

STARDUST – Capture and Return of Wild-2 and Interstellar Samples

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The 4th NASA Discovery Mission, STARDUST, was launched on February 7, 1999 and will collect P/Wild-2 coma and interstellar samples and return them to Earth in January of 2006 by a direct reentry capsule. In January 2004, coma dust in the 1 μm – 100 μm size range will be captured by ultra-low-variable-density silica aerogel during a 6.2 km/s flyby of Comet Wild-2. The goal will be to capture at least 1000 15 μm or larger particles at the nominal closest encounter of 150 km from the nucleus. Interstellar samples will be collected over two periods: March through May, 2000 and July through December 2002. Capturing at least 100 interstellar dust particles from 0.1 μm to 5 μm is the goal. In situ chemical composition of interstellar dust will be measured by Comet and Interstellar Dust Analyzer over extensive periods as electrical power permits beginning March 2000. The sensitivity particle size range will be 0.08 μm to 18 μm with an atomic mass range of 1 to 350 Daltons. The Imaging Camera is inherited from the Voyager wide-field camera with a Casini CCD sensor and will perform coma and nucleus imaging. The Dust Flux Monitor has three sensors covering 10 μm to 1 cm size range and will monitor interplanetary dust during long cruise periods and at the Wild-2 encounter. Finally, using two-way-Doppler shifts of the communication with the spacecraft and its small forces file of the attitude control subsystem, Dynamic Science of the integrated cometary dust impact and specific large impacts can be measured. If communication can be maintained during the closest Wild-2 encounter, cometary mass may be ascertained.

STARDUST is a dust in situ characterization and a dust sample return mission. This paper will discuss how the various instruments characterize the dust environment of Wild-2 and contemporary interstellar dust. STARDUST will provide an unique opportunity to compare samples of interstellar dust that accreted in comets during the formation of solar system with the unprocessed interstellar dust streaming encounter by the solar system with a separation of five billion years apart!