trometers, and other equipment to be installed. HIAPER's price tag, he added, represents only a tiny slice of NSF's annual $3.5 billion budget. And NSF has reviewed its cost projections for HIAPER with officials from the Air Force and NOAA, says Jacobs.

NCAR officials are also confident they can handle HIAPER, which they see as the inevitable next step for atmospheric research. "Scientists want to go higher, further, and stay up longer," says Warren Johnson, assistant director of NCAR's Atmospheric Technology Division. "We believe it's time for a high-performance jet aircraft."

–JENNIFER COUZIN

CAREERS IN SCIENCE

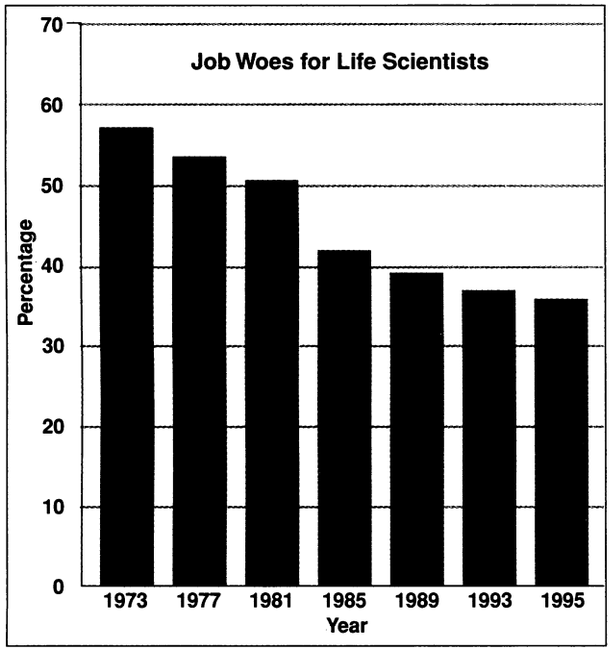
Report Paints Grim Outlook for Young Ph.D.s

In what surely will make depressing reading for aspiring researchers, a report released this week by the National Research Council (NRC) argues that the supply of newly minted Ph.D.s in the life sciences vastly outstrips the availability of desirable jobs. Putting the imprimatur of authority on the well-known plight of those laboring in the trenches, the report states that young life scientists these days are trapped for years in low-paid and transitory postdoc positions. "I call it the La Guardia effect," says panel chair Shirley Tilghman, a molecular biologist at Princeton University. She has a vision of "a lot of trained scientists who are circling, burning up very important and useful fuel, and waiting for their turn to land."

Every young life scientist knows colleagues who have struggled to find jobs, and the report* sees no reason to expect that the hard times will soon come to an end. "There is no sign in the data that this [problem] is going to peak," says Tilghman. So the panel recommends a painful remedy: To trim the swelling Ph.D. ranks, it calls on universities to freeze the size of their programs and to develop no new ones "except under rare and special circumstances, such as a program to serve an emerging field or to encourage the education of members of underrepresented minority groups."

The current Ph.D. glut appears to have begun building about a decade ago. Until 1987, the number of new Ph.D.s in the life sciences increased at an annual rate of roughly 1%. Since then, however, the rate has averaged about 4% a year, climbing to 5.1% in 1996. Overall, the number of new life sciences Ph.D.s has grown from 5399 in 1987 to 7696 in 1996, a 42% increase. If such a growth rate is sustained, the report says, the number of new life sciences Ph.D.s each year could double in just 14 years. Swelling the ranks "could adversely affect the future of the research enterprise," the report says, by breeding "destructive" competition and suppressing scientific creativity by causing scientists to play it safe.

The Ph.D. surge has already deeply chilled job prospects for today's grads. The proportion of Ph.D.s holding permanent jobs 5 or 6 years out has decreased from 89% in 1973 to 62% in 1995. "The average life scientist [nowadays] is likely to be 35 to 40 years old before obtaining his or her first permanent job," says the report. As a result, morale is sagging: "The feelings of disappointment, frustration, and even despair are palpable in the laboratories of academic centers."



Untenurable position. The percentage of life scientists with faculty appointments 9 to 10 years after receiving their Ph.D.s has plummeted.

