STONYHURST COLLEGE

OBSERVATORY.

RESULTS

OF

METEOROLOGICAL AND MAGNETICAL OBSERVATIONS,

BY THE

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1884.

MANRESA PRESS, ROEHAMPTON.

1885.

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INTRODUCTION.

THE meteorological work carried on at this Observatory during the last fifteen years has not been much affected by the alterations made at the commencement of 1884 at the Meteorological Office of the Board of Trade. The Thermograph for wet and dry bulb, and the Barograph have continued their photographic records as before, and there has been no interruption in the continuous curves showing the changes in the direction and velocity of the wind, in the amount and hours of rainfall, and in the duration of sunshine. The observations of the upper and lower clouds, of the solar radiations, of the temperature on the grass, and of the amount of evaporation, are also carried on as previously. The chief alteration consists in the form of the Reports sent to the Meteorological Office. Instead of weekly tabulations of all the meteorological data, the only results now sent weekly are the agricultural report and the tabulated sunshine, but every month a meteorological report is forwarded along with the photographic curves from the barograph and thermograph, and tracings of the anemograms and rain curves. The synchronous report for the U.S. Signal Officer passes through the Meteorological Office, and no change has been made in the results previously sent to other persons.

It may be well to mention in connection with the continuous record of the variations of the elements of terrestrial magnetism, and of their absolute monthly and weekly determinations, that a comparison of the Declination Magnetograms of Kew and Stonyhurst is being made at present by Dr. Balfour Stewart, and that it already gives promise of interesting results.

The total of 281 drawings of the solar surface on 257 days, along with 88 complete measures of the chromosphere, shows that even in our climate useful solar work may be done. The solar drawings were exhibited at the Soirée of the Royal Society, and also at the June meeting of the Royal Astronomical, where they raised an important discussion on the respective merits of drawings and photographs, a full report of which appeared in the July number of the *Observatory* and of the *Astronomical Register*. The accuracy of the drawings has been tested by comparisons with all the drawings and photographs that were available, and the result is very encouraging for future work of the same description. Two glass scales for measuring the area of solar spots and faculæ have been made by J. Beck and presented to the Observatory by J. Roberts, Esq. One consists of two sets of parallel lines, one millemetre apart, ruled at right angles to each other. The other is formed of concentric circles, whose radii vary as the sine of the angular distance from the centre of the visible hemisphere, with lines diverging from the centre 5° apart. The effect of foreshortening can thus be rapidly calculated by aid of tables, and the positions determined with sufficient accuracy for most questions of solar physics. The measurement of the drawings is progressing, and the areas are being computed; but the life history of individual

spots, with the study of the fainter markings and of the connection between spots and faculæ, have occupied most attention during the past year. A paper on this subject was read before a meeting of the American Association at Philadelphia, and afterwards appeared in full in the *Astronomical Register*.

The spectra of sun spots have been examined on 30 days, and the widening of 200 lines between B and D accurately measured. A short paper on these results was communicated to the British Association during their meeting at Montreal.

The publication of *Copernicus* having ceased, the results of our daily measures of the chromosphere appear in the *Observatory*. Wolf's comet was carefully followed during the months of October, November, and December, and fourteen positions were completely reduced, and published in the Monthly Notices of the R.A.S., along with our observations of Jupiter's satellites, and of lunar occultations.

An excellent 3¾ inch achromatic has been constructed by Cooke of York, and attached to the tube of the large equatorial, in order to facilitate the work with the star spectroscope.

Stonyhurst Observatory.

Lat. 53° 50′ 40″ N. Long. 9m. 52s. 68. W. Height of the Barometer above the sea, 381 ft.

METEOROLOGICAL REPORT.

January, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·540	29·434
Highest ,, on the 16th	30·212	30·042
Lowest ,, on the 26th	27·803	28·573
Range of Barometer Readings	2·409	1·469
Highest Reading of a Max. Therm. on the 5th	52·4	51·6
Lowest Reading of a Min. Therm. on the 27th	30·2	21·2
Range of Thermometer Readings	22·2	30·4
Mean of all the Highest Readings	46·7	42·2
Mean of all the Lowest	37·6	32·8
Mean Daily Range	9·1	9·4
Deduced Monthly Mean (from Mean of Max. and Min.)	41·9	37·3
Mean Temperature from dry bulb	42·3	37·2
Adopted Mean Temperature	42·1	37·3
Mean Temperature of Evaporation	40·5	36·9
Mean Temperature of Dew Point	38·6	33·9
Mean elastic force of Vapour	0·234 in	0·202 in
Mean weight of Vapour in a cubic foot of air	2·7gr	2·3gr
Mean additional weight required for saturation	0·4gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·84	0·86
Mean weight of a cubic foot of air	545·8gr	549·0gr
Fall of Rain	7·516 in	4·260 in
Number of days on which Rain fell	27	20·2
Amount of Evaporation	1·280 in	0·938 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	3	1	0	1	5	19	2
Mean Velocity in miles per hour	0	6·3	10·3	0	6·2	17·8	17·7	11·9
Total No. of miles for each Direction	0	451	248	0	148	2138	8064	569

The total number of miles registered during the month was 11618.

The max. Velocity of the wind was 55 miles per hour; direction S. on the 23rd at 7 and 8 p.m., and on the 26th at 4 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)			9·1
In the month of January, the highest reading of the Barometer during 37 years, was on the 18th, in 1882, and was			30·480
The lowest	,,	26th, 1884	27·803
The highest Temperature	,,	7th, 1877	59·9
The lowest	,,	15th, 1881	4·6
The highest adopted mean temperature of the month,		1875	42·5
The lowest	,,	1881	29·2

The mean reading of the Barometer differed little from the average, but the range was great; the reading on the 26th was the lowest ever recorded in the month of January. The mean temperature was high, and the range of Thermometer readings small. The Rainfall was more than three inches above the average, and the number of rainy days was large. A remarkable hail-storm occurred at 0.30 p.m. on the 11th. The prevailing wind was from W.

February, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·412	29·484
Highest ,, on the 2nd	29·950	30·056
Lowest ,, on the 9th	28·704	28·654
Range of Barometer Readings	1·246	1·402
Highest Reading of a Max. Therm. on the 14th	52·0	51·8
Lowest Reading of a Min. Therm. on the 2nd	22·9	23·1
Range of Thermometer Readings	29·1	28·7
Mean of all the Highest Readings	45·8	44·2
Mean of all the Lowest	34·1	34·1
Mean Daily Range	11·7	10·1
Deduced Monthly Mean (from Mean of Max. and Min.)	39·6	38·8
Mean Temperature from dry bulb	39·9	38·8
Adopted Mean Temperature	39·8	38·8
Mean Temperature of Evaporation	38·2	37·0
Mean Temperature of Dew Point	36·2	35·0
Mean elastic force of Vapour	0·213 in	0·193 in
Mean weight of Vapour in a cubic foot of air	2·6 gr	2·4gr
Mean additional weight required for saturation	0·4 gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·87	0·87
Mean weight of a cubic foot of air	545·9 gr	548·2gr
Fall of Rain	3·899 in	3·741 in
Number of days on which Rain fell	20	18·2
Amount of Evaporation	1·699 in	0·984 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	0	3	6	1	8	5	6	0
Mean Velocity in miles per hour	0	9·6	14·5	2·2	17·8	16·7	12·2	0
Total No. of miles for each Direction	0	693	2093	53	3418	2001	1754	0

The total number of miles registered during the month was 8012.
The max. Velocity of the wind was 35 miles per hour; direction S. by E. on the 21st at 2 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·3
In the month of February, the highest reading of the Barometer during 37 years, was on the 11th, in 1849, and was			30·452
The lowest	,,	6th, 1867	28·208
The highest Temperature	,,	8th, 1877	58·3
The lowest	,,	1st, 1855	10·1
The highest adopted mean temperature of the month, 1869			44·0
The lowest	,,	1855	28·6

Both Barometer and thermometer readings agreed closely with the mean. The rainfall was also very near the average amount. The amount of evaporation was rather large. The prevailing wind was from S.

March, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·455	29·468
Highest ,, on the 27th	29·830	30·075
Lowest ,, on the 10th	28·744	28·698
Range of Barometer Readings	1·086	1·377
Highest Reading of a Max. Therm. on the 18th	67·5	56·8
Lowest Reading of a Min. Therm. on the 25th	28·1	23·3
Range of Thermometer Readings	39·4	33·5
Mean of all the Highest Readings	50·0	47·1
Mean of all the Lowest	35·6	34·5
Mean Daily Range	14·4	12·6
Deduced Monthly Mean (from Mean of Max. and Min.)	41·8	39·8
Mean Temperature from dry bulb	42·6	40·1
Adopted Mean Temperature	42·2	40·0
Mean Temperature of Evaporation	40·1	38·2
Mean Temperature of Dew Point	37·5	35·6
Mean elastic force of Vapour	0·245 in	0·208 in
Mean weight of Vapour in a cubic foot of air	2·6gr	2·5gr
Mean additional weight required for saturation	0·3gr	0·5gr
Mean degree of Humidity (saturation 1·00)	0·85	0·85
Mean weight of a cubic foot of air	544·1gr	546·4gr
Fall of Rain	2·743 in	3·126 in
Number of days on which Rain fell	16	17·8
Amount of Evaporation	1·543 in	1·728 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	7	1	3	10	4	6	0
Mean Velocity in miles per hour	0	4·2	7·1	7·9	11·3	10·2	14·2	0
Total No. of miles for each Direction	0	703	170	572	2722	982	2050	0

The total number of miles registered during the month was 7199.
The max. Velocity of the wind was 46 miles per hour, direction W. by S. on the 20th at noon.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·2
In the month of March, the highest reading of the Barometer during 37 years, was on the 6th, in 1852, and was			30·401
The lowest	,,	,, 31st, 1860	28·199
The highest Temperature	,,	25th, 1871	68·0
The lowest	,,	,, 4th, 1866	14·5
The highest adopted mean temperature of the month, 1871			44·0
The lowest	,,	,, 1855	35·6

The range of Barometer readings was small. The mean Temperature was rather high, and the range of Thermometer readings large. Rainfall below average. Prevailing Wind from S.S.W.

April, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·437	29·480
Highest ,, on the 13th	29·783	29·965
Lowest ,, on the 5th	28·828	28·773
Range of Barometer Readings	0·955	1·192
Highest Reading of a Max. Therm. on the 3rd	68·8	66·4
Lowest Reading of a Min. Therm. on the 10th & 15th	28·0	28·8
Range of Thermometer Readings	40·8	37·6
Mean of all the Highest Readings	54·7	54·1
Mean of all the Lowest	35·5	38·1
Mean Daily Range	19·2	16·0
Deduced Monthly Mean (from Mean of Max. and Min.)	43·6	44·7
Mean Temperature from dry bulb	44·6	44·7
Adopted Mean Temperature	44·1	44·7
Mean Temperature of Evaporation	41·3	41·9
Mean Temperature of Dew Point	38·0	38·7
Mean elastic force of Vapour	0·229 in	0·236 in
Mean weight of Vapour in a cubic foot of air	2·7 gr	2·7 gr
Mean additional weight required for saturation	0·8 gr	0·7 gr
Mean degree of Humidity (saturation 1·00)	0·79	0·80
Mean weight of a cubic foot of air	541·6 gr	541·6 gr
Fall of Rain	1·009 in	2·337 in
Number of days on which Rain fell	16	14·9
Amount of Evaporation	1·544 in	2·475 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	16	5	3	2	0	2	1
Mean Velocity in miles per hour	1·3	6·1	5·1	11·5	17·3	0	7·1	2·1
Total No. of miles for each Direction	31	2360	609	829	828	0	339	51

The total number of miles registered during the month was 5047.

The max. Velocity of the wind was 36 miles per hour, direction S.E., on the 1st at 4 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·8
In the month of April, the highest reading of the Barometer during 37 years, was on the	22nd,	in 1855, and was	30·191
The lowest ,,	,,	20th, 1868	28·358
The highest Temperature ,,		14th, 1852	74·1
The lowest ,,	,,	12th, 1862	24·7
The highest adopted mean temperature of the month,		1865	48·5
The lowest ,,	,,	1879	40·7

Although the readings of the Barometer and Thermometer agreed very closely with the average for the month, the rainfall was an inch below the mean. The prevailing wind was N.E.

At a few minutes to 11 a.m. on the morning of the 26th, the sky in the W.S.W. was noticed to be rapidly getting dark. At 11.30 the darkness had become so great that it was found impossible to read bold print close by the window. At this time, a dense black cloud, with a slightly yellowish tinge, hung over the S.W. sky; the blackness being most intense at about 10° above the horizon. At 11.35 it became somewhat lighter, and at 11.40 rain began to fall. In forty minutes 0·114 in. of rain was collected in our gauges. This rain was almost as black as ink, and full of fine carbon in suspension. Hail that fell at the distance of one mile to S.W. by S., and both hail and snow that fell on the hills two miles to the West were also quite black. At Preston, 14 miles S.W., the darkness was very marked, but at 5½ miles N.E. nothing very particular was noticed.

May, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·535	29·507
Highest ,, on the 22nd	30·022	29·964
Lowest ,, on the 3rd	28·698	28·938
Range of Barometer Readings	1·324	1·026
Highest Reading of a Max. Therm. on the 11th	77·9	72·0
Lowest Reading of a Min. Therm. on the 6th	32·0	31·5
Range of Thermometer Readings	45·9	40·5
Mean of all the Highest Readings	61·1	59·8
Mean of all the Lowest	40·5	42·3
Mean Daily Range	20·6	17·5
Deduced Monthly Mean (from Mean of Max. and Min.)	49·1	49·4
Mean Temperature from dry bulb	49·8	49·6
Adopted Mean Temperature	49·5	49·6
Mean Temperature of Evaporation	46·5	46·3
Mean Temperature of Dew Point	43·3	42·8
Mean elastic force of Vapour	0·281 in	0·276 in
Mean weight of Vapour in a cubic foot of air	3·2gr	3·2gr
Mean additional weight required for saturation	0·9gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·82	0·76
Mean weight of a cubic foot of air	537·3gr	536·9gr
Fall of Rain	2·318 in	2·536 in
Number of days on which Rain fell	13	14·9
Amount of Evaporation	3·818 in	3·562 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	7	2	0	3	4	15	0
Mean Velocity in miles per hour	0	8·1	8·7	0	12·0	13·6	13·0	0
Total No. of miles for each Direction	0	1357	415	0	864	1307	4712	0

The total number of miles registered during the month was 8655.
The max. Velocity of the wind was 35 miles per hour, direction W. by S. on the 4th at 3 a.m., W. on the 4th at 4 a.m., and S. on the 11th at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			·6·1
In the month of May, the highest reading of the Barometer during 37 years, was on the 22nd, in 1855, and was			30·124
The lowest	,,	,, 28th, 1877	28·559
The highest Temperature	,,	19th, 1864	82·5
The lowest	,,	,, 4th, 1855	23·5
The highest adopted mean temperature of the month, 1848			55·1
The lowest	,,	,, 1855	45·0

The mean Barometer and Thermometer agreed closely with that of previous years. The range of Barometer readings was rather large. The Rainfall was slightly below the average. Prevailing Wind West.

June, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·635	29·523
Highest ,, on the 14th	29·933	29·873
Lowest ,, on the 2nd	29·192	29·011
Range of Barometer Readings	0·741	0·862
Highest Reading of a Max. Therm. on the 28th	80·0	76·7
Lowest Reading of a Min. Therm. on the 7th	39·0	39·2
Range of Thermometer Readings	41·0	37·5
Mean of all the Highest Readings	66·9	65·2
Mean of all the Lowest	45·4	48·0
Mean Daily Range	21·5	17·2
Deduced Monthly Mean (from Mean of Max. and Min.)	54·4	54·8
Mean Temperature from dry bulb	54·9	54·7
Adopted Mean Temperature	54·7	54·8
Mean Temperature of Evaporation	50·7	52·0
Mean Temperature of Dew Point	46·8	48·7
Mean elastic force of Vapour	0·321 in	0·356 in
Mean weight of Vapour in a cubic foot of air	3·6gr	3·9gr
Mean additional weight required for saturation	1·3gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·74	0·79
Mean weight of a cubic foot of air	533·5gr	544·5gr
Fall of Rain	1·123 in	3·776 in
Number of Days on which Rain fell	8	17·1
Amount of Evaporation	2·623 in	3·677 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	2	6	1	1	0	1	12	7
Mean Velocity in miles per hour	5·7	4·3	8·8	8·4	0	6·1	6·7	6·6
Total No. of miles for each Direction	273	626	210	202	0	147	1942	1107

The total number of miles registered during the month was 4507.

The max. Velocity of the wind was 25 miles per hour, direction W. by S. on the 24th at 9 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	7·4
In the month of June, the highest reading of the Barometer during 37 years, was on the 15th, in 1874, and was	30·219
The lowest ,, ,, 12th, 1862	28·632
The highest Temperature ,, 27th, 1878	87·2
The lowest ,, ,, 30th, 1856	34·2
The highest adopted mean temperature of the month, 1858	59·0
The lowest ,, ,, 1856 and 1860	52·2

Barometer readings were rather high, and therange low. . The Mean Temperature was very close to that of previous years, but the range was great. The Rainfall was more than 2½ inches below the average for the month. Prevailing wind West.

July, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·493	29·501
Highest ,, on the 30th	29·776	29·872
Lowest ,, on the 16th	29·133	28·999
Range of Barometer Readings	0·643	0·873
Highest Reading of a Max. Therm. on the 3rd	81·0	79·0
Lowest Reading of a Min. Therm. on the 19th	40·0	42·4
Range of Thermometer Readings	41·0	36·6
Mean of all the Highest Readings	68·8	67·9
Mean of all the Lowest	50·8	51·0
Mean Daily Range	18·0	16·9
Deduced Monthly Mean (from Mean of Max. and Min.)	57·9	57·6
Mean Temperature from dry bulb	59·6	58·0
Adopted Mean Temperature	58·8	57·8
Mean Temperature of Evaporation	54·8	55·0
Mean Temperature of Dew Point	51·2	52·5
Mean elastic force of Vapour	0·377 in	0·395 in
Mean weight of Vapour in a cubic foot of air	4·3gr	4·5gr
Mean additional weight required for saturation	1·3gr	1.0gr
Mean degree of Humidity (saturation 1·00)	0·76	0·82
Mean weight of a cubic foot of air	526·3gr	527·1gr
Fall of Rain	5·197 in	4·285 in
Number of days on which Rain fell	25	18·1
Amount of Evaporation	3·897 in	4·044 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	0	2	0	1	3	14	10 *	1
Mean Velocity in miles per hour	0	4·3	0	4·7	6·9	7·4	7·2	2·3
Total No. of miles for each Direction	0	206	0	113	498	2480	1734	55

The total number of miles registered during the month was 5086.

The max. Velocity of the wind was 29 miles per hour, direction S. by W., on the 14th at 10 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	8·0
In the month of July, the highest reading of the Barometer during 37 years, was on the 24th, in 1868, and was	30·112
The lowest ,, ,, 15th, 1877	28·564
The highest Temperature ,, 22nd, 1873	88·2
The lowest ,, ,, 1st, 1857	36·0
The highest adopted mean temperature of the month, 1852	63·0
The lowest ,, ,, ,, 1879	54·7

The range of Barometer readings was small. Both the mean Temperature and the range were high. The Rainfall was nearly an inch in excess of the mean of previous years, and the number of rainy days was large. Wind S.W. by W.

August, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·570	29·487
Highest ,, on the 4th	29·861	29·889
Lowest ,, on the 28th	29·154	28·955
Range of Barometer Readings	0·707	0·934
Highest Reading of a Max. Therm. on the 11th	84·0	77·3
Lowest Reading of a Min. Therm. on the 20th	43·0	41·8
Range of Thermometer Readings	41·0	35·5
Mean of all the Highest Readings	73·5	67·6
Mean of all the Lowest	51·8	50·9
Mean Daily Range	21·7	16·7
Deduced Monthly Mean (from Mean of Max. and Min.)	61·0	57·6
Mean Temperature from dry bulb	60·9	57·6
Adopted Mean Temperature	61·0	57·6
Mean Temperature of Evaporation	57·1	54·8
Mean Temperature of Dew Point	53·7	52·1
Mean elastic force of Vapour	0·413 in	0·393 in
Mean weight of Vapour in a cubic foot of air	4·6gr	4·3gr
Mean additional weight required for saturation	1·4gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·77	0·83
Mean weight of a cubic foot of air	525·3gr	527·1 gr
Fall of Rain	2·649 in	4·853 in
Number of days on which Rain fell	14	19·1
Amount of Evaporation	1·392 in	3·032 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	2	5	0	2	1	3	16	2
Mean Velocity in miles per hour	3·4	5·8	0	4·8	7·2	4·3	5·6	7·2
Total No. of miles for each Direction	164	692	0	232	173	313	2141	345

The total number of miles registered during the month was 4060.

The max. Velocity of the wind was 25 miles per hour; direction S. by W. on the 24th, at 3 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	5·6
In the month of August, the highest reading of the Barometer during 37 years, was on the 21st, in 1874, and was	30·114
The lowest ,, ,, 31st, 1876	28·555
The highest Temperature ,, 2nd, 1868	88·0
The lowest ,, ,, 21st, 1864 & 1869	36·0
The highest adopted mean temperature of the month, 1857 & 1884	61·0
The lowest ,, ,, 1848	52·5

The Mean Barometer was rather high, and the range small. Mean Temperature very high, and range large. The Rainfall was 2 inches below the average. Prevailing wind West.

September, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·558	29·504
Highest ,, on the 12th & 18th	30·031	30·027
Lowest ,, on the 6th	28·802	28·827
Range of Barometer Readings	1·229	1·200
Highest Reading of a Max. Therm. on the 17th	73·9	72·1
Lowest Reading of a Min. Therm. on the 3rd	36·1	36·9
Range of Thermometer Readings	37·8	35·2
Mean of all the Highest Readings	66·5	62·3
Mean of all the Lowest	48·0	47·1
Mean Daily Range	17·6	15·2
Deduced Monthly Mean (from Mean of Max. and Min.)	55·5	53·4
Mean Temperature from dry bulb	56·6	54·1
Adopted Mean Temperature	55·8	53·8
Mean Temperature of Evaporation	52·8	51·1
Mean Temperature of Dew Point	50·7	48·6
Mean elastic force of Vapour	0·363 in	0·343 in
Mean weight of Vapour in a cubic foot of air	4·0gr	3·9gr
Mean additional weight required for saturation	1·1gr	0·8gr
Mean degree of Humidity (saturation 1·00)	0·82	0·82
Mean weight of a cubic foot of air	537·9gr	532·1gr
Fall of Rain	3·749 in	4·546 in
Number of days on which Rain fell	15	18·4
Amount of Evaporation	1·392 in	2·290 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	7	2	0	1	8	10	2
Mean Velocity in miles per hour	0	7·5	3·2	0	9·1	9·4	9·4	9·3
Total No. of miles for each Direction	0	1256	154	0	219	1805	2252	447

The total number of miles registered during the month was 6133.

The max. Velocity of the wind was 35 miles per hour, direction W. by S. on the 27th at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			6·5
In the month of September, the highest reading of the Barometer during 37 years, was on the 15th, in 1851, and was			30·274
The lowest	,,	,, 2nd, 1883	28·323
The highest Temperature		,, 6th, 1868	85·0
The lowest	,,	,, 6th, 1855	30·7
The highest adopted mean temperature of the month, 1865			59·1
The lowest	,,	,, 1863	50·9

The Thermometer readings were rather high, and the range was also high. Rainfall low. Wind from W.S.W.

October, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·629	29·422
Highest ,, on the 5th	30·306	30·006
Lowest ,, on the 18th	28·930	28·651
Range of Barometer Readings	1·376	1·355
Highest Reading of a Max. Therm. on the 1st	62·0	64·4
Lowest Reading of a Min. Therm. on the 10th	29·9	29·6
Range of Thermometer Readings	32·1	34·8
Mean of all the Highest Readings	54·8	54·7
Mean of all the Lowest	41·7	42·1
Mean Daily Range	13·1	12·6
Deduced Monthly Mean (from Mean of Max. and Min.)	47·3	47·4
Mean Temperature from dry bulb	47·8	48·0
Adopted Mean Temperature	47·6	47·7
Mean Temperature of Evaporation	45·0	45·5
Mean Temperature of Dew Point	42·1	43·1
Mean elastic force of Vapour	0·268 in	0·280 in
Mean weight of Vapour in a cubic foot of air	3·1 gr	3·1 gr
Mean additional weight required for saturation	0·5 gr	0·6 gr
Mean degree of Humidity (saturation 1·00)	0·82	0·85
Mean weight of a cubic foot of air	541·2 gr	543·2 gr
Fall of Rain	3·971 in	5·206 in
Number of days on which Rain fell	16	21·4
Amount of Evaporation	2·495 in	1·769 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	4	0	1	1	4	15	5
Mean Velocity in miles per hour	3·1	4·3	0	6·7	6·3	11·2	13·5	12·2
Total No. of miles for each Direction	74	414	0	160	151	1073	4877	1660

The total number of miles registered during the month was 8409.

The max. Velocity of the wind was 49 miles per hour; direction W. on the 26th at 11 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...				8·1
In the month of October, the highest reading of the Barometer during 37 years, was on the	5th,	in	1884, and was	30·306
The lowest ,,	,,		19th, 1862	28·139
The highest Temperature ,,	,,		9th, 1869	72·8
The lowest ,,	,,		21st, 1880	23·1
The highest adopted mean temperature of the month, 1861 and 1876				51·6
The lowest ,,	,,		1880	43·1

The Barometer was high, with range close to average. Rainfall more than an inch below average. Prevailing wind West.

November, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·718	29·451
Highest ,, on the 19th	30·195	30·049
Lowest ,, on the 4th	29·058	28·586
Range of Barometer Readings	1·137	1·463
Highest Reading of a Max. Therm. on the 1st	60·0	55·6
Lowest Reading of a Min. Therm. on the 19th	21·9	25·3
Range of Thermometer Readings	38·1	30·3
Mean of all the Highest Readings	47·5	46·9
Mean of all the Lowest	33·6	36·0
Mean Daily Range	13·9	10·9
Deduced Monthly Mean (from Mean of Max. and Min.)	40·6	41·5
Mean Temperature from dry bulb	40·8	41·2
Adopted Mean Temperature	40·7	41·4
Mean Temperature of Evaporation	38·7	38·9
Mean Temperature of Dew Point	36·2	37·6
Mean elastic force of Vapour	0·213 in	0·225 in
Mean weight of Vapour in a cubic foot of air	2·4gr	2·6gr
Mean additional weight required for saturation	0·5gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·85	0·87
Mean weight of a cubic foot of air	550·8gr	545·0gr
Fall of Rain	1·491 in	4·164 in
Number of days on which Rain fell	13	19·2
Amount of Evaporation	1·130 in	1·459 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	6	5	0	3	4	5	3	4
Mean Velocity in miles per hour	7·7	3·6	0	5·3	12·2	12·8	15·2	13·1
Total No. of miles for each Direction	1103	437	0	385	1175	1530	1095	1259

The total number of miles registered during the month was 6984.

The max. Velocity of the wind was 40 miles per hour; direction S. on the 4th at 8 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·7
In the month of November, the highest reading of the Barometer during 37 years, was on the 12th, in 1857, and was			30·350
The lowest	,,	,, 1st, 1859	28·007
The highest Temperature	,,	6th, 1872	61·9
The lowest	,,	,, 17th, 1861	19·1
The highest adopted mean temperature of the month, 1881.....			47·0
The lowest	,,	,, 1851.....	36·7

Barometer readings were high, and the range low. The range of thermometer readings was very large. The Rainfall was very small, being more than 2½ inches below the usual amount for the month. Prevailing wind S.W. by S.

December, 1884.

Results of Observations taken during the month.		Mean for the last 37 years.
Mean Reading of the Barometer	29·385	29·446
Highest ,, on the 22nd	29·960	30·054
Lowest ,, on the 4th	28·590	28·603
Range of Barometer Readings	1·370	1·451
Highest Reading of a Max. Therm. on the 5th and 6th	50·0	53·0
Lowest Reading of a Min. Therm. on the 24th	26·0	20·6
Range of Thermometer Readings	24·0	32·4
Mean of all the Highest Readings	43·4	42·9
Mean of all the Lowest	33·0	33·4
Mean Daily Range	10·4	9·5
Deduced Monthly Mean (from Mean of Max. and Min.)	38·4	38·2
Mean Temperature from dry bulb	38·6	38·8
Adopted Mean Temperature	38·5	38·5
Mean Temperature of Evaporation	36·7	37·3
Mean Temperature of Dew Point	34·2	35·3
Mean elastic force of Vapour	0·198 in	0·208 in
Mean weight of Vapour in a cubic foot of air	2·3 gr	2·4 gr
Mean additional weight required for saturation	0·5 gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·85	0·87
Mean weight of a cubic foot of air	548·9 gr	547·7 gr
Fall of Rain	6·400 in	5·565 in
Number of days on which Rain fell	19	20·5
Amount of Evaporation	1·013 in	1·017 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	5	3	1	0	5	13	3
Mean Velocity in miles per hour	8·0	4·2	6·1	6·4	0	17·3	16·8	9·9
Total No. of miles for each Direction	191	509	440	154	0	2074	5242	715

The total number of miles registered during the month was 9321.

