

probably the finest in the world. Here are found the Oriental sapphire, ruby, and emerald, in perfection.

Topaz has recently been found at Pike's Peak, Colorado, in large quantity. Some masses weighed 2 pounds each; and very fine clear white stones have been cut, weighing from 125 to 193 carats.

Among ornamental stones should be mentioned a very beautiful variety of serpentine from Maryland, called verd antique, which is being largely used in the interior decorations of the Philadelphia Court House. Another variety, resembling jade, is the green williamsite from Pennsylvania. Alabaster of various colours abounds in many localities; and marbles, some as beautiful as the Mexican onyx, are found in nearly every State. The malachite and azurite, jet, and many other gems of minor importance were briefly described.

THE OCTOBER METEOR-SHOWER OF 1887.

THE display of Orionids has been recently observed at this station with greater success than has attended my efforts in any previous year. This shower has not, perhaps, exhibited such richness as it did in 1877, but the present occasion has been more favourable as regards the conditions; the moon being absent from the morning sky, and a period of tolerably clear weather occurring just at the important time.

In all, I numbered ninety Orionids between October 11 and 24, and the radiant-point during this period exhibited a stationary position amongst the stars. The shower has this year met with rather a formidable rival in a bright display of forty-five meteors from a radiant at $40^\circ + 20^\circ$ close to ϵ Arietis. I have witnessed the latter stream in several preceding years, though not in such conspicuous strength, and have particularly referred to it in the *Monthly Notices*, vol. xlv., pp. 24-26, as furnishing many bright fireballs at this season.

It will be convenient to arrange my new observations in a tabular form:—

Date 1887	Period of Observation	Real Duration	Meteors seen	Orionids.	Arietids.	Radiant of Orionids.
Oct. 11	7½ to 12½	4½	30	1	2	91° + 17°
12	8½ „ 12½	4	31	2	1	
13	10 „ 12	2	16	1	1	
14	9½ „ 16¾	7	75	1	10	
15	7 „ 8½	7½	86	17	7	91° + 16°
17	10½ „ 17					
19	8 „ 12½	4½	29	3	3	90° + 15°
20	13 „ 15	1½	19	10	—	90½° + 15½°
21	10 „ 15	5¼	61	22	9	90° + 14½°
22	9 „ 16	6¾	76	23	7	92° + 14°
23	12½ „ 14	1½	13	1	3	—
24	12 „ 14½	2¼	23	9	2	91° + 16°

11 nights 46¼ 459 90 45 91° + 15°

The 16th and 22nd were overcast, and on the 19th and 23rd the observations were much obstructed by clouds. It is noteworthy that I only recorded one Orionid on October 14 during a watch of seven hours, though on the following night this shower supplied seventeen meteors.

The radiant-point of the October meteors has long been accurately known. Prof. A. S. Herschel observed it with great precision on October 18, 1864, and October 20, 1865, and found the centre at $90^\circ + 16'$, and $90^\circ + 15'$ respectively, in those years. All the best of later determinations have agreed closely with these results, and it will be noticed that my value for the present year, as given above, is nearly identical with them. In further confirmation I may mention that Mr. David Booth, of Leeds, observed more than sixty shooting-stars during a watch of five hours, from 10½h. to 15½h. on the night of October 20 last, and saw twenty-four Orionids which gave a sharply-defined radiant at $90^\circ + 16'$.

One of the principal objects of my late observations was to ascertain whether the radiant centre of this stream showed any displacement of position on successive nights, and similar to that affecting the Perseids of August—a peculiarity which I first pointed out in NATURE, vol. xvi. p. 362. But the radiant of the Orionids has (when the small, unavoidable errors of observation are allowed for) quite failed to exhibit any change of place relatively to the contiguous stars. It appeared to maintain an

absolutely persistent position 1° north of the star ξ Orionis. My observation on October 15 placed it at $91^\circ + 16'$, and nine nights later, viz. on October 24, I found the meteors were radiating from exactly the same focus. In 1877 and 1879, October 15, I derived the radiant at $92^\circ + 15'$ and $93^\circ + 17'$, and in 1878, October 22, I fixed it at $92^\circ + 14'$. A comparison of all these values renders it sufficiently obvious that there is no visible displacement in the position of the Orionid radiant during its active display from October 11 to October 24. And there is a high degree of probability that the point is stationary during the whole period of the shower's sustenance from about October 9 to October 29; but I have never secured many paths and been enabled to get a good radiant near the limiting epochs of its display, when it is extremely feeble.

Mr. Booth, at Leeds, has been carefully observing numbers of meteors during the past few months, and a searching comparison of his results with those obtained at Bristol during the progress of the Orionid shower has shown that several of the same meteors were observed at both stations. Three of these are typical members of the October display, whilst three others had their origin in the minor systems which are so plentifully distributed over the sky at this season of the year. The computed heights and paths of these six meteors are:—

Date 1887	Hour G.M.T.	Mag.	Height at appearance.	Height at disappearance.	Length of real path.	Radiant point.	Inclination to horizon.
13	10 25	1-2	69	50	26	73° + 61'	48°
13	11 25	2-4	70	42	37	127° + 83'	49°
14	12 5½	4-5	64	40	26	355° + 36'	67½°
15	14 48½	1½-3	89	61	39	87° + 15'	46°
20	11 45	4-4	106	90	34	87° + 21'	28½°
20	12 55	1-1½	92	53	70½	87° + 13½'	33½°

The three last in the list were Orionids, and they appear to have been observed at somewhat greater elevations in the atmosphere than is usual. The 4th magnitude meteor of October 20, 11h. 45m., was no less than 106 miles high at its first appearance, over a point near Eversham, Kent, and the two observations are in perfect agreement in indicating these figures. The mean of the three Orionids gives 96 miles for the beginning points and 68 for the ending, and the average radiant comes out at $87^\circ + 16'$, which is 3° or 4° west of the usual position. But the average values deduced from so small a number of instances cannot have much weight as indicating accurately either the heights or radiant of the general body of the meteors forming this notable group.

The Arietids, which have developed into an important shower this year, traverse their paths with medium speed, and are rather conspicuous meteors, without trains or streaks except in exceptional cases. As to the Orionids, they move swiftly, and are accompanied in almost every instance with streaks. The latter will sometimes brighten up considerably after the nuclei of the meteors have died away. The more brilliant Orionids are fine flashing meteors, leaving streaks which are occasionally very durable.

The contemporary showers of the October epoch, though extremely abundant, are not marked by special activity, except perhaps in the case of the Arietids, already referred to. This year the following have been the best of the minor streams:—

Date.	Radiant.	Meteors.	Appearance.
October 14-15	25° + 44'	10	Slow, fair t.
„ 14-21	54° + 71'	12	Swift.
„ 14-21	105° + 22'	12	Very swift, streaks.
„ 20-21	125° + 43'	7	Very swift, streaks
„ 14-23	135° + 68'	11	Swift.
„ 12-20	312° + 77'	8	Swift.

Of these the most pronounced is at $105^\circ + 22'$, near δ Geminorum, which I also observed in 1877 and 1879. It has also been recorded as a prominent stream by Zezioli and others, and is identical with the Gemellids of Mr. Greg's catalogue (1876). It is chiefly a morning shower; its meteors are often brilliant, and regularly display the phosphorescent streaks which form so characteristic a feature of the Perseids, Orionids, and Leonids. The shower in the head of Ursa Major at $135^\circ + 68'$ is also an active one at this epoch; I saw it in 1877 at $133^\circ + 68'$, October 2-19, and these appear to be the only two observations of it obtained hitherto. W. F. DENNING.