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Craft Sweeps Sky For Solar System's History

From: Stig Agermose <stig.agermose@get2net.dk>
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Stig

FRIDAY, FEBRUARY 5, 1999

New Craft Sweeps Sky For Clues To Solar System's History

Stardust spacecraft launches tomorrow in first effort to bring material from beyond the moon.

Peter N. Spotts (pspotts@pspotts@nasw.org)

Staff writer of The Christian Science Monitor

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Tomorrow, the world's most sophisticated dustpan is set to begin a seven-year sweep through the solar system - returning in 2006 with pristine samples of the microscopic bricks that are believed to have given rise to the planets.

The mission marks the first time scientists have reached beyond the moon's orbit to return samples of extraterrestrial material.

Scheduled for an afternoon launch from Cape Canaveral in Florida, the Stardust spacecraft will eventually pass near the core of a comet, known as Wild 2, to capture material from its coma - the cloud of cometary gas and dust that cloaks the nucleus.

Scientists say the mission offers a unique opportunity to gain insights into the origin of the solar system. By bringing samples back to Earth - and analyzing them with high-tech equipment that can't be flown in space - they hope to unlock secrets contained within these ancient keepers of the solar system's early history.

[Image: STARDUST: Drawing of the spacecraft, set for launch tomorrow. It will collect interstellar dust and fly past a comet in 2004. (NASA)]

Earlier comet flybys - of Giacobini-Zinner in 1985 and Halley in 1986 - confirmed the theory that comets are "dirty snowballs."

They formed on the frigid fringes of the solar system from a nebula of gas and dust that also gave rise to the sun and planets. A good deal of knowledge about comets' constituents has been gleaned from those missions and through the use of ground-based telescopes.

In this mission, though, scientists hope to glean more by analyzing samples down to the level of individual atoms.

Researchers "have long sought a sample directly from a known comet because of the unique chemical and physical information these bodies contain," says Edward Weiler, associate administrator for space science at the National Aeronautics and Space Administration (NASA), which is funding the mission.

During its five-year cruise to the comet, Stardust also will snatch samples of interstellar dust, which constantly passes through the solar system. The dust forms through a variety of stellar processes, and scientists expect their examination to yield valuable clues about those processes. The relatively fresh interstellar dust, when compared with dust samples from the comet, could also yield insights into how these basic building blocks changed over the past 5.5 billion years.

The effort provides an important reference point for studying cosmic dust that shuttle missions and high-flying U-2 research craft have returned. The rare particle of dust that isn't incinerated as it enters Earth's atmosphere is, however, altered by the heat.

"But most important, we don't know where it comes from," says Donald Brownlee, a planetary scientist at the University of Washington in Seattle and the principal investigator for the Stardust mission.

The \$165 million Stardust spacecraft uses a unique device to capture the dust. The collector, which resembles an ice-cube tray shaped like a tennis racket, contains cubes of aerogel - a porous glass "cooked" much like Jell-O, then baked to draw out the moisture. What remains is a very light, transparent material that has been dubbed "frozen smoke."

During the cruise to the comet, aerogel tiles in the tennis racket's "backhand" will sweep up interstellar dust. Other samples will be analyzed by a spectrometer aboard Stardust. The spectrometer determines a particle's composition from the ions the particle creates when it collides with a target inside the instrument.

When Stardust reaches Wild 2 and enters the coma, the armored spacecraft will present the collector's "forehand" to pick up cometary dust. In addition, the navigation camera on Stardust will be used to try to take the first close-up shots of a comet's nucleus, just 93 miles away.

After the samples have been collected, the tennis racket retracts into a special shell designed to withstand the heat of reentry into Earth's atmosphere. On Jan. 15, 2006, the craft will fly by Earth and eject the shell, which is expected to land on salt flats at the US military's Utah Test and Training Range near Salt Lake City.

Although this mission marks the first time researchers have reached for samples of extraterrestrial material from beyond the moon's orbit, they are worried less about the samples contaminating Earth than Earth contaminating the samples.

When the dust motes strike the aerogel tiles, they hit at speeds 30 times faster than a rifle bullet, briefly reaching temperatures sufficient to sterilize them, says Peter Tsou, a researcher at CalTech's Jet Propulsion Laboratory in Pasadena, Calif., who developed the collector system.

He notes that when dust is captured in the atmosphere "you don't worry about contamination because the sample is already contaminated. Now we're catching dust that doesn't go through that. We have to take excruciating care not to introduce Earth stuff into the samples."

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