lenge the new decision in federal court. The NLRB "doesn't know what the hell it's doing with regard to universities," says Silber.

NYU officials haven't said whether they will take that advice. In the meantime, 1500 NYU grad students are awaiting the result of an organizing election held last spring but suspended pending appeals. A tally was expected this week. —CONSTANCE HOLDEN

See the Coalition of Graduate Employee Unions (www.cgeu.org) for a roster of campus union groups.

TOXICOLOGY

Panel Backs EPA Dioxin Assessment

Outside scientists last week gave a thumbs-up to a long-awaited Environmental Protection Agency (EPA) report finding that dioxin may be causing health effects at levels close to background exposures. The massive report is "by and large a very fair and balanced description," said environmental scientist Morton Lippman of New York University, chair of the subpanel assembled by EPA's Science Advisory Board to review the document, 5 years in the making. However, Lippman urged the agency to "clean up" some conclusions, especially on cancer risks, which have been slightly downgraded since a draft version was released last spring (*Science*, 16 June, p. 1941).

The favorable reaction comes as a relief to the EPA, whose 1994 draft dioxin report was criticized sharply by a similar outside panel for ignoring scientific uncertainties. The 2000 reassessment again finds that dioxin—produced mainly by incinerators, smelters, landfill fires, and backyard burning—and related chlorinated chemicals may be causing health problems such as endometriosis, immune effects, developmental delays, and cancer.

While endorsing the report overall, the 17 reviewers—who included academics, industry scientists, and private consultants—criticized some sections. For example, some panel members took issue with EPA's decision to assume that dioxin's effects are linear and have no threshold. Another conclusion that sparked debate last spring—that the risk of cancer for the most exposed individuals is between 1 in 100 and 1 in 1000, or 10 times higher than in the 1994 report—has been softened: The report now describes the highest risk as greater than 1 in 1000. Even so, panelist Roy Alberts, an environmental health professor at the University of Cincinnati Medical Center, called the report's cancer summary "too one-sided," because it relies on worker studies that are "not decisive."

The review panel emphasized that dioxin's other effects are at least as worrisome as those that are linked to cancer. The thorny issue of whether steps should be taken to reduce dioxin in the food supply will soon be considered by a National Academy of Sciences committee. —JOCELYN KAISER

PLANETARY SCIENCE

Halley's Origins Mysterious No More?

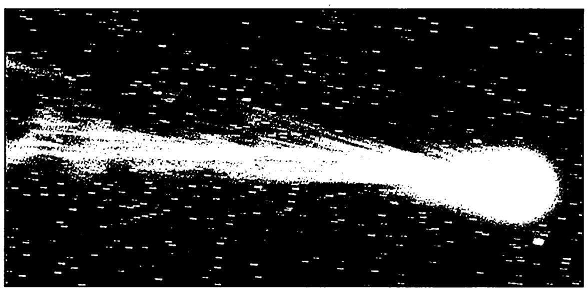
Like astrophysicists, planetary scientists have their own puzzling "dark matter": trillions of invisible "dirty snowballs" left over from the formation of the solar system. Tens of kilometers or larger in size, they linger thousands of times farther from the sun than Earth, much too distant for any telescope to pick up even a glimmer. As comets, a few become visible as they blaze a path near the sun. Fifty years ago, Jan Oort used the shape and orientation of cometary orbits to infer the existence of a spherical cloud of incipient comets surrounding the sun. Now astronomers equipped with modern computers are able to "see" the inner part of Oort's comet cloud for the first time, using a modern version of Oort's technique.

These tools have allowed dynamical astronomers Harold Levison and Luke Dones of the Boulder, Colorado, office of the Southwest Research Institute and Martin Duncan of Queen's University in Kingston, Ontario, to posit the origin of comet Halley and others with similar orbits. They believe it's the innermost part of the Oort cloud, within a distance from the sun of 20,000 times the sun-Earth distance, or 20,000 astronomical units (AU). Speaking at last month's meeting of the Division for Planetary Sciences in Pasadena, California, the trio also suggested that, unlike the outer parts of the Oort cloud, the inner part appears to be flattened. If the findings hold up, they would nail down the location and layout of the last unknown source of comets.

Oort found the first "dark matter" of the solar system by looking for the origins of a couple of dozen comets with highly elongated orbits randomly oriented in every possible direction. To have such orbits, he calculated, the comets must have come from a uniform, spherical cloud of objects 20,000 AU to more than 50,000 AU from the sun. These chunks of ice and rocky dust would have formed within 40 AU of the sun among the nascent outer planets, which then gravitationally slung them out into a disk far beyond the planets. There, gravitational stirring by passing stars and by the mass of the galaxy would have spread them into a spherical cloud and continued driving a tiny dribble of them inward toward the sun to become visible comets.

There are also comets with smaller orbits of 200 years or shorter that tend to stay near the plane of the planets in low-inclination orbits. Most of these short-period comets, dynamical astronomers concluded in 1988, must come from a then-unseen, close-in disk just beyond Neptune, the Kuiper belt. A third type of comet, which includes comet Halley, also has an orbital period of under 200 years. But, unlike other short-period comets, Halley-type comets show few dynamical signs of having had close encounters with massive Jupiter.

Advances in computer power have allowed Levison and his colleagues to track the motions of each of 27,700 simulated comets under the influence of the gravity of the sun, the four giant planets, the galaxy, and passing stars for up to a billion years. Their first conclusion is to rule out a spherical Oort cloud of randomly orbiting objects as a source for Halley-type comets. The jiggling by the galaxy and passing stars sent comets inward at all angles, not just the low angles of most Halley-type comets. So Levison and his colleagues fiddled with their simulation until they got Halley-type comets. They had to come from the inner Oort cloud inside 20,000 AU, Levison and his colleagues concluded, and the cloud there had to be flattened in a dense disk.



Distant visitor. Computer simulations suggest comet Halley comes from a distant, unseen disk of solar system debris.

CREDIT: MAX PLANCK INSTITUTE FOR ASTRONOMY

A flattened inner Oort cloud source for Halley is intriguing to many researchers. "I think the argument is quite convincing," says dynamical astronomer Alessandro Morbidelli of the Observatory of the Côte d'Azur. Morbidelli wonders whether Halley-type comets might not be coming from the higher inclination members of the Kuiper belt, and Levison plans to check out the possibility. But he's skeptical, saying that the inclinations would be too high.

If Levison and his colleagues are right, more than cometary origins are at stake. Every few hundred million years, a massive passing star cuts deep into the Oort cloud, showering comets into the inner solar system. Earth is thought to have been pummeled 35 million years ago (*Science*, 30 January 1998, p. 652). Understanding the nature of the Oort cloud should help scientists better assess the lethality of the next bombardment.

—RICHARD A. KERR