

*Glaisher*

M. Zantedeschi's publication has induced Prof. Ragona-Scinà of Palermo to extend this new field of inquiries. The following are some of the principal results which he has made known\*. The horizontal and vertical lines may be perceived

Glaisher. 5

Remarks on the Weather for  
Quarters ending March 31. 1848<sup>June</sup>  
Sept<sup>and</sup>  
December 31. 1848. *AW 1848*

Colours, red, yellow, orange, and green. M. Zantedeschi speedily acknowledged himself of this opinion, and also explained, by the reciprocal influence of the luminous rays, his longitudinal lines†. This is proved, according to him, by their appearing so much the more distinct the narrower and longer the spectrum is; whilst the contrary conditions favour the visibility of

de l'Académie Royale des Sciences de Nancy. We know that Cooper had announced the existence of a visible brightness beyond the red rays (Proceedings of the Royal Society of London, vol. iv. p. 146). The Venetian Professor has not only verified the fact, but he also thinks that he has found an analogous appendage at the opposite extremity. Moreover, the discovery of an extension in the solar spectrum, beyond the violet, is due to Sir John Herschel. He made it as early as 1819, whilst repeating some experiments on the polarized rings with Biot's apparatus; but he did not describe it till 1840, in his beautiful memoir On the Chemical Action of the Rays of the Solar Spectrum on preparations of Silver and other Substances, in the Philosophical Transactions. In the § 56, entitled "Extension of the Visible Prismatic Spectrum, a new Prismatic Colour," he says expressly that there exists, beyond the violet, some luminous rays of a different colour from that of the different bands of the spectrum, and which is of a lavender-gray. M. Zantedeschi owes to the sky of Venice, which is much more propitious than that of Collingwood, the possibility of studying this extension of coloration in detail, which will no doubt be of some importance in the question of the real number of simple colours, and to which I called attention in my memoir on Daltonism (Taylor's Scientific Memoirs, vol. iv. p. 156). Lastly, the author mentions the existence of tints of bright blue, visible above and below some prismatic zones of a horizontally projected spectrum, and he proposes calling these tints *secondary spectra*. But this denomination cannot be adopted, since it has for a long time been applied to the spectra produced by a prism achromatized for the extreme rays.

\* *Sulle righe trasversali e longitudinali dello spettro luminoso e su taluni fenomeni affini.*—Raccolta Fisico-Chimica Italiana, t. ii. p. 483.

† It is as well to remark, that the lens performs the part of a prism with concave surfaces, with a more or less decided curve.

‡ *Raccolta*, t. ii. p. 507.



the transversal lines. Strange as may seem M. Ragona's theory, it deserves examination; but I confess that that of the Venetian Professor appears to me to be very obscure. To explain the encroachments of the coloured bands in the longitudinal direction, we must admit that the spectrum is double, and that its elements overlap at right angles. The too great brevity of the author, which is limited to the paragraph above quoted, does not allow us to suppose that such is his opinion. Moreover, these lines, far from constituting a fact opposed to the theory of undulations, are, on the contrary, an interesting confirmation of its truth.

LXVII. *Remarks on the Weather during the Quarter ending March 31, 1848.* By JAMES GLAISHER, Esq., of the Royal Observatory, Greenwich\*.

IN the February Number of your Magazine you did me the favour to insert my remarks upon the weather during the quarter ending December 31, 1847. The weather of the past quarter has been as unusual as that of the preceding, and some account of it may probably interest your readers.

The quarterly meteorological returns for the past quarter furnished to the Registrar-General have been obtained from thirty-five different places, situated between the longitudes of  $5^{\circ} 18'$  W. and  $0^{\circ} 16'$  E.; and between the latitudes of  $50^{\circ}$  and  $55^{\circ}$ . These observations have been all rigorously examined and reduced by myself, and their results are worthy the attention of meteorologists. The following are the particulars of the weather during the quarter ending March 31, 1848.

The weather during the past quarter has been remarkable in many respects. The daily temperature of the air has for the most part been above the average, yet there was a period of exceedingly cold weather between the 20th and 28th of January; the departures from the average on the 26th, 27th, and 28th, were  $12^{\circ} 8'$ ,  $10^{\circ} 8'$ , and  $16^{\circ}$  respectively. The temperature then suddenly increased to  $6^{\circ} 5'$  above the average on the 30th; and for the most part the daily values afterwards exceeded those of the average, or differed very little from them.

It may perhaps tend to clearness if I speak of each subject of investigation separately.

*The mean temperature of the air at Greenwich—*

For the month of January was  $34^{\circ} 6'$ , which is  $1^{\circ} 7'$  above that of 1842,  $4^{\circ} 5'$ ,  $3^{\circ} 7'$ ,  $9^{\circ} 1'$ , and  $0^{\circ} 5'$  below those in the years 1842 to 1847 respectively; or it is  $3^{\circ} 8'$  below the average of these six years.

\* Communicated by the Author.

*during the Quarter ending March 31, 1848.* 507

For the month of February was  $43^{\circ} 4'$ , which is  $2^{\circ} 6'$ ,  $7^{\circ} 4'$ ,  $8^{\circ} 2'$ ,  $10^{\circ} 7'$  above those of the years 1842 to 1845 respectively,  $0^{\circ} 5'$  below that in 1846, and  $8^{\circ} 0'$  below that of 1847; or it is  $2^{\circ} 6'$  above the average of these six years.

For the month of March was  $43^{\circ} 8'$ , which is  $1^{\circ} 1'$  below that of 1842,  $0^{\circ} 9'$ ,  $2^{\circ} 3'$ ,  $8^{\circ} 6'$ ,  $0^{\circ} 5'$  and  $2^{\circ} 8'$  above those of the years 1843 to 1847 respectively; or it is  $2^{\circ} 3'$  above the average of these six years.

The mean value for the quarter was  $40^{\circ} 6'$ ; that for 1841 was  $38^{\circ} 4'$ ; for 1842 was  $39^{\circ} 5'$ ; for 1843 was  $39^{\circ} 6'$ ; for 1844 was  $38^{\circ} 5'$ ; for 1845 was  $35^{\circ} 4'$ ; for 1846 was  $43^{\circ} 6'$ ; and for 1847 was  $37^{\circ} 2'$ ; so that the excess for this quarter above the corresponding quarter in the years 1841, 1842, 1843, 1844, 1845 and 1847, were  $2^{\circ} 2'$ ,  $1^{\circ} 1'$ ,  $1^{\circ} 0'$ ,  $2^{\circ} 1'$ ,  $5^{\circ} 2'$ , and  $3^{\circ} 4'$  respectively; the only year between 1841 and 1847 whose mean temperature for this period exceeded that of the present year was 1846; the excess of the period in this year exceeded that of the corresponding period of 1848 by  $3^{\circ} 0'$ . The average value for this quarter from the seven preceding years was  $38^{\circ} 9'$ , so that the mean temperature of the air for the past quarter exceeds that of the corresponding quarter in the seven preceding years by  $1^{\circ} 7'$ . This excess is remarkable, from the circumstance of the mean temperature of the preceding quarter being in excess to the large amount of  $5^{\circ} 4'$ , so that the temperature of the period between 1847, September 30, and 1847, March 31, exceeds the average by  $2^{\circ} 55'$ .

*The mean temperature of the evaporation at Greenwich—*

For the month of January was  $32^{\circ} 6'$ , which is  $4^{\circ} 7'$  below that for the preceding six years.

For the month of February was  $41^{\circ} 6'$ , which is  $5^{\circ} 8'$  above that for the preceding six years.

For the month of March was  $41^{\circ} 6'$ , which is  $2^{\circ} 2'$  above that for the preceding six years.

The mean value for the quarter was  $38^{\circ} 6'$ , which is  $1^{\circ} 1'$  above that for the corresponding period of the preceding six years.

*The mean temperature of the dew-point at Greenwich—*

For the month of January was  $31^{\circ} 7'$ , which is  $1^{\circ} 7'$  above that for 1842,  $5^{\circ} 6'$ ,  $4^{\circ} 4'$ ,  $4^{\circ} 2'$ ,  $9^{\circ} 1'$ , and  $1^{\circ} 9'$  below those of the years 1843 to 1847 respectively; or it is  $3^{\circ} 9'$  below the average of these six years.

For the month of February was  $38^{\circ} 8'$ , which is  $0^{\circ} 4'$ ,  $5^{\circ} 4'$ ,  $7^{\circ} 0'$ ,  $10^{\circ} 3'$  above those of the years 1842 to 1845,  $1^{\circ} 1'$  below that of 1846, and  $7^{\circ} 8'$  above that of the year 1847; or it is  $5^{\circ} 0'$  above the average for these years.

For the month of March was  $38^{\circ} 5'$ , which is  $2^{\circ} 2'$  and  $0^{\circ} 4'$  below those of the years 1842 and 1843,  $1^{\circ} 9'$ ,  $8^{\circ} 5'$ ,  $0^{\circ} 2'$ , and



5°·0 above those of the years 1844 to 1847 respectively; or it is 2°·2 above the average value for these six years.

The mean value for the quarter was 36°·3, which is 1°·1 above the average for the six preceding years.

The mean weight of water in a cubic foot of air for the quarter was 2·7 grains, which is of the same value as that of the average for the six preceding years.

The additional weight of water required to saturate a cubic foot of air was 0·47 grain; the average for the six preceding years was 0·36 grain.

The mean degree of humidity of the atmosphere for January was 0·837, for February was 0·864, and for March was 0·839; these values being less than the average for the six preceding years by 0·077, 0·029, and 0·002 respectively; the value for the quarter was 0·846, which is 0·036 less than the average for these years.

The mean elastic force of vapour for the quarter was 0·230 inch, which is 0·006 inch above the average for the six preceding years.

The mean reading of the barometer at Greenwich for January was 29·816 inches, for February was 29·517 inches, and for March was 29·505 inches; these values are 0·057 inch above, 0·199 inch below, and 0·256 inch below respectively, the averages for the seven preceding years. The mean value for the quarter was 29·613 inches, which is 0·132 inch below the average for these years. The readings of the barometer during the greater part of the quarter were remarkable, and will be spoken of presently.

The average weight of a cubic foot of air under the average temperature, humidity and pressure, was 545 grains; the average for the six preceding years was 549 grains.

The rain fallen at Greenwich in January was 1·2 inch; in February was 2·6 inches; and in March was 3·1 inches; the average values for the seven preceding years were 1·9 inch, 1·6 inch, and 1·4 inch respectively. The total amount fallen in the quarter was 7·9 inches, which is 3·0 inches greater than the average for the years 1841 to 1847. I shall presently speak of this large amount of rain.

The temperature of the Thames water was 39°·3 by day, and 37°·0 by night. The water, on an average, was 2°·4 warmer than the air.

The horizontal movement of the air was about 168 miles daily, being somewhat more than its average value.

The highest and lowest readings of the thermometer in air at the height of four feet above the ground, and protected as much as possible from the effects of radiation and rain, were 71°·5 and 15°·8.

during the Quarter ending March 31, 1848.

The average daily range of the readings of the thermometer in air at the height of four feet, was 11°·1, which is 0°·8 greater than the average range for the seven preceding years.

In January the readings of the thermometer on grass were at or below 32° on twenty-seven nights, and the lowest reading was 12°·5. In February it was at or below 32° on fourteen nights, and the lowest reading was 20°. In March it was at or below 32° on twenty-one nights, and the lowest reading was 18°. These low readings have generally taken place at times when the sky has suddenly become clear, and for the most part their periods of continuance have been short, as the amount of clear sky at night during the quarter has been small. The observer at Durham says, that on the night of January 19, the reading of a thermometer on grass fell below zero.

The mean amount of cloud for the quarter was such as to cover upon the average four-fifths of the whole sky. The amount of cloud during the period from 1847, November 30, to 1848, March 31, was larger than in any period of equal length for many years.

In the last report I spoke of the smallness of the amount of the electricity which had existed in the air at Greenwich during the quarter ending 1847, December 31. In consequence of this remark, Francis Ronalds, Esq., the Director of the Observatory at Kew, communicated with me, and he has kindly lent the original Electrical Observations made at that Observatory, both in that quarter and in the one just ended. By an examination of this journal, it appears that during the quarter ending December 31, 1847, the electricity of the atmosphere was never in a neutral state at Kew, excepting for the short period of time in its transmission from the one to the other state. The situation of the Observatory is in the Old Deer Park, at Richmond, and near the river Thames.

The electricity during the past quarter at Greenwich has been about its usual amount at this period of the year. At Kew the amount has been at all times very much larger than at Greenwich, and there does not appear to have been any period during which the instruments were unaffected.

During the quarter there were five exhibitions of the aurora borealis, which occurred on the following days, viz. February 20, 22, March 19, 20, and 31. At these times the magnets were disturbed.

The approximate mean monthly temperatures for other places besides Greenwich are shown in the tables printed in the Registrar-General's quarterly report, and they differ from those at Greenwich by small quantities only; those places situated south of Greenwich being somewhat higher, and



those situated north of Greenwich being lower than at Greenwich, according to the difference of latitude and elevation.

The mean monthly temperatures of the places in Cornwall and Devonshire, in each of these three months, were above those of other places. At Exeter, however, the values were intermediate between those at places situated within these counties, and those situated out of them in the same latitude.

On March 29 a remarkable solar halo was seen from many places in England, and in the Isles of Wight, Guernsey, and Jersey. This halo, with its accompanying parhelia\*, was well seen, and the descriptions of the phenomena from different localities agree better with each other than is usually the case with these optical phenomena. The following are the principal facts:—

1st. A coloured circle, whose diameter was  $22^\circ$ , the centre of which was occupied by the sun; seen by all the observers.

2nd. A colourless circle, whose diameter was  $22^\circ$ , the centre of which was situated a little to the east of the sun; seen by the observers at Guernsey and the Isle of Wight.

3rd. A coloured arc of a circle, of which the sun occupied the centre, whose diameter was  $44^\circ$ ; seen at Oxford.

4th. A large white brilliant circle, whose centre was the zenith, passing through the sun; seen by all the observers.

5th. There were on this circle four parhelia, two of them a little beyond the first-mentioned circle, at its intersections with the large white horizontal circle; these were seen by most of the observers.

6th. There were two parhelia opposite to the sun, the one above, the other below him, at the intersections of the 1st and 2nd described circles; seen at Guernsey.

7th. The 5th and 6th parhelia were white; they were placed on the circumzenithal circle, as near as I can tell, at the points of intersections of a circle with a radius of  $90^\circ$ , with the sun for its centre; these were seen at Christchurch.

8th. At the culminating point of the first-mentioned circle there was a bright and coloured arc, which was concave towards the sun; this was seen at Christchurch and Oxford.

9th. The observer at Guernsey† saw four arcs of circles, one situated on either side of the two first-mentioned parhelia, one below the parhelia mentioned in No. 6, and one near the parhelia situated on the circumzenithal circle in the N.E.; these arcs were convex towards the sun.

10th. There were two coloured arcs of circles, convex

[\* For a description of this halo with its accompanying parhelia, as seen at Portsea, see p. 434 of the present volume of this Journal.—*Ed. Phil. Mag.*]  
† The appearance of the halo, as seen at Guernsey, was engraved in the Illustrated London News of April 8, 1848.

towards the sun, and situated at the distance of  $22^\circ$  from the circle first mentioned, the one S.E., and the other S.W. of the sun; the latter of these was seen at Christchurch, and both were seen at the Isle of Wight.

At Stone, near Aylesbury, the observer saw some phenomena at 3<sup>h</sup> P.M., different in some respects from those seen by the other observers.

1st. The upper part of the circle of  $22^\circ$  radius, of which the sun occupied the centre, was seen, and the colours were vivid.

2nd. There were segments of two circles, about  $95^\circ$  in extent, whose diameters were both  $22^\circ$ , and which cut each other vertically above the sun.

3rd. These segments terminated at the distance of about  $14^\circ$  on each side of the sun, and at these points there were two bright and luminous mock suns. The one on the W. was accompanied by a bright and long ray of light. The phenomena were visible during two hours, and an elaborate drawing was made of the appearances.

