTER ON THE SUMMIT OF ARARAT.

Ciel et Terre contains an interesting note respecting the above. It is rather out of date, for it is an observation made in 1889 published at the end of 1893, but it is none the less welcome. The following are the leading facts:—

On August 13th, 1888, M. E. Markow placed near the summit of Mount Ararat (16,919 ft.) a minimum thermometer. On July 25th, 1889, some officers of a regiment quartered at the foot of the mountain ascended to the summit, and found that the thermometer was undamaged and read —50° C. (= —58° F.).

That the reading should be just —50° C. is suspicious, and indicates a want of care in the observation, and it is not stated whether the index was reset, nor what the thermometer indicated as the then existing temperature.

The article goes on to state that when M. Markow's proposal became known, it was said that it must fail; that the first tempest would carry the thermometer away, or the first avalanche or fall of the rocks would shatter it. It did not; and then *Ciel et Terre* proceeds to urge that mountaineers could render service to meteorologists by placing thermometers on analagous peaks.

We may remind our readers* that on a much lower peak than Ararat, but one where very likely the wind is quite as rough, viz., on Y Glyder Fach, 4 miles E.N.E. of Snowdon, and 3,262 ft. above the sea, Mr. Piffe Brown not merely placed a minimum thermometer in

* See *Quar. Jour. R. Met. Soc.*, xix. (1893), p. 149.

1867, but has read it almost every year since that date, but *it has never fallen even to zero*, the lowest being 9° for the winter 1891-92. So also at Ben Nevis, 4,404 ft., the lowest in the years 1884-89 was 6°·4 on February 10th, 1889, while zero is not at all unusual at low stations in Scotland.

On the whole, while not forgetting the definition of the "Frosty Caucasus," we hope that further efforts will be made towards ascertaining with precision the minimum on Mount Ararat.

ROYAL METEOROLOGICAL SOCIETY.

THE first meeting of this Society for the present Session was held on Wednesday evening, November 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Dr. C. Theodore Williams (President) in the chair.

Twenty-three new Fellows were elected.

Mr. F. J. Brodie, F.R.Met.Soc., read a paper on "The Great Drought of 1893, and its attendant Meteorological Phenomena." The author confined his investigation to the weather of the four months March to June, during which period the absence of rain was phenomenal; barometric pressure was greatly in excess of the average; temperature was high, with a large diurnal range; and the duration of sunshine was in many places the longest on record. The mean temperature over England was about 4° above the average. Along the south and south-west coasts the sunshine was between 50 and 60 per cent. of the possible duration. The rainfall was less than half the average amount over the southern and eastern parts of England, the extreme south of Ireland, and a portion of Durham and Northumberland; while over the Southern Counties of England generally the fall amounted to less than one-third of the average. The smallest number of days with rain was at the North Foreland, where there were only 18.—A rather prolonged discussion followed, in which the President, Mr. Symons, Dr. Buchan, and Messrs. Baldwin Latham, C. Harding, Gaster, and Southall took part.

Mr. W. Marriott, F.R.Met.Soc., gave an account of the "Thunder and Hail Storms" which occurred over England and the South of Scotland on July 8th, 1893. Thunderstorms were very numerous on that day, and in many instances were accompanied by terrific hailstorms and squalls of wind. It was during one of these squalls that a pleasure boat was capsized off Skegness, 29 persons being drowned. About noon a thunderstorm, accompanied by heavy hail and a violent squall of wind, passed over Dumfries, and along the valley of the Nith; many of the hailstones measured from 1 in. to 1½ in. in length. At the same hour a similar storm occurred at Peterborough. From about 2 until 10 p.m. there was a succession of thunderstorms over the north-east of England and south-east of Scotland, and at many places it was reported that the thunderstorms

were continuous for nine hours. Two storms were remarkable for the immense hailstones which fell during their prevalence over Harrogate and Richmond, in Yorkshire. The hailstones were 4 and 5 inches in circumference, and some as much as 3 inches in diameter. Great damage was done by these storms, all windows and glass facing the direction from which the storm came being broken. It is computed that within a radius of five miles of Harrogate not fewer than 100,000 panes of glass were broken, the amount of the damage being estimated at about £3,000. The thunderstorms in the northern part of the country travelled generally in a north-north-westerly direction at the rate of about 20 miles an hour. They appear to have taken the path of least resistance, and consequently passed over low ground and along river valleys and the sea coast. Several storms seem to have followed each other along the same track.

RAINFALL IN PERSIA.