SOURCE: NRC

The report takes a dim view of alternative careers as a means to ease the plight of young life scientists. Competition for science-related jobs in law, journalism, business, or precollege teaching is stiff and the pay is often low, the panel states. "I wish I had a dollar from every graduate student who said they wanted to be a science writer," says Tilghman. Says the report: "Our analysis suggests that opportunities in these fields might not be as numerous or as attractive as advocates of alternative careers imply."

Instead, the NRC panel advocates some old-fashioned belt-tightening. It recommends that federal agencies take greater control over the number of Ph.D. students by supporting graduate study through training grants and individual fellowships, rather than through research grants. Limiting the number of grad students a principal investigator can hire could help constrict the pipeline, Tilghman explains. The panel also recommends that the government subsidize "career transition" grants so some postdocs can set up their own research projects even before they have obtained permanent posts. The Ph.D. degree itself, the committee affirms, should neither be diluted nor redesigned: It should "remain a research-intensive degree, with the current primary purpose of training future independent scientists."

–CONSTANCE HOLDEN

* Trends in the Early Careers of Life Scientists, available at www.nas.edu

CRYSTALLOGRAPHY

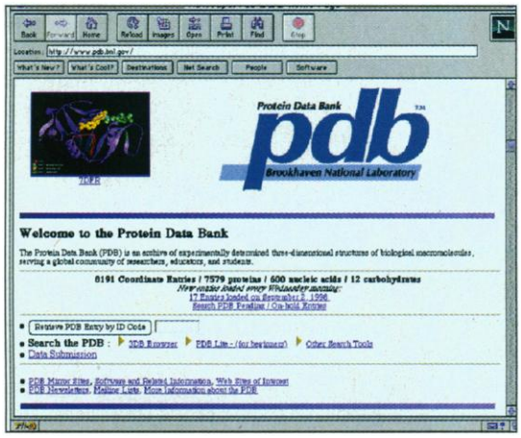
Transfer of Protein Data Bank Sparks Concern

On 19 August, structural biologist Joel Sussman got a call no manager wants to receive: A federal official phoned to say that funding will soon be withdrawn from the Protein Data Bank (PDB), a catalog of molecular images and structural data Sussman runs at the Brookhaven National Laboratory on Long Island, New York. The National Science Foundation (NSF), he was informed, has decided to shift the contract for managing the database to Rutgers University in New Brunswick, New Jersey. As news of the decision—agreed to by PDB's other sponsors, the National Institutes of Health and the Department of Energy—began to filter out last week, it kicked up a ruckus among crystallographers. As one of them says: "We feel it was done behind our backs." Some want the decision reviewed.

The contract at the center of this tussle is small, about $2 million per year. But as Sussman says, its impact has been "huge." Thousands tap into the database daily via the Internet, logging 1.5 billion hits per year. (Some journals, including *Science*, require that crystal structures be deposited in the PDB at the time of publication.) Sussman, who also holds a half-time appointment at the Weizmann Institute of Science in Rehovot, Israel, says he was "surprised" and "shocked" by the decision to yank funding for PDB, which he views as "an international resource held in trust" by Brookhaven. He claims that Brookhaven has sharply im-

proved the efficiency and user-friendliness of the system, after a rocky period about 5 years ago. He and others who use PDB are asking: Why tinker with a system that seems to be working well?

The move shouldn't have come as a complete surprise, however. NSF announced in 1994 that it would put the PDB contract up for renewal in 1998. It chose this year's winner after a confidential peer review and a series of site visits that began last spring. The winning team is an experienced three-member coalition headed by Rutgers structural biologist Helen Berman. It includes Philip Bourne of the University of California, San Diego, and Gary Gilliland of the National Institute of Standards and Technology in Gaithersburg, Maryland. Berman says she cannot comment until a contract is awarded. But she notes that the coalition has already created a database that integrates PDB files and other structural data in a single format; her group demonstrated it at the Protein Society meeting last July. This new team, which is expected to take over from PDB on 1 November 1999, is proposing to implement the new system rapidly.



New structure. The contract for managing the PDB will be moved from Brookhaven to Rutgers University.

Nevertheless, when news about the decision leaked last week to Long Island's daily paper, *Newsday*, NSF officials and members of the peer panel were bombarded with calls and e-mails. One bioinformatics group, for example, posted an exchange between a French researcher who questioned the decision and Mary Clutter, NSF's assistant director for biological sciences. Without identifying the winner, Clutter wrote that "the decision was based on plans for the future and not on current or past performance."

