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# JOURNAL CLUB

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## Observations of a Leonid Meteor at 1000 Frames/second

by

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### ABSTRACT

Images of a magnitude -3 Leonid meteor were recorded with a camera developed at the Geophysical Institute capable of recording 1000 frames per second. The meteor occurred at 10:42:59 UT on November 18, 2001, and it was observed from our observatory at Poker Flat Research Range. The key observations were made as the meteor descended from 114 km to 104 km altitude. As the meteor descended below 110 km it brightened and spatial structure developed into a  $\sim 300$  m wide shock-like feature with a spherical zone of emission in front of the shock and centered on the meteoroid. Observation of such structuring has not been reported before and the observations have caused considerable interest. The hard body of a magnitude  $\sim 3$  meteor is only  $\sim 1$  cm in size and  $\sim 1$  gram in mass and, based on classical fluid dynamics commonly used to model and analyze meteor data, would lead to a trail of no more than a few meters in width. Thus the observed structure is orders of magnitude larger than anything previously expected to be associated with such a meteor. The origin of, and the process leading to, the observed shock-like structure are not known. It is tempting to suggest that the structure may be associated with ionization detected by radars, the so called meteor head echos, which have a comparable cross-section, but this can only provide a partial explanation at best. The observed spatial asymmetry in the optical emissions near the meteor body itself suggests that the ambient atmosphere inside the shock structure has been altered. A possible cause could be intense UV radiation from the meteor and the ablation cloud, which other data indicate would have a temperature in excess of 4400 °K.

Friday, September 13  
Elvey Bldg. Globe Room  
3:45 pm