Stardust parachutes to soft landing in Utah

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Donald Brownlee stands by the clean room where the Stardust sample return capsule is being prepared to ship comet samples to Johnson Space Center in Houston. Credit University of Washington/Vince Stricherz

Nearly seven years after setting off in pursuit of comet Wild 2, the Stardust return capsule streaked across the night sky of the Western United States early Sunday, making a soft parachute landing in the Utah desert southwest of Salt Lake City.

Special helicopter-borne teams secured and recovered the capsule, containing tens of thousands of comet grains and as many as 100 bits of interstellar dust, shortly after it landed. The capsule was moved to a clean room at the Air Force's Utah Testing and Training Range, where a canister containing the collector grid was to be extracted and shipped to

the Johnson Space Center in Houston later this week.

Donald Brownlee, a University of Washington astronomy professor who is Stardust's principal investigator, or lead scientist, believes the comet dust carries evidence, preserved in the deep-freeze of deep space, about how the sun and the solar system formed more than 4 billion years ago.

"What's really exciting to me is that we soon expect to have this cosmic library in the laboratory so that we can try to read those records of our earliest history," Brownlee said. "Our seven-year journey actually went back in time 4.5 billion years to gather these primitive samples."

Stardust, launched by the National Aeronautics and Space Administration from Cape Canaveral, Fla., on Feb. 7, 1999, encountered Wild 2 (pronounced Vilt 2) on Jan. 2, 2004, beyond the orbit of Mars. It flew less than 150 miles from the comet's nucleus to capture tiny grains of dust and snap close-up photographs of the comet's main body. Though the grains were traveling faster than rifle bullets, they were not appreciably altered because the spacecraft's collector used a remarkable substance called aerogel that is as much as 99.9 percent empty space. The aerogel, Brownlee said, greatly reduced the effects of impact. The collector's reverse side was used to capture bits of interstellar dust streaming into the solar system from other parts of the galaxy.

On its voyage, Stardust traveled 2.88 billion miles – the equivalent of more than 1 million trips from Los Angeles to New York. The mission became a quest for Brownlee after Wild 2 had a close encounter with Jupiter in 1974. The giant planet's gravitational tug deflected the comet away from its previous path that went beyond Uranus, and brought it to the inner solar system where it could be reached by a spacecraft such as Stardust. Other spacecraft have visited comets, but Stardust is the only one designed to bring comet dust samples back to Earth.

Brownlee noted that thousands of tons of microscopic comet particles blanket the Earth each year, but there is no way to pinpoint where they came from. Previously the only solid extraterrestrial samples for which a point of origin had been firmly established were moon rocks brought back during the Apollo era and meteorites that scientists know had to come from Mars. Now there will be samples of material from another known space body, and they can be compared with all the previously collected meteorites and bits of dust to see if there are similar origins.

Once the canister arrives in Houston, it will be opened and work will begin extracting the comet and interstellar grains from the aerogel collector grid. The material will be parceled out to laboratories around the world for a variety of studies and experiments. One irony is that the microscopically tiny particles will be studied with some of the largest instruments.

"There's a whole variety of scientific instruments, and people all over the world are going to be investigating using the very best possible tools," Brownlee said. "They will use electron microscopes, mass spectrometers and even nuclear accelerators. The largest instrument to be used that I know is Stanford University's linear accelerator, which is 2 miles long."

Stardust is part of NASA's series of Discovery missions and is managed by the Jet Propulsion Laboratory in Pasadena, Calif. Besides the UW, other major partners for the $212 million project are Lockheed Martin Space Systems; The Boeing Co.; Germany's Max-Planck Institute for Extraterrestrial Physics; NASA Ames Research Center; the University of Chicago; The Open University in England; and Johnson Space Center in Houston.

Brownlee likened the mission to some of the great seafaring adventures in human history.

"A lot of great explorers didn't make it back," he said. "This is the longest return voyage. Nothing has ever gone this far away and come back.

"In a very real sense, it is a great gift to be given the chance to do something like this."

Source: University of Washington