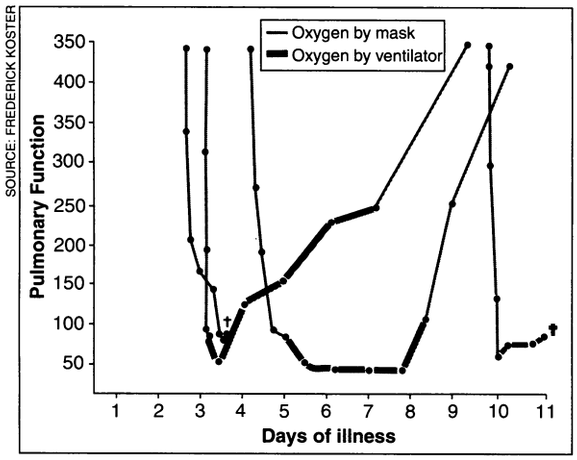
effective in reducing deaths from Hantaan virus. But the drug must be given to patients early to prevent hantaviruses from doing catastrophic tissue damage, and the Four Corners strain may move too rapidly for ribavirin to be effective. Few experts are optimistic about ribavirin. Johnson says that prescribing it is just an "emotional" gesture. CDC's Butler notes, "So far, we don't have any evidence it changes the course of disease."

It might be possible to develop a vaccine against the Four Corners strain, once the virus has been cultured in the lab or its entire genome extracted. For the past decade, Army microbiologist Schmaljohn has been developing a vaccine to combat the Hantaan virus in Asia, and she plans to begin a large field trial in China next year. But developing a similar weapon against the Four Corners strain could take years.



Rapid killer. Plots of pulmonary function of four patients show sharp drop followed by death in cases 1 and 4 and slow recovery in the other two.

Meanwhile, two researchers at the University of New Mexico—Brian Hjelle and Steven Jenison—have been working on a quick diagnostic test based on "Western blot" technology to distinguish flu sufferers from hantavirus victims in the clinic. They began work on it in a rush in June, "as soon as we heard about hantavirus." After downloading viral sequence data by computer from federal databanks, they got help from CDC and learned to pull pieces of viral genome from patient tissue. They spliced these genes into bacteria, which expressed viral proteins that could be used to test human serum for antibodies to the virus. They claim their test can provide a reliable identification of hantavirus infection within 26 hours. But CDC staffers feel the test is still too complex to be used on a mass scale.

Attacking the vector

If researchers can't yet cure those who are infected, they aren't entirely helpless against this new viral threat. The best route of attack against the virus is preventing it from being transmitted from rodents to people. CDC researchers have concluded that it is most likely transmitted by aerosol from the rodents' urine and feces. The evidence, says CDC immunologist Pierre Rollin, is anecdotal and is derived from experience with other hantaviruses. He recalls the case of the doctor who made a short visit to a barn in France where infected rodents lived, saw no animals, but came down with a fatal infection of Puumala. C.J. Peters, chief of CDC's special pathogens branch, recalls the case of a Korean restaurateur who used a broom to beat a rat to death in his bedroom, then got sick. No one knows exactly how the U.S. victims acquired their infections, but many lived around rodents, and transmission by aerosol seems likely, says Peters. For that reason CDC is telling people to "avoid contact" with deer mice by keeping them out of homes.

Public health officials in New Mexico have already run a massive mouse roundup, and some officials have advised people to trap rodents and disinfect them with Lysol. CDC staffers aren't keen on the idea of having people handle rodents, however, since they often excrete fluids around the trap. But for now, "We don't know if it's safer" to trap or not to trap, Childs says.

Most people are hoping that 1993 will prove to have been an extraordinary year, and that the virus will not return. "But we would be remiss not to be prepared" for a resurgence, Simpson says, as he braces for the unknown. He's not alone in his concern. "We're worried that there's a good possibility we'll see more hantavirus infections in the area this fall," says Childs. One reason to worry is that the Hantaan and Puumala viruses exhibit two epidemic peaks: one in summer and a second in late fall between November and January.

One hopeful sign is that the deer mouse population in New Mexico declined in late summer, although it is still above 1992 levels. But just in case the Four Corners strain mimics Hantaan, New Mexico has set up an emergency team involving the University of New Mexico and the CDC to sort emergency cases from ordinary flu sufferers. The aim is to perform rapid triage if necessary. It's possible that none of this planning will be needed. In spite of the rapid progress made so far in identifying the culprit, developing initial diagnostic tests, and providing advice to the local populace, even CDC's experts cannot predict what course the virus will take next.