The whole of the papers and drawings are deposited in the archives of the Royal Observatory at Greenwich.

The following meteorological observations made at the Royal Observatory at about the time of the appearance of the halo, are published by permission of the Astronomer Royal.

1848. Day and hour.	Barometer readings corrected, and reduced to 32°.	Readings of thermometers.		Temperature of the deduced dew-point.	Dew-point tempera- ture below air tem- perature.	Weight of water in a cubic foot of air.	Degree of humidity.	Amount of clouds.	Direction of wind.	
		Dry.	Wet.							
March 29, 6 A.M.	in.	29.732	44.8	44.5	44.1	0.7	3.4	0.973	10	w.s.w.
" 9 A.M.		29.767	48.1	47.3	46.4	1.7	3.5	0.632	10	e. by n.
" Noon.		29.783	55.2	49.5	44.9	10.3	3.6	0.707	4	s.s.w.
" 3 P.M.		29.760	58.1	49.9	43.3	14.8	3.5	0.632	4	s.
" 6 P.M.		29.733	51.5	46.6	41.7	9.8	3.2	0.700	8	s. by e.
" Midnight.		29.709	41.6	40.3	38.6	3.0	2.9	0.901	10	Calm.
March 30, 6 A.M.		29.659	43.5	43.0	42.3	1.2	3.3	0.965	7	s.e.
" 9 A.M.		29.662	51.5	50.1	48.7	2.8	4.1	0.903	10	s.e.
" Noon.		29.663	53.5	51.2	48.9	4.6	4.1	0.848	10	s. by e.
" 3 P.M.		29.669	60.5	54.5	50.4	10.1	4.2	0.708	10	s.

March 29, 6 A.M.—Overcast; a heavy rain has been falling since March 28<sup>th</sup> 10<sup>h</sup> P.M.

" 9 A.M.—Overcast; no rain falling.

" Noon.—Cirrostratus near the horizon; the zenith clear.

" 3 P.M.—The zenith and around it clear; banks of cumuli near the horizon; the halo visible.

" 6 P.M.—The sky is for the most part covered by thin cirrostratus.

" Midnight.—Overcast; cirrostratus.

March 30, 6 A.M.—Cirri, cirrostrati, and haze.

" 9 A.M.—Overcast.

" Noon.—Overcast.

" 3 P.M.—Overcast.



From the circumstance of the increasing temperature during the continuance of the halo, both evaporation and the ascending current of air were increasing, and they would be at about their maxima at about 3<sup>h</sup> P.M. From the numbers in the 5th column, it seems the temperature of the dew-point was becoming less as the temperature was increasing, so that the ascending current not only carried with it all the water then evaporating, but also some of that which had evaporated previously. It seems, therefore, highly probable, that at the time of the appearance of the halo the largest quantity of water was mixed with the air in its locality, and also, as at this place the temperature of the air during the day was without change, and probably below the freezing-point of water, that the degree of humidity was at the time at a maximum value.

As this halo is one of the best ever observed, and it seems to have been dependent upon the humid state of the air, it is very desirable that observations of the dry and wet bulb thermometers taken at about the time, should be collected together from different places, and I should be glad if such were forwarded to me.

The reading of the barometer during the months of February and March have been remarkable for large fluctuations. Although I have detailed them in the Registrar-General's weekly reports for these months, it is desirable to mention them here also. On February 1, at 6<sup>h</sup> A.M., the reading was 29.505 inches; this increased to 30.274 inches by February 3, at 9<sup>h</sup> A.M. The reading decreased day by day till the 10th, at midnight, when it was 28.598 inches; it then turned to increase, which, during the 11th, amounted to one inch nearly; and at noon, on the 13th, the reading was 29.944 inches, when it turned to decrease. On the 15th, at 3<sup>h</sup> P.M., it was 29.373 inches. On the 18th, at 9<sup>h</sup> A.M., it was 30.333 inches, being the highest during the month. On the 20th, at noon, it was 29.288 inches, which increased to 29.618 inches at midnight, and continued to increase slowly afterwards till the 21st at 9<sup>h</sup> A.M., when the reading was 29.684 inches, after which it decreased. On the 23rd, at 6<sup>h</sup> A.M., it was 28.888 inches; at midnight it was 29.229 inches; shortly after this it decreased, and continued to decrease till the 26th at 9<sup>h</sup> 45<sup>m</sup> A.M., when the remarkably low reading of 28.299 inches took place, a reading lower than that of the 18th by 2.034 inches; it then turned to increase, but did not pass the point 29 inches till midnight on the 27th, and reached only to 29.343 inches on the 29th at 9<sup>h</sup> A.M., when it again began to decrease, and by 6<sup>h</sup> P.M. again decreased below 29 inches. On March 1st, at 9<sup>h</sup> A.M., the reading was 28.530 inches; it then turned to increase, which during the 2nd amounted to half an inch nearly. On

the 4th, at 6<sup>h</sup> A.M., the reading was 30.070 inches; on the 5th, at 6<sup>h</sup> P.M., it was 29.658 inches; on the 8th, at 9<sup>h</sup> A.M., it was 30.147 inches, which was the highest value reached during the month. Early in the morning of the 11th, the reading passed below 29 inches, and decreased to 28.582 inches by 11<sup>h</sup> A.M. on the 12th. Between this time and the 14th, at midnight, the reading increased to 29.716 inches; it then turned to decrease, and passed the point 29 inches on the 19th at 6<sup>h</sup> P.M., and to 28.630 inches by 6<sup>h</sup> A.M. on the 21st; at midnight, on this day, the reading was 29.330 inches, the increase in the previous 12 hours having been as large as 0.79 inch; after this time the reading slowly increased to 30.000 inches by the 25th at 9<sup>h</sup> A.M. Between this time and the end of the month, the lowest reading was 29.540 inches at midnight on the 27th.

Between February 9 and March 21, the reading of the barometer was below 29 inches on parts of sixteen days; nine of these were in February, and seven were in March. The average reading for the whole day was below 29 inches on ten of these days, viz. on February 9, 10, 25, 26, 27, March 1, 11, 12, 20 and 21.

I have examined the readings of the barometer on every day since 1800, and I find the average number of instances in one year that these readings have been below 29 inches on parts of a day, at the height of 150 feet, is seven. In the years 1829 and 1832 there was no instance of the barometer reading so low as 29 inches. In the year 1809 there were thirteen such instances, six of which were in December. In 1816 there were sixteen cases, seven of which were in January. In 1817 there were seventeen cases, six of which were in March. In 1820 there were seventeen cases, twelve of which were in October. In 1823 there were twenty. In 1824 and 1825 there were fourteen in each year; in the latter year there were eight in November. In 1836 there were thirteen instances, nine of which occurred in February and March; and in 1845 there were thirteen. Therefore there has not been any similar instance in this century of such a succession of low readings, as sixteen cases out of forty days. The year whose corresponding period most nearly resembles that of the present year in these particulars, is 1836.

The mean reading of the barometer for February and March was 29.51 inches, being less than the mean value of any consecutive two months in this century, with the solitary exception of the same two months in the year 1836, whose mean barometer reading was somewhat below that of the present year.



Usually a period of many years passes between two readings of the barometer so low as 28·3 inches. In the last quarter I spoke of the remarkably low reading of 28·383 inches as occurring on December 7 at 3<sup>h</sup> A.M.; it will be seen from the preceding accounts, that on February 26, at 9<sup>h</sup> 45<sup>m</sup> A.M., the reading was lower than that in the preceding December, being 28·299 inches. This circumstance, in addition to the other successive low readings, render this period one of the most remarkable in a meteorological point of view; and an investigation of the several successive barometrical waves would be highly instructive. The returns I have received do not enable me to indicate the direction of motion of a single wave. The observer at Stonyhurst says, "On February 27, at 1<sup>h</sup> P.M., the reading of the barometer was the lowest during the quarter, being 28·140 inches; and during the period between February 22 and March 1, the reading was always below 28·8 inches."

The observer at Latimer says, "On February 3, at 9<sup>h</sup> A.M., the reading was 30·048 inches; on the 10th, at 3<sup>h</sup> P.M., it was 28·556 inches; on the 18th, at 9<sup>h</sup> A.M., it was 30·132 inches; on the 26th, at 9<sup>h</sup> A.M., it was 28·096 inches; on the 29th, at 9<sup>h</sup> A.M., it was 29·108 inches; on March 1, at 9<sup>h</sup> A.M., it was 28·455 inches; on March 8, at 9<sup>h</sup> A.M., it was 29·974 inches; and on March 12, at 9<sup>h</sup> A.M., it was 28·442 inches."

The observer at Cardington says, "The following extremely low readings of the barometer have taken place. On February 12, at 9<sup>h</sup> A.M., it was 28·63 inches; on the 26th, at noon, it was 28·63 inches; on March 1, at 9<sup>h</sup> A.M., it was 28·64 inches; on the 12th, at 9<sup>h</sup> A.M., it was 28·63 inches; and on the 21st, at 9<sup>h</sup> A.M., it was 28·74 inches."

It appears, therefore, that the great fluctuations of the readings of the barometer have been general.

The unusual meteorological character of the period which we have just experienced, together with its influence on the public health, makes it an object of general interest to trace the cause of so remarkable a phenomenon. To enable persons who have time at their disposal for this investigation, I have detailed the principal meteorological facts for England for the period, and which may be briefly mentioned as exhibiting an excess of temperature for the six months ending 1848, March 31, of 2°·55 upon the average for the same period from the seven preceding years,—an excess remarkable both for its amount and continuance. During the past quarter, the amount of water mixed with the air has been about its average value, although in consequence of the high temperature, the

humidity of the air has been less. We have had an unusual prevalence of S.W., W.S.W., and S.S.W. winds at this season, when they are usually replaced by dry and cold N. and N.E. winds. The air has been in frequent rapid motion, and during the period between January 22 and March 4, it passed over Greenwich at the rate of 220 miles daily.

The barometer readings have been remarkable for great and frequent oscillations and very low readings, exhibiting a difference in these particulars from any period since the year 1800 (records previous to this date I have not examined). The amount of rain in March was very nearly double its usual amount; and that for the quarter exceeds the average, reckoned from 1815 to the present time, by 2½ inches. The water-sodden state of the soil, in many parts, has prevented wheat-sowing and preparing the land at the proper season. The observer at Leeds says, "The rivers in the West Riding of Yorkshire have been much swollen during February and March, and farming operations have, as far as relates to outdoor work, been completely at a stand. Horned cattle and sheep have suffered severely from disease of the lungs." The year whose corresponding period most nearly resembles that of the present, is 1836. From the preceding remarks, it will be seen that the weather during the past quarter has been as unusual as that of the preceding.

To the report of the Registrar-General are appended the monthly values at every station, from which the average values for the quarter have been determined, and which are contained in the following table.

From the numbers in the first column it seems that the volume of dry air was the same at all parts of the country. The mean of all these results is 29·512 inches, and this value may be considered as the pressure of dry air for England during the quarter ending March 31, 1848.

From the numbers in the second column, we find for the quarter ending March 31, 1848, that the mean temperature of the air for the counties of Cornwall and Devonshire was 42°·1, and for the remaining places, excepting Brighton, Liverpool and Whitehaven, was 38°·9.

The average daily range of the temperature of the air in Cornwall and Devonshire was 9°·2; at Brighton, Liverpool and Whitehaven, was 6°·7; that at Brighton was 5°·1 only, and seems to be too small; at places situated between the latitudes of 51° and 53° was 11°·0, except at London, where the range was 8°·9 only; and at all places N. of 53°, was 10°·3.

The greatest mean daily ranges took place at Hartwell,  
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Meteorological Table for the Quarter ending March 31, 1848.

Names of the places.	Mean pressure of the atmosphere of dry air reduced to the level of the sea.	Mean temperature of the air.	Highest reading of the thermometer.	Lowest reading of the thermometer.	Mean daily range of temperature.	Range of the thermometer.	Wind.		Mean amount of cloud 0-10.	Rain.		Mean weight of vapour in a cubic foot of air.	Mean additional weight required to saturate a cubic foot of air.	Mean degree of humidity.	Mean whole amount of water in a vertical column of atmosphere.	Mean weight of a cubic foot of air.	Height of station of the barometer above the level of the sea.	
							Mean estimated strength 0-6.	General direction.		Number of days on which it fell.	Amount collected.							
Helston	29.542	42.4	61.0	24.0	9.9	37.0	1.5	s.w.	6.4	67	12.7	3.1	0.4	0.877	3.7	3.3	542	106
Falmouth	29.542	42.2	62.0	27.0	10.0	35.0	1.8	w.s.w.	7.3	60	13.9	3.1	0.6	0.843	3.7	3.4	540	106
Truro	29.542	42.2	56.0	26.0	8.1	30.0	1.0	Variable.	7.3	60	14.7	3.0	0.4	0.870	3.6	3.0	549	60
Torquay	29.542	43.1	57.0	26.0	7.1	31.0	2.5	s.w.	5.5	52	9.3	3.0	0.4	0.870	3.6	3.0	549	60
Exeter	29.549	40.5	63.8	19.0	11.0	44.8	1.2	n.	6.4	57	9.5	2.5	0.3	0.888	3.0	3.3	545	180
Brighton	29.549	37.7	55.0	15.0	5.1	40.0	1.2	s.w. & n.e.	6.4	57	9.5	2.5	0.3	0.888	3.0	3.3	545	180
Chichester	29.549	38.7	62.0	13.0	10.9	49.0	1.3	s.w. & n.e.	7.1	58	9.5	2.5	0.3	0.888	3.0	3.3	545	180
Uckfield	29.549	39.6	67.0	11.0	10.5	56.0	1.3	s.w.	8.0	49	7.9	2.7	0.5	0.847	3.2	3.4	545	180
Beckington	29.516	38.6	70.0	19.0	12.4	51.0	1.3	s.w.	8.2	52	6.2	2.8	0.4	0.875	3.3	3.4	543	32
Royal Observatory, Greenwich	29.582	39.5	71.5	15.8	11.1	55.7	3.5	s.w.	7.7	53	7.6	2.8	0.4	0.881	3.4	3.4	544	300
Walworth	29.464	40.6	69.0	18.0	8.0	51.0	3.5	Variable.	7.7	52	10.0	2.7	0.3	0.914	3.3	3.4	542	300
St. John's Wood, London	29.527	37.7	67.0	16.0	12.7	51.0	1.1	s.	7.5	50	8.7	2.8	0.3	0.913	3.3	3.4	540	280
Latimer Rectory	29.448	38.6	65.0	15.0	12.2	50.0	0.8	s.w.	7.1	50	8.7	2.8	0.4	0.862	3.1	3.4	541	300
Aylesbury	29.557	39.2	61.0	16.0	16.0	45.0	1.1	s.w.	6.3	60	6.7	2.6	0.3	0.862	3.1	3.4	544	300
Stone Observatory	29.557	38.5	65.0	19.0	10.7	47.0	3.4	Variable.	6.3	60	6.7	2.6	0.3	0.862	3.1	3.4	544	300
Hartwell House	29.557	39.4	55.5	23.0	32.0	49.0	3.4	s.w.	6.6	46	6.6	2.8	0.3	0.909	3.3	3.4	546	200
Saffron Walden	29.557	38.4	60.0	18.0	10.3	42.0	3.4	s.w.	6.6	46	6.6	2.8	0.3	0.909	3.3	3.4	546	200
Pool Cottage, Hereford	29.557	39.9	68.0	15.0	9.3	53.0	3.4	s.e. & s.w.	6.6	46	6.6	2.8	0.3	0.909	3.3	3.4	546	200
Cardington	29.537	39.2	66.0	17.0	8.0	49.0	3.4	s.e. & s.w.	6.6	46	6.6	2.8	0.3	0.909	3.3	3.4	546	200
Thwaite	29.472	38.6	61.0	11.0	11.8	50.0	1.2	s.w. & n.w.	5.1	62	11.8	2.7	0.4	0.802	3.1	3.4	545	39
Norwich	29.528	39.8	69.8	16.0	9.4	53.8	2.0	n.w. & s.w.	7.5	71	8.4	2.7	0.4	0.902	3.3	3.4	541	103
Derby	29.516	41.2	54.5	20.7	6.4	33.8	1.2	s.w. & n.w.	6.3	52	7.9	2.6	0.4	0.882	3.2	3.4	546	103
Highfield House, Notts	29.526	39.5	61.0	11.0	9.6	50.0	1.2	w.	6.3	52	7.9	2.6	0.4	0.872	3.1	3.4	548	37
Liverpool Observatory	29.526	39.5	61.0	11.0	9.6	50.0	1.2	w.s.w.	8.0	57	15.0	2.6	0.3	0.892	3.2	3.4	545	113
Wakefield	29.449	37.7	64.2	12.2	11.3	52.0	0.5	s.w. & n.e.	8.0	57	15.0	2.6	0.3	0.898	3.1	3.4	539	381
Stonyhurst Observatory	29.512	37.2	57.0	6.0	12.7	51.0	0.4	s.w. & n.e.	8.0	57	15.0	2.6	0.3	0.898	3.1	3.4	539	381
Leeds	29.512	37.2	61.0	15.0	9.3	46.0	0.4	n.w. & s.w.	8.5	45	10.9	2.7	0.1	0.979	3.4	3.4	545	148
York	29.512	37.2	61.0	15.0	9.3	46.0	0.4	n.w. & s.e.	8.5	45	10.9	2.7	0.2	0.931	3.2	3.4	545	50
Scarva, Ireland	29.483	37.8	56.2	23.0	7.0	33.2	1.7	s.w.	8.5	45	10.9	2.7	0.2	0.931	3.2	3.4	545	162
Whitehaven	29.483	40.1	55.5	15.0	8.5	40.5	2.2	s.w.	6.4	38	7.5	2.6	0.3	0.883	3.3	3.4	543	340
Durham	29.435	38.6	57.2	3.8	8.8	53.4	1.9	s.w.	6.4	38	7.5	2.6	0.1	0.964	3.0	3.4	544	340
Newcastle	29.435	38.6	58.5	9.5	10.0	49.0	.....	s.w.	.....	41	11.8	2.8	0.2	0.939	3.0	3.4	544	121

Latimer, Leeds, Beckington, Aylesbury, &c., and the least occurred at Brighton, Liverpool, Scarva, Torquay, &c.

