STONYHURST COLLEGE

OBSERVATORY.

RESULTS

OF

METEOROLOGICAL AND MAGNETICAL OBSERVATIONS,

BY THE

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INTRODUCTION.

On the 29th of August the Director of Stonyhurst Observatory, along with the Rev. W. Sidgreaves and Mr. W. Carlisle, sailed for the Cape of Good Hope, on their way to the S.W. of Madagascar, the most easterly station chosen by the British Government for the observation of the Transit of Venus across the Sun's disk, on December 6, 1882.

The Rev. J. New took charge of the Observatory during the absence of the Director, and all the routine work in meteorology, magnetism, and astronomy, was thus enabled to be carried on during the remainder of the year.

The chief astronomical work of 1882, independent of the preparations for the Transit of Venus at Madagascar, was the series of observations of solar spots and faculæ, and the measures of the height and extent of the sun's chromosphere and prominences. 227 drawings were made of the entire solar surface, on 186 different days, besides a number of enlarged pictures of remarkable spots. The chromosphere was measured completely on 70 days, and partially on 4 others. Some spot spectra have also been observed occasionally, but the staff remaining at the Observatory did not allow of any systematic work of this description during the absence of the Expedition to

Madagascar. A summary of the chromospheric observations has been published in "Copernicus."

Three complete occultations of stars by the moon were observed during the year, and twenty-four separate phenomena of Jupiter's satellites, including six of the third satellite. These have appeared in the Monthly Notices of the Royal Astronomical Society.

Positions were taken on several nights of the great comet and of comparison stars, but these have not been printed on account of the numerous observations by other astronomers in every part of the world.

Greater attention than before was paid to the determination of meteor radiants, and a list of the meteors observed has been forwarded to Mr. W. F. Denning for comparison with observations at other stations.

The usual routine work in meteorology and in terrestrial magnetism has been considerably increased this year by the arrangements made with Professor Wild of St. Petersburg for taking part in the series of observations connected with the Arctic Observatories. The international programme has been carried out at this Observatory, a complete set of Determinations of the Magnetic Dip, Declination, and Intensity, on the 1st and 15th of each month, forming part of the programme.

The Auroral displays being more marked than usual this year, a separate account of those observed at Stonyhurst has been drawn up by the Rev. A. Cortie, and appended to this Report.

Besides the publications of the Meteorological Office of the Board of Trade, which contain the hourly readings of our meteorological curves, the Registrar General prints a monthly summary of our results.

The daily mean values of the hourly measures of our photographic records are sent in monthly tables to the Meteorological Society of France, and our Synchronous readings of the meteorological instruments are forwarded to the Washington Observatory through the Office of the Board of Trade.

A new series of observations of water temperatures has been started during the year.

A number of the more advanced students of the College have this year availed themselves of the Observatory to learn the practical use of astronomical instruments, and also to acquire a familiarity with spectroscopy and photography.

The Director of the Cuba Observatory has spent a considerable time at Stonyhurst examining the instruments and methods of observation, and he has ordered a large supply of the best instruments for research in meteorology, magnetism, and astronomy, from Casella, Elliott, Cooke, and Hilger.

Stonyhurst Observatory.

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

METEOROLOGICAL REPORT.

January, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·858	29·432
Highest ,, on the 18th	30·480	30·034
Lowest ,, on the 29th	28·484	28·596
Range of Barometer Readings	1·996	1·438
Highest Reading of a Max. Therm. on the 4th, 9th, 13th	50·0	51·6
Lowest Reading of a Min. Therm. on the 29th	32·6	20·8
Range of Thermometer Readings	16·5	30·8
Mean of all the Highest Readings	45·6	42·1
Mean of all the Lowest	37·2	32·6
Mean Daily Range	8·4	9·5
Deduced Monthly Mean (from Mean of Max. and Min.)	41·2	37·2
Mean Temperature from dry bulb	40·5	37·4
Adopted Mean Temperature	40·9	37·3
Mean Temperature of Evaporation	39·7	35·9
Mean Temperature of Dew Point	38·2	33·8
Mean elastic force of Vapour	0·231 in	0·196 in
Mean weight of Vapour in a cubic foot of air	1·9gr	2·3gr
Mean additional weight required for saturation	0·3gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·90	0·86
Mean weight of a cubic foot of air	552·8gr	549·4gr
Fall of Rain	4·054 in	4·102 in
Number of days on which Rain fell	17	20·0
Amount of Evaporation	1·724 in	0·791 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	2	0	1	6	6	15	1
Mean Velocity in miles per hour	0	22·5	0	12·3	5·7	10·0	11·6	1·6
Total No. of miles for each Direction	0	641	0	294	819	1442	4188	38

The total number of miles registered during the month was 7422.

The max. Velocity of the wind was 41 miles per hour; direction W. by S. on the 6th at noon.

Mean amount of Cloud (an overcast sky being indicated by 10·0)	9·5
In the month of January, the highest reading of the Barometer during 35 years, was on the 18th, in 1882, and was	30·480
The lowest ,, ,, 15th, 1865	27·939
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 was high, and its range very large for the month.

The Thermometer was only slightly in excess of the mean of previous years, but the range of Temperature scarcely exceeded half the mean for the month.

The prevailing wind was W. by S.W.

February, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·712	29·484
Highest ,, on the 19th	30·348	30·082
Lowest ,, on the 26th	28·484	28·659
Range of Barometer Readings	1·864	1·423
Highest Reading of a Max. Therm. on the 21st	56·0	51·8
Lowest Reading of a Min. Therm. on the 1st	26·6	22·9
Range of Thermometer Readings	29·4	28·9
Mean of all the Highest Readings	47·4	44·1
Mean of all the Lowest	37·6	34·0
Mean Daily Range	9·8	10·1
Deduced Monthly Mean (from Mean of Max. and Min.)	42·1	38·7
Mean Temperature from dry bulb	42·3	38·7
Adopted Mean Temperature	42·2	38·7
Mean Temperature of Evaporation	40·1	36·9
Mean Temperature of Dew Point	37·5	35·0
Mean elastic force of Vapour	0·225 in	0·191 in
Mean weight of Vapour in a cubic foot of air	2·6 gr	2·4 gr
Mean additional weight required for saturation	0·5 gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·84	0·87
Mean weight of a cubic foot of air	548·5 gr	548·4 gr
Fall of Rain	3·371 in	3·759 in
Number of days on which Rain fell	19	18·1
Amount of Evaporation	1·849 in	0·942 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	1	1	1	2	3	8	11	1
Mean Velocity in miles per hour	2·5	11·2	14·4	5·9	6·5	11·4	15·3	5·4
Total No. of miles for each Direction	61	268	345	142	464	2190	4049	129

The total number of miles registered during the month was 7648.

The max. Velocity of the wind was 45 miles per hour, at 5 a.m. on the 17th, direction W.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			9·2
In the month of February, the highest reading of the Barometer during 35 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

The mean Barometer was again high, and the range large. The Thermometer readings also remain above the mean. Prevailing wind W. by S.W.

March, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·488	29·465
Highest ,, on the 5th	30·178	30·076
Lowest ,, on the 1st	28·399	28·693
Range of Barometer Readings	1·779	1·383
Highest Reading of a Max. Therm. on the 17th, 18th	59·0	56·5
Lowest Reading of a Min. Therm. on the 22nd	29·1	23·4
Range of Thermometer Readings	29·9	33·1
Mean of all the Highest Readings	50·9	47·0
Mean of all the Lowest	38·5	34·5
Mean Daily Range	12·4	12·5
Deduced Monthly Mean (from Mean of Max. and Min.)	43·7	39·8
Mean Temperature from dry bulb	43·5	40·0
Adopted Mean Temperature	43·6	39·9
Mean Temperature of Evaporation	41·9	38·1
Mean Temperature of Dew Point	39·9	35·7
Mean elastic force of Vapour	0·247 in	0·208 in
Mean weight of Vapour in a cubic foot of air	2·8gr	2·4gr
Mean additional weight required for saturation	0·4gr	0·5gr
Mean degree of Humidity (saturation 1·00)	0·87	0·85
Mean weight of a cubic foot of air	542·8gr	546·3gr
Fall of Rain	5·413 in	3·188 in
Number of days on which Rain fell	22	18·1
Amount of Evaporation	3·113 in	1·748 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	2	11	0	1	1	8	17	1
Mean Velocity in miles per hour	11·4	11·4	0	3·5	4·6	15·6	12·7	20·6
Total No. of miles for each Direction	547	274	0	84	110	2998	5198	495

The total number of miles registered during the month was 9706.

The max. Velocity of the wind was 36 miles per hour, direction N.W., at 11 a.m. on the 26th.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·6
In the month of March, the highest reading of the Barometer during 35 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 large, the adopted mean Temperature high, and the Rainfall heavy. The prevailing wind was again W. by S.W.

April, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·339	29·478
Highest ,, on the 7th	30·035	29·962
Lowest ,, on the 13th	28·616	28·766
Range of Barometer Readings	1·419	1·196
Highest Reading of a Max. Therm. on the 19th	62·2	66·4
Lowest Reading of a Min. Therm. on the 8th & 15th	29·6	28·8
Range of Thermometer Readings	32·6	37·6
Mean of all the Highest Readings	54·5	54·0
Mean of all the Lowest	41·0	38·2
Mean Daily Range	13·5	15·8
Deduced Monthly Mean (from Mean of Max. and Min.)	46·2	44·6
Mean Temperature from dry bulb	45·2	44·7
Adopted Mean Temperature	45·7	44·7
Mean Temperature of Evaporation	42·8	41·9
Mean Temperature of Dew Point	39·5	38·7
Mean elastic force of Vapour	0·243 in	0·236 in
Mean weight of Vapour in a cubic foot of air	2·8gr	2·7gr
Mean additional weight required for saturation	0·8gr	0·7gr
Mean degree of Humidity (saturation 1·00)	0·79	0·80
Mean weight of a cubic foot of air	537·8gr	541·5gr
Fall of Rain	5·657 in	2·383 in
Number of days on which Rain fell	15	15
Amount of Evaporation	2·197 in	2·512 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	5	8	1	1	5	8	1
Mean Velocity in miles per hour	10·6	8·8	13·4	5·9	5·2	9·5	15·3	9·6
Total No. of miles for each Direction	254	1033	2570	141	125	1134	2945	231

The total number of miles registered during the month was 8453.

The max. Velocity of the wind was 36 miles per hour, direction W., on the 24th at 6 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·0
In the month of April, the highest reading of the Barometer during 35 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

The range of Barometer readings still continued large, and the amount of Rain heavy.

The wind was variable, blowing from opposite quarters W. by S.W. and E. by N.E.

May, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·618	29·533
Highest ,, on the 17th	30·070	29·961
Lowest ,, on the 24th	28·860	28·967
Range of Barometer Readings	1·210	0·994
Highest Reading of a Max. Therm. on the 18th	73·0	71·9
Lowest Reading of a Min. Therm. on the 14th	36·1	31·6
Range of Thermometer Readings	36·9	40·3
Mean of all the Highest Readings	63·1	59·8
Mean of all the Lowest	45·9	42·3
Mean Daily Range	17·2	17·5
Deduced Monthly Mean (from Mean of Max. and Min.)	52·8	49·4
Mean Temperature from dry bulb	50·9	49·6
Adopted Mean Temperature	51·9	49·5
Mean Temperature of Evaporation	47·9	46·3
Mean Temperature of Dew Point	43·9	42·9
Mean elastic force of Vapour	0·288 in	0·277 in
Mean weight of Vapour in a cubic foot of air	3·3gr	3·2gr
Mean additional weight required for saturation	1·1gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·74	0·76
Mean weight of a cubic foot of air	535·7gr	536·8gr
Fall of Rain	2·763 in	2·584 in
Number of days on which Rain fell	11	15·2
Amount of Evaporation	3·593 in	3·566 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	8	6	1	5	1	9	1
Mean Velocity in miles per hour	0	8·0	8·7	4·2	14·3	9·6	8·8	10·9
Total No. of miles for each Direction	0	1534	1183	100	1714	230	1911	261

The total number of miles registered during the month was 6933.

The max. Velocity of the wind was 36 miles per hour, direction E. by S., on the 20th at 11 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			5·6
In the month of May, the highest reading of the Barometer during 35 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 range of Barometer readings remained above the average, and the mercury in the Thermometer stood slightly higher than in previous years.

Wind very variable.

June, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·452	29·519
Highest ,, on the 1st	29·956	29·868
Lowest ,, on the 9th	28·922	29·001
Range of Barometer Readings	1·034	0·867
Highest Reading of a Max. Therm. on the 25th	73·0	76·6
Lowest Reading of a Min. Therm. on the 12th	44·1	39·1
Range of Thermometer Readings	28·9	37·5
Mean of all the Highest Readings	63·8	65·2
Mean of all the Lowest	51·1	48·1
Mean Daily Range	12·7	17·1
Deduced Monthly Mean (from Mean of Max. and Min.)	55·7	54·9
Mean Temperature from dry bulb	52·8	54·7
Adopted Mean Temperature	54·3	54·8
Mean Temperature of Evaporation	51·5	52·1
Mean Temperature of Dew Point	48·2	48·9
Mean elastic force of Vapour	0·336 in	0·358 in
Mean weight of Vapour in a cubic foot of air	3·8gr	3·9gr
Mean additional weight required for saturation	1·0gr	0·9gr
Mean degree of Humidity (saturation 1·00)	0·79·	0·79
Mean weight of a cubic foot of air	529·9gr	545·1gr
Fall of Rain	6·066 in	3·551 in
Number of Days on which Rain fell	20	17·5
Amount of Evaporation	2·856 in	3·719 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	1	0	3	1	1	5	13	6
Mean Velocity in miles per hour	14·3	0	10·0	8.5	4·6	10·4	10·2	9.9
Total No. of miles for each Direction	343	0	720	205	111	1250	3196	1661

The total number of miles registered during the month was 7486.

The max. Velocity of the wind was 40 miles per hour, direction W., at 2 p.m. on the 14th.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	8·0
In the month of June, the highest reading of the Barometer during 35 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 range still above the mean.

Rainfall very heavy.

July, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·369	29·504
Highest ,, on the 26th	30·010	29·879
Lowest ,, on the 6th	28·750	28·996
Range of Barometer Readings	1·260	0·873
Highest Reading of a Max. Therm. on the 1st	76·8	78·8
Lowest Reading of a Min. Therm. on the 30th	47·9	42·6
Range of Thermometer Readings	28·9	36·2
Mean of all the Highest Readings	67·5	67·9
Mean of all the Lowest	53·4	51·1
Mean Daily Range	14·1	16·8
Deduced Monthly Mean (from Mean of Max. and Min.)	58·6	57·5
Mean Temperature from dry bulb	56·6	57·9
Adopted Mean Temperature	57·6	57·7
Mean Temperature of Evaporation	54·9	55·1
Mean Temperature of Dew Point	51·7	52·5
Mean elastic force of Vapour	0·384 in	0·396 in
Mean weight of Vapour in a cubic foot of air	4·3gr	4·5gr
Mean additional weight required for saturation	1·1gr	0.9gr
Mean degree of Humidity (saturation 1·00)	0·80	0·82
Mean weight of a cubic foot of air	524·7gr	527·1gr
Fall of Rain	7·886 in	4·295 in
Number of days on which Rain fell	24	17·8
Amount of Evaporation	3·778 in	4·068 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	0	2	0	6	11	11	1
Mean Velocity in miles per hour	0	0	4·1	0	13·6	9·9	8·3	9·7
Total No. of miles for each Direction	0	0	196	0	1960	2613	2179	232

The total number of miles registered during the month was 7180.

The max. Velocity of the wind was 29 miles per hour, direction S.S.W., at 10 p.m. on the 13th, and S., at 3 p.m. on the 21st.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·5
In the month of July, the highest reading of the Barometer during 35 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

An increase in the range of the mean Barometer.

Rainfall excessive. Wind S.W.

August, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·449	29·484
Highest ,, on the 4th	29·886	29·889
Lowest ,, on the 23rd	28·690	28·948
Range of Barometer Readings	1·196	0·949
Highest Reading of a Max. Therm. on the 10th	76·5	77·1
Lowest Reading of a Min. Therm. on the 23rd	47·6	41·8
Range of Thermometer Readings	18·9	35·3
Mean of all the Highest Readings	66·5	67·2
Mean of all the Lowest	54·0	51·0
Mean Daily Range	12·5	16·2
Deduced Monthly Mean (from Mean of Max. and Min.)	58·6	57·5
Mean Temperature from dry bulb	56·8	57·5
Adopted Mean Temperature	57·7	57·5
Mean Temperature of Evaporation	54·4	54·7
Mean Temperature of Dew Point	51·3	52·1
Mean elastic force of Vapour	0·378 in	0·392 in
Mean weight of Vapour in a cubic foot of air	4·2 gr	4·3 gr
Mean additional weight required for saturation	1·1 gr	0·9 gr
Mean degree of Humidity (saturation 1·00)	0·80	0·83
Mean weight of a cubic foot of air	526·9 gr	527·1 gr
Fall of Rain	5·332 in	4·955 in
Number of days on which Rain fell	16	19·4
Amount of Evaporation	2·543 in	3·112 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	0	1	0	1	1	7	19	2
Mean Velocity in miles per hour	0	6·9	0	3·2	5·7	6·9	11·7	7·6
Total No. of miles for each Direction	0	166	0	77	137	1153	5330	366

The total number of miles registered during the month was 7229.

The max. Velocity of the wind was 35 miles per hour; direction W. at 2 p.m. on the 21st.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·0
In the month of August, the highest reading of the Barometer during 35 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			61·0
The lowest	,,	,, 1848	52·5

Barometer range still high, and temperature range small. Wind W. by S.W.

September, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·438	29·506
Highest ,, on the 7th	30·029	30·031
Lowest ,, on the 27th	28·866	28·842
Range of Barometer Readings	1·163	1·189
Highest Reading of a Max. Therm. on the 7th	66·4	72·1
Lowest Reading of a Min. Therm. on the 11th	37·8	36·9
Range of Thermometer Readings	28·6	35·2
Mean of all the Highest Readings	61·7	62·2
Mean of all the Lowest	45·6	47·1
Mean Daily Range	16·1	15·1
Deduced Monthly Mean (from Mean of Max. and Min.)	53·7	53·4
Mean Temperature from dry bulb	53·1	54·0
Adopted Mean Temperature	53·4	53·7
Mean Temperature of Evaporation	50·6	51·1
Mean Temperature of Dew Point	47·1	48·5
Mean elastic force of Vapour	0·323 in	0·342 in
Mean weight of Vapour in a cubic foot of air	3·6gr	3·9gr
Mean additional weight required for saturation	0·8gr	0·8gr
Mean degree of Humidity (saturation 1·00)	0·7	0·82
Mean weight of a cubic foot of air	532·1gr	531·8gr
Fall of Rain	3·116 in	4·530 in
Number of days on which Rain fell	15	18·5
Amount of Evaporation	1·516 in	2·280 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	4	2	1	1	3	5	10	4
Mean Velocity in miles per hour	5·3	13·4	7·7	2·7	10·9	8·3	6·2	3·4
Total No. of miles for each Direction	506	641	185	64	783	1000	1498	330

The total number of miles registered during the month was 5007.

The max. Velocity of the wind was 27 miles per hour, direction S. and S.W., at 5 p.m., on the 1st, and 7 a.m. on the 2nd.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			6.7
In the month of September, the highest reading of the Barometer during 35 years, was on the 15th, in 1851, and was			30·274
The lowest	,,	,, 22nd, 1863	28·371
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

Range of temperature small.

Rainfall below average.

October, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·411	29·416
Highest ,, on the 5th	30·189	29·995
Lowest ,, on the 22nd	28·756	28·641
Range of Barometer Readings	1·433	1·354
Highest Reading of a Max. Therm. on the 1st	66·0	64·6
Lowest Reading of a Min. Therm. on the 25th	30·0	29·5
Range of Thermometer Readings	36·0	35·1
Mean of all the Highest Readings	55·6	54·7
Mean of all the Lowest	42·8	42·1
Mean Daily Range	12·8	12·6
Deduced Monthly Mean (from Mean of Max. and Min.)	48·2	47·4
Mean Temperature from dry bulb	49·0	48·0
Adopted Mean Temperature	48·6	47·7
Mean Temperature of Evaporation	46·3	45·5
Mean Temperature of Dew Point	43·8	43·1
Mean elastic force of Vapour	0·287 in	0·280 in
Mean weight of Vapour in a cubic foot of air	3·2gr	3·2gr
Mean additional weight required for saturation	0·7gr	0·6gr
Mean degree of Humidity (saturation 1·00)	0·84	0·85
Mean weight of a cubic foot of air	535·7gr	543·4gr
Fall of Rain	4·689 in	5·225 in
Number of days on which Rain fell	23	21·1
Amount of Evaporation	2·930 in	1·702 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	5	6	4	2	3	6	3	2
Mean Velocity in miles per hour	5·6	9·1	8·8	8·1	12·2	9·0	7·8	7·1
Total No. of miles for each Direction	678	1310	842	390	881	1303	563	339

The total number of miles registered during the month was 5306.

The max. Velocity of the wind was 37 miles per hour, direction S., at 3 p.m. on the 1st.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			9·0
In the month of October, the highest reading of the Barometer during 35 years, was on the 6th, in 1877, and was			30·282
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

Wind very variable, N.E. and S.W. being somewhat in excess.

The general values for the month differ very slightly from the mean of previous years.

November, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·194	29·449
Highest ,, on the 13th	29·788	30·049
Lowest ,, on the 8th	28·505	28·589
Range of Barometer Readings	1·283	1·460
Highest Reading of a Max. Therm. on the 1st	55·0	55·6
Lowest Reading of a Min. Therm. on the 17th	25·5	25·4
Range of Thermometer Readings	29·5	30·2
Mean of all the Highest Readings	46·9	46·9
Mean of all the Lowest	34·7	36·2
Mean Daily Range	12·2	10·7
Deduced Monthly Mean (from Mean of Max. and Min.)	40·4	41·2
Mean Temperature from dry bulb	41·1	41·3
Adopted Mean Temperature	40·8	41·3
Mean Temperature of Evaporation	39·0	38·9
Mean Temperature of Dew Point	36·9	37·6
Mean elastic force of Vapour	0·218 in	0·225 in
Mean weight of Vapour in a cubic foot of air	2·5gr	2·6gr
Mean additional weight required for saturation	0·4gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·86	0·87
Mean weight of a cubic foot of air	540·8gr	544·5gr
Fall of Rain	8·127 in	4·255 in
Number of days on which Rain fell	24	19·3
Amount of Evaporation	3·435 in	1·490 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	3	4	0	3	4	3	11	2
Mean Velocity in miles per hour	3·5	7·9	0	13·4	15·8	20·6	17·0	9·2
Total No. of miles for each Direction	252	671	0	969	1517	1481	4476	440

The total number of miles registered during the month was 9896.

The max. Velocity of the wind was 48 miles per hour, direction W. by S., on the 2nd at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...	7·6
In the month of November, the highest reading of the Barometer during 35 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

The Rainfall was greatly in excess of former years.

Prevailing wind W. by S.W.

December, 1882.

Results of Observations taken during the month.		Mean for the last 35 years.
Mean Reading of the Barometer	29·223	29·443
Highest ,, on the 20th	29·790	30·052
Lowest ,, on the 31st	28·324	28·596
Range of Barometer Readings	1·466	1·456
Highest Reading of a Max. Therm. on the 28th	53·0	52·9
Lowest Reading of a Min. Therm. on the 10th	17·0	20·4
Range of Thermometer Readings	36·0	32·5
Mean of all the Highest Readings	42·0	42·8
Mean of all the Lowest	32·3	33·4
Mean Daily Range	9·7	9·4
Deduced Monthly Mean (from Mean of Max. and Min.)	37·7	38·1
Mean Temperature from dry bulb	37·1	38·8
Adopted Mean Temperature	37·3	38·5
Mean Temperature of Evaporation	35·7	37·3
Mean Temperature of Dew Point	33·3	35·3
Mean elastic force of Vapour	0·191 in	0·208 in
Mean weight of Vapour in a cubic foot of air	2·2 gr	2·4 gr
Mean additional weight required for saturation	0·4 gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·83	0·87
Mean weight of a cubic foot of air	545·1 gr	547·6 gr
Fall of Rain	3·751 in	4·535 in
Number of days on which Rain fell	21	20·5
Amount of Evaporation	1·711 in	1·006 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	2	14	0	1	2	4	6	2
Mean Velocity in miles per hour	18·2	6·3	0	4·9	11·5	11·8	13·4	10·9
Total No. of miles for each Direction	874	2107	0	118	553	1134	1924	525

The total number of miles registered during the month was 5235.