[In the article in our last, we quoted two rainfall records outside of Persia, because they afforded some indication of what probably occurred in that country. Our esteemed correspondent, Prof. Raulin, has taken even a wider range, so that his letter might almost be headed Rainfall of Western Asia; but as his returns relate primarily to the previous article, we retain the heading.—ED.]

To the Editor of the Meteorological Magazine.

SIR,—I have read with much pleasure your article on the rainfall of Persia. It seems to me that starting with Lenkoran, at the S.W. angle of the Caspian, you might also have quoted Astrabad and Aschur-Ade, at the S.E. angle, and, further east, the returns from Merv and Sultan-Bend. You might also have added those made at Mosul and Baghdad, and in the eastern part of the plateau of Iran; in Baluchistan, at Peshin, Quetta and Kelat. The following are the stations and mean values:—

STATION.	COUNTRY.	Lat. N.	Lon. E.	Altitude. Feet.	Date.	PERIOD OF OBSERVATION.	
						Duration.	
						Yrs. Ms.	
Astrabad	Turkestan	36 52	54 26	—70	1858, 1873-9	7	7
Aschur-Ade ...	„	36 54	53 55	80	1883-86	2	3
Merv	„	37 35	61 47	686?	1885-90	1	4
Sultan Bend ...	„	37 0	62 22	860?	1889-91	2	0
Mosul.....	Kurdistan	36 19	43 9	—	1854-55	2	0
Baghdad	Turkey in Asia	33 19	44 26	—	1887-90	3	3
Peshin	Baluchistan ...	30 27	67 0	...	1885-90	6	0
Quetta	„ ...	30 11	67 3	5501	1878-90	13	0
Kelat	„	28 53	66 28	6514	1879-90	12	0

[We add to Prof. Raulin's table the means of the returns given in our last number, and also those for two Indian stations, so as (in conjunction with the map) to render the information complete. The figures on the map indicate the mean annual rainfall to the nearest inch.—ED.]

	Jan. in.	Feb. in.	Mar. in.	April in.	May. in.	June. in.	July. in.	Aug. in.	Sep. in.	Oct. in.	Nov. in.	Dec. in.	YEAR. in.
Astrabad	2·01	·78	1·18	1·08	1·08	·55	·71	1·37	2·56	1·53	1·34	2·09	16·28
Aschur-Ade ...	1·65	1·40	1·42	1·04	1·74	·90	1·14	·55	1·58	1·26	1·18	2·44	16·30
Merv	·99	·87	2·12	1·18	·10	·00	·00	·00	·00	·39	·13	·58	6·36
Sultan Bend....	2·36	·87	·00	·78	·52	·01	·00	·00	·00	·12	·42	1·11	6·19
Mosul	3·18	2·36	1·54	1·60	·25	·04	·00	·00	·00	·52	·66	2·03	12·18
Baghdad	·52	2·75	2·00	1·86	·22	·01	·00	·35	·00	·00	·32	2·21	10·24
Peshin.....	3·07	1·35	1·48	1·10	·28	·05	·30	·04	·00	·00	·99	·92	9·58
Quetta	1·83	1·50	1·92	1·21	·37	·09	·62	·62	·16	·07	·32	·61	9·32
Kelat	1·69	1·78	1·77	·65	·25	·04	·51	·61	·01	·06	·44	·58	8·39
Teheran (1) ...	2·39	2·72	1·46	1·68	·81	·34	·00	·00	·04	·47	·59	1·14	11·64
„ (2) ..	1·72	·50	1·03	1·85	·26	·00	·03	·26	·00	·71	2·28	1·81	9·45
Ooroomiah	1·69	2·83	4·06	5·22	2·43	·43	·00	·48	·65	1·48	·95	1·29	21·51
Bushire	3·45	3·06	·94	·80	·01	·00	·00	·00	·00	·00	1·01	3·69	12·96
Lenkoran	4·37	2·83	3·66	2·67	1·53	·87	1·16	1·91	8·15	8·70	6·65	4·37	46·87
Muscat	—	—	—	—	—	—	—	—	—	—	—	—	6·11
Hyderabad (3) .	·28	·20	·13	·18	·14	·40	2·68	3·14	·68	·00	·14	·03	8·00
Karachi (4).....	·69	·25	·15	·16	·18	2·90	1·75	·76	·05	·21	·19	·05	7·34

The observations at Ooroomiah were made by the Rev. D. T. Stoddart, in the village of Seir, at the altitude of 6,225 feet, from Feb., 1853, to March, 1854, and are given in *Silliman's Amer. Jour. of Science*, 2nd series, vol. xx., p. 256.

