STONYHURST COLLEGE OBSERVATORY.

RESULTS

OF

METEOROLOGICAL AND MAGNETICAL OBSERVATIONS.

BY THE

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TABLE OF CONTENTS.

INTRODUCTION.

As no alteration of any moment has been made during the last twelve months in the Meteorological and Magnetic work of this Observatory, it may suffice to refer to the reports of the last few years for any details regarding these branches of research.

In connexion, however, with these subjects, it will not be considered out of place to recall the constant encouragement and assistance this Observatory has for so many years received from the late lamented Dr. Balfour Stewart, who was engaged at the time of his death in preparing a paper for the Royal Society on the comparison of the Kew and Stonyhurst Magnetograms.

It might also be well to mention that, at the request of the Medical Officer of the Local Board of Health, the Stonyhurst Meteorological Registers for the years 1876 to 1885 have been forwarded to Somerset House for comparison with other similar records.

The sun continues to absorb a considerable portion of the energy of the assistants at this Observatory, and although unfortunately during the first three months of the year an accident deprived the staff of one of its ablest members, no interruption occurred in the constant record of solar phenomena.

The solar drawings of spots and faculæ were made on 259 different days; and the spot area for 1886 and 1887 has been measured, corrected for foreshortening, expressed in millionths of the visible hemisphere, and represented graphically. The observations of the general surface, and of the various classes of veiled spots, have furnished matter for a paper presented to the Royal Astronomical Society.

Complete measurements of the height of the chromosphere have been secured on 123 occasions; and the inclination of the chromospheric filaments and of the lesser prominences was observed whenever the definition was exceptionally good. The results are published in the "Observatory." Occasional observations have also been made of spot spectra, and a large grating spectroscope is in course of construction by Mr. Hilger for use in this important branch of solar physics.

The comets of Finlay and Barnard were observed with companion stars, and positions reduced by the Rev. W. Crofton. The observations of Jupiter's satellites and of lunar occultations are continued as before; and a systematic watch for meteors has been carried on for several months in connexion with the general plan of Mr. W. F. Denning.

The Paris Congress of Astronomers, called together to discuss the important question of a complete photographic record of the siderial heavens, met in the month of April, and the Director of the Stonyhurst Observatory was enabled to accept a special invitation to take part in the deliberations.

The preparation of instruments for the observation of the total solar eclipse in Russia, and the necessary preliminary photographic experiments, occupied several months of the year. The result at Pogost, the chosen station on the

Volga, was only a series of photographs of the partial phases of the eclipse, clouds having covered the sun during totality, and thus marred the most important portion of the work proposed A paper read at the November meeting of the R.A.S. gives the chief details of the expedition; and a more popular account appeared in the pages of the "Tablet."

The Results of the Government Transit of Venus Expeditions in 1882, formed the subject of a report presented to Parliament this year by Mr. E. J. Stone, the Radcliffe Observer, the contacts observed at Madagascar by the Revs. W. Sidgreaves and S. J. Perry being incorporated in the report. The resulting solar parallax is $8''\cdot832 \pm 0''\cdot024$.

A Report on the observation of the Total Solar Eclipse at Carriacou, in 1886, was published in the Proceedings of the Royal Society.

The chief addition to the instruments at the Observatory is a large heliostat by Hilger, for use in the spectroscopic room.

Stonyhurst Observatory.

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

METEOROLOGICAL REPORT.

January, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·505	29·419
Highest ,, on the 20th	30·178	30·023
Lowest ,, on the 5th	28·406	28·563
Range of Barometer Readings	1·772	1·460
Highest Reading of a Max. Therm. on the 29th	53·8	51·6
Lowest Reading of a Min. Therm. on the 6th	16·9	21·0
Range of Thermometer Readings	36·9	30·6
Mean of all the Highest Readings	41·2	42·1
Mean of all the Lowest	29·8	32·5
Mean Daily Range	11·4	9·6
Deduced Monthly Mean (from Mean of Max. and Min.)	35·3	37·1
Mean Temperature from dry bulb	35·9	37·1
Adopted Mean Temperature	35·6	37·1
Mean Temperature of Evaporation	34·5	35·9
Mean Temperature of Dew Point	32·9	33·8
Mean elastic force of Vapour	0·189 in	0·196 in
Mean weight of Vapour in a cubit foot of air	2·2 gr	2·3 gr
Mean additional weight required for saturation	0·4 gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·90	0·86
Mean weight of a cubic foot of air	552·6 gr	549·1 gr
Fall of Rain	3·200 in	4·265 in
Number of days on which Rain fell	19	19·4
Amount of Evaporation	236·2 in	0·900 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	0	4	4	1	4	8	10	0
Mean Velocity in miles per hour	0	6·7	6·4	7·0	11·3	11·2	8·0	0
Total No. of miles for each Direction	0	647	616	168	1084	2149	1917	0

The total number of miles registered during the month was 6581.

The max. Velocity of the wind was 36 miles per hour ; direction S. on the 11th at 10 and 11 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0) 8·5

In the month of January, the highest reading of the Barometer during 40 years, was on the 18th, in 1882, and was .....30·480

The lowest ,, ,, 26th, 1884 ..... 27·803

The highest Temperature ,, 7th, 1887 ..... 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 Barometer readings were pretty close to the average, but the range of the Barometer was rather large. The mean temperature was low, and the range of temperature great. The Rainfall was nearly an inch below the mean for January. The prevailing wind was W.S.W.

February, 1887.

Results of Observations taken during the Month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·864	29·492
Highest ,, on the 8th	30·337	30·059
Lowest ,, on the 2nd	29·205	28·669
Range of Barometer Readings	1·132	1·390
Highest Reading of a Max. Therm. on the 22nd	55·5	52·0
Lowest Reading of a Min. Therm. on the 8th	19·3	22·9
Range of Thermometer Readings	36·2	29·1
Mean of all the Highest Readings	45·4	44·2
Mean of all the Lowest	31·1	33·9
Mean Daily Range	14·3	10·3
Deduced Monthly Mean (from Mean of Max. and Min.)	37·9	38·7
Mean Temperature from dry bulb	38·2	38·7
Adopted Mean Temperature	38·1	38·7
Mean Temperature of Evaporation	36·2	37·0
Mean Temperature of Dew Point	33·7	34·9
Mean elastic force of Vapour	0·193 in	0·193 in
Mean weight of Vapour in a cubic foot of air	2·2gr	2·4 gr
Mean additional weight required for saturation	0·5gr	0·4 gr
Mean degree of Humidity (saturation 1·00)	0·84	0·87
Mean weight of a cubic foot of air	556·6gr	548·5 gr
Fall of Rain	1·839in	3·610 in
Number of days on which Rain fell	8	17·4
Amount of Evaporation	1·139in	0·985 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	0	5	4	0	3	5	10	1
Mean Velocity in miles per hour	0	7·9	5·6	0	7·4	17·5	10·4	37
Total No. of miles for each Direction	0	953	541	0	539	2099	2493	89

The total number of miles registered during the month was 6107.
The Max. Velocity of the wind was 43 miles per hour ; direction S. by E. at 4 p.m., on the 2nd.

Mean amount of Cloud (an overcast sky being indicated by 10·0)			6·1
In the month of February, the highest reading of the Barometer during 40 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 Barometer readings were high, with a small range. The mean Temperature was close to the average; but the range of Thermometer readings was great. The amount of Rain was very small. The prevailing wind was West.

March, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·639	29·477
Highest ,, on the 2nd	30·195	30·082
Lowest ,, on the 23rd	28·628	28·705
Range of Barometer Readings	1.567	1·377
Highest Reading of a Max. Therm. on the 30th	56·1	56·9
Lowest Reading of a Min. Therm. on the 12th	12·5	22·8
Range of Thermometer Readings	43·6	34·1
Mean of all the Highest Readings	46·3	47·0
Mean of all the Lowest	29·4	34·3
Mean Daily Range	16·9	12·7
Deduced Monthly Mean (from Mean of Max. and Min.)	36·9	39·7
Mean Temperature from dry bulb	36·8	39·9
Adopted Mean Temperature	16·9	39·8
Mean Temperature of Evaporation	35·4	38·0
Mean Temperature of Dew Point	33·3	35·4
Mean elastic force of Vapour	0·191 in	0·207 in
Mean weight of Vapour in a cubic foot of air	2·2 gr	2·4 gr
Mean additional weight required for saturation	0·5 gr	0·5 gr
Mean degree of Humidity (saturation 1·00)	0·88	0·85
Mean weight of a cubic foot of air	553·5 gr	546·8 gr
Fall of Rain	3·008 in	3·153 in
Number of days on which rain fell	10·0	17·6
Amount of Evaporation	1·255 in	1·726 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	4	8	4	0	0	2	11	2
Mean Velocity in miles per hour	4·3	5·4	6·0	0	0	10·4	13·9	3·1
Total No. of miles for each Direction	408	1041	574	0	0	499	3666	148

The total number of miles registered during the month was 6336.
The max. Velocity of the wind was 39 miles per hour, direction W., on the 23rd, at 1 and 3 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			6·9
In the month of March, the highest reading of the Barometer during 40 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	,,	,, 6th, 1886	11·5
The highest adopted mean temperature of the month, 1871			44·0
The lowest	,,	,, 1855	35·6

Both the Barometer readings and the range were slightly in excess of the mean for 40 years. Mean Temperature was low, and the range of Temperature great. The Rainfall was very close to the average. The prevailing wind was West.

April, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·599	29.480
Highest ,, on the 17th	30·251	29·970
Lowest ,, on the 23rd	28·779	28·770
Range of Barometer Readings	1·472	1·200
Highest Reading of a Max. Therm. on the 12th	61·1	66·2
Lowest Reading of a Min. Therm. on the 14th	22·9	28·3
Range of Thermometer Readings	38·2	37·9
Mean of all the Highest Readings	52·0	54·2
Mean of all the Lowest	33·6	37·9
Mean Daily Range	18·4	16·3
Deduced Monthly Mean (from Mean of Max. and Min.)	41·3	44·6
Mean Temperature from dry bulb	41·4	44·6
Adopted Mean Temperature	41·4	44·6
Mean Temperature of Evaporation	38·5	41·8
Mean Temperature of Dew Point	35·0	38·3
Mean elastic force of Vapour	0·203in	0·237in
Mean weight of Vapour in a cubic foot of air	2·4gr	2·7gr
Mean additional weight required for saturation	0·7gr	0·7gr
Mean degree of Humidity (saturation 1·00)	0·79	0·80
Mean weight of a cubic foot of air	547·9gr	541·8gr
Fall of rain	1·844in	2·342in
Number of days on which Rain fell	12	14·8
Amount of Evaporation	2·844	2·477

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	3	9	2	0	0	4	11	1
Mean Velocity in miles per hour	11·3	9·3	6·0	0	0	13·3	10·8	5·4
Total No. of miles for each Direction	812	2014	289	0	0	1274	2841	130

The total number of miles registered during the month was 7360.
The max. Velocity of the wind was 33 miles per hour, direction S. W., on the 26th, at 9 a. m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			6·6
In the month of April, the highest reading of the Barometer during 40 years, was on the 17th, in 1887, and was			30·251
The Lowest	,,	20th, 1868.....	28·358
The highest Temperature	,,	14th, 1852.....	74·1
The lowest	,,	4th, 1885.....	21·1
The highest adopted mean temperature of the month,		1865.....	48·5
The lowest	,,	1879.....	40·7

The mean reading of the Barometer differed little from the average. The range of Barometer readings was rather large. The mean Temperature was somewhat low, and the range a little in excess of the average. The Rainfall was small. The most prevalent winds were from W. and N.E.

May, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·630	29·506
Highest „ on the 14th	30·047	29·962
Lowest „ on the 20th	28·761	28·931
Range of Barometer Readings	1·286	1·031
Highest Reading of a Max. Therm. on the 1st	66·0	71·6
Lowest Reading of a Min. Therm. on the 3rd	30·1	31·4
Range of Thermometer Readings	35·9	40·2
Mean of all the Highest Readings	57·5	59·6
Mean of all the Lowest	40·2	42·1
Mean Daily Range	17·3	17·5
Deduced Monthly Mean (from Mean of Max. and Min.)	47·2	49·2
Mean Temperature from dry bulb	47·8	49·4
Adopted Mean Temperature	47·5	49·3
Mean Temperature of Evaporation	44·6	46·1
Mean Temperature of Dew Point	41·4	42·6
Mean elastic force of Vapour	0·261 in	0·274 in
Mean weight of Vapour in a cubic foot of air	3·0 gr	3·2 gr
Mean additional weight required for saturation	0·7 gr	0·9 gr
Mean degree of Humidity (saturation 1·00)	0·80	0·76
Mean weight of a cubic foot of air	541·4 gr	5371·gr
Fall of Rain	2·794 in	2·624 in
Number of days on which Rain fell	10	15·4
Amount of Evaporation	2·664 in	3·459 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	0	12	3	0	1	1	11	3
Mean Velocity in miles per hour	0	8·1	9·7	0	5·1	7·3	11·1	17·3
Total No. of miles for each Direction	0	2528	697	0	122	172	2942	1246

The total number of miles registered during the month was 7707.
The max. Velocity of the wind was 43 miles per hour, direction N.W., on the 20th, at 8 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			8·2
In the month of May, the highest reading of the Barometer during 40 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 Barometer readings were very close to the average ; and the range slightly in excess. The Temperature was a little below the mean, and the range small. The Rainfall was also close to the average. The prevailing winds were almost equally from N.E. and W., but the strongest winds blew from N.W.

June, 1887.