–Eliot Marshall

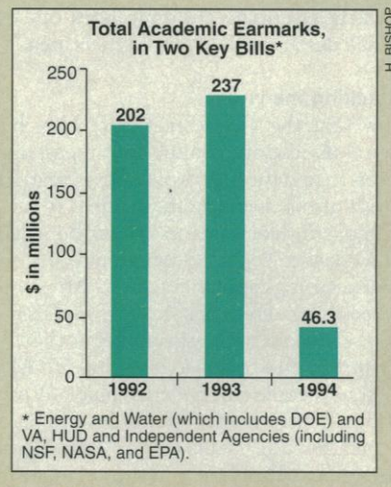
With reporting by Richard Stone.

THE 1994 BUDGET

Better for Science Than Expected

When Congress decided last month to kill the Superconducting Super Collider (SSC), some researchers took the vote as a sign that the United States no longer cared about basic research (*Science*, 29 October, p. 644). But the flurry of appropriations bills passed by Congress in the past couple of weeks tell a different story: Most research agencies have received increases, of varying sizes, for the fiscal year that began last month.

Although in some cases these increases are less than the Administration requested (see table), they are welcome news in a year in which Congress made cuts in almost every other sector. Increases for basic science can be found throughout the discretionary portion of the 1994 federal budget. The National Science Foundation (NSF) received $293 million more, to $3.027 billion. The $11 billion National Institutes of Health (NIH) got a boost of $617 million, double the increase President Clinton requested.



Pork light. A relentless campaign by Representative George Brown (D–CA) against congressional earmarking of academic facilities appears to be making some headway. The amount of money set aside for pork-barrel projects in two 1994 appropriations bills important to science—Energy and Water, and Veterans Administration, Housing and Urban Development, and Independent Agencies—dropped sharply after skyrocketing in 1992 and 1993, according to figures released last week by Brown's science committee.

The budget for the National Institute of Standards and Technology, riding the current wave of support in Washington for applied research, rose by a whopping 35%, to $520 million. NIST's Advanced Technology Program, which funds cutting-edge industrial collaborations, saw its budget triple.

"The SSC was not a vote against science," says John Gibbons, the president's science adviser. "And it doesn't reflect congressional attitudes toward basic research. From what I have seen of the overall budget, science has done pretty well."

Here are some highlights of the 1994 civilian budget. (The defense budget was expected to be completed this week.)

■ **NIH.** In what has become a regular autumn ritual, Congress gave NIH more funds than the president had sought last spring. While groups like the American Association of Medical Colleges are "pleased" with the outcome, they recognize the 6% increase will mean more of the same rather than any dramatic innovations. The number of new and competing grants awarded in 1994—long a yardstick for growth—is expected to be higher than the 6125 funded in the fiscal year just ended, but less than the 6768 awarded in 1992.

Among the highlights of the new budget is a 21% increase for the National Center for Human Genome Research—enough for director Francis Collins to launch an intramural program to complement the center's existing funding of grants to outside scientists. In contrast, 15 institutes and centers will receive increases of just 5.2%. Only the National Institute of Allergy and Infectious Diseases, the mainstay of AIDS research, got significantly more, an 8% increase that raises its budget to $1.066 billion. Within the National Cancer Institute, breast cancer research was given a 34% boost, to $263 million. (That figure does not include the $200 million that ended up in the Army's budget last year for a multi-year program against the disease.)

Some members of Congress and Administration officials—notably Senator Tom Harkin (D–IA) and assistant secretary for health Philip Lee—have been talking about creating a multibillion-dollar "trust fund" for research. But the health care reform package the Administration submitted last week, which could have been the vehicle for such a fund, had no mention of it and there is no indication the Administration is taking the idea seriously.

■ **NSF.** "I think that we fared very well," says NSF's new director, Neal Lane. "But the fact that we didn't have such a good year in 1993 [a flat research budget] means we are very limited in what we can do in 1994." By "well," Lane means that Congress gave NSF two-thirds of what the Clinton Administration had requested.

