

OBSERVING THE 1966 LEONIDS

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The greatest meteor shower in recorded history was witnessed by a 13-man team of Tucson amateurs on 6 850-foot (2 055 m) Kitt Peak in Southern Arizona. A rate equal to around 150 000 per hour for a single observer was seen for about 20 minutes. This is perhaps twice the rate of the 1833 Leonids, when the peak rate for a single observer was 20 per second.

The Kitt Peak Team consisted of:

Mike Barrett	Dennis Milon	Jack Sulentic
Roger Duewel	Lee McDonald	Lyle Supp
Steven Jay	David McLean	Daniel Vukobratovich
Earle Kapchuck	Alvin Post	
Gregory Lazear	Don Pearson	

Our 6-man team had disappointing observing on Wednesday morning November 16, with only about 9 Leonids an hour per observer. Wednesday night our team of 13 observers left the University of Arizona campus under cloudy skies for the 45-mile (72 km) drive to Kitt Peak.

The skies began clearing, and several Leonids were seen through the car windows. Like a portentous sign in the sky, a trail rose in the west and was distorted by winds. It was a cannon shot to an altitude of 85 miles (136 km) in a series of atmospheric experiments from the Army's Yuma Proving Ground. On Kitt Peak the sky held some clouds, but the transparency was good overall. Lee McDonald pointed out the Gegenschein just west of the Pleiades.

From 1.30 a.m. MST to 2.30 we made meteor counts and magnitude estimates in a programme for Peter Millman of the Canadian National Research Council. By the end of the hour it was clear that a fair shower was in progress. Still, the rate of about 33 Leonids per hour gave no indication of the spectacle to come.

Our second hour of observing began at 2.50. The observing was getting more exciting as the rate climbed and the number of meteors rivalling Jupiter and Venus increased. Our timekeeper Roger Duewel was frantically calling out serial numbers as all 9 observers, it seemed, yelled at once, "Meteor! Meteor!" and "More observing forms!" At the end of the hour, at 3.50, 192 Leonids had been recorded by a single observer. Up to 30 of these were of negative magnitudes.

But it was getting impossible to write down magnitude estimates as the meteors came faster and faster. Looking up and down and writing as fast as we could, the Leonids got ahead of us, and there were yells of "I can't do it! There are just too many!" So we stopped estimating magnitudes and started making counts per minute. The count was about 30 per minute at 4.10 when a -8 or so exploded.

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The sky literally began to rain shooting stars. Everywhere we turned we saw them. We excitedly figured hourly rates from our counts and wondered how this would compare with the great showers of the past. It was obvious to us that this type of shower would terrify the ignorant, not to mention effects upon astrologers!

By 4.30 there were several hundred per minute. At 4.45 the meteors were so intense we guessed how many were seen by a sweep of the head in one second. The fantastic rate of about 40 per second was reached at 4.54 a.m. It was indeed difficult to gauge such a rate, but this is the consensus of the observers. Our graph defines the time of maximum very well even without the peak estimates, since the easily made counts below 100 per minute are symmetrical with the observed peak.

The average magnitude of the Leonids was 1.5 or 2.0, as averaged from the team's magnitude estimates (to the nearest half-magnitude, by reference to guide stars) from 2.50 to 3.50.

Some of the brighter ones left trains for several minutes, and were photographed. Fully half left trains.



FIGURE 1. Looking west near maximum. A 2-minute exposure by David McLean of the Kitt Peak team, using a 50 mm f/2 lens with Tri-X developed in D 19 for 12 minutes at 68°F.

We took many photos with fast black and white and colour film. The highest photo rate is on Dave McLean's 43-second exposure of the Big Dipper which shows 43 Leonids.

Since the meteors were falling all over the sky, even on the horizon, the



FIGURE 2. Forty-three Leonids in 43 seconds. Photograph by David McLean, using a 50 mm f/2 lens, and Tri-X film. Photograph taken at Kitt Peak about 12.00 hrs U.T., 1966 Nov. 17.

foreshortening of the paths near the radiant was especially noted. Jack Sulentic commented that looking directly at the radiant gave the effect of depth of the Earth moving through space. Point meteors on our photos marked the radiant.

While looking around with wide-field 13° binoculars, I was fascinated to watch Leonids in the Sickle slowly burn in. One came in glowing greenish, and I watched as the twisted train was swept along north-west at several degrees per second. Everywhere I looked with binoculars I saw one or more trains! David McLean photographed a train lasting over 5 minutes.

The view was so spectacular we just didn't know where to look! Sometimes we would spin around, taking in the whole sky. Or we alternated with looking toward the western horizon (where it was very clear) and gazing right at the radiant. Different parts of the sky would light up, and we would glance here and there. Everyone was yelling and laughing at the incredible, dazzling sight, and at our luck in seeing it.



