Earth Science

Diamonds not a dinosaur's best friend

As the last remaining dinosaurs neared their end, a dusting of microscopic diamonds apparently fell from the sky, according to a scenario proposed by two Canadian researchers who found extremely tiny diamonds in 65-million-year-old rocks from Alberta. That time corresponds to the mass extinctions that wiped out the last dinosaurs as well as many other animal and plant species at the end of the Cretaceous period.

David B. Carlisle of Environment Canada in Ottawa and Dennis R. Braman of the Royal Tyrrell Museum of Palaeontology in Drummheller, Alberta, isolated micrograins of carbon having diamond-like properties from the Alberta rocks. Each diamond measures 3 to 5 nanometers across, they report in the Aug. 22 NATURE. The diamonds are so small that "1,000 of them strung end to end would make a necklace for a bacterium, if bacteria had necks," says Carlisle.

He and Braman believe the microdiamonds may have some connection with the mass death at the end of the Cretaceous. Over the last decade, scientists have accumulated evidence that a meteorite or comet struck Earth at that time and caused the extinctions. The Canadian researchers suggest the diamond dust was either brought to Earth by the impacting meteorite or created during the high-pressure collision. The impact would have lofted the diamond dust and other rocky debris high into the atmosphere, blocking out sunlight and causing a wide range of environmental problems. With time, the diamonds then fell to Earth, the researchers suggest.

A summer spate of Pacific quakes

Something is stirring off the coast of northern California and southern Oregon, and it's not a sea monster. Four sizable quakes rocked this region during July and August—a testament to the plate tectonic activity along the Pacific Northwest coastline.

The summer shakes began on July 12, when a magnitude 6.9 tremor occurred under the seafloor about 100 kilometers off the coast near Crescent City, Calif. On Aug. 16, a region just south of the July epicenter generated a magnitude 6.2 quake, followed a day later by a magnitude 7.1 quake. Splitting that pair on Aug. 17, an onshore, magnitude 6.0 quake rattled the Cape Mendocino region. While the smaller quake occurred about 200 kilometers south of the others, scientists suspect they are all related, says seismologist Jerry Eaton of the U.S. Geological Survey in Menlo Park, Calif.

The stress sparking these quakes comes from tectonic movement of the seafloor in the region. Inching slowly southeastward, a block of ocean crust called the Gorda plate is colliding with two separate bodies: the North American plate on the east and the Pacific plate on the south. Caught in this complex crash, the Gorda plate is both compacting and slipping beneath North America in an act called subduction. The Gorda quakes interest scientists because mounting evidence suggests that subduction just to the north of this region may generate huge earthquakes along the Pacific Northwest coast (SN: 2/17/90, p.104).

Glasnost in space

Recent turmoil in the Soviet Union apparently has not affected the launch and operations of the first Soviet satellite to carry a significant U.S. instrument, according to NASA scientists. On Aug. 15, four days before the failed coup attempt, a Meteor-3 satellite lifted off with a U.S. ozone-measuring device called TOMS. The new instrument will replace an aging 13-year-old TOMS that has provided satellite pictures of the Antarctic ozone hole and helped scientists track ozone depletions around the world. NASA researchers have already started receiving data from the new TOMS.

Space Science

Neptune: A watery planet at heart

Neptune may indeed merit its aquatic name. On the basis of key measurements taken by Voyager 2 and a laboratory experiment that simulated the extreme conditions at the distant planet's interior, scientists say they believe Neptune has a core composed almost entirely of liquids — resembling the interior of Uranus.

Most researchers had assumed that rock accounts for 25 percent of the mass of Neptune's core, making it more like Earth's interior than Uranus'. But scientists based that belief on models never fully tested by observations, says William B. Hubbard of the University of Arizona in Tucson. Two years ago, Voyager 2 passed close to Neptune, measuring the planet's rate of rotation and mapping its gravitational field. Results of the flyby, Hubbard says, strongly suggest that Neptune's core has a relatively low density — about that of water — rather than the high density associated with iron, silicon and magnesium.

This interpretation, however, assumes that researchers can accurately model the equilibrium behavior of fluids at the extreme temperatures and pressures found inside Neptune and Uranus. To verify his model, Hubbard collaborated with experimenters at the Lawrence Livermore National Laboratory in Livermore, Calif. These researchers created "a planet in a bottle" — a mixture of water, ammonia and alcohol that approximated the postulated composition of Uranus' core.

Using shock waves generated by firing a cylindrical bullet at the container, the Livermore team created pressures in the bottled planet up to 2.2 million times that of Earth's atmosphere and temperatures as hot as 4,100 kelvins. The simulation confirmed that a fluid core could produce the density deduced from the Voyager measurements. Alternatively, but less likely, says Hubbard, the cores of Uranus and Neptune might consist of dense metals interspersed with materials less dense than water, such as hydrogen. Overall, such a core would still have a density equal to that of water. The investigators report their work in the Aug. 9 SCIENCE.

Galileo's antenna: Pinning the problem

In mid-August, NASA scientists failed in their third attempt to use temperature changes to unfurl the main antenna aboard the Galileo spacecraft, now heading toward a 1995 rendezvous with Jupiter. If two to four graphite "ribs" of the umbrella-like antenna stay stuck after further thermal tries to loosen them in December and next year, the $1.3 billion mission may prove largely fruitless, since Galileo could transmit only a fraction of the data it would collect during its Jovian visit (SN: 8/3/91, p.79).

In the meantime, says Neal Ausman Jr., mission director for Galileo at the Jet Propulsion Laboratory (JPL) in Pasadena, Calif., researchers have identified a key factor that contributed to the antenna malfunction. Scientists had already suggested that alignment pins, which keep the ribs properly positioned around the antenna's mast when the antenna is closed, somehow jammed. The new information: Some of the lubricant added in 1982 to the pins' receptacles to reduce friction apparently rubbed off during four or more cross-country trips between JPL and the Kennedy Space Flight Center in Florida, Ausman says. The trips were due to delays in the shuttle program following the Challenger accident, he adds.

The pins likely to have lost the most lubricant during transport are the same ones that now appear stuck, Ausman observes. "It's a shame that we weren't a bit better and able to find this [before], but it's not the kind of thing that stares you in the face," says engineer Thomas Williams of the NASA Goddard Space Flight Center in Greenbelt, Md. Ausman told SCIENCE NEWS that pins on similar antennae aboard NASA communications satellites are replaced just before launch and new lubricant added.