SCIENCE FUNDING

Congress Boosts NSF, NASA Budgets

This was supposed to be the year the federal deficit finally took a big bite out of the research budget. But two key science agencies —the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA)—have survived the budget process relatively intact, at least for one more year. Last week, a House-Senate conference committee approved a budget bill for the two agencies for fiscal year 1994 (which began on 1 October) that provides less than they requested but more than many researchers expected.

For NSF, the legislation—which may clear Congress this week—will give the agency its first $3 billion budget. That's an increase of 10% over its 1993 budget. Within that total, support for research will climb by 7%, to $1.986 billion. Although that falls far short of NSF's request for an 18% increase, it keeps funding for both investigator-initiated research and group projects ahead of inflation—no mean feat given the pressure to reduce the $300 billion budget deficit. "We're very pleased, in fact, we're delighted with 7%," says Bob Park of the American Physical Society. "Nobody else is doing any better these days."

Researchers connected with NSF's supercomputer centers should be especially pleased. The Senate approved a bill last month that would have gutted the centers, but the conference committee restored most of the funds. The committee also dropped language in the Senate bill that would have prohibited NSF from establishing any new research centers; NSF officials have proposed two new engineering research centers.

The Senate did, however, get its way on one key effort: NSF's academic infrastructure program. The final version of the bill follows the Senate's lead in doubling the $50 million now being spent, dividing the $100 million pot evenly between buildings and large instruments. The program has been touted as an alternative to porkbarrel funding of university facilities, but few observers expect universities to lessen their pressure on legislators for special "earmarks" for their campuses. "Universities have pretty much adopted the attitude of getting whatever they can wherever they can," says Howard Silver, executive director of the Consortium of Social Science Associations. Education also remains a favorite of Congress, with an increase of 17% to $569 million.

All in all, the bill is a nice welcoming present for Neal Lane, NSF's director-designate, who ended a 25-year career at Rice University last week and headed for a new home and life in Washington. Lane, a physicist and most recently provost at Rice, is expected to be approved easily by the Senate sometime this month.

One issue awaiting his attention is a directive from the Senate that NSF must devote more resources to "strategic" rather than basic research (*Science*, 17 September, p.1512). Although the conference committee didn't include this language in the final bill, the appropriations subcommittee that wrote the language, chaired by Senator Barbara Mikulski (D–MD), is expected to keep the pressure on NSF next year.

Space squeeze. In a year of turmoil for NASA, officials have been steeling themselves for flat funding. In fact, they got a bit better than that, but the relatively good news was tempered by a few disappointments. Overall, NASA got $14.5 billion, $200 million more than 1993 but $800 million less than the president's request. Within the total, space science programs will get a $207 million increase to $1.784 billion.

But a few high-profile projects fell victim to the budget-cutters along the way. The Mission to Planet Earth environmental monitoring project took a $69 million cut to $1.079 billion. But perhaps the hardest hit is the High Resolution Microwave Survey, previously known as the Search for Extraterrestrial Intelligence. House-Senate conferees killed the $12 million-a-year project outright, leaving just $1 million for termination costs. Despite broad support from the scientific community and NASA, the effort has been condemned repeatedly by legislators who see it as a wasteful search for "little green men."

Another high-profile science project, the second Advanced X-Ray Astrophysics Facility (AXAF), emerged with $19 million less than the requested $260 million. AXAF, says George Washington University space policy analyst John Logsdon, is considered technically sound, but "it was caught up in the adjustment to small science at NASA."

As for NASA's biggest single project, the space station, the conference committee approved the full $2.1 billion the president requested. But half that amount hinges on congressional approval of an acceptable plan for a collaborative effort with the Russians. Finally, the legislators added $10 million for NASA to begin work on a replacement for the Mars Observer mission that was lost in August. NASA has not yet decided whether to launch a duplicate of Mars Observer or convert some other spacecraft for the job.

–**Christopher Anderson** and **Jeffrey Mervis**

PHYSICS PUBLISHING

E-Mail Withdrawal Prompts Spasm

For some 8000 physicists around the world it was like waking up to find that the coffee had run out or that the newspaper hadn't been delivered. For some it was even more traumatic. One Russian physicist from the Landau Institute in Moscow described it as the beginning of the dark ages—"Brezhnev's dream of the total information screening comes true."

The problem? On 27 September, physicists who tried to dial into the e-print archives of Los Alamos National Laboratory—the electronic bulletin boards to which physicists e-mail preprints and from which they receive the latest work of colleagues and competitors—discovered the system had been shut down. Instead of their daily fix of abstracts, they got an "out of order" message and a suggestion: "If you are in the U.S. and feel strongly about the utility of the system, now is a good time to contact your [National Science Foundation, NSF] and [Department of Energy, DOE] program officers, and encourage them to find a way to support it adequately."

The result was a worldwide spasm of withdrawal and a barrage of messages to DOE and NSF administrators, as well as to Paul Ginsparg, founder and operator of the e-print archives. This electronic fusillade had an immediate effect: Top brass at Los Alamos quickly agreed to provide more resources to run the system, which was back on line by the end of the week.

The episode not only demonstrates how much political clout can be generated through e-mail, it also shows just how much physicists have come to rely on the bulletin boards, and the extent to which they have changed the culture of physics (*Science*, 26 February, p. 1246). "It would be really painful" to do without them, says Yale physicist Jim Horne. These days, says Horne, "The only thing I use journals for is looking back for papers that came out before the bulletin boards existed."