I agree with you in regretting that there are no records from Ispahan; but why should we expect more from the Persians than from the Chinese? How many centuries more must elapse before they equal the Japanese?—Yours very truly,

V. RAULIN.

Montfauçon, d'Argonne (Meuse).

(1) Russian Observations.

(2) Mr. Hontum Schindler's Observations.

(3) Lat. 25° 25' N., Lon. 68° 27' E.; Altitude 134 feet.

(4) Lat. 24° 47' N., Lon. 67° 4' E.; Altitude 49 feet.

REVIEWS.

Weather Lore. A Collection of Proverbs, Sayings, and Rules concerning the Weather, compiled and arranged by RICHARD INWARDS, F.R.A.S., F.R.Met.Soc. London: Elliot Stock, 1893. 8vo. X.—190 pages and 2 plates.

It is not always easy to hide anything. Mr. Inwards, in the year 1869, brought out *Weather Lore*; why he has not called the present far larger work the Second Edition we know not, but he has effaced himself in the excellent Bibliography which occupies five pages of the present work; he does not put "Second Edition" on the title page, or mention the existence of the early edition anywhere except (accidentally?) on page vii., where he says, "In this Second Edition I have been able," &c.

Mr. Inwards certainly has no need to be ashamed of the little volume of 1869, for it was better than any similar work then in

existence, just as the present one is indisputably the best upon the subject yet issued in any country.

Having pronounced our verdict, we proceed with a few comments, and to mention one or two microscopic faults.

The frontispiece, a series of clouds grouped according to the altitudes usually ascribed to them, is instructive, but cloud forms are always puzzling, and we can imagine observers feeling some difficulty in deciding between Alto Cumulus and Cirro Cumulus. In another edition (without waiting another 24 years) we hope to see the clouds produced upon a blue ground.

On page vii. the author says: "The Shepherd of Banbury, who in the last century wrote a short list of outdoor signs of coming changes in the state of the air." This is a common, in fact nearly universal, error. In Mr. Inwards's Bibliography the edition of 1764 is quoted, and that is the ground for the expression "in the last century," but the *real* first edition was published nearly 100 years earlier, viz., in 1670.

We have never before seen the following lines, but we do not quite see that they relate to the weather:—

"In Aprill, the Koo-coo can sing her song by rote;
In June, of tune she cannot sing a note:
At first, Koo-coo, Koo-coo, sing still can she do;
At last, Kooke, Kooke, Kooke, six Kookes to one Koo."

Haywood, 1587.

On page 64 there is either a misprint or a joke, we do not know which; we suspect a trick of the printer:—

"Acosta observes that in Peru, which is a bery [*sic*] windy country, there is most wind at the full moon."—*Bacon*.

[*Note*.—There is no special wind in Peru that I ever experienced.—R.I.]

Mr. Inwards evidently enjoys a joke, as witness the end of the following:—"Cats with their tails up and hair apparently electrified, indicate approaching wind—or a dog."

There are remarkably few mistakes or misprints; the only repeated one is that the Hon. Rollo Russell never gets the final "l."

The collection is without precedent as to the number of proverbs collected, and as they are well arranged, and there is an index with more than 2,000 entries, we do not see how, in its own province, it can be surpassed.

Specola Vaticana, 1890. Fascicolo I. 4to. Roma, 1891. 180 pages.

Specola Vaticana. Classificazione delle Nubi. 4to. Roma, 1893. 14 pages, 12 plates.

PADRE DENZA has, with his usual promptitude and kindness, sent Fascicolo I. of the Pubblicazioni, and thus rendered our set perfect. This first volume is naturally smaller than the later ones, but it is of value as giving the history of the Vatican Observatory, and many incidental bits of information. For instance: in the middle of this century lived A. Perrey of Dijon, the greatest worker and writer

upon the subject of Earthquakes that the world has yet seen. Perrey formed a splendid library and died, and we knew not where his books were, but Padre Denza, when writing on quite a different subject, says, "Nella Biblioteca sismica del Perrey, acquistata della Sezione del Club Alpino Italiano in Napoli, trovasi," &c. So Perrey's library is safe in Naples; long may it remain so.

The second article is a history of Celestial Photography from Arago's first mention of the subject before the French Academy on August 19th, 1839, down to the present day, and to the co-operation of the Vatican Observatory in the great work of photographing the whole of the stars, the Vatican Observatory will have to take 1,000 negatives.

This article is followed by a report by Padre Lais on the result of his visit to Paris to make himself familiar with the practice of Celestial Photography, and this by others on a Solar Eclipse, on Shooting Stars, on Geodynamics, and one on the Photography of Clouds, by the Engineer Sig. F. Mannucci, who from the very beginning has taken quite front rank as an expert.