The max. Velocity of the wind was 40 miles per hour, direction S.W., at 9 p.m. on the 2nd.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·4
In the month of December, the highest reading of the Barometer during 35 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

The amount of Evaporation was large for the month.

The wind varied from N.E. by N. to W. by S.W.

Summary of the Observations

FOR 1882.

		Mean for the last 35 years.
Mean Reading of the Barometer	29·463	29·482
Highest ,, on January 18th	30·480	30·287
Lowest ,, on December 31st	28·324	28·272
Range of Barometer Readings	2·156	2·015
Highest Reading of a Max. Therm. on July 1st	76·8	81·6
Lowest Reading of a Min. Therm. on December 10th	17·0	15·5
Range of Thermometer Readings	59·8	66·1
Mean of all the Highest Readings	55·5	54·7
Mean of all the Lowest	43·3	40·9
Mean Daily Range	12·2	13·8
Deduced Yearly Mean (from Mean of Max. and Min.)	48·2	46·7
Mean Temperature of dry bulb	47·4	46·9
Adopted Mean Temperature	47·8	46·9
Mean Temperature of Evaporation	45·4	44·6
Mean Temperature of Dew Point	42·6	42·1
Mean elastic force of Vapour	0·279 in	0·276 in
Mean weight of Vapour in a cubic foot of air	3·1 gr	3·3 gr
Mean additional weight required for saturation	0·7 gr	0·7 gr
Mean degree of Humidity (saturation 1·00)	0·83	0·84
Mean weight of a cubic foot of air	537·7 gr	539·1 gr
Total Fall of Rain in the Year	60·175 in	47·931 in
Number of days per Month on which Rain fell	18·8	18·4
Amount of Evaporation	31·505 in	27·947 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 November, 1859, and was		2·290
The least ,, ,,	in July, 1852, and was	0·505
The highest reading of the Barometer, during 35 years, was on January 18th, 1882, and was		30·480
The lowest ,, ,,	on July 22nd, 1873, and was	27·939
Extreme range		2·541
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

The greatest hourly velocity of the wind ever recorded was 58 miles, direction S. by E., on February 7, 1881.

The high reading of the Barometer in January was very remarkable, being 0.028 in excess of any previous record.

The Temperature during the summer months never exceeded 76°·8, but the adopted mean for the year was above the average.

The amount of Rain was very heavy, yet the number of days on which rain fell scarcely passed the usual figure.

DATES OF OCCASIONAL PHENOMENA.

1882.	Frost.	Hoar frost only.	Snow.	Hail.
January	3, 8, 24, 26, 28, 29		29	4, 7
February	1, 3, 8, 15, 18	2, 4		15
March	3, 6, 10—12, 13, 15, 20, 21	11	21	6, 21
April	7--10, 15, 26	8—10, 27	29	25
May	14, 16	12, 16		1
June				12
July				
August				
September				
October	30	26		
November	9—22, 24—30	12—14, 30	27	19, 26, 27
December	1, 2, 4—15, 23, 24	1, 9—11	2, 6, 13	

1882.	Heavy Rain.	Fog.	Thunder.	Lightning.	Lunar Halo.	Solar Halo.
January		16, 18, 19			23, 28	
February						
March		4, 11, 17				
April	13, 30		30	30		21
May	1, 4, 27		1, 3, 27	13		
June	3, 4, 6, 13, 23, 24		4, 6, 24—26, 30	4, 6		
July	6, 7, 18, 21, 24		6, 7, 18, 19, 23	7, 18, 19	26	12
August		9	13, 14	13		
September		13, 18			28	
October		9, 10		22	28	
November	3, 8	7	8	5, 8, 12	20	21, 28
December						

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	1·5	1·2	0	1·0	3·1	1·2	0	4·2	0	0	0·2	2.2	0	0	0	0
February	1·2	0	0	0	0	0	0·9	0·9	0	0	2·1	3·4	0	4·9	2·1	0	0
March	0	0	2·1	0	1·4	5·8	0	0	0·2	0	1·7	7·1	2·0	3·3	8·8	7·2	4·8
April	1·8	2·9	1·8	6·9	0	5·3	11·2	12·0	11·1	9·5	6·8	2·1	0	0	1·0	3·7	0
May	3·2	9·2	0·9	7·8	9·9	13·4	2·9	4·3	0	12·2	9·1	13·6	13·6	13·8	5·5	13·2	13·5
June	13·6	3·9	1·4	1.8	3·2	8·4	5·2	0·4	4·1	5·3	11·8	6·0	2·9	4·4	9·6	11·4	0
July	9·8	7·4	2·1	0	4·4	2·2	7·1	7·2	9·0	8·0	0.5	9.3	0	4·7	4·3	4·8	3·9
August	0	3·8	9·7	8·6	5·3	9·4	9·0	9·3	7·2	11·7	11·6	5·8	3·5	2·5	1·7	10·1	1·0
September	0	0	0·5	2·4	1·2	7·9	9·7	1·3	2·5	1·4	6·5	8·0	8·0	0	8·7	4·9	1·2
October	0·9	7·3	3·9	0	4·8	5·9	0	1·9	4·6	0·5	0	0	0	1·9	0	0·7	0.3
November	0	0·3	2·7	3·2	0	0·2	0	1·9	3·8	2·5	6·7	4·8	4·1	3·0	1·9	0	2·1
December	0	0	0	0	0	0	0·6	1·2	0	4·9	0	0	0	0	0	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 cent. each Month.
January	0	0	0	0	0	0	0	2·7	0	0	0	0	2·6	0	19·9	13·3
February	0	7·6	0	5·3	0·9	0·3	0	0	0	0	0	0	0	0	29·6	11·7
March	6·6	1·5	0·2	4·0	10·1	0	0	3·3	8·3	0·3	0	0	0	0	78·7	23·1
April	8·1	0·7	9·0	3·8	0	0	4·7	8·7	2·9	8·2	0	4·2	6·8	0	133·2	32·9
May	12·8	14·7	12·3	8·4	12·5	3·9	0·2	2·7	3·4	5·9	7·8	11·1	6·4	8·7	256·9	54·6
June	3·5	6·7	7·3	3·3	0	4·8	8·0	3·7	3·3	12·8	5·8	9·7	6·7	0	166·0	34·6
July	5·1	8·1	7·8	0·2	1·0	3·0	7·5	5·4	9·3	0·6	8·7	11·3	4·7	1·5	158·9	33·7
August	4·4	7·2	4·5	5·7	0·1	2·4	2·3	4·1	6·3	1·0	0·8	3·8	8·3	0·3	161·4	36·7
September	5·6	0·3	1·4	1·7	6·3	0	9.0	0	5·3	1·6	8·1	4·5	0·5	0	100·4	30·0
October	3·1	1·5	0	0	1·1	5·1	0	7·1	2·2	1·6	1·8	4·8	0·2	3·7	64·9	21·0
November	1·8	0	0	1·3	0	0	0	1·5	1·8	1·6	2·7	2·4	4·0	0	54·3	22·6
December	0	0	0	0	1·8	5·0	1·0	0	0	0	0	0	0	0	14·5	7·8

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	0·8	2·8	3·9	5·5	3·7	2·6	0·6	0	0	0	0	0
February	0	0	0	0·4	1·7	2·3	2·4	4·4	4·0	6·1	4·4	3·2	0·7	0	0	0	0
March	0	0	0·9	3·3	5·6	7·9	7·9	7·1	8·5	9·2	9·9	10·3	6·9	1·3	0	0	0
April	0	1·1	4·9	9·7	11·6	13·1	15·4	13·9	12·5	12·3	11·6	10·6	9·2	6·6	0·7	0	0
May	1·7	10·9	12·8	16·3	20·9	22·4	23·4	20·9	21·5	21·4	19·5	17·0	16·2	16·2	12·4	3·4	0
June	3·0	5·3	7·0	9·2	11·5	10·4	10·8	12·2	15·3	15·9	13·5	13.3	12·8	10·6	10·5	4·7	0
July	0·6	4·7	7·5	8·2	7·2	8·0	8·4	10·0	13·8	15·4	14·4	15·7	16·3	13·1	11·4	4·2	0
August	0·1	1·3	6·9	9·0	10·4	12·5	12·5	12·8	15·8	16·7	15·0	15·8	14·9	13·1	4·6	0	0
September	0	0	0·4	3·6	8·2	10·3	12·0	12·3	11·9	11·3	12·3	9·8	5·9	2·4	0	0	0
October	0	0	0	1·4	3·6	7·0	6·8	9·3	10·2	10·3	9·6	5·6	1·1	0	0	0	0
November	0	0	0	0	2·5	7·9	9·9	10·4	7·8	6·8	7·0	2·0	0	0	0	0	0
December	0	0	0	0	0	2·6	2·8	3·1	2·7	1·9	1·2	0	0	0	0	0	0
Total	5·4	23·3	40·4	61·1	83·2	105·2	115·1	120·3	129·5	131·0	121·0	103·9	84·0	63·3	39·6	12·3	0

AGRICULTURAL NOTES.

JANUARY.—Rather warm, but cloudy. The ground was too wet for working. The snowdrop was in blossom on the 29th, and a few primroses were out by the end of the month.

FEBRUARY.—This month was warm, cloudy, and wet, with very little sun. The ground was still heavy, but ploughing progressed fairly towards the end of the month.

MARCH.—Although the middle and end of the month were very wet, the bright, sunny weather in the middle of the month was favourable for agricultural operations. Most of the corn was sown by the beginning of the last week.

APRIL.—The first part of April was fine and sunny, and all the oats were in by the end of the first week. Planting potatoes began on the 11th, and was finished, in most places, by the end of April, but owing to the rain in the middle and end of the month very little of the green crops were sown.

MAY.—Bright and sunny, and the green crops were all in by the middle of the month. The blossom on the fruit trees gave promise of a good crop. Corn looked well towards the end of the month, and the grass looked extremely well.

JUNE.—A very wet month, and very unfavourable for farming. A great quantity of the blossom on the fruit trees, especially the apple blossom, was destroyed. Clover was cut towards the end of the month, and housed by the 28th. This was one of the heaviest crops ever got in. Some grass was cut during the last week; but, owing to rain, none was carted before the end of the month.

JULY.—Exceedingly wet. Haymaking progressed very little. Great fears were entertained that the corn would be spoiled. A fair quantity of currants was gathered during the month. But apples and pears were very scarce, and the few that were ripening were very small.

AUGUST.—The early part of the month (with the exception of the first day, which was very wet) was fine, and a great quantity of exceedingly good hay was housed. The rain towards the latter end of the month stopped work and prevented the farmers from finishing the haymaking. Corn was looking better, but both it and the green crops wanted sun.

SEPTEMBER was a much better month for agriculture. The last of the hay was got in during the first week. Potatoes looked pretty well. The corn also looked promising, but was not ripe by the end of the month.

OCTOBER.—Wheat was cut during the first week, and housed, in most places by the end of the third week. Oats were cut during the latter part of the month, and were nearly all got in by the end. There was a good crop of potatoes by the end of the month, being almost entirely free from disease; but they were rather small. Green crops were generally carted by the end of the month. They were small, but of average quantity.

NOVEMBER.—This month was very wet. The last of the oats were housed during the first week, and the last of the green crops by the middle of the month. Owing to the wet and stormy weather, scarcely any wheat was sown by the end of the month.

DECEMBER.—In some places wheat was not in the ground before the end of the third week, the ground being too wet for working.

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 20th	July 18th	October.	Potatoes	April	May 5th	October.
Oats	March	June 26th	July 18th	October.	Turnips	May	May 6th	Oct.—Nov.
Peas	March	June 10th		Aug. 14th	Beet	May	May 25th	October.
Beans	March	June 17th		Oct. 2nd	Mangel	May	May 26th	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	May 10th	May 20th	Apple	Ap. 28th	Aug. 30th	Lilac	May 25th
Oak	May 16th	May 20th	Pear	May 5th	Aug. 27th	Privet	Aug. 11th
Sycamore	Ap. 18th	May 17th	Cherry	Ap. 21st	Aug. 5th	Syringa	June 3rd
Plane	Ap. 1st	Ap. 15th	Red Currant	Ap. 17th	July 10th	Laburnum	May 19th
Lime	Ap. 16th	May 10th	White Currant	Ap. 17th	July 16th	Dog Rose	June 2nd
Hawthorn	May 9th	June 10th	Black Currant	May 1st	Aug. 1st	Holly	June 10th
Hazel	Ap. 11th	May 7th	Strawberry	Ap. 12th	June 25th	Guelder-Rose	June 21st
Ash	May 7th	Ap. 26th	Gooseberry	Mar. 20th	Aug. 19th	Woodbine	June 29th
Beech	Ap. 4th	May 10th				Portugal Laurel	July 5th
Horse Chesnut	Mar. 30th	May 12th				Elderberry	June 15th
Mountain Ash	Ap. 2nd					Tree Mallow	May 2nd

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1882.

