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Meteors and Falling-Stars.

*Read before the Canadian Institute, February 4th, by T. Henning, Esq.**

SHOOTING-STARS.

The more important questions relating to shooting-stars, are the smaller size of the meteors, their infinitely greater frequency, the arcs they describe, their divergence or point of departure, their frequent occurrence in showers, and the periodicity of certain of these phenomena. We can touch but very slightly upon any of these interesting points. Falling-stars are distinguished by most observers into those that fall separately and in small numbers, and those that come in swarms or showers of many thousands. The former are said to fall *eporadically;* the latter which the Arabian writers compare to swarms of locusts, are periodic in their visits and move in streams, generally in a parallel direction, proceeding from one or more points of divergence. Olbers gives five or six as the mean number of meteors which can be reckoned hourly in the range of vision of one person on ordinary occasions; Quetelet gives eight. Julius Schmidt, of the Bonn Observatory, an observer long accustomed to astronomical accuracy, states in a letter lately written to Humboldt, that the mean number of *sporadic* shooting-stars observed in an hour on ordinary occasions is from *four* to *five*. Of the *periodic* meteors, there may be expected on the average in each hour *above* thirteen or fifteen. The most remarkable of the *periodic* falls are those which occur from the 12th to the 14th November, and on the 10th August, the festival of St. Lawrence, "whose 'fiery tears' were noticed in former times in a Church Calendar of England, no less than in old traditionary legends, as a meteorological event of constant occurrence." Although several remarkable falls on the night between the 12th and 13th November had been noted, such as the splendid one in 1799, described by Humboldt, and which had been seen in America from the equator to New Herrnhut in Greenland (*Cosmos*, vol. iv., p. 216), also in 1818, 1822, 1823, 1831, and 1832, still, the connection existing between these falls and the recurrence of certain days was unthought of. The magnificent shower of 1833, when the stars fell "like flakes of snow," 240,000 having fallen during a period of nine hours, and was visible from Jamaica to Boston. Similar streams, of somewhat less intensity, were observed in the United States in 1834, 1835, and 1836, of which very interesting accounts are given in the 27th, 29th, and 31st volumes of *Silliman's Journal*, by Olmsted and Palmer, of Yale College, who were perhaps the first to detect the periodical character of this fall. The next most celebrated fall is that of the 10th of August. The frequency of meteors in the month of August was noticed by Muschenbroek as early as 1762, but their periodic return about St. Lawrence's Day was first shown by Quetelet, Olbers, and Beuzenberg. Several other periods, however, have since been added to this number, making the list stand thus:—

JANUARY: between the 1st and 3rd. (Somewhat doubtful.)

APRIL: 18th or 20th. (?) (Arago was the first to call attention to this as a recurring phase. Great streams: 25th April, 1095; 22nd April, 1800; 20th April, 1803.—*Cosmos*, vol. i., p. 125–6.)

MAY: 26th. (?)

JULY: 26th to 30th. (Quetelet: maximum properly between the 27th and 29th July.)

AUGUST: 10th. (Muschenbroek and Brandes.)

OCTOBER: 16th to 18th, according to Professor Lowe; 19th, and the days about the 26th, says Quetelet.

NOVEMBER: 12th to 14th; very seldom the 8th or 10th.

DECEMBER: 9th to 12th; but in 1798, according to Brandes' observation, the 6th and 7th; Herrick, in New Haven, 1838, the 7th to 8th; Heis (Aix la Chapelle), 1847, the 8th and 10th.

Eight or nine epochs of periodic meteoric streams are thus recommended to the attention of observers.

The *hourly variation* in the number of stars observed to fall during the night is a very remarkable thing, and one very difficult to account for. A very important paper upon this point was presented lately to the Institute at Paris, by M. de Coulvier Gravier, a plain country gentleman, who has devoted thirteen years to the study of falling stars, with the view principally of being able to predict therefrom the changes in the atmosphere. By the advice of M. Arago, he commenced in 1840 to keep a journal, which, by the personal co-operation of the celebrated astronomer Saigney, has been rendered a valuable acquisition to astronomical science. From 1841 to 1845, 5312 shooting-stars were observed in 1034 hours. An analysis of these observations prove that they appeared, with slight exceptions, in increased numbers as the night advanced towards morning. The number seen hourly stand thus:

From 6 to 7	o'clock,	p. m	3·1
" 7 to 8	"	"	4·5
" 8 to 9	"	"	3·7
" 9 to 10	"	"	4·10
" 10 to 11	"	"	4·5
" 11 to 12	"	"	5·0
" 12 to 1	"	a.m.	5·8
" 1 to 2	"	"	6·4
" 2 to 3	"	"	7·1
" 3 to 4	"	"	7·6
" 4 to 5	"	"	6·0
" 5 to 6	"	"	8·2

His observations between the 10th and 11th August, 1853, correspond with this. The hourly number of stars seen by him on the 9th was 49, and on the 10th 56. Between 9 and 10 o'clock p.m. on the 9th he saw 36, but between 1 and 2 a.m. 56. Between 12 and 1 o'clock on the night of the 10th–11th, 78 were seen, and 88 from 1 to 2. The direction was quite uniform, the radiant being near Cassiopeia. Mr. Herrick, at New Haven, on 10th August, 1853, saw from 12 to 3¼ o'clock, 388 stars, being 110 from 12 to 1, 115 from 2 to 3, and 44 from 3 to 3·25. Apparent radiant place did not change its position among the stars. Another result of M. Gravier's tables is the fact that the light of the moon does not efface more than three-fifths of the aggregate number of the stars thus seen. Again: while shooting stars appearing in the north of the hemisphere are not so numerous as those from the south, it is the same with the stars from the west as compared with the abundance of their appearance in the east. M. Gravier also ascertained that those stars comprised between the N.N.E. and the N.E. make the longer mean course, viz., 11°3′, while those between the S.W. and W.S.W. take the shortest mean course, viz., 11° 30′.

With regard to the point of divergence it may be necessary to state a few facts, as on this has been grounded an argument for

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