In fact, the second work at the head of this list is devoted to Sig. Mannucci's splendid photographs of clouds, and is a reprint (with additions) from Fasci. III. It is very handy to have it separate, and our only regret is that as "we have seen nothing approaching them for beauty and for fidelity," we are not able to state whether copies can be purchased. It would certainly be desirable.

NOVEMBER RASPBERRIES.

To the Editor of the Meteorological Magazine.

SIR,—I am able to bring the record of this abnormal fruit season down to Nov. 12th, on which day I had given to me at Colchester, a bunch of ripe raspberries just gathered in a garden in the neighbourhood of that town. It may be of interest to add that in the middle of September, at Budleigh Salterton, S. Devon, I saw a laburnum tree in full flower, being, of course, the second flowering of this year.

Yours truly,

R. MELDOLA.

6, Brunswick Square, W.C., Nov. 17th, 1893.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1893.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
°		°		°	°	°	0-100	°	°	inches			
England, London	90·4	19	38·3	1	74·9	51·4	49·2	65	134·3	35·0	·74	9	4·5
Malta.....	87·2	30	59·5	10	80·6	65·0	62·4	73	141·4	54·5	·15	2	2·6
Cape of Good Hope ...	66·2	25	38·9	20	61·2	49·1	50·7	90	...	...	4·60	17	7·7
Mauritius.....	76·0	10	59·0	29	74·2	63·6	59·5	74	123·2	49·6	2·53	20	4·5
Calcutta.....	91·9	3	75·4	1	87·6	78·1	78·4	86	157·4	73·9	25·65	15	7·7
Bombay.....	91·3	9	74·3	21	85·9	78·2	76·5	83	145·1	72·7	21·47	21	7·6
Ceylon, Colombo	86·4	...	74·0	4	85·0	77·2	71·5	77	153·5	70·0	11·01	17	7·0
Melbourne.....	62·3	11	33·0	26	55·0	43·1	44·2	85	113·9	26·0	3·21	14	7·3
Adelaide	64·6	9	36·5	25	59·0	45·8	45·1	76	124·3	30·0	3·86	21	6·1
Sydney	64·7	12	41·7	21	59·0	48·9	48·3	89	108·0	28·8	7·78	15	5·0
Wellington	69·0	1	34·0	11	55·8	45·1	41·8	73	104·0	24·0	3·23	15	4·6
Auckland	65·5	2	41·5	11	59·3	48·9	48·8	82	112·0	30·0	5·07	18	7·0
Jamaica, Kingston.....	89·6	30	69·2	6	86·8	72·6	70·8	78	...	...	1·80	9	6·8
Trinidad	91·0	2, 30	66·0	10a	89·1	69·0	73·1	80	143·0	63·0	10·19	22	...
Toronto	90·7	19	48·5	7	76·8	56·5	58·2	75	...	42·0	1·83	14	5·0
New Brunswick, Fredericton	85·0	30	39·0	28	74·7	49·8	52·0	66	...	...	2·32	6	5·0
Manitoba, Winnipeg ...	92·8	13	40·6	9	76·6	54·6	...	...	...	...	3·87	18	6·0
British Columbia, Esquimalt	80·0	5	42·2	1	62·8	47·8	48·7	80	...	...	1·73	16	6·0

a And 11th.

REMARKS.

MALTA.—Mean temp. 71°·7; mean hourly velocity of wind 8·8 miles. Thunderstorms on 2nd and 10th; a few hailstones on the 2nd. J. SCOLES.

Mauritius.—Mean temp. of air 1°·6 below, dew point 1°·2 below, and rainfall 47 in. above, their respective averages. Mean hourly velocity of wind 11·3 miles, or 0·2 mile below average; extremes, 25·1 on 6th, and 1·9 on 21st; prevailing direction, E.S.E. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 1st, 3rd and 4th; a thunderstorm occurred on the 5th. D. G. MANTELL.

Melbourne.—Dense fog on the 8th, 9th and 10th; sharp frost and ice on the 24th and 26th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp. 1°·2 below the average of 36 years. R 1·08 in. in excess of the average. C. TODD, F.R.S.

Sydney.—Temp. 0°·4 below, humidity 11 above, and rainfall 2·18 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part of the month, and strong N.W. wind up to the 4th; fine weather about the middle of the month, then showery from 19th to 24th, and from 25th to the end, fine; prevailing winds N.W. and S.; snow and hail on 9th and 10th; foggy on the 16th; earthquake on 15th. Mean temp. 1°·4 above, and rainfall 1·90 in. below, the average. R. B. GORE.

