

Atlantic Ocean. Five ships reported meteors in unusual numbers, at times varying from 8:51 to 10:01 p.m., 75th meridian time. For one ship the shower continued thirty minutes. Three of the five ships reported the general direction of motion as follows: "from north to south," "from west by north to southeast," and "from west of the constellation Orion toward the south." These directions are all in general agreement with the leading radiant.

England. Bright meteors were unusually numerous according to Denning. No time or radiant is given.

THE APPARENT RADIANT

To determine the apparent radiant the reports were examined to find those giving the apparent path of a meteor or fireball in the sky. Reports giving merely an estimate of the general altitude and direction of the path are of no value. Neither are the numerous reports giving the observer's guess as to the real direction of travel of the meteor. Two references suggest that the radiant was under the constellation Cassiopeia. One observer reports that a bright meteor appeared "right under Cassiopeia" and travelled northward. Another reports that the meteors came from 5° west of Cassiopeia and travelled southward.

Three reports were selected as of value in determining the apparent radiant. First, an astronomer at the University of Michigan gives the right ascension and declination of the points of appearance and disappearance of the Ann Arbor meteor, a shadow-casting fireball. Second, Colonel Winters, who observed a fireball in Bermuda, reported that it appeared in Ursa Major and went across the eastern sky. A measured altitude of $30\frac{1}{2}^\circ$ is given as its apparent height in the eastern sky. Unfortunately, the azimuth of this point is not given, but as the altitude changes rather slowly, the error in assuming a due east direction probably is not great. Third, an observer at Dunnville, Ontario, reported that meteors passing exactly overhead were travelling in a due east-southeast direction. For overhead meteors, the apparent direction of travel is the real direction, and so this report can be used. Probably these are the only reports from which one could hope to determine the radiant directly with an uncertainty of less than 20° .

Using these three reports the apparent radiant was determined as, approximately, in right ascension $= 21^h 30^m$, declination $= +61^\circ$. It is interesting to note that a detonating meteor which fell in Europe on January 25, 1894, had an apparent radiant in right ascension $= 22^h 1^m$, and declination $= +55^\circ$. In this preliminary determination of the radiant,⁵ the zenith attraction has not been allowed for, and the error due to that might be more than 10° .

The radiant can be determined more accurately by computing the path and apparent radiant of the detonating meteor and then obtaining the zenith attraction on the assumption that the Ann Arbor fireball, reported

⁵ From the more accurate work of the following paragraphs, the apparent radiant of the Ann Arbor meteor was determined as R. A. $= 21^h 25^m$, Decl. $= +60^\circ 43'$. The agreement with the approximate determination is excellent.