The highest reading during the quarter was at Greenwich and Lewisham, which was  $71^{\circ}5$ , and the lowest was at Durham, which was  $3^{\circ}8$ . The extreme range of temperature in England, during the quarter, was therefore  $67^{\circ}7$ .

The average quarterly range of the reading of the thermometer in Cornwall and Devonshire was  $35^{\circ}6$ ; at Brighton, Liverpool and Whitehaven, was  $38^{\circ}1$ ; at those places situated between the latitudes of  $51^{\circ}$  and  $52^{\circ}$  was  $51^{\circ}3$ ; and between the latitudes of  $52^{\circ}$  and  $55^{\circ}$  was  $48^{\circ}3$ .

The mean direction of the wind was S.W. At Exeter it was N., but this is probably wrong.

From the numbers in the ninth column, the distribution of cloud seems to have been the same in amount nearly at all parts of the country, and such as to have covered about three-fourths of the sky. The actual amount I believe to have been greater than three-fourths.

The fall of rain during the quarter has greatly exceeded the average amount for the season, and it has fallen on a greater number of days than usual. At Highfield House, it fell on 71 days; at Helston, on 67; at Leeds, on 63; at Falmouth, Truro and Saffron Walden, each 60. The places at which rain fell on the least number of days were Hereford, Durham, Thwaite, Newcastle, &c. The places at which the largest falls have taken place, are Whitehaven, Stonyhurst, Truro, Falmouth, Helston, Derby, Newcastle, &c.; and the places where the fall has been the least in amount, are Walworth, Cardington, Saffron Walden, &c.; generally the fall has been much smaller on the east coast than on the west coast. The average amount for the quarter in Cornwall and Devonshire was 12 inches, at places situated between  $51^{\circ}$  and  $53^{\circ}$  was  $8.2$  inches, and at places N. of  $53^{\circ}$  was  $10.7$  inches.

Columns 12 to 16 contain the mean hygrometrical results, and they are as nearly identical as can be expected from un-compared instruments. At Beckington the air seems to have been near saturation. At Hartwell the results cannot be correct; these instruments, however, are to be shortly compared with standards. At Leeds the results are evidently erroneous; the instruments here are to be replaced by new ones. Omitting the results from these places, we find that the mean weight of vapour in a cubic foot of air for England (excepting Cornwall and Devonshire) in the quarter ending March 31, 1848, was  $2.7$  grains. The mean additional weight required to saturate a cubic foot of air in the quarter ending March 31, 1848, was  $0.3$  grain. The mean degree of hu-



midity in the quarter ending March 31, 1848, was 0.888. The mean amount of vapour mixed with the air would have produced water, if all had been precipitated at one time on the surface of the earth, to the depth of (in the quarter ending March 31, 1848) 3.25 inches. And these values for Cornwall and Devonshire were 2.7 grains; 0.5 grain; 0.863 grain; and 3.6 inches.

The results from the station in Ireland, depending on the temperature of the air, the direction of the wind, and the amount of clouds, agree with those in England at the same latitude; but the results which depend on the humidity of the air and the amount of rain, exhibit an excess over those in England, and the daily and monthly ranges of the readings of the thermometer are less than those in England.

May 25, 1848.

#### LXVIII. Notices respecting New Books.

*Results of Astronomical Observations made during the years 1834, 1835, 1836, 1837, 1838, at the Cape of Good Hope; being the Completion of a Telescopic Survey of the whole Surface of the visible Heavens, commenced in 1825. By Sir JOHN F. W. HERSCHEL, Bart., K.H., &c. &c. London: Smith, Elder and Co. 1847. (Second notice.)*

##### Chap. II. Of the Double Stars of the Southern Hemisphere.

IN the Introduction to the Catalogue of Southern Double Stars the author observes, that as the principal object kept in view by him during the progress of his southern sweeps was the discovery of new nebulae, or the determination of the places of those already known, the detection and measurement of double stars was regarded as of subordinate interest, and allowed to interfere as little as possible with what was looked upon as the main inquiry. When nebulae were expected, and especially on new ground, little leisure was afforded for any minute examination of stars; but in regions which had been already examined, or where nebulae were thinly scattered, stars down to the sixth or seventh magnitude were seldom dismissed till they had undergone the application of one or more of the diaphragms. To have executed a regular review of the southern heavens with the 20-foot reflector, for the purpose of detecting close double stars, would have required at least two additional years, probably more. When double stars occurred they were of course always taken, and a measured angle of position secured as accurate as a single rapid setting of the wires afforded; but excepting in special circumstances no close examination was made, unless some suspicion, excited under the ordinary sweeping power (180), induced an application of high magnifying powers, and in such cases it would occasionally happen that a long and pertinacious scrutiny took place.

*To the British Museum & from W. G. Fisher*



The weather during the first month of this quarter was a continuance of the wet weather of the two preceding months; that during May was extremely fine; and that in the month of June was changeable, wet and dull. Till April 5, the daily temperatures of the air exceeded the averages of the same days of seven previous years by  $11^{\circ}9$ ,  $12^{\circ}8$ ,  $15^{\circ}6$ ,  $16^{\circ}1$  and  $7^{\circ}2$ ; on the 6th it was below the average, and for the most part continued below, till May 2, at times to a great extent; from this time till the 30th of May the daily temperatures exceeded their averages by quantities varying from  $2^{\circ}$  to  $15^{\circ}$ . From May 30 to the end of the quarter the daily temperatures were below their average values, with the exception of eight days only.

In pursuance of the arrangement I have hitherto followed, I will speak of each subject of investigation separately.

*The mean temperature of the air at Greenwich—*

For the month of April was  $47^{\circ}6$ , which is  $0^{\circ}6$ ,  $2^{\circ}4$ ,  $0^{\circ}5$  above those of the years 1841, 1842, and 1843 respectively,  $4^{\circ}1$  below that in 1844;  $1^{\circ}3$ ,  $0^{\circ}5$ , and  $2^{\circ}3$  above those of the years 1845, 1846 and 1847; or it is  $0^{\circ}5$  above the average of these seven years;

For the month of May was  $59^{\circ}7$ , which is  $2^{\circ}9$ ,  $6^{\circ}5$ ,  $7^{\circ}5$ ,  $6^{\circ}8$ ,  $10^{\circ}3$ ,  $5^{\circ}1$ , and  $3^{\circ}3$  above those of the years 1841 to 1847 respectively; or it is  $6^{\circ}1$  above the average of these seven years;

For the month of June was  $58^{\circ}5$ , which is  $2^{\circ}1$ ,  $2^{\circ}2$ , and  $0^{\circ}5$  above those of the years 1841, 1843, and 1847 respectively,  $4^{\circ}4$ ,  $2^{\circ}2$ ,  $2^{\circ}2$ , and  $6^{\circ}8$  below those of the years 1842, 1844, 1845, and 1846, respectively; or it is  $1^{\circ}6$  below the average of these seven years.

The mean value for the quarter was  $55^{\circ}3$ ; that for 1841 was  $53^{\circ}4$ ; for 1842 was  $55^{\circ}8$ ; for 1843 was  $51^{\circ}9$ ; for 1844 was  $55^{\circ}1$ ; for 1845 was  $52^{\circ}1$ ; for 1846 was  $55^{\circ}7$ ; and for 1847 was  $53^{\circ}2$ ; so that the excess for this quarter above the corresponding quarter in the years 1841, 1842, 1843, 1844, 1845, and 1847, was  $1^{\circ}9$ ,  $1^{\circ}5$ ,  $3^{\circ}4$ ,  $0^{\circ}2$ ,  $3^{\circ}2$ , and  $2^{\circ}1$ ; the only year between 1841 and 1847 whose mean temperature for this period exceeded that for the present year was 1846; the difference, however, is small, being  $0^{\circ}4$  only. The average value for this quarter from the seven preceding years was  $53^{\circ}6$ ; so that the mean temperature of the air for the quarter ending June 30, 1848, exceeds that of the corresponding quarter in the preceding seven years by  $1^{\circ}7$ . In the quarter ending March 31, 1848, this value was found to be  $1^{\circ}7$  in excess; and in that ending Dec. 31, 1847, it was found to be  $3^{\circ}4$  in excess; so that the mean temperature of the air in the

XXVII. *Remarks on the Weather during the Quarter ending June 30, 1848. By JAMES GLAISHER, Esq., of the Royal Observatory, Greenwich\*.*

THE meteorological returns for the past quarter furnished to the Registrar-General have been obtained from thirty-seven different places, situated between the latitudes of  $50^{\circ}$  and  $55^{\circ}$ , and between the longitudes of  $5^{\circ}18'$  W. and  $0^{\circ}16'$  E.

The results from every place have been examined and further reduced by myself. The following are the particulars of the weather during the quarter ending June 30, 1848.

\* Communicated by the Author.



nine months ending June 30, 1848, exceeds the average value for the same period of time in the preceding seven years by  $2^{\circ}3$ .

*The mean temperature of the evaporation at Greenwich—*

For the month of April was  $44^{\circ}5$ , which is  $0^{\circ}4$  above that for the preceding seven years;

For the month of May was  $53^{\circ}0$ , which is  $2^{\circ}6$  above that for the preceding seven years;

For the month of June was  $54^{\circ}4$ , which is  $1^{\circ}2$  below that for the preceding seven years.

The mean value for the quarter was  $50^{\circ}6$ , which is  $0^{\circ}6$  above the average for the seven preceding years.

*The mean temperature of the dew-point at Greenwich—*

For the month of April was  $41^{\circ}4$ , which is  $0^{\circ}7$ ,  $3^{\circ}1$ ,  $0^{\circ}8$ , and  $4^{\circ}2$  above those for the years 1841, 1842, 1845, and 1847 respectively;  $1^{\circ}2$ ,  $2^{\circ}8$ , and  $0^{\circ}9$  below those of the years 1843, 1844 and 1846; or it is  $0^{\circ}6$  above the average of these seven years;

For the month of May was  $48^{\circ}6$ , which is  $1^{\circ}9$ ,  $2^{\circ}7$ ,  $4^{\circ}0$ , and  $0^{\circ}6$  above those for the years 1842, 1844, 1845, and 1846 respectively,  $2^{\circ}2$  and  $0^{\circ}2$  below those of the years 1841 and 1843, and is the same as that for 1847; or it is  $0^{\circ}9$  above the average for these seven years;

For the month of June was  $51^{\circ}6$ , which is  $2^{\circ}4$ ,  $0^{\circ}4$ ,  $1^{\circ}8$  above those for the years 1841, 1843 and 1847 respectively;  $2^{\circ}7$ ,  $3^{\circ}6$ , and  $4^{\circ}4$  below those of the years 1842, 1845 and 1846 respectively, and is the same as that for 1844, or it is  $0^{\circ}8$  below the average for these seven years.

The mean value for the quarter was  $47^{\circ}2$ , which is  $0^{\circ}2$  above the average for the corresponding period of the preceding seven years.

*The mean weight of water in a cubic foot of air for the quarter* was 3.8 grains, which is 0.1 grain less than the average for the seven preceding years.

*The additional weight of water required to saturate a cubic foot of air* was 1.4 grain. The average for the seven preceding years was 1.2 grain. The value required in May was 2 grains, and the mean value for May from the preceding seven years is  $0^{\circ}9$  grain only.

*The mean degree of humidity of the atmosphere for April* was  $0.794$ , for May was  $0.664$ , and for June was  $0.768$ ; these values being less than their averages for the seven preceding years by  $0.012$ ,  $0.154$ , and  $0.012$  respectively. The value for the quarter was  $0.742$ , which is  $0.059$  less than the average for these years.

*The mean elastic force of vapour for the quarter* was  $0.343$

inch, which is of the same value as the average of the seven preceding years.

*The mean reading of the barometer at Greenwich for April* was  $29.589$  inches, for May was  $29.926$  inches, and for June was  $29.642$  inches; these values are  $0.164$  inch below,  $0.158$  inch above, and  $0.167$  inch below respectively the averages for the seven preceding years. The mean value for the quarter was  $29.719$  inches, which is  $0.058$  inch below the average for these years.

The mean reading in February was  $29.517$  inches, in March was  $29.505$  inches, and in April, as above,  $29.589$  inches. There is no similar instance in this century of the mean reading of the barometer for any three consecutive months being so small as this; the nearest approach to it was in the months of November and December, 1803, and January, 1804.

*The average weight of a cubic foot of air under the average temperature, humidity, and pressure*, was 531 grains; the average for the seven preceding years was 533 grains.

*The rain fallen at Greenwich in April* was 3.4 inches; in May was 0.4 inch; and in June was 3.5 inches; the average values for the seven preceding years were 1.3 inch, 1.6 inch, and 1.5 inch respectively. The amount fallen in the quarter was 7.3 inches, which is 2.9 inches above the average of the corresponding quarters of seven previous years. The total amount fallen in this year till June 30 was 15.2 inches, which is nearly six inches above the average fall in this period as deduced from the above-mentioned years. So large a fall of rain as 7.3 inches has not occurred at the Observatory within the corresponding quarter since the year 1824; and so large a fall as 15 inches within the first six months of the year has not taken place within the previous thirty-three years,—probably not within this century.

*The temperature of the water of the Thames* was  $60^{\circ}7$  by day, and  $59^{\circ}6$  by night. The water, on an average, was  $3^{\circ}6$  warmer than the air.

*The horizontal movement of the air* was about 114 miles daily, being about its average value.

*The highest and lowest readings of the thermometer in Air* at the height of four feet above the ground, and protected as much as possible from the effects of radiation and rain, were  $80^{\circ}0$  and  $32^{\circ}0$ .

*The average daily range of the readings of the thermometer in Air* at the height of four feet, were  $16^{\circ}7$ ,  $30^{\circ}5$ , and  $17^{\circ}7$  in the months of April, May, and June respectively. The average ranges for these months from the observations of the seven preceding years were  $16^{\circ}7$ ,  $17^{\circ}6$ , and  $19^{\circ}4$ . The range



in the month of May exceeded the average value for that month by  $12^{\circ}9$ , and it was larger than the mean daily range in any month in the preceding seven years. The next largest mean daily range was  $22^{\circ}5$ , which took place in the month of June 1846. The average for the quarter was  $21^{\circ}6$ , being  $3^{\circ}4$  in excess over the average for the seven years ending 1847.