The max. Velocity of the wind was 35 miles per hour; direction W. at 10 a.m. on the 19th.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·7
In the month of December, the highest reading of the Barometer during 37 years, was on the 22nd, in 1849, and was			30·378
The lowest	,,	,, 5th, 1876	28·028
The highest Temperature	,,	,, 9th, 1876	58·1
The lowest	,,	,, 24th, 1860	6·7
The highest adopted mean temperature of the month, 1857			44·6
The lowest	,,	,, 1878	30·3

Barometer readings were slightly below average. Temperature very close to mean for the 37 years. Rainfall was rather great, but the number of rainy days a little below the mean. Prevailing wind W.S.W.

Summary of the Observations

FOR 1884.

		Mean for the last 37 years.
Mean Reading of the Barometer	29·531	29·482
Highest ,, on October 5th	30·306	30·289
Lowest ,, on January 26th	27·803	28·260
Range of Barometer Readings	2·503	2·029
Highest Reading of a Max. Therm. on August 11th	84·0	81·6
Lowest Reading of a Min. Therm. on Nov. 19 and 29	21·9	15·8
Range of Thermometer Readings	62·1	65·8
Mean of all the Highest Readings	56·6	54·8
Mean of all the Lowest	40·6	40·9
Mean Daily Range	16·0	13·9
Deduced Yearly Mean (from Mean of Max. and Min.)	47·6	46·7
Mean Temperature of dry bulb	48·2	46·9
Adopted Mean Temperature	47·9	46·8
Mean Temperature of Evaporation	45·2	44·6
Mean Temperature of Dew Point	42·4	42·1
Mean elastic force of Vapour	0·279 in	0·276 in
Mean weight of Vapour in a cubic foot of air	3·2gr	3·3gr
Mean additional weight required for saturation	0·8gr	0·7gr
Mean degree of Humidity (saturation 1·00)	0·82	0·84
Mean weight of a cubic foot of air	539·8gr	539·1gr
Total Fall of Rain in the Year	42·265 in	47·734 in
Number of days per Month on which Rain fell	16·8	18·4
Amount of Evaporation	23·807 in	27·832 in

The Maximum monthly mean height of the Barometer was in January, 1880, and was ..... 29·928

The Minimum ,, ,, in December 1868, and was ... 28·984

The Maximum yearly mean height of the Barometer was in 1858, and was ..... 29·544

The Minimum ,, ,, ,, ,, in 1866, and was ... 29·389

The greatest monthly range of the Barometer was in January, 1884, and was		2·409
The least ,, ,,	in July, 1852, and was	0·505
The highest reading of the Barometer, during 37 years, was on January 18th, 1882, and was		30·480
The lowest ,, ,,	on January 26th, 1884, and was	27·803
Extreme range		2·677
The highest temperature was on July 15th, 1868, and was		88·2
The lowest ,, ,,	January 15th, 1881	4.6
The highest adopted mean temperature of a month, July 1868		62·4
The lowest ,, ,,	February, 1855	28·6
The highest adopted mean temperature of a year, 1868		49·1
The lowest ,, ,, ,, ,,	1879	44·1
The greatest monthly mean weight of vapour, in a cubic foot of air	July, 1852	5·1
The least ,, ,, ,,	February, 1855	1·4
The greatest fall of rain in a month, was in October, 1870, and was		13·437 in
The least ,, ,, ,,	March, 1852	0·047
The greatest number of days on which rain fell in one month	July, 1861, December, 1868	31
The least ,, ,,	March, 1852	3

RAINFALL.

	1884.	Mean of 37 years.	Excess in 1884.
January	7·516	4·260	+3·256
February	3·899	3·741	+0·158
March	2·743	3·126	−0·383
April	1·009	2·337	−1·328
May.....	2·318	2·536	−0·118
June.....	1·123	3·776	−2·653
July	5·197	4·285	+0·912
August	2·649	4·853	−2·204
September	3·749	4·546	−0·797
October	3·917	5·206	−1·235
November	1·491	4·164	−2·673
December	6·400	5·565	+0·835
Means.	42·265	47·734	−5·469

The deficiency of the Rainfall in 1884 is due mainly to the smallness of the supply during the Autumn months: the fall in Spring was also considerably below the average.

DATES OF OCCASIONAL PHENOMENA.

1884.	Frost.	Hoar frost only.	Snow.	Hail.
January	1, 2, 11, 23, 25, 26, 27, 28, 31		25, 26	23, 24, 25, 26, 27
February	1—3, 9—11, 16, 18, 20, 22, 24, 25, 26—29		3, 10, 11	21
March	1—4, 8—11, 21—25, 37, 30, 31	11, 12	1, 3, 10	10, 20
April	7, 9, 10, 12, 15, 16, 17, 19—26, 28—30	18	26	26
May	5, 6, 18, 19, 20, 21, 31			1, 3, 4
June				
July				
August				
September				
October	1, 4, 8, 9, 10, 12, 14, 24, 28	11	10	26
November	2, 3, 7, 9—25, 28, 29, 30	9, 20, 21, 22, 23, 25, 28, 29	25, 30	7
December	1, 3, 8, 9, 11, 12, 14—17, 19—31			

1884.	Heavy Rain.	Fog.	Thunder.	Lightning.	Lunar Halo.	Solar Halo.
January	22	16	26	20, 21, 26		
February			10, 21	21, 25		23
March		24		20	3, 6, 8, 9	7, 9, 10, 24, 25
April			2, 3	14		6
May						5
June			7			6
July	6, 8, 9, 13		3, 4, 6, 8, 9, 11, 12, 13, 18, 23	3, 4, 8, 9, 11, 12, 13, 18, 23, 24		
August	10		9	8, 10, 11, 12		
September	2, 21		2, 21	2, 21		
October	26, 27				29	
November				21	2	
December	7		19	4, 19		

SUN OBSERVATIONS AT STONYHURST IN 1884.

	Sunshine recorded on	Amount of Sunshine recorded.	Drawings of Sun, 10½ inch to diameter on	Other drawings of Sun and Solar notes on	Entire Chromosphere measured on	Chromosphere partially measured on	Spot spectra observed on
January	10 days	17·7 hours	11 days	1 days	1 days	1 days	1 days
February	19 ,,	43·8 ,,	17 ,,	3 ,,	5 ,,	1 ,,	2 ,,
March	22 ,,	74·6 ,,	22 ,,	6 ,,	2 ,,	2 ,,	1 ,,
April	28 ,,	130·1 ,,	24 ,,	6 ,,	7 ,,	...	4 ,,
May	30 ,,	213·6 ,,	27 ,,	2 ,,	13 ,,	...	12 ,,
June	28 ,,	176·5 ,,	24 ,,	3 ,,	14 ,,	...	5 ,,
July	26 ,,	138·7 ,,	22 ,,	5 ,,	4 ,,	...	2 ,,
August	29 ,,	191·7 ,,	24 ,,	6 ,,	13 ,,	...	3 ,,
September	28 ,,	139·6 ,,	27 ,,	3 ,,	9 ,,	...	4 ,,
October	23 ,,	78·7 ,,	21 ,,	...	6 ,,	...	1 ,,
November	22 ,,	60·5 ,,	24 ,,	...	7 ,,	...	1 ,,
December	10 ,,	20·8 ,,	14 ,,	...	7 ,,	1 ,,	...

N.B.—Satisfactory sketches of the solar surface can sometimes be made when the heat is not strong enough to char the card of the sunshine recorder.

TOTAL AMOUNT OF SUNSHINE RECORDED ON EACH DAY.

MONTH.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
January	0	0	0	0	0	0	0	0	0	0	1·6	3·1	0	0	0·1	0	0
February.....	0	5·7	1·5	0	0·4	3·5	0	0	0	0	0·7	0·6	0	5·1	4·7	0·1	0
March	0	4·9	0	0	0	1·3	1·2	4·1	2·5	5·7	3·5	4·3	0	0·3	2·8	6·7	4·0
April	0	0	3·4	8·6	8·8	5·3	1·6	6·4	9·5	5·9	9·7	6·0	3·8	1·0	1·7	2·2	8·8
May.....	0·3	1·1	4·8	6·0	6·2	11·0	0·8	1·4	0·7	5·3	12·7	4·4	7·3	5·6	0	2·1	6·0
June.....	6·8	1.4	5·0	10·2	0	7·7	2·3	0	0·8	9·9	0·9	14·6	13·8	13·6	6·9	4·6	0·5
July	6·0	11·2	5·3	3·8	1·3	5·6	0·1	4·0	0	0·3	7·9	8·6	4·8	9·6	3·6	7·8	5·2
August.....	9·5	2·2	1·7	3·7	10·8	9·9	8·8	11·2	7·3	7·0	7·4	0·1	5·3	6·2	6·1	7·1	10·4
September	4·7	8·4	4·4	7·5	10·5	1·3	5·5	2·0	0	1·2	6·0	9·9	5·8	7·5	4·1	5·2	1·8
October	7.2	2·6	4·5	6·2	8·6	1·6	5·2	0	5·4	2·8	3·2	4·4	2·2	0·7	0	0	0
November	4·3	0	5·5	0·5	3·7	0	1·3	0·5	2·0	2·2	3·7	0	4·7	0·9	0	0	0·3
December	0	0	0	0	0·9	1·6	0	0	0·6	0	0	0	0	0	0·8	0	0

TOTAL AMOUNT OF SUNSHINE RECORDED ON EACH DAY.

(*Continued.*)

MONTH.	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Monthly Total.	Approximate per centage each Month.
January	0	0	1·5	3·8	0	0·4	3·4	0	0	1·2	1·5	1·1	0	0	17·7	9·5
February.....	0·2	0	1·6	3·3	3·8	0·3	3·3	1·4	4·9	1·0	1·7	0	0	0	43·8	18·9
March	2·2	3·7	4·3	7·8	1·9	3·0	4·0	3·4	0	0	1·0	0	0	2·0	74·6	24·1
April	2·0	3·8	6·5	3·5	5·8	2·6	6·8	3·7	0·6	2·7	3.2	1·0	5·2	0	130·1	36·1
May.....	13·3	12·5	12·6	9·5	12·9	12·4	12·5	11·9	10·3	13·2	6·4	3·7	4·5	2·2	213·6	49·2
June.....	4·2	3·6	1·9	9·8	0·8	8·6	0·4	8·5	5·0	11·1	13·9	2·8	6·9	0	176·5	17·0
July	8·7	13·0	13·2	0·1	0·4	3·2	5·3	7·5	0	0·6	1·6	0	0	0	138·7	38·6
August	7·7	3·7	8·6	3·2	10.5	9·1	11·1	9·0	0·1	0	6·2	5·8	2·0	0	191·7	47·6
September	8·8	3·5	7·2	3·4	4·2	2·0	2·7	6·1	0	4·8	0·4	6·6	4·1	0	139·6	44·3
October	0	2·9	0	0	0·5	2·6	0·2	0	3.1	1·1	3·8	3·9	0·3	5·7	78·7	28·3
November	2·2	0·6	2·7	1·4	5·0	6·0	4·3	0	2·2	0	1·3	5·2	0	0	60·5	28·8
December	0	0	3·0	5·2	3·8.	0	0	2·7	1·8	0	0·4	0	0	0	20·8	11·2

MONTHLY TABLES FOR EACH HOUR OF RECORDED SUNSHINE.

Local apparent time.	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9
January	0	0	0	0	0	0·9	2·4	4·2	4·9	3·9	1·4	0	0	0	0	0	0
February	0	0	0	0	1·7	5·7	6·6	7·4	7·7	6·0	5·2	3·5	0	0	0	0	0
March	0	0	0	1·2	8·2	10·3	10·8	12·5	9·0	8·5	5·6	5·9	2·5	0·1	0	0	0
April	0	0	3·6	8·6	10·4	12·5	12·8	14·1	14·4	14·9	11·1	12·4	8·5	5·8	1·0	0	0
May	0	3·6	13·3	14·4	13·5	15·8	15·3	16·0	19·5	22·0	20·4	17·9	16·4	17·2	8.0	0·3	0
June	0·9	8·6	11·1	13·5	13·4	11·4	11·8	13·0	14·4	15·5	14·8	15·2	13·9	12·0	5·9	1·1	0
July	0	2·0	7·3	8·2	11·3	13·5	14·2	10·6	9·1	9·0	11·7	13·3	11·3	9·4	7·2	0·6	0
August	0	0·5	7·8	15·2	14·7	16·8	17·5	18·8	18·4	18·6	18·8	18·6	15·6	9·4	1·0	0	0
September	0	0	0	4·2	12·7	15·0	14·8	15·6	17·4	15·1	14·0	14·2	11·3	5·3	0	0	0
October	0	0	0	2·1	7·3	8·8	10·1	10·0	10·4	10·3	9·6	7·8	2·3	0	0	0	0
November	0	0	0	0	0	5·7	9·8	11·6	13·3	11·7	7·8	0·6	0	0	0	0	0
December	0	0	0	0	0	0·5	4·1	6·2	5·4	3·4	1·2	0	0	0	0	0	0
Total	0·9	14·7	43·1	67·4	93·2	116·9	130·2	140·0	143·9	138·9	121·6	109·4	81·8	59·2	23·1	2·0	0

OBSERVATIONS OF UPPER CLOUDS (CIRRUS).