RANUNCULACEÆ.		
Anemone nemorosa	Wood anemone	April 10
Ranunculus ficaria	Lesser celandine	March 5
R. repens	Creeping buttercup	May 2
R. bulbosus	Bulbous buttercup	April 27
Trollius Europæus	Globe flower	May 16
NYMPHÆACEÆ.		
Nuphar lutea	Yellow water lily	June 25
PAPAVERACEÆ.		
Papaver Rhæas	Red poppy	July 2
CRUCIFERÆ.		
Cardamine pratensis	May flower	April 15
C. hirsuta	Hairy bitter cress	April 3
Alliaria officinalis	Garlic mustard	May 4
VIOLACEÆ.		
Viola canina	Dog violet	April 22
POLYGALACEÆ.		
Polygala vulgaris	Milkwort	May 7
CARYOPHYLLACEÆ.		
Lychnis flos cuculi	Ragged Robin	May 21
L. diurna	Red Robin	May 4
Stellaria media	Chickweed	March 2
S. holostea	Great starwort	April 3
HYPERICACEÆ.		
Hypericum quadrangulum	Square-stalked hypericum	June 25
H. perforatum	Common hypericum	July 4
GERANIACEÆ.		
Geranium pratense	Meadow geranium	June 23
G. Robertianum	Herb Robert geranium	April 30
G. lucidum	Shining geranium	April 26
Oxalis acetosella	Wood sorrel	April 26
PAPILIONACEÆ.		
Sarcothamnus scoparius	Common broom	May 4
Ononis arvensis	Rest harrow	June 23
Medicago lupulina	Black medic	May 21
Trifolium repens	White clover	May 15

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1882 (*continued*).

T. pratense	Purple clover	May 16
Lotus corniculatus	Common bird's-foot trefoil	May 21
Vicia sepium	Bush vetch	May 8
Lathyrus pratensis	Meadow vetchling	June 21
ROSACEÆ.		
Spiræa ulmaria	Meadow sweet	June 25
Geum urbanum	Common avens	May 16
G. rivale	Water avens	April 29
Fragaria vesca	Wood strawberry	May 5
Potentilla fragariastrum	Strawberry-leaved potentil	May 2
P. tormentilla	Tormentil potentil	May 7
P. reptans	Creeping potentil	May 18
P. anserina	Silver weed	May 29
Alchemilla vulgaris	Lady's mantle	May 3
ONAGRACEÆ.		
Circæa lutetiana	Enchanter's nightshade	June 28
LYTHRARICÆ.		
Lythrum salicaria	Purple loosestrife	May 25
SAXIFRAGACEÆ.		
Saxifraga tridactylites	Rue-leaved saxifrage	April 2
S. umbrosa	London pride saxifrage	May 19
S. Granulata	Meadow saxifrage	May 16
Chrysosplenium oppositifolium	Opposite chrysosplene	April 30
S. alternifolium	Alternate chrysosplene	May 1
UMBELLIFERÆ.		
Sanicula europæa	Wood sanicle	May 5
Heracleum spondylium	Common Heracleum	June 28
Bunium flexuosum	Tuberous bunium	May 21
CAPRIFOLIACEÆ.		
Adoxa moschatellina	Tuberous moscatel	April 2
STELLATÆ.		
Galium cruciatum	Crosswort galium	May 4
G. verum	Yellow galium	May 30
G. saxatile	Heath galium	June 1
G. aparine	Cleavers galium	June 25
Asperula odorata	Woodruff asperule	May 4
VALERIANEÆ.		
Valeriana dioica	Marsh valerian	May 8
V. officinalis	Common valerian	June 25

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1882 (*continued*).

DIPSACEÆ.		
Scabiosa avensis	Field scabious	June 28
COMPOSITÆ.		
Tussilago farfara	Common colt's-foot	April 10
T. petasites	Butterbur colt's-foot	April 9
Bellis perennis	Common daisy	March 20
Chrysanthemum leucanthemum	Ox-eye daisy	May 21
Achillea millefolium	Yarrow	June 27
Arctium lappa	Common burdock	July 21
Carduus palustris	Marsh thistle	June 27
Centaurea nigra	Black centaurea	June 25
Hypochœris radicata	Long-rooted cat's-ear	June 12
Taraxacum dens-leonis	Common dandelion	May 14
Hieracium pilosella	Mouse-ear hawkweed	May 18
PRIMULACEÆ.		
Primula vulgaris	Common primrose	Feb. 5
P. veris	Cowslip	May 16
Lysimachia vulgaris	Common lysimachia	April 30
APOCYNACEÆ.		
Vinca minor	Lesser periwinkle	April 20
BORAGINEÆ.		
Mysotis palustris	Forget-me-not	May 4
Symphytum officinale	Common comfrey	May 16
SOLANACEÆ.		
Solanum dulcamara	Bittersweet	June 19
OROBANCHACEÆ.		
Lathræa squamaria	Toothwort	April 24
SCROPHULARINEÆ.		
Scrophularia aquatica	Water figwort	May 29
Digitalis purpurea	Purple foxglove	June 8
Veronica chamædrys	Germander veronica	May 4
Euphrasia officinalis	Common eyebright	June 19
Rhinanthus crista-galli	Common yellow rattle	May 23
Pedicularis palustris	Marsh red rattle	June 3
LABIATÆ.		
Mentha aquatica	Water mint	July 1
Nepeta glechoma	Ground ivy	May 1
Stachys sylvatica	Hedge stachys	June 2

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1882 (*continued*).

S. palustris	Marsh stachys	June 22
Ajuga reptans	Creeping bugle	April 29
POLYGONACEÆ.		
Rumex acetosa	Sorrel dock	May 16
R. acetosella	Sheep-sorrel dock	May 15
Polygonum bistorta	Bistort polygonum	May 18
EUPHORBIACEÆ.		
Euphorbia peplus	Petty spurge	June 12
Mercurialis perennis	Dog's mercury	April 10
ORCHIDACEÆ.		
Listera ovata	Twayblade listera	May 29
Orchis mascula	Early orchis	May 20
O. maculata	Spotted orchis	June 11
Habenaria bifolia	Butterfly orchis	June 10
IRIDACEÆ.		
Iris pseudacorus	Yellow iris	June 8
Crocus vernus	Spring crocus	March 18
AMARYLLIDEÆ.		
Narcissus pseudonarcissus	Daffodil (*cult.*)	May 6
Galanthus nivalis	Snowdrop (*cult.*)	Jan. 29
LILIACEÆ.		
Paris quadrifolia	Common Paris	May 4
Scilla nutans	Bluebell Squill	April 3
AROIDEÆ.		
Arum maculatum	Common arum	April 29

OBSERVATIONS OF UPPER CLOUDS (CIRRUS).

Date.	G. M. T.	Cloud Direction.	Velocity.	Wind.		Direction of Lr. Clds.
				Direction.	Force (0 to 12).	
January 6	11.25 a.m.	S.S.W.	3	W.	5	W.
,, 9	10.15 a.m.	S. by W.	2	W.	2	W.
,, 12	1 p.m.	W.	1	S.	1	W.
,, 24	4.15 a.m.	N.E.	1	W.	1	W.
,, 26	3 p.m.	N.N.E.	2	S.	1	S.W.
,, 30	9 a.m.	E.	2	E.N.E.	2	E.
February 1	2.30 p.m.	S. by E.	2	S.E.	0	S.W.
,, 12	1 p.m.	S.S.W.	1	W.S.W.	2	S.W.
,, 19	2 p.m.	N.E.	2	N.W.	3	N.W.
,, 21	Noon.	W.S.W.	1	W.	1	N.W.
,, 21	2 p.m.	S.W.	2	W.	1	N.E.
,, 21	4 p.m.	W.S.W.	2	W.	1	N.E.
March 6	3 p.m.	W. by S.	3	N.W.	3	W.
,, 7	5 p.m.	W.	2	W.	4	W.
,, 11	9.30 a.m.	S.E.	2	S.W.	1	W.
,, 12	4 p.m.	S. by E.	2	W.S.W.	2	W.
,, 13	2 p.m.	S.E.	1	W.	3	S.W.
,, 13	4 p.m.	S.S.E.	1	W.	2	W.
,, 15	4 p.m.	N.E.	1	W.	2	W.
,, 16	3.30 p.m.	E.	2	W.	3	W.
,, 17	2.15 p.m.	S.S.W.	2	W.N.W.	2	W.
April 4	2.30 p.m.	N.	2	E.	4	S.E.
,, 6	3 p.m.	N.E.	1	E.	2	N.E.
,, 10	5 p.m.	S. by E.	2	W.	2	
,, 11	9.45 a.m.	W.	2	N.E.	1	E.N.E.
,, 18	2 p.m.	N.E.	3	N.W.	2	N.E.
,, 18	4 p.m.	N.E.	3	W.	2	N.E.
,, 18	10 p.m.	N.E.		W.	0	N.E.
,, 19	2 p.m.	W.N.W.	2	S.W.	3	W.N.W.
,, 25	2 p.m.	W.	2	W.N.W.	2	W.
,, 25	4 p.m.	W.	1	W.N.W.	2	W.
May 2	2 p.m.	S.S.E.	1	W.	4	W.
,, 4	4 p.m.	S.E.	1	W.N.W.	2	W.
,, 5	3.30 p.m.	S. by E.	2	W.	2	W.
,, 10	9 a.m.	W.	2	W.	1	W.
,, 10	4 p.m.	W.	1	W.	2	W.
,, 12	3 p.m.	S. by E.	2	W.N.W.	2	W.
,, 22	2.45 p.m.	S.	3	E.S.E.	2	N.W.
,, 22	6 p.m.	S.S.W.	2	E.S.E.	2	W.
,, 27	9.30 a.m.	E. by S.	2	S.S.W.	3	W.
,, 29	10.30 a.m.	S.W.	1	W.	2	S.W.
,, 29	11 a.m.	S.S.W.	2	W.	2	S.W.
June 1	1 p.m.	S.	2	E.	2	W.
,, 2	Noon.	S.	2	E.	4	S.E.
,, 7	3 p.m.	S. by W.	1	W.	4	W.