In April the *readings of the thermometer on grass* were at or below  $32^{\circ}$  on twelve nights, and the lowest reading was  $25^{\circ}$ . In May they were at or below  $32^{\circ}$  on fourteen nights, and on eleven other nights the readings were below  $40^{\circ}$ . In June the lowest reading was  $31^{\circ}5$ : on six nights the readings were between  $32^{\circ}$  and  $40^{\circ}$ . The amount of heat radiated at night from the earth in the month of May was very great indeed. The observer at Leeds says, that white frosts were almost of nightly occurrence during this month. The observer at Beckington speaks of the severe frost of the 30th of June, and which was general over the south of England.

The mean amount of cloud for April was 7.3, for May was 3.0, and for June was 7.4. The month of May presented this remarkable peculiarity,—that the sky was absolutely cloudless both day and night during the first eight days, and almost free from cloud till the 15th day, the atmosphere being free from haze during this time. These circumstances are without a parallel on record. The sky during the months of April and June was more clouded than usual, so that the mean amount for the quarter, viz. 5.9, is only 0.2 less than the average for the corresponding quarter of the seven previous years.

There were three exhibitions of the *aurora borealis* during the quarter, which occurred on April 3, 7, and 29.

The *electricity* in the atmosphere during the month of April was generally in an active state, and rather more than the average amount. It was frequently negative, which circumstances always preceded or occurred during the fall of rain. In the month of May the amount of electricity was small, and particularly during the first half of the month, excepting on the 3rd, 4th, and 5th, on which days very active positive electricity was shown. Till the last week in June the electricity was frequently active, being mostly positive, and at times negative. Generally the electricity was positive at all times when rain was not falling, and at times after rain had been falling for some time.

*Thunder-storms* at different parts of the country occurred on April 1, 2, 7, 17, 19, May 10, 14, 15, 18, 20 and 26, June 12 and 22. The heaviest of these storms occurred on June 12, and extended over all the southern parts of the country, in-

cluding latitude  $52^{\circ}$ ; north of this parallel very heavy rain fell. At many places on this day more than an inch of rain fell in a few hours. Generally, however, the storms during this quarter, and more particularly in the month of April, were local, in many cases not extending beyond a radius of a mile. The observer at Cardington says, "On April 2, at 4 p.m., an exceedingly heavy storm of hail and rain fell; within twenty minutes water to the depth of 0.64 inch was collected." By inquiries it appeared that this storm was confined within a circumference of three miles. The observer at Whitehaven says, "that on May 14 a violent thunder-storm occurred, accompanied by a heavy fall of triangular pieces of ice; near Grasmere, garden plants, shrubs, and vegetables were completely riddled, and eighty panes of glass were broken in a conservatory by the ice-shower. Though the ground was previously quite warm, the hail, or rather ice, remained on the ground for several hours, and in some places till the following morning."

This storm continued for about forty minutes, and was confined to a radius of less than two miles. Many other storms of a similar character took place in different parts of the country.

Snow fell at Saffron Walden on April 9, at Greenwich\*, Lewisham, and Stone on April 10, and at Leeds on April 11. The flakes at Stone measured three inches by two inches.

The mean *monthly temperatures* of the places in Cornwall and Devonshire have not been very different from those at other places during this quarter; usually in the summer months they are below those of other places.

The *reading of the barometer* during the month of April was fluctuating, and exhibited a continuance of those oscillations and low readings mentioned in last report in February and March. On April 1, at 9<sup>h</sup> a.m., the reading was 29.969 inches; slight variations only took place till the 5th, on this day the reading decreased 0.3 inch, and on the 6th, at 6<sup>h</sup> p.m., was 29.516 inches, and still decreasing; on the 8th, at 6<sup>h</sup> p.m., it was 29.198 inches, it then turned to increase, and was 29.330 inches at midnight. On the 9th, at noon, it was 29.430 inches, when it again turned to decrease, and was 29.183 inches on the 10th at midnight; shortly after this the reading increased, and was 29.639 inches on the 11th at 3<sup>h</sup> p.m.; it again decreased, and was 29.301 inches on the 12th at 6<sup>h</sup> a.m.; it then turned to increase, at first slowly, and then quickly. The reading on the 12th at midnight was

\* The fact of snow having fallen on April 10 at Greenwich and Lewisham, was inadvertently omitted in the remarks accompanying the Registrar-General's report.



29.928 inches; it then turned to decrease, and was 29.179 inches on the 18th at midnight; it continued at about this value on the 19th and 20th; it then began to increase slowly, and reached 29.8 inches on the 26th at midnight; it then alternately decreased and increased by small quantities till the last day, when for the first time in the month it reached the point 30 inches.

From May 1 to 14 its readings were above 30 inches, the highest being 30.217 inches on the 11th at 6<sup>h</sup> A.M.; this value decreased to 29.155 inches on the 17th at 6<sup>h</sup> P.M.; it increased to 30 inches on the 20th, and to 30.169 inches on the 24th; it passed below 30 inches on the 26th, and to the end of the month the changes were small.

During June the reading was generally low; its extreme readings were 29.143 inches on the 3rd, and 30.015 inches on the 20th.

The heavy rains in April, following the wet weather of February and March, caused the land to be in a soddened state, and rivers generally to be much swollen. The thunder-storms in many places did much damage. The months of February, March, and April were so wet that the spring corn was sown with much difficulty. The month of May was distinguished by high temperatures, cloudless skies both day and night for a long period, very small falls of rain, with only the average amount of water mixed with the air, notwithstanding the high temperature, so that the degree of humidity was small. The earth became sun-baked, and so hard as to be almost unbreakable; vegetation was greatly checked. During the month of June the earth became again saturated; the crops improved, and at the end of the quarter there was every prospect of a full average produce.

The observer at Leeds says, "that in April the diseases in the lungs affecting cattle and sheep were extremely frequent and generally fatal. In May, notwithstanding the great heat during the days, the almost nightly occurrence of white frosts checked the growing vegetation greatly; the disease among cattle and sheep was in a great measure stopped. In June, with the return of wet and cold weather, the disease among cattle again appeared. So fatal a season to milch cows has not occurred within my remembrance in this neighbourhood. The potato crop is free from disease, and this vegetable is so abundant, that I have never known it so cheap before at this season."

The observer at Beckington says, "I have heard a good deal of the potato disease in this parish, but my own are in as healthy a state as they have ever been. The severe frost

on Friday night, the 30th of June, struck the potato haulm, and did much damage to the peas."

The approximate mean *monthly values* of the several subjects of investigation are printed in the Registrar-General's quarterly report, for the time or times of the day that the observations have been made. These numbers have been reduced as follows:—First, for diurnal variations to deduce true monthly values for each element; secondly, the reduced monthly mean "elastic force of vapour" was taken from the reduced "barometer readings;" thirdly, the mean of these reduced monthly values were then taken; reducing that for the barometer to the level of the sea, and in this way the subjoined quarterly table was formed.

From the numbers in the first column it seems that the volume of dry air was the same at all parts of the country. The mean of all these results is 29.554 inches, and this value may be considered as the pressure of dry air for England during the quarter ending June 30, 1848.

From the numbers in the second column it seems that the mean temperature of the air for the quarter ending June 30, 1848, in the counties of Cornwall and Devonshire, was 54°.1; at places situated south of latitude 52° was 54°.0; between the latitudes of 52° and 53° was 53°.6; between the latitudes of 53° and 54° was 52°.0; and of Durham and Newcastle was 50°.7.

The average daily range of the temperature of the air in Cornwall and Devonshire was 15°.3; at Brighton, Liverpool and Whitehaven, was 14°.9; south of the latitude of 52° was 21°.3; between the latitudes of 52° and 53° was 20°.3; between the latitudes of 53° and 54° was 19°.5; and of Durham and Newcastle was 14°.9.

The greatest mean daily ranges took place at Latimer, Hartwell, Aylesbury, and Beckington respectively; and the least occurred at Liverpool, Brighton, Whitehaven, and Newcastle respectively.

The highest thermometer reading during the quarter was at Leeds, which was 88°; and the lowest was also at Leeds, viz. 23°. The extreme range of temperature in England during the quarter was therefore 65°, but this is probably somewhat too great.

The average quarterly range of the reading of the thermometer in Cornwall and Devonshire was 42°.5; at Brighton, Liverpool, and Whitehaven, was 37°.7; at all other places, except Beckington, Hartwell, Leeds and Wakefield, was 51°.5.

The direction of the wind has been so variable, that it is not possible to determine its mean direction. Observers in



Names of the places.	Mean pressure of the atmosphere of dry air reduced to the level of the sea.	Mean temperature of the air.	Highest reading of the thermometer.	Lowest reading of the thermometer.	Mean daily range of temperature.	Range of the thermometer.	Wind.		Mean amount of cloud 0-10.	Rain.		Mean weight of vapour in a cubic foot of air.	Mean additional weight required to saturate a cubic foot of air.	Mean degree of humidity.	Mean whole amount of water in a vertical column of atmosphere.	Mean cubic foot of air.	Height of station above the level of the sea.
							Strength 0-6.	General direction.		Number of days on which it fell.	Amount collected.						
Helston	29.539	53.5	78.0	30.0	15.8	48.0	1.6	n.e. & s.w.	4.3	35	8.3	4.0	1.0	0.804	4.7	531	106
Falmouth	29.539	53.4	77.0	30.0	18.4	47.0	1.5	Variable.	5.6	40	8.5	3.8	1.1	0.767	4.6	530	120
Truro	29.539	52.1	70.0	35.0	11.8	35.0	0.9	n.e.	4.3	38	9.1	3.7	1.4	0.725	4.1	533	140
Torquay	29.549	55.1	72.0	37.0	12.3	35.0	2.3	n.e.	2.4	42	8.4	4.0	1.1	0.778	4.1	533	60
Exeter	29.549	56.3	77.5	30.0	18.0	47.5	2.0	n.e.	4.3	39	7.6	4.0	0.9	0.813	4.9	533	180
Brighton	29.588	54.2	77.5	30.0	12.8	47.5	2.0	n.e.	5.6	37	10.6	3.9	1.7	0.684	4.7	530	265
Chichester	29.588	52.6	77.0	30.0	16.2	47.0	0.7	n.	5.4	46	9.2	3.8	1.4	0.819	4.6	532	265
Southampton	29.588	54.5	81.5	28.0	21.2	53.0	0.7	Variable.	5.9	46	7.3	3.8	1.4	0.775	4.7	531	159
Uckfield	29.556	55.9	82.0	29.0	21.6	53.0	1.3	s.w.	6.0	41	7.2	3.9	1.1	0.781	4.7	531	107
Beckington	29.572	53.1	83.0	24.0	22.4	59.0	1.3	s.w.	5.7	45	6.7	3.8	1.2	0.742	4.5	532	32
Royal Observatory, Greenwich	29.570	54.3	80.0	30.2	21.6	49.8	1.3	e.	5.3	43	5.8	3.7	1.2	0.773	4.6	529	300
Maidenstone Hill, Greenwich	29.563	54.2	78.6	30.7	18.9	47.9	1.3	e.	5.3	43	5.8	3.7	1.2	0.773	4.6	529	300
Walworth	29.618	54.8	80.0	35.0	19.0	45.0	3.3	s.w.	5.7	45	6.7	3.8	1.2	0.763	4.6	527	335
Latimer Rectory	29.588	53.2	82.0	23.5	26.7	58.5	1.3	n.	5.3	46	7.9	3.8	1.2	0.718	4.7	529	280
Aylesbury	29.482	55.0	82.0	28.0	23.3	54.0	0.8	s.	5.3	43	5.8	3.7	1.2	0.754	4.6	529	300
Stone Observatory	29.596	53.3	77.9	27.7	19.6	50.2	0.8	Variable.	5.7	48	7.5	4.0	1.2	0.793	4.9	531	150
Hartwell House	29.581	53.7	84.0	24.0	26.0	60.0	0.8	s.	5.7	48	7.5	4.0	1.2	0.793	4.9	531	150
Cardington	29.594	54.2	81.0	29.0	21.8	52.0	1.3	e.	5.7	48	7.5	4.0	1.2	0.793	4.9	531	150
Thwaite	29.628	53.6	79.5	33.0	20.0	51.0	0.6	s.w.	6.4	39	5.5	3.8	1.1	0.776	4.6	532	88
Cambridge Observatory	29.628	53.6	79.5	30.7	18.7	48.8	0.6	Variable.	6.4	39	5.5	3.8	1.1	0.781	5.0	531	39
Norwich	29.482	54.9	84.0	31.0	20.8	53.0	1.3	Variable.	4.7	47	8.5	3.8	1.0	0.798	4.6	531	39
Derby	29.544	52.5	77.0	26.0	18.1	51.0	1.0	Variable.	6.2	54	8.3	3.8	1.1	0.778	4.6	533	103
Highfield House, Notts	29.541	53.7	83.0	27.0	21.3	56.0	1.0	n.w.	5.9	47	7.0	3.6	0.8	0.835	4.3	537	27
Liverpool Observatory	29.561	52.2	71.9	34.7	11.3	37.2	1.0	Variable.	5.9	49	9.4	3.8	0.9	0.801	4.6	532	148
Leeds	29.513	50.5	88.0	23.0	21.7	65.0	1.4	Variable.	4.8	48	9.4	3.5	1.2	0.739	4.2	532	113
Wakefield	29.452	52.8	85.0	25.0	21.0	60.0	0.8	w.	6.8	51	11.6	3.5	0.9	0.784	4.2	531	381
Stonyhurst Observatory	29.452	51.1	75.5	27.0	18.1	48.0	0.8	w.s.w.	6.8	51	11.6	3.5	0.9	0.784	4.2	531	381
York	29.534	53.4	79.5	27.0	17.3	52.5	1.3	s.e.	6.0	34	6.1	3.9	0.9	0.805	4.7	532	162
Scarva, Ireland	29.531	53.1	77.6	28.1	16.9	49.5	1.9	s.w.	6.0	34	6.1	3.9	0.9	0.805	4.7	532	162
Whitehaven	29.565	52.2	73.0	31.0	13.1	42.1	1.9	s.w.	6.0	41	6.2	3.7	1.1	0.779	4.3	530	340
Durham	29.565	50.7	76.4	24.5	15.6	51.9	1.4	s.w.	6.0	41	6.2	3.5	1.0	0.887	4.8	531	121
Newcastle	29.506	50.6	79.5	26.5	14.2	53.0	1.4	s.w.	6.0	41	6.2	3.5	1.0	0.887	4.8	531	121

adjacent localities have estimated it differently. At all places its strength seems to have been unusually small.

From the numbers in the ninth column, the distribution of cloud seems to have been the same at all places, and such as to cover about one-half of the sky. This value is much less than the average amount of cloud.

The fall of rain during the quarter has greatly exceeded the average amount for the season. The amount in May was much below the average for that month. In the months of April and June the amount was unusually large, particularly in the latter month. The places at which rain fell on the greatest number of days were Leeds, Nottingham, Stonyhurst, Saffron Walden, &c.; and on the smallest number of days were Thwaite, Scarva, Helston, Newcastle, &c. The places at which the largest falls have taken place were Hereford, Stonyhurst, Southampton, York, Leeds, Wakefield, &c.; and the places where the falls have been the least in amount, are Saffron Walden, Cambridge, Newcastle, Stone, &c.; but it would seem that the amount at the last-mentioned place is wrong (see the amounts at Hartwell and Aylesbury). Generally the largest falls have been in Yorkshire, and the smallest in the counties north of Yorkshire.

The numbers in column 12 to 16 contain the mean values of the hygrometrical results at every station; from which we find that—

The mean weight of vapour in a cubic foot of air for England (excepting Cornwall and Devonshire) in the quarter ending June 30, 1848, was 3.8 grains.

The mean additional weight required to saturate a cubic foot of air in the quarter ending June 30, 1848, was 1.1 grain.