Date.	G. M. T.	Cloud Direction.	Velocity. 0—6.	Wind.		Direction of Lr. Clds.
				Direction.	Force (0—12).	
January 11	Noon.	W.	3	W.N.W.	7	W.N.W.
,, 12	11 a.m.	N. by E.	3	W.N.W.	2	N.W.
,, 20	3 p.m.	N.	2	W.S.W.	1	S.W.
,, 20	4 p.m.	N.N.W.	1	S.W.	1	S.W.
,, 24	11 a.m.	S.E.	2	W.	5	W.S.W.
,, 24	Noon.	S.S.E.	3	W.	6	S.W.
,, 30	2 p.m.	N.	1	W.	5	S.W.
,, 30	4 p.m.	N.	2	W.S.W.	3	W.S.W.
February 2	10 a.m.	W.	3	N.	3	N.E.
,, 2	4 p.m.	W.	3	N.	1	...
,, 5	11 a.m.	N.W.	2	W.S.W.	2	W.S.W.
,, 14	Noon.	S.E.	1	S.	0	S.S.W.
,, 14	2 p.m.	S.E.	1	N.	0	S.W.
,, 18	2 p.m.	N.W.	3	N.N.E.	2	E.S.E.
,, 18	4 p.m.	N.W.	3	N.E.	1	E.
,, 20	9.30 a.m.	N.W.	2	S.	4	S.
,, 21	8 a.m.	N.N.W.	1	S.	1	S.
,, 22	4 p.m.	S. by W.	1	W.S.W.	1	...
,, 26	8.30 a.m.	S. by E.	2	N.E.	0	S. by E.
,, 26	11 a.m.	S.E. by E.	1	N.E.	0	S.E.
,, 27	7.50 a.m.	S.W.	3	E.	1	S.E.
March 2	10 a.m.	S. by E.	2	N.E.	1	...
,, 5	3 p.m.	S.W.	2	W.	3	S.W.
,, 6	11.20 a.m.	N.E.	1	S.W.	1	S.W.
,, 7	9 a.m.	S.E.	2	S.W.	1	S.W.
,, 7	Noon.	S. by E.	2	S.	2	S.W.
,, 10	11 a.m.	W.S.W.	3	W.S.W.	1	S.W.
,, 12	9 a.m.	S. by E.	2	S.E.	2	S. by E.
,, 12	10 a.m.	S. by E.	1	S.S.E.	4	S. by E.
,, 12	Noon.	S.E.	1	S.S.E.	4	S.E.
,, 15	10 a.m.	S. by E.	2	S.	2	S.
,, 15	Noon.	S.E.	2	S.	3	S.W.
,, 15	2 p.m.	S.E.	1	S.S.E.	3	S.W.
,, 16	9 a.m.	S. by E.	1	N.E.	0	S.E.
,, 16	10 a.m.	S. by E.	1	S.	2	...
,, 16	Noon.	S. by E.	1	S.E.	3	S. by E.
,, 17	Noon.	S. by E.	2	S.S.E.	3	...
,, 19	9 a.m.	S.W.	1	W.S.W.	2	S.S.W.
,, 19	10 a.m.	S. by W.	2	S.W.	2	...
,, 19	Noon.	S.W.	1	S.W.	2	S.W.
,, 23	9 a.m.	W.S.W.	1	W.N.W.	2	W.
,, 23	10 a.m.	W.	2	W.N.W.	3	W.
,, 24	9 a.m.	S.W.	2	E.	0	S.E.
April 3	2.40 p.m.	N.W.	2	E.	3	S.E.
,, 4	2 p.m.	S.	2	S.E.	3	S.

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G. M. T.	Cloud Direction.	Velocity. 0—6.	Wind..		Direction of Lr.Clds.
				Direction.	Force (0—12).	
April 9	8.30 a.m.	S.S.E.	1	E.	1	S.S.E.
,, 9	5 p.m.	N.	2	E.N.E.	1	W.S.W.
,, 11	3 p.m.	N.	2	S.E.	1	N.
,, 11	7 p.m.	N.N.W.	1	N.W.	1	N.N.W.
,, 12	7.30 a.m.	S.W.	2	N.E.	1	N.E.
,, 17	5.45 p.m.	W.S.W.	3	N.E.	2	N.N.E.
,, 22	11.20 a.m.	N.N.E.	2	E.	1	N.N.E.
,, 25	3.30 p.m.	N.	1	N.E.	1	E.N.E.
,, 28	6 p.m.	W.N.W.	2	N.E.	2	N.E.
,, 29	2.30 p.m.	N.W.	2	W.N.W.	0	N.W.
May 10	7.15 p.m.	S.S.E.	1	S.S.W.	0	...
,, 11	9 a.m.	N.W.	2	S.S.E.	2	N.W.
,, 11	4 p.m.	W.N.W.	1	W.	3	N.W.
,, 13	10.30 a.m.	N.	2	S.	1	S.E.
,, 16	1 p.m.	N.N.E.	2	W.S.W.	4	W.S.W.
,, 17	Noon.	W.S.W.	1	S.W.	4	W.S.W.
,, 19	8.30 a.m.	S.S.W.	2	W.S.W.	1	S.E.
,, 21	9 a.m.	W.S.W.	1	S.	3	S.W.
,, 21	Noon.	W.S.W.	1	S.W.	3	S.S.W.
,, 26	9 a.m.	E.	1	E.	1	E.
,, 26	4 p.m.	N.E.	1	E.	1	...
June 3	2 p.m.	N.E.	1	E.	2	N.E.
,, 3	4 p.m.	N.E.	2	E.	2	N.E.
,, 10	3 p.m.	S. by E.	2	W.S.W.	1	W.
,, 14	9 p.m.	S.W.	2	N.N.W.	1	S.W.
,, 14	2 p.m.	S.W.	1	W.	3	...
,, 14	4 p.m.	S.W.	2	N.W.	3	S.W.
,, 18	3.20 p.m.	N.W.	2	W.N.W.	3	W.
,, 18	4 p.m.	W.N.W.	1	N.W.	3	W.N.W.
,, 23	2 p.m.	N.W.	1	W.	2	N.W.
,, 26	2 p.m.	N.E.	2	W.	2	W.
,, 26	4 p.m.	N.E.	1	W.	2	W.S.W.
,, 27	7 p.m.	E.	2	E.	0	W.
,, 30	5 p.m.	N.N.E.	2	W.	1	W.
July 1	8 a.m.	N.E.	1	N.E.	0	N.E.
,, 3	5 p.m.	W.N.W.	1	W.N.W.	0	S.E.
,, 17	11 a.m.	N.	2	W.S.W.	3	S.W.
,, 19	6 p.m.	W.	1	W.	1	W.
,, 25	11 a.m.	S. by W.	1	N.N.W.	1	S.W.
,, 25	7 p.m.	S.W.	2	W.N.W.	2	S.W.
,, 27	4 p.m.	S.	1	N.E.	2	N.W.
August 1	9 a.m.	N.W.	1	N.E.	0	N.W.
,, 1	10 a.m.	N.N.W.	2	N.E.	0	N.N.W.
,, 1	10 p.m.	N.W.	1	E.	0	...
,, 11	Noon.	N.E.	1	W.	1	N.E.

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G.M.T.	Cloud Direction.	Velocity. 0—6.	Wind.		Direction of Lr.Clds.
				Direction.	Force (0—12)	
August 14	2 p.m.	S.E.	2	W.N.W.	2	S.W.
,, 14	4 p.m.	S.E.	2	N.W.	1	S.W.
,, 15	9 a.m.	S.W.	2	N.	0	S.W.
,, 15	10 a.m.	S.W.	1	S.W.	1	S.W.
,, 16	2 p.m.	S.W.	1	S.	2	S.W.
,, 17	9 a.m.	S.W.	1	S.W.	0	S.W.
,, 17	10 a.m.	W.S.W.	2	W.S.W.	1	W.S.W.
,, 20	8 a.m.	S.	2	N.W.	0	N.N.W.
,, 22	10 a.m.	N.E.	2	S.	1	W.
,, 25	9 a.m.	W.N.W.	1	N.W.	1	W.N.W.
Sept. 2	7 p.m.	S.S.W.	2	S.W.	0	S.S.W.
,, 3	6 p.m.	W.	1	S.E.	0	W.S.W.
,, 18	Noon.	N.E.	1	E.N.E.	0	N.E.
,, 18	2 p.m.	N.E.	1	S.W.	0	N.E.
,, 19	10 a.m.	N.E.	2	...	...	N.E.
,, 19	2 p.m.	N.E.	1	...	...	N.E.
,, 25	9 a.m.	N.W.	1	W.	0	W.
,, 25	2 p.m.	E.	2	W.	2	W.
,, 25	4 p.m.	E.	2	S.W.	1	W.
,, 27	2 p.m.	W.S.W.	1	S.W.	5	W.S.W.
,, 29	10 a.m.	W.	2	W.	2	W.
,, 29	Noon.	W.	2	W.	3	W.
Oct. 1	2 p.m.	N.E.	3	W.	3	W.
,, 1	4 p.m.	N.N.E.	2	W.N.W.	2	W.S.W.
,, 4	9.30 a.m.	S. by E.	1	N.W.	1	N.W.
,, 7	2 p.m.	N.E.	2	E.N.E.	1	N.E.
,, 9	2 p.m.	N.E.	1	N.E.	1	...
,, 31	Noon.	S.W.	2	S.S.W.	4	S.W.
Nov. 15	11 a.m.	S.S.E.	1	S.E.	2	S.S.E.
,, 28	3 p.m.	N.E.	2	N.W.	1	N.N.W.
Dec. 8	2 p.m.	W.N.W.	1	W.S.W.	3	N.W.
,, 20	11 a.m.	S.E.	3	N.W.	3	W.
,, 22	9.45 a.m.	S.W.	1	N.E.	1	W.
,, 26	Noon.	N.E.	2	N.W.	0	N.E.
,, 26	2 p.m.	N.E.	1	N.E.	1	N.E.
,, 30	3 p.m.	N.N.E.	1	N.N.E.	0	N.N.E.
,, 31	11 a.m.	S.S.W.	2	E.N.E.	1	S.E.

AGRICULTURAL NOTES.

JANUARY was warm; but throughout the greater part of the month wet, stormy, and gloomy. Owing to the absence of sunshine, only a very few flowers were in blossom by the end of the month.

FEBRUARY was warm and dry, with more sunshine. Ploughing began in most places in the neighbourhood before the end of the third week. Early spring flowers were in moderate abundance by the end of the month.

MARCH.—At the beginning of the month vegetation was looking rather forward; but the cold during the latter end retarded growth generally. The land was in good condition for working, and oat-sowing was commenced about the 26th.

APRIL.—Although the mean temperature of the month differed little from the average, there were rather sharp frosts during the night for a considerable portion of the month, which did damage to the early fruit trees. Oats were in the ground in most places by the middle of the month, and by the end nearly all the green crops were sown.

MAY was generally bright and sunny; but the nights were cold. Rain was much wanted towards the end of the month. Grass looked very poor, and the pastures in many places were quite brown.

JUNE.—This month was very dry, but with little sunshine. Throughout the greater part of the month the drought was felt very much. Wheat, oats, and potatoes were looking fairly well, but grass and crops were very badly in want of rain. A little clover was got in towards the close of the month.

JULY.—The first four days were hot and dry; but the rest of the month was wet. Haymaking was commenced on the first day of the month, but owing to the continual rain not much was stacked. The crop of hay was very light. The green crops were much improved by the rain. At the end of the month corn was looking very well.

AUGUST.—With the exception of the last week this month was hot and dry, and the want of rain was much felt. Hay was got in by the 14th. It yielded only a very thin crop. Apples and pears were about the average, but stone fruit was almost a failure in most places. Some oats were cut towards the end of the month.

SEPTEMBER.—Wheat and oats were got in in most places by the middle of the month. Both yielded a fair average. Green crops were rather poor from the lack of moisture. Potatoes were got in by the end of the month—a very heavy crop, and with very little disease.

OCTOBER.—Green crops were lifted by the end of the month. They were, generally, small, and yielded only a light crop. A little wheat was sown towards the close of the month.

NOVEMBER.—Wheat was sown in most places by the middle of the month.

DECEMBER.—During this month agricultural operations were suspended owing to the cold and wet.

OBSERVATIONS OF CROPS.

GRAIN, ETC.					GREEN CROPS.			
Name.	When Sown.	In Flower.	In Ear.	When Cut.	Name.	When Sown.	Above Ground.	Stored.
Wheat	Nov.	June	July 10th	Sept.	Potatoes	April	May 10th	Sept.—Oct.
Oats	Mar.—Apl.	June	July 10th	Aug.—Sept.	Turnips	May	May 11th	October.
Peas	March	June 5th		August	Beet	May	May 14th	October.
Beans	March	June 11th		Sept.	Mangel	May	May 15th	Oct.—Nov.

OBSERVATIONS OF TREES AND SHRUBS.

FOREST TREES, ETC.			FRUIT TREES, ETC.			SHRUBS.	
Name.	In Bud.	In Leaf.	Name.	In Blossom.	Ripe.	Name.	In Blossom.
Field Elm	Ap. 30th	May 15th	Apple	Ap. 21st	Aug. 16th	Lilac	May 20th
Oak	May 14th	May 22nd	Pear	Mar. 27th	Aug. 20th	Syringa	June 1st
Sycamore	Ap. 15th	May 10th	Cherry	Ap. 15th	July 28th	Laburnum	May 24th
Lime	Ap. 1st	Ap. 30th	Red Currant	Ap. 18th	July 6th	Red Flowering Currant	Ap. 10th
Ash	May 10th	May 25th	Black Currant	Ap. 18th	July 29th	Dog Rose	June 1st
Beech	Ap. 19th	May 5th	Strawberry	Ap. 15th	June 16th	Guelder-Rose	June 16th
Horse Chesnut	Ap. 3rd	Ap. 28th	Gooseberry	Mar. 25th	Aug. 20th	Woodbine	June 20th
						Portugal Laurel	June 24th
						Elderberry	June 3rd

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1884.

RANUNCULACEÆ.		
Anemone nemorosa	Wood anemone	March 16
Ranunculus ficaria	Lesser celandine	Feb. 1
R. acris	Meadow crowfoot	May 8
R. repens	Creeping buttercup	April 17
R. bulbosus	Bulbous buttercup	April 22
R. auricomus	Wood crowfoot	May 5
Trollius Europæus	Globe flower	May 5
Caltha palustris	Marsh marigold	March 25
NYMPHÆACEÆ.		
Nymphæa alba	White water lily	June 27
Nuphar lutea	Yellow water lily	June 23
PAPAVERACEÆ.		
Papaver rhæas	Red poppy	June 25
Chelidonium majus	Common celandine	May 27
CRUCIFERÆ.		
Cardamine pratensis	May flower	April 15
C. amara	Large bitter cress	June 10
C. hirsuta	Hairy bitter cress	April 1
Capsella bursa pastoris	Shepherd's purse	May 4
Arabis hirsuta	Hairy rock cress	March 19
Sisymbrium officinale	Hedge mustard	May 12
Nasturtium officinale	Water cress	May 20
Alliaria officinalis	Garlic mustard	May 12
Brassica campestris	Common wild navew	May 15
VIOLACEÆ.		
Viola canina	Dog violet	April 2
Viola odorata	Sweet violet	March 16
POLYGALACEÆ.		
Polygala vulgaris	Milkwort	May 17
CARYOPHYLLACEÆ.		
Lychnis flos cuculi	Ragged robin	May 3
L. diurna	Red robin	April 13
Stellaria media	Chickweed	March 15
S. holostea	Great starwort	April 14
S. aquatica	Water starwort	May 12
HYPERICACEÆ.		
Hypericum quadrangulum	Square-stalked St. John's wort	July 2
H. perforatum	Common St. John's wort	July 7

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1884 (*continued*).