Results of Observations taken during the month.		Mean for the last 40 years
Mean Reading of the Barometer	29·794	29·534
Highest ,, on the 29th	30·061	29·880
Lowest ,, on the 3rd	29·352	29·024
Range of Barometer Readings	0·709	0·856
Highest Reading of a Max. Therm. on the 19th	82·8	76·8
Lowest Reading of a Min. Therm. on the 10th	40·4	39·1
Range of Thermometer Readings	42·4	37·7
Mean of all the Highest Readings	71·3	65·4
Mean of all the Lowest	48·6	47·9
Mean Daily Range	22·7	17·5
Deduced Monthly Mean (from Mean of Max. and Min.)	58·2	54·9
Mean Temperature from dry bulb	58·4	54·8
Adopted Mean Temperature	58·3	54·9
Mean Temperature of Evaporation	54·3	52·1
Mean Temperature of Dew Point	50·7	48·7
Mean elastic force of Vapour	0·371 in	0·357 in
Mean weight of Vapour in a cubic foot of air	4·0 gr	3·9 gr
Mean additional weight required for saturation	1·3 gr	0·9 gr
Mean degree of Humidity (saturation 1·00)	0·76	0·79
Mean weight of a cubic foot of air	532·3 gr	543·1 gr
Fall of Rain	0·525 in	3·679 in
Number of days on which Rain fell	4	16·5
Amount of Evaporation	3·713 in	368·2 in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	7	4	0	0	1	17	0
Mean Velocity in miles per hour	3·8	7·5	8·2	0	0	14·9	8·0	0
Total No. of Miles for each Direction	91	1257	786	0	0	357	3246	0

The total number of miles registered during the month was 5737.
The max. Velocity of the wind was 31 miles per hour, direction W. on the 9th, at 3 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			5·4
In the month of June, the highest reading of the Barometer during 40 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

Both Barometer and Thermometer readings were rather high. The range of the Barometer was close to the average; but the range of Temperature was great. Rainfall 3 inches below the average. Prevailing wind West.

July, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·595	29·506
Highest ,, on the 1st	29·921	29·879
Lowest ,, on the 26th	28·975	29·003
Range of Barometer Readings	0.946	0·876
Highest Reading of a Max. Therm. on the 8th	82·2	79·4
Lowest Reading of a Min. Therm. on the 5th	38·0	42·8
Range of Thermometer Readings	44·2	36·6
Mean of all the Highest Readings	71·7	68·0
Mean of all the Lowest	50·0	50·9
Mean Daily Range	21·7	17·1
Deduced Monthly Mean (from Mean of Max. and Min.)	59·0	57·6
Mean Temperature from dry bulb	60·2	58·0
Adopted Mean Temperature	59.6	57·8
Mean Temperature of Evaporation	55·6	55·0
Mean Temperature of Dew Point	52·0	52·4
Mean elastic force of Vapour	0·389 in	0·395 in
Mean weight of Vapour in a cubic foot of air	4.4gr	4·5 gr
Mean additional weight required for saturation	1·3 gr	1·2 gr
Mean degree of Humidity (saturation 1·00)	0.77	0·82
Mean weight of a cubic foot of air	527.3 in	527·2 in
Fall of Rain	2·311 in	4·208 in
Number of days on which Rain fell	10	18·0
Amount of Evaporation	2·500	3.949

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	0	0	0	0	2	4	20	5
Mean Velocity in miles per hour	0	0	0	0	12·0	16·0	8·4	7·1
Total No. of miles for each Direction	0	0	0	0	578	1535	4044	587

The total number of miles registered during the month was 7014.
The max. Velocity of the wind was 36 miles per hour; direction W. by N., on the 10th, at 11 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			5·4
In the month of July, the highest reading of the Barometer during 40 years, was on the 24th, in 1868, and was			30·112
The lowest	,,	,, 15th, 1877	28·564
The highest Temperature	,,	22nd, 1873	88.2
The lowest	,,	,, 1st, 1857	36·0
The highest adopted mean temperature of the month,		1852	63·0
The lowest	,,	,, 1879	54·7

The Mean Barometer and range of Barometer readings were almost identical with the average. The Thermometer readings and the range of Temperature were a little higher than usual. The rainfall was nearly two inches below the average amount for July. The prevailing wind was W., but the strongest winds were from S.S.W.

August, 1887.

Results of Observations taken during the month		Mean for the last 40 years.
Mean Reading of the Barometer	29·547	29·492
Highest ,, on the 3rd	29·971	29·891
Lowest ,, on the 31st	28·903	28·957
Range of Barometer Readings	1·068	0·934
Highest Reading of a Max. Therm. on the 6th	82·8	77·4
Lowest Reading of a Min. Therm. on the 13th	33·4	41·5
Range of Thermometer Readings	49·4	35·9
Mean of all the Highest Readings	68·8	67·3
Mean of all the Lowest	48·3	50·5
Mean Daily Range	20·5	16·8
Deduced Monthly Mean (from Mean of Max. and Min.)	56·9	57·2
Mean Temperature from dry bulb	58·1	57·5
Adopted Mean Temperature	57·5	57·4
Mean Temperature of Evaporation	53·3	54·6
Mean Temperature of Dew Point	49·5	52·0
Mean elastic force of Vapour	0·354 in	0·390 in
Mean weight of Vapour in a cubic foot of air	3·9gr	4·3 gr
Mean additional weight required for saturation	1·4gr	0·9 gr
Mean degree of Humidity (saturation 1·00)	0·75	0·83
Mean weight of a cubic foot of air	528·9gr	527·3 gr
Fall of Rain	2·255 in	4·664 in
Number of days on which Rain fell	11	18·7
Amount of Evaporation	2·980	3·025

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	1	5	0	0	5	0	12	8
Mean Velocity in miles per hour	4·8	4·5	0	0	6·4	0	10·3	7·0
Total No. of miles for each Direction	115	536	0	0	767	0	2972	1350

The total number of miles registered during the month was 5740.
The max. Velocity of the wind was 28 miles per hour; direction W.. on the 8th, at 3 p.m., and also on the 9th at 11 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·3
In the month of August, the highest reading of the Barometer during 40 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 ,,	,,	13th, 1887.....	33·4
The highest adopted mean temperature of the month,		1857 & 1884	61·0
The lowest ,,	,,	1848.....	52·5

Both Barometer and Thermometer readings were very close to average. The Rainfall was more than two inches below the mean for August. The prevailing wind was West.

September, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·485	29·503
Highest ,, on the 8th	30·136	30·030
Lowest ,, on the 2nd	28·538	28·832
Range of Barometer Readings	1·598	1·198
Highest Reading of a Max. Therm. on the 4th	65.0	72·1
Lowest Reading of a Min. Therm. on the 27th	30·7	36·5
Range of Thermometer Readings	34·3	35·6
Mean of all the Highest Readings	59·8	62·2
Mean of all the Lowest	44.5	47·0
Mean Daily Range	15·3	15·2
Deduced Monthly Mean (from Mean of Max. and Min.)	50·9	53·3
Mean Temperature from dry bulb	51·7	54·0
Adopted Mean Temperature	51.3	53·7
Mean Temperature of Evaporation	48·2	51·0
Mean Temperature of Dew Point	45·0	48·4
Mean elastic force of Vapour	0·301 in	0·340 in
Mean weight of Vapour in a cubic foot of air	3·5 gr	3·9 gr
Mean additional weight required for saturation	0·9 gr	0·8 gr
Mean degree of Humidity (saturation 1·00)	0·79	0·81
Mean weight of a cubic foot of air	5·340 gr	532·2 gr
Fall of Rain	5·755 in	4·614 in
Number of days on which Rain fell	18	18·3
Amount of Evaporation	1·268 in	2·312 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	2	9	2	0	1	4	10	2
Mean Velocity in miles per hour	5·7	5·7	3·9	0	12·1	11·1	11·0	7·7
Total No. of miles for each Direction	273	1238	189	0	290	1062	2633	371

The total number of miles registered during the month was 5856.
The max. Velocity of the wind was 27 miles per hour; direction W., on the 2nd at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·2
In the month of September, the highest reading of the Barometer during 30 years, was on the 15th, in 1851, and was			30·274
The lowest	,,	,, 2nd, 1883.....	28·323
The highest Temperature	,,	6th, 1868.....	85·0
The lowest	,,	,, 25th, 1885.....	29·8
The highest adopted mean temperature of the month, 1865.....			59·1
The lowest	,,	,, 1863.....	50·9

The Barometer readings were very close to the average for September. The range was large. The Temperature was rather low. Rainfall an inch above the mean. The prevailing wind was West, but the number of days on which it blew from N.E., was larger than is usual in September.

October, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·603	29·423
Highest ,, on the 17th	30·182	30·006
Lowest ,, on the 30th	28·850	28·654
Range of Barometer Readings	1·332	1·352
Highest Reading of a Max. Therm. on the 3rd and 7th	59·1	64·2
Lowest Reading of a Min. Therm. on the 11th	23·2	29·5
Range of Thermometer Readings	35·9	34·7
Mean of all the Highest Readings	51.2	54·6
Mean of all the Lowest	36·6	41·9
Mean Daily Range	14·6	12·7
Deduced Monthly Mean (from Mean of Max. and Min.)	42·9	47·3
Mean Temperature from dry bulb	43·5	47·9
Adopted Mean Temperature	43·2	47·6
Mean Temperature of Evaporation	40·5	45·3
Mean Temperature of Dew Point	37·3	43·0
Mean elastic force of Vapour	0·223 in	0278 in
Mean weight of Vapour in a cubic foot of air	2·6 gr	2·9 gr
Mean additional weight required for saturation	0·6 gr	0·6 gr
Mean degree of Humidity (saturation 1·00)	0·80	0·85
Mean weight of a cubic foot of air	547 0 gr	543·0 gr
Fall of Rain	2·121 in	5·140 in
Number of days on which Rain fell	12·	21·2
Amount of Evaporation	0·500 in	1·714 in

No. of days in the month on which the prevailing wind was	N	NE	E	SE	S	SW	W	NW
	6	5	0	0	1	2	9	8
Mean Velocity in miles per hour	9·7	2·2	0	0	19·9	13·5	10·2	6·8
Total No. of miles for each Direction	1401	620	0	0	477	649	2200	1307

The total number of miles registered during the month was 6654.
The max. Velocity of the wind was 30 miles per hour; direction N., on the 13th, at 9 a.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)			7·2
In the month of October, the highest Reading of the Barometer during 40 years, was on the	5th, in	1884, and was	30·306
The lowest ,,	,,	19th, 1862.....	28·139
The highest Temperature ,,		9th, 1869	72·8
The lowest ,,	,,	21st, 1880.....	23·1
The highest adopted mean temperature of the month,		1861 and 1876	51·6
The lowest ,,	,,	1880.....	43·1

The Barometer readings were rather high. The Temperature was low, but the range great. Rainfall three inches below the average. The prevailing wind was West.

November, 1887.

Results of Observations taken during the Month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·272	29·447
Highest ,, on the 15th	29·927	30·052
Lowest ,, on the 3rd	28·231	28·575
Range of Barometer Readings	1696	1·477
Highest Reading of a Max. Therm. on the 26th	51·6	55·6
Lowest Reading of a Min. Therm. on the 15th	22·4	25·5
Range of Thermometer Readings	29·2	30·1
Mean of all the Highest Readings	45·0	46·9
Mean of all the Lowest	33·3	36·0
Mean Daily Range	11·7	10·9
Deduced Monthly Mean (from Mean of Max. and Min.)	39·2	41·4
Mean Temperature from dry bulb	39·3	41·3
Adopted Mean Temperature	39·3	41·4
Mean Temperature of Evaporation	37·5	38·9
Mean Temperature of Dew Point	35·2	37·5
Mean elastic force of Vapour	0·206in	0·225in
Mean weight of Vapour in a cubic foot of air	2·4gr	2·6gr
Mean additional weight required for saturation	0·5gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·86	0·87
Mean weight of a cubic foot of air	544·0gr	5449gr
Fall of Rain	2·474in	4·108in
Number of days on which Rain fell	16	19·0
Amount of Evaporation	1·006in	1·452in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	3	11	1	0	4	6	5	0
Mean Velocity in miles per hour	3·7	7·1	2·8	0	18·3	11·0	6·7	0
Total No. of miles for each Direction	269	1872	66	0	1752	1586	799	0

The total number of miles registered during the month was 6344.
The Max. Velocity of the wind was 62 miles per hour; direction S. by E., on the 1st, at 1 p.m.

Mean amount of Cloud (an overcast sky being indicated by 10·0)			7·7
In the month of November, the highest reading of the Barometer during 40 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 Barometer readings did not differ much from the average. The mean Temperature was rather lower than usual in November. Rainfall was about 1½ in. below the usual mean for the month. Prevailing wind N.E.

December, 1887.

Results of Observations taken during the month.		Mean for the last 40 years.
Mean Reading of the Barometer	29·381	29·447
Highest ,, on the 2nd	29·973	30·059
Lowest ,, on the 8th	28·683	28·595
Range of Barometer Readings	1·290	1·464
Highest Reading of a Max. Therm. on the 15th	51·1	53·0
Lowest Reading of a Min. Therm. on the 28th	19·8	22·1
Range of Thermometer Readings	31·3	30·9
Mean of all the Highest Readings	41·6	42·8
Mean of all the Lowest	28·9	33·0
Mean Daily Range	12·7	9·8
Deduced Monthly Mean (from Mean of Max. and Min.)	35·3	37·9
Mean Temperature from dry bulb	36·4	38·6
Adopted Mean Temperature	35·8	38·3
Mean Temperature of Evaporation	34·1	37·1
Mean Temperature of Dew Point	31·6	35·0
Mean elastic force of Vapour	0·179in	0·206in
Mean weight of Vapour in a cubic foot of air	2·1gr	2·3gr
Mean additional weight required for saturation	0·3gr	0·4gr
Mean degree of Humidity (saturation 1·00)	0·85	0·87
Mean weight of a cubic foot of air	549·9gr	547·9gr
Fall of Rain	3·124in	5·436gr
Number of days on which Rain fell	19	20·0
Amount of Evaporation	1·593in	1·066in

	N	NE	E	SE	S	SW	W	NW
No. of days in the month on which the prevailing wind was	4	2	2	0	3	10	6	4
Mean Velocity in miles per hour	5·0	4·6	3·3	0	19·9	8·4	17·7	6·8
Total No. of miles for each Direction	248	217	167	0	1430	2006	2544	669

The total number of miles registered during the month was 7515.
The max. Velocity of the wind was 48 miles per hour; direction S., at 11 a.m., on the 6th.

Mean amount of Cloud (an overcast sky being indicated by 10·0)...			7·7
In the Month of December, the highest reading of the Barometer during 40 years, was on the 22nd in 1849, and was			30·378
The lowest	,,	8th, 1886.....	27·350
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 Barometer readings were close to the average; and the range rather lower than usual in December. The Temperature was low with large range. Rainfall more than two inches below the mean for the month. Prevailing wind S.W. by W.

Summary of Observations FOR 1887.