The mean degree of humidity in the quarter ending June 30, 1848, was 0.778.

The mean amount of vapour mixed with the air would have produced water, if all had been precipitated at one time on the surface of the earth, to the depth of 4.6 inches.

The mean weight of a cubic foot of air at the level of the sea, under the mean temperature, humidity and pressure, was 534 grains.

And these values for Cornwall and Devonshire were 3.8 grains; 1.2 grain; 0.765; 4.7 inches; and 534 grains respectively.

The results from the station in Ireland agree very closely with those in England in the same parallel of latitude, excepting those depending on the water mixed with the air, and in these respects an excess of humidity is shown at this station.



LVII. *Remarks on the Weather during the Quarter ending September 30, 1848.* By JAMES GLAISHER, Esq., of the Royal Observatory, Greenwich\*.

THE meteorological returns for the past quarter furnished to the Registrar-General have been obtained from the usual places. These have been all examined and discussed by myself in the same manner as detailed in the previous Numbers of the Philosophical Magazine. The following are my remarks upon the weather of the past quarter.

With the exception of a few days in July, and the period between the 9th and 23rd of September, the weather during the quarter ending September 30, 1848, was wet, with very little sunshine. The month of August was extremely wet, and in many places the falls of rain both in July and September were unusually great. So much rain falling in a period immediately following the previous bad weather, renders the season and the year very remarkable. On July 1 the mean temperature of the air was  $8^{\circ}4$  below the average value from the seven preceding years, and on the 6th it was  $12^{\circ}2$  in excess above the average; on the former day the mean temperature was  $46^{\circ}7$ , and on the latter day it was  $74^{\circ}0$ . On the 9th it was  $3^{\circ}$  below the average, and on the 14th it was  $9^{\circ}4$  above the average; and on the 15th it was again below the average. These changes were large and abrupt. From July 11 to September 19 the temperature of the air was almost always below the average value, and particularly so between the 11th and the 15th of September; on the 12th the departure from the average was  $12^{\circ}6$ . From the 20th of September to the end of the quarter, the temperature of the air ranged somewhat above the average value.

The hottest day in this year was July 6, and this day was the hottest all over the country. On an average of seven years, the hottest day is July 5.

In pursuance of the arrangement hitherto followed, I will speak of each subject of investigation separately.

*The mean temperature of the air at Greenwich—*

For the month of July was  $61^{\circ}5$ , which is  $3^{\circ}7$ ,  $1^{\circ}3$ ,  $0^{\circ}6$ ,  $0^{\circ}1$ , and  $1^{\circ}7$  above those of the years 1841 to 1845 respectively,  $3^{\circ}0$  and  $3^{\circ}9$  below those of the years 1846 and 1847; or it is  $0^{\circ}1$  above the average of these seven years;

For the month of August was  $58^{\circ}5$ , which is  $2^{\circ}0$ ,  $6^{\circ}9$ ,  $3^{\circ}6$ ,  $4^{\circ}7$ , and  $3^{\circ}6$  below those of the years 1841, 1842, 1843, 1846, and 1847 respectively,  $0^{\circ}8$  and  $1^{\circ}2$  above those of the years 1844 and 1845 respectively; or it is  $2^{\circ}7$  below the average of these seven years;

\* Communicated by the Author.



For the month of September was  $55^{\circ}8$ , which is  $2^{\circ}3$ ,  $0^{\circ}6$ ,  $3^{\circ}7$ ,  $1^{\circ}1$ , and  $4^{\circ}3$  *below* those of the years 1841, 1842, 1843, 1844, and 1847 respectively,  $1^{\circ}2$  and  $1^{\circ}5$  *above* those of the years 1845 and 1846 respectively; or it is  $1^{\circ}2$  *below* the average of these seven years.

The mean value for the quarter was  $58^{\circ}6$ ; that for 1841 was  $58^{\circ}8$ ; for 1842 was  $60^{\circ}7$ ; for 1843 was  $60^{\circ}8$ ; for 1844 was  $58^{\circ}7$ ; for 1845 was  $56^{\circ}9$ ; for 1846 was  $62^{\circ}6$ ; and for 1847 was  $60^{\circ}3$ ; so that the defect for this quarter *below* the corresponding quarter in the years 1841, 1842, 1843, 1844, 1846, and 1847, was  $0^{\circ}2$ ,  $2^{\circ}1$ ,  $2^{\circ}2$ ,  $0^{\circ}1$ ,  $4^{\circ}0$ , and  $1^{\circ}7$  respectively; the only year between 1841 and 1847 whose mean temperature for this period was less than that for the present year was 1845, and the difference is  $1^{\circ}7$ . The average value for this quarter from the seven preceding years was  $59^{\circ}8$ ; so that the mean temperature of the air for the quarter ending September 30, 1848, was *below* that of the corresponding quarter in the preceding seven years by  $1^{\circ}2$ .

*The mean temperature of evaporation at Greenwich—*

For the month of July was  $57^{\circ}6$ , which is  $0^{\circ}1$  *above* that for the preceding seven years;

For the month of August was  $55^{\circ}2$ , which is  $2^{\circ}9$  *below* that for the preceding seven years;

For the month of September was  $55^{\circ}2$ , which is  $1^{\circ}5$  *below* that for the preceding seven years.

The mean value for the quarter was  $55^{\circ}3$ , which is  $1^{\circ}4$  *below* the average for the seven preceding years.

*The mean temperature of the dew-point at Greenwich—*

For the month of April was  $54^{\circ}6$ , which is  $3^{\circ}0$ ,  $1^{\circ}4$ ,  $0^{\circ}2$ ,  $1^{\circ}9$ , and  $1^{\circ}8$  *below* those for the years 1841, 1842, 1845, 1846, and 1847 respectively,  $1^{\circ}7$  and  $0^{\circ}1$  *above* those for the years 1843 and 1844 respectively; or it is  $0^{\circ}9$  *above* the average of these seven years;

For the month of August was  $52^{\circ}8$ , which is  $2^{\circ}2$ ,  $6^{\circ}1$ ,  $5^{\circ}0$ ,  $4^{\circ}7$ , and  $3^{\circ}3$  *below* those for the years 1841, 1842, 1843, 1846, and 1847 respectively,  $0^{\circ}5$  and  $0^{\circ}2$  *above* those for the years 1844 and 1845; or it is  $2^{\circ}9$  *below* the average for these seven years;

For the month of September was  $50^{\circ}9$ , which is  $2^{\circ}8$ ,  $2^{\circ}6$ ,  $4^{\circ}0$ ,  $2^{\circ}3$ , and  $4^{\circ}0$  *below* those for the years 1841, 1842, 1843, 1844, and 1846 respectively,  $1^{\circ}2$  *above* those of the years 1845 and 1847; or it is  $1^{\circ}9$  *below* the average of these seven years.

The mean value for the quarter was  $52^{\circ}8$ , which is  $1^{\circ}3$  *below* the average for the corresponding period of the preceding seven years.

*The mean weight of water in a cubic foot of air for the*

quarter was 4.5 grains, which is 0.2 grain *less* than the average for the seven preceding years.

*The additional weight of water* required to saturate a cubic foot of air was 1.1 grain. The average value for the seven preceding years was 1.0 grain.

*The mean degree of humidity* of the atmosphere for July was 0.762, for August was 0.797, and for September was 0.795. The averages for the seven preceding years were 0.780, 0.804, and 0.842 respectively. The value for the quarter was 0.785, which is 0.024 *less* than the average for these years.

*The mean elastic force of vapour* for the quarter was 0.411 inch, which is 0.026 *less* than the average for these years.

*The mean reading of the barometer* at Greenwich for July was 29.836 inches, for August was 29.732 inches, and for September was 29.832 inches; these values are 0.041 inch *above*, 0.065 inch *below*, and 0.021 inch *above* respectively the averages for the seven preceding years. The mean value for the quarter was 29.797 inches, which is of the same value as the average for the seven preceding years.

*The average weight of a cubic foot of air* under the average temperature, humidity, and pressure, was 527 grains; the average for the seven preceding years was 526 grains.

*The rain fallen at Greenwich* in July was 2.1 inches; in August was 4.6 inches; and in September was 2.4 inches; the average amount for the seven preceding years was 2.3 inches in July, 2.7 inches in August, and 2.2 inches in September. The amount fallen in the quarter was 9.1 inches, which is 1.9 inch greater than the average for the seven preceding years. The average fall of rain during this quarter, as derived from the observations since the year 1815, is 7 inches. In the year 1824 the fall of rain in the quarter ending September 30 was 9 inches, in 1828 it was 12.5 inches, in 1829 it was 11 inches, and in 1839 it was 10.5 inches. The total amount of rain fallen this year till September 30 was 24.3 inches; in 1841 it was 21.2 inches; in 1842 it was 14.2 inches; in 1843 it was 17.5 inches; in 1844 it was 16.2 inches; in 1845 it was 16.6 inches; in 1846 it was 17.5 inches; and in 1847 it was 11.6 inches. So that the fall of rain this year exceeds that in 1841 by 2.7 inches; in 1842 by 9.7 inches; in 1843 by 6.4 inches; in 1844 by 7.7 inches; in 1845 by 7.3 inches; in 1846 by 6.4 inches; and in 1847 by 12.3 inches. The *excess* of the fall of rain this year over the average for the seven preceding years is 7.5 inches.

In the years 1824 and 1828 the depth of rain fallen to the end of September exceeded 23 inches; and in the years 1829 and 1839 the amount collected exceeded 20 inches. So large



a fall as 24·3 inches within the first nine months of the year has probably not been exceeded within this century.

The temperature of the water of the Thames was 63°·0 by day, and 62°·0 by night. The water, on an average, was 3°·9 warmer than the air.

The horizontal movement of the air was about 130 miles daily; during the period of time between July 19 and July 27 it amounted to 233 miles per day; from July 31 to August 6 its average daily value was 240 miles; and on August 21 it exceeded 300 miles.

The highest and lowest readings of the thermometer in Air at the height of four feet above the ground, and protected as much as possible from the effects of radiation and rain, were 85°·3 and 32°·8.

The average daily ranges of the readings of the thermometer in Air at the height of four feet, were 22°·5 in July, 18°·5 in August, and 20°·9 in September. The average ranges for these months from the observations of the seven preceding years were 17°·2, 17°·1, and 16°·2 respectively.

In July the readings of the thermometer on grass were 29°·5 on one night; between 32° and 40° on nine nights; between 40° and 50° on twelve nights; and above 50° on nine nights.

In August the lowest reading was 36°: and the readings were below 40° on four nights; between 40° and 50° on eighteen nights; and above 50° on nine nights.

In September the readings were below 32° on nine nights, and the lowest was 23°; they were between 32° and 40° on seven nights; between 40° and 50° on nine nights; and above 50° on four nights.

The mean amount of cloud for July was 6·6, for August was 7·6, and for September was 5·6. The average values for the seven preceding years were 6·7, 6·3, and 6·0 respectively.

There were five exhibitions of the *aurora borealis* during the quarter, which occurred on July 11, August 28, September 4, 8 and 18.

Thunder-storms at different parts of the country occurred on July 14, 26, August 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 22, 23, 31, and September 5; and lightning unaccompanied by thunder was seen on July 24, August 23, 24, 25, September 22 and 25. The storms of July 14 were observed at Greenwich, Latimer Rectory, Cardington, Saffron Walden and Leicester. At Greenwich, thunder-clouds were observed first in the west and north-west at 8<sup>h</sup> 30<sup>m</sup> P.M.; and from this time till near midnight the thunder followed the lightning at intervals varying from 5<sup>s</sup> to 40<sup>s</sup>; and lightning was visible during the whole of the night. At Latimer the storm is described as awful, and

of five hours' duration. On July 24 lightning was seen at Saffron Walden; on July 26 there was a thunder-storm at Leicester; on August 1, thunder was heard at Greenwich during the afternoon; on August 3 and 4 at Saffron Walden; on August 5 there were thunder-storms at Greenwich, Stone, Saffron Walden, Leicester and Empingham. Near the last-mentioned place a tree was struck by the lightning.

On August 6 and 7 there were thunder-storms at Leicester; on August 8 at Leicester and at Exeter; on August 9 at Greenwich, but no lightning was seen; on August 10 at Stone; on August 11 at Greenwich, between the hours of 6 and 8 P.M.; the storm began in the east, and many of the flashes of lightning were vivid, and preceded the thunder by two or three seconds only. On August 22 there were storms at Exeter, Stone, Saffron Walden, Cardington, and at Leicester. At Greenwich, on August 23 and 24, between the hours of 8 P.M. and midnight, on both days many flashes of lightning were seen. On August 31, at Greenwich and at Stone, there were thunder-storms; at the former place the thunder followed the lightning at intervals varying from 1<sup>s</sup> to 12<sup>s</sup>. On September 5 there were storms at Greenwich, Stone and Leicester; on September 22 lightning was seen at Greenwich and at Stone, and again at Stone on the 25th.

Hail fell at Stone and Cardington on August 22, and at Empingham on August 5; the hailstones at Cardington were of very large dimensions.

Gales of wind took place all over the country on August 20, 21 and 22, but more particularly on the 21st. At many places trees were blown down, and a great deal of injury was done; coasting-vessels and fishing-boats generally suffered very much.

Large and continuous falls of rain.—In July, at Greenwich, rain fell to the depth of 0·3 inch on the 15th, 23rd and 31st. On the 14th, at Latimer Rectory, rain to the depth of half an inch fell in half an hour. In August rain was falling more or less at every part of the country on every day. At Greenwich the amount collected exceeded 0·3 inch on the 1st, 3rd, 8th, 10th and 21st; and the falls exceeded 0·7 inch on the 14th and 31st; on the 14th a large fall occurred at all places. In September, on the 24th, at Thwaite, between 4<sup>h</sup> A.M. and 9<sup>h</sup> A.M., rain fell to the depth of 2·12 inches, a greater fall within the same interval of time than has occurred at Thwaite within the preceding forty years; and on this day, at Leeds, the fall within nine hours was 2 inches. On the 28th, 29th and 30th days, rain was falling almost continuously over all parts of the country. At Cardington the fall within sixty hours was 2·6



inches. At Leicester the amount within seventy-two hours was 2·25 inches, and this was the amount which fell on these days at most places. This large fall, extending over so large a portion of the country, was most unusual.

*The approximate mean monthly values* of the several subjects of research are shown in extensive tables in the report of the Registrar-General.

The mean monthly temperatures of the places in Cornwall and Devonshire in these three months are about the same values as those of other places, but the extremes of daily and monthly temperatures are much less than elsewhere.

*The reading of the barometer* was low at the beginning of July, being 29·403 inches at 6<sup>h</sup> A.M. on the 1st; this reading increased to 29·740 by 6<sup>h</sup> P.M. on the 2nd; decreased to 29·611 on the 3rd, and increased quickly on the 4th, and reached 30 inches before midnight on this day. The reading ranged above 30 inches on the 5th, and decreased to 29·635 by midnight on the 9th. During the 10th the value increased 0·539 inch, having passed the point 30 inches at about 1<sup>h</sup> P.M. on this day. The reading continued above 30 inches till the 17th; the highest value was 30·344 on the 12th. From the 17th there was a gradual decrease to 29·146 on the 20th at 3<sup>h</sup> P.M.; at midnight on this day the reading was 29·467, and increased to 29·781 on the 24th; during the 25th the decrease was 0·300 inch, and the reading was 29·480 at midnight; it then gradually increased to 30 inches by the 29th. On the 30th the change was considerable, amounting to half an inch during the day; and at the end of the month the reading was 29·313 inches, and still decreasing.

On August 1st, at 6<sup>h</sup> A.M., the reading was 29·244 inches; after this time it turned to increase, and was 29·581 at midnight, and reached 29·817 on the 2nd day. On the 3rd it decreased, and was 29·582 at midnight; during the 4th the changes were small; on the 5th the decrease was 0·190 inch, and the reading at midnight was 29·335 inches. During the 6th and 7th there was a slight increase. From this time to the 20th the changes were small, and at midnight on the 20th the reading was 29·846 inches. The decrease on the 21st was 0·334 inch, and at noon on the 22nd the reading was 29·423 inches, when it turned to increase, and was 29·528 at midnight; the increase continued till the 25th at noon, the reading at this time being 29·947, when it turned to decrease, and the changes after this time to the end of the month were small.