GERANIACEÆ.		
Geranium Robertianum	Herb Robert geranium	May 15
G. lucidum	Shining geranium	May 5
G. molle	Dove's-foot geranium	May 13
G. phæum	Dusky geranium	May 12
Oxalis acetosella	Wood sorrel	April 17
PAPILIONACEÆ.		
Medicago lupulina	Black medic	May 27
Trifolium repens	White clover	
T. pratense	Purple clover	May 21
Lotus corniculatus	Common bird's-foot trefoil	May 2
Vicia cracca	Tufted vetch	May 18
V. sepium	Bush vetch	May 18
Sarothamnus scoparius	Common broom	Feb. 20
Ononis arvensis	Rest harrow	July 20
Lathyrus pratensis	Meadow vetchling	June 14
ROSACEÆ.		
Spiræa ulmaria	Meadow sweet	June 29
Geum urbanum	Common avens	May 16
G. rivale	Water avens	April 21
Fragaria vesca	Wood strawberry	May 7
Potentilla tormentilla	Tormentil potentil	May 20
P. anserina	Silver weed	June 6
P. fragariastrum	Strawberry-leaved potentil	May 23
P. verna	Spring potentil	May 22
Alchemilla vulgaris	Lady's mantle	April 2
LINACEÆ.		
Linum catharticum	Cathartic flax	June 15
SAXIFRAGACEÆ.		
Saxifraga umbrosa	London pride	April 12
Chrysosplenium oppositifolium	Opposite chrysosplene	March 15
C. alternifolium	Alternate chrysosplene	March 16
UMBELLIFERÆ.		
Sanicula europæa	Wood sanicle	May 11
Bunium flexuosum	Tuberous bunium	May 15

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1884 (*continued*).

CAPRIFOLIACEÆ.		
Adoxa moschatellina	Common moschatel	March 22
ARALIACEÆ.		
Hedera helix	Common ivy	Oct. 12
STELLATÆ.		
Galium cruciatum	Crosswort galium	April 29
G. verum	Yellow galium	May 20
G. saxatile	Heath galium	June 2
G. aparine	Cleavers galium	June 6
Asperula odorata	Sweet Woodruff	April 17
VALERIANEÆ.		
Valeriana dioica	Marsh valerian	May 14
V. officinalis	Common valerian	May 30
DIPSACEÆ.		
Scabiosa arvensis	Field scabious	June 22
COMPOSITÆ.		
Tussilago farfara	Common colt's-foot	Feb. 26
T. petasites	Butterbur colt's-foot	March 23
Chrysanthemum leucanthemum	Ox-eye daisy	June 20
Achillea millefolium	Common Yarrow	July 21
A. tormica	Common sneezewort	July 27
Arctium lappa	Common burdock	July 19
Carduus palustris	Marsh thistle	June 19
Centaurea nigra	Black centaurea	June 21
Hypocaris radicator	Long-rooted cat's-ear	June 7
Taraxacum dens-leonis	Common dandelion	Jan. 10
Lapsana communis	Common nipple-wort	June 24
PRIMULACEÆ.		
Primula vulgaris	Common primrose	Jan. 22
P. veris	Cowslip	May 6
Lysimachia vulgaris	Common lysimclia	May 14
L. nemorum		May 14
APOCYNACEÆ.		
Vinca minor	Lesser periwinkle	April 5
POLEMONIACEÆ.		
Polemonium ceruleum	Blue polemonium	May 26

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1884 (*continued*).

BORAGINEÆ.		
Myosotis palustris	Forget-me-not	April 13
Symphytum officinale	Common comfrey	May 18
SOLONACEÆ.		
Solanum dulcamara	Woody nightshade	June 22
OROBANCHACEÆ.		
Lathræa squamaria	Toothwort	April 3
SCROPHULARINEÆ.		
Scrophularia aquatica	Water figwort	June 16
S. Nodosa	Common figwort	June 16
Digitalis purpurea	Purple foxglove	June 18
Veronica chamædrys	Germander veronica	May 8
V. officinalis	Common speedwell	May 13
V. serpyllifolia	Thyme-leaved speedwell	May 13
V. anagallis	Water veronica	June 4
Euphrasia officinalis	Common eyebright	June 18
Rhinanthus crista-galli	Common yellow rattle	May 27
Pedicularis palustris	Marsh red rattle	May 8
P. sylvatica	Lousewort	May 11
Verbascum thapsus	Great mullein	June 22
LABIATÆ.		
Nepeta glechoma	Ground ivy	April 16
Prunella vulgaris	Common prunella	June 18
Ajuga reptans	Creeping bugle	May 13
Lamium purpuream	Purple dead-nettle	April 17
LENTIBULARICEÆ.		
Pinguicula vulgaris	Common butterwort	June 24
POLYGONACEÆ.		
Rumex acetosa	Sorrel dock	May 10
R. acetosella	Sheep-sorrel dock	May 12
Polygonum bistorta	Bistort polygonum	June 10
EUPHORBIACEÆ.		
Mercurialis perennis	Dog's mercury	March 7
ORCHIDACEÆ.		
Listera ovata	Twablade listera	June 18
Orchis mascula	Early orchis	April 17
O. maculata	Spotted orchis	April 29
Habenaria bifolia	Butterfly orchis	June 17

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1884 (*continued*).

AMARYLLIDEÆ.		
Narcissus pseudonarcissus	Daffodil	March 16
Galanthus nivalis	Snowdrop	Feb. 2
LILIACEÆ.		
Scilla nutans	Bluebell squill	April 5
Allium ursinum	Broad-leaved garlic	May 11
AROIDEÆ.		
Arum maculatum	Common arum	May 6

THE UPPER GLOWS IN 1884.

THE glows preceding sunrise and following sunset were seen from time to time during the whole year, but were often entirely absent for considerable periods. After January 12th they were of much shorter duration, and their general character feebler than previous to this date. The following is a list of the dates on which they were seen:

January 9, 11, 12, 15, 26, 27, 28.
February 15, 20, 24, 29.
March 2, 18, 21.
April 7, 9, 11, 12.
May, none.
June 7, 8, 10.
July 25.
August 1, 23, 24.
September 3, 4, 12, 13, 18, 27.
October 1, 3, 5, 11, 14, 26.
November 2, 9, 18, 19, 21, 23—27.
December 6, 9, 14, 21, 22.

The thin stratum of cloud seldom accompanied the glows in 1884, which, on September 3, 13, and 18, took the form of broad radiating pink streamers, while from the 21st to the 27th of November no pink at all was seen, but simply an intense white glow, this being very remarkable sometimes for two hours before sunrise and after sunset.

Violet tinted arches opposite these pink displays have frequently been seen very distinctly, and they appear to occur only on occasions when the sun glows are unusually fine. They form just before the pink appears over the position of the sun, and remain till after it has gone, varying meantime in intensity, and sometimes extending along the horizon till they meet the pink display opposite.

The glow encircling the sun during the day has never been entirely absent, though it varied in intensity from time to time, and was once or twice hardly perceptible. Sometimes it was merely a bright silvery glow without any warmth of tint, but more commonly the pink or salmon colour extended from the sun to a distance of 18° or 20°. This colour varied in intensity, and was frequently very remarkable even in a perfectly cloudless sky, with a decided preponderance of the tinted matter in the direction of horizon or south of the sun, and when the sun got low it sometimes extended along the horizon some 180°, like a broad band of warm tinted dust.

The edges of the clouds in vicinity of the sun have frequently been seen tinted with the colours of the spectrum.

A glow exactly similar to the day glow round the sun has been seen encircling the moon on August 4, September 1, 4, 5, 6, 26, October 1, November 3, 7, and December 3, 4, and this late at night many hours after sunset.

LIST OF SUN DRAWINGS DURING THE YEARS 1880—1884.

THE necessity of obtaining daily observations of the sun, in order to study accurately the changes that are continually taking place upon its surface, makes it most advisable for all solar observers to publish at an early date a complete catalogue of their photographs and drawings of the sun, so that the unavoidable breaks of continuity in any one series may be filled up, if possible, by the information supplied by others. This should, for convenience sake, be printed in the same form by all, and therefore the form published by the Solar Physics Committee has been adopted in this report. The chief series of Stonyhurst drawings of the sun spots and faculæ are on the scale of 10½ inches to the solar diameter, and in the following tables the numbers give the G.M.T. to the hundredth of a day reckoned from midnight on which a 10½ inch sketch was made. The time entered is that at which the outline of the spots was drawn, the details of the umbra and penumbra and the faculæ being added as soon as possible afterwards.

c indicates that observations of the chromosphere were taken at the corresponding date,

d that drawings of the sun were made on a scale differing from 10½ inches,

n that the solar surface was examined, and notes taken without a drawing, and

s shows that spot spectra were examined.

1880.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1		c			c	c					d	
2					c			c		d	c,d	c,d
3											c,d	
4											c,d	
5												
6												
7												
8					c						c,n	
9					c			c		c,d		
10										c	c,d	
11		c			c			c				
12		c			c			c				
13												
14					c			c		c,n		
15					c							
16					c							
17	c				c						c	c
18			c			c					c,d	
19	c		c								c	
20	c		c		c		c			c	c,d	
21			c				c			c,d	c,d	c
22										c,d	c,d	
23										c,d		
24			c									
25			c									c
26			c									c
27				c					c		c,d	
28												
29									c,n			
30				c	c							c,n
31												c

1881.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1				·39		·38,c,d	·67	·43	·69	·53,c,d		·65
2			n			·43,c,d				·42,d		
3				·45,c		·38				n		
4				·40		·49,d				d		
5	·65			·40,c				·45,c		·36,c,d		n
6	·42,c	·50		·41,c		·54,d					·66,d	n
7	·43,c			·67						·39		·43
8	·56			·36,c,d	c					·51,d	·51	·46,d
9				·53,c,d	·51,c		·46		·40,c			·50
10				·41,c,d	·42,c							·41,c
11							·52,c,d			·41		
12		·38,c			·46,c,d		n					d
13					·43,c,d							·46
14	·54					·47	·55,c		·69,c			
15			·69,c				·69,c,d			·41,c,d	d	·43,c
16			·44,d						·50,c	·37,c,d		
17				·55						·37,c,d		
18				·39,c,d						·44,c,d	d	d
19						n			·68,c,d	·37,d		·48
20	n									d	·37,d	
21	c,n		n		·43,c	n	·44,c				·65,d	
22											·46	n
23		·46			·49,c							
24		·49	·46	·50	·64,c,d	·68						n
25									·51	d		
26									·55	d	·39,d	
27						n	·67		·66			·47,c
28			c	·45,c		·68			·42		·45	
29					c,n				·40,c,d	·37,c,d	·44,d	
30			·40,c		·49,c,d				n		·42	
31			·41,c		·47,c,d							·44

1882.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.
1		·49,d		·70	d	·46,c	·47,c,d					
2	·45	d		·38	c,d	·48,d	·43			·35,c		
3		·65	.64,d	d		d	·80				.42	
4	·45			·50,c,d	·73,c,d						·48	
5			·43,d		·39,c	d	·67	·56		·69		
6	·47,c		·47,d	c,d	c,d	d	·51	·50	·71,c	·44		·38.
7	n		d	·61,c	d	·70	·66,c	·52	·41,c			
8		d		·67,c	d		·67	·48,c				
9	c,d			·42,c		·67	·47	·67,c		·49	·43	·64,c
10				·64,c,d	·68,c,d,s	·80,d	·69,c	·40,c				·42
11		·47,d	·39	c,d	·42,c	·38,d		·45,c	·71,c			·53,c
12	d		·49,d	·52,d	·67,c,s	d	·67,c	·53	·61,c		·42,c	
13	d		·68,d		·38,c,d,s				·41,c			
14		·65,d	·64,c,d		·40,c		·44				·65	
15		·38	·51,c,d	·74,d	d	·78,c,d	·69		·72,c			
16			·46,c	·38,d	·42,c	·66,d	·47	·55,c	c			
17			·60,c		·49,c						·53	
18		·69,d	·48,c,d	·41,c,d	·41,c	·80				·42		
19		·37,c			·47,c	·69	d	·55			·48	
20				·39,c	·39,c,s	d	d			·45		
21		·45,d	·48,d	·41	·50,c	·83					·47	
22		d	·38,c,d		·41,c				·61,c			
23	d					d	·74			·44		·47
24	·65,d		d	·42,d		·48,d	·67		·45			
25			·51,d	·66,d		·70	·68			·41,c		
26	n		·37,c,d	d	d	d	·65,c		·47,c	·50	·42	
27	n			c,d	d	·41,c,d						
28	d				d	c,d	·65,c		·69,c		·40	
29			d	d	c,d	·70,c	·61,c		·45	·50		
30	·49,d		·40,d	c,d	·44,c	·45,c	·75	·56			·50,c	
31			·51,d		c							

1883.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1			·67,c	c	·40,c,s		·72,c,s			d		·50
2			·50,c	·71,c	·44	·69,c	·38	·76,c		·44		
3		·43	·53,c	·52	·40	·40,c,d	·66,d	c		·65	·54	
4		·44,c	·42,c	·52,c,d,s	·65	·52,c	·40			·37	·63	·44,c,d
5		·51	·49,c		·76	·41,c,s	·44		c		·48	·44,c
6		·48,c		·39,c,s	·42,c,s	·52,c,d,s	n			·41	·46	·57
7	·41,d	·52,c	·39,c	·39,c	·41		d	n			·50	
8	·50		·66,c	·42,c			·50		d		·46	
9	·47	·48	·46,c	·45,c		·66,c,d		n	·43		·62	
10				·40		n	·52				·38	
11		·51		·74	·77,c	·74,c,d			·60,c		·42	·47
12			·45,c	·43	s,n	n	·76		·37,c,s	·41	·62,c,s	
13		·44				d,n	·49,c,s	·48	·43,c	·51	·38,c,s	
14			·72	·41	·74,c,s	·70	·49,c	d	·40,c,s			
15	·62,d		n		·42		·54		·59	·42	·64,s	
16	·57,d	·46,c	d	·37	c	·79			·53	·35,d		·48
17			d		·42,c	·42	·68		·41	·40	·61	·61
18	·62	·51,c	d		n	·47,d	·73	·49,c	·61	·50		
19					·60		·62	d	·52	n		
20	·50,c	c		·50,c				n		·61	·63	
21						·37		·69,c		·42,c	·61	
22		·41,c		·44	·41,c	·36	·70	·65,c	·71	·45,c,s	·50	·40
23		·69,c	·62,c		·51	·41	·50	c		·41,c,s	·42,c	·45
24					·53	·62	·69,c	·53,c		n		
25	·53,c	·52,c		·46,c	·38,c	·61				c,d		
26	·53		·42	·40	·71,c	·69			·50			
27			c		·38,c	·38				·52	·44,c	
28		·61	·40,c,d,s				·42,c	·38	d	d		
29	·61				·48	·44	n	·67,d		·40	·63,c	
30	·52				c,n	·65,c,s				·37,c		
31	·44		·75,c,d,s				d					

