Magnet Lab to Analyze Stardust Mission's Comet Dust

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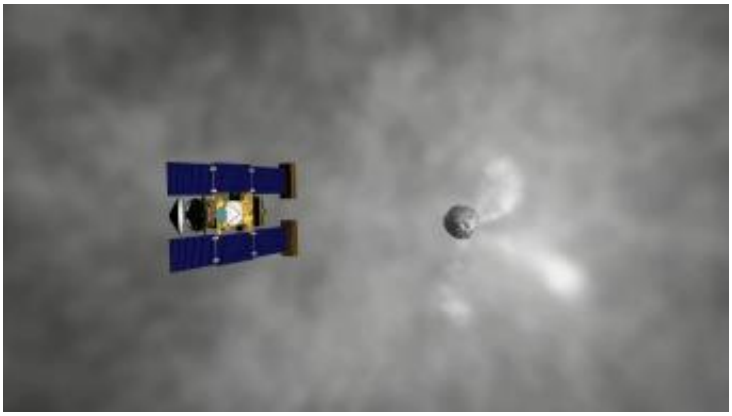

Artist&acutes impression of Stardust&acutes encounter with Comet Wild 2. Scientists believe the material snatched from the trail of a comet could provide dramatic information about the birth of the solar system and the origins of life on Earth. Launched in 1999, the 385-kilogram (849-pound) probe, circled the Sun twice and then flew in January 2004 by comet Wild 2, which was located at the time next to Jupiter. Credit: NASA

The Stardust spacecraft that left Florida seven years ago is expected to have its homecoming early Sunday in Utah, bringing with it tiny particles of comet dust that are expected to unlock big secrets about the origin of our solar system. A few months later, scientists in the Geochemistry Program at Tallahassee's National High Magnetic Field Laboratory will study some of those particles as they seek to discover our cosmic ancestry.

With grants from NASA and the National Science Foundation and matching funds from Florida State University, the magnet lab will acquire a mass-spectrometry-based "microanalysis" system for studying this and other extraterrestrial material. The state-of-the-art instrument will be housed in the lab's forthcoming Plasma Analytical Facility.

A supplemental grant also will fund educational outreach to local schools and the development of additional science-education materials for teachers through the Research Experiences for Teachers program run by the lab's Center for Integrating Research and Learning (CIRL) (education.magnet.fsu.edu).

Munir Humayun, an associate professor of geochemistry at FSU and one of the principal investigators on the grant, said the magnet lab's new spectrometers will be able to glean 40 times more information from the sample than traditional microanalysis techniques allow.

"The genealogy of the solar system is recorded in comets," said Humayun, a cosmochemistry expert. "These grains of authentic cometary material, together with the new techniques for studying them, will help us develop a deeper understanding of the formation of asteroids and comets. Understanding their origins will help us better understand our own."

Mass spectrometry - a technique for measuring the mass of atoms or molecules - is a key strength of the scientists at the magnet lab. The technique converts molecules to ions that then are separated, using magnetic fields, according to the ratio of their mass to electric charge. At the lab, scientists will "shoot" the cosmic dust with a laser, vaporizing the grains and turning them into an aerosol. That aerosol then will be simultaneously directed to two different mass spectrometers for analyses; one spectrometer will scan the sample for major elements, while the other measures a selection of the trace constituents. This will

tell the scientists what elements are in the grains; from that, insights into the processes that formed the comets will be learned.

A covered patio area at the lab will be converted into the Plasma Analytical Facility. Construction will start after the lab's annual Open House, scheduled this year for Feb. 18. (See www.magnet.fsu.edu for more information).

Educational outreach is a special component of the grant. Mary Gaboardi, an FSU graduate student in geochemistry, will work with local teachers to bring "Comet Tales" - a hands-on educational program based on the Stardust mission - into the classroom.

"If you want to teach science, you have to capture the imagination of the student," Gaboardi said. "That is why we are so excited to share this NASA mission with local students. The grains Stardust is bringing back will allow us to peer through time into the very birth of the solar system. That should fascinate anyone!"

"Comet Tales" is a two- to three-week science inquiry program. Fifteen Tallahassee-area classrooms will be selected to participate, based on teacher interest and application. Five each of fifth-, sixth- and ninth-grade teachers will receive supplies and assistance to complete the NASA-approved program "Technology for Studying Comets" with their students.

In this program, students work cooperatively, exploring technology and creating collection tools like the ones used on the Stardust mission. Gaboardi said the focus is on technology, because without recent innovations such as aerogel (see stardust1.jpl.nasa.gov/tech/aerogel.html), scientists would not have the chance to make leaps of learning in space science. During the program, Gaboardi will visit each classroom to introduce comet properties, answer questions, and assist the students in

"cooking up a comet."

Teacher training is scheduled for March 17, and the program is expected to run from March 27 to April 21. After the program ends, each teacher will choose one student to represent his or her classroom at the magnet lab for a day as "Stellar Students." These students will tour the lab, where they will observe research activities in the Cosmochemistry Lab and meet the researchers.

Gaboardi and Humayun also will work with four teachers in the lab's Research Experience for Teachers program this summer, with the teachers ultimately translating their research experience into teaching and learning opportunities for their classrooms.

Source: Florida State University