ASTRONOMICAL PHENOMENA FOR THE WEEK 1886 *NOVEMBER* 7–13

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on November 7

Sun rises, 7h. 6m.; souths, 11h. 43m. 49·6s.; sets, 16h. 22m.; decl. on meridian, 16° 21′ S.: Sidereal Time at Sunset, 19h. 29m.

Moon (Full on November 11) rises, 15h. 4m.; souths, 20h. 58m.; sets, 3h. 2m.*; decl. on meridian, 1° 49′ S.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury	9 22	13 11	17 0	23 59 S.
Venus	6 26	11 20	16 14	13 25 S.
Mars	10 42	14 27	18 12	24 27 S.
Jupiter	4 55	10 19	15 43	7 43 S.
Saturn	20 30*	4 32	12 34	21 18 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Occultations of Stars by the Moon (visible at Greenwich)

Nov.	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
7	4 Ceti	6	17 45	18 32	32 321
7	5 Ceti	6	18 0	19 1	48 311
7	B.A.C. 5	6	18 23	19 42	89 281
9	ν Piscium	4½	18 4	19 9	60 277
12	48 Tauri	6	19 18	20 18	61 251
12	γ Tauri	4	21 17	22 25	55 271
13	75 Tauri	6	2 38	3 37	162 275
13	θ¹ Tauri	4½	2 46	3 57	62 17
13	θ² Tauri	4½	3 6	near approach	39 —
13	B.A.C. 1391	5	3 39	4 46	115 332
13	Aldebaran	1	6 27	7 16	165 284

Saturn, Nov. 7.—Outer major axis of outer ring = 43″·5; outer minor axis of outer ring = 16″·8; southern surface visible.

Nov.	h.	
13	17	Mercury at greatest elongation from the Sun, 22° east.

Variable Stars

Star	R.A. h. m.	Decl. ° ′		h. m.
S Cassiopeiæ	0 17·1	55 10 N.	Nov. 9,	*M*
U Cephei	0 52·2	81 16 N.	,, 8,	3 49 *m*
			,, 12,	3 29 *m*
Algol	3 0·8	40 31 N.	,, 11,	3 56 *m*
R Aurigæ	5 8·1	53 27 N.	,, 10,	*M*
S Cancri	8 37·4	19 27 N.	,, 9,	3 53 *m*
U Ophiuchi	17 10·8	1 20 N.	,, 8,	3 37 *m*
			and at intervals of	20 8
β Lyræ	18 45·9	33 14 N.	Nov. 12,	19 0 *m*
R Lyræ	18 51·9	43 48 N.	,, 13,	*m*
η Aquilæ	19 46·7	0 43 N.	,, 7,	5 0 *m*
R Vulpeculæ	20 59·3	23 22 N.	,, 9,	*M*
δ Cephei	22 24·9	57 50 N.	,, 10,	5 0 *M*

M signifies maximum; *m* minimum.

Meteor Showers

A radiant near δ Hydræ, R.A. 124°, Decl. 4° N., and one in Camelopardus, R.A. 102°, Decl. 73° N., are active in the early part of this week. Moonlight interferes with meteor observation during the greater part of the week.

THE HIGH TEMPERATURE IN OCTOBER

THE warm weather which occurred at the commencement of the month was so exceptional for the season, and extended over so large a part of Europe, that a few facts as to its general character may be of interest, and will afford opportunity of comparison with earlier records, as well as with records of any similar weather in time to come.

The highest temperatures were experienced during the first five days of the month, and were chiefly confined to Western, Central, and Southern Europe. During this time atmospheric pressure was generally high over Central Europe, and decreased towards the western or Atlantic coasts, so that the conditions of pressure were favourable to anticyclonic circulation over France and the south-east of England, and cyclonic circulation in Ireland and the northern parts of the British Islands. The barometric gradients were very slight over the Continent, but were rather steeper over Great Britain and Ireland, owing to the proximity of a barometric depression to the westward. This distribution of pressure was accompanied by southerly and south-easterly winds over Western Europe, and especially over France and our own islands, but it was only in Ireland and the more western parts of Great Britain that the wind was at all fresh.

At this season of the year our warmest weather in England is commonly experienced with south-easterly winds, as is well shown in the valuable discussion of the Greenwich observations for the years 1849 to 1868, in which the temperatures have been averaged for the several wind directions. The following are the temperatures for October:—

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Monthly means	47	50	52	55	53	53	51	51
Highest hourly means	52	55	59	61	59	58	57	55

The same discussion also shows the striking difference which exists, in October, between the temperature with a cloudless and a cloudy sky:—

	Mean	Mean max.	Mean min.
Cloudless sky	50·8	61·1	43·5
Cloudy sky	51·8	54·8	49·8

The high temperatures experienced over England in October this year occurred with an exceptionally clear sky, as well as with a remarkably steady south-easterly wind, and the air before reaching England had been subjected to very similar conditions on the continent of Europe.

