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Stardust Comet Mission Reports New Kind of Organics

"A portion of the organic material in the samples is unlike anything seen before in extraterrestrial materials."
- Scott Sandford, NASA's Ames Research Center

Special "needles" mounted on micro-manipulators controlled by computer to carefully and precisely cut out sections of aerogel that contain cometary samples. Image courtesy NASA.

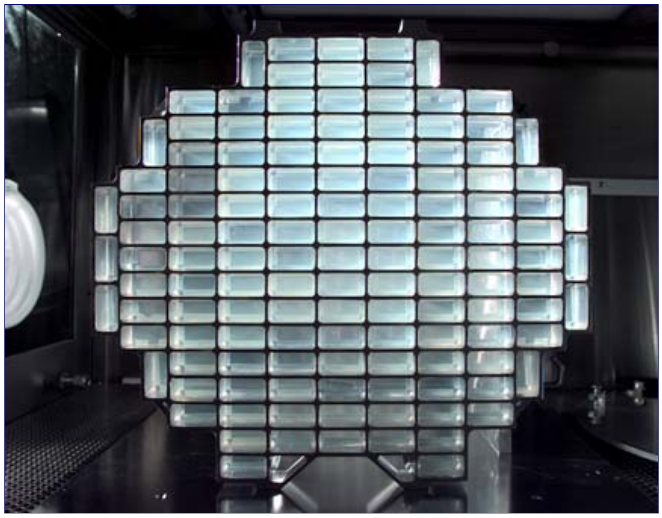
Earthfiles, news category.

Also see **120106 Earthfiles** report about Deep Impact study of Comet Tempel I.

December 15, 2006 Pasadena, California - NASA reports that scientists have found a new class of organics in comet dust captured from comet Wild 2 in 2004 by NASA's Stardust spacecraft. [See December 15, 2006 issue of *Science Express* online.]

In January 2004, the Stardust spacecraft flew through comet dust and captured specks of it in a very light, low-density substance called aerogel. Stardust's return capsule parachuted to the Utah Test and Training Range on Jan. 15, 2006, after a seven-year mission. The science canister containing the comet particles and interstellar dust particles arrived at Johnson Space Center on Jan. 17. From there, the cometary samples have been processed and distributed to about 150 scientists worldwide who are using a variety of techniques to determine the properties of the cometary grains.

Stardust spacecraft flew through Comet Wild 2 dust in 2000, 2002 and 2004, collecting particles in aerogel. Image and graphic courtesy NASA.



Stardust aerogel collector. Aerogel is as light as air, but is strong and an excellent insulator. Images courtesy NASA.

"A portion of the organic material in the samples is unlike anything seen before in extraterrestrial materials," said Scott Sandford, the study's lead author and a scientist from NASA's Ames Research Center in California's Silicon Valley. "Capturing the particles in aerogel was a little bit like collecting BBs by shooting them into Styrofoam."

The comet organics collected by the Stardust spacecraft are more "primitive" than those seen in meteorites and may have formed by processes in nebulae, either in space clouds between the stars, or in the disk-shaped cloud of gas and dust from which our solar system formed, the study's authors found.

"Comets are a major source of the water and carbon on the moon," said S. Pete Worden, NASA Ames director. "Therefore, understanding comets will help scientists learn what natural resources to search for on our nearest neighbor in space -- resources that will aid astronauts in exploration beyond Earth," Worden explained.

Image of the glass needle performing the first series of cuts. Researchers can monitor the progress of the keystone operation from the computer monitor or from outside the cleanroom.

Several of the analyses indicated that the samples contain polycyclic aromatic hydrocarbons (PAHs), scientists said. PAHs are molecules made of carbon and hydrogen that are common in interstellar space - and in barbeque grill soot.

Certain PAHs chemical varieties also contain oxygen and nitrogen. Some scientists believe that these PAHs variants exist in interstellar space as well. They are of interest to astrobiologists because these kinds of compounds play important roles in terrestrial biochemistry, according to Sandford.

"Our studies of the comet dust show that the organics are very rich in oxygen and nitrogen," Sandford said. "The data are not incompatible with some of it being in the PAHs, but we still have a lot to learn in this area."

Although some of the other organics captured by the Stardust spacecraft look somewhat similar to the fairly stable organics found in meteorites, Sandford noted that many of the organic compounds appear to be very volatile. One sample even showed an abundance of material containing alcohols.

Many scientists believe that comets are largely made of the original material from which our solar system formed and could contain pre-solar system, interstellar grains. According to scientists, continued analysis of these celestial specks may well yield important insights

into the evolution of the sun, its planets and possibly, even the origin of life.

