

ASTRONOMY

1931 Leonids Best in Years, Many Astronomers Report

Net of Observers Extending From Coast to Coast See As Many as 90 "Shooting Stars" Flash in Half-Hour

WELL WATCHED in spite of unfavorable weather, the Leonid meteor shower, through which the earth dashed during the mid-month days, provided the best display of "shooting stars" that has been seen since the great shower a couple of generations ago. It surpassed the really good "show" of last year, and in the opinion of astronomers may be taken as a promise of a really dazzling display in 1932, when the earth is due to hit even closer to the center of the swarm, as the two circum-solar orbits intersect.

Clouds and fog handicapped observers all over the country. They beat the bad weather either by climbing mountains or by patiently waiting for a few hours of decent "seeing" during the critical quarter-day between midnight and dawn; and one observer took to the sky himself in a plane, climbing above the untimely clouds.

One Every Twenty Seconds

Shooting stars at a rate as high as one every twenty seconds were observed by Dr. Charles P. Olivier, director of the Flower Observatory of the University of Pennsylvania. He observed the Leonids from the estate of John A. Kingsbury, amateur astronomer, in Ulster County, N. Y. High in the Catskill Mountains, this location had perfect weather while the lower ground for most of the surrounding region was enveloped in thick fog. The greatest display was seen early Tuesday morning, Nov. 17. With the assistance of ten other observers, a total of 2,500 meteors was reported, but allowing for duplicates, there were probably about nine hundred separate ones visible from this location. There were a number of fine fireballs, including two with trains that lasted twelve minutes each. Prof. Olivier himself observed 266 meteors, which came fastest during the half-hour from 3:30 to 4:00 A. M., when he saw 90.

Meteors of the Leonid shower burned very bright as they coursed through the Arizona air on the morning of Tuesday, Nov. 17. A. W. Beck of the Stewart Astronomical Observatory, who with a

party of observers watched the heavens for three hours during the early morning, reported that "their brightness was conspicuous; mostly brighter than Jupiter and few fainter than Sirius." A number of the meteors left persisting trails behind them. One of these lasted for ten minutes, one for seven and several for five. During the period of observation the meteors fell at an average rate of seventy per hour.

Handicapped by cloudy weather and rain on Saturday and Sunday, astronomical observers from the University of Iowa were able, during the early morning hours of Monday, Nov. 16, to carry out their program of observing from three widely separated towns the fall of the meteor shower. C. C. Wylie, director of the observatory, stationed himself at Amana, his research assistant at Tipton and two advanced students north of Mt. Vernon. This made a triangle 37 by 27 by 22 miles, and gave opportunity for mathematical plotting of the position of meteors observed simultaneously from all three points. The maximum fall was observed between one and two o'clock, with a total count of 25; other hour periods gave counts of 15, 12 and 17.

Meteors to the number of 289 were counted in six hours between midnight and daybreak on Monday morning, Nov. 16, by a group of seven students at Columbia College, Dubuque, Iowa, who kept vigil under the direction of the Rev. John Theobald.

Although the sky was slightly hazy, Father Theobald's watchers were able to keep a close count through the entire period. The meteors were falling at a rate of 40 an hour at one o'clock, 65 an hour at 3:15, 90 an hour at 4:45, and 50 an hour at 5:15.

Despite thick clouds hiding the sky and making it impossible for ground observers to observe the meteor shower, Dr. Paul Merrill, Mount Wilson Observatory astronomer, was able to count 135 of these "shooting stars" from the cabin of an air-mail plane as it flew over Utah and Nevada during the pre-dawn hours of Tuesday, Nov. 17. Although

the sky was cloudy in spots above the plane, Dr. Merrill was able to make enough observations to indicate that the shower was probably the best since 1866, at which time the Leonids appeared in great swarms.

During one 39-minute period, he counted 49 meteors. Many of them were very bright, and one left a phosphorescent trail as it blazed through the heavens. This trail was visible for about four minutes, and was blown out of shape by the wind. Another meteor appeared to make a right-angle turn, which was the first phenomenon of this type to be observed by Dr. Merrill.

When the plane landed at Las Vegas, Nevada, Dr. Merrill was assisted by the newspapermen in counting the Leonids that fell during a 25-minute period. In this manner, 67 others were observed. Only seven random meteors were noticed.

Radio Roof Disrupted

The Kennelly-Heaviside layer, radio roof of the world, was shot to pieces by the shower, A. M. Skellett found at the Bell Telephone Laboratories at Deal, N. J. He predicted this result last June, when the main meteor swarm was still far from the earth. The meteors, bursting down into the atmosphere, lose most of their speed about seventy miles above the surface of the earth, at just about the same region where ascending radio waves are turned back on their course by the Kennelly-Heaviside reflecting layer.

Mr. Skellett and his associates made measurements of the height of the layer on the nights when the present meteor shower was at its height. On Monday, Nov. 16, a "very erratic and disturbed condition of the Heaviside layer" was observed. This was not of the same type as those produced by a magnetic storm, and could only have been due, Mr. Skellett believes, to the swarms of meteors raining down from the sky. A cloud of electrified particles accompanies every meteor in its descent. When the meteor enters the Kennelly-Heaviside conducting layer this disturbs the condition of balance so that the effective height of the layer is temporarily lowered. A fogging of radio signals results.

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Despite the increasing use of electric refrigeration, the ice industry has not only held its own but has advanced, due partly to increasing transportation of fresh fruits and vegetables and partly to the fact that more of the population are using ice and more uses are found for it.