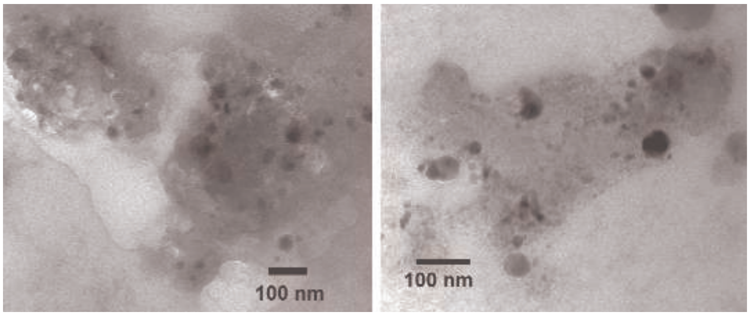
GEOCHEMISTRY

Where Has All the Stardust Gone?

Surprise has followed surprise for cosmochemists analyzing the dust sample that the Stardust spacecraft returned from comet Wild 2 in January 2006. First, they found tiny flecks of once-molten minerals—material very different from the raw, primordial dust they expected to see. Such unaltered, so-called presolar material was the prime ingredient of the rocky planets and was thought to abound in icy comets. But on page 447, researchers report that they have failed to find a single speck of it.



An unfortunate match. Globs of mineral-riddled glass (*left*) from a comet sample were created during sample collection, as replicated in the lab (*right*).

"For those of us who study presolar materials, it's turned out to be a bit of a bust," says cosmochemist Larry R. Nittler of the Carnegie Institution of Washington's Department of Terrestrial Magnetism in Washington, D.C. "Wild 2 seems more related to asteroids than comets," because all asteroids were altered from the solar system's primitive starting materials. Still, "the mission's been a huge success," says John Bradley of Lawrence Livermore National Laboratory (LLNL) in California, a co-author of the *Science* paper. "It's changing the way we think about comets."

Before Stardust's return, cosmochemists thought of comets as vaults where the primitive ingredients of the planetary recipe had been locked up. Their best look at the likely ingredients list came from the study of certain meteoritic particles collected in Earth's stratosphere by retired spy planes. Because of their exotic isotopic composition, these particular interplanetary dust particles (IDPs) looked as though they might be comet dust. Presumably, such primitive dust fell into the cold, outer reaches of the nebula that gave rise to the planets and combined with nebular ices to form comets, in which the dust has been preserved ever since.

One of the unaltered components of cometlike IDPs was so-called GEMS (glass with embedded metal and sulfides). And early analyses of particles captured near Wild 2 by Stardust tantalizingly revealed GEMS-like particles. But cosmochemist Hope Ishii of LLNL and her colleagues report in this issue that the GEMS-like particles in Stardust samples were actually forged as Wild 2 dust particles plowed into the wispy glass of the Stardust sample collector at a blistering 22,000 kilometers per hour. The researchers made some themselves by shooting mineral particles into collector material at Stardust velocities. Stardust principal investigator Donald Brownlee of the University of Washington, Seattle, does allow that any true GEMS—which tend to be submicrometer in size—might have been lost on impact with the Stardust sample collector.

Ishii's group also found only one microscopic "whisker" of the mineral enstatite. Such threadlike crystals are common in primitive, cometlike IDPs, but the lone Stardust find has the wrong orientation to have come from a comet. And what little organic matter could be found in the Stardust sample has a much lower deuterium-hydrogen ratio than the organic matter of cometlike IDPs.

All in all, "it's looking as if Wild 2 is more like an asteroid than a primitive comet," says Ishii. Brownlee agrees. Rather than preserving the original ingredients of planets, comets—or at least Wild 2—seem to be loaded with materials first altered by the great heat near the young sun, he says. Then those altered materials must have been carried outward to the outer reaches of the nebula, where comets incorporated them. "I would say a large fraction of the [outermost] nebular materials were probably transported there" from much nearer the sun, Brownlee says, "which is pretty amazing." Now, no one is at all sure where the solar system's lingering primitive materials might reside.

–RICHARD A. KERR

HISTORY OF SCIENCE

Dutch Universities Split Over Nobel Laureate's Rehabilitation

AMSTERDAM, THE NETHERLANDS—Allegations that the late Dutch physicist Peter Debye was cozy with the Nazis before and during World War II have produced a split decision among schools who once honored him. Following the advice of an independent committee, Utrecht University last week exonerated the Nobelist by restoring the name of its Debye Institute for NanoMaterials Science. But Maastricht University, in Debye's hometown, rejected the advice and removed his name from a scientific prize permanently.

Both universities dropped Debye's name after a book and a magazine article by journalist and science historian Sybe Rispens charged that Debye had "dirty hands" during and after his 1934–1939 stint as director of the Kaiser Wilhelm Institute for Physics in Berlin. Debye asked Jewish members of the German Physical Society to step down in a 1938 letter, for instance. Although not disputing the letter, Debye's defenders said he was neither an anti-Semite nor a Nazi sympathizer but an apolitical figure mainly interested in science (*Science*, 30 June 2006, p. 1858).

In November, a 200-page study by Martijn Eickhoff of the Netherlands Institute for War Documentation, which called Rispens's portrayal of Debye a "caricature," offered a nuanced picture of the scientist. It said Debye had a "survival mechanism of ambiguity." Based on that report, a committee set up by the two universities and chaired by physicist and politician Jan Terlouw concluded on 17 January that there's "no evidence of bad faith" on Debye's behalf, and that the institutes should reinstate his name. But in a statement, Maastricht University insisted that Debye's role remains "irreconcilable" with an award.

To Mark Walker, a historian at Union College in Schenectady, New York, who specializes in science in the Nazi era, that is an unsatisfactory ending. "I think the whole affair is unfair to Debye's memory," he says. "He acted according to his standards. They weren't the standards of a hero, but they weren't that bad."

–MARTIN ENSERINK

CREDIT (LEFT TO RIGHT): H. A. ISHII ET AL., SCIENCE

Published by AAAS