Ginsparg acknowledges that the recent outpouring was the result of some fairly calculated maneuvers on his part. He says he decided to shut down temporarily one part of the system—the daily announcements of new papers—because the system had become overwhelmed by hundreds of e-mail messages that were being bounced back each day. He explains that many postdocs and graduate students, who represent a healthy portion of his subscribers, change e-mail addresses with the new academic year without bothering to

notify the system's automated address changer. "It just needed a cooling off period," he says, for all the previous errant messages to bounce back and be purged from the system. But he admits that the way he did it was calculated to light a fire under the government to provide more resources for the operation.

Ginsparg, a theoretical physicist by profession, had been running the e-print archive singlehandedly since he originated it 2 years ago. He has repeatedly requested funding from DOE, NSF, and his own laboratory administrators to help run the system, with no luck whatsoever. As Ginsparg tells it, none of them had been willing to step forward and offer support.

Ginsparg was not asking for much: for starters, a low-level employee to do administrative labor and go through the e-mail bounceback would help. A talented programmer, who could implement Ginsparg's ideas for improving the system and set up new archives when necessary, would be even better. Ginsparg himself is too busy writing grant proposals to do it himself, he says.

The problem, says Ginsparg, is that funding agencies are not set up to react quickly to these new forms of databases that are appearing as community services on the electronic network. "They never existed before," says Ginsparg. "And you can't convince government agencies that this is something they will have to deal with." Ginsparg adds that it is hard to get the attention of these agencies because so few administrators use e-mail themselves. NSF was the one agency that expressed interest, but NSF is not supposed to fund research at a DOE laboratory.

Two days after Ginsparg shut the system down, however, the Los Alamos computer and communications division finally decided that the lab's library would be given responsibility for the archives. According to Hassan Dayem, the division leader, the head of the library was already searching for an employee to be assigned the task of maintaining the e-print archives and a programmer would be recruited to write software to improve the system.

Ginsparg says he was "staggered," by the beneficent response from his laboratory. While he sheepishly concedes that he wasn't thrilled about having to use radical shutdown tactics to get results, he is elated at the results themselves. "Everything we've been trying to do for the last 10 months will actually happen. I had no idea that this was going to be so effective."

On 30 September, Ginsparg returned the e-print archives to full working order, and physicists around the world found that, once again, they could face the day.

–Gary Taubes

SCIENCE EDUCATION

Moving Science From Museum to School

Field trips to the local natural history or science museum are standard elementary school fare, but in Nebraska, thanks to a $500,000 grant from the Howard Hughes Medical Institute (HHMI), the museum is the one making trips to the schools. The University of Nebraska State Museum at Lincoln is using the Hughes money to start a 5-year project to create 12 education kits—on topics ranging from water to dinosaurs to the stars—that will make the rounds of schools all over the state. "The kits are extremely valuable. They bring hands-on science right down to the elementary student level," says Rosemary Thornton, a K-6 science teacher at Fredstrom Elementary School in Lincoln. Each kit has everything a teacher needs to instruct a class for anywhere from an hour to a complete month. One kit on pollen includes microscope viewers, pollen, and flowers—carefully embedded in acrylic, so the kids won't be allergic—as well as extra resource books and a video in which a pollen scientist describes how she puts her knowledge of pollen to work in forensics.

MUSEUM OF SCIENCE AND DISCOVERY

Balancing act: Third-graders get excited about physics when the Museum of Science and Discovery comes to visit their class.

The Nebraska grant is just one of 51 given to museums during the past 2 years by HHMI, all with the same goal: to get elementary school kids excited about science. HHMI initiated the program last year, and gave out $6.4 million in 5-year grants to 29 museums. This year, the number of meritorious grant applications was so overwhelming that, last month, HHMI announced it is expanding the program. It has given out another $4.2 million for 22 new grants, this time including zoos, aquariums, and botanical gardens. The new grant money means that HHMI, which has established itself as a major force in cutting-edge biomedicine, is now a powerful player in museum science education. It is second only to the National Science Foundation, which spent approximately $17 million on science education programs in museums during the 1993 fiscal year.

A key goal of the HHMI museum program is to use mobile exhibits and classroom curricula to teach kids how science is actually done, says HHMI's program officer for precollege science education, Kathi Hannah. "Children know how to ask questions. We want these programs to teach them how to answer those questions," she says.

The museums have created programs with a variety of different curricula: Some take kids on outdoor field trips, some send books and videos to the classroom for indoor learning, and some opt for long-term involvement, aiming to teach different subjects to a class throughout several years in elementary school. Currently most of the programs are in trial stages, but teachers who have participated in the pilots give them high marks, mostly because the programs do their best to work within the preexisting curricula. "Everything has to fit in with the state standards and our school program," says Denise dePasquale, a third-grade teacher at the Colbert Elementary school in Fort Lauderdale, who worked with that city's Museum of Science and Discovery on a pilot program. "They were very open to our suggestions and took a lot of time to make sure everything fit." Adds Leticia Matienzo, another third-grade teacher at Colbert Elementary, "We're excited about their bringing concrete science right into our classroom."

While the new programs may be adaptable to current standards, they depart from traditional elementary school science by tackling more than the mere cataloguing of bugs and plants. Instead, they aim to impart general themes of scientific inquiry. The Museum of Discovery and Science, for example, entitles its program: "Balance, template, iterations and code." These words weave their way through modern genetics, cell biology, physics, and environmental science, says project director M.J. Morse. To learn about ecological balance, for example, the kids place blocks representing a certain amount of rainfall on one side of a seesaw. On the other side they carefully add blocks that represent water consumption until they have a perfect balance, thus emphasizing the crucial need for ecological equilibrium. The kids go on to learn about balance in gravitational forces and in the perfect homeostasis of a living cell. "We're not just giving kids little balloons of information," says Morse. "We give them beams, a framework onto which they can attach their knowledge."

–Karen Fox