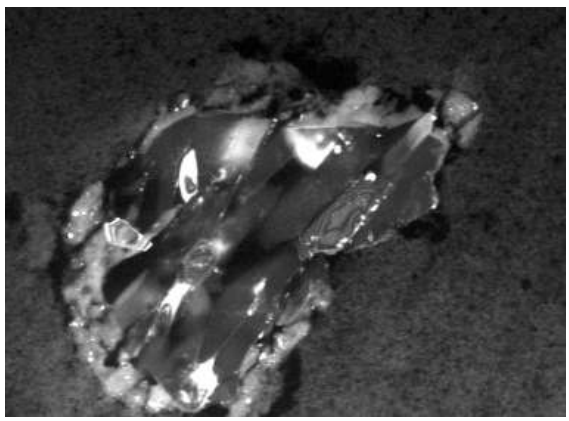
PLANETARY SCIENCE

Minerals Point to a Hot Origin for Icy Comets

HOUSTON, TEXAS—Scientists analyzing the first samples returned from a comet announced startling news this week. They are finding not the unprocessed "stardust" thought to have glommed together in the frigid fringes of the early solar system, but bits of rock forged in white-hot heat. The discovery may mean that the disk of dust and gas from which all planetary bodies formed was far more violently mixed than previously thought.

At the Lunar and Planetary Science Conference here, leaders of the 150-strong Stardust science team told how team members on four continents have been slicing, dicing, and analyzing 10-micrometer particles collected by the Stardust spacecraft. It swept by comet Wild 2 two years ago and returned its samples to Earth on 15 January. Working first on the larger particles snared in the Stardust collectors, analysts are finding mineral crystals such as forsterite, pyroxene, anorthosite, spinel, and titanium nitride. These "are all minerals that formed at moderately high to extremely high temperatures," Stardust principal investigator Donald Brownlee of the University of Washington, Seattle, later told a press conference at NASA's nearby Johnson Space Center.



A hot one. This 2-micrometer bit of comet Wild 2—a magnesium-rich olivine called forsterite—formed at a high temperature, perhaps near the young sun.

"These are hot minerals from the coldest place in the solar system," the comet-forming region beyond Neptune.

The minerals must have formed at 1400 K or hotter, Brownlee said, especially a couple of particles resembling the so-called calcium-aluminum inclusions (CAIs) known from meteorites. In contrast, the dust the analysts expected to find in comets would be submicrometer in size and lacking in any crystalline structure. That's the form they would have taken as they condensed from vapor in deep space after being blown off other stars.

Brownlee offered two possible solutions to the hot-and-cold conundrum. The crystals "could have come from the innermost region of the [still-forming] solar system," he said. Astrophysicist Frank Shu of National Tsing Hua University in Taiwan has advanced that idea to explain CAIs and once-molten droplets called chondrules that dominate the most common type of meteorite coming from the asteroid belt (*Science*, 20 June 1997, p. 1789). Shu argues that the young, violently active sun would have blasted nearby solids to their melting points and magnetically flung them—including CAI and chondrule particles—out over the disk as far as the comet-forming region. Alternatively, says Brownlee, the Stardust minerals may have crystallized from melts near other stars and reached the forming solar system by some unspecified means.

"If this were astronomy, we'd stop there," Brownlee told his colleagues. Astronomers have nothing to go on but the electromagnetic spectrum, which would yield no further information in this case. "But we have samples; that will solve this mystery." The key will be isotopes, he said. The mix of isotopes in solar system material is wildly different from that of other stars, he noted, as evidenced in rare bits of interstellar material long known from meteorites. "We'll know in weeks or months," says Brownlee.

–RICHARD A. KERR

U.S. REGULATORY POLICY

Courts Ruled No Forum for Data-Quality Fights

A federal appeals court ruled last week that the public can't sue federal agencies over their compliance with a controversial law on the quality of scientific data. The decision is a victory for environmentalists and government watchdog groups, which have accused industry of using the so-called Data Quality Act (DQA) to delay new regulations.

The 2000 act, which requires federal agencies to set standards to ensure the quality of information they disseminate, allows critics to petition agencies that they believe have not met the standards. Many such petitions have been filed, largely by industry groups challenging reports on topics such as the effects of toxic chemicals. But petitioners have no recourse if rebuffed.

In May 2003, the Salt Institute and the U.S. Chamber of Commerce filed a DQA petition to obtain unpublished data from DASH-Sodium, a study funded partly by the National Heart, Lung, and Blood Institute (NHLBI) (*Science*, 30 May 2003, p. 1350). The study found that eating less salt lowered participants' blood pressure, and NHLBI has cited these findings in recommending that all Americans lower their salt intake. But DASH researchers had failed to break down the data for subgroups (such as white men under age 45 without hypertension), argued the industry group, which demanded that NHLBI release these data for independent analysis. After NHLBI rejected the request, the groups sued the Department of Health and Human Services (HHS), NHLBI's parent agency.

In November 2004, a Virginia federal district court turned down the suit, a decision upheld on 6 March by the U.S. Court of Appeals for the 4th Circuit in Alexandria, Virginia. The panel of three judges found that the DQA "does not create any legal right to information or its correctness," and for that reason, the plaintiffs lacked legal "standing" to pursue their case.

The decision is "very broad" and will likely stand because it's from "a very conservative panel," says University of Maryland law professor Rena Steinzor of the Center for Progressive Reform. But proponents of the law say they aren't giving up. "I'm deeply disappointed. I feel that Congress intended that the Data Quality Act should be enforced," says Richard Hanneman, president of the Salt Institute.

NHLBI has been providing a limited data set to qualified researchers since January 2004. But the Salt Institute has not requested the data because "there's no assurance" its request would be granted, Hanneman says. Jim Tozzi of the industry-funded Center for Regulatory Effectiveness, who helped craft the legislation, is thinking about suing HHS over its position that marijuana has no accepted medical benefit. "A dozen people with diseases" might have a better shot at convincing a court they have standing, says Tozzi.

Meanwhile, the Chamber of Commerce is pondering whether to push for legislation that would open up any DQA decision to legal challenge. Steinzor predicts that such an effort will mobilize opponents of the act to maintain the status quo.

–JOCELYN KAISER

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