1884.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1		·41	·41				·52,s	·36,d	·68	·36,c	·39,c	
2		·41,c	·40			·42	·41,c	·64	·39	·48		
3				·49,d	·48	·63	·52,c	n	·69	·38	·41,c	
4				·36,c,s	·65	·43,c,s	·51	·70	·41,c	·50,c		
5		·50	·66,d	·42,c	·65	·38	d	·31,c	·41,c	·43,c	·40	·43
6			·50	·46	·41,c,s	·44,c	·62,d	·50,c	·43	·67 'c	·45	·40*
7			·39	·71	·40	·49	n	·38,c	·49	·44	·38	
8			·69	·50,c,s	n		·37	·37,c	n		·39	
9			·51,d	·48,c,s	·72	n	n	·41,c		·43,c,s	·51	·43,c
10		·63,d	·45	·63	·64	·43,c		·39,c,s	·41	·45	·37,c	
11	·46		·38	·30,c,s	·42,c,s	·76	·34	·38	·40,c	·39	·43	
12	·41,c.	·53	·38,c	·39,c	·52,s	·39,c,s	·30	·36	·45,c,s	·35		
13				·59	·39	·41,c	·43	·47	·49	·36	·42,c	
14		·43,c,s			·64,d	·42,c,s	·30	·43	·45	·53	·51	
15		·45,c	·45,c,d	·74		·43	·42	·37	·51		·40	·51
16			·41,c,s	·73,d	·52	·39	·37	·51	·50			·39
17			·37	·39	·39,c	·74	·45	·43,c,s	·65		·50	·44
18		·37	·46		·50,c,s	·66,c	·71,d	·44,c	·46,c,s		·39	
19			·39	·41,d	·37,c,s	·70,c	·30,c,s	·73	·46	·42	·53	
20	·51	·35,c	·48,d	·39,c	·44,c,s	·47	·41,c	·29,c	·38,c,s		·51	·47,c
21	·42,c,s	·44,c	·36		·44,c,s	·32,c		n	·45,c		·61	·41,c
22		·61		d	·40,c,s	·80,d		·31,c,s	·37		·41,c	·45,c
23	·61	·48	·42,d	·40	·42,c,s	·80,c	·68	·38,c	·67,d	·63	·44,c	
24	·43	·48	·37,c	·38	·39,c,s		·78,d	c.d	·39	·50	·40,c	
25	·66	·71	·44,d	n	·44,c,s	·67,c,d	·62	·58,c,d	·37		·48	·49,c
26	·42	·39,c,s	*	·40	·44,c				·75	·39	·44	·43,c
27	·46	·70,d		·44	·39,c,s	·40,c	·51		·51	·49		·54
28	·62	·45	·37	·64	·65	·40,c,s	·37	·60,d	·40	·57,d	·45	·50
29				·68,d	·53			n	·43,c.s	d	·43,c,s	
30	·53,d			·69,d	·61	·48,c,s			c			·44,c
31			·66,d		·70					·36,c		

Monthly Magnetical Observations taken at the College Observatory, Stonyhurst, 1884.

THE Horizontal, Vertical, and Total Forces are calculated to English measure; one foot, one second of mean solar time, and one grain being assumed as the units of space, of time, and of mass.

The Vertical and Total Forces are obtained from the absolute measures of the Horizontal Force and of the Dip.

In the observations of Deflection and Vibration, taken each month for absolute measure of Horizontal Force, the same magnet has always been employed.

The moment of inertia of the magnet with its stirrup, for different degrees of temperature, and the co-efficients in the corrections required for the effects of temperature and of terrestrial magnetic induction on the magnetic moment of the magnet, were determined at the Kew Observatory by the late Mr. Welsh.

The moment of inertia of the magnet with its stirrup, using the grain and foot as the units of mass and of linear measure, is 5·27303. Its rate of increase for increase of temperature is 0·00073 for every 10° of Fahr.

The weight of the magnet with its stirrup is approximately 825 grains, and the length of the magnet is nearly 3·94 inches. The moment of inertia was determined, independently of the weight and dimensions, by the method of vibration, with and without a known increase of the moment of inertia.

The temperature corrections have always been obtained from the formula $q(t°-35°)+q'(t°-35°)^2$, where t° is the observed temperature and 35° Fahr. the adopted standard temperature. The values of the co-efficients q and q' are respectively ·0001128 and 0·000000436.

The induction co-efficient μ is 0·000244.

The correction for error of graduation of the Deflection bar at 1·0 foot is +0·00004 ft., at 1·3 + 0·000064 ft.

The observed times of vibration are entered in the Table without corrections.

The time of one vibration has been obtained each month from the mean of twelve determinations of the time of 200 vibrations.

The angles of deflection are each the mean of two sets of readings.

In deducing from these observations the ratio and product of the magnetic moment m of the magnet, and the earth's horizontal magnetic intensity X, the induction and temperature corrections have always been applied, and the observed time of vibration has been corrected for the effect of torsion of the suspending thread; but no correction has been required for the rate of the chronometer, or for the arc of vibration, the former having been always under 2″, and the latter never over 50′.

The average deflection of the magnet caused by a twist of the torsion circle through 90°, has been about 8′·5 of arc.

In the calculations of the ratio $\frac{m}{X}$, the third and subsequent terms of the series $1 + \frac{P}{r^2} + \frac{Q}{r^4}$ + &c., have always been omitted.

The value of the constant P was found to be 0·0037654.

The Declination observations have been taken once a week. Each reading has been corrected by the photographic curves for all irregular disturbances, as well as for daily and monthly range.

OBSERVATIONS OF DEFLECTION FOR ABSOLUTE MEASURE OF HORIZONTAL FORCE.

Month.	G. M. T.	Distances of centres of Magnets.	Temperature.	Observed Deflection.	$\text{Log}\frac{m}{X}$
	D. H. M.	FOOT.	°	° ′ ″	
January ...	16th 11 6 a.m.	1·0	42·8	13 26 20	9·06726
	,, 11 39 a.m.	1·3	43·0	6 5 2	9·06752
February...	18th 11 10 a.m.	1·0	45·0	13 25 50	9·06711
	,, 11 52 a.m.	1·3	45·6	6 4 58	9·06763
March ...	17th 11 55 a.m.	1·0	47·7	13 25 10	9·06696
	,, 0 30 p.m.	1·3	47·9	6 4 50	9·06758
April	15th 11 40 a.m.	1·0	52·1	13 24 46	9·06704
	,, 0 8 p.m.	1·3	52·1	6 4 30	9·06747
May	16th 11 34 a.m.	1·0	61·8	13 23 20	9·06698
	,, 11 59 a.m.	1·3	62·5	6 3 30	9·06702
June	16th 11 44 a.m.	1·0	61·4	13 22 51	9·06668
	,, 0 15 p.m.	1·3	61·2	6 2 58	9·06634
July.....	18th 11 50 a.m.	1·0	65·4	13 22 10	9·06662
	,, 0 36 p.m.	1·3	66·1	6 3 15	9·06699
August ...	20th 11 56 a.m.	1·0	58·6	13 21 4	9·06545
	,, 0 24 p.m.	1·3	59.4	6 2 5	9·06511
September.	19th 10 45 a.m.	1·0	57·4	13 22 30	9·06568
	,, 11 20 a.m.	1·3	58·3	6 2 50	9·06592
October ...	15th 9 50 a.m.	1·0	51·5	13 23 4	9·06609
	,, 10 25 a.m.	1·3	52·8	6 3 30	9·06623
November.	17th 11 38 a.m.	1·0	42·2	13 23 2	9·06546
	,, 11 59 a.m.	1·3	47·3	6 3 11	9·06546
December.	18th 11 20 a.m.	1·0	45·1	13 22 25	9·06534
	,, 11 56 a.m.	1·3	46·8	6 2 49	9·06514

m represents the Magnetic Moment of the Deflecting Magnet.
X represents the Earth's Horizontal Magnetic Intensity.

VIBRATION OBSERVATIONS FOR ABSOLUTE MEASURE OF HORIZONTAL FORCE.

Month.	G. M. T.	Temperature.	Time of one vibration.	Log m X	Value of m.
	D. H. M.	°			
January ...	16th...10 35 a.m.	41·0	5·74910	0·19635	0·42842
February...	18th...10 44 a.m.	44·2	5·74872	0·19615	0·42831
March	17th...11 8 a.m.	52·0	5·74409	0·19729	0·42882
April	15th...10 50 a.m.	53·8	5·74531	0·19728	0·42881
May.....	16th...11 5 a m.	61·6	5·74213	0·19814	0·42910
June	16th...11 10 a.m.	60·0	5·74109	0·19799	0·42879
July.....	18th...11 15 a.m.	64·6	5·74626	0·19741	0·42866
August ...	20th...10 44 a.m.	56·5	5·74792	0·19676	0·42759
September.	19th...10 14 a.m.	56·6	5·74556	0·19737	0·42814
October ...	15th... 9 34 a.m.	47·1	5·73646	0·19848	0·42886
November.	17th...11 18 a.m.	39·5	5·73938	0·19837	0·42847
December.	18th...10 59 a.m.	42·1	5·37920	0·19732	0·42784

DIP OBSERVATIONS.				MAGNETIC INTENSITY.		
Month.	G. M. T.	Needle.	Dip.	X. or Horizontal Force.	Y, or Vertical Force.	Total Force.
	D. H. M.		° ′ ″			
January .	17th...10 42 a.m.	1	69 18 20	3·6685	9·7025	10·3731
	,, ...11 15 a.m.	3	69 16 14			
February.	19th...10 33 a.m.	1	69 18 32	3·6677	9·7062	10·3760
	,, ...11 20 a.m.	3	69 17 30			
March ...	18th...10 10 a.m.	1	69 17 21	3·6726	9·7040	10·3764
	,, ...10 40 a.m.	3	69 14 50			
April ...	16th...10 15 a.m.	1	69 15 25	3·6730	9·6976	10·3702
	,, ...11 20 a.m.	3	69 15 15			
May	17th...11 50 a.m.	1	69 14 45	3·6777	9·6929	10·3846
	,, ... 0 20 p.m.	3	69 16 10			
June	17th...10 45 a.m.	1	69 15 8	3·6791	9·6954	10·3898
	,, ...11 10 a.m.	3	69 16 11			
July	19th...10 52 a.m.	1	69 17 30	3·6754	9·7130	10·3866
	,, ...11 30 a.m.	3	69 15 40			
August...	21st ...11 20 a.m.	1	69 15 18	3·6792	9·7181	10·3914
	,, ...11 51 a.m.	3	69 16 27			
Sept. ...	20th...11 30 a.m.	1	69 16 25	3·6795	9·7161	10·3890
	,, ...11 58 a.m.	3	69 14 32			
October..	16th...11 5 a.m.	1	69 17 0	3·6836	9·7380	10·4101
	,, ...11 40 a.m.	3	69 16 39			
Nov.....	18th...10 24 a.m.	1	69 16 11	3·6852	9·7378	10·4075
	,, ...10 55 a.m.	3	69 15 18			
Dec.....	19th...10 20 a.m.	1	69 15 52	3·6816	9·7117	10·3860
	,, ...11 10 a.m.	3	69 14 21			
Means ...	.....	...	69 16 11	3·6769	9·7111	10·3867

DECLINATION OBSERVATIONS.

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
January ...	7th... 9 3 a.m.	19 56 13		19 57 5	
	14th... 8 59	51 10		54 2	
	21st... 9 9	52 23		55 2	
	28th... 9 2	48 55	19 52 10	52 56	19 53 49
February..	4th... 9 1	56 30		59 5	
	12th... 8 56	53 9		56 28	
	19th... 9 3	57 43		57 43	
	25th... 8 58	59 40	19 56 46	57 5	19 57 35
March ...	4th... 9 11	55 6		56 49	
	10th... 9 8	50 29		54 1	
	17th... 9 3	42 49		48 32	
	24th... 9 5	49 11		54 54	
	31st... 9 9	48 10	19 49 11	52 45	19 53 12
April	7th... 9 8	49 58		55 25	
	14th... 9 9	50 13		54 14	
	21st... 9 1	52 23		55 49	
	28th... 9 4	47 58	19 50 23	50 33	19 54 0
May	5th... 9 0	45 24		45 41	
	12th... 9 3	46 13		49 48	
	19th... 9 9	49 58		52 26	
	26th... 9 13	48 9	19 47 26	56 55	19 54 12
June	2nd.. 9 1	50 53		49 44	
	9th... 9 0	48 14		50 49	
	16th... 9 5	44 34		48 17	
	23rd... 9 10	49 50		47 50	
	30th... 8 55	48 10	19 48 44	49 53	19 49 19
July	7th... 9 10	50 21		52 29	
	14th... 9 2	51 30		51 30	
	21st... 8 58	50 26		50 26	

DECLINATION OBSERVATIONS (*Continued*).

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
July	28th... 9 13 a.m.	19 49 29	19 50 24	19 49 29	19 50 59
August ...	4th... 9 11	46 15		46 49	
	11th... 9 6	48 34		52 18	
	18th... 9 3	49 30		52 5	
	25th... 8 56	50 9	19 48 40	53 9	19 51 5
September	1st ... 8 57	49 57		51 6	
	8th... 8 53	51 10		51 17	
	15th... 9 10	48 13		51 49	
	22nd.. 8 57	50 20		53 26	
	29th... 9 4	48 17	19 49 33	52 52	19 52 6
October ...	6th... 9 2	47 15		51 16	
	13th... 9 6	45 29		48 38	
	20th... 9 3	47 42		50 51	
	27th... 9 0	50 36	19 47 46	54 21	19 51 59
November	4th... 9 7	52 10		52 44	
	10th... 9 0	50 16		52 51	
	17th... 9 15	45 59		49 8	
	24th... 9 2	49 15	19 49 25	53 24	19 52 2
December.	1st... 8 57	50 43		53 8	
	8th... 9 8	48 20		49 29	
	15th... 9 6	49 36		48 10	
	22nd.. 9 4	45 11		48 3	
	29th... 9 7	50 36	19 48 53	53 28	19 52 28
Yearly mean			19 49 57		19 52 47

MAGNETIC DISTURBANCES.

JANUARY.—The first day of the year 1884 that showed any signs of magnetic disturbance was the 8th, and the curves of the 11th, 13th, and 19th were somewhat irregular, but with the exception of the night of the 25th and the morning of the 26th, the month was throughout very quiet. A slight increase of the horizontal component of the intensity was recorded between 11 p.m. and midnight on the 25th and 26th.

FEBRUARY.—The afternoon of the 1st and the night of the 3rd were not very regular, and during the afternoon of the 4th there was so much disturbance that it amounted almost to a magnetic storm. From noon on the 23rd disturbing forces were again at work until the 27th, and the month closed with some very irregular movements of the H. F. magnet, and a diminution of 27′ 47″.3 in the W. Declination between 9·32 and 10.5 p.m.