Auckland.—A showery and disagreeable month. Rainfall, mean temperature and barometric pressure all above the average of 26 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Fair, with half the average rainfall. Mean hourly velocity of wind 4·4 miles. Earthquakes on the 2nd and 4th. ROBT. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL,
 NOVEMBER, 1893.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2.68	XI.	Builth, Abergwessin Vic.	5.11
„	Birchington, Thor	3.13	„	Rhayader, Nantgwillt..	4.25
„	Brighton, Prestonville Rd .....	...	„	Corwen, Rhug	3.89
„	Hailsham	2.58	„	Carnarvon, Cocksida ...	3.45
„	Ryde, Thornbrough	2.46	„	I. of Man, Douglas	2.31
„	Alton, Ashdell	2.84	XII.	Stoneykirk, Ardwell Ho.	3.56
III.	Oxford, Magdalen Col...	1.53	„	New Galloway, Glenlee	3.89
„	Banbury, Bloxham	1.83	„	Melrose, Abbey Gate...	2.76
„	Northampton, Sedgebrook	1.88	XIII.	N. Esk Res. [Penicuik]	2.75
„	Alconbury	1.83	„	Edinburgh, Blacket Pl.	1.74
„	Wisbech, Bank House..	3.18	XIV.	Glasgow, Queen's Park.	3.07
IV.	Southend	2.32	XV.	Islay, Gruinart School..	3.48
„	Harlow, Sheering	2.54	XVI.	Dollar	2.05
„	Colchester, Lexden	2.37	„	Balquhiddier, Stronvar..	4.24
„	Rendlesham Hall	3.75	„	Coupar Angus Station..	1.63
„	Diss	3.44	„	Dunkeld, Inver Braan..	2.09
„	Swaffham	3.39	„	Dalnaspidal H.R.S. ...	4.26
V.	Salisbury, Alderbury ...	1.96	XVII.	Keith H.R.S.	3.81
„	Bishop's Cannings	2.42	„	Forres H.R.S.	2.82
„	Blandford, Whatcombe .	2.01	XVIII.	Fearn, Lower Pitkerrie.	3.45
„	Ashturton, Holne Vic....	3.50	„	Loch Shiel, Glenaladale	11.80
„	Okehampton, Oaklands .	3.72	„	N. Uist. Loch Maddy ...	4.57
„	Hartland Abbey	2.54	„	Invergarry	4.87
„	Lynmouth, Glenthorne .	3.59	„	Aviemore H.R.S.	3.25
„	Probus, Lamellyn	3.43	„	Loch Ness, Drumnadrochit	4.00
„	Wincanton, Stowell Rec.	2.28	XIX.	Invershin	2.97
„	Weston-super-Mare .....	...	„	Scourie	9.51
VI.	Clifton, Pembroke Road	2.50	„	Watten H.R.S.	5.03
„	Ross, The Graig	1.22	XX.	Dunmanway, Coolkelure	4.34
„	Wem, Clive Vicarage ...	1.49	„	Fermon, Gas Works ...	2.56
„	Cheadle, The Heath Ho.	1.47	„	Killarney, Woodlawn ...	3.37
„	Worcester, Diglis Lock	1.06	„	Tipperary, Henry Street	2.79
„	Coventry, Coundon	1.92	„	Limerick, Kilcornan ...	2.35
VII.	Ketton Hall [Stamford]	1.93	„	Ennis	1.91
„	Grantham, Stainby	2.25	„	Miltown Malbay	2.87
„	Horncastle, Bucknall ...	2.22	XXI.	Gorey, Courtown House	1.55
„	Workshop, Hodsck Priory	2.06	„	Mullingar, Belvedere...	1.23
VIII.	Neston, Hinderton	1.32	„	Athlone, Twyford	1.32
„	Knutsford, Heathside...	1.65	„	Longford, Currygrane...	1.41
„	Lancaster, Rose Bank...	1.87	XXII.	Galway, Queen's Coll...	2.97
„	Broughton-in-Furness..	4.39	„	Crossmolina, Enniscoe..	3.36
IX.	Ripon, Mickley	1.76	„	Collooney, Markree Obs.	2.95
„	Scarborough, South Cliff	3.96	„	Ballinamore, Lawderdale	2.53
„	East Layton [Darlington]	1.83	XXIII.	Lough Sheelin, Arley ..	1.47
„	Middleton, Mickleton..	1.95	„	Warrenpoint .....	...
X.	Haltwhistle, Unthank..	2.61	„	Seaford	1.57
„	Bamburgh	1.81	„	Belfast, Springfield	2.53
„	Newton Reigny	2.32	„	Bushmills, Dundarave...	2.58
XI.	Llanfrechfa Grange	1.69	„	Stewartstown	1.80
„	Llandovery	3.30	„	Buncrana	3.03
„	Castle Malgwyn	3.43	„	Lough Swilly, Carrablagh	3.80