1994 Budget
(by agency, $ in millions)

	1993	'94 request	1994	% change
National Institutes of Health	10,339	10,668	10,956	+6.1
Cancer	1978	2142	2082	+5.3
Allergy	988	1065	1065	+7.8
Human Genome	106	134	129	+21.3
National Science Foundation	2734	3180	3027	+10.7
Research directorates	1859	2204	1998	+7.5
Education	487	556	569	+17.1
Academic infrastructure	50	55	110	+120.0
Department of Energy				
SSC	517	640	*	*
Basic energy sciences	838	793	792	-5.4
High-energy physics	595	628	628	+5.5
Nuclear physics	365	322	353	-3.1
Biological, environment	329	409	409	+24.4
Solar and other renewables	177	240	245	+38.4
Fusion	322	338	338	+5.0
National Aeronautics and Space Administration				
Research and development	8847	9529	9284	+4.9
Space station	2122	1946	1946	-8.3
Environmental Protection Agency				
Research and development	323	354	339	+5.0
National Institute of Standards and Technology	384	533	520	+35.4
Advanced Technology Program	68	199	199	+192.7
National Oceanic and Atmospheric Administration				
Oceanic & Atmospheric Research	202	214	226	+11.9
Department of Agriculture				
National Research Initiative	97	130	112	+15.5

* Congress voted $640 million to terminate the SSC. SOURCE: AAAS, appropriations bills

For new applicants, that translates into another tough year. The number of competitive grants NSF awarded in the fiscal year that just ended—9050—was 1020 fewer than in 1992, and even an 8% increase in NSF's research account won't be enough to bring that number all the way back as NSF continues its commitment to increase the size and duration of its awards to individual investigators.

Congress may have been relatively generous toward NSF, but it is taking a hard look at some of its research priorities. After the Senate expressed concern about the payoff from NSF's large, interdisciplinary research centers, Congress asked the agency to hire the independent National Academy of Public Administration to study them. Lane says that centers "must add value" to the research that otherwise could be done by individuals and small teams to justify their continued existence.

■ **DOE.** The SSC's termination doesn't provide a great deal of relief for the Department of Energy's other research programs—at least for this year. Overall, DOE's research and development budget went up by 2.8%, to $7.59 billion (although DOE has yet to decide which programs will be cut to absorb a congressionally mandated $100 million reduction). Within that narrow increase, however, there are some bright spots—spending on solar and renewable energy research rose 38%, and on conservation 22%. However, most areas received level funding or worse. Even a 14% rise ($195 million) in general science and research was narrowly focused on two items: $124 million more to pay for the termination of the SSC and $36 million to start work on the B meson factory at the Stanford Linear Accelerator Center.

Another proposed new start, the Advanced Neutron Source (ANS), will have to wait. Congress appropriated just $17 million of a requested $39 million, and specified that it be used to continue research and preliminary design rather than to begin construction. Although language accompanying the bill predicts that ground will be broken next year, the facility's $2.7 billion price tag is expected to bring SSC-like scrutiny to the project. Anticipating the need for a backup neutron source, the conferees provided $19 million to keep alive the Los Alamos Meson Physics Facility.

A second neutron battle—this one over a controversial $2 million earmark for a university consortium pursuing a Boron Neu-

tron Cancer Therapy facility (*Science*, 15 October, p. 329)—appears to have ended in victory for opponents. Conferees crafted language that says DOE should fund the project only if there is extra money in its budget, an unlikely prospect.

■ **NASA.** Space boosters would normally be breathing a sigh of relief over this year's moderate 6% increase ($424 million) for NASA's research and development budget (*Science*, 8 October, p. 173). But the fate of the space station remains a question mark for NASA, whose supporters are also worried about the sudden ability of Congress to kill large high-tech projects such as the SSC and the Advanced Solid Rocket Motor (*Science*, 22 October, p. 499).

"I don't think people realize how close we came to losing the space station this year," says Lori Garver, executive director of the National Space Society. The House this summer kept the international project alive, by one vote, after the Clinton Administration rolled out its big lobbying guns, but the ever-changing station is being redesigned once again, this time with the Russians in mind. Garver predicts that the new partner will appeal to some wavering legislators, but any loss of U.S. jobs that results from the collaboration could make the space station even harder for Congress to swallow next year. And that leaves space scientists wondering about the impact of the station, which now consumes about one-seventh of NASA's budget, on future NASA appropriations.

