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Meteoroids and Meteors: Investigating the Crumbs of Creation.

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Meteoroids are solid objects in space that typically originate from the breakup of comets and asteroids. Meteoroids are of fundamental importance to our understanding of the Earth and our solar system because they are composed of the material from which everything in our solar system was originally made. Outstanding questions include how many meteoroids enter Earth's atmosphere, how much material do they deposit, what is their origin, and what are their densities. When a meteoroid – typically the size of a grain of sand – enters into the Earth's atmosphere, it ablates and forms localized plasma near 100 km altitude; the luminous phenomenon associated with a meteoroid's entry is referred to as a meteor. Large-aperture, narrow-beam radars often detect the meteor plasma that surrounds a meteoroid and moves at its speed; these signals are called head echoes. By analyzing head echo data, we can derive fundamental meteoroid properties by modeling the scattering interaction of a radio wave with highly-dense plasma. In this presentation, we will discuss the relationship between meteoroid and head echo plasmas and how we use high-power, large-aperture radar data to analyze both stellar and interstellar meteoroids.