		Mean for the last 40 years.
Mean Reading of the Barometer	29·582	29·485
Highest ,, on February 8th	30·337	30·289
Lowest ,, on November 3rd.	28·231	28·252
Range of Barometer Readings	2·126	2·037
Highest Reading of a Max. Therm. on June 19th and August 6th	82·8	81·5
Lowest Reading of a Min. Therm. on March 12th	12·5	15·6
Range of Thermometer Rerdings	70·3	65·9
Mean of all the Highest Readings	54·3	54·7
Mean of all the Lowest	37·9	40·7
Mean Daily Range	16·4	14·0
Deduced Yearly Mean (from Mean of Max. and Min.)	45·1	46·7
Mean Temperature of dry bulb	45·6	46·9
Adopted Mean Temperature	45·4	46·8
Mean Temperature of Evaporation	42·7	44·5
Mean Temperature of Dew Point	39·8	42·0
Mean elastic force of Vapour	0·255 in	0·275 in
Mean weight of Vapour in a cubic foot of air	2·9 gr	3·3 gr
Mean additional weight required for saturation	0·9 gr	0·7 gr
Mean degree of Humidity (saturation 1·00)	31·250	0·84
Mean weight of a cubic foot of air	543·4 gr	539·3 gr
Total Fall of Rain in the Year	31·250	47·284
Number of days per Month on which Rain fell	12·7	18·2
Amount of Evaporation	23·824	22·954 in

The Maximum monthly mean height of the Barometer was in January, 1880, and was	29·928
The Minimum ,, ,, in December 1868, and was	28984
The Maximum yearly mean height of the Barometer was in 1887, and was	29·582
The Minimum ,, ,, ,, ,, in 1866, and was	29·389

The greatest monthly range of the Barometer was in January, 1884, and was		2·409
The least ,, ,, in July, 1852. and was		0·505
The highest reading of the Barometer, during 40 years, was on January 18th, 1882, and was		30·480
The lowest ,, ,, on December 8th, 1886, and was		27·350
Extreme range		3·130
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 1861		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		13·437in
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

DATES OF OCCASIONAL PHENOMENA.

1887.	Frost.	Hoar Frost only.	Snow.	Hail.
January	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 27	10, 12, 13, 17, 20, 27	2, 4, 5, 7, 8, 9, 17,	
February	1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 25, 26, 27, 28	6, 7, 8, 9, 10, 11, 12, 13		1
March	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 26, 29, 30, 31	4, 5, 6, 11, 13, 14, 15, 17, 19, 20, 21	16, 17, 18, 21, 22	
April	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 17 18, 24, 25, 26, 28, 30	5, 9, 15, 17	26, 27	5, 23, 24, 26, 27
May	1, 2, 4, 13, 14, 23			20, 21
June				
July				
August	13	14		
September	27	28		
October	9, 10, 11, 14, 15, 16, 17, 20, 21, 22, 24, 25, 26	11, 12, 16, 17, 21, 22, 24, 25, 26	11	29, 30
November	4, 5, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 28, 29, 30	15, 16, 17, 18, 19, 20, 21, 30		
December	4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31	5, 23, 24	6, 7, 11, 19, 26, 27, 31	6, 7, 17, 18

DATES OF OCCASIONAL PHENOMENA

(*Continued.*)

1887.	Heavy Rain.	Fog.	Thunder.	Lightning.	Lunar Halo.	Solar Halo.
January	11	10, 13			4, 5, 6, 10	6
February					3	2
March	23, 27	4, 5, 29			5	
April	23	3	23, 26	23		
May	19, 20					
June		29	19	19		
July	13, 16		31	31		
August	18, 26, 28		18, 28	28		
September	3, 4	20	6	6		20
October			30	10, 14, 30	31	
November		19			1, 2, 28	
December	8	11	19	20		

SUN OBSERVATIONS AT STONYHURST IN 1887.

Number of days on which each observation was made.

	Sunshine recorded.	Amount of Sunshine expressed in hours.	Drawings of Sun, $10\frac{1}{2}$ inches to diameter.	Other Drawings of Sun and Solar notes.	Entire Chromosphere measured.	Chromosphere partially measured.
January	12	37·6	11	1	5	
February	21	89·3	18		14	
March	26	122·9	24		17	
April	28	180·0	22		15	
May	29	172·1	22	1	6	
June	29	272·5	28		18	1
July	30	247·2	30		13	
August	29	191·5	25		7	1
September	25	113·9	21		7	
October	25	104·4	23	1	8	
November	19	42·5	17	1	7	1
December	17	39·8	18		5	
Totals	290	1613·7	259	4	122	3

DATES OF SOLAR DRAWINGS, OF NOTES, AND OF OBSERVATIONS OF CHROMOSPHERE

1887	January.	Febuary.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
1		·48,c	·69	·50,c	·38	·67	·43,c	·41,c	·41	·52		
2		·40,c		·35,c		·39	·35,c	·51	·53	·52	·44,c	
3	n			·44			·47,c	·39	·51	·66		·44,c
4	·49	·39,c	·51,c		n	·66,c	·36	·37,c		·39,c	n	
5			·49,c	·37,c		·41,c	36,c	·40,c			·43	
6		·39,c	·44	·36,c	·38		·40,c	·42	·40		·45,c	
7		·41		·44,c	·51,c	·72	·56	·42	·41		·41	·41
8		·45,c	·65,c	·34	·42	·45,c	·34		·45			·39
9		·43,c		·39,c	·65	·41	·35	·52				
10	·55	·49,c		·38,c	·47	·34,c	·45	·45	·43	·52		·43
11		·55		·46,c		·38,c		·42		·39,c	·42	
12	45,c	·40,c	·63,c	·42,c	·43	·71	·38		·44	·43,c		·44
13		·48,c	·42,c	·40	·49	·38,c	·35		·41,c	·39		·49
14	·66		·49,c	·35		·65,c	·43	·39,c		·52		·48,c
15			·45'c			·48,c	·65,c	·71		·45,c	·43,c	·53
16			·47,c	·38,c	·67	·43	·68,c	·42,c	·38	·45		·43
17		·47,c	·35,c	·47,c	·41	·33,c	·37		·33,c	·39	·43,c	
18	·43,c	·65	·67,c	.67,c	·37,c	·41,c	·34,c	·50,c	·44,c	n		·43
19		·36,c	·47,c	·48,c	·48	·41,c	·68,c	·43	·50	·47	·50	
20	·50,c		·45		·68	·38,c	·44,c	·37,c	·35,c	·38	·39	·44
21			·46		·47	·41,c	·42,c	·44	·65	·51,c	·44	·44
22			·62,c		·47	·52	·49,c	·38	·69	·43		47,c,s
23			·67,c		·36	·41,c	·38	·41	·35,c		·40,c	·42,c
24			·51,c		·46	·51,c	·48	·65.c	·47	·37,c	·57,c	·46
25		·45	·49	·65		·37,c	·37	·52		·40,c	·44	·49
26		·38,c	·44,c	·50	·39,c	·48	·40,c		·67	·43	·38	
27	·50	·42,c	·70	·53	·49	·44,c	·45	·69			·41	·42,c
28	·45,c,s	·42,c,s	·65	·51,c	·36,c	·36,c	·68	·46	·41,c	·40,c	·40,c	·42,c
29	·45,c		·49,c			·50	·37	·51	·42,c	·40		
30	·38		·49,c	·47,c	·60,c	·35,c	·55	·44		·43	·40,c	
31	·52				·41,c		·54			·65		·51

The figures give the ~~solid hours~~ [illegible], expressed in hundredths of a day, at which the drawings were made; *n* are notes, *c* chromosphere, *s* spot spectra.

SUN-SPOT DAILY AREAS FROM THE STONYHURST DRAWINGS,
EXPRESSED IN MILLIONTHS OF THE VISIBLE HEMISPHERE.

1886.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
January				614		472	586	822	807		775		1339	1375		1375
February	155		156	586	516	468	409					464	422	364	304	
March		828	1067		2090	2106	2058	2459	1473	1382	1276	953	853		639	
April	1221	1575	1476	1012	987	516			251	186	197	211		116	121	141
May	1002	2274	1711	1941	2147	1894	1395			509				49	0	0
June		316	99	317	538	704	706	768	598	501	400	414	0		109	
July	656	509	483	438	429		363	319	225	0		0		24	22	73
August	302	287	227		147		141	101	98	95	172	191	87	85	94	77
September	224		273	163	118	137	218		119	289				280	269	204
October		53	75	95	78			64	65	61	19		0	0		
November	0	0		0			0		0	0						18
December	0	0		4			0	5		26			68			171

SUN-SPOT DAILY AREAS FROM THE STONYHURST DRAWINGS,
EXPRESSED IN MILLIONTHS OF THE VISIBLE HEMISPHERE.

1886.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
January		1020	558	492		18								156	
February				84			24	7	47	59	37				
March						379		668	680			831	1016		1021
April	116		256	646	646		639	494	479	451	646		990	975	
May		10	13		261	282		390		363		335	340	365	461
June	247		233	250	268		278	192		86	442	504	551		
July		266	401	505	467	497		626			406	444			351
August	80		32	14			7	5		155	120	55		76	201
September	207	227	231			24				37		0			
October				18		12	30	55	39	43		35			
November		0			0									0	
December	200	212		74	0		483		700		477			195	155

SUN-SPOT DAILY AREAS FROM THE STONYHURST DRAWINGS,

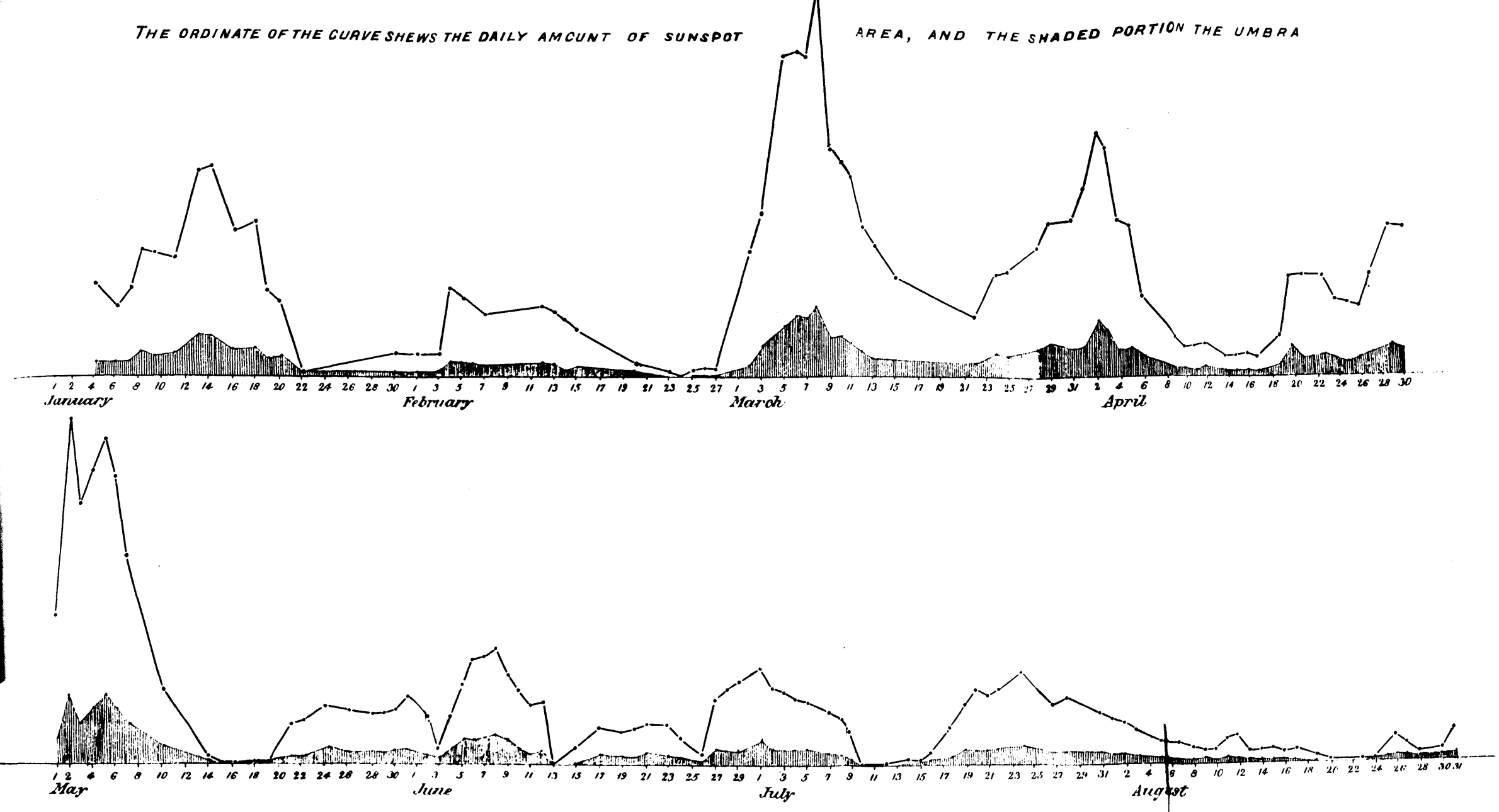
EXPRESSED IN MILLIONTHS OF THE VISIBLE HEMISPHERE.