NOVEMBER, 1893.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.						Days on which "01 or more fell.	TEMPERATURE.				No. of Nights below 32	
		Total Fall.	Differ- ence from average 1880-9.	Greatest Fall in 24 hours		Max.	Min.		In shade.	On grass.				
				Dpth	Date									
											Deg.	Date	Deg.	Date
		inches.	inches.	in.				Deg.	Date	Deg.	Date			
I.	London (Camden Square) ...	2·17	—	·49	·59	14	15	59·8	3	27·8	1	10	13	
II.	Maidstone (Hunton Court)...	2·61	—	·32	·62	14	16	...	...	...	...	...	...
III.	Strathfield Turgiss	2·09	—	·63	·57	14	15	60·5	3	24·0	13	11	18	
III.	Hitchin	2·34	—	·34	·62	25	19	58·0	3	25·0	4, 12	16	...	
IV.	Winslow (Addington)	2·25	—	·68	·48	18	15	60·0	3	23·0	1	14	19	
IV.	Bury St. Edmunds (Westley)	3·12	+	·57	·85	18	14	55·0	3	20·0	5	...	...
V.	Norwich (Cossey)	4·12	+	1·55	·80	18	20	...	...	...	...	...	...
V.	Weymouth (Langton Herring)	1·55	—	2·11	·40	30	13	58·0	2a	28·0	19c	10	...	
"	Torquay (Cary Green)	1·85	...	...	·57	16	14	60·8	3	30·0	23	3	11
"	Bodmin (Fore Street) .....	...	...	...	...	...	...	...	...	...	...	...	...
VI.	Stroud (Upfield)	2·19	—	1·14	·57	17	19	57·0	3	27·0	18	10	...	
"	Church Stretton (Woolstaston)	1·72	—	1·80	·50	25	14	58·5	3	24·0	19	13	17	
"	Tenbury (Orleton)	1·45	—	1·69	·38	25	15	60·5	3	22·0	1	11	14	
VII.	Leicester (Barkby)	1·91	—	·38	·47	18	15	59·0	3	17·0	4	14	22	
"	Boston	2·63	+	·43	·72	18	18	56·0	3	26·0	27	2	...	
"	Hesley Hall [Tickhill]	1·60	—	·42	·38	17	17	59·0	3	24·0	5	14	...	
VIII.	Manchester (Plymouth Grove)	2·41	—	·59	·77	25	17	56·0	3	26·0	4, 5	13	15	
IX.	Wetherby (Ribston Hall) ...	1·08	—	·99	·42	19	10	...	...	...	...	...	...
"	Skipton (Arncliffe)	4·60	—	2·15	·64	26	24	...	...	...	...	...	...
"	Hull (Pearson Park)	3·20	+	1·19	·77	18	22	56·0	17	25·0	5, 23	17	19	
X.	Newcastle (Town Moor)	2·60	+	·20	·48	6	22	...	...	...	...	...	...
"	Borrowdale (Seathwaite)	11·54	—	3·25	2·25	25	18	...	...	...	...	...	...
XI.	Cardiff (Ely)	2·69	—	2·22	·63	1	16	...	...	...	...	...	...
"	Haverfordwest	4·26	—	1·60	1·39	18	18	55·6	17	27·0	1	9	12	
"	Aberystwith, Gogerddan	4·44	—	·67	·98	25	12	55·0	3	20·0	4	16	...	
"	Llandudno	3·30	+	·21	·52	16	17	56·8	4	...	...	...	...
XII.	Cargen [Dumfries]	1·78	—	2·78	·49	1	10	55·0	28	26·0	5	12	...	
"	Jedburgh (Sunnyside)	2·86	+	·36	1·00	5	16	57·0	16	26·0	27	5	...	
XIV.	Old Cumnock	3·40	—	1·57	·48	3	14	...	...	...	...	...	...
XV.	Lochgilhead (Kilmory)	5·67	—	1·62	1·08	24	15	...	...	19·0	30	19	...
"	Morvern (Drimnin)	5·47	...	...	1·26	16	19	...	...	...	...	...	...
"	Mull (Quinish)	4·41	—	2·58	1·02	16	16	...	...	...	...	...	...
XVI.	Loch Leven Sluices	1·90	—	2·06	·70	4	8	...	...	...	...	...	...
"	Dundee (Eastern Necropolis)	1·25	—	1·45	·50	3	10	55·2	28	26·8	23	13	...	
XVII.	Braemar	3·05	—	1·53	·51	5	21	53·0	28	18·7	21	17	26	
"	Aberdeen (Cranford)	4·22	...	...	1·26	16	22	55·0	29	24·0	30	9	...
XVIII.	Strome Ferry .....	...	...	...	...	...	...	...	...	...	...	...	...
"	Cawdor [Nairn]	3·73	+	·83	·94	17	22	...	...	...	...	...	...
XIX.	Dunrobin	5·15	+	2·31	1·63	17	18	55·0	28	24·0	25	14	...	
"	S. Ronaldsay (Roeberry)	5·97	+	2·55	1·71	17	23	47·0	10b	18·0	18	10	...	
XX.	Darrynane Abbey	3·44	...	...	1·09	16	16	...	...	...	...	...	...
"	Waterford (Brook Lodge) ...	2·34	—	1·33	·67	16	17	59·0	3	28·0	1d	8	...	
"	O'Briensbridge (Ross)	2·59	...	...	·49	25	14	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	1·91	—	1·15	·46	16	14	...	...	...	...	...	...
"	Dublin (Fitz William Square)	1·87	—	·96	·82	16	17	57·6	3	30·8	7	3	18	
XXII.	Ballinasloe	1·97	—	1·94	·38	16	15	52·0	3	28·0	6	13	...	
"	Clifden (Kylemore)	5·06	...	...	1·47	16	16	...	...	...	...	...	...
XXIII.	Waringstown	1·90	—	1·20	·41	16	15	58·0	3	22·0	6	12	19	
"	Londonderry (Creggan Res.) ..	3·37	—	1·15	·65	16	19	...	...	...	...	...	...
"	Omagh (Edenfel)	2·37	—	1·50	·60	16	17	54·0	3, 28	21·0	14	12	19	