FIGURE 3. Two point meteors are shown in this 3½-minute exposure by Dennis Milon at Kitt Peak. About 70 Leonids are seen. A 105 mm f/3.5 Voigtlander lens was used with 120 Tri-X film, developed for 12 minutes in D 19 at 67°F. 12.00 hrs U.T., 1966 Nov. 17.

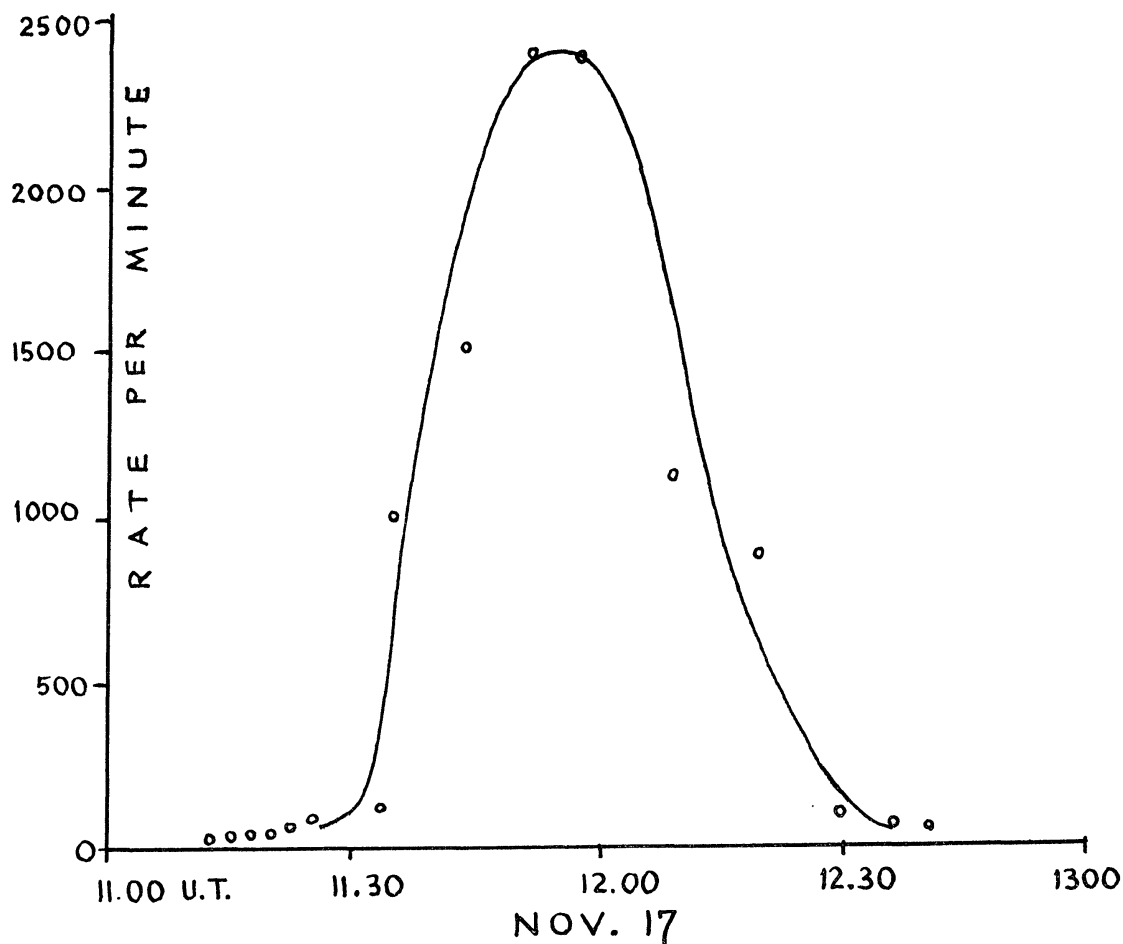


FIGURE 4.

The rate was over 100 per minute for an hour, from about 4.30 to 5.30. It was over 1000 per minute for 40 minutes, 4.35 to 5.15. The peak of perhaps 2400 per minute was centred at 4.55. The sharp peak of the 1966 Leonids within an hour, as shown on our graph, should be noted. On the day before and after November 17 there were very few Leonids. In 1961 when the Leonids began their reappearance, there were equally good rates on two mornings. It seems that the most spectacular showers have sharp peaks.

By 5.40 the shower was back down to 30 per minute. We continued to see Leonids in the brightening dawn sky until a colourful Arizona sunrise closed out our observing.

Some said it was like a dream, an amateur astronomer's dream come true.