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G. M. T.	Cloud Direction.	Velocity.	Wind.		Direction of Lr. Clds.
				Direction.	Force (0 to 12).	
June 16	4 p.m.	W.	1	W.	2	W.
,, 24	11 a.m.	N.	2	W.	1	S.
,, 27	1 p.m.	S.W.	1	W.	2	W.
July 1	9 a.m.	N.E.	2	E.N.E.	0	W.N.W.
,, 2	10 a.m.	N.W.	1	N.W.	1	N.W.
,, 8	7.20 a.m.	N.	2	S.W.	1	S.W.
,, 8	9 a.m.	N.W.	1	S.W.	1	W.
,, 12	2 p.m.	N.W.	2	W.	3	S.W.
,, 12	4 p.m.	N.W.	2	W.	3	S.W.
,, 16	8 a.m.	W.	2	S.	4	S.S.E.
,, 19	4.30 p.m.	W.	3	W.S.W.	4	W.S.W.
,, 20	11 a.m.	S.	2	S.W.	3	S.S.W.
,, 28	4.30 p.m.	S.E.	1	W.	2	W.
August 2	9 a.m.	S.W.	2	W.	5	S.W.
,, 3	11 a.m.	N.W.	2	W.N.W.	3	S.W.
,, 3	1.30 p.m.	N.N.W.	2	W.	2	W.S.W.
,, 5	5 p.m.	N.	1	W.	2	N.W.
,, 6	10 a.m.	N.	1	W.	3	N.
,, 6	11 a.m.	N.	1	W.	3	N.
,, 6	2 p.m.	N.N.W.	2	W.N.W.	4	W.N.W.
,, 6	4 p.m.	N.N.W.	3	W.N.W.	4	W.N.W.
,, 7	7 a.m.	N.E.	2	N.W.	1	N.W.
,, 7	8 a.m.	N.N.E.	1	W.	1	N.W.
,, 7	5.30 p.m.	N.E.	1	W.	1	W.
,, 9	10.30 a.m.	N.E.	2	S.W.	1	N.E.
,, 9	2 p.m.	N.E.	2	W.S.W.	2	W.
,, 15	4 p.m.	W.	1	W.S.W.	1	S.W.
,, 15	6 p.m.	W.S.W.	2	S.W.	1	W.S.W.
,, 24	6 p.m.	N.	2	W.	2	N.W.
,, 30	8.30 a.m.	N.E.	1	W.N.W.	2	S.W.
,, 30	9.20 a.m.	N.N.E.	2	W.N.W.	3	S.W.
,, 30	1 p.m.	E.N.E.	1	W.	3	S.W.
,, 31	7 a.m.	S.S.E.	2	S.W.	2	W.
,, 31	11 a.m.	S.E.	2	S.W.	4	W.
Sept. 5	5 p.m.	N.E.	1	W.N.W.	1	W.S.W.
,, 5	6 p.m.	N.N.E.	2	W.N.W.	1	S.W.
,, 6	11 a.m.	N.E.	3	N.N.W.	1	W.
,, 6	1 p.m.	N.E.	2	N.	1	W.
,, 6	5 p.m.	S.W.	1	N.N.W.	1	W.
,, 10	1.30 p.m.	S. by W.	2	S.	2	S.E.
,, 11	1 p.m.	N.	1	W.	2	W.S.W.
,, 11	4.30 p.m.	N.E.	2	W.	1	W.
,, 13	9 a.m.	W.	2	N.	0	W.
,, 13	3 p.m.	N W.	1	W.	2	W.
,, 13	5 p.m.	W.N.W.	2	W.S.W.	0	W.S.W.

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G.M.T.	Cloud Direction.	Velocity.	Wind: Direction.	Wind: Force (0 to 12).	Direction of Lr. Clds.
Sept. 16	Noon.	N.E.	1	S.W.	1	N.W.
,, 16	3 p.m.	N.N.E.	2	W.	2	N.W.
,, 17	9 a.m.	W.	1	N.W.	0	N.W.
,, 18	3 p.m.	N.E.	2	N.N.W.	1	W.
,, 18	7 p.m.	N.N.E.	2	N.	1	W.
,, 21	2 p.m.	N.	2	N.N.E.	1	N.W.
,, 21	5 p.m.	N.E.	2	E.N.E.	1	N.
,, 22	3.30 p.m.	S. by W.	3	N.E.	0	W.
,, 24	7 a.m.	S.S.E.	2	S.W.	1	N.
,, 26	3 p.m.	N.	1	E.	1	S.E.
,, 28	7 a.m.	N.E.	2	W.S.W.	1	S.W.
,, 28	11 a.m.	N.	2	W.	3	S.W.
,, 29	8 a.m.	N.W.	1	N.N.E.	1	N.
October 2	8 a.m.	W.	2	S.W.	1	S.S.W.
,, 2	1.30 p.m.	W.	1	S.W.	4	S.
,, 3	2 p.m.	N.	1	W.	3	S.S.W.
,, 5	11 a.m.	W.	1	E.N.E.	1	N.E.
,, 6	8 a.m.	N.W.	2	N.N.E.	2	N.E.
,, 6	3 p.m.	N.E.	1	N.E.	3	N.E.
,, 14	3.30 p.m.	N.W.	2	E.	1	E.S.E.
,, 23	9 a.m.	N.W.	2	S.S.W.	1	S.W.
,, 23	1 p.m.	N.	2	S.S.W.	3	S.W.
,, 23	3 p.m.	W.N.W.	1	S.S.W.	2	S.W.
,, 25	11 a.m.	S. by E.	1	S.W.	2	S.W.
,, 25	2 p.m.	E.S.E.	1	S.W.	1	S.W.
,, 25	3 p.m.	S.E.	1	S.W.	1	S.W.
,, 25	4 p.m.	S.E.	2	S.W.	0	S.W.
,, 26	11 a.m.	N.	2	N.N.E.	1	S.W.
,, 26	3.30 p.m.	N.W.	3	S.E.	0	S.W.
,, 28	1 p.m.	S.E.	2	N.N.E.	3	N.
,, 31	9 a.m.	S.S W.	2	S.W.	1	S.S.W.
Nov. 3	9 a.m.	S.E.	1	S.W.	1	S.
,, 4	1 p.m.	W.	2	W.S.W.	6	S.W.
,, 11	3 p.m.	S. by E.	2	N.N.W.	1	N.W.
,, 13	11 p.m.	S.	2	N.E.	1	N.E.
,, 13	3 p.m.	W.	1	N.E.	1	N.N.E.
,, 14	11 a.m.	N.	2	N.E.	2	N.E.
,, 14	1 p.m.	N.E.	1	N.E.	2	N.E.
,, 15	8 a.m.	N.N.W.	2	N.N.E.	0	
,, 15	9 a.m.	N.W.	1	N.N.E.	0	
,, 15	10 a.m.	N.W.	1	N.N.E.	0	
,, 15	11 a.m.	N.N.W.	2			N.W.
,, 15	Noon.	N.N.W.	1			
,, 15	1 p.m.	N.W.	2			
,, 15	2 p.m.	N.W.	2			

OBSERVATIONS OF UPPER CLOUDS (*Continued*).

Date.	G.M.T.	Cloud Direction.	Velocity.	Wind.		Direction of Lr. Clds.
				Direction.	Force (0 to 12)	
Nov. 17	3 p.m.	W.	1	N.N.E.	1	N.E.
,, 18	11 a.m.	N.	2	S.E.	2	N.E.
,, 26	11 a.m.	E.	3	W.S.W.	3	N.W.
,, 28	9 a.m.	N.W.	3	N.W.	1	
,, 28	10 a.m.	N.W.	2	W.	2	
,, 28	11 a.m.	W.N.W.	2	W.	2	
,, 28	Noon.	N.W.	1	N.W.	3	
,, 28	1 p.m.	N.W.	1	N.W.	2	
,, 28	2 p.m.	N.W.	1	W.N.W.	1	
,, 28	3 p.m.	N.W.	1	W.N.W.	1	
,, 28	4 p.m.	W.N.W.	2	W.N.W.	1	
,, 29	1 p.m.	N.E.	2	W.N.W.	3	W.
,, 29	3 p.m.	N.N.E.	2	W.N.W.	2	W.
,, 30	11 a.m.	S.E.	2	N.E.	1	N.W.
Dec. 1	9 a.m.	N.W.	2	N.N.E.	0	N.W.
,, 6	8 a.m.	S. by E.	1	N.	2	N.E.
,, 6	9 a.m.	S. by E.	3	N.	3	N.N.E.
,, 23	11 a.m.	E.	2	N.N.W.	3	N.W.
,, 23	1 p.m.	N.E.	2	N.W.	4	N.W.
,, 26	9 a.m.	N.E.	2	S.W.	1	N.W.

Monthly Magnetical Observations taken at the College Observatory, Stonyhurst, 1882.

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 100 or 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 maximum value of the former having been 1°·03, 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 4′·52 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 adopted value of the constant P is 0·004054.

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 ...	26th	11 15 a.m.	1·0	40·2	13	35	12	9·07189
	,,	11 37 p.m.	1·3	41·2	6	9	7	9·07209
February...	23rd	9 58 a.m.	1·0	44·7	13	36	7	9·07266
	,,	10 44 a.m.	1·3	46·3	6	10	9	9·07363
March ...	14th	11 26 a.m.	1·0	46·7	13	36	20	9·07290
	,,	10 45 a.m.	1·3	45·7	6	8	32	9·07170
April	19th	10 47 a.m.	1·0	51·0	13	35	31	9·07276
	,,	11 16 a.m.	1·3	52·7	6	8	15	9·07184
May	23rd	9 6 a.m.	1·0	57·0	13	33	56	9·07235
	,,	9 46 a.m.	1·3	59·8	6	8	29	9·07261
June	13th	0 13 p.m.	1·0	53·7	13	33	34	9·07202
	,,	0 53 p.m.	1·3	52·9	6	8	39	9·07233
July.....	18th	0 14 p.m.	1·0	63·6	13	33	4	9·07237
	,,	0 40 p.m.	1·3	63·0	6	7	42	9·07190
August ...	1st	0 57 p.m.	1·0	62·0	13	34	2	9·07276
	,,	1 44 p.m.	1·3	62·4	6	7	41	9·07186
	15th	11 52 a.m.	1·0	58·6	13	33	49	9·07240
	,,	0 16 p.m.	1·3	58·0	6	8	15	9·07221
September.	1st	11 56 a.m.	1·0	62·0	13	32	39	9·07204
	,,	0 37 p.m.	1·3	62·1	6	7	21	9·07145
	15th	0 24 p.m.	1·0	61·2	13	32	1	9·07164
	,,	0 46 p.m.	1·3	62·2	6	7	28	9·07160
October ...	1st	0 5 p.m.	1·0	64·6	13	31	32	9·07163
	,,	0 33 p.m.	1·3	65·1	6	7	1	9·07127
	15th	11 46 a.m.	1·0	49·2	13	34	22	9.07205
	,,	0 51 p.m.	1·3	48·5	6	8	31	9·07187
November.	1st	11 55 a.m.	1·0	53·7	13	32	31	9·07138
	,,	0 28 p.m.	1·3	53·6	6	7	37	9·07117
	15th	11 33 a.m.	1·0	48·1	13	31	58	9·97071
	,,	0 1 p.m.	1·3	49.5	6	7	15	9·07045
December.	1st	11 40 a.m.	1·0	36·2	13	34	11	9·07110
	,,	0 11 p.m.	1·3	36·6	6	8	33	9·07113
	15th	11 59 a.m.	1·0	39·5	13	32	49	9·07060
	,,	0 32 p.m.	1·3	39·7	6	8	39	9·07143

m represents the Magnetic moment of the Deflection Magnet.
X represents the Earth's Horizontal Magnetic Intensity.

VIBRATION OBSERVATIONS FOR ABSOLUTE MEASURE OF HORIZONTAL FORCE.

Month.	G. M. T. D. H. M.	Temperature.	Time of one vibration.	Log m X	Value of m.
January ...	26th...10 21 a.m.	45·7	5·71463	0·20132	0·43317
February...	22nd... 9 3 a.m.	44·8	5·71042	0·20204	0·43411
March	14th... 0 22 p.m.	47·0	5·71496	0·20152	0·43342
April	19th... 9 30 a.m.	51·8	5·72227	0·20056	0·43294
May.....	23rd...11 35 a.m.	65·2	5·72394	0·20116	0·43333
June	13th...10 24 a.m.	52·4	5·72236	0·20077	0·43299
July.....	18th...10 58 a.m.	62·7	5·72735	0·20182	0·43349
August ...	1st ...10 11 a.m.	60·3	5·73852	0·19897	0·43216
	15th... 9 50 a.m.	60·6	5·73035	0·19972	0·43253
September.	1st ... 9 54 a.m.	59·5	5·72692	0·20069	0·43273
	15th...11 9 a.m.	57·3	5·72848	0·20023	0·43244
October ...	1st ...10 55 a.m.	64·4	5·73102	0·20037	0·43242
	15th...10 24 a.m.	48·6	5·72686	0·19997	0·43248
November.	1st ...10 3 a.m.	52·9	5·72554	0·20045	0·43238
	15th... 9 59 a.m.	43·2	5·71992	0·20059	0·43211
December.	1st ... 9 53 a.m.	37·3	5·71817	0·20061	0·43238
	15th...10 28 a.m.	39·1	5·71692	0·20111	0·43258

DIP OBSERVATIONS.