1887.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
January				55						0		0		0		
February	157	116		147		14	0	0	0	0	0	0	0			
March	96			0	0	0		0				0	0	0	0	0
April	41	11	0		0	0	0	0	0	0	0	26	0	0		0
May	10					249	267	323	326	300		166	134			267
June	71	59		32	456		510	580	612	550	572	536	494	443	411	414
July	204	370	407	419	374	776	830	717	635	561		344	331	269	187	115
August	432	373	352	265	318	359	289		208	103	22			116	69	114
September	0	0	28			12	0	0		0		0	0			213
October	0	45	100	56						0	0	0	0	0	0	0
November		0			123	105	126				149				51	
December			310				907	731		453		402	350	920	1228	999

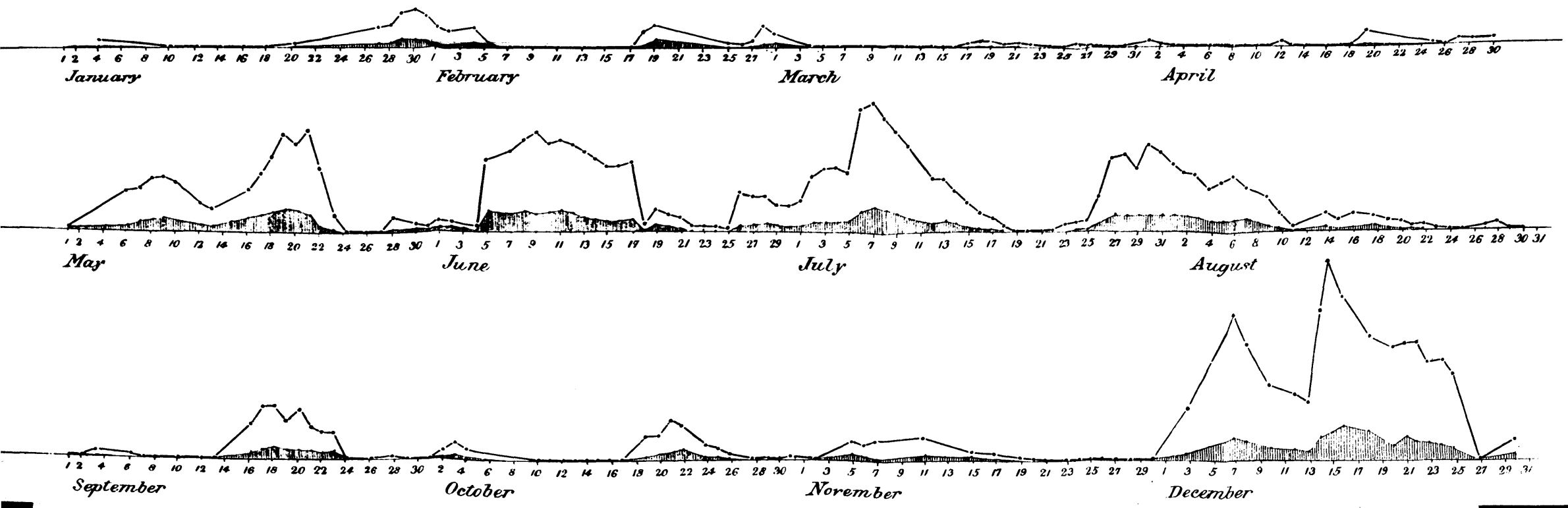
SUN-SPOT DAILY AREAS FROM THE STONYHURST DRAWINGS,
EXPRESSED IN MILLIONTHS OF THE VISIBLE HEMISPHERE.

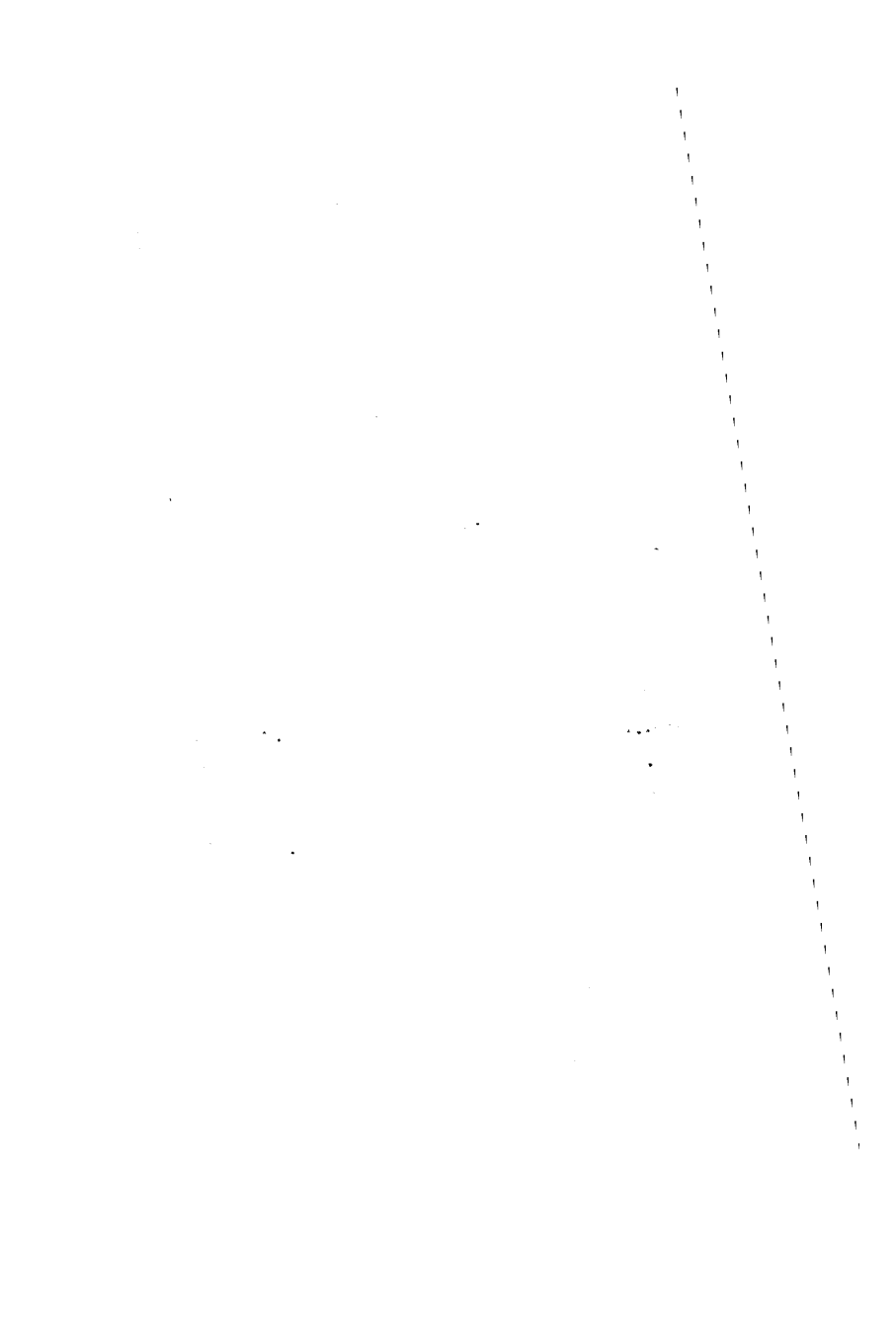
1887	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
January		0		24							139	164	241	257	231
February	14	112	148						29	21	56	139			
March	24	42	46	26	24	14	4	0	0	24	16	0	0	0	
April	0	15	112						20	15	59	49		43	
May	372	458	612	537	640	404	104	0		0	0	95		47	31
June	449	53	147	118	92	41	33	24	18	265	219	222	172	169	
July	100	42	0	0	0	3	46	58	58	214	456	489	401	543	497
August		80	63	56	27	26	14	0	0		25	43	0	0	
September	344	340	249	318	207	167	173	0		0		4	0		
October	0		146	160	250	224		98	73	29		3	7	0	16
November	46	763	11	5	0		0	0	0	0	0	0		0	
December				694	710	717	586	607	519		0			112	

THE ORDINATE OF THE CURVE SHEWS THE DAILY AMOUNT OF SUNSPOT AREA, AND THE SHADED PORTION THE UMBRA



1887.





TOTAL AMOUNT OF SUNSHINE RECORDED ON EACH DAY.

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

TOTAL AMOUNT OF SUNSHINE RECORDED ON EACH DAY.

(Continued.)

MONTH.	18	19	20	21	20	23	24	25	26	27	28	2·9	30	31	Monthly Total.	Approximate per centage each Month.
January	2·2	0	4·9	0	0	0	0·2	0	0	3·2	6·1	4·2	4·0	2·9	37·6	20·2
February	1·2	8·5	0	0·7	0	0·5	0	6·3	7·2	9·0	8·7	0	0	0	89·3	39·4
March	2·9	3·5	5·4	1·6	2·8	5·3	5·4	4·1	5·7	8·3	2·8	4·0	5·4	0	122.9	39·6
April.....	3·9	9·0	0·3	0	0·9	7·9	4·3	6·3	5·0	4·5	11·5	1·8	8·3	0	180·0	50·0
May	11·6	2·8	5·5	8·1	6·2	6·8	2·2	0·3	12·4	0·9	12·8	2·6	6·7	14·7	172·1	38·5
June	14·1	12·8	14·9	14·7	2·1	15·5	15·2	14·2	11·8	10·8	11·5	5·1	11·5	0	272·5	60·6
July	14·3	8·6	14·0	12·0	7·9	6·7	1·3	11·6	7·5	6·7	1·5	4·9	7·4	4·7	247·2	54·9
August	5·2	2·7	5·8	9·2	3·7	9·9	7·8	3·9	0·5	7·8	7·8	7·2	7·3	2·1	191·5	47·5
September	6·2	5·2	9·2	3·7	0	3·9	7·7	0	3·2	3·6	6·0	3·7	1·7	0	113·9	36·2
October.....	0·3	1·0	2·7	8·6	0	1·3	8·4	8·2	1·5	0	6·0	5·1	4·3	0·5	104·4	37·8
November	0	0	0·7	2·1	0	2·4	0·6	1·4	0	3·8	3·4	0	5·4	0	42·5	19·6
December.....	0	1·9	1·3	1·0	4·8	4·2	3·0	2·9	0	4·9	0·0	0	0	0·3	30·8	21·2

MONTHLY TABLES FOR EACH HOUR OF RECORDED SUNSHINE.

	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	0·9	3·5	6·2	6·1	6·5	5·7	6·8	1·9	0	0	0	0	0
February	0	0	0	1·0	4·4	10·2	12·4	14·0	11·6	13·2	11·5	8·5	2·4	0	0	0	0
March	0	0	0	2·6	8·2	9·4	11·9	16·1	16·8	17·9	16·0	13·9	8·5	1·6	0	0	0
April	0	1·3	7·7	13·3	12·2	17·2	17·1	16·0	18·0	16·1	15·1	15·4	17·6	10·3	2·7	0	0
May	0·7	6·7	11·0	13·1	10·1	12·2	12·7	14·2	13·4	14·7	15·0	13·9	12·4	11·3	9·8	1·9	0
June	2·2	9·4	15·3	15·1	18·0	10·4	20·5	20·4	19·4	20·4	21·3	22·7	22·3	21·6	17·2	7·3	0
July	0·0	10·3	15·3	14·9	10·2	17·3	16·4	17·1	18·5	19·9	21·2	18·4	18·3	15·2	15·4	8·9	0
August	0	1·9	10·6	16·0	15·0	17·0	10·5	17·4	17·0	17·4	18·0	14·6	12·0	9·6	5·3	0·2	0
September	0	0	1·0	6·7	0·0	13·6	13·0	12·5	11·0	11·6	11·4	8·9	9·9	2·4	0·2	0	0
October	0	0	0	2·8	8·3	11·6	13·0	13·5	13·0	14·9	11·6	10·4	3·7	0	0	0	0
November	0	0	0	0	0·7	5·7	7·7	8·2	7·7	7·4	3·8	1·3	0	0	0	0	0
December	0	0	0	0	0	1·8	8·0	0·0	8·8	6·6	4·5	0·2	0	0	0	0	0
Total	3·8	29·6	60·9	85·5	116·0	138·9	160·8	164·5	163·5	165·8	156·2	130·1	106·1	72·0	50·6	18·3	0

OBSERVATIONS OF UPPER CLOUDS (CIRRUS).

Date.	G. M. T.	Cloud Direction.	Velocity. (0—6).	Wind. Direction.	Wind. Force. (0—12).	Direction of Cirrus.
January 3	9 a.m.	S.S.E.	2	S.W.	1	S.S.E.
,, 3	10 a.m.	S.S.E.	2	S.S.W.	2	S.S.E.
,, 4	10 a.m.	N.W.	1	N.N.E.	0	
,, 4	Noon	W.	2	N.E.	0	N.N.W.
,, 4	4 p.m.	W.S.W.	2	W.	0	N.N.W.
,, 10	11 a.m.	W. by S.	3	S.E.	1	N.E.
,, 18	Noon.	N.E.	2	W.	0	N.E.
,, 20	2 p.m.	S.E.	3	S.	1	N.N.W.
,, 26	2 p.m.	N.E.	2	S.S.W.	1	W.
,, 27	Noon.	N.N.E.	3	S.E.	0	N.W.
,, 28	2 p.m.	W.	2	S.W.	3	W.
February 2	9 a.m.	W. by N.	3	S.	4	
,, 2	10 a.m.	W. by N	2	S.	4	
,, 4	11 a.m.	E. by N.	2	S.W.	3	S.S.W
,, 7	1.30 p.m.	N.N.W.	3	S.S.E.	0	S.W
,, 11	3.45 p.m.	E.	2	N.E.	3	E.
,, 19	1 p.m.	N.N.E.	3	S.W.	1	S.S.W
,, 26	Noon.	N.N.W.	2	S.	3	
,, 26	2 p.m.	N.W.	2	S.	3	N.W.
March 6	9 a.m.	N.E. by N.	2	N.E.	2	N.E. by N
,, 6	10 a.m.	N.E.	1	N.E.	1	N.E.
,, 8	11.30 a.m.	E.	2	N.E.	1	E.
,, 8	4 p.m.	N.E.	2	E.N.E.	1	N.E.
,, 11	10.45 a.m.	N.N.E.	2	W.S.W.	1	W.
,, 12	10 a.m.	N.	2	N.E.	1	N.
,, 12	Noon.	N.N.W.	3	N.N.E.	2	N.N.W.
,, 14	10 a.m.	N.W.	2	N.N.W.	0	E.N.E.
,, 14	Noon.	W.N.W.	1	N.N.W.	0	N.N.E.
,, 19	10 a.m.	N.N.E.	2	N.W.	0	N.N.E.
,, 20	2 p.m.	N.E.	2	E.S.E.	1	N.E.
,, 24	2.45 p.m.	N. by E.	1	W.	3	W.S.W
,, 26	11 a.m.	S.S.W.	2	W.N.W.	4	N.W.
,, 29	3 p.m.	E.N.E.	1	W.N.W.	2	N.W.
April 1	9.30 p.m.	N. by E.	1	N.N.E.	5	N.N.W
,, 1	11 a.m.	N.E.	2	N.	5	N.W.
,, 2	3.45 p.m.	N.	2	W.	2	N.
,, 2	6 p.m.	N.N.E.	2	W.N.W.	1	N.
,, 5	7.30 a.m.	S. by E.	2	N.N.W.	0	W.
,, 7	11 a.m.	E.	1	N.E.	3	E.
,, 14	3 p.m.	N.N.E.	2	E.N.E.	2	E.
,, 18	4 prm.	E.N.E.	3	W.	2	W.
,, 19	10 a.m.	N.E.	2	W.N.W.	4	W.
,, 19	Noon.	E.N.E.	3	W.N.W.	4	N.W.

OBSERVATIONS OF UPPER CLOUDS *(Continued)*.