–Jeffrey Mervis, Christopher Anderson and Eliot Marshall

EPIDEMIOLOGY

Women's Health Initiative Draws Flak

The Women's Health Initiative, the largest clinical study ever undertaken by the National Institutes of Health (NIH), began recruiting test subjects at 16 clinics this fall to participate in an ambitious attempt to explore the causes of disease among older women. But just as the long-planned study is finally getting off the ground, a panel of medical experts has concluded that it may never achieve its goals. The panel said it is highly unlikely that the $625 million study will stay within budget or find solid evidence linking low-fat diets to a reduction in breast cancer rates—its primary concern. The panel urged that the study be changed to emphasize other health issues, and that its monitoring methods and informed consent procedures be improved.

The unusually critical review, requested by a cost-conscious House appropriations subcommittee, came out on 1 November. Authored by a special panel at the Institute of Medicine (IOM), the review stops short of calling on NIH to abandon the clinical trial at the center of the initiative. But panel members had harsh comments about the feasibility of the trial, designed to collect data on the diets and illnesses of 63,000 women between age 50 and 79. Lynn Rosenberg, an epidemiologist at Boston University and a member of the review panel, explains that "it's a very weak hypothesis that changing the diets of women in their fifties, sixties, or seventies will influence their risks" of getting breast cancer. Furthermore, the logistics of testing this hypothesis are "extremely difficult," according to Rosenberg, because it is hard to keep people on low-fat diets and collect accurate data over 10 years.

Similar criticisms have been leveled in the epidemiology community for months (*Science*, 7 May, p. 744), but the Women's Health Initiative has been popular since Bernadine Healy, former director of NIH, launched it in 1991 as part of a general effort to improve the status of women in medicine. One of her goals was to redress a bias in NIH-funded clinical studies, which have focused on men. The project has three parts, the largest of which is the clinical trial. In addition to looking at diet and breast cancer, it is designed to test for a variety of dietary and drug effects, including the apparent benefits of hormone supplements in reducing heart disease. A related "observational study" is designed to collect unspecified data on a variety of topics, and the "community prevention trials" are meant to instruct low-income and ethnic groups in healthy lifestyles. The entire project is being designed and run by the NIH director's office and managed through contracts with 45 clinics around the country.

"It is a very weak hypothesis that changing diets of [older] women will influence their risks."
—Lynn Rosenberg

The IOM panel took issue with some of the basic goals of this network of projects. The panel urged NIH to:

■ De-emphasize research on fat as a cause of breast cancer and concentrate on other parts of the initiative that stand a better chance of producing scientifically valid results, such as the effect of diet on heart disease and colorectal cancer or the risks and benefits of hormone supplements. More women are likely to be affected by heart disease, and the statistics are likely to be stronger.

■ Write better consent forms. For example, volunteers who join the study section focused on hormone supplements should know that they could be given a placebo, and that this could result in bone loss.

■ Do better planning. Two parts of the initiative—the observational study and the community prevention trials—are still poorly defined, according to panel member Joanne Lynn, professor of medicine at the Dartmouth Medical School.

■ Develop a more rigorous monitoring system that would allow the agency to terminate the study early—after 7 or 8 of its planned 14 years—if the results on the diet elements of the project are not promising.

The panel appears to have been divided between those who felt these comments should be presented in an optimistic light and those who were in favor of using strong language. According to the chair, Marion Finkel, vice president for drug registration at the Sandoz Pharmaceuticals Corp., "There wasn't total agreement among members." In the end, the skeptics held the majority, though the final report, she says, represents a "consensus." One member of the team that wrote the report says a "sunny" draft was scrapped and replaced with a harsher version.

Healy is characteristically unconcerned by these attacks on one of her best-known legacies. In a phone interview from Ohio, where she's running for the Senate, Healy called the study "magnificent." She argues that evidence is evenly balanced on the diet-cancer question, and it deserves a large trial. Furthermore, she says, this is just one of several facets of the study. It would be a "serious mistake" to back off now, just because "a handful" of skeptics don't like the study, she says.

NIH leaders are also putting a good face on the report. "We interpret it as a positive report," says William Harlan, associate NIH director for preventive health and director of the Women's Health Initiative. It could have been worse. He finds encouragement in the fact that the report "says the study should continue," and adds that "we are looking at their suggestions very carefully." Harlan says the investigators have already decided to improve the consent forms and provide for an interim review of the project in 2002.

Still, Harlan says that NIH has no intention to shift the main theme of the study away from diet and breast cancer. But that could change after the House appropriations subcommittee finishes digesting the report.

–Eliot Marshall