Month.	G. M. T.	Needle.	Dip.	Mean.	Observer.
	D. H. M.		° ′ ″		
January	27th...10 45 a.m.	1	69 17 30		W. C.
	,, ...11 20 a.m.	3	69 18 10	69 17 50	,,
February	21st...11 2 a.m.	1	69 22 52		,,
	,, ...11 33 a.m.	3	69 21 44	69 22 18	,,
March	13th...11 55 a.m.	3	69 16 58		W. McK.
	,, ... 1 10 p.m.	1	69 16 45	69 16 52	,,
April	20th...10 32 a.m.	1	69 15 8		W. C.
	,, ...11 10 a.m.	3	69 17 20	69 16 14	,,
May	25th...11 20 a.m.	1	69 12 43		W. McK.
	,, ... 0 25 a.m.	3	69 19 59	69 16 21	,,
June	23rd...10 14 a.m.	1	69 16 13		J. R.
	,, ...11 0 a.m.	3	69 18 58	69 17 36	,,
July	18th... 4 41 p.m.	1	69 11 38		,,
	,, ... 5 25 p.m.	3	69 12 12	69 11 55	,,
August	1st... 3 19 p.m.	1	69 16 19		W. McK.
	,, ... 4 15 p.m.	3	69 16 53		,,
	15th... 2 48 p.m.	1	69 30 42		J. R.
	,, ... 3 39 p.m.	3	69 29 49	69 23 26	,,
September...	1st... 1 5 p.m.	1	69 13 3		,,
	,, ... 2 13 p.m.	3	69 13 49		,,
	15th...11 25 a.m.	1	69 23 19		,,
	,, ... 0 25 p.m.	3	69 25 41	69 18 58	,,
October	1st...10 30 a.m.	1	69 18 41		,,
	,, ...11 30 a.m.	3	69 15 56		,,
	15th...10 42 a.m.	1	69 17 47		,,
	,, ...11 55 a.m.	3	69 19 58	69 18 6	,,
November ...	1st...10 0 a.m.	1	69 17 50		,,
	,, ...11 0 a.m.	3	69 20 45		,,
	15th... 1 23 p.m.	1	69 11 49		W. McK.
	,, ... 2 10 p.m.	3	69 17 6	69 16 53	,,
December ...	1st...11 28 a.m.	1	69 12 8		J. R.
	,, ... 0 3 p.m.	3	69 19 29		,,
	15th...11 20 a.m.	1	69 15 12		,,
	,, ... 0 8 p.m.	3	69 14 57	69 15 27	,,
	Means		.....	69 17 39	

MAGNETIC INTENSITY.

	X. or Horizontal Force.	Y, or Vertical Force.	Total Force.
January.....	3·6701	9·7111	10·3815
February	3·6682	9·7443	10·4119
March	3·6696	9·7015	10·3722
April	3·6655	9·6852	10·3557
May	3·6673	9·6913	10·3619
June	3·6669	9·7009	10·3707
July	3·6715	9·6647	10·3386
August 1.....	3·6588	9·6707	10·3397
,, 15.....	3·6619	9·7065	10·4585
September 1.....	3·6684	9·6692	10·3417
,, 15.....	3·6670	9·7560	10·4223
October 1.....	3·6683	9·7018	10·3722
,, 15.....	3·6644	9·7053	10·3728
November 1.....	3·6694	9·7219	10·3918
,, 15.....	3·6729	9·6899	10·3626
December 1.....	3·6707	9·6957	10·3672
,, 15.....	3·6712	9·6906	10·3626

DECLINATION OBSERVATIONS.

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
January ...	3rd... 9 12 a.m.	20 12 43		20 13 34	
	11th... 9 11	10 29		10 46	
	17th... 9 22	14 35		14 52	
	23rd... 9 8	7 56		8 47	
	31st... 9 1	8 53	20 10 56	8 53	20 11 22
February..	7th... 9 1	5 22		7 5	
	13th... 9 14	7 58		9 1	
	20th... 8 54	10 49		10 56	
	27th... 9 2	1 54	20 6 31	6 12	20 8 34
March ...	8th... 9 2	6 0		9 44	
	13th... 9 6	7 55		11 14	
	20th... 9 5	9 11		8 19	
	27th... 9 16	5 39	20 7 11	(5 39)	20 8 44
April	3rd... 9 9	11 34		15 52	
	10th... 9 5	12 25		17 0	
	17th... 9 6	13 4		16 30	
	24th... 8 52	14 18	20 12 33	17 17	20 16 40
May	1st... 8 55	5 30		7 30	
	8th... 9 25	19 54 29		19 54 29	
	10th... 9 16	58 29		20 1 21	
	15th... 9 4	20 2 12		9 17	
	22nd.. 9 12	2 50		19 59 6	
	31st... 9 6	3 55	20 1 14	20 6 13	20 3 0
June	7th... 9 3	3 57		5 23	
	12th... 9 3	6 10		10 28	
	20th... 9 5	6 8		9 52	
	26th... 9 6	6 14	20 5 37	9 40	20 8 51

DECLINATION OBSERVATIONS (*Continued*).

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
July	4th... 8 54 a.m.	20 3 17		20 6 26	
	10th... 9 3	19 58 27		5 2	
	17th... 9 14	59 54		2 59	
	24th... 9 1	20 1 48	20 0 51	7 15	20 5 26
August ...	1st... 9 7	7 2		1 1	
	8th... 9 9	6 9		4 43	
	15th... 9 1	5 37		10 29	
	21st... 9 5	5 52		(5 52)	
	28th... 9 10	2 20	20 5 44	7 12	20 5 52
September	1st... 9 3	19 55 46		19 57 12	
	4th... 9 7	54 38		57 30	
	11th... 9 10	59 20		20 1 5	
	15th... 9 2	56 29		19 59 21	
	18th... 9 10	57 14		20 0 40	
	25th... 9 9	20 1 42	19 57 32	0 14	19 59 20
October ...	1st... 9 7	19 58 20		2 55	
	3rd... 9 9	20 3 12		7 26	
	9th... 9 8	1 18		3 18	
	15th... 9 15	19 59 6		19 59 6	
	23rd... 9 8	20 0 38	20 0 31	20 2 56	20 3 8
November	1st... 9 11	19 59 15		19 59 15	
	8th... 9 4	57 26		20 2 18	
	15th... 9 13	58 48		6 14	
	21st... 9 7	20 0 44		(0 44)	
	27th... 9 12	19 58 49	19 59 0	19 52 49	19 58 16
December .	1st... 9 5	59 21		(59 21)	
	5th... 9 4	59 28		20 0 2	
	11th... 9 7	59 5		1 5	
	15th... 9 16	55 49		19 55 59	
	19th... 9 9	20 8 23		20 8 57	
	20th... 9 25	4 54	20 1 10	3 11	20 1 26
Yearly mean			20 4 19		20 5 53

MAGNETIC DISTURBANCES.

JANUARY.—The earth's magnetism was slightly disturbed between 1 and 4 on the morning of the 1st, and this was followed by a more serious disturbance which lasted from 4.45 p.m. until 10 a.m. on the 2nd. The Vertical Force magnet showed a constant increase of intensity during the greater part of this interval. The Declination magnet was occasionally a little irregular for the next three days, but it remained remarkably quiet from the 6th to the evening of the 8th. On the evenings of the 11th, 12th, 13th, 14th, 15th, and 16th the needle was more unquiet than usual, and then two days of calm preceded the outburst at 4.30 p.m. on the 19th. The Horizontal Force was generally under its mean value during this disturbance, and the irregularities of the Vertical Force magnet consisted of several smaller oscillations superposed on a single long wave, whose maximum was reached shortly before 8 p.m., and its minimum between 3 and 4 on the following morning. The magnets returned to their normal state at noon on the 20th, but there were frequent irregularities in the curves until the end of the month.

FEBRUARY.—A bold movement of the Declination magnet towards the East took place during the afternoon of the 2nd, and the curve attained a minimum at 6.35 p.m. The Horizontal Force minimum occurred a few minutes earlier, viz., at 6.27, and this was followed by a maximum at 6.45. The Vertical Force was scarcely affected. The Declination was very changeable after noon on the 5th, and all three needles were very irregular throughout the whole of the 6th; at 6 p.m. the magnet was considerably deflected towards the East. No very quiet day occurred previous to the afternoon of the 11th. The following days were undisturbed with the sole exception of the early morning of the 18th, when the Vertical Force felt the effect of the perturbing force. The force that produced the magnetic storm of the month began to manifest its influence during the early hours of the 20th. This storm reached its height in the course of the afternoon, and at 8.35 p.m. the magnet moved 1° 4′ 27″ towards the East in 13 minutes. The Horizontal Force was much disturbed between 8.7 p.m. and 8.45; and the Vertical Force attained a

very considerable maximum at 7.8 p.m., and was extremely irregular from 6 to 9 p.m. The maximum variation of Vertical Force was 0·0033 in British units. The following days were fairly quiet until the end of the month.

MARCH.—From the 3rd to the 8th the magnet was unsteady, and on the 9th this unsteadiness was greatly increased, the most marked disturbance on the Declination curve happening at 4.10 p.m. The Horizontal Force was very irregular on the afternoon of the 7th, and on the morning of the 9th; and the Vertical Force trace shows some very bold movements, the minimum occurring at 2.37 a.m. on the 9th. From the 10th to the 15th there was little to remark, and on the 15th the only irregularity of any moment was the diminution of West Declination at 8.20 p.m., accompanied by a slight increase of the Horizontal Force. Disturbances again appeared on the 19th, 20th, and 21st, and on the afternoon of the 23rd, but these were not of much moment, nor were others observed later on in the month of greater importance. Auroral light was seen on the 21st.

APRIL.—A few irregularities were noticed at the beginning of the month, and on the morning of the 4th a storm broke out which lasted about 24 hours. The greatest movement of the needle was a Westerly swing at 6.15 a.m. on the 5th, accompanied by a diminution of both components of the intensity, but the general disturbance was greater during the previous afternoon. Other irregular movements were apparent during the four following days. The magnet was then quiet for a few days, but at 11 p.m. on the 13th disturbing forces were again at work, and their action culminated in the grand storm of the 17th.

The first rapid movement of the Declination magnet occurred at 9.28 p.m. on the 16th, and the greatest variation was noticed from 5 to 6 a.m. on the 17th, the Westerly Declination increasing 1° 25′ 57″ between 5.32 and 5.45. The swing of the magnet was very exaggerated from 2 to 6 a.m., and continued to oscillate with little abatement of velocity until the evening. At midnight the disturbance had ceased. The greatest Easterly movement was recorded at 6.37 p.m., and this made the total variation of the Declination during the storm amount to 1° 47′ 26″. The Horizontal Force was most remarkably disturbed, the action of a great perturbing force being first manifested by an instantaneous increase at 11.30 p.m. on the 16th. The range between the minimum at 6.9 a.m. and the maximum at 0.35 p.m. was the extraordinary amount of 0·1155 in British units. The oscillations of the Horizontal Force magnet were most violent between 2 a.m. and 8, and from noon to 4 p.m. Between 6.13 a.m. and 6.32 the increase of ordinate in the curve was $1\frac{7}{8}$ inches, equivalent to

0·0617 in British units. Unfortunately the Vertical Force magnet was thrown off its balance by the violence of the disturbance at 3.54 a.m. on the 17th, but the trace on the paper still records many details of interest. The Vertical Force began to decrease steadily at 11.30 p.m. on the 16th, and this continued until 1 a.m. A rapid decrease occurred at 2 a.m., followed by as quick a rise. Between 2.55 and 3.28 a.m. the Vertical Force diminished 0·0086 British units, the total recorded range being 0·0136. The highest reading of the Vertical Force occurred about 2 p.m. on the 17th.

After the storm of the 17th the magnet remained quiet until the morning of the 20th, when another storm burst out suddenly at 4 a.m., the needle moving 1° 11′ 37″ Westward in 45 minutes, and then oscillating most violently for 7 hours. Afterwards it gradually became more quiet, and finally returned to its normal state on the morning of the 22nd. This second storm of the month began on the Horizontal Force curve by a sudden increase of ordinate at 3.34 a.m., and the movements that immediately followed were very rapid and extended, but not equal to those on the 17th. The Vertical Force fell very rapidly at first, then rose slightly for nearly half an hour, and was finally thrown off its balance. It became steady again just 24 hours after the commencement of the storm. During the remainder of the month the disturbances were never of an unusual character, except during the last two days.

MAY.—The curves were rather irregular at the opening of the month, but the needles gradually became quiet, and remained so until 2 a.m. on the 11th. From this time there were frequent abnormal movements, and finally a short storm, which began at 8 p.m. on the 14th. A sudden movement of the Declination magnet towards the East, was followed by a rapid succession of short swings for about six hours. The Horizontal Force and Vertical Force were more affected in proportion than the Declination, a decided minimum for both components of the intensity occurring at 11.37 p.m. The Vertical Force decreased 0·0064 in British units between 11.21 p.m. and 11.37, and returned almost as rapidly to its previous value. The magnets then remained more or less at rest for several days, the decrease of Declination during the morning of the 20th being the only abnormal feature of the curves. The 22nd was rather disturbed, but no movement of any considerable extent was recorded before the 28th, when the Declination diminished suddenly by 25′ 4″ between 0.31 and 1.14 a.m., and remained disturbed until the end of the month. The vibrations were very small and rapid during the mornings of the 28th and 29th.