MARCH.—The storm that commenced at the end of February continued until the night of the 3rd. A very rapid change of the Declination occurred between 11 a.m. and noon on the 1st, the needle moving 28′ 38″.9 towards the East between 11.5 and 11.27, and returning Westward with equal rapidity. The D. magnet was again disturbed between 6 and 10 p.m. on the 7th, but was remarkably quiet from the 9th to the 16th. Movements somewhat similar were recorded on the evenings of the 19th and 20th, and a storm commenced about 7 p.m. on the 28th. The Horizontal Force trace was very irregular during this storm, but the Vertical Force was only slightly affected.

APRIL.—The 4th and 5th of the month were much disturbed, as was also the night of the 10th. Similar depressions were recorded on the V.F. magnetogram at about 3 a.m. on the 15th and 16th. From the 17th to the 20th there were frequent irregularities in the D. and H.F. curves, and the V.F. magnet was also disturbed on the night of the 17th. Both Components of the Intensity showed signs of the presence of a disturbing force during the night of the 24th and the afternoon of the 26th.

MAY.—The magnetic traces were somewhat abnormal during the mornings of the 7th and 8th, but there was no very marked irregularity in the movements recorded previous to the 10th. On the 12th the magnets again came to rest, and remained very steady until the 22nd, when all were affected by a disturbing force.

JUNE.—On the afternoon of the 2nd there was a great increase of the V.F., with irregular changes of the Declination. The V.F. curve was abnormal during the night of the 14th. Between 8 and 9 p.m. on the 18th, and at 2 a.m. on the 19th, the needle moved considerably towards the West, accompanied by an increase of the H.F. and a decrease of the V.F., but at 10 a.m. the disturbance ceased. At 9 p.m. on the 22nd the commencement of a disturbance is apparent on the D. and H. F. curves, and the needle was vibrating violently between 3 and 11 a.m. on the 23rd; shortly before 4 p.m. the V.F. also became irregular, and was considerably above the mean at 4 p.m. Soon after 8 a.m. on the following day all the magnets were again at rest. A rather rapid Easterly movement of the needle was recorded at 8.40 p.m. on the 28th, when the V.F. was large.

JULY.—At 5.17 p.m. on the 2nd a very rapid rise of the H.F. and fall of the V.F., accompanied by a slight Westerly movement of the Declination, indicated the advent of a disturbing force. At midnight the movements of all the magnets were extended, and between 4 and 6 a.m. the vibrations of the Declination magnet were very rapid but short, whilst the H. F. needle was trembling violently. During the afternoon the disturbance continued, and finally culminated in some very rapid and extended movements of the Declination and H.F. between 8 p.m. and midnight. Between 8.32 and 8.58 p.m. the W. Declination increased 55′ 30″.0, and immediately afterwards decreased almost as rapidly. The V.F. movement was too extended to be recorded on the cylinder at 10.45, but returned in 15 minutes sufficiently for photographic record. Its oscillation from 5.55 to 10.46 was at least 0.01334 in British units, while the range of the H. F. was 0.00992 between 11 p.m. and 12.13. The magnet was considerably to the Westward of its mean position at 4 a.m. on the 6th. During the night of the 13th the V.F. was considerably affected, and the H.F. and Declination slightly, the minimum of the V.F. was reached at 12.28 and that of the Declination at 12.39. The curves were also irregular on the mornings of the 20th and 26th, the V.F. being small at 4 a.m. on the 20th, and at 3.40 a.m. on the 26th.

AUGUST.—The 8th, 9th, and 10th were disturbed days, the V.F. being most affected during the afternoon of the 8th. A sharp movement Eastward occurred at 9.12 p.m. on the 14th. From noon on the 19th to noon on the 20th the magnetic needle was very quiet, but the range of the Declination was considerably above the average. During the afternoon of the 20th a disturbance began which lasted for two days, but the movements call for no special comment. The remainder of the month was very tranquil.

SEPTEMBER.—The morning of the 10th was disturbed, and the movements of the magnets remained rather irregular until the morning of the 15th. An increase of the V.F. was well marked on the afternoons of the 13th and 14th. The night of the 17th was stormy, and some very rapid movements occurred just before midnight and towards 2 a.m. The H.F. increased, but the V.F. fell 0.00385 between 10 and 11.24. Other great movements were recorded between 8 and 9 and between 10 and 11 the following night, accompanied in each case by an increase of the H.F. and a decrease of the V.F.

OCTOBER.—A storm began at 9.53 p.m. on the 1st with a sudden increase of the H.F., and lasted until 4 a.m. on the 3rd. During the morning of the 2nd the oscillations of the needle were rapid but very short. The greatest Declination changes were recorded between 2 and 4 a.m. and from 3 to 6 p.m. on the 2nd, and from 10 p.m. on the 2nd to 4 a.m. on the 3rd. The V.F. fell 0.00408 between 2 a.m. and 3.11 on the 2nd, and its range from 5.17 p.m. on the 2nd to 4.7 the next morning was 0·00519. During the whole of the 7th the needle was swinging considerably but slowly, the V.F. minimum occurring at 2.30 a.m. and the maximum at 5 p.m. During the whole of the 14th and 15th disturbing forces were at work, and the V.F. was in excess in the afternoons of both days. In the early hours of the afternoon the Declination needle was rather irregular on the 17th, 19th, 20th, and 21st. The whole of the 29th was much disturbed, and the V.F. increased considerably in the evening.

NOVEMBER.—Some irregularities on the afternoon of the 1st were followed by a storm, which lasted throughout the 2nd and the morning of the 3rd. A very rapid movement, first E. and then W., commenced at 7.3 p.m. on the 2nd and ended at 7.22, the extent of the oscillation being about 32′ 14″. On the morning of the 3rd, between 1.42 and 2.11, the Declination increased by 40′ 17″.2, and its total range from 1.42 to 5.33 was 57′ 17″.8. The decrease of the V.F. between 2 and 3 a.m.

was too great to be recorded on the photographic paper. The last rapid change of the Declination occurred between midnight and 1 a.m. on the 4th. The nights of the 6th, 8th, and 10th were somewhat disturbed, as were also the afternoons of the 17th, 18th, and 19th. From noon on the 23rd until the next morning there were evidences of a perturbing force; and the swing of the needle, first E. and then W., was not inconsiderable between 3 and 5 p.m. on the 24th. The movements of the Declination and H.F. magnets were again irregular from midnight until 3 p.m. on the 28th.

DECEMBER.—On the 11th the Declination needle was disturbed throughout the evening, and the V.F. somewhat increased. Again, from 9 to 10 p.m. on the 14th there was an abnormal movement towards the E. of considerable extent, accompanied by an increase of the V.F. during the afternoon, and followed by a decrease of this component of the intensity the next morning. This change of the V.F. recurred during the next 24 hours. The night of the 20th was far from tranquil. On the 22nd, between 10.16 and 11.12 p.m., the needle oscillated, first W. and then E., through an angle of 33′ 25″.4, the greatest irregularity of the H.F. occurring between 10 p.m. and midnight, and the V.F. attaining a considerable maximum at 9.46 p.m. The morning of the 28th was again rather irregular.

AURORÆ OBSERVED AT STONYHURST COLLEGE OBSERVATORY, 1884.

FEBRUARY 24th.—During the evening a faint auroral glow was observed in the N.W.

MARCH 21st.—Polar shine in the N. seen from 9.45 to 10.15 G.M.T.

APRIL 24th.—At 8.30 p.m. the sky between N. and N.W. was observed to be more than ordinarily bright.

At 9.20 the glow was exceedingly intense, and at times of a reddish tint. Shortly afterwards streamers were seen, their altitude being about 30°. The following were the most remarkable:

At 9.50 a faint broad crimson streamer, the western side of which was near the planet Venus. The intensity of the red tint increased and attained a maximum at 9.54. At this time a fainter and small companion formed at its northern side. Both faded at 9.56. Their height was 25°, and the breadth of both combined was about 12°.

Other streamers were seen up to 11.10, their positions extending in azimuth from Venus to 120° towards N.

At 11.0 five streamers were noticed; altitude 30°.

Many of the streamers seen were of a beautiful crimson hue. The sky was at times half covered with stratus clouds.

SEPTEMBER 17th.—Strong polar shine observed from 8.30 to 10.20 p.m. At 8.40 it extended from W. to due N., being most intense about λ, μ Ursa Majoris. Its altitude was 25°.

At 8.45 there was an increase in brilliancy, especially in the W. about Arcturus, where a bright cone of light rose to some 50°.

At 8.53 an increase in intensity for a few moments in the N. by W. The light fluctuated, varying continually in brilliancy.

At 9.20 a strong increase of light in the N. by W., which soon died away, but was succeeded by a similar increase of brilliancy one or two points of the compass more towards the W.

At 10.20 the glow was still remarked, and fairly bright about Cor Caroli; altitude about 20°.
No streamers were seen.

SEPTEMBER 18th.—At 7.30 a pink glow in the N.W., and one streamer seen. The horizon was afterwards covered with a thick haze.

OCTOBER 3rd. — In bright moonlight at 9.30 long streamers were observed from N. by W. to W., some stretching through the zenith, but apparently not at any great elevation. A large one stretched across Capella. The moonlight prevented any exact determination of the nature of these streamers, but they were perhaps auroral.

OCTOBER 4th.—From 8.0 to 9.0 p.m. streamers wrre seen radiating from the N. and extending all over the heavens. When the moon was eclipsed, a faint glow in the N. was all that could be distinguished. The streamers however seemed to be auroral. During this time the moon was surrounded by a small patch of brilliant cirrus, which disappeared as she rose higher.

OCTOBER 16th.—From 8.0 to 9.0 p.m. the northern sky was observed to be lit up with a distinct glow, which showed even through the cirrhus clouds which completely covered the sky, and which sent down a drizzling rain. At times it flashed out brilliantly, and once, about 8.20, this was most intense. The glow may have been auroral.

Excluding the doubtful appearances of October, only five auroræ were observed during 1884, and they are all coincident with a disturbed condition of the solar surface. An outburst began on February 18th, as a triplet of spots of moderate size, which was joined on the 25th by a similar group which grew rapidly (Aurora observed on February 21st). In the next rotation these groups had become two normal round spots, but a renewal of disturbance took place in the preceding spot on March 19th—21st, which subsided on the 24th, 25th (Aurora, March 21st). In the third rotation the preceding spot had vanished, but its companion developed most curiously into a fine group very similar to its original form between April 17th—20th (Aurora, April 24th), which group was followed through another rotation until it died away on May 17th, only to reappear again on June 1st, amid faculæ of vast extent. It finally disappeared on June 13th, leaving a great amount of

faculæ in its place. The magnets were disturbed both on February 24th and April 24th, but not on March 21st, although there were irregularities in the curves traced on the 19th and 20th.

The strong Polar shine of September 17th was coincident with the largest spot of the year, which appeared first on September 6th, attained its maximum on September 14th, and was followed through various fluctuations in size till December 6th. The magnets were disturbed on September 17th. The remarks above would seem to strengthen what was said last year, "that there is some evidence to show that the auroræ and magnetic storms synchronise rather with particular classes of spots, than with solar disturbances generally."

The zodiacal light was observed on March 18th, and a very fine display on November 14th.

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APPENDIX.

RESULTS

OF

METEOROLOGICAL OBSERVATIONS

TAKEN AT

ST. IGNATIUS' COLLEGE,

MALTA,

BY THE

REV. J. SCOLES, S.J.

1884.

ST. IGNATIUS' COLLEGE, MALTA.

Lat. 35° 55′ N. Long. 14° 29′ E. Barometer Readings reduced to 32° at Sea Level.

METEOROLOGICAL REPORT.

January—February, 1884.

Results of Observations taken during the Month.	January.	February.
Mean Reading of Barometer ..... inches	30·224	30·170
Highest ,, ,, ,,	30·494	30·448
Lowest ,, ,, ,,	29·710	29·858
Range of Barometer Readings ..... ,,	0·784	0·590
Highest Reading of Max. Therm.	62·6	67·0
Lowest ,, Min. Therm.	42·7	41·2
Range of Thermometer Readings	19·9	25·8
Greatest Range in 24 hours	16·2	19·5
Mean of all the highest Readings	58·1	61·2
Mean of all the lowest Readings	47·5	49·2
Mean Daily Range	10·6	12·0
Mean Temperature (deduced from Max. and Min.)	52·8	54·5
Mean Temperature (deduced from Dry Bulb)	51·4	53·8
Adopted Mean Temperature	52·1	54·2
Mean Temperature of Evaporation	48·1	51·4
Mean Temperature of Dew-point	44·0	48·6
Mean Elastic force of Vapour ..... inches	0·288	0·343
Mean Weight of Vapour in a cubic foot of air...grains	3·3	3·9
Mean additional weight required for saturation ,,	1·1	0·8
Mean degree of Humidity	75	81
Mean Weight of a cubic foot of air ..... grains	545·0	541·3
Fall of Rain ..... inches	2·429	0·670
Number of days on which Rain fell	9	6
Mean amount of Cloud (an overcast sky=10).....	4·0	4·1
Total number of miles of Wind indicated	8165	5956
Mean Velocity of Wind per hour ..... miles	11·0	8·5

March—April.

Results of Observations taken during the Month.	March.	April.
Mean Reading of Barometer ..... inches	29·995	29·863
Highest ,, ,, ,,	30·380	30·077
Lowest ,, ,, ,,	29·693	29·520
Range of Barometer Readings .... ,,	0·687	0·557
Highest Reading of Max. Therm.	69·2	74·2
Lowest ,, Min. Therm.	45·8	50·9
Range of Thermometer Readings	23·4	23·3
Greatest Range in 24 hours	21·9	21·7
Mean of all the highest Readings	62·4	68·7
Mean of all the lowest Reading.....	51·3	55·5
Mean Daily Range	11·1	13·2
Mean Temperature (deduced from Max. and Min.)...	55·9	61·1
Mean Temperature (deduced from Dry Bulb)	55·8	60·9
Adopted Mean Temperature	55·9	61·0
Mean Temperature of Evaporation	53·2	56·8
Mean Temperature of Dew-point	50·7	53·2
Mean Elastic force of Vapour ..... inches	0·370	0·406
Mean Weight of Vapour in a cubic foot of air...grains	4·2	4·5
Mean additional weight required for saturation ,,	0·8	1·5
Mean degree of Humidity	84	76
Mean Weight of a cubic foot of air ..... grains	536·3	526·9
Fall of Rain ..... inches	1·380	0·344
Number of days on which Rain fell	8	2
Mean amount of Cloud (an overcast sky = 10)	4·5	3·3
Total number of miles of Wind indicated	8447	8323
Mean Velocity of Wind per hour ..... miles	11·4	11·6

May—June.

