RAMAN SPECTROSCOPY OF WHOLE SAMPLES IN AEROGEL USING A LASER SCANNING CONFOCAL MICROSCOPE.

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Introduction: The NASA Stardust mission to comet Wild 2 returned to Earth in 2006 with cometary and interstellar material captured in aerogel. Cometary particles impacted with an aerogel collector at a relative velocity of 6.1 km/s, creating three-dimensional (3D) impact tracks of melted and crushed aerogel, void space, and fragmented cometary material [1]. Tracks are harvested as translucent 'keystones' [2] suitable for light microscopies. The main focus of Stardust work at the American Museum of Natural History (AMNH) has been to fully morphologically characterize whole tracks.

Methods: Using a Zeiss LSM 710 laser scanning confocal microscope (LSCM) located in the AMNH, we have imaged in 3D and studied the morphology of multiple, whole Stardust tracks. LSCM yields high resolution (<80 nm/pixel in XY) 3D image sets of track morphology and distribution of fine material along the track walls both quickly and without disturbing the sample [3, 4]. Complementary chemical data is acquired for a subset of tracks using synchrotron X-ray fluorescence mapping.

Burchell et al. [5, 6] showed that the identities of minerals shot into aerogel can be determined using a Raman instrument with some subtle effects to any detailed mineralogy [7] but without the aerogel causing significant alterations to the Raman spectra. A Princeton Instruments IsoPlane SCT 320 imaging spectrograph has been coupled to the LSM 710 to allow for Raman phase data to be obtained for all tracks allocated. The initial investigation of standards is underway, using Stardust-like aerogels that have been shot with known material at the University of Kent light gas gun facility [**8**].

Discussion: By adding a Raman spectrometer to the confocal microscope the capability of identifying mineral phases of small grains *in situ* on an in-house, bench top instrument is gained. A coupled LSCM-Raman spectrograph system should allow for the high resolution of the LSM 710 to be utilized for pinpointed Raman analysis of the fine material in track walls.

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