JUNE.—The curves for the first half of this month were very regular, the only departure from the mean position being an increase of the Declination on the morning of the 13th, when the maximum was reached

at 6.15. The disturbance on the 15th began quite suddenly at 1.2 a.m., and the principal feature was a long oscillation, the minimum of which occurred at 4.7 and the maximum at 4.45 a.m. The range was 30′ 26″. This was followed by some rapid vibrations, and by a rather irregular curve for two days. From the afternoon of the 17th to the morning of the 20th the magnets were very quiet. There was no considerable perturbation until a few minutes after noon on the 24th, when an important disturbing force gradually manifested itself. Between 4.55 p.m. and 8.50 the Declination diminished by 1° 2′ 39″. The Horizontal Force varied considerably at the same time, the difference between the minimum at 3.39 p.m. and the maximum at 4.52 being 0·0227 in British units. On the Vertical Force curve the maximum occurred at 5.23 p.m., and the minimum at 3.7 the next morning, the range being only 0·0054. The curves were a little disturbed almost to the end of the month. The Daily Range of the Vertical Force was well marked during the earlier part of the month.

JULY.—The magnets were remarkably quiet during the first half of the month, but on the morning of the 16th a disturbing force began to manifest itself, its greatest effect being shown on the curves between 11 p.m. and 8 the next morning. The Vertical Force was considerably diminished between 11 p.m. and 5 a.m. A perfect calm succeeded this slight outburst, and no further disturbance was noted until the afternoon of the 30th. The Declination curve was very irregular during the morning of the 31st, and still more so in the course of the afternoon. The most rapid movements of the needle were noted between 8.50 and 10 p.m.; it moved Westward through 32′ 13″ from 9.23 to 9.45, and then Eastward through 35′ 47″ before 1.40 a.m. During the afternoon of the 31st the Horizontal Force was much above its mean value, the highest reading being attained shortly after 4 p.m. The Vertical Force increased with the Horizontal Force, but its maximum occurred a little later, and its minimum between 1 and 2 the next morning.

AUGUST.—The storm still continued at the opening of this month, but its strength gradually abated during the afternoon of the 1st. Another disturbance started suddenly at 3.51 p.m. on the 4th, the movements being very violent during the remainder of the day, and the needle not coming to rest before 7 the next morning. The Horizontal Force and Vertical Force were both affected at the same instant as the Declination, but the Vertical Force was not much disturbed before 4.45, and reached its maximum at 5.42. It was thrown off its balance shortly after 1 a.m., when the Horizontal Force was a good deal below its normal value. The Horizontal Force maximum reading was at 4.25 p.m., and the minimum at 1.50 the next morning, the range being 0·0293. A few quiet days succeeded, and then the curve became again slightly abnormal at 3.20

a.m. on the 10th. A rapid oscillation occurred between 0.30 and 1.40 a.m. on the 11th, the needle first moving 25′ 1″ to the West, and then 30′ 26″ to the East. The Vertical Force diminished rather quickly. The afternoon of the 12th was a good deal disturbed, the Vertical Force being considerably increased, and there were frequent irregular movements on the following days; but nothing was very marked until 7 p.m. on the 25th, when a disturbance began which lasted until midnight, the magnet then returning quietly in 45 minutes to its normal position. The magnets were somewhat irregular in their movements on the 28th.

SEPTEMBER.—The night of the 2nd was rather unsteady, but nothing of any moment occurred before the 5th of the month, when there were some quick movements in the course of the evening, the minimum, or greatest Eastern range, of the Declination being reached at 8.15. There was a short storm on the morning of the 12th, the Vertical Force decreasing and the Horizontal Force magnet trembling continuously. During the remainder of the month there were only slight departures from the normal curve. The 25th was the most unsteady.

OCTOBER.—At 9.40 a.m. on the 2nd a violent storm began with an oscillation of the Declination magnet first to the West and then to the East. At 6 p.m., when the storm was at its height, the motions were very rapid and extended, the magnet moving 1° 22′ 22″ from West to East between 6.27 and 9.38. The oscillations of the Horizontal Force magnet were quickest between 6 and 7.30, and from 6.47 to 6.57 the ordinate diminished $1\frac{5}{16}$ inches, which is equivalent to 0·0433, one of the most rapid changes ever recorded. The Vertical Force disturbance consisted mainly of an increase of intensity, the maximum being reached at 6.22 p.m. and the minimum at 1.7 a.m., where the range was 0·0090. Another storm commenced about 6 p.m. on the 5th, and ended suddenly at 4.7 p.m. on the 6th. The longest oscillation occurred between 4.17 and 4.45 a.m., showing a diminution of 37′ 36″ in West Declination. The needle was greatly agitated, and varied considerably in Declination during the later hours of the morning, the maximum being reached at 8.33. The Horizontal Force was also much affected by this disturbing force, and the Vertical Force trace was thrown off the paper at 3.30 a.m., but afterwards read considerably above the average. An aurora was seen in the evening. There was again a disturbance of the magnet before midnight on the 7th, and on the four following days. The nights of the 16th and 22nd were also very irregular, the most rapid movement on the 22nd occurring between 7.13 and 7.36, when the Declination varied by 31′ 20″. At 6.33 p.m. on the 27th a disturbance began which lasted for more than two days; the most rapid oscillation was recorded between 4 and 5 p.m. on the 28th.

NOVEMBER.—A disturbance began at 11.52 p.m. on the 2nd, which lasted several hours, but consisted mainly of a quivering motion of the magnet. The night of the 5th and the afternoon of the 7th were considerably disturbed, but no storm occurred before the evening of the 11th.

At 8.37 p.m. on the 11th the magnet began to move slowly towards the East, and after the disturbing force had produced a few irregularities in the Declination it gradually developed the grandest magnetic storm that has ever been recorded in this Observatory, where the photographic magnetographs have been in constant action for fourteen years. The most Westerly bearing of the needle on the 12th was at 8.38 a.m., and on the 13th at 5.19 a.m., and the disturbance continued to increase until the afternoon of the 13th, when the Declination was changing very rapidly, an increase of 39′ 24″ between 4.12 and 4.15 being immediately followed by a decrease of 41′ 11″, and the minimum reached before 4.30. The Vertical Force curves from noon on the 12th to noon on the 13th consisted of one long undulation, and the afternoon of the 13th was a more disturbed repetition of that of the previous day. The magnets were somewhat more quiet during the morning of the 14th, but the afternoon was much disturbed. Throughout the 15th and 16th there was no great departure from the mean, but the needle frequently trembled violently.

The 17th opened with a considerable movement of the magnet towards the West, and soon it began to tremble much more violently than before, and by 10 a.m. this motion became so rapid that the spot of light left scarcely any trace on the sensitized paper. Between 3 p.m. and 5.15 the needle was continually swinging backwards and forwards, the greatest range being about 2° 23′ 14″. The principal maximum was at 11.43 p.m., followed by a minimum at 1.32 a.m., the magnet having altered more than 2° 42′ 56″ in less than two hours. Another well-marked maximum was reached at 3.56 a.m. on the 18th, the Declination having increased 2° 16′ 5″ in the previous 20 minutes. One of the most rapid movements that was perfectly photographed occurred between 0.25 and 0.32 on the same morning, when the magnet moved through 1° 54′ 36″ in 7 minutes. After 5 a.m. the excursions of the magnet were less extensive, but the vibrations continued as rapid as before until a little after noon. The photographic trace of the Horizontal Force magnet during this storm was a most remarkable curve and perfectly recorded throughout, though the line is rather faint in parts between 3 and 6 p.m. on account of the extreme rapidity of the oscillations. The range of the Horizontal Force was 0·1723 in British units, the maximum being at 4.53 p.m. on the 17th, and the minimum at 0.30 a.m. on the 18th, from which it rose 0·0743 in 14 minutes. Another great increase was 0·0382, between 3.46 and 3.53 the same morning. The vibrations about 5 p.m. on the 17th were more rapid, but not so extended. In the afternoon of the 17th a great increase of the Vertical Force was followed by a still greater decrease, until the magnet was thrown off its balance towards midnight. The Vertical Force

trace was again lost in the same manner in the early morning of the 20th, and late on the evening of the 21st. A splendid aurora was seen during the night of the 17th. The storm still continued up to midnight of the 18th, when there was a lull which lasted during the morning of the 19th. The afternoon of the 19th was much disturbed, and a few minutes after midnight the storm again burst forth in all its fury, and continued most violent during the whole of the 20th, the oscillations about noon being the most rapid. The maxima of the Horizontal Force at 11.38 a.m. and at 1.54 p.m. on the 20th were respectively 0·0722 and 0·0638 above the mean, but the minima were less striking. On the 21st the magnet was quiet in the morning, and much disturbed in the afternoon, but towards midnight the magnetism of the earth gradually returned to its normal condition after the unprecedented event of a ten-days' storm. No other disturbance of any moment occurred before the end of the month, except during the afternoon of the 25th, when the Vertical Force was very irregular.

DECEMBER.—A slight disturbance towards midnight on the 1st, and another similar one between 5 and 10 p.m. on the 3rd, were followed by a more considerable irregularity during the afternoon of the 4th. On the 4th, 5th, 6th, and 7th the movements of the Declination needle were very similar between the hours of 8 and 10 p.m., and this reappears rather later on the 9th and 11th. The Declination curve at about 4 a.m. on the 11th, is an exact reproduction of the curve between 6 and 7 a.m. on the 9th. The 11th and 12th were rather irregular, and a still greater disturbance began about 8 p.m. on the 15th, which ended in a decided diminution of the Western Declination, the minimum being reached at 7.30 p.m. on the 16th. The 19th was also disturbed, and a storm commenced about noon on the 20th, which gradually died out after lasting a day and a half. The Vertical Force increased at first, and then diminished very considerably during this storm. During the afternoons of the 20th and 21st the Declination curves bear a striking resemblance to each other, and the same irregularities, in a modified form, are noticeable on some of the following days. The last few days of the year were rather disturbed, but no movements of any great importance were recorded.

AURORÆ SEEN AT STONYHURST OBSERVATORY.

1882.

MARCH 21st.—At 8.30 p.m., a whitish light, without any well-marked outline, was observed a little E. of N., extending between the stars α Lyræ and γ Cygni. From this glow two or three streamers arose, of a pale-green colour, reaching the stars in the head of the constellation Draco. The base of these streamers extended over 2° or 3°, but as they arose they became diffused, being however still discernible at a height of 20° above the horizon. They presented an appearance very much like that of an opened fan. At 8.35 p.m., the same phenomenon was reproduced at a point somewhat W. of N. in the region of the stars κ, λ, ν, θ Andromedæ. The streamers were still more diffused and less brilliant, while the whitish glow about the horizon had almost disappeared. In a few minutes all auroral light had vanished.

AUGUST 5th.—At 9.30 p.m. the horizon, from about N.N.E. to W., was fringed with a bright glow, which appeared to be most brilliant at N.N.W., its altitude at this point being estimated at 10°. Although the sky was overcast at the time, yet this bright glow was very striking. By 10 p.m. it had disappeared. However, the phenomenon observed may have been due to the contrast between the strong twilight and the dark clouds above, and cannot be put down with certainty as auroral.

AUGUST 23rd.—At 9.15 p.m. a bright streamer was seen, partly on the clear sky, and partly superposed on a bank of cumulus clouds. Its position was N. by W., and it was bent slightly towards the E., its summit being curved downwards. It attained an altitude of 25°, remaining visible for about five minutes, when it gradually faded away.

Bright diffused light was also observed in the N., but the moonlight rendered it difficult to decide whether it was auroral or not. At 9.45 the sky became overcast.

OCTOBER 5th.—At 8.40 p.m. an arch was observed extending from about N. to W., of a bluish tinge, the apex being about 25° above the horizon. Its brightness was a little less than that of the Milky Way. At 8.44 it had disappeared.

At 8.45 p.m. three faint white streamers rose from a point W. of N. to the stars ϵ. ζ. η Ursæ Majoris.