In September, till the 4th, the reading was above 30 inches; during the 5th it decreased 0·2 inch, and was 29·638 at mid-

night; from the 6th to the 9th the changes were small; on the 10th, by P.M., the reading decreased 0·219 inch, and the reading was 29·496 inches; it then turned to increase quickly; on the 11th the reading at midnight was 30·091 inches. From this time till the 18th the reading was always above 30 inches; the highest value was 30·345 on the 16th. On the 19th it began to decrease, and on the 24th the reading was 29·223 inches; and from this time to the end of the month the changes were small, and chiefly about the mean reading of 29·6 inches.

The great prevalence of rain during the quarter, together with the very short periods of sunshine, have harassed the farmer in gathering in the crops. The month of July was about its usual character, but the constant rain in August impeded the farmer in his operations, and in many of the southern counties injured the crops considerably, causing the corn to sprout and seed-leaves to appear, of fully an inch in length, by the middle of August; the greater coldness of the northern counties prevented the sprouting of the corn, but it otherwise was seriously injured.

Between the 9th and the 23rd of September the weather was generally fine, and this period was the only good interval of time for harvest work during the quarter, and the wheat gathered within this time was in good condition. The heavy falls of rain at the end of this month flooded many parts of the country, and the roads in some places were deeply trenched.

John Fletcher Miller, Esq., of Whitehaven, says, "The harvest in this neighbourhood was completed by September 20, somewhat earlier than usual. The crops were abundant, and secured in excellent condition."

Charles Charnock, Esq., of Leeds, says, "The harvest has been most protracted, and there is yet much both of barley and oats out in the fields, which I fear is seriously injured. There is in fact much more corn out in the northern districts than is generally supposed. On September 25 I observed in the East Riding of Yorkshire hundreds of acres of corn and potatoes with water to the depth of a foot upon them. The wheat and barley, which were housed between the 9th and the 23rd of September, were without damage and in good condition; that which was housed before this time was in a bad state from not being dry. Wheat in this neighbourhood has not sprouted generally. Wheat and barley yield badly, and both crops are under an average. Both oats and beans are average crops. Potatoes are getting worse; the winter or late varieties of this vegetable are now attacked and rotting very fast; *wherever the tops have been very luxuriant they are the worst.* I have observed that the disease seems to have



been immediately preceded by a white frost, which disease I have no doubt is attributable to meteorological causes.

"Sheep stock has not been healthy; the deaths among the lambs have been very numerous even in the driest districts."

Samuel Charles Whitbread, Esq., says, "My harvest began on the 28th of July; it continued forty-two days, and rain fell on twenty-eight of these days, depositing 4.75 inches of water; on the whole the crops suffered no damage." This remark has reference to the crops in Bedfordshire.

The observer at Stone says, speaking of the crops in the Vale of Aylesbury, "that those of hay and clover were abundant and good, but were not well-gathered; that wheat was below an average of many years, but was well-housed; that both barley and oats were average crops, and they were well-housed." The observer speaks of the potato crop as being generally bad.

John Drew, Esq., F.R.A.S., of Southampton, has kindly procured me an agricultural report from John Clark, Esq. of Finsbury Farm, near Romsey, Hampshire, and which I have condensed into the following few lines.

The South Hampshire farmer has been subjected during the past quarter to more trying dispensations of Providence than Mr. Clark has experienced within a period of twenty-five years' practice. This gentleman further observes that the almost constant wet weather has injured every kind of crop, and that but little has come to maturity. The occasional short periods of sunshine have frequently induced the hope that a season would come for haymaking and harvest work, but which expectation unfortunately has never been realized. A large quantity of hay has been consequently rendered useless, and turnips have been very much injured. The wide range of prices of new wheat affords the best evidence of the extent to which this crop has been harassed. On those lands which have been well-farmed and well-drained, or on those which would readily part with an excess of moisture, the crops are an average (with the exception of potatoes, which are almost a failure). On heavy cold soils the crops are below an average. In consequence of the exceeding wetness cattle have done badly.

The recent heavy rains (now Oct. 6) excite great anxiety with respect to seed-time. On wet lands a great deal is needed to be done to prepare them for sowing, which operation must be late, and therefore to a certain extent more precarious than if performed under the more favourable circumstances of a good seed season.

The mean of the numbers in the first column of the subjoined quarterly meteorological table is 29.541 inches, and this value

may be considered as that of the pressure of dry air for England during the quarter ending September 30, 1848. The differences between this number and the separate results contained in the first column, show the probable sums of the errors of observation and reduction; the latter arising partly from erroneously assumed altitudes, and partly in consequence of the index error of the instruments not having been determined. In most cases, however, the sums of these errors are small.

The mean of the numbers in the second column, for those places situated in the counties of Cornwall and Devonshire, is  $58^{\circ}1$ ; for those places situated south of latitude  $52^{\circ}$ , including Chichester and Hartwell, is  $57^{\circ}8$ ; for those places situated between the latitudes of  $52^{\circ}$  and  $53^{\circ}$ , including Saffron Walden and Highfield House, was  $56^{\circ}8$ ; for those places situated between the latitudes of  $53^{\circ}$  and  $54^{\circ}$ , including Liverpool and Whitehaven, but not Stonyhurst, whose mean temperature, from its greater elevation, is lower than that due to its latitude alone, was  $56^{\circ}2$ ; and for Durham and Newcastle was  $55^{\circ}8$ . This value, however, is somewhat too high for the former place and too low for the latter, on account of the difference of elevation of these places. These values may be considered as those of the mean temperature of the air for these different parallels of latitude during the quarter ending September 30, 1848.

The average daily range of the temperature of the air in Cornwall and Devonshire was  $14^{\circ}2$ ; at Liverpool and Whitehaven was  $10^{\circ}2$ ; south of latitude  $52^{\circ}$  was  $19^{\circ}5$ ; between the latitudes of  $52^{\circ}$  and  $53^{\circ}$  was  $15^{\circ}8$ ; between the latitudes of  $53^{\circ}$  and  $54^{\circ}$  was  $15^{\circ}9$ ; and of Durham and Newcastle was  $14^{\circ}4$ .

The greatest mean daily ranges of the temperature of the air took place at Hartwell, Latimer, Aylesbury and Leicester respectively; and the least occurred at Liverpool, Whitehaven, Torquay and Truro respectively.

The highest thermometer readings in air during the quarter were  $95^{\circ}$  at Leicester,  $90^{\circ}$  at Wakefield, and  $89^{\circ}$  at Hartwell; but it seems highly probable that these readings are greater than the temperature of the air really reached. The reading  $88^{\circ}$  seems to be confirmed, and this value may be considered as the highest during the quarter. The lowest values of the thermometer readings in air were  $29^{\circ}$  at Hartwell,  $31^{\circ}$  at Latimer and Cardington. The extreme range of temperature of the air during the quarter was therefore about  $59^{\circ}$ .

The average quarterly range of the reading of the thermometer in Cornwall and Devonshire was  $33^{\circ}2$ ; at Liverpool and Whitehaven was  $32^{\circ}5$ ; and the mean of the numbers at all the other places is  $49^{\circ}2$ . The highest and lowest readings



Name of the place.	Mean pressure of the atmosphere of dry air reduced to the level of the sea.	Mean temperature of the air.	Highest reading of the thermometer.	Lowest reading of the thermometer.	Mean daily range of temperature.	Range of the thermometer.	Mean estimated strength 0-6.	Wind.	Mean amount of cloud 0-10.	Number of days on which it fell.	Rain.	Mean weight of vapour in a cubic foot of air.	Mean additional weight required to saturate a cubic foot of air.	Mean degree of humidity.	Mean whole amount of water in a vertical column of atmosphere.	Mean weight of a cubic foot of air.	Height of station of the barometer above the level of the sea.
Helston	29.535	58.5	76.0	41.0	15.0	35.0	1.5	s.w.	5.2	57	11.3	4.8	0.9	0.839	5.9	527	106
Falmouth	29.535	58.0	79.0	42.0	18.4	37.0	1.4	s.w.	6.3	50	11.6	4.8	0.9	0.839	5.9	527	106
Truro	29.535	57.3	72.0	42.0	10.9	30.0	0.9	s.w.	6.3	45	12.5	4.8	0.9	0.839	5.9	527	106
Torquay	29.535	58.0	75.0	46.0	10.4	22.3	2.2	s.w.	4.3	52	8.9	4.9	0.9	0.847	6.1	528	120
Exeter	29.656	58.6	80.7	39.0	16.5	41.7	1.4	w.	4.3	52	8.9	4.9	0.9	0.847	6.1	528	140
Chichester	29.531	55.9	78.0	39.0	15.0	39.0	0.8	Variable.	6.7	50	11.0	5.0	0.7	0.906	6.2	528	55
Southampton Observatory	29.531	58.7	85.0	38.0	17.9	47.0	0.8	Variable.	6.7	50	11.0	5.0	0.7	0.906	6.2	528	55
Uckfield	29.558	59.6	83.0	36.0	19.0	47.0	0.8	s.w.	5.8	59	12.7	4.4	0.9	0.827	5.7	529	180
Beckington	29.498	57.1	88.0	35.0	19.5	53.0	0.8	s.w.	5.8	59	12.7	4.4	0.9	0.827	5.7	529	265
Royal Observatory, Greenwich	29.581	58.6	85.3	32.8	20.6	52.7	0.8	s.w.	6.4	45	10.2	4.7	1.1	0.810	5.7	528	107
Maidenstone Hill, Greenwich	29.571	58.4	85.0	34.0	19.2	51.0	3.1	Variable.	6.6	52	10.5	4.5	1.1	0.817	5.5	524	335
Walworth	29.534	59.4	85.0	34.0	23.4	53.0	1.5	Variable.	6.1	47	10.4	4.4	1.2	0.781	5.5	524	280
Latimer Rectory	29.571	56.1	84.0	31.0	23.4	53.0	0.5	s.w.	6.1	47	10.4	4.4	1.2	0.781	5.5	524	300
Aylesbury	29.561	58.3	88.0	33.0	22.9	55.0	0.5	s.w.	6.7	53	8.1	4.4	0.9	0.813	5.4	524	300
Stone Observatory	29.527	56.2	76.1	37.0	15.3	39.1	0.9	s.w.	6.3	53	10.5	4.9	0.6	0.876	5.9	525	300
Hartwell House	29.515	57.7	89.0	29.0	25.8	60.0	0.8	s.w.	4.7	56	7.8	4.7	1.0	0.835	5.8	527	70
Saffron Walden	29.515	56.8	82.0	32.0	17.0	50.0	2.5	s.w.	6.1	51	9.9	4.7	1.0	0.835	5.8	527	200
Cardington	29.591	57.6	85.0	31.0	20.2	54.0	0.8	s.w.	6.1	51	9.9	4.7	1.0	0.835	5.8	527	200
Thwaite	29.522	57.7	84.0	38.0	16.3	46.0	0.8	s.w.	5.3	50	11.3	3.9	0.5	0.900	5.7	528	150
Norwich	29.522	57.7	84.0	38.0	16.3	46.0	0.8	s.w.	5.3	50	11.3	3.9	0.5	0.900	5.7	528	150
Leicester	29.603	57.2	95.0	35.0	21.9	60.0	2.0	s.w.	5.3	50	11.3	3.9	0.5	0.900	5.7	528	150
Derby	29.502	55.7	81.0	35.0	16.6	46.0	0.8	s.w.	6.3	58	11.7	4.4	1.0	0.813	5.4	529	103
Highfield House, Notts.	29.516	57.2	84.8	37.2	16.6	47.6	0.8	s.w.	6.3	58	11.7	4.4	1.0	0.813	5.4	529	103
Liverpool Observatory	29.465	56.3	76.8	45.2	10.7	31.6	0.9	n.w.	6.7	54	8.9	4.2	0.8	0.842	5.1	530	37
Leeds	29.519	55.3	84.0	35.0	17.7	49.0	1.5	Variable.	6.3	53	12.6	4.5	0.6	0.882	5.5	529	148
Wakefield	29.517	57.2	90.0	32.5	20.0	57.5	0.8	s.w.	7.4	62	15.2	4.2	0.7	0.860	5.1	528	381
Stonyhurst Observatory	29.517	53.9	83.5	32.6	16.0	50.9	0.9	s.w.	7.4	62	15.2	4.2	0.7	0.860	5.1	528	381
York	29.517	55.2	84.0	35.0	15.9	49.0	0.9	w.	4.5	9.0	11.0	4.3	1.2	0.780	5.3	529	50
Whitehaven	29.544	57.2	72.0	38.5	10.2	33.5	2.5	n.w.	5.8	39	6.8	4.1	1.1	0.798	5.0	525	340
Durham	29.544	54.7	79.6	34.8	15.0	44.8	1.3	s.w.	5.8	39	6.8	4.1	1.1	0.798	5.0	525	340
Newcastle	29.488	56.8	79.5	34.5	13.7	45.0	0.8	s.w.	9	10	11	12	13	14	15	16	17
Number of columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

at Stone, and all depending upon them, are evidently erroneous.

From the numbers in this quarter, as well as those of preceding quarters, it would seem that the Vale of Aylesbury is subject to greater extremes of temperature than any other part of the country of equal extent.

The great mass of air has passed from the south-west in all places except Liverpool and Whitehaven, at both of which places it seems to have passed from the north-west. By reference to the Monthly Table, it will be seen that this was particularly the case in July and August; but in September the direction of the wind was frequently from the east, and its compounds.

From the numbers in the ninth column, the distribution of cloud seems to have been nearly the same in amount at most places, and such as to have covered about three-fifths of the whole sky.

The fall of rain during the quarter has greatly exceeded the average amount for the season, and this was particularly the case in the month of August. The places at which rain has fallen on the greatest number of days were Stonyhurst, Greenwich, Beckington, Leeds, Highfield House, Helston and Wakefield, and the average number of these places was 59; and the places at which rain fell on the least number of days are those situated near the eastern coast. The places at which the largest falls have taken place were Stonyhurst, Hereford, Beckington, Leeds and Torquay. The places where the falls have been the least in amount are Durham, Newcastle, Saffron Walden, Walworth, Stone and Norwich. The amount at Stone being so much less than the fall at adjacent places, seems to be strange; and this was the case in the preceding quarter, in consequence of which the Rev. J. B. Reade, on August 17, wrote to me, stating that "there had been many electrical clouds giving copious showers around us, especially on the Chiltern Hills and in the neighbourhood of Aylesbury, while we were in sunshine. This was particularly the case yesterday afternoon."

The numbers in column 12 to 16 show the mean values of the hygrometrical results at every station; from which we find that—

The mean weight of vapour in a cubic foot of air for England (excepting Cornwall and Devonshire) in the quarter ending September 30, 1848, was 4.5 grains.

The mean additional weight required to saturate a cubic foot of air in the quarter ending Sept. 30, 1848, was 1.0 grain.

The mean degree of humidity (complete saturation = 1) in the quarter ending September 30, 1848, was 0.815.



The mean amount of vapour mixed with the air would have produced water, if all had been precipitated at one time on the surface of the earth, to the depth of 5.5 inches.

The mean weight of a cubic foot of air at the level of the sea, under the mean pressure, temperature and humidity, was 529.3 grains.

And these values for Cornwall and Devonshire were 4.8 grains; 0.9 grain; 0.843; 6.0 inches; and 530 grains respectively.

*To the British Meteorological Society  
from W. Glaisher*



*Remarks on the Weather during the Quarter ending December 31, 1848. By JAMES GLAISHER, Esq., of the Royal Observatory, Greenwich.*

THE meteorological returns for the past quarter furnished to the Registrar-General have been received from stations spread over the country. The observations have been made, for the most part by experienced observers, upon an uniform plan. The following remarks are based upon observations which have been furnished either to myself or to the Registrar-General, and drawn up to accompany the meteorological tables published by the Registrar-General, all of which have been examined by myself, and reduced under my direction.