a And 3, 4. b And 21, 24. c And 24. d And 5, 27.

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

METEOROLOGICAL NOTES ON NOVEMBER, 1893.

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

ENGLAND.

STRATHFIELD TURGISS.—On the whole a pleasant month, but chiefly characterised by the sudden and severe changes of temperature and sharp paroxysms of cold of short duration, and by a severe and long-lasting storm from the N. W. on the 18th and subsequent days. S on 18th.

ADDINGTON.—The weather during the month was of a very varied and uncertain description, with frequent rapid and great changes of temperature. A difference of 15 degrees occurred in the max. of the 17th and 18th. The 18th was a very wild day; S began to fall about 11 a.m., and driven by a very high wind, formed great wreaths 3 ft., 4 ft., and 5 ft. deep, on the south side of all hedges running E. and W. It was impossible to tell how deep the S would have lain had it been still, but on the morning of 19th the gauge yielded 48 in. of R and melted S.

BURY ST. EDMUNDS.—A month of sudden and frequent changes both of temp. and pressure. No fog. S on 18th, 19th, 22nd, 26th, and 30th.

LANGTON HERRING.—The changes of temp. were sudden and great. The min. on the 1st was 30°; from the 2nd to the 4th the weather was very mild. A cold spell lasted from the 6th to the 15th, with N.E. and E. winds, which were very high on the 8th, 9th, and 10th. On the 18th and 19th there was a great storm, but no serious damage was caused in this locality. S fell on the 18th. From the 20th to the end of the month the temp. was very variable. Fogs on 14th, 15th, and 30th. Mean temp. at 9 a.m., 41°·6, or 2°·6 below the average of 21 years.

STROUD, UPPFIELD.—Earthquake felt at 5.45 p.m. on the 2nd. Gale on 17th. Severe gale on the 18th, with S and R, about half an inch of S laying on the ground. H storm on the 22nd; flakes of S on 30th.

WOOLSTASTON.—A cold month, with a good deal of frost. A shock of earthquake was distinctly felt on the 2nd about 5.50 p.m.; the direction appeared to be from the N.E. Heavy gales occurred between the 16th and 19th, and a wild blizzard raged on the 18th from noon to night, with driving S and sleet. Violent storms of H on the 22nd, and S on the 30th. Mean temp. 40°·3.

TENBURY, ORLETON.—A rather cold, but dry month, the mean temp. being nearly 0°·5 below the average. A great gale occurred on the 18th and 19th, accompanied by S, which drifted very much. Fog on the 2nd, 13th, 14th, and 21st.

LEICESTER, BARKBY.—A fine month, but variable in temp.; some beautiful sunsets. Water still short, and has to be carted to stock in the fields; most exceptional in this month. S on the 18th, 19th, and 30th, nearly 4 ft. deep not far from here. Mean temp. of month 39°·6.