Crystallographers read this to mean that Brookhaven was doing an excellent job, but that Rutgers promised more exciting new software. They worry that the review panel may have been wowed by promises of new technology, at the risk of losing reliability. Although Brookhaven is also planning to install a new database next year, its top priorities, says biology chair William Studier, were to improve efficiency and make PDB more accessible.

"We are concerned about the potential damage in terms of stability" during a transition to a new manager, says Axel Brunger, a structural biologist at Yale University. He says a dozen Yale colleagues—including Paul Sigler, Thomas Steitz, Donald Engelman, and Donald Crothers—signed a letter asking NSF for more information and possibly a second review. He is upset that the six-member review panel appears to have included only two crystallographers. But Brunger concedes that he hasn't seen the winning proposal, which may be excellent.

In a phone interview with *Science*, Clutter declined to elaborate on her comments. But she acknowledged that "I've been getting e-mails from all over the world ... asking if we're out of our minds." She believes that researchers will be pleased with NSF's decision when NSF releases the details, which she hopes to do "in a few weeks." The transition, she promises, "will be seamless" to the research community.

Like NSF staffers, members of the review panel, chaired by bioinformatics researcher Sylvia Spengler of the Lawrence Berkeley National Laboratory in Berkeley, California, declined comment. But one panelist, speaking on condition of anonymity, said the review involved a "very difficult choice between two very competent groups of structural biologists." He continued: "At the end of the day you have to choose," and in this case, NSF appears to have opted for the more adventurous course. **–ELIOT MARSHALL**

SOLAR PHYSICS

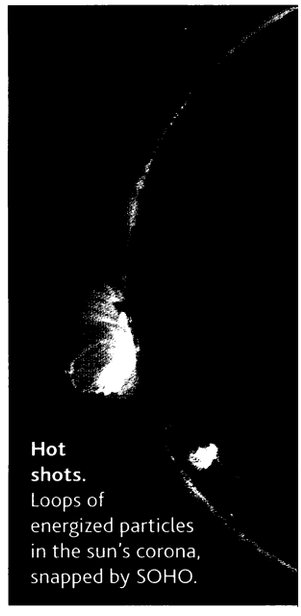
So Far, So Good For SOHO

Engineers who have been gingerly trying to bring the Solar and Heliospheric Observatory (SOHO) back from suspended animation have so far detected no permanent damage to the $1 billion spacecraft. The long process of thawing out the frozen satellite, which spun out of control and lost power after a series of ground-control errors in June, will take several more weeks. But officials from NASA and the European Space Agency (ESA) are now hopeful that they can bring the spacecraft back to life. That optimistic assessment was provided at a press briefing last week by NASA and ESA officials, who also released a final report confirming that errors by an overworked control team caused the spacecraft's problems.

Controllers reestablished contact with SOHO last month and directed the spacecraft to begin recharging its batteries (*Science*, 14 August, p. 891). That allowed them to turn on electric heaters to thaw the hydrazine propellant, which froze when the spacecraft's solar panels were turned away from the sun. The main tank is now thawed, and they are warming the pipes that connect the hydrazine tank to the thrusters outside. It is a delicate operation that may take up to 2 more weeks, since a quicker thaw could burst the pipes. But "so far the recovery [has been] fairly smooth," says Berhard Fleck, ESA deputy project scientist for SOHO at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

Fleck says the telemetry, power, and control systems appear to be undamaged. Once the thawing is completed, controllers will test the mechanism that adjusts the craft's position and attempt to stop the spacecraft's slow spin. "Finally," says Fleck, "we will point the spacecraft with thrusters back to the sun."

The final report on what caused the mishap contained few surprises. A panel of NASA and ESA scientists confirmed that the spacecraft spun out of control during routine maintenance procedures largely because of two software errors in preprogrammed command sequences and the decision by ground controllers to turn off one of the craft's gyroscopes, which detect roll, because they thought it was faulty (*Science*, 24 July, p. 499). "What should have been done instead was really to stop the operation and go into detail in the telemetry to identify exactly what caused the loss of the configuration of the spacecraft," says ESA Inspector-General Massimo Trella. The controllers were, however, under pressure to find a quick solution: "Any downtime for the scientific mission was considered to be a very heavy penalization," Trella says.



Hot shots. Loops of energized particles in the sun's corona, snapped by SOHO.

NASA

The report also pointed to several underlying factors that contributed to the accident. The computer display of telemetry data was not user-friendly, a situation recognized in 1994 but still not remedied. And when the