Date.		G. M. T.	Cloud Direction.	Velocity (0–6).	Wind. Direction.	Wind. Force (0–12).	Direction of Lr. Cds.
May	7	3 p.m.	W.S.W.	1	W.	3	W.S.W.
,,	8	9 a.m.	E.	2	W.	2	W.N.W.
,,	9	7 p.m.	W.	1	W.	2	W.
,,	10	8 a.m.	N.W.byW.	3	W.	4	S.W.
,,	13	7.30 a.m.	N.	2	N.N.E.	3	N.
,,	13	5 p.m.	S.S.W.	2	N.E.	1	N.E.
,,	10	2.45 a.m.	N.N.E.	2	E.N.E.	2	W.N.W.
,,	22	9 a.m.	W.	1	N.W.	3	W.
,,	20	6.50 a.m.	N.E.	2	N.E.	2	N.E.
,,	20	11 a.m.	N.	2	E.N.E.	3	E.N.E.
,,	20	4 p.m.	E.N.E.	1	E.N.E.	2	E.N.E.
,,	28	12.30 p.m.	N.E.	2	N.E.	2	N.E.
,,	31	7.15 p.m.	E.N.E.	3	E.	2	E.N.E.
June	1	8 a.m.	N.W.	2	E.N.E.	2	S.E.
,,	2	1.30 p.m.	N.N.W.	2	N.E.	3	E.
,,	4	5 p.m.	S. by W.	1	W.	1	N.W.
,,	6	11 a.m.	W.	1	W.	1	W.
,,	8	3 p.m.	N.E.	1	W.	3	W.
,,	10	1.15 p.m.	N.N.W.	2	S.W.	2	N.N.W.
,,	11	10 a.m.	N. by E.	2	W.	2	S.W.
,,	11	Noon.	N.E.	1	W.	3	S.W
,,	13	2 p.m.	N.E.	2	W.	4	W.
,,	15	4 p.m.	N. by E.	3	W.	2	W.
,,	15	4 p.m.	E.	2	W.N.W.	2	W.S.W.
,,	17	Noon.	N. by E.	2	S.S.E.	1	S.W.
,,	20	Noon.	S.E.	1	E.S.E.	1	S.E.
,,	27	10 a.m.	W.	1	W.S.W.	2	W.
,,	27	Noon.	N.N.W.	2	W.	3	N.W.
,,	27	2 p.m.	N.W.	3	W.	3	N.W.
,,	27	4 p.m.	W.	2	W.	4	W.
July	2	Noon.	N.W.	2	W.	1	N.W.
,,	5	1 p.m.	N.N.W.	1	W.N.W.	3	N.W.
,,	8	10 a.m.	W.S.W.	2	S.S.E.	3	W.S.W.
,,	8	Noon.	S.W.	2	S.	3	S.W.
,,	8	2 p.m.	W.	2	S.	3	S.
,,	14	4 p.m.	E.	2	W.	3	S.W.
,,	18	2 p.m.	E.S.E.	1	W.	2	W.
,,	18	4 p.m.	S.E.	2	W.N.W.	2	W.
,,	20	7.30 a.m.	S. by W.	3	W.	1	N.E.
,,	21	11 a.m.	S. by E.	2	W.S.W.	1	W.
,,	25	Noon.	S.S.E.	3	W.N.W.	2	W.
,,	20	10 a.m.	N. by E.	2	S.	2	S.W.
August	3	2 p.m.	S. by E.	1	W.	2	N.W.

OBSERVATIONS OF UPPER CLOUDS *(Continued)*.

Date.		G. M. T.	Cloud Direction.	Velocity (0—6).	Wind. Direction.	Wind. Force (0—12).	Direction of Lower Cloud
August	4	2 p.m.	W.	2	W.N.W.	1	W.
,,	6	9.30 a.m.	N.N.E.	2	S.S.W.	1	W.
,,	10	10 a.m.	N.E.	2	W.N.W.	1	S.S.W.
,,	16	8 a.m.	N. by E.	2	N.N.E.	1	N. by E.
,,	23	10 a.m.	N.E.	1	W.S.W.	1	S.W.
,,	23	Noon.	N.	1	W.S.W.	2	W.S.W.
,,	27	10 a.m.	S.W.	3	S.	1	S.W.
,,	30	6 p.m.	E.	2	S.W.	2	W.S.W.
Sept.	6	11.30 a.m.	S.	1	W.	3	S.
,,	8	7.45 a.m.	W.	2	N.W.	1	N.N.W
,,	10	11 a.m.	N.W.	2	W.	4	N.W.
,,	17	8 a.m.	N.N.E.	3	N.	1	N.N.E.
,,	19	6 p.m.	E.S.E.	2	N.W.	2	N.W.
,,	21	3 p.m.	N.E.	1	E.N.E.	1	N.E.
,,	24	Noon.	N.W.	3	E.	1	E.N.E.
,,	28	10 a.m.	N.E.	2	N.E.	0	S.S.W.
,,	28	Noon.	N.E.	1	N.	1	S.W.
,,	29	10 a.m.	N.W.	1	N.N.E.	1	N.W
Oct.	2	9 a.m.	E.N.E.	2	E. by N.	0	E. by N.
,,	11	10 a.m.	W.	1	N.W. by W.	2	N.W.W
,,	12	Noon.	N.	2	W. by N.	1	W. by N
,,	13	10 a.m.	N.N.W.	2	N.	5	N.
,,	13	2 p.m.	N.N.E.	2	N.N.W.	3	N.N.W.
,,	14	2 p.m.	N.E.	1	N.N.W.	5	N.N.W.
,,	15	2 p.m.	E.	2	N.N.E.	2	N.N.E.
,,	24	2 p.m.	N. by E.	1	N. by W.	3	N. by W
Nov.	5	11 a.m.	S. by E.	1	W. by S.	2	W. by S.
,,	17	4 p.m.	S.	1	S. by W.	0	S. by W.
,,	23	10 a.m.	E.S.E.	2	N.N.E.	1	N.N.E.
,,	28	11.30 a.m.	N.N.E.	1	S.W. by S.	1	S.W. by S.
,,	30	10 a.m.	W. by S.	1	S.W.	0	S.W.
,,	30	2 p.m.	W. by S.	2	W.S.W.	1	W.S.W.
Dec.	3	2 p.m.	S.W.	1	S.W. by W.	2	S.W. by W.
,,	7	1-30 p.m.	S.S.W.	2	N.W. by W	3	N.W. by W
,,	9	2.15 p.m.	S.E.	2	W. by N.	0	W. by N.
,,	23	2 p.m.	E.N.E.	2	S.W. by W.	1	S.W. by W
,,	24	10 a.m.	N.E.	1	N. by W.	1	N. by W.
,,	24	Noon.	N.E.	1	N. by W.	2	N.N.W.

AGRICULTURAL NOTES.

JANUARY and FEBRUARY were cold, the ground was too hard for working, and, even in sheltered places, very few flowers were to be seen at the close of February.

MARCH was also cold and frosty, ploughing commenced at the beginning of the second week, and was nearly finished at the end of the month. During the last week some of the farmers had got a little corn into the ground.

APRIL.—This month was favourable for agricultural operations generally, although the prevalence of cold easterly winds retarded vegetation. Oat sowing had finished in most places in the neighbourhood by about the middle of the month. Potatoes were in by the 20th and a few green crops by the 30th. Everything looked very late at the end of the month.

MAY.—Although the commencement of May was cold, with North Easterly winds, and growth was much retarded in consequence, farmers and gardeners hoped that the prospects were better than those of more forward seasons, which are so often spoiled by night frost destroying the buds and young leaves. All green crops were sown soon after the middle of the month. Towards the close fruit looked very well, and the fine display of blossom on the early trees gave promise of very good crops.

JUNE was fine, but the want of rain was much felt in some places. The blossom on the apple and pear trees looked very well. Soon after the commencement of the second week insects caused some damage to fruit trees especially to gooseberries. Strawberries were very small, owing to lack of moisture, but were above average quantity. Red and white currants were very plentiful. Hay was being cut on the 20th, the crop was only a light one, but was of very good quality.

July was hot and dry, and rain very much needed. Insects did a good deal of damage to fruit trees generally. Garden vegetables, especially carrots, also suffered much from them. Hay was all housed by the 25th. Apples and pears looked well, and, had it not been for the insects, would have been the heaviest crop for many years past. Stone fruit very poor both in quantity and quality. Great numbers of strawberries withered from want of moisture.

AUGUST.—The drought still continued, and water had to be carried to the cattle in the fields in many places, as the brooks were dried up. Cereals were looking very well at the close of the month, but oats were very short of straw. Some early apples were gathered towards the end of the month.

SEPTEMBER.—Wheat and oats were cut in the early part of the month, and oats housed by the 20th; all the wheat was got in a few days later. Apples yielded a very good crop. Pears also were good. Plums were in most places but scanty. Damsons about average.

OCTOBER.—Potatoes were lifted from about the 15th, and with the exception of a few, which were spoiled by frost at night, were good both in quantity and quality. Crops, which were small, but plentiful, were being got in at the end of the month.

NOVEMBER.—All the potatoes were housed early in the month. Green crops were all in by about the third week; and wheat was in the ground in most places towards the close of the month.

DECEMBER was very cold, and with the exception of sowing the remainder of the wheat, which was done early in the month, no work was done on the land.

OBSERVATIONS OF CROPS.

GRAIN, ETC.					GREEN CROPS.			
Name.	When Sown.	In Flower.	In Ear.	When Cut.	Name.	When Sown.	Above Ground.	Stored.
Wheat	Nov.—Dec.	June	July 7th	Sept.	Potatoes	April—May	May 25th	Oct.
Oats	Mar.—Apl.	June	July 15th	Aug.—Sept.	Turnips	April—May	May 19th	September
Beans	March	June		Sept.	Beet	April—May	May 20th	Oct.—Nov.
					Mangel	May	May 20th	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 9th	May 28th	Apple	May 15th	Aug. 25th	Lilac	May 20th
Oak	May 19th	May 27th	Pear	Ap. 3rd	Aug. 21th	Laburnum	May 28th
Sycamore	Ap. 30th	May 21st	Red Currant	Ap. 17th	July 19th	Red Flowering Currant	Ap. 21st
Lime	Ap. 25th	May 16th	Black Currant	Ap. 26th	July 27th	Dog-Rose	July 3rd
Ash	May 19th	May 26th	Strawberry	May 15th	July 3rd	Guelder-Rose	June 29th
Beech	Ap. 30th	May 10th	Gooseberry	Ap. 18th	Aug. 20th	Woodbine	June 28th
Horse Chestnut	Ap. 24th	May 12th				Elder	June 15th
						Yellow Azalea	May 20th
						Blackthorn	May 5th

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1887.

RANUNCULACEÆ.		
Anemone nemorosa	Wood anemone	March 29
Ranunculus Ficaria	Lesser celandine	March 5
R. acris	Meadow crowfoot	May 16
R. repens	Creeping buttercup	May 24
R. bulbosus	Bulbous buttercup	May 4
R. auricomus	Wood crowfoot	May 12
R. lingua	Great spearwort	June 10
R. hederaceus	Ivy-leaved crowfoot	May 18
Caltha palustris	Marsh marigold	April 22
Trollius Europæus	Globe flower	May 19
Aquilegia vulgaris	Columbine	June 18
NYMPHÆACEÆ.		
Nymphæa alba	White water lily	June 29
Nuphar lutea	Yellow water lily	June 21
PAPAVERACEÆ.		
Papaver rhæas	Red poppy	June 20
Chelidonium majus	Common celandine	June 15
CRUCIFERÆ.		
Nasturtium officinale	Common watercress	May 15
Arabis hirsuta	Hairy rock cress	April 20
Cardamine amara	Large bitter cress	May 10
C. pratensis	May flower	May 5
C. hirsuta	Hairy bitter cress	April 12
Sisymbrium officinale	Hedge mustard	May 17
Alliaria officinalis	Garlic mustard	May 15
Brassica campestris	Common wild navew	May 19
Cochlearia Armoracia	Horse radish	June 25
C. officinalis	Scurvy grass	April 14
RESEDACEÆ.		
Reseda luteola	Dyer's rocket	June 16
VIOLACEÆ.		
Viola canina	Dog violet	March 28
V. odorata	Sweet violet	March 12
V. palustris	Marsh violet	May 14
V. hirta	Hairy violet	May 20
POLYGALACEÆ.		
Polygala vulgaris	Milkwort	May 19

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1887 *(continued)*.

CARYOPHYLLACEÆ.		
Lychnis vespertina	Evening campion	May 15
L. diurna	Red robin	May 11
L. Githago	Corn cockle	July 16
L. Flos cuculi	Ragged robin	June 9
Arenaria serpyllifolia	Thyme-leaved sandwort	June 5
A. trinervis	Three-nerved sandwort	May 20
Cerastium vulgatum	Mouse-ear chickweed	April 19
Stellaria aquatica	Water starwort	May 22
S. nemorum	Wood starwort	May 10
S. graminea	Lesser starwort	May 26
S. holostea	Great starwort	May 8
S. media	Chickweed	Feb. 2
HYPERICACEÆ.		
Hypericum perforatum	Common St. John's wort	July 12
H. quadrangulum	Square-stalked St. John's wort	July 20
H. humifusum	Trailing St. John's wort	July 11
H. pulchrum	Slender St. John's wort	July 20
H. hirsutum	Hairy St. John's wort	July 16
LINACEÆ.		
Linum catharticum	Cathartic flax	June 21
MALVACEÆ.		
Malva sylvestris	Common mallow	June 15
GERANIACEÆ.		
G. Phæum	Dusky crane's-bill	May 10
G. sylvaticum	Wood crane's-bill	May 12
G. pratense	Meadow crane's-bill	June 20
G. Robertianum	Herb Robert	May 23
G. lucidum	Shining crane's-bill	May 10
Oxalis acetosella	Wood sorrel	April 13
PAPILIONACEÆ.		
Ononis arvensis	Rest harrow	July 5
Medicago lupulina	Black medic	June 3
Trifolium pratense	Purple clover	May 21
T. repens	White clover	June 20
T. procumbens	Lesser clover	June 17
Lotus corniculatus	Bird's-foot trefoil	May 24
Vicia cracca	Tufted vetch	June 12

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1887 *(continued)*.