The following table gives the *maximum* day temperatures at twenty stations selected from the Daily Weather Report of the Meteorological Office and from the Paris *Bulletin International* for the first five days of October:—

	Station	Day 1 °	2 °	3 °	4 °	5 °	Mean °
British Islands	York	64	63	66	69	63	65
	Greenwich	78	68	69	79	77	74
	Parsonstown (Ireland)	58	61	61	64	66	62
France	Dunkirk	79	72	72	81	79	77
	Cherbourg	72	73	64	72	68	70
	Paris	77	65	78	78	77	75
	Nantes	79	70	81	82	64	75
	Biarritz	82	73	81	81	68	77
	Nice	72	73	75	77	75	74
Germany	Hamburg	61	68	61	64	68	64
	Berlin	63	73	63	61	66	65
	Carlsruhe	75	70	75	72	70	72
Belgium	Brussels	76	64	71	75	77	73
Austria	Vienna	73	75	73	72	70	73
Spain and Portugal	Barcelona	88	100	95	91	85	92
	Madrid	62	72	75	70	68?	69
	Lisbon	70	68	68	70	68	69
Italy	Turin	72	73	73	73	73	73
	Rome	77	79	81	81	81	80
	Palermo (Sicily)	82	84	84	82	84	83
	Mean	73	72	73	75	72	

The stations have been selected as representative of Western, Central, and Southern Europe, and the table shows well the area over which the warm weather extended.

The more northern parts of Europe did not experience any exceptional heat, the highest temperature at Copenhagen being 63°, and at Stockholm 61°. The more western parts were also but little affected: in Ireland the highest maximum was 66° at Parsonstown on the 5th, and at no other station was the temperature above 65°. In Scotland the temperature did not reach 70°.

The Greenwich observations from 1841 show that a higher temperature has only once been registered in October, viz. 81° on the 4th in 1859; but the daily mean, which was 67°·1 on the 4th this year, is higher than any previously recorded.

The observations which were made in the apartments of the Royal Society from the year 1794, excepting the years 1811 to 1819, do not show so high a reading between 1794 and 1840. At Kew Observatory the highest temperature recorded was 77°

on the 4th, and this is the highest ever observed in the month of October; on the 5th, 76° was registered, which corresponds with the temperature observed on October 4, 1859. The returns of the Meteorological Office show that 80° was observed on the 4th in London and at Cambridge, whilst 77° was registered at several stations in the east of England and in the Midland Counties.

It is difficult to make any satisfactory comparison with previous records, except at one or two places, but these tend to show that so high a temperature at this season does not occur more than about twice in a century. CHAS. HARDING

VOLCANOES OF JAPAN

THE last number (vol. ix. part 2) of the *Transactions* of the Seismological Society of Japan is wholly occupied by a paper of Prof. Milne's, on Japanese volcanoes, which is the longest contribution that has yet appeared in the Society's *Transactions*. The paper is partly historical and partly scientific, and contains, so far as the writer has been able to collect, references to everything that is known on the subject. Very much comes from his own observations, for he has travelled over the greater part of Japan, and has ascended many of the volcanoes. The paper also contains an epitome of some thirty or forty works in Japanese. On the whole, it is a systematic account of material which has been accumulating for the last eleven years.

The following are the more important conclusions which Prof. Milne has formulated in the paper:—

1. *Number of Volcanoes.*—As Japan has not yet been completely explored, and, moreover, as there is considerable difficulty in defining the kind of mountain to be regarded as a volcano, it is impossible to give an absolute statement as to the number of volcanoes in the country. If under the term volcano be included all mountains which have been in a state of eruption within the historical period, those which have a true volcanic form, together with those which still exhibit on their flanks matter ejected from a crater, we may conclude that there are at least 100 such mountains in the Japanese Empire. If to this list be added the ruins and basalt wrecks of volcanic cones, the number would be considerably increased. These mountains are distributed as follows:—

Northern Region	Kuriles	23
	Yezo	28
Central Region	Northern main island, Central ,, ,, Oshima group	35
Southern Region	Southern main island	1
	Kiushiu, Southern islands	13
	Total	100

Of this number about 48 are still active, or have been so during the historical period. These active volcanoes are distributed as follows:—

Northern Region	Kuriles 16, Yezo 11	27
Central Region		12
Southern Region		9
	Total	48

From this it will be seen that volcanic activity in Japan decreases from the north towards the south.

