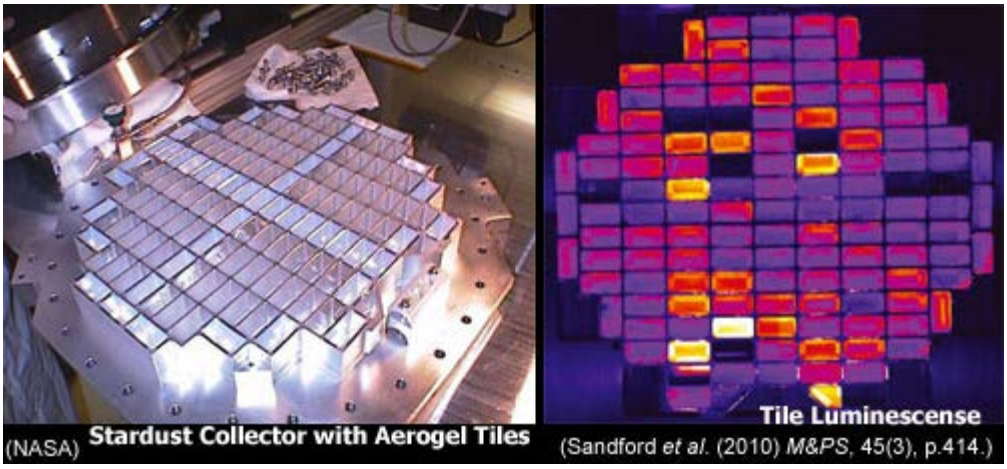
PLANETARY SCIENCE RESEARCH DISCOVERIES
CosmoSparks

Quick Views of Big Advances

Controlling Contamination Before, During, and After Spaceflight

After a seven-year, 4.5-billion-kilometer round trip, NASA's Stardust mission successfully collected particles from Comet 81P/Wild 2 and interstellar space and returned those particles to Earth for laboratory analysis. One of the goals of the mission is to establish whether cometary dust contains complex organic materials, and if so, determine the abundance, chemical, and isotopic nature of the organic phase(s). In order to reach this goal, the team took measures to control and assess potential organic (and other) contaminants during the design, construction, and flight of the spacecraft, and during and after recovery of the sample return capsule from the Utah desert. Scott Sandford (NASA Ames Research Center) and coauthors describe the detailed results of the studies made by the Stardust organics preliminary examination team. They characterized the populations of potential Stardust contaminants and assessed the nature of any organic contaminants found within the Stardust aerogel collector tiles (*photo on left*) and sampling system using an alphabet-soup of high-tech analytical methods:



Fourier infrared (IR) microspectroscopy, nuclear magnetic resonance (NMR) spectroscopy, luminescence imaging (*photo on right*), liquid chromatography with UV fluorescence detection and time-of-flight mass spectrometry (LC-FD/TOF-MS), time-of-flight secondary ion mass spectrometry (TOFSIMS), X-ray absorption near-edge spectroscopy (XANES), X-ray diffraction, and microprobe laser-desorption laser-ionization mass spectrometry (μL^2MS). The carbon in the original aerogel collector tiles, in particular, has been carefully characterized so that it can be distinguished from the cometary materials. Though many potential sources of organic contaminants could have greatly complicated interpretations of the Stardust samples, careful analysis of control standards and returned samples show that contamination issues do not, and will not, preclude the investigation of cometary organics in the returned samples.

While scientists continue to study the treasure of returned particles, the Stardust sample return capsule now has a place of honor in the Smithsonian's National Air and Space Museum alongside other flight icons on public display.

See: Sandford, S. A. and 20 co-authors (2010) Assessment and Control of Organic and Other Contaminants Associated with the Stardust Sample Return from Comet 81P/Wild 2. *Meteoritics and Planetary Science,* v. 45(3), p. 406-433, doi: 10.1111/j.1945-5100.2010.01031.x. [***NASA ADS entry***] and ***Stardust: A Mission with Many Scientific Surprises*** by Donald Brownlee (Stardust Principal Investigator) and the **PSRD** article ***Wee Rocky Droplets in Comet Dust***.

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