"I anticipate that people will be asking for and working on these samples for decades to come," said Sandford. "What we report in the papers that appear this week is just the beginning of what we will learn from these samples. One of the advantages of returned samples is that they are available for study into the future, a gift that keeps on giving."

More Information:

Also see **120106 Earthfiles** report about Deep Impact study of Comet Tempel I.

For further information about Deep Impact, Stardust and other comet research, please see the **Earthfiles Archives:**

• **08/12/2005** -- Deep Impact Spectra: Carbonate, PAHs and Some Amino Precursors in Comet Tempel I
• **07/10/2005** -- First Data from Deep Impact Crash Into Comet Tempel I
• **06/29/2005** -- July 3-4, 2005: NASA "Deep Impact" Spacecraft to Blast Hole in Comet Temple I
• **01/13/2005** -- NASA "Deep Space" Craft Will Hit Comet On July 4, 2005
• **06/25/2004** -- Wild 2, An Amazing Comet - Stardust Mission

• 08/19/2006 -- Red Rain Cells of Kerala, India - Still No Definite DNA
• 09/16/2005 -- "Planet X" and the Kuiper Belt's Oddballs, "Santa" and "Easterbunny"
• 08/12/2005 -- Deep Impact Spectra: Carbonate, PAHs and Some Amino Precursors in Comet Tempel I
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• 06/29/2005 -- July 3-4, 2005: NASA "Deep Impact" Spacecraft to Blast Hole in Comet Temple I
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• 02/17/2005 -- Iapetus and Enceladus: Baffling Moons of Saturn
• 01/13/2005 -- NASA "Deep Space" Craft Will Hit Comet On July 4, 2005
• 12/17/2004 -- Is Our Solar System's Red, Mysterious Sedna An Alien Planetoid?
• 11/17/2004 -- European Space Agency's SMART-1 Satellite Begins Moon Orbit
• 09/20/2004 -- Part 1: Martian Water Vapor and Methane Overlap in Equatorial Regions
• 06/25/2004 -- Wild 2, An Amazing Comet
• 03/31/2004 -- Methane on Mars - Biology? Volcanic?
• 03/15/2004 -- Most Distant "Icy Planetoid" in Our Solar System Has A Most Baffling Orbit
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• 09/02/2003 -- Astronomers Don't Think Asteroid Will Hit Earth in 2014
• 03/07/2003 -- Scientist's Record Sun's Plasma Interaction with Comet NEAT
• 10/07/2002 -- Large Kuiper Belt Planetoid Found Beyond Pluto
• 08/16/2002 -- Did CONTOUR Probe Break Apart Or Disappear Into Space?
• 07/25/2002 -- Mile and A Half Diameter Asteroid 2002 NT7 Might Impact Earth in 2019
• 07/11/2002 -- Hubble Telescope Photographs Seven Objects Traveling In Pairs Beyond Pluto
• 06/01/2002 -- Scientists Surprised by Abundance of Water On Mars
• 02/24/2002 -- Mysterious Slowing of Pioneer Spacecraft 7 Billion Miles from Earth
• 01/26/2002 -- Something Is Perturbing Comet Orbits in the Oort Cloud Surrounding Our Solar System
• 12/01/2001 -- 1200 B. C. - What Caused Earthquake Storms, Global Drought and End of Bronze Age?
• 11/01/2001 -- Astronomy News
• 01/14/2001 -- An Australian Zircon Crystal is 4.4 Billion Years Old
• 01/07/2001 -- Dinosaur-Killing Asteroid Punched 22 Miles Through Earth's Entire Crust
• 12/24/2000 -- Martian Bacteria?
• 12/03/2000 -- Bacteria from Outer Space?
• 10/01/2000 -- A Search for Earth's First Life
• 03/11/2000 -- Is 433 Eros Asteroid Younger Than Expected?
• 02/16/2000 -- 433 Eros, Orbiting An Asteroid Up Close
• 10/25/1999 -- A Mysterious "Perturber" at the Edges of Our Solar System
• 06/15/1999 -- Current Brightest Binocular Comet and Upcoming Solar Eclipse
• 02/01/1999 -- Astronomy Updates with Brian Marsden and John Huchra, Harvard

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Websites:

Stardust: http://stardust.jpl.nasa.gov/home/index.html

Deep Impact: http://deepimpact.jpl.nasa.gov/mission/index.html

Comets and Meteorites: http://comets.amsmeteors.org/

http://www.daviddarling.info/encyclopedia/A/Allende.html

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