V. sepium	Bush vetch	May 22
V. sativa	Common vetch	May 29
Lathyrus pratensis	Meadow pea	June 4
ROSACEÆ.		
Spiræa ulmaria	Meadow sweet	July 9
Geum urbanum	Wood avens	June 1
G. rivale	Water avens	May 14
G. intermedium	Intermediate avens	May 25
Fragaria vesca	Wood Strawberry	May 10
Potentilla fragariastrum	Barren Strawberry	Feb. 6
P. reptans	Creeping cinque-foil	June 10
P. tormentilla	Tormentil cinque-foil	May 21
P. verna	Spring cinque-foil	May 20
P. comarum	Marsh cinque-foil	June 20
P. anserina	Silver weed cinque-foil	June 1
Alchemilla vulgaris	Lady's mantle	May 1
Sanguisorba officinalis	Great burnet	July 14
Agrimonia eupatoria	Common agrimony	July 20
ONAGRACEÆ.		
Epilobium montanum	Common willow-herb	June 11
E. palustre	Marsh willow-herb	June 21
E. parviflorum	Hoary willow-herb	June 18
E. tetragonum	Square willow-herb	June 29
Circæa lutetiana	Enchanter's nightshade	July 7
SAXIFRAGACEÆ.		
S. umbrosa	London pride	May 20
Chrysosplenium oppositifolium	(Opposite leaved) (golden saxifrage)	May 10 / March 10
C. alternifolium	Alternate leaved do.	March 8
UMBELLIFERÆ.		
Sanicula europæa	Wood sanicle	June 24
Pimpinella magna	Greater sanicle	July 10
Caucalis anthriscus	Hedge parsley	July 5
CAPRIFOLIACEÆ.		
Adoxa moschatellina	Tuberous moscatel	April 5
Lonicera periclymenum	Honeysuckle	July 20
ARALIACEÆ.		
Hedera Helix	Common ivy	Oct. 18

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1887 (*continued*).

STELLATÆ.		
Galium cruciatum	Crosswort	May 12
G. verum	Yellow bedstraw	May 25
G. palustre	Marsh bedstraw	May 30
G. saxatile	Heath bedstraw	June 5
G. aparine	Cleavers	June 11
Asperula adorata	Sweet woodruff	May 11
VALERIANEÆ.		
Valeriana dioica	Marsh valerian	May 2
V. officinalis	Common valerian	July 2
DIPSACEÆ.		
Scabiosa arvensis	Field scabious	June 25
COMPOSITÆ.		
Tussilago farfara	Common colt's-foot	Feb. 24
Tussilago petasites	Butterbur	March 3
Chrysanthemum leucanthemum	Ox-eye daisy	June 7
Achillea millefolium	Common yarrow	July 7
Gnaphalium uliginosum	Marsh cudweed	July
Senecio vulgaris	Groundsel	Feb. 20
S. jacobæa	Ragwort	July 7
Arctium lappa	Common burdock	July 5
Carduus Lanceolatus	Spear thistle	July 20
C. palustris	Marsh thistle	June 21
Centaurea nigra	Black knapweed	July 1
Leontodon hispidus	Common hawkbit	June 20
Hypochæris radicata	Cat's-ear	June 3
Sonchus oleraceus	Common sow thistle	June 20
Taraxacum dens-leonis	Common dandelion	April 5
Hieracium pilosella	Mouse-ear hawkweed	June 10
H. murorum	Wall hawkweed	June 5
H. umbellatum	Smooth-leaved hawkweed	July 13
Crepis virens	Smooth crepis	June 15
C. paludosa	Marsh crepis	June 5
Lapsana communis	Nipplewort	June 2
CAMPANULACEÆ.		
Campanula latifolia	Giant bell-flower	July 30
C. rapunculoides	Creeping bell-flower	July 25
C. rotundifolia	Harebell	July 15

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1887 (*continued*).

ERICACEÆ.		
Erica tetralix	Cross-leaved heath	July 4
PRIMULACEÆ.		
Primula vulgaris	Common primrose	Mar. 3
P. veris	Cowslip	May 6
Lysimachia vulgaris	Great yellow loosestrife	May 14
L. nemorum	Yellow pimpernel	May 24
LENTIBULARIACEÆ.		
Pinguicula vulgaris	Common butterwort	June 11
APOCYNACEÆ.		
Vinca minor	Lesser periwinkle	April 9
GENTIANACEÆ.		
Menyanthes trifoliata	Common buckbean	June 30
POLEMONIACEÆ.		
Polemonium cœruleum	Jacob's ladder	June 10
CONVOLVULACEÆ.		
Convolvulus sepium	Large convolvulus	July 6
BORAGINACEÆ.		
Myosotis sylvatica	Forget-me-not	April 19
M. arvensis	Field myosote	May 20
Symphytum officinale	Common comfrey	June 6
SOLANACEÆ.		
Solanum dulcamara	Bittersweet	June 21
OROBANCHACEÆ.		
Lathræa squamaria	Toothwort	April 13
SCROPHULARINEÆ.		
Verbascum thapsus	Great mullein	July 7
Scrophularia nodosa	Common figwort	June 5
S. aquatica	Water figwort	June 27
Mimulus luteus	Yellow mimulus	June 14
Linaria cymbalaria	Ivy-leaved toad-flax	May 6

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1887 (*continued*).

Digitalis purpurea	Foxglove	June 20
Veronica serpyllifolia	Thyme-leaved speedwell	May 21
V. officinilas	Common speedwell	June 14
V. anagallis	Water speedwell	June 16
V. beccabunga	Brooklime speedwell	June 1
V. montana	Mountain speedwell	May 18
V. chamædrys	Germander speedwell	May 10
Bartsia odontites	Red bartsia	July 11
Euphrasia officinalis	Eyebright	July 15
Rhinanthus crista galli	Yellow rattle	June 10
Pedicularis sylvatica	Lousewort	May 12
Melampyrum pratense	Cow-wheat	July 13
LABIATÆ.		
Nepeta Glechoma	Ground ivy	April 13
Prunella vulgaris	Self-heal	May 29
S. sylvatica	Hedge woundwort	June 17
Lamium purpurem	Purple dead-nettle	April 4
Ajuga reptans	Bugle	May 15
PLANTAGINACEÆ.		
Plantago major	Greater plantain	June 3
P. lanceolata	Ribwort plantain	May 20
CHENOPODIACEÆ.		
Chenopodium bonus Henricus	Good King Henry	June 7
Atriplex patula	Common orache	July 9
POLYGONACEÆ.		
Rumex obtusifolius	Broad dock	June 2
R. crispus	Curled dock	June 9
R. acetosa	Sorrel	May 20
Polygonum aviculare	Knotgrass	July 7
P. bistorta	Snakeweed	July 1
P. persicaria	Common persicaria	July 2
P. convolvulus	Black bindweed	July 27
EUPHORBIACEÆ.		
Mercurialis perennis	Dog's mercury	March 17
URTICACEÆ.		
Urtica dioica	Common nettle	June 10
AROIDEÆ.		
Arum maculatum	Common arum	May 5

DATES OF THE FLOWERING OF PLANTS AT STONYHURST IN 1887 (*continued*).

NAIADACEÆ.		
Potamogeton natans	Broad pondweed	July 17
ALISMACEÆ.		
Alisma plantago	Water plantain	June 20
ORCHIDACEÆ.		
Epipactis latifolia	Helleborine	July 21
Listera ovata	Twayblade	June 19
Orchis mascula	Early orchis	May 8
O. maculata	Spotted orchis	May 30
IRIDACEÆ.		
Iris pseudacorus	Yellow iris	June 27
Crocus vernus	Spring Crocus	March 4
AMARYLLIDEÆ.		
Narcissus pseudonarcissus	Daffodil	April 12
Galanthus nivalis	Snowdrop	Jan. 20
LILIACEÆ.		
Paris quadrifolia	Herb Paris	May 12
Scilla nutans	Bluebell	May 10
Allium ursinum	Broad-leaved garlic	May 5

THE UPPER GLOWS IN 1887.

THE glow encircling the sun, which was first noticed in 1883, and described in previous reports, can hardly, as yet, be said to have wholly disappeared. A faint but peculiar white haze, of about the same intensity as in 1886, was generally present, and could be traced to a distance of about 10° from the sun. During the Summer months this was sufficiently strong to be easily observed, but at other times it was difficult to detect except when the sun was near the hoizon.

The pink "fore" and "after glows" diminished in frequency this year, to about half that recorded in 1886, but their intensity and general character remained about the same. The following are the dates on which such glows were seen:—

February 10, 26.
March 1.
April 4, 6, 8, 9, 14. 15.
May 29.
June 9, 18, 23, 24.
July 1, 5, 7, 13, 18.
September 12.
October 10, 15, 24, 25, 26, 28.
December 3, 19, 21. 22.

Monthly Magnetical Observations taken at the College Observatory, Stonyhurst, 1887.

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 0·0001128 and 0·0000004436.

The induction co-efficient μ is 0·000244.

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

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

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

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

In deducing from these observations the ratio and product of the magnetic moment m of the magnet, and the earth's horizontal magnetic intensity X, the induction and temperature corrections have always been applied, and the observed time of vibration has been corrected for the effect of torsion of the suspending thread; but no correction has been required for the rate of the chronometer, or for the arc of vibration, the former having been always under one second 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 7.5 of arc.

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

The value of the constant P' was found to be 0·002508.

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.			$\log \frac{m}{X}$
	D.	H. M.	FOOT.		°	′	″	
January ...	21st	11 30 a.m.	1·0	42·3	13	18	40	9·06360
	,,	11 45 a.m.	1·3	42·6	6	1	25	9·06262
February .	18th	11 15 a.m.	1·0	45·3	13	17	50	9·06237
	,,	11 58 a.m.	1·3	51·4	6	0	47	9·06248
March ...	17th	11 6 a.m.	1·0	48·0	13	17	37	9·06248
	,,	11 50 a.m.	1·3	50·1	6	0	58	9·06259
April	22nd	11 39 a.m.	1·0	51·9	13	15	23	9·05289
	,,	0 17 p.m.	1·3	60·3	5	59	47	9·06187
May	24th	11 5 a.m.	1·0	58.8	13	17	40	9·06315
	,,	11 59 a.m.	1·3	55·7	6	0	35	9·06251
June	19th	11 30 a.m.	1·0	65·2	13	16	20	9·06293
	,,	11 57 a.m.	1·3	67·0	5	59	30	9·06212
July	21st	10 49 a.m.	1·0	67·5	13	15	41	9·06276
	,,	11 15 a.m.	1·3	68·6	6	0	10	9·06292
August ...	22nd	11 17 a.m.	1·0	67·3	13	14	17	9·06172
	,,	11 52 a.m.	1·3	70·4	5	59	20	9·06207
September	19th	11 11 a.m.	1·0	60.4	13	14	55	9·06283
	,,	11 50 a.m.	1·3	60.3	5	59	35	9·06152
October ...	25th	11 20 a.m.	1·0	55.1	13	12	39	9·06023
	,,	11 49 a.m.	1·3	59·8	5	58	22	9·06003
November	27th	10 51 a.m.	1·0	42·5	13	13	15	9·05974
	,,	11 45 a.m.	1·3	44·8	5	59	10	9·06013
December.	18th	11 30 a.m.	1·0	60·5	13	12	43	9·06008
	,,	11 51 a.m.	1·3	60·5	5	58	28	9·05991

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

VIBRATION OBSERVATIONS FOR ABSOLUTE MEASURE OF HORIZONTAL FORCE.

Month.	G. M. T.		Temperature.	Time of one vibration.	Log m X	Value of m
	D.	H. M.	°			
January...	21st	10 25 a.m.	39·1	5.74216	0·19679	0·42564
February .	18th	10 37 a.m.	40·8	5·74135	0·19757	0·42625
March ..	17th	10 15 a.m.	44·2	5·74983	0·19601	0·42545
April	22nd	11 3 a.m.	54·7	5·73921	0·19800	0·42697
May	24th	10 31 a.m.	55.6	5·74321	0·19783	0·42649
June	19th	11 1 a.m.	63·1	5·75010	0·19707	0·42595
July	21st	9 45 a.m.	66·1	5·74832	0·19667	0·42571
August ...	22nd	10 20 a.m.	65·9	5·75213	0·19674	0·42559
September	19th	10 46 a.m.	57·3	5·75122	0·19614	0·42555
October...	25th	10 32 a.m.	53·9	5·74055	0·19772	0·42595
November	27th	10 12 a.m.	40·8	5·73915	0·19797	0·42514
December.	18th	10 23 a.m.	48·6	5·73684	0·19395	0·42361

DIP OBSERVATIONS.				MAGNETIC INTENSITY.		
Month.	G. M. T.	Needle	Dip.	X. or Horizontal Force.	Y. or Vertical Force.	Total Force
	D. H. M.					
January .	22nd 10 25 a.m.	1	69 9 47	3·6885	9·6853	10·3638
	,, 10 50 a.m.	3	69 8 20			
February	18th 10 10 a.m.	1	69 10 40	3·6987	9·7142	10·3940
	,, 10 41 a.m.	3	69 8 33			
March ...	19th 11 5 a.m.	1	69 8 15	3·6876	9·6830	10·3508
	,, 11 35 a.m.	3	69 9 50			
April ...	23rd 10 59 a.m.	1	69 10 30	3·6918	9·7150	10·3947
	,, 11 36 a.m.	3	69 9 27			
May	25th 11 30 a.m.	1	69 7 20	3·6920	9·5831	10·3632
	,, 11 58 a.m.	3	69 8 10			
June	20th 10 50 a.m.	1	69 9 45	3·6921	9·6994	10·3785
	,, 11 25 a.m.	3	69 9 23			
July	22nd 11 1 a.m.	1	69 10 46	3·6891	9·6913	10·3696
	,, 11 45 a.m.	3	69 8 25			
August...	23rd 11 15 a.m.	1	69 10 55	3·6934	9·7081	10·3870
	,, 11 53 a.m.	3	69 9 36			
Sept. ...	20th 10 9 a.m.	1	69 8 10	3·6897	9·6987	10·3570
	,, 10 41 a.m.	3	69 7 15			
October..	25th 11 25 a.m.	1	69 9 52	3·6966	9·7028	10·3832
	,, 11 52 a.m.	3	69 7 28			
Nov.....	28th 10 58 a.m.	1	69 8 44	3·6984	9·7112	10·3916
	,, 11 21 a.m.	3	69 9 25			
Dec.....	19th 11 5 a.m.	1	69 8 39	3·6896	9·6798	10·3584
	,, 11 16 a.m.	3	69 7 22			
Means ...	.....	...	69 9 2			

DECLINATION OBSERVATIONS.