MANCHESTER.—Fog on the 21st, and thick fog all day on the 14th; damp and foggy on the 15th, 28th, and 30th. Slight S showers on the 18th and 23rd. Fine autumn weather prevailed on the 3rd, 9th, 10th, 12th, 13th, and 29th. Very stormy from 16th to 19th, but very little property destroyed and no lives lost. Mean temp. 41°·0.

SEATHWAITE.—Falls of R exceeding an inch occurred on 5 days; exceeding two inches on the 25th. S on the hills on the 6th. Great storm on the 18th.

WALES.

HAVERFORDWEST.—A changeable, wet, stormy month, at times very cold, with very sharp frosts; the Precelly range three times environed with S from one end to the other. Four grass readings below 23°, lowest 21° on the 12th. On the 17th, 18th, and 19th a terrible gale blew; it commenced from S.E. with R, increasing in violence throughout the 18th; many trees blown down and houses stripped; the greatest force of the gale was from the N.N.W. to

N.N.E., consequently it did not do so much damage here as a westerly gale. The month ended fine and calm; wind very fresh on the night of the 30th.

GOGERDDAN.—Very changeable throughout the month. Wind from N.E. or N.W. H and S on several days.

SCOTLAND.

CARGEN.—The latter part of the month was very unsettled, the fluctuation of temp. and pressure being very marked; in 12 hours (27th–28th) the range of temp. was $26^{\circ}2$, and on the 17th and 18th the difference in pressure was nearly 1·2 inches. The gale on the 18th, which caused so much havoc in most parts of Britain, was comparatively little felt in this district, and the damage to trees, &c., was trifling; it was remarkable as coming from the N.E., a quarter severe gales very seldom come from. Easterly winds prevailed for 18 days. The mean temp. for the month was about $0^{\circ}5$ below the average.

JEDBURGH.—The weather was on the whole pleasant for the month, with no interruption to out-door work. The wind on 17th, 18th, and 19th was very high, but no damage to property resulted, except a few trees blown over or broken.

ABERDEEN, CRANFORD.—Violent gale on 18th; wind about 90 miles per hour; great destruction to plantations and loss of life at sea.

ROEBERRY.—On the 17th, after raining more or less all day, with a moderate S.E. wind, at about 5.45 p.m. the wind suddenly sprang up from the N.E. and blew a terrific gale all night, accompanied by R and sleet.

IRELAND.

DARRYNANE ABBEY.—A fine month, except a few days in the middle and at the end. A very strong gale on night of 16th and 17th.

WATERFORD, BROOK LODGE.—A great deal of N.E. wind. Heavy gales about the 18th. Mean temp. $42^{\circ}8$, nearly four degrees less than last year. S on the Comeraghs and Carlow mountains on the 19th.

O'BRIENSBRIDGE, ROSS.—An unusually fine month. Low temp. during the middle, with frequent slight frosts. Strong gales from N.W. on 17th and 18th.

DUBLIN.—This was a generally favourable month. Its leading characteristics were a prevalence of northerly winds, a tolerably low mean temp., an absence of calm and fog, a moderate R, but a high percentage of cloud. The storm from the 16th to 19th inclusive deserves special mention. The cyclonic depression which caused it was of great intensity, the bar. falling in its centre to about $28\cdot5$ in. on the morning of the 17th. The wind velocity during the northerly gales of this depression was great everywhere, but it was altogether exceptional at Holyhead, where the anemometer registered more than 1,800 miles of wind in 24 hours, and in one hour upwards of 85 miles. A slight shock of earthquake was felt at Greystones, Co. Wicklow, at 5.35 p.m. on the 2nd. Mean temp. $43^{\circ}8$, $0^{\circ}9$ below the average. High winds were noted on 15 days, but attained the force of a gale on only four occasions, the 16th, 17th, 18th, and 29th. Fogs on 5 days. A lunar halo was seen on the 21st. S or sleet fell on 4 days. H on 5 days.

BALLINASLOE.—Heavy R and gale on the 16th and 17th, and gale all day on the 25th.

OMAGH, EDENFEL.—The month commenced in dull, rainy weather, which gave way on the 6th to 10 days of rainless and generally bright weather, without much frost. On the 16th the bar. dropped 1·2 in. during the day, but it was not till the evening of the 17th that a northerly gale, exceeding in violence any since January 26th, 1884, commenced, and continued till evening of 18th, uprooting trees and doing much damage. The remainder of the month was raw, rainy, and unsettled, with extremely variable temperature.