

in the sky known to astronomers as the radiant, that is their paths produced backward all pass through or near that point, though they do not usually start there. Meteors which appear near the radiant are apparently stationary or describe paths which are very short, while those in the more distant regions of the sky pursue longer courses. The radiant keeps its place among the constellations sensibly unchanged during the whole continuance of the showers, which may last for hours or days. The radiant is merely the effect of perspective, as the meteors are all moving in lines nearly parallel when encountered by the earth, and the radiant is simply the perspective vanishing point of this system of parallels.

At the time of the meteoric shower of 1833, Professors Olmsted and Twining of New Haven were the first to recognize the radiant and to point out its significance as indicating the existence of a swarm of meteors revolving about the sun in a permanent orbit. Erman, a German astronomer of Berlin, shortly afterward developed a method of computing the meteors orbit when the radiant was known.

Sometime after this in the year 1864 Professor Herbert Newton, of New Haven, showed by an examination of the old records that there had been a number of great meteoric showers in the month of November, at intervals of thirty-three to thirty-four years, and he predicted confidently a repetition of the shower on Nov. 13th or 14th. 1866. The shower occurred as was predicted and was observed in Europe. This discovery made by Dr. Newton confirmed the theory advanced by Olmsted and Twining in 1833, and established the view that these meteoric bodies move in orbits about the sun. By further research, Newton and Adams, the discoverer of Neptune, showed that this swarm of the Leonid meteors, which produced the November showers moves in a long eclipse with a thirty-three-year period.

Meteoric showers are hence accounted for by the earth's encounter with a swarm of these little bodies, and since this swarm of meteors pursues a regular orbit around the sun, the earth can only meet it when she is at the point where her orbit cuts the path of the meteors. This, of course, must always happen at or near the same time of the year, except, in process of time the meteoric orbits shift their positions on account of perturbations.

The researches of Newton and Adams awakened a lively interest in the subject of meteors and their orbits, and a few weeks after the