2. *Number of Eruptions.*—Altogether about 232 eruptions have been recorded, and of these the greater number took place in the southern districts. This may perhaps be accounted for by the fact that Japanese civilisation advanced from the south. In consequence of this, records were made of various phenomena in the south when the northern districts were still unknown and unexplored regions. The greater number of eruptions took place in February and April. Comparing the frequency of eruptions in the different seasons, the volcanoes of Japan appear to have followed the same law as the earthquakes, a greater number having taken place during the cold months. This winter frequency of volcanic eruptions may possibly be accounted for in the same manner that Dr. Knott accounted for the winter frequency of earthquakes. During the winter months the average barometric gradient across Japan is steeper than in summer. This, coupled with the piling up of snow in the northern regions, gives rise to long-continued stresses, in consequence of which certain portions of the earth's crust are more prepared to give way during the winter months than they are in summer.

3. *Position and Relative Age of Japanese Volcanoes.*—The youngest of the Japanese volcanoes appear to be those which exist as, or on, small islands. On the islands in the Kuriles, in the Oshima group, and in the Satsuma sea, many of the volcanoes are yet young and vigorous. Moreover, many of these islands have been formed during the historical period. The island-forming period in the Satsuma sea, for example, was about the year 1780.

The volcanoes of Japan form a long chain running from N.E. towards S.W.; but a closer examination of the distribution of the volcanic vents shows that there are probably four lines:—

(*a*) The N.E.-S.W. line running from Kamchatka through the Kuriles and Northern Yezo.

(*b*) The curved line following the backbone of the main island, and terminating on the western side of the Yezo anticlinal.

(*c*) The N.N.W.-S.S.E. line of the Oshima group. This line, coming from the Ladrones, passes through Oshima and Fujisan parallel to and near to the line of a supposed fault. Here it intersects the main line running through the main island. Volcanic vents are here very numerous. As the main island line is intersected, while the Oshima line is the intersector, it may be argued that the Oshima-Fujisan line of volcanoes are younger than many of those on the main island line.

(*d*) The Satsuma line, coming from the Philippines through Sakurajima and culminating in the famous Mount Aso, which is the nucleus of Kiushiu.

4. *Lithological and Chemical Character of Lavas.*—Although Prof. Milne has made an extensive collection of the volcanic rocks of Japan, the opportunity for examining them has not yet presented itself, and therefore he can only speak of them in general terms. They are at present being carefully studied by the officers of the Geological Survey. The rocks in his possession are chiefly andesites. Those containing augite, like the rocks of Fujisan, closely approximate to basalts. True basalt is, however, rare. Another common rock is hornblende andesite, some of which contains free quartz. Quartz trachytes occur in the north of Japan. The following table shows the percentages of silica, and ferrous and ferric oxide, contained in the rocks of ten volcanoes:—

Locality.	SiO_2	FeO	Fe_2O_3
1. Norokura	61·72	1·35	3·50
2. Misake	59·97	3·27	3·86
3. Kusatsu	61·49	3·30	4·35
4. Amagi (Hakone)	65·34	2·45	3·09
5. Komagadake	56·27	2·19	6·69
6. Moriyoshi	59·17	2·65	4·15
7. Chokai	60·64	3·81	3·14
	54·55	5·19	4·42
8. Hakone (Tonosawa)	48·97	4·02	4·81
9. Fujisan	49·00	5·1	6·06
10. Oshima	52·00	13·70(?)	

One feature exhibited by the table is that the rocks of Oshima, Fujisan, and Tonosawa are basic, while those like Chokaisan and Moriyoshiyama belonging to the line of volcanoes of the main island, are relatively acidic. More extended observations of this description may show that different lines of volcanoes have thrown out different lavas, or that the lavas of different constitution are of different ages.

5. *Magnetic Character of Rocks.*—In a study of the soils in the neighbourhood of Tokio, Mr. E. Kinch refers specially to the magnetite they contain. A great portion of this comes from the disintegration of volcanic rocks. Many of the Japanese lavas have a distinct effect upon a compass needle, and many of the black lavas from the crater of Fujisan will easily turn the needle of an ordinary compass through 360°. Many of the pieces of lava are not only magnetic but polar. Dr. Naumann found a block of augite trachyte on the top of Moriyoshiyama which would deflect the needle of a compass through 155°. The most curious observation made by this investigator was that the magnetic declination near Gaujusan has during the last eighty years (when it was about 14° 30′ E.) decreased 19°, being now about 5° W. As we recede from this mountain the amount of