

Campus control of crystal growth in space

A command typed into a computer last week at the Rensselaer Polytechnic Institute (RPI) started a new round of crystal-growing experiments. The signal also represented the first time that NASA has allowed a team of researchers at a campus site to take control of an experiment aboard an orbiting space shuttle.

Following a circuitous route, the signal traveled from a control room at RPI in Troy, N.Y., to NASA's Lewis Research Center in Cleveland, to the Marshall Space Flight Center in Huntsville, Ala., to the Johnson Space Center in Houston, and finally, to the space shuttle Columbia. Normally, commands for shuttle experiments originate at the Marshall Space Flight Center.

"This was an important operational experiment, as well as a significant sci-

ence experiment," says RPI's Martin E. Glicksman, principal investigator for the isothermal dendritic growth experiment.

This crystal-growing effort was one of four scientific experiments that made up the U.S. Microgravity Payload, launched into Earth orbit aboard Columbia on Feb. 22 and returned to the ground on Mar. 9. Though overshadowed by the drama of a snapped tether and a lost satellite (SN: 3/2/96, p. 134), these experiments generated high-quality data that may prove useful in elucidating the behavior of materials on Earth.

Glicksman and his coworkers focused on the growth of dendritic crystals, which have a tapered, branched shape resembling that of a spruce tree (SN: 1/13/96, p. 31). Such crystals often form when molten metals solidify.

Survey finds gaps in kids' dental care

Think of it as a single snapshot of the smiles on millions of young faces—but be prepared. The picture isn't entirely a pretty one.

As tooth decay continues its slow decline among the nation's children, 80 percent of tooth decay cases among kids aged 5 to 17 now occur in just one-quarter of those children, according to a newly released government survey.

"I'd be hard-pressed to think of any other disease of consequence that affects so many schoolchildren," says Gary Rozier, a dentist and professor at the University of North Carolina School of Public Health in Chapel Hill.

The nationwide survey examined 15,000 children under 18 years of age, comparing three ethnic groups. In children over 5 years old, nearly 40 percent of tooth surfaces in non-Hispanic black and Mexican American children were decayed, and 40 percent of those had not been filled.

Among non-Hispanic white children in the same age group, just 14 percent of tooth surfaces were decayed, and over 80 percent of the decayed surfaces were properly filled.

The contrast apparently has little to do with stockpiled sweets or heredity. It is more likely linked to differences in income and insurance. "There definitely is an access problem," says dentist Lawrence J. Furman, a senior epidemiologist at the National Institute of Dental Research (NIDR) in Bethesda, Md.

Furman was one of many investigators involved in phase one of the third National Health and Nutrition Examination Survey, an assessment of the nation's health from 1987 to 1991. Results on dental health appeared in the March *JOURNAL OF THE AMERICAN DENTAL ASSOCIATION* and other publications, and they are also being presented at a meeting of the International

Association for Dental Research this week in San Francisco.

The survey—the first national study of dental health that includes children with baby teeth—found that more than 40 percent of those under 10 years old had cavities in their primary teeth. Many of them don't get the treatment they need, Rozier says. Cutbacks in Medicaid may make matters worse. "Pediatric dentists say they are already overbooked in the emergency room, trying to deal with baby-bottle tooth decay and other problems in low-income children."

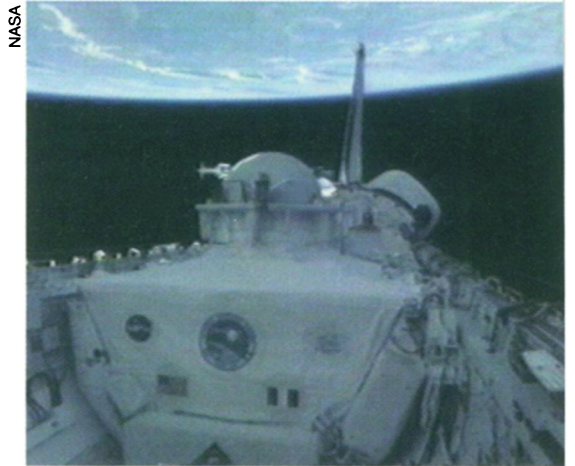
Baby-bottle decay results when a baby falls asleep with a bottle in his or her mouth, creating a perfect culture medium for destructive bacteria.

Despite the bad news, however, the study demonstrates that overall dental health among children has improved slightly in recent years. For instance, 55 percent of kids aged 5 to 17 had decay-free permanent teeth, 5 percent more than reported in an unrelated NIDR survey conducted from 1986 to 1987.

Rozier attributed the continued improvement to 40 years of fluoridation in water, toothpaste, dental rinses and other products. In the latest survey, however, only 20 percent of all children—and just 1.4 percent of those with baby teeth—had been treated with dental sealants. These plastic resins are painted onto biting surfaces to seal out bacteria and thus prevent decay. Use of sealants has far to go to reach the 50 percent goal set by the Public Health Service for the year 2000.

The cost, \$15 to \$35 per tooth, may explain some of the shortfall. The government will make survey data, including information on hygiene and other aspects of dental health, available to researchers seeking to examine such questions.

— S. Sternberg



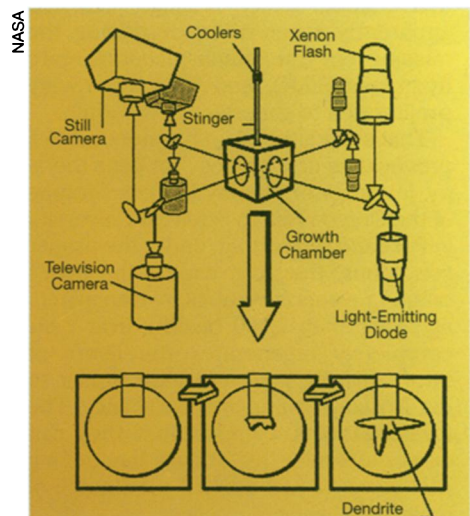
View of the space shuttle Columbia's cargo bay where the U.S. Microgravity Payload is housed.

By remote control, the researchers repeatedly melted and cooled samples of an organic material known as succinonitrile. This compound mimics the crystallization behavior of common metals and alloys but is transparent. Photographs, therefore, can reveal any crystals that form within the liquid (diagram below).

Performing these experiments in an environment in which the apparent force of gravity is only one-millionth as strong as it is on the ground, the researchers could observe how crystals form in the absence of gravity-driven settling and fluid flow. They found a basic pattern of branching similar to that observed on Earth, but the growth rate was dramatically slower. Small fluid flows caused by Columbia's gradual change in orientation and other slow movements of the shuttle did not significantly alter that rate.

By generating three-dimensional images from pairs of photographs taken of dendritic crystal formation in space, the researchers at RPI can now begin probing the effect on solidification of such factors as the sample container's shape and size.

— I. Peterson



Apparatus for growing branched, or dendritic, crystals in space.