Results of Observations taken during the month.	May.	June.
Mean Reading of Barometer ..... inches	30·032	29·990
Highest ,, ,, ,,	30·157	30·123
Lowest ,, ,, ,,	29·865	29·725
Range of Barometer Readings ..... ,,	0·292	0·398
Highest Reading of Max. Therm.	78·8	79·2
Lowest ,, Min. Therm.	53·0	57·4
Range of Thermometer Readings	25·8	21·8
Greatest Range in 24 hours	25·8	17·2
Mean of all the highest Readings	72·4	74·9
Mean of all the lowest Readings	59·4	62·7
Mean Daily Range	13·0	12·2
Mean Temperature (deduced from Max. and Min.)...	64·9	68·1
Mean Temperature (deduced from Dry Bulb)	64·9	67·8
Adopted Mean Temperature	64·9	68·0
Mean Temperature of Evaporation	61·5	63·4
Mean Temperature of Dew-point	58·7	59·7
Mean Elastic force of Vapour ..... inches	0·494	0·512
Mean Weight of Vapour in a cubic foot of air...grains	5·4	5·6
Mean additional weight required for saturation ,,	1·4	1·9
Mean degree of Humidity	80	75
Mean Weight of a cubic foot of air ..... grains	527·4	522·9
Fall of Rain ..... inches	0·642	0·539
Number of days on which Rain fell	5	4
Mean amount of Cloud (an overcast sky=10)	3·0	3·9
Total number of miles of Wind indicated	6896	7437
Mean Velocity of Wind per hour .... miles	9·3	10·3

July—August.

Results of Observations taken during the month.	July.	August.
Mean Reading of Barometer ..... inches	30·038	30·017
Highest ,, ,, ,,	30·172	30·124
Lowest ,, ,, ,,	29·890	29·889
Range of Barometer Readings..... ,,	0·282	0·235
Highest Reading of Max. Therm.	94·6	91·3
Lowest ,, Min. Therm.	63·2	64·3
Range of Thermometer Readings	31·4	27·0
Greatest Range in 24 hours	22·9	24·0
Mean of all the highest Readings	83·8	85·2
Mean of all the lowest Readings	68·8	70·6
Mean Daily Range	15·0	14·6
Mean Temperature (deduced from Max. and Min.) ...	75·8	77·1
Mean Temperature (deduced from Dry Bulb)	75.2	77·0
Adopted Mean Temperature	75·5	77·1
Mean Temperature of Evaporation	69·6	71·4
Mean Temperature of Dew-point	65·4	67·4
Mean Elastic force of Vapour ..... inches	0·626	0·671
Mean Weight of Vapour in a cubic foot of air...grains	6·7	7·3
Mean additional weight required for saturation ,,	2·8	2·8
Mean degree of Humidity	70	73
Mean Weight of a cubic foot of air ..... grains	515·4	513·6
Fall of Rain ..... inches	—	—
Number of days on which Rain fell	—	—
Mean amount of Cloud (an overcast sky = 10).....	0·5	1·0
Total number of miles of Wind indicated	6025	5582
Mean Velocity of Wind per hour ..... miles	8·1	7·5

September—October.

Results of Observations taken during the month.	September.	October.
Mean Reading of Barometer ..... inches	30·123	30·075
Highest ,, ,, ,,	30·294	30·362
Lowest ,, ,, ,,	29·935	29·780
Range of Barometer Readings ..... ,,	0·359	0·582
Highest Reading of Max. Therm.....	90·1	82·2
Lowest ,, Min. Therm.....	62·2	56·8
Range of Thermometer Readings	27·9	25·4
Greatest Range in 24 hours	23·9	16·2
Mean of all the highest Readings	81·2	74·9
Mean of all the lowest Readings	67·5	63·4
Mean Daily Range	13·7	11·5
Mean Temperature (deduced from Max. and Min.)...	73·5	68·2
Mean Temperature (deduced from Dry Bulb)	73·5	67·7
Adopted Mean Temperature	73·5	68·0
Mean Temperature of Evaporation	68·2	63·3
Mean Temperature of Dew-point	64·3	59·8
Mean Elastic force of Vapour ..... inches	0·603	0·514
Mean Weight of Vapour in a cubic foot of air...grains	6.6	5·6
Mean additional weight required for saturation ,,	2·4	1·8
Mean degree of Humidity	73	77
Mean Weight of a cubic foot of air ..... grains	518·9	524·8
Fall of Rain ..... inches	0·538	1·325
Number of days on which Rain fell	2	5
Mean amount of Cloud (an overcast sky = 10).....	2·0	3·8
Total number of miles of Wind indicated.....	5863	5810
Mean Velocity of Wind per hour ..... miles	8·1	7·8

November—December.

Results of Observations taken during the month.	November.	December.	Year.
Mean Reading of Barometer ..... inches	30·100	30·060	30·057
Highest ,, ,, ,,	30·293	30·466	30·494
Lowest ,, ,, ,,	29·675	29·361	29·361
Range of Barometer Readings ..... ,,	0·618	1·105	1·133
Highest Reading of Max. Therm.....	71·6	66·2	94·6
Lowest ,, Min. Therm.....	49·2	44·6	41·2
Range of Thermometer Readings.....	22·4	21·6	53·4
Greatest Range in 24 hours	16·3	17·0	25·8
Mean of all the highest Readings	66·5	61·9	70·9
Mean of all the lowest Readings	56·8	52·8	58·8
Mean Daily Range	9·7	9·1	12·1
Mean Temperature (deduced from Max. and Min.)	60·6	56·7	64·1
Mean Temperature (deduced from Dry Bulb)	60·5	56·2	63·7
Adopted Mean Temperature	60·6	56·5	63·9
Mean Temperature of Evaporation	55·5	52·8	59·6
Mean Temperature of Dew-point	51·9	50·2	56·2
Mean Elastic force of Vapour ... inches	0·386	0·364	0·453
Mean Weight of Vapour in a cubic foot of air ..... grains	4·3	4·1	5·1
Mean additional weight required for saturation ..... grains	1·5	0·9	1·6
Mean degree of Humidity	75	83	77
Mean Weight of a cubic foot of air...grs.	533·3	537·6	528·6
Fall of Rain ..... inches	5·236	4·865	17·968
Number of days on which Rain fell	12	15	68
Mean amount of Cloud (an overcast sky=10)	4·8	4·9	3·3
Total number of miles of Wind indicated	6690	8168	83362
Mean Velocity of Wind per hour	9·3	11·0	9·5

NOTES FOR THE SEPARATE MONTHS.

JANUARY.

THE Dew-point rose from 40° on the 1st to 50° on the 7th, at which value it remained till the gale of the 14th carried it down to 30° with a N.W. wind. From this figure it rose steadily to 52° on the 28th, when the high winds from the W. again lowered it to 37°.

The wind maintained a velocity of 30 miles per hour for 7 hours on the 14th, and of 33 miles per hour on the 28th.

In Sunshine the highest readings were 119·2° on the 26th, and 116·8° on the 25th.

On the ground the lowest temperatures were 38·4° on the 1st, 38.0° on the 4th, and 36·0° on the 18th.

The high Barometrical readings of the 1st, 6th, 22nd, and 31st, were accompanied by a noticeable depression of sea-level.

Fine displays of the upper glow after Sunset were seen; especially on the 4th and 5th.

FEBRUARY.

The Dew-point varied but little on either side of 50° till the 16th, when it rose to 56·3°; but the easterly winds of the 17th, 18th, and 19th, carried it steadily downwards till it reached 38·3° on the 22nd; it then rose steadily to 56·0° on the 29th. The wind maintained a velocity of 31·5 miles for 4 hours on the 19th.

In Sunshine the highest temperature was 124·5° on the 24th. 118·2° was recorded on the 23rd.

On the ground the lowest temperature was 36·0° on the 23rd. On no other day did the temperature fall below 40°.

The temperature of the sea oscillated between 59° and 61°.

In some places near to this station the potatoes that had appeared above ground were blackened by frost on the 23rd.

MARCH.

The Dew-point was very steady till the 20th, moving a little to either side of 50°. On that day it rose to 55°, the Barometer falling

rapidly, and on the following day it reached 56·7° at the same time as the Barometer fell to its lowest. The recovery of the Barometer was attended by a rapid fall of the Dew-point to 42·8° on the 22nd. From that date to the end of the month both Barometer and Dew-point were very unsteady. In Sunshine the highest temperature was 127·8° on the 19th, and 126·0° was recorded on the 9th.

On the ground the lowest temperatures were 41·5° on the 31st, and 41·6° on the 26th.

The sea remained steadily at 61°.

On the 18th potatoes in the neighbourhood were blackened by frost.

April.

The Dew-point was very unsteady all through the month, ranging between 46° and 58°. Its highest value was 59·2° on the 18th, and its lowest 46.0° on the 30th.

The wind maintained a velocity of 27 miles per hour during 7 hours on the 28th.

In Sunshine 133·3° was recorded on the 26th, and 130° on the 30th.

On the ground the lowest temperatures were 46·0° on the 6th, and 46·9° on the 21st.

The sea rose from 61° to 65°.

Potatoes began to suffer badly from blight during the first week, and those plants that were attacked were nearly all destroyed by the end of the month. Some that had been planted later than the rest escaped.

Bee-eaters, fly-catchers, and quails came on the 19th.

May.

The Dew-point was very unsteady during the first half of the month. Starting from 45·2 on the first it oscillated continually between 50° and 60°, occasionally varying as much as 10° in 4 hours. During the second half of the month it was very steady. The highest value attained was 64·6° on the 24th.

The wind averaged 24 miles per hour on the 1st from 8 a.m., to 3 p.m.

In Sunshine 142·5° was recorded on the 7th.

On the ground the lowest temperatures were 46·5° on the 5th, and 48° on the 4th.

The sea rose from 65° to 71°.

Date-palms flowered during the first week; caper, prickly-pear, and oleander in the third week.

Sand-flies appeared on the 27th.

JUNE.

From the 1st to the 21st the Dew-point varied continually, ascending and descending between 50° and 65°. After the 23rd it became more steady, but was always above 61°

The highest for the month was 67·5 on the 18th, the lowest 49·6° on the 20th.

The wind averaged 26 miles per hour from 3 p.m., to 7 p.m., on the 19th.

In Sunshine 137·8° was recorded on the 18th.

On the ground the lowest temperature was 52·5° on the 14th.

The sea rose from 70° to 74°.

The day temperatures were decidedly lower than last year, the mean of the highest readings being 5° below the value for last year.

The upper glow after Sunset which began last November has not yet ceased. Its colour has become a pale rose, and it is visible half an hour after Sunset.

JULY.

The Dew-point remained about 63° till the 8th, when it rose above 70° and reached 74·6° on the 18th. On the 21st it again descended, dropping 10° in 24 hours and reached its lowest value 54·7° on the 29th. From the 9th to the 18th the weather was very oppressive.

The wind averaged 28 miles per hour from noon to 3 p.m., on the 20th.

In Sunshine 142·6° was recorded on the 18th.

The sea rose to 83° on the 20th and fell to 77° by the 28th.

The sea and Dew-point temperatures have ranged higher than last year, and Barometric pressure has been less regular.

The mean of maxima in Sunshine was 136·5°, last year it was 139·3°.

AUGUST.

The Dew-point was very steady with the exception of a sudden drop and recovery of 8° on the 8th, 9th, and 13th. The highest value reached was 72·9° on the 22nd, and lowest 58·0° on the 9th.

The wind averaged 26 miles per hour from 4 p.m., to 6.30 p.m., on the 30th.

In Sunshine 149·0° was recorded on the 22nd.

The sea rose again to 82° by the 12th, then fell to 79° by the end of the month.

The sea and Dew-point temperatures are higher than those of last year.

The upper glow at Sunset still continues in the same form as last month.

SEPTEMBER.

The Dew-point rose to 70° on the 2nd, and remained steadily at 70° till the 5th, when it fell rapidly to 54·2°. at 3 p.m. It regained its former position by the 13th, but immediately receded to 60°. On the 25th and 26th it again stood at 70° and reached 72·1° on the 27th. On the 28th it dropped rather suddenly to 56°, rising afterwards to 62°.

The wind averaged 23·5 miles per hour from 8 a.m., to 3 p.m., on the 5th. The sea was very free from disturbance during the month, and salt-water mosquitoes were unusually abundant in consequence of the pools of sea-water on the rocks being left undisturbed.

In Sunshine 140·3° was recorded on the 11th.

On the ground the lowest temperature was 57·6° on the 22nd.

The sea fell from 78° to 76° by the 10th, and remained at 76° till the end of the month.

A thunderstorm passed on the 13th at 9 a.m. and lightning was seen on the 11th and 12th.

The upper glow after Sunset was seldom seen.

OCTOBER.

The Dew-point remained at 60° till the 6th, on the 7th and 8th it stood at 71°, and on the 9th it fell rapidly to 55°. On the 14th it was again close to 70°, and on the 15th and 16th it was down to 52° and 51° During the rest of the month it made two long oscillations between 63° and 53.°

The wind averaged 22 miles per hour, from 8 a.m., to noon on the 28th.

In Sunshine 131·9° was recorded on the 2nd.

On the ground the lowest temperature was 51.3° on the 30th.

The sea fell from 77° to 72°.

Thunder and lightning were observed on the 3rd, 6th, 12th, and 27th; lightning alone on the 2nd, 7th, 8th, 10th, 21st, and 23rd.

On the 7th a terrible cyclone broke on Catania, the disturbance being marked here by two slight depressions on the 7th and 8th, succeeded by an abrupt rise and fall of 0·2 inch; the wind on the 7th averaging 7 miles per hour and veering from S.E. to N.

The rainfall was very unevenly distributed, good rains falling in the centre of the island and on its south side, and but little on the north-east coast.

NOVEMBER.

The Dew-point rose gradually to 60·2° on the 6th, falling immediately after to 50° on the 13th and 14th; it rose again from 50° to 60°, falling back on the 15th to 50°. On the 16th, and again on the

20th, 56° was reached during very heavy rains, and during the last 10 days the oscillations were more rapid, and between 57° and 41·6°.

The wind rose to 42 miles per hour on the 16th from the East, and to 30 miles per hour on the 30th, from the North West.

In Sushine 118·2° was recorded on the 1st and 12th

On the ground the lowest temperature was 44·0° on the 22nd.

The sea fell from 72° to 65°.

Thunderstorms passed on the 13th, 16th, and 20th.

Hail fell on the 24th.

The rosy upper glow reappeared after Sunset on the 28th well marked.

DECEMBER.

The Dew-point touched 58·7° on the 4th, and from the 6th to the 16th remained steadily at 51°. After a couple of oscillations it went down to 40·1° on the 23rd, and recovered its place at 50° at the end of the month.

The wind averaged 32 miles per hour, from 8 a.m., to noon on the 3rd.

In Sunshine 109·4° was recorded on the 9th.

On the ground the lowest temperature was 37·9° on the 23rd and 27th.

Thunderstorms occurred on the 17th and 24th.

Hail fell on the 22nd and 24th.

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