The weather during the period has been variable. The changes of temperature have been frequent and great, there has been an unusually large number of exhibitions of the aurora borealis, and the magnetic instruments have been greatly disturbed. The amount of electricity in the atmosphere has been small, many days together having passed without the instruments at Greenwich being affected.

From the 1st of October to the 10th the excess of temperature above the average of seven years was  $6^{\circ}6$ ; the greatest daily excess was  $12^{\circ}3$  on the 7th. Between the 11th and

during the Quarter ending December 31, 1848. 183

21st the temperature was  $4^{\circ}5$  below the average; on the 18th it was  $10^{\circ}$  in defect. From October 22 to October 30 it was  $5^{\circ}3$  in excess; the greatest was  $7^{\circ}7$  on the 27th. From October 31 to November 16 the temperature was mostly below the average, its mean defect was  $4^{\circ}2$ , its greatest within the period was  $10^{\circ}2$  on the 4th. From November 17 to December 19 the temperature exceeded the average by  $4^{\circ}8$ . On December 7 the excess was  $12^{\circ}4$ ; on the 8th was  $15^{\circ}7$ ; on the 9th was  $14^{\circ}4$ ; and on the 10th was  $10^{\circ}1$ . From December 20 to December 24 the defect was  $6^{\circ}2$ ; from December 25 to December 29 the excess was  $5^{\circ}8$ ; and it was  $2^{\circ}3$  below the average on December 30 and 31. The following are the particulars of each subject of investigation arranged as in the preceding quarters.

*The mean temperature of the air at Greenwich—*

For the month of October was  $51^{\circ}6$ , which is  $2^{\circ}5$ ,  $6^{\circ}2$ ,  $3^{\circ}6$ ,  $2^{\circ}1$ ,  $1^{\circ}4$ , and  $1^{\circ}1$  above those of the years 1841 to 1846 respectively, and  $1^{\circ}3$  below that in the year 1847; or it is  $2^{\circ}3$  above the average of these seven years;

For the month of November was  $43^{\circ}8$ , which is  $1^{\circ}1$  and  $1^{\circ}0$  above those of the years 1841 and 1842, of the same value as that of 1843,  $0^{\circ}2$ ,  $2^{\circ}0$ ,  $2^{\circ}2$ , and  $3^{\circ}1$  below those of the years 1844 to 1847 respectively; or it is  $0^{\circ}7$  below the average of these seven years;

For the month of December was  $44^{\circ}0$ , which is  $3^{\circ}5$ ,  $0^{\circ}1$ ,  $11^{\circ}0$ ,  $2^{\circ}3$ ,  $11^{\circ}1$  and  $1^{\circ}2$  above those of the years 1841, 1843, 1844, 1845, 1846, and 1847 respectively; and  $1^{\circ}0$  below that of the year 1842, or it is  $4^{\circ}1$  above the average of these seven years.

The mean value for the quarter was  $46^{\circ}5$ ; that for 1841 was  $44^{\circ}0$ ; for 1842 was  $44^{\circ}4$ ; for 1843 was  $45^{\circ}2$ ; for 1844 was  $42^{\circ}2$ ; for 1845 was  $45^{\circ}9$ ; for 1846 was  $43^{\circ}1$ ; and for 1847 was  $47^{\circ}5$ ; so that the excess of temperature this quarter above the corresponding quarter in the years 1841 to 1846 was  $2^{\circ}5$ ,  $2^{\circ}1$ ,  $1^{\circ}3$ ,  $4^{\circ}3$ ,  $0^{\circ}6$ , and  $3^{\circ}4$  respectively; the only year between 1841 and 1847 whose mean temperature for this period was greater than that for the present year was 1847, and the difference is  $1^{\circ}0$ . The average value for this quarter from the seven preceding years was  $44^{\circ}6$ ; so that the mean temperature of the air for the quarter ending December 31, 1848, was above that of the corresponding quarter in the preceding seven years by  $1^{\circ}9$ .

*The mean temperature of evaporation at Greenwich—*

For the month of October was  $49^{\circ}3$ , which is  $1^{\circ}5$  above that for the preceding seven years;

For the month of November was  $41^{\circ}7$ , which is  $1^{\circ}7$  below that for the preceding seven years;



For the month of December was  $42^{\circ}3$ , which is  $3^{\circ}5$  above that for the preceding seven years.

The mean value for the quarter was  $44^{\circ}4$ , which is  $1^{\circ}1$  above that for the preceding seven years.

*The mean temperature of the dew-point at Greenwich—*

For the month of October was  $47^{\circ}4$ , which is  $2^{\circ}3$ ,  $5^{\circ}0$ ,  $2^{\circ}7$ ,  $1^{\circ}4$ ,  $0^{\circ}9$ , and  $0^{\circ}2$  above those of the years 1841 to 1846 respectively, and  $1^{\circ}7$  below that of the year 1847; or it is  $1^{\circ}6$  above the average of these seven years;

For the month of November was  $38^{\circ}8$ , which is  $1^{\circ}0$ ,  $1^{\circ}6$ ,  $2^{\circ}1$ ,  $3^{\circ}1$ ,  $4^{\circ}0$ ,  $4^{\circ}3$ , and  $5^{\circ}3$  below those of the years 1841 to 1847; or it is  $3^{\circ}0$  below the average for these seven years;

For the month of December was  $40^{\circ}1$ , which is  $4^{\circ}9$ ,  $10^{\circ}1$ ,  $2^{\circ}4$ ,  $10^{\circ}7$ , and  $0^{\circ}3$  above those of the years 1841, 1844, 1845, 1846, and 1847 respectively,  $3^{\circ}1$  and  $1^{\circ}9$  below those of the years 1842 and 1843; or it is  $3^{\circ}3$  above the average of these seven years.

The mean value for the quarter was  $42^{\circ}1$ , which is  $0^{\circ}7$  above the average for the corresponding period of the preceding seven years.

*The mean weight of water in a cubic foot of air for the quarter was  $3\cdot3$  grains, which is  $0\cdot1$  grain greater than the average of the preceding seven years.*

*The additional weight of water required to saturate a cubic foot of air was  $0\cdot54$  grain. This value from the preceding seven years was  $0\cdot38$  grain.*

*The mean degree of humidity of the atmosphere for October was  $0\cdot853$ , for November was  $0\cdot848$ , and for December was  $0\cdot873$ . The averages for the seven preceding years were  $0\cdot888$ ,  $0\cdot909$ , and  $0\cdot900$  respectively. The value for the quarter was  $0\cdot858$ , which is  $0\cdot041$  less than the average for these years.*

*The mean elastic force of vapour for the quarter was  $0\cdot285$  inch, which is  $0\cdot008$  less than the average for the preceding seven years.*

*The mean reading of the barometer at Greenwich for October was  $29\cdot646$  inches, for November was  $29\cdot785$  inches, and for December was  $29\cdot807$  inches; these values are  $0\cdot014$  inch below,  $0\cdot075$  inch above, and  $0\cdot028$  inch below the average for the same months from the preceding seven years. The mean value for the quarter was  $29\cdot746$  inches, which is  $0\cdot011$  above the average for these years.*

*The average weight of a cubic foot of air under the average temperature, humidity, and pressure, was  $540\cdot3$  grains; the average for the seven preceding years was  $542$  grains.*

*The rain fallen at Greenwich in October was  $3\cdot50$  inches; in November was  $1\cdot20$  inch; and in December was  $2\cdot55$  inches. In October, in the years 1841 to 1847, were  $5\cdot95$ ,  $1\cdot41$ ,  $4\cdot25$ ,*

$4\cdot03$ ,  $1\cdot38$ ,  $5\cdot13$ , and  $2\cdot00$  inches respectively; the mean of these values is  $3\cdot45$  inches. In November, in the years 1841 to 1847, were  $3\cdot70$ ,  $4\cdot28$ ,  $2\cdot30$ ,  $4\cdot32$ ,  $2\cdot40$ ,  $1\cdot52$ , and  $2\cdot00$  inches respectively; the mean of these values is  $2\cdot92$  inches. In December, in the years 1841 to 1847, were  $2\cdot40$ ,  $0\cdot74$ ,  $0\cdot40$ ,  $0\cdot42$ ,  $2\cdot00$ ,  $1\cdot13$ , and  $2\cdot00$  respectively; and the mean of these values is  $1\cdot29$  inches. The depth of rain in October this year was nearly the same as the average from the seven preceding years, the fall in three instances being less, and in four exceeding that of this year. In November the fall in this year was less than that in any corresponding period since the year 1828, its amount being  $1\cdot72$  inch less than the average from the seven preceding years. In December the fall exceeded that in every December since 1833, the mean excess being  $1\cdot26$  inch above the average since 1841. In October rain fell on twenty-four days, on fourteen of which the amount was less than  $0\cdot1$  inch; on six it was between  $0\cdot1$  inch and  $0\cdot2$  inch; on three it was greater than  $0\cdot2$  inch and less than  $0\cdot3$  inch; there was one instance exceeding  $0\cdot3$  inch, one exceeding  $0\cdot4$  inch, and one between  $0\cdot5$  inch and  $0\cdot6$  inch. In November there were only two instances of the fall in one day exceeding  $0\cdot1$  inch; on one of these it amounted to  $0\cdot390$  inch. In December there were three instances exceeding  $0\cdot1$  inch, five exceeding  $0\cdot2$  inch, and one amounting to  $0\cdot685$  inch; on all other days the fall was less than  $0\cdot1$  inch. The amount for the quarter is  $7\cdot25$  inches, and the average from the seven preceding years is  $7\cdot66$  inches.

*The fall of rain during the year 1848 at Greenwich was  $31\cdot9$  inches; in 1841 it was  $33\cdot3$  inches; in 1842 it was  $22\cdot6$  inches; in 1843 it was  $24\cdot5$  inches; in 1844 it was  $25$  inches; in 1845 it was  $22\cdot3$  inches; in 1846 it was  $25\cdot3$  inches; and in 1847 it was  $17\cdot6$  inches. The mean of their values is  $24\cdot4$  inches; so that the excess of the fall of rain this year over the average from the seven preceding years is  $7\cdot5$  inches. At Beckington it was  $43\cdot16$  inches; in 1845 it was  $24\cdot94$  inches; in 1846 it was  $32\cdot30$  inches; and in 1847 it was  $28\cdot74$  inches. In 1845 it fell on 134 days; in 1846 on 168 days; in 1847 on 151 days; and in 1848 on 219 days, as registered by the Rev. Charles Blathwayt.*

At St. John's Wood, London, the fall exceeded the average from ten years by  $5\cdot05$  inches, as observed by George Leech, Esq.

At Aylesbury it fell on 174 days, amounting to  $34\cdot68$  inches, exceeding the average from the preceding six years by  $9\cdot5$  inches, as observed by Thomas Dell, Esq.

At Empingham it amounted to  $30\cdot36$  inches, which is the



largest fall since 1830, as observed by William Fancourt, Esq.

At Derby was 40·07 inches, exceeding the average from the preceding four years by more than 10 inches, and by 12 inches the average from twenty years, as observed by John Davis, Esq.

At Leeds was 37·86 inches, it having fallen on 244 days. In the year 1846 it fell on 218 days, and in 1847 it fell on 174 days; and the amount was 28·442 inches, as observed by Charles Charnock, Esq.

At Hereford was 46·41 inches; the average fall from a long series of years is rather more than 30 inches, as observed by James Pendergrass, Esq.

The fall of rain during the year 1848 all over the country was about one-third larger than the average fall, and this excess fell during the first three quarters. The fall in the last quarter was about its average value at most places.

The temperature of the water of the Thames was 47°·5 by day, and 45°·7 by night. The water, on an average, was of the same temperature as that of the air. During the quarter the temperature of the water has changed more than usual; the decrease of temperature from November 4 was rapid.

*The direction of the wind at Greenwich—*

From October 1 to 11 was chiefly S.W.; between October 11 and 20 was chiefly N.; and from October 20 to 31 was mostly S.;

From November 1 to 7 was variable, but was chiefly S.W. and N.W.; from the 7th to 15th was N.; from the 16th to the 21st was S.W.; from the 21st to the 23rd was S.E.; and was chiefly S.W. to the end of the month;

From December 1 to 9 was S.W.; from the 9th to the 15th was mostly S. by E., and was then N. and N.E. to the end of the month.

*The daily horizontal movement of the air—*

From October 1 to 11 was about 160 miles; the greatest value during the period was 300 miles, and the least was 80 miles; from October 11 to the 20th was 130 miles; the greatest was 270 miles, and the least was 30 miles; and from October 20 to the end of the month was 150 miles; the greatest being 240 miles, and the least 40 miles. The average for the month was 150 miles daily;

From November 1 to 7 was 150 miles, the greatest and least being 245 miles and 10 miles; from November 7 to 15 was 110, the extremes being 200 miles and 80 miles; from the 16th to the 21st was 250 miles, the extremes being 495 miles and 185 miles; from the 21st to the 23rd was 190 miles; and

from the 24th to the end of the month was 230 miles, the extremes being 300 miles and 70 miles; the average for the month was 165 miles;

From December 1 to 9 was 290 miles daily; from the 9th to the 15th was 170 miles; and it was 94 miles from the 15th to the end of the quarter. The extremes in December were 320 miles and 10 miles. The average for the month was 170 miles, and that for the quarter was 160 miles daily.

In October the readings of the thermometer on grass were at and below 32° on four nights; between 32° and 40° on fourteen and above 40° on thirteen nights. In November the lowest reading was 21°·5; the readings were below 32° on eighteen nights, and above 32° on thirteen nights. In December the lowest reading was 18°, and the readings were below 32° on twelve nights, between 32° and 40° on fifteen nights, and above 40° on four nights.

The mean amount of clouds was 7·3 in October, and 6·7 both in November and December. The averages for the seven preceding years were 6·9, 7·2, and 7·2 respectively.

There were no less than twenty-four exhibitions of the *aurora borealis* during the quarter ending December 31, 1848, which occurred on October 18, 19, 20, 22, 24, 25, 27 and 30, both in the morning and in the evening of the 30th; November 13, 14, 17, 18, 21, 23, 24, 25, 26, 30; December 13, 17, 22, 27 and 29. At all these times the magnets were more or less disturbed. In the weekly reports it was stated that from October 17 to 30 the magnetic instruments were almost always under some cause of disturbance, and particularly on the 17th, 18th, 19th, 23rd and 24th, slightly on the 21st and 22nd, and moderate on the remaining days. The finest aurora was that on the 17th of November; this was best observed by Professor Challis, and described by him in the Cambridge Chronicle. The most important part of his communication was that relative to the varying position of the corona. Professor Challis says, "I took twenty-four observations of the position of the corona, partly by reference to stars, and partly by a small altitude and azimuth instrument expressly constructed for this kind of observation, which I call a meteoroscope. A comparison of the results of the several observations seemed to show that the central point has not a fixed altitude and azimuth, but oscillates in a capricious manner about a medium position, more especially in the azimuthal direction." Observations of this kind are of the highest importance for comparison with the varying positions of the corona with the simultaneous variations of the magnetic dip and positions of the magnets.



*Thunder-storms* occurred at Whitehaven on October 9, 23, 28, 29, November 22, December 1; at Preston on Dec. 1; at Stonyhurst on December 9, distant thunder and lightning were noticed. Thunder was heard at Exeter on October 22 and on December 1. Lightning was seen at Truro on October 16, at Stone on October 28, at Saffron Walden on December 1 and 6, at Durham on October 18 and 28, at Whitehaven on December 2, at Greenwich on October 25, and at Stone on October 6 and November 3.

*Hail* fell at Truro on October 18, November 4, 7 and 8, at Greenwich on December 1, at Exeter on December 23, at Whitehaven on October 23, 28, 29, December 1 and 4.

*Snow* fell at Exeter, Empingham, and Saffron Walden on October 18, at Truro, Southampton, Greenwich, and Empingham on November 4, at Truro on November 7 and 8, at Hartwell on November 23 and December 2, and at Exeter on December 23.

*Solar halos* were seen at Maidenstone Hill, Greenwich, on October 5, 24, 29, and November 25; at Stone on Nov. 30; at Greenwich on October 24; at Highfield House on Oct. 1, 4, 18, 29, and December 2.