Also at 8.45 p.m. a remarkably white glow lit up the northern sky, its contour forming a misshaped arch, the outline however being very sharp and decided, and in contrast with the darker sky above. It reached a point 1° or 2° above Cor Caroli.

From 8.45 to 8.50 p.m. this arch became brighter in parts, and from these brighter portions streamers ultimately issued. A reddish tinge was also noticed.

At 8.50 p.m. four silvery white streamers at a bright spot in N.N.W. They were fan-shaped, and attained an altitude of 40° or 50.° Also a remarkably bright single streamer due N., and another somewhat fainter at N.W. All the streamers disappeared at 8.57 p.m., when two new faint streamers were noted, one reaching a point 2° below ϵ Ursæ Maj., and the other a point 2° from β Ursæ Maj.

At 9.2 p.m. another very faint streamer appeared in the N.W. by W.

The glow in the N. continued getting fainter till 9.25 p.m.

OCTOBER 30th.—At 9.5 p.m. a broad white streamer was seen in the S., its altitude being about 25°. This streamer seemed to be superposed over dense black clouds. The sky at this time was about eight parts covered with cloud.

At 9.14 p.m. three streamers were seen in the N. They were pink and violet in colour, and reached to about θ Ursæ Maj.

At 9.23 p.m. patches of glowing light were observed on the northern horizon.

At 9.25 p.m. patches of light were seen, and a decided white cone about 5° above the horizon, a little E. of N. There was no arch, but the northern horizon was still very bright and glowing. Magnetic clouds were also observed. During the observations a large black strato-cumulus cloud hung almost stationary over the moon. At 9.30 p.m. the moon shone out and no more auroral light was seen.

NOVEMBER 12th.—At 6.30 p.m. a faint auroral arch of white light was observed, extending from N.N.E. to N.W. by N. Its apex was under the star γ Ursæ Majoris, and its altitude was estimated at 25°. It faded away about 6.45 p.m.

At 10 p.m. a similar arch was observed, which lasted till after 11 p.m.
At 17.10 a streamer shot up due N.W.
At 17.15 a reddish glow was observed N.N.W.
At 17.25 seven or eight streamers stretched from the N.W. horizon to the constellation Musca. At this time heavy black clouds hung almost stationary on the N.W. horizon, but the reddish glow was clearly seen between them. Two minutes later, a large broad streamer, white in colour, rose almost to the zenith.
At 17.30 eight more white streamers were seen in the N.W. The reddish glow still continued, with occasional streamers, until 17.40.
At 18.0 there was no trace of the aurora, and the horizon was covered by heavy clouds.

NOVEMBER 13th.—At 6.30 p.m. a glow was seen in the North, which continued intermittently until last observed at 9.50 p.m. The arch, when observed at 6.45 p.m., extended from a point under Corona Borealis, to a point under Capella, or by compass-bearings from W. by N. to N.N.E. (true). Its estimated height was 20°. At 8.10 p.m. some white streamers were seen in the N.W. Later on in the night the sky became overcast.

NOVEMBER 14th.—An auroral glow persisted in the N. from about 8.30 till 11 p.m. The estimated height was from 10° to 15° above the horizon. A few white streamers were seen in the N.N.W. at 10.45 p.m.

NOVEMBER 17th.—The auroras of November the 12th, 13th, and 14th, were but preliminary to a magnificent outburst which was witnessed through the whole of this night. Early in the morning the magnets were observed to be greatly disturbed, and consequently a close watch was kept to observe the first symptoms of the expected aurora. They came at 4.40 p.m.; although the twilight was still very strong, and only first magnitude stars were visible, when a red glow stretched like a huge cloud from the Western horizon almost to the zenith. It passed thence to the N., reaching to the zenith and passed Vega. So bright was this glow that even in the strong twilight it was reflected on a watch-glass.
At 4.50 p.m. a crimson cloud-like streamer, of a moderate breadth, glided rapidly from a point in the horizon under γ Ursæ Majoris to the zenith, whence it curved round towards the N.E., as if carried in that direction by a current. Immediately afterwards the Western horizon became strongly tinged with crimson light, which gradually spread northwards. Five minutes later another similar streamer formed under Capella and joined the former in the zenith.

At 5.3 p.m. a bright broad streamer formed under Aldeberan, and reached a point a little to the north of the zenith. This streamer was, two minutes afterwards, joined by another of a precisely similar character, which arose from a point in the W., where the crimson glow was very intense. By the juncture of these two streamers a most beautiful arch was formed, extending right across the magnetic meridian, its altitude being at least 80° above the horizon, and its width 8° or 10°. The dissolution of this arch did not commence until 5.15, when it began to break in the centre, and immediately two crimson semicircles formed, apparently from the materials of the arch, situated near the zenith, and with their convex sides turned towards the S., their diameters being about 25°. The colour of both the arch and the semicircles was a deep rose or crimson. Even when the arch had altogether broken up, the portions of the E. and W. horizon, whence it had arisen, were so intensely crimson as to stand out in marked contrast against a sky which was itself lit up with a rose colour. So brilliant was this colour with which the whole heavens were suffused that a reference star map was rendered quite glowing with the red light.

During the continuance of the phenomenon just described, intermittent and violent currents of light, at first red and then yellow, were seen to form and disappear in various portions of the sky, principally between N. and E. and converging towards the zenith. They were very remarkable, and gave the impression of being denser than the streamers, exactly resembling in appearance very narrow clouds. Patches of light of large extent were also observed both in the N.E. and S.W. sky, of a constant brilliancy, but at times suddenly vanishing and re-appearing. Those in the S.W. were of a crimson tint, while those in the N.E. were a yellowish green. It is also worthy of remark that from 5.10 to about 5.30 p.m., the part of the heavens immediately surrounding the constellation of Auriga remained quite dark. Heavy black clouds also hung about the northern horizon. From 5.30 to 5.45 p.m., at frequent intervals, very bright silvery white streamers, tinged with crimson, shot rapidly past the zenith from E. towards W.

At 5.44 p.m. another arch was formed. Three large broad streamers, parts as it were of one whole, arose from the point in the Western horizon whence the first arch had been formed, this portion of the heavens being still glowing with red, and having reached an altitude of 45°, completed an arch about the magnetic pole, the other extremity of this arch being placed about half way between α Aurigæ and Aldeberan. Its colour in the N.N.E. was a yellowish white, that of the Western portion being bright crimson. The northern horizon beneath this arch remained quite dark without any glow.

At 5.50 p.m. the sky became cloudy and overcast, but at 5.59 a very bright, broad crimson streamer suddenly darted from the horizon just under α Aurigæ and formed a third magnificent arch, the other extremity being due W., and its central altitude about 80°, or very nearly the same as that of the first observed arch. This streamer lit up the whole sky almost sufficiently to enable a person to read, the moon at the time being covered with clouds. The point in the N.N.E., from which it arose, was of a much brighter crimson than the rest of the band, the edge nearest the N. being of the deepest colour, the arch becoming gradually paler as it extended Westwards, until it became of a very bright yellowish white, slightly tinged with green. Underneath this arch in the N.N.W., faint white vertical streamers were now seen shooting up in the dark background.

At 6.5 p.m. a very bright pencil of light gradually glided up to the zenith from a point due E., and remained visible for a few minutes.

At 6.7 p.m. two bright streamers suddenly formed in N. by E., 6° apart at their base, and met in the zenith.

At 6.10 p.m. the auroral light had almost disappeared, fading away first in the W. and then in the E.

At 6.15 a very faint white light still lingered on the northern horizon, being brightest at those points where the last arch had formed and had been most intense.

At 6.30 p.m. very faint diffused crimson light appeared due magnetic N.

At 6.38 p.m. the light was fading away and becoming more diffused.

At 8.35 p.m., however, a very bright narrow steamer shot up from the W.N.W. horizon, reached an altitude of 50°, and faded away in about three minutes.

This was succeeded at 8.42 p.m. by two other bright narrow streamers, but slightly broader than the preceding one, which arose in the N.W. by W. On the horizon they were separated by about 4°, but joined one another in the zenith. They remained visible for about five minutes.

After midnight another outbreak of the aurora was witnessed.

At 12.57 p.m. several streamers were seen in the N., reaching almost to the zenith. They were not very bright, but remained visible for about ten minutes.

Similar streamers in the N. were again observed at 13.31, but they did not reach so high, and remained visible but a very short time.

At 15.46 a very bright broad crimson streamer started from a point N.N.W., reached the zenith, and thence curved towards the W., which was lit up with a brilliant glow. Very vivid flashes of white light were also seen in the N.W.

The sky now became covered with a thick haze, but at 16.35 a very bright glow suddenly appeared in the W.N.W., and five beautiful streamers burst from it, rising vertically for about 60°, and then curving to the N.

At 16.40 another broad streamer of a deep crimson hue, and accompanied by two smaller white streamers, rose in the N.N.E.

Again at 16.52 the horizon from W. to N. became suffused with a bright crimson glow, from which darted a great number of white vertical streamers. Their average height was about 40°, and they remained visible for at least six minutes.

At 17.0 a streamer in the N.N.E. reached an altitude of 80°, but soon faded away.

During the time of these latter observations, *i.e.*, from 16.30 to 17.15, the vivid flashes of white light in the N.W. still continued, and with still greater frequency than before.

At 17.15 two streamers formed, one in the N.N.E. and the other in the N.N.W., and reached an altitude of 63°, where they met. Then followed several very remarkable flashes of light more frequent and brilliant than ever. They continued until 17.27, at which time they were most intense, especially in the W. Six minutes later dark clouds began to form in the N. and W., but the flashes of light were still vivid in the zenith. A few minutes later they had ceased, and nothing further was observed.

SOLAR OUTBURSTS COINCIDENT WITH THE ABOVE AURORÆ.

Even a cursory examination of the daily sun-spot drawings made throughout the year, shows a striking coincidence of auroral displays with extraordinary manifestations of solar activity. Thus on the 21st of March, a large group of spots had formed within the last three days. Again, between the 9th of September, and the 5th of October, two groups of spots increased immensely in size so as to become visible to the naked eye on the 2nd of October. On the 20th of October a few spots, scarcely larger than pores, gradually joined together, and developed into a large spot of very irregular outline. Another spot became visible on the 23rd, and was large enough on the 26th to be seen without a telescope. This spot, which was at first circular, became considerably elongated on the 29th. Lastly, on the 12th of November, a long dark line appeared on the following limb of the sun, the line being an enormous spot seen in perspective, and this was well on the solar disk during the magnificent auroral display and grand magnetic storm of the 17th.

INDEX TO PREVIOUS REPORTS.

THE Stonyhurst Observatory was founded in 1846, but the yearly Reports were not printed before the year 1860.

In 1865 the Magnetic Report was first added.

In 1868 the amount of Evaporation for previous years was printed at the end of the Monthly Tables.

A New Table of the Mean and of the Maximum Velocity of the Wind was also added.

A note on the Secular Variation of the Dip and Total Force accompanied the usual Magnetic Report.

In 1869 the occurrence of Magnetic Storms is first recorded.

In 1870 Tables are added of the Velocity and Frequency of the Wind.

Also a Table of the amount of Rainfall from 1848.

In 1871 a Set of Comparisons of Old and New Instruments was printed.

A Table of Frequency of Rainfall from 1848.

In 1872 the Secular Variations of the Meteorological Elements were tabulated and represented graphically.

Weekly Observations of the Magnetic Declination were commenced.

In 1873 the Annual Variations of the Meteorological Elements are represented graphically.

In 1875 an Introduction and the List of Presents received were first added to the Report.

Time Curves for Maximum and Minimum Temperature are given.

In 1876 the Astronomical Day was substituted for the Civil Day in drawing the Curves of Minimum Temperature.

Agricultural Notes and Observations of Crops and Flowers were first added to the Report.

In 1877 Barometrical Tables and Curves are given showing the times of the Maxima and Minima.

A Table containing the Observations of Upper Clouds was first printed.

In 1878 the Rainfall is tabulated for thirty years, and Annual and Monthly Curves of the amount and frequency are traced.

The dates of Occasional Phenomena are given in a separate page, and also a Table of Contents.

In 1879 the Daily Range of the Magnetic Declination from 1868 to 1879 is given in tables, and also represented graphically.

In 1880 similar Tables and Curves are given for the Horizontal Component of the Magnetic Force.

The Duration of Sunshine appears for the first time in the Report.

In 1881 the dates of the Flowering of Plants were first recorded.

In 1882 the Observations of the Aurora Borealis form a separate Appendix.

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