Month.	G. M. T.	Uncorrected. Observation	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′
January ...	3rd ..9 1 a.m.	19 37 10		19 38 45	
	10th...9 6 a.m.	39 15		39 51	
	17th...8 56 a.m.	36 23		38 10	
	24th...9 6 a.m.	32 0	19 36 12	36 15	19 38 [illegible]
February .	1st ...9 10 a.m.	34 32		33 12	
	7th ...9 2 a.m.	32 9		36 41	
	16th...8 57 a.m.	31 24		34 20	
	21st ...9 6 a.m.	36 42		38 35	
	28th...9 15 a.m.	31 50	19 33 19	35 30	19 35 [illegible]
March ...	7th...9 5 a.m.	32 15		33 21	
	14th...9 1 a.m.	30 27		31 29	
	21st ...9 0 a.m.	31 31		34 10	
	28th...8 58 a.m.	29 28	19 30 55	34 17	19 33 [illegible]
April	4th...9 7 a.m.	33 19		38 11	
	12th...9 2 a.m.	36 10		35 15	
	18th...9 17 a.m.	33 38		36 12	
	25th...9 1 a.m.	35 15	19 33 51	35 20	19 36 [illegible]
May	2nd...9 5 a.m.	30 10		31 45	
	10th...8 55 a.m.	38 46		39 58	
	16th...9 7 a.m.	37 21		41 11	
	24th...9 0 a.m.	38 29		38 12	
	30th...9 10 a.m.	40 15	19 37 0	39 15	19 38 [illegible]
June	6th...9 5 a.m.	32 20		36 52	
	13th...9 5 a.m.	33 33		31 10	
	20th...9 19 a.m.	36 15		40 17	
	27th...9 4 a.m.	33 50	19 33 47	34 30	19 35 [illegible]

DECLINATION OBSERVATIONS (*Continued*).

Month.	G. M. T.	Uncorrected. Observation.	Uncorrected. Monthly Mean.	Corrected. Observation.	Corrected. Monthly Mean.
	D. H. M.	° ′ ″	° ′ ″	° ′ ″	° ′ ″
July	5th...9 7 a.m.	19 34 10		19 34 35	
	11th...9 2 a.m.	31 22		36 17	
	19th...9 15 a.m.	36 16		38 40	
	25th...8 59 a.m.	31 30	19 33 20	32 10	19 35 25
August ...	1st ...9 10 a.m.	30 18		35 1	
	8th...9 3 a.m.	32 20		36 50	
	15th...9 21 a.m.	31 29		32 41	
	22nd..9 11 a.m.	37 16		36 20	
	30th...9 0 a.m.	31 3	19 33 7	34 10	19 36 20
September	5th...9 2 a.m.	32 0		32 15	
	13th...8 57 a.m.	29 51		37 19	
	21st ...9 12 a.m.	31 17		32 40	
	27th...9 11 a.m.	33 35	19 31 26	37 11	16 34 51
October ...	3rd...9 5 a.m.	31 40		33 20	
	11th...9 7 a.m.	33 19		34 40	
	17th...9 15 a.m.	31 22		35 29	
	24th...9 13 a.m.	36 7	19 33 7	38 17	19 35 27
November	1st ...8 53 a.m.	34 5		36 15	
	14th...9 2 a.m.	31 50		34 0	
	21st ...9 17 a.m.	28 55		35 20	
	28th...9 5 a.m.	34 15	19 32 14	31 31	19 34 4
December.	5th...9 10 a.m.	31 26		30 55	
	12th...9 15 a.m.	27 9		33 10	
	20th...9 7 a.m.	32 40		34 55	
	26th...9 3 a.m.	30 29	19 30 26	32 58	19 32 0
Yearly mean			19 33 14		19 35 11

MAGNETIC DISTURBANCES.

JANUARY.—The year began with a perfectly quiet magnet, but during the afternoon of the 3rd there were some slightly irregular movements. Shortly after 11 p.m. the magnet had swung a little towards the East, and this was followed the next day by a similar but less extended movement. At about 6 p.m. on the 4th there was a double oscillation of the H.F. needle. At 2.25 a.m. on the 11th the Declination needle pointed rather West of its mean position, whilst the Horizontal Force increased, but the latter was again a little below its normal value between 6 and 7 p.m. The Declination had in the mean time moved Eastward, and then remained steady until about noon of the 14th. The storm which then commenced lasted until the morning of the 19th, the most rapid movement occurring towards 9 p.m. on the 14th. The H.F. was much disturbed during the first 36 hours of this storm, but the mornings of the 17th, 18th, and 19th were generally quiet. The Vertical Force increased slightly during this disturbance. There was some unsteadiness in the Declination during the afternoon of the 19th and the evening of the following day. The next two days were very calm, but there was an increasing disturbance on the evenings of the 22nd and 23rd, which occurred rather earlier on the 24th. The principal movement was one towards the East between 7 and 8 p.m. on the 24th, the H.F. increasing at the same time and being rather disturbed. The Easterly movement was repeated on the 25th and on the five following days. The only irregularity of any importance during the latter part of the month occurred at 5 a.m. on the 23rd. On the last day of the month a rapid movement towards the East took place between 9 and 10 p.m.

FEBRUARY.—The Declination and H.F. curves were rather irregular at the opening of the month, and the magnet was considerably to the East of its mean position between 8 p.m. on the 3rd and 2 a.m. on the 4th, the H.F. being at the same time irregular. The afternoon of the 5th was a good deal disturbed, as shewn by both Declination and H.F., but this was followed by a calm which lasted until the 9th. From the 9th to the 12th the Declination was always abnormal, and at 6.38 p.m. on the 12th the needle moved suddenly towards the East, with an increase of H.F., and then by a succession of irregular movements reached its minimum at 8.48. The Vertical Force was also rather abnormal during the night of the 12th and the early morning of the 13th. The storm continued during the following days, the most rapid motion of the magnetic needle occurring between 6.54 and 7.15 p.m. on the 13th, when it oscillated Westward through an angle of 35′48″·6. Quick movements also took place between 8 and 10 p.m. on the 14th, and from 3 to 5 a.m. the next morning. The V.F. was disturbed the same night. The needle was also unsteady from the 15th to the morning of the 18th, and again from the evening of the 19th to the morning of the 24th. During the remainder of the month the needle was not much affected by the disturbing force.

MARCH.—The opening of the month was remarkably quiet, but during the evening of the 5th the presence of a disturbing force was noticed on the Declination and H.F. curves, whilst there was an increase of the V.F. and this disturbing force continued more or less active for fully 24 hours. The magnet then remained fairly quiet until the night of the 15th, although the H.F. showed considerable irregularity on the night of the 8th and the afternoon of the 9th, and the V.F. was a little disturbed during the night of the 8th. An Easterly movement of some extent occurred between 10 and 11.40 p.m. on the 15th with an accompanying disturbance of the H.F. Another Easterly movement was recorded on the evening of the 19th, the minimum being reached about 10 p.m. : the H.F. changes were also numerous, but of no great extent, during the hours of the afternoon. The next four days were rather irregular, but no rapid oscillation took place. A slight decrease in the intensity of the V.F. was observable on the morning of the 24th. The remainder of the month was remarkably quiet.

APRIL.—Towards midnight on the 1st the disturbing force was again at work, and the curves were very irregular until midday on the 9th. The H.F. trace became more abnormal each day until the 7th, when the V.F. was also very much disturbed. On the morning of the 15th the curves of the Declination and of both components of the intensity were again irregular, but the magnets soon came to rest and remained quiet until the afternoon of the 22nd. The V.F. decreased during the night of the 22nd, and was disturbed on the morning of the 24th. The afternoon of the 28th was abnormal, the V.F. increasing and the other component force being even more disturbed than the Declination, this continued during the following night; and on the night of the 29th there was a slight decrease of the V.F.

MAY.—The first important movement of the month was an increase of Declination between 6 and 8 a.m. on the 2nd, and the same evening, as well as the next morning there was evidence of a strong disturbing force in the movements of the Declination and H.F. needles and in the variations of the V.F. The disturbance gradually diminished, and on the 8th there was almost a perfect calm. This continued until the 12th, when the Declination magnet began to tremble, and the H.F. was exceedingly irregular throughout the afternoon. The 13th and 14th were somewhat disturbed, as were also the mornings of the 18th and 19th, the V.F. decreasing on both the 13th and 19th, but more suddenly on the latter date. Another disturbance commenced on the night of the 23rd and lasted rather more than a day. The V.F. was above the normal on the afternoon of the 24th, but diminished during the night. On the 26th and 27th the magnetic needle was somewhat East of its usual position during the night, and the H.F. was irregular on the first of these days. The remainder of the month was very quiet.

JUNE.—The month opened with disturbed curves both for Declination and H.F., and slightly also for V.F., but the magnets soon came to rest, and remained quiet until the morning of the 5th. On the 5th, the Declination magnet trembled very much at first, and was afterwards disturbed, the V.F. increased considerably and the H.F. was very irregular. The mornings of the 8th and 9th were also slightly abnormal, as was also the night of the 9th and the morning of the 10th. The H.F. was most irregular during the afternoon of the 10th. The next disturbance of

any extent occurred during the night of the 17th, and the movements continued irregular until the 23rd. At the close of the month there was some evidence of the presence of a disturbing force.

JULY.—On the 6th the Declination curve became a little irregular, and this continued for about three days: there was also a considerable increase of the V.F. during the evening of the 7th. The magnets then remained quiet until the afternoon of the 18th with only an occasional abnormal undulation. During the evening of the 18th there was a very slight increase of the V.F., and on the 19th and 20th the Declination trace showed some irregularity, but the remainder of the month was remarkably calm. Any irregularity of the H.F. during this month occurred almost invariably in the afternoon.

AUGUST.—The first severe storm of the year commenced on the afternoon of the 1st, and was at its height between 6 p.m. and 5 o'clock the next morning. Between 10 minutes after midnight and 1. 50. a. m. the Declination increased by 26′51″·5. The H.F. was changing most rapidly between the 1.47 a.m. and 2.13 on the 2nd having increased ·00997 during those 26 minutes. The V.F. increased slightly during the afternoon of the 1st, and was much disturbed on the following morning, the action of the disturbing force being still very apparent during the afternoons of the 3rd and 4th. The magnetic movements were irregular until the afternoon of the 8th, but then the needles remained at rest until the night of the 14th. The 15th and 16th were disturbed days, but they were followed by a long calm. On the afternoon of the 28th the V.F. increased, and this was followed by some irregularity which was repeated the following day. The storm which commenced on the 28th was equal in intensity to that of the 1st, and was most evident on the H.F. curve during the afternoon of the 29th. Between 6.50 p.m. and 7.52 on the 28th the Declination needle moved Eastward through 25′57″·7, and the disturbance continued for the rest of the month.

SEPTEMBER.—The disturbing forces were still at work at the beginning of the month, being apparent in the increase of V.F. during the afternoons of the 1st and 2nd, but the magnets came to rest on the morning of the 3rd, and continued very quiet until the 9th. On the 10th the Declination magnet was very tremulous, but no movements of any

considerable magnitude were observed. The V.F. was rather irregular during the night. The Declination was rather variable during the afternoon of the 15th, and the V.F. decreased slightly the next morning. The magnets then remained very quiet until the morning of the 22nd. Between 6.27 p.m. on the 23rd and 40 minutes past midnight the magnet was considerably East of its mean position. This was also the case from 6 p.m. on the 25th to 2.57 a.m. on the 26th, the oscillations of the Declination and H.F. magnets being very bold and those of the Declination rapid. The total range of the Declination was 51′55″·5 the minimum occurring at 10.37 p.m. and the maximum at 2.57 a.m. The most rapid movement was an Easterly oscillation of 26′15″·6 between 6.35 and 6.52 p.m. on the 25th. The V.F. was increasing the same afternoon, but diminished during the early morning of the 26th: its total Range was ·00192. The early part of the afternoons of both the 26th and 27th were very similar. The greatest oscillation of the H.F. magnet occurred between 3 and 4 a.m. on the 26th when the value of this component of the intensity varied ·00981 (British units) in less than 15 minutes. The storm lasted until the afternoon of the 28th. The movement of the Declination needle was very rapid between 7 and 8 p.m. on the 27th, being 25′4″·0 in about 13 minutes. The month ended with rather a rough Declination curve.

October.—The first disturbance of the month took place on the 7th, and was most apparent at the earliest and latest hours of the day. There were also irregularities in the curves of the 12th, 13th, 14th, and 15th, principally during the evenings. From the 16th until shortly before 8 a.m. on the 22nd the magnets remained very quiet, but then the Declination needle began to tremble. This tremulous motion continued on the increase for fully 24 hours, and the disturbing force remained vigorously at work during the following day. The V.F. began to increase during the afternoon of the 22nd and was much disturbed at night. The irregular movements of the H.F. needle were very numerous but exceedingly minute during the whole morning of the 23rd, but on the previous afternoon they had been of the same character as most other disturbances. A slight storm commenced on the morning of the 26th, but gradually died out on the following day. The V.F. was very irregular on the afternoon of the 26th. On the 30th a very rapid decrease of the Declination occurred between 5. 22 p. m. and 5. 56 the needle moving Eastward

though 27′ 27″·3. The V.F. was rather above the average in the course of the afternoon.

NOVEMBER.—No disturbance of any moment took place this month previous to the 8th, when the V.F. was somewhat above its mean value in the evening, and from 10 p. m. the Declination was diminished for about two hours. The next day was a little irregular, as was also the afternoon of the 10th, and the late hours of the 17th. The 20th was stormy both in the early morning and in the evening, the movement between 7 and 8 p.m. being very brisk, amounting to 21′ 29″·2 in 27 minutes. The most rapid oscillation recorded in the year was that which took place during the evening of the 21st, when a decrease of 37′ 36″·0 in the Declination was immediately followed by an increase of 39′ 23″·4, the whole movement taking place between 6. 42 p.m. and 7.5. This was followed at once by another oscillation as rapid almost as the first. The 22nd and 23rd were rather abnormal, as were also the 29th and 30th. Some movements of the H.F. on the morning of the 22nd were unusually rapid, and the V.F, was greatly disturbed during the afternoon of the 24th.

DECEMBER.—The two irregular movements of the Declination magnet on November the 30th reappeared on the curve of December the 1st, but with diminished energy. From the 6th to the 9th at noon the abnormal oscillations were not unfrequent, and the perturbing force continued in vigorous action until the afternoon of the 22nd, although the morning hours of the 20th and 21st were less troubled. The V.F. was much disturbed on the 16th, increasing in the evening, and this was repeated on the 17th, 18th, and 19th though with less intensity. A great wave of disturbance was shown on the V.F. trace, starting with an increase, and having lesser inequalities superposed: this occurred during the afternoon of the 21st and the morning of the 22nd. The undulations of the curves during the afternoons of the 17th and 18th were very similar. The 26th and the three following days were very much disturbed, but no very extended oscillations were recorded. The V.F. was most disturbed on the morning of the 26th and during the evenings of the 27th, 28th, and 29th.