On November 8 a *mock sun* was seen at Highfield House.

*Lunar halos* were seen on October 8, December 2, 4, 10 and 12.

*Large and continuous falls of rain.*—On October 23, at Latimer Rectory, rain to the depth of 1·7 inch fell in twenty-four hours following 9 A.M.

At Falmouth, on December 27, there was a heavy fall of rain; in a few hours 1·5 inch fell. At Truro, on December 27, rain fell to the depth of 2·1 inches. In some parts of the county of Cornwall the fall of rain on December 27 exceeded 2 inches; at Penzance more than 2 inches fell. Great damage was done by the consequent floods.

*The mean monthly values* of the several subjects of research for the times of observations are appended to the report of the Registrar-General.

*The monthly mean temperatures* in the counties of Cornwall and Devonshire exceeded those at other places; but there seems to have been a good deal of bad weather in these counties, and more snow, hail and sleet seems to have fallen in these counties than elsewhere.

*The readings of the barometer* till October 4 were between 29·5 inches and 29·7 inches; after October 4 it steadily increased, and passed the point 30 before noon on the 5th, and remained above this point until the 7th; the highest reading was 30·062, and took place at 9<sup>h</sup> A.M. on the 6th. Between

the 8th and the 20th the fluctuations were very frequent, with generally larger decreasing than increasing readings. On the 25th the reading was 29·111, and was the lowest in the month. On the 26th, at 6<sup>h</sup> P.M., it had increased to 29·749, and after this the readings were low, and with slight variation to the end of the month. The extreme difference of the readings during the month was 0·953 inch.

From November 1 to 6 the readings were between 29·6 and 29·4; it then increased from the latter reading to 30·248 on the 10th at midnight. On the 15th the reading was 30·348, which was the highest during the month. On the 18th, at midnight, the reading was 29·417; on the 19th the increase was 0·520 inch, and on the 20th the decrease was 0·454. On the 23rd, at midnight, the reading was 29·048, which was the lowest in the month. On the 25th, at noon, the reading was 29·984; after this the changes were small till the end of the month. The range during the month was 1·300 inch.

On December 1 the reading decreased 0·436, and was 29·284 at midnight; on the 2nd it increased 0·253, and on the 3rd, at 10<sup>h</sup> A.M., it was 29·730; it then decreased rapidly, and the lowest reading during the quarter took place on the 5th at 6<sup>h</sup> A.M.; it increased slowly till the 7th, and then quickly from the 7th to the 10th. The reading was above 30 from the 10th to the 13th; it was between 29·5 and 30 from the 13th to the 18th. On this day, at 6<sup>h</sup> P.M., it was 29·677, and on the 22nd, at midnight, the reading was 30·266, the highest during the month. The reading was generally high till the end of the month. The range during the month was 1·432 inches.

At Stonyhurst, from Nov. 1 to 6, the readings were between 29·098 and 29·355, it then increased to 30·150 at 11 P.M.; on the 12th it remained above 29·8 till November 17, when it decreased suddenly to 29·518, and gradually to 28·923 on the 20th; it increased to 29·110 on November 21, but decreased to 28·624 by 3<sup>h</sup> P.M. on the 22nd; it then increased steadily till November 25 at 9 A.M., when it was 29·615, and the variations afterwards were small.

On December 5, at 9<sup>h</sup> A.M., the reading was 28·421, the wind at the time blowing strongly from the west.

Charles Charnock, Esq., of Stourton Lodge, Leeds, has kindly furnished me with the following agricultural report for the North Riding of Yorkshire.

“The continued rain from the 20th of September to November 1 prevented any large quantity of wheat being sown, even on dry lands; and that which was sown was finished in a very unsatisfactory manner. The comparative dry weather



from November 1 to 12 enabled the farmers to sow a great portion of their wheat. On strong wheat soils a large breadth remains for spring sowing with wheat or oats. The seed time upon an average was nearly a month later than usual, and the seed since has vegetated very slowly, owing to the wetness and coldness of the soil.

"The continued fall of rain in September completely destroyed the crops of corn in the backward situations, and large quantities of barley, oats and beans, in the straw have been carried into the yards for the cattle and pigs, as not worth the expense of thrashing.

"The disease among potatoes has not been found so destructive as was anticipated, and will be more injurious to the grower than to the consumer. In some situations the crops were totally, and in others partially destroyed; yet from the great extra breadth planted with this vegetable last spring, there will perhaps be no great scarcity felt. I was most surprised by seeing field potatoes taken up as late as the 18th of December.

"The crops of corn now thrashing are very deficient both in quantity and quality. Turnips are an indifferent crop, and do not bear much eating; the sheep folded upon them have been prevented from doing well by the wetness of the weather. Symptoms of rot are apparent among many flocks of sheep.

"From the open weather the grass land has been full of meat, and has kept cattle out of the straw yards longer than usual. The disease on the lungs of beasts and milch-cows has been prevalent and exceedingly fatal; the mortality is calculated to have been 95 per cent. of those attacked.

"Within the last few weeks the epidemic prevalent in the years 1839 and 1840 has appeared among lean stock; its symptoms are blisters on the tongue and lameness. It is not often fatal, but reduces the cattle attacked by it very much.

"Employment for agricultural labourers is scarce, and its ill effects are much augmented by the great number of men who have been discharged from the railways, whose intemperate and vicious habits tend greatly to demoralise the agricultural districts.

"Many of the low grounds have been flooded, and farming operations prevented in consequence."

The mean of the numbers in the first column is 29.608 inches, and this value may be considered as that of the pressure of dry air for England during the quarter ending December 31, 1848. The differences between this number and the separate results contained in the first column show the probable sums of the errors of observation and reduction; the latter arising partly

from erroneously assumed altitudes, and partly from the index error of the instruments not having been determined. In most cases the sums of their errors are small.

The mean of the numbers in the second column, for those places situated in Cornwall and Devonshire, is  $47^{\circ}.9$ ; for those places situated south of latitude  $52^{\circ}$ , including Chichester and Hartwell, is  $44^{\circ}.6$ ; for those places situated between the latitudes of  $52^{\circ}$  and  $53^{\circ}$ , including Saffron Walden and Highfield House, is  $44^{\circ}.2$ ; for those places situated between the latitudes of  $53^{\circ}$  and  $54^{\circ}$ , including Liverpool and Whitehaven, is  $43^{\circ}.3$ ; and for Durham and Newcastle is  $43^{\circ}.0$ . These values may be considered as those of the mean temperature of the air for their parallels of latitude during the quarter ending December 31, 1848.

The average daily range of the temperature of the air in Cornwall and Devonshire was  $9^{\circ}.6$ ; at Liverpool and Whitehaven was  $6^{\circ}.9$ ; south of latitude  $52^{\circ}$  was  $11^{\circ}.6$ ; between the latitude of  $52^{\circ}$  and  $54^{\circ}$  was  $9^{\circ}.6$ ; and at Durham and Newcastle was  $8^{\circ}.9$ .

The greatest mean daily ranges of the temperature of the air took place at Greenwich, Hartwell, Latimer Rectory, and Aylesbury respectively; and the least occurred at Whitehaven, Guernsey, Torquay, Liverpool, and Truro respectively.

The highest thermometer readings during the quarter were  $76^{\circ}$  at Hartwell and Leicester,  $74^{\circ}$  at Greenwich and Aylesbury. The lowest thermometer reading was  $20^{\circ}.5$  at Stonyhurst, and readings about  $21^{\circ}$  occurred at several places. The extreme range of temperature of the air during the quarter was therefore about  $55^{\circ}$ .

The average quarterly range of the reading of the thermometers in air in Cornwall and Devonshire was  $37^{\circ}.0$ ; at Liverpool and Whitehaven was  $36^{\circ}.9$ ; and the mean of the numbers at all the remaining places is  $48^{\circ}.7$ .

The mean temperature of the dew-point in Cornwall and Devonshire was  $43^{\circ}.5$ ; at all places south of  $53^{\circ}$  was  $41^{\circ}.6$ ; and it was  $39^{\circ}.6$  at places north of  $53^{\circ}$ .

The great mass of air has passed from the south-west in all places except Exeter and Stonyhurst, at both of which places it seems to have passed from the north.

From the numbers in the tenth column the distribution of clouds has been the same at all places, and such as to have covered somewhat more than three-fifths of the whole sky.

Rain has fallen on the greatest number of days during the quarter at Highfield House, Stonyhurst, Derby, Leeds, Helston and Latimer, and the average number at those places was 63. It fell on the least number of days at Aylesbury,



Names of the places.	Mean pressure of the atmosphere of dry air reduced to the level of the sea.	Mean temperature of the air.	Highest reading of the thermometer.	Lowest reading of the thermometer.	Mean daily range of temperature.	Range of the thermometer.	Mean temperature of the dew-point.	Mean estimated strength 0-6.	Wind. General direction.	Mean amount of cloud 0-10.	Rain. Number of days on which it fell.	Amount collected.	Mean weight of vapour in a cubic foot of air.	Mean additional weight required to saturate a cubic foot of air.	Mean degree of humidity.	Mean whole amount of water in a vertical column of atmosphere.	Mean weight of a cubic foot of air.	Height of station of the barometer above the level of the sea.
Guernsey.....	29.701	51.4	70.5	30.0	7.0	40.0	42.5	1.7	W. & N.	6.6	59	15.7	3.7	0.5	0.868	4.4	537	123
Helston.....	29.592	48.3	65.0	31.0	9.7	34.0	45.3	1.4	S. & S.W.	7.4	61	12.5	3.7	0.5	0.868	4.4	537	106
Falmouth.....	.....	48.7	69.0	30.0	10.7	39.0	.....	0.9	S.W.	7.2	58	13.1	3.3	0.6	0.792	4.0	541	120
Truro.....	.....	47.7	66.0	32.0	8.7	34.0	42.3	.....	S.W.	7.2	53	15.0	3.3	0.6	0.857	4.0	541	140
Torquay.....	.....	48.4	66.0	33.0	7.1	33.0	42.3	.....	n.	5.1	50	9.4	3.4	0.6	0.857	4.0	541	140
Exeter.....	29.736	46.6	69.0	24.2	12.1	44.8	42.9	.....	Variable.	6.5	52	8.9	3.4	0.3	0.935	4.1	543	55
Chichester.....	.....	44.2	67.0	25.0	10.3	42.0	43.6	0.9	Variable.	6.3	56	11.7	3.2	0.3	0.858	3.8	542	265
Southampton.....	29.641	46.2	70.0	27.0	10.7	43.0	41.1	1.2	S.W.	6.9	50	7.3	3.3	0.6	0.881	4.0	540	159
Beckington.....	29.635	43.2	72.0	21.0	11.0	51.0	42.1	.....	S.W. & N.	6.6	41	7.0	3.3	0.5	0.900	3.9	542	107
Royal Observatory, Greenwich	29.653	45.9	74.0	21.8	14.9	52.2	42.1	.....	S.W.	6.5	.....	.....	3.4	0.4	0.933	3.9	540	335
Maidenstone Hill, Greenwich	29.669	45.5	70.0	24.7	9.4	45.3	41.6	.....	S.W.	7.2	60	10.1	3.3	0.2	0.836	3.6	538	280
Lewisham.....	.....	45.4	73.0	21.0	13.0	52.0	42.9	.....	S.W.	6.4	51	6.3	3.2	0.4	0.881	3.6	538	300
Latimer Rectory.....	29.648	43.3	72.5	22.0	13.3	50.5	42.0	1.2	S.	5.5	44	6.3	3.4	0.6	0.910	4.0	539	300
Aylesbury.....	29.629	43.9	74.0	22.0	13.2	52.0	39.1	1.1	S.E.	6.4	52	7.3	3.3	0.3	0.914	4.0	543	70
Stone Observatory.....	29.625	44.0	69.0	23.0	10.1	46.9	39.0	1.2	S.W.	6.3	54	9.4	3.3	0.4	0.851	3.9	543	39
Hartwell House.....	29.672	45.0	76.0	22.0	14.5	54.0	42.3	.....	S.	5.5	44	6.3	3.3	0.4	0.851	3.9	543	156
Saffron Walden.....	.....	44.5	.....	.....	.....	.....	.....	2.8	S.W.	6.4	52	7.3	3.3	0.3	0.914	4.0	543	70
Pool Cottage, Hereford.....	.....	45.8	.....	.....	.....	.....	.....	.....	S.W.	6.4	52	7.3	3.3	0.4	0.851	3.9	543	39
Cardington.....	29.531	44.3	70.0	21.5	10.2	48.5	42.3	.....	S.W.	6.3	59	8.1	3.2	0.3	0.930	3.9	540	39
Norwich.....	29.608	44.7	71.0	26.0	8.8	45.0	41.4	.....	S.W.	6.7	66	7.8	3.1	0.5	0.867	3.7	542	103
Leicester.....	29.711	44.2	76.0	22.0	11.0	54.0	.....	.....	Variable.	7.0	51	7.0	3.1	0.5	0.890	3.6	544	37
Derby.....	29.589	43.6	68.0	23.0	11.0	45.0	42.0	.....	S.W.	6.3	64	8.1	3.2	0.3	0.930	3.9	540	39
Highfield House, Notts.....	29.595	44.6	71.0	22.7	9.0	48.3	40.4	.....	S.W.	6.7	66	7.8	3.1	0.5	0.867	3.7	542	103
Liverpool Observatory.....	29.626	43.5	67.8	29.4	7.3	38.4	39.6	0.9	Variable.	7.0	51	7.0	3.1	0.5	0.890	3.6	544	37
Wakefield.....	29.639	43.0	72.5	19.0	11.7	53.5	39.5	.....	S.W.	7.2	64	14.1	3.0	0.5	0.854	3.6	543	113
Stonyhurst Observatory.....	29.639	43.0	67.1	20.5	11.2	46.6	38.8	1.0	n.	7.2	64	14.1	3.0	0.5	0.860	3.5	534	381
Leeds.....	29.602	42.5	67.5	19.0	10.6	48.5	38.5	1.4	S.W. & N.W.	8.2	63	8.8	3.0	0.5	0.829	3.5	543	148
York.....	.....	41.7	70.0	22.0	9.9	48.0	.....	.....	S.	4.7	77	.....	.....	.....	0.847	3.7	541	50
Whitehaven.....	.....	44.6	62.5	27.0	6.6	35.5	40.6	3.0	S.W.	.....	58	14.1	3.2	0.5	0.847	3.7	541	340
Durham.....	29.634	42.5	69.6	21.4	8.8	48.2	38.2	1.7	W.	6.1	53	7.2	2.9	0.4	0.864	3.4	540	121
Newcastle.....	29.552	43.5	68.0	95.0	11.0	43.0	41.1	.....	S.W.	10	42	10.4	3.2	0.3	0.907	3.8	542	121
Number of columns.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Hereford, Newcastle and Saffron Walden, and the average number at these places was 41. The places at which the largest falls have taken place were Guernsey, Truro, Wakefield, Whitehaven, Falmouth and Helston. The falls were smallest in amount at Saffron Walden, Stone, Hartwell and Liverpool. The average fall in the counties of Cornwall and Devonshire was 12°·3; and at all other places except Southampton, Beckington, Hereford, Stonyhurst and York, was 8°·5.

The numbers in column 13 to 17 show the mean values of the hygrometrical results at every station; from which we find that—

The mean weight of vapour in a cubic foot of air for all places (excepting Cornwall and Devonshire) in the quarter ending December 31, 1848, was 3·2 grains.

The mean additional weight required to saturate a cubic foot of air in the quarter ending December 31, 1848, was 0·49 grain.

The mean degree of humidity (complete saturation = 1) in the quarter ending December 31, 1848, was 0·884.

The mean amount of vapour mixed with the air would have produced water, if all had been precipitated at one time on the surface of the earth to the depth of 3·7 inches.

The mean weight of a cubic foot of air at the level of the sea, under the mean pressure, temperature and humidity, at the mean height of 160 feet, was 541 grains.

And these values for Cornwall and Devonshire were 3·5 grains; 0·6 grain; 0·839; 4·1 inches, and 540 grains respectively.