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APPENDIX.

RESULTS

OF

Meteorological Observations

TAKEN AT

ST. IGNATIUS' COLLEGE,

MALTA,

BY THE

REV. J. SCOLES, S.J.

1887.

ST. IGNATIUS' COLLEGE.

MALTA.

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

METEOROLOGICAL REPORT.

1887

January—February.

Results of Observations taken during the Month.	January.	February
Mean Reading of Barometer.....inches	30·084	30·180
Highest ,, ,, ,,	30·627	30·537
Lowest ,, ,, ,,	29·600	29·828
Range of Barometer Readings ,,	1·027	0·709
Highest Reading of Max. Therm.	61·6°	65·2°
Lowest ,, Min. Therm.	43·0°	43·2°
Range of Thermometer Readings	18·6°	22·0°
Greatest Range in 24 hours	17·4°	18·7°
Mean of all the highest Readings	59·0°	60·1°
Mean of all the lowest Readings	46·6°	48·5°
Mean Daily Range	12·4°	11·6°
Mean Temperature (deduced from Max. and Min).	52·1°	53·3°
Mean Temperature (deduced from Dry Bulb.)	51·0°	53·5°
Adopted Mean Temperature	51·5°	53·4°
Mean Temperature of Evaporation	47·3°	49·5°
Mean Temperature of Dew point	44·7°	47·1°
Mean elastic force of Vapour .....inches	0·296	0·324
Mean weight of Vapour in a cubic foot of air...grains	3·4	3·7
Mean additional weight required for saturation ,,	0·7	0·7
Mean degree of Humidity	84	84
Mean weight of a cubic foot of air .....grains	545·0	544·1
Fall of Rain.....inches	2·308	1·298
Number of days on which Rain fell	14	11
Mean amount of Cloud (an overcast sky = 10)	4·7	3·9
Total number of miles of Wind indicated	6142	5368
Mean Velocity of Wind per hour .....miles	8·3	8·0

March—April.

Results of Observations taken during the month.	March.	April.
Mean Reading of Barometer.....inches	30·048	29·958
Highest ,, ,, ,,	30·359	30·296
Lowest ,, ,, ,,	29·503	29·491
Range of Barometer Readings	0·856	0·805
Highest Reading of Max. Therm.....	73·7°	72·7°
Lowest Reading of Min. Therm.	46·2°	45·0°
Range of Thermometer Readings	27·5°	27·7°
Greatest Range in 24 hours.....	19·5°	19·8°
Mean of all the highest Readings	64·5°	65·6°
Mean of all the lowest Readings.....	53·2°	52·7°
Mean Daily Range	11·3°	12·9°
Mean Temperature (deduced from Max. and Min.)	58·1°	58·1°
Mean Temperature (deduced from Dry Bulb)	57·2°	58·3
Adopted Mean Temperature	57·7°	58·2°
Mean Temperature of Evaporation	53·9°	55·0°
Mean Temperature of Dew-point	51·1	52·0°
Mean elastic force of Vapour .....inches	0·375	0·388
Mean weight of Vapour in a cubic foot of air. grains	4·2	4·3
Mean additional weight required for saturation ..	1·0	1·1
Meah degree of Humidity	81	79
Mean weight of a cubic foot of air .....grains	536·0	533·0
Fall of Rain.....inches	0·287	1·174
Number of days on which Rain fell	4	9
Mean amount of Cloud (an overcast sky = 10).....	5·3	4·5
Total number of miles of Wind indicated	8475	7365
Mean velocity of Wind per hour.....	11.4	10·2

May—June.

Results of Observations taken during the Month.	May.	June.
Mean Reading of Barometer.....inches	30·048	30·049
Highest ,, ,, ,,	30·217	30·276
Lowest ,, ,, ,,	29·773	29·887
Range of Barometer Readings .....,,	0·444	0·389
Highest Reading of Max. Therm	91·9°	92·3°
Lowest Reading of Min. Therm	52·0°	60·2°
Range of Thermometer Readings	39·9°	32·1°
Greatest Range in 24 hours	29·0°	25·6°
Mean of all the Highest Readings	75·7°	82·6°
Mean of all the Lowest Readings	59·4°	66·3°
Mean Daily Range	16·3°	16·3°
Mean Temperature (deduced from Max. and Min.)	66·5°	73·8°
Mean Temperature (deduced from Dry Bulb)	65·9°	73·0°
Adopted Mean Temperature	66·2°	73·4°
Mean Temperature of Evaporation.....	60·6°	67·5°
Mean Temperature of Dew point	55·9°	63·1°
Mean elastic force of Vapour ....inches	0·447°	0·578
Mean weight of Vapour in a cubic foot of air...grains	4·9	6·3
Mean additional weight required for saturation ,,	2·2	2·6
Mean degree of Humidity	69	70
Mean weight of a cubic foot of air .....grains	525·7	518·0
Fall of Rain.....inches	0·168	0·088
Number of days on which Rain fell	4	2
Mean amount of Cloud (an overcast sky = 10)	3·0	1·8
Total number of miles of Wind indicated	7418	4839
Mean Velocity of Wind per hour .....miles	10·0	6·7

July—August.

Results of Observations taken during the Month.	July.	August.
Mean Reading of Barometer.....inches	30·022	30·001
Highest ,, ,, ,,	30·156	30·197
Lowest ,, ,, ,,	29·849	29·849
Range of Barometer Readings.....	0·307	0·348
Highest Reading of Max. Therm	100·2°	98·6°
Lowest ,, Min. Therm.	68·0°	67·9°
Range of Thermometer Readings	32·2°	30·7°
Greatest Range in 24 hours.....	26·8°	23·1°
Mean of all the Highest Readings.....	88·8°	90·1°
Mean of all the lowest Readings.....	71·5°	73·0°
Mean Daily Range	17·3	17·1°
Mean Temperature (deduced from Max. and Min,)	79·7°	80·7°
Mean Temperature (deduced from Dry Bulb)	78·7°	81·1°
Adopted Mean Temperature	79·2°	80·9°
Mean Temperature of Evaporation	72·1°	72·8°
Mean Temperature of Dew-point	67·3°	67·1°
Mean elastic force of Vapour .....inches	0·668	0·664
Mean weight of Vapour in a cubic foot of air...grains	7·2	7·1
Mean additional weight required for saturation ,,	8·5	4·3
Mean degree of Humidity	67	62
Mean weight of a cubic foot of air .....grains	511·6	509·1
Fall of Rain.....inches		0·569
Number of days on which Rain fell		2
Mean amount of Cloud (an overcast sky=10	0·7	1·2
Total number of miles of Wind indicated	4641	4647
Mean Velocity of Wind per hour ... .miles	6·2	6·2

September—October.

Results of Observations taken during the Month.	September.	October.
Mean Reading of Barometer.....inches	29·982	30·022
Highest ,, ,, ,,	30·147	30·266
Lowest ,, ,, ,,	29·689	29·614
Range of Barometer Readings..... ,,	0·458	0·652
Highest Reading of Max. Therm.	93·4°	98·4°
Lowest ,, Min. Therm.	65·7°	49·6°
Range of Thermometer Readings	27·7°	48·8°
Greatest Range in 24 hours.....	21·8°	28·2°
Mean of all the highest Readings	86·8°	74·7°
Mean of all the lowest Readings.....	71·1°	63·1°
Mean Daily Range	15·7°	11·6°
Mean Temperature (deduced from Max. and Min.)...	78·0°	68·0°
Mean Temperature (deduced from Dry Bulb)	78·0°	67·2°
Adopted Mean Temperature	78·0°	67·6°
Mean Temperature of Evaporation	71·6°	62·4°
Mean Temperature of Dew point	67·0°	58·6°
Mean elastic force of Vapour ..... inches	0·661	0·492
Mean weight of Vapour in a cubit foot of air...grains	7·1	5·4
Mean additional weight required for saturation ,,	3·2	1·9
Mean degree of Humidity	69	75
Mean weight of a cubit foot of air	511·9	522·9
Fall of Rain..... .....inches	0·278	8·803
Number of days on which Rain fell	4	12
Mean amount of Cloud (an overcast sky = 10)	2·5	5·7
Total number of miles of Wind indicated.....	5767	7875
Mean Velocity of Wind per hour ..... miles	8·0	10·6

November—December.

Results of Observations taken during the month.	November.	December.
Mean Reading of Barometer.....inches	29·967	30·012
Highest ,, ,, ,,	30·177	30·353
Lowest ,, ,, ,,	29·542	29·579
Range of Barometer Readings..... ,,	0·635	0·774
Highest Reading of Max. Therm.	74·8°	68·0°
Lowest Reading of Min. Therm.	49·6°	45·2°
Range of Thermometer Readings	25·2°	22·8°
Greatest Range in 24 hours.....	19·5°	16·0°
Mean of all the highest Readings	68·0°	63·1°
Mean of all the lowest Readings.....	57·3°	53·3°
Mean Daily Range	10·7°	9·8°
Mean Temperature (deduced from Max. and Min.)	61·9°	57·5°
Mean Temperature (deduced from Dry Bulb)	61·6°	57·1°
Adopted Mean Temperature	61·7°	57·3°
Mean Temperature of Evaporation	57·8°	52·9°
Mean Temperature of Dew-point	55·2°	49·8°
Mean elastic force of Vapour	0.436	0·358
Mean weight of Vapour in a cubic foot of air...grains	4·9	4·0
Mean additional weight required for saturation ,,	1·0	1·0
Mean degree of Humidity	83	79
Mean weight of a cubic foot of air	530·2	539·6
Fall of Rain	1·206	1·041
Number of days on which Rain fell	9	11
Mean amount of Cloud (an overcast sky = 10)	5·4	5·2
Total number of miles of Wind indicated	7502	9594
Mean Velocity of Wind per hour .....miles	10·4	12·9

NOTES FOR THE SEPARATE MONTHS.

JANUARY.

THE Dew-point has been very steady varying slowly between 39·4° and 50·1°.

In Sunshine 120·2° was reached on the 24th.

On ground the lowest was 36·0° on the 30th.

The Sea fell to 58·5°

A thunderstorm passed on the 3rd.

Hail fell on the 1st and 3rd.

FEBRUARY.

The Dew-point has been more steady than usual. It reached 56·2° on the 11th and fell to 40.2° on the 24th.

In Sunshine 123·8 was recorded on the 16th.

On ground the lowest was 36·0° on the 7th.

The Sea ranged between 58·6° and 60·2°.

Thunderstorms passed on the 4th, 12th and 19th.

Hail fell on the 19th and 22nd.

MARCH.

The Dew-point has ranged between 43·0° on the 30th and 56·9° on the 19th.

In Sunshine—the highest 128·3° on the 29th.

On ground—the lowest 38·1° on the 6th.

The Sea rose from 59·0° to 62·0°.

APRIL.

The Dew-point has ranged from 42·9° on the 8th to 59·0° on the 22nd.

In Sunshine the highest was 133·9° on the 13th.

On ground the lowest was 38·9° on the 2nd.

The Sea rose from 60·0° to 63·5°.

Thunderstorms passed on the 14th and 22nd.

Hail fell on the 9th.

MAY.

The Dew-point ranged from 46·5° on the 24th to 61·9° on the 17th.

In Sunshine the highest was 144·6° on the 31st.

On ground the lowest was 46·2° on the 12th.

The Sea rose from 62·5° to 72·6°.

JUNE.

The Dew-point has ranged between 50·9° on the 2nd and 70·4° on the 28th.

In Sunshine 144·7° was reached on the 2nd.

On ground the lowest was 53·7° on the 9th.

The Sea temperature rose from 70·5° to 79·5°.

JULY.

The Dew-point ranged between 53·4° on the 6th and 72·2° on the 21st.

In Sunshine 158·4° was reached on the 24th.

On ground the lowest was 60·5° on the 6th.

The Sea rose from 79·6° to 84·3°.

AUGUST.

The Dew-point has ranged from 58·2° on the 17th to 74·7° on the 21st.

In Sunshine 148·2° was reached on the 23rd.

On ground the lowest was 63·0° on the 30th.

The Sea has fallen from 85·0° on the 5th to 81·9°

Lightning was seen on the 6th and thunderstorms passed on the 7th and 27th.

SEPTEMBER.

The Dew-point has varied from 57·7° on the 23rd to 75·0° on the 30th.

In Sunshine 148·6° was reached on the 25th.

On ground the lowest was 61.0° on the 24th.

The Sea fell from 81·9° to 78·5°

A thunderstorm passed on the 27th.

Lightning was seen on the 11th, 16th, 18th and 25th.

OCTOBER.

The Dewpoint fell from 74·2° on the 1st to 44·9° on the 26th.

In Sunshine 142·7° was reached on the 1st.

On ground the lowest was 45·2° on the 25th.

The Sea fell from 78·5° to 69.0°

Thunderstorms passed on the 8th, 12th, 13th, 19th, 20th, 26th and 27th.

Lightning was seen on the 3rd, 11th, 16th and 28th.

Hail fell on the 27th.

The extreme range of temperature 48·8° is excessively great being 50 per cent above the average. On the 19th 3·5 inches rain fell in 10 hours the wind being E.N.E., but upwards of 12 inches were reported at Notabile for the same storm.

NOVEMBER.

Dew point: ranged between 65·4° on the 9th and 44·1° on the 13th.

In Sunshine: the highest reading was 125·2° on the 16th.

On ground: the lowest reading was 41·9° on the 21st.

The Sea has fallen from 69·0° to 64·3°.

Thunderstorm passed on the 28th.

Lightning was seen on the 3rd and 9th.

Total Rainfall since last June 10·856 inches;
the average of 5 years, 8·795. inches.

DECEMBER.

Dew-point: ranged between 59·6° on the 2nd.
and 34·5° on the 31st.

In Sunshine: the highest reading was 119·0° on the 3rd.

On Ground: the lowest reading was 43·1° on the 22nd.

The Sea has fallen from 64·3° to 59·0°.

Lightning was seen on the 5th.

Hail fell on the 24th.

Total Rainfall since last June 11·897 inches;
the average of 5 years, 12·033 inches.

St. Ignatius' College.

J. SCOLES, S.J.