

Civilian Gains at Defense's Expense

By RON COWEN

Most federal research agencies comfortably survived this year's unusually protracted and contentious budget battles. Some Big Science projects—most notably the much criticized space station, the Superconducting Super Collider and the Star Wars initiative—suffered setbacks in the 101st Congress, but most agencies conducting civilian research and development (R&D) are budgeted to receive real increases, surpassing the estimated 4.9 percent inflation rate for the last fiscal year.

A Congressional Research Service (CRS) analysis shows that in the new fiscal year, which began 11 weeks ago, overall federal R&D spending will rise about 3 percent over last year. However, civilian R&D programs will actually increase roughly 10.7 percent (or almost 6 percent after inflation) because defense-related programs, which presently account for about 58 percent of the R&D budget, take a cut for the second year in a row—and a substantial one at that. The civilian R&D increase also exceeds by about 2.7 percent the overall spending increase for the entire federal budget.

The tug-of-war over this year's budget began last January, when George Bush proposed a federal spending plan for the 1991 fiscal year, beginning this past Oct. 1 (SN: 2/3/90, p.71). The war ended on a frenetic late October weekend six weeks ago, when Congress finally agreed on a budget that not only met spending limits

in the Deficit Reduction Act, but also met with the President's approval.

Some of the last-minute negotiations brought unexpected casualties. For example, Congress was about to increase the National Science Foundation (NSF) basic-research budget by 8.9 percent over last year. But that rise depended upon a Department of Defense (DOD) pledge to pick up the tab for military personnel participating in the Antarctic research program NSF oversees—a cost NSF had paid in past years. When the White House Office of Management and Budget nixed that plan in October, Congress plucked \$40 million from the NSF research budget to help finance the \$75 million personnel cost. In the end, NSF's basic-research budget increased just 6.4 percent—far from the 14.4 percent increase Bush requested last January.

According to Robert L. Park, Executive Director of Public Affairs at the American Physical Society, that smaller increase—combined with NSF's commitment to several large science projects—is leading many scientists to question whether NSF will be able to increase the number of grants it funds to individuals.

On a brighter note, even after two last-minute cuts the National Institutes of Health (NIH) enjoyed a 9.2 percent increase over its 1990 total—nearly double the increase proposed by the President.

Congress requested that NIH use its increase to help fund roughly 1,400 more new research grants in 1991—bringing to about 6,000 the new grants NIH initiates each year. Congress also directed NIH to submit by early February a long-range cost-containment plan detailing how the agency could continue to fund 6,000 new grants each year without jeopardizing grants already underway. NIH proposed eliminating the across-the-board increases for grants recommended by its reviewers, offering instead to limit those grant increases to a more general biomedical-research inflation rate.

Lawmakers increased spending for AIDS research and education at NIH from \$743.5 million to \$804.9 million. Total funding for NIH's portion of the human genome research project rose by 47 percent, to \$87.4 million. (Funding for human genome research within the Department of Energy rose to \$47.8 million, a \$26 million increase over its 1990 level.)

As part of the Farm Bill passed in October, lawmakers directed the U.S. Department of Agriculture (USDA) to revise its research funding by increasing emphasis on environmental issues and by increasing the proportion of money it awards through competitive grants.

Among other big winners and losers in this year's budget:

NSF: Even with this year's relatively large, \$194 million increase for NSF, it appears increasingly unlikely that the administration will achieve its stated goal for this agency—an annual budget by fiscal year 1993 twice the size of FY 1987's (about \$1.622 billion).

Education programs emerge as NSF's clear winner, receiving a 46.2 percent increase over 1990 levels, to \$322.4 million. The clear loser: twin, 4-kilometer long, gravitational wave detectors. Congress axed all \$47 million the President had asked for the proposed project.

USDA: Overall, Congress appropriated a \$115 million increase for USDA—about double the increase Bush had requested. The Agricultural Research Service, the lead federal agency for nutrition research, receives slightly more than half the agency's R&D funds this year—\$621.6 million, or a 10.7 percent increase over last year. Congress earmarked \$41 million of that increase for modernizing of facilities at four high-priority research labs.

The Cooperative State Research Service (CSRS), which funds agricultural R&D at universities and other organizations, received \$388.5 million, or 15 percent more than last year. CSRS' special grants program aimed at applying advanced technologies to problems facing farmers, ranchers and consumers will increase by 75 percent, to \$73 million.

NASA: Despite congressional criticism over the agency's space shuttle delays and Hubble Space Telescope woes, NASA received a larger R&D dollar increase—\$777.6 million—than any other agency.

FY 1991 Federal R&D Funding				
Appropriations (in millions)				
Department or Agency	1990 Actual	1991 Proposed	1991 Actual	% Change from '90
Defense and Energy (military)	\$39,297.9	\$40,629.3	\$38,363.9	- 2.4
Health and Human Services	8,506.0	8,933.0	8,931.5*	+ 5.0
(NIH only)	(7,576.0)	(7,928.0)	(8,277.0)	(+ 9.2)
NASA	5,246.0	7,074.0	6,023.6	+14.8
Energy (civilian)	4,245.6	4,266.2	4,511.1	+ 6.3
National Science Foundation	2,121.8	2,383.0	2,316.1	+ 9.2
Agriculture	1,117.7	1,173.4	1,233.0	+10.3
Environment	425.9	449.6	433.6**	+ 1.8
NIST	164.0	198.0	215.0	+31.0
All others	5,609.1	6,092.5	6,708.2	+19.6
Total	\$66,734.0	\$71,199.0	\$68,736.0	+ 3.0

* Rough estimate reflecting HHS expectation.

** Based on estimates by agency officials.

"Totals" for each column, provided by the Congressional Research Service, reflect substantial rounding. The Congressional Budget Office expects to have more precise figures in about a month. Figures for the "All others" category (derived by subtracting appropriations for listed agencies from the total) thus represent very rough estimates.

Nearly three-quarters of its total R&D budget will support Space Station Freedom (at \$1.9 billion) and space-science research. However, Congress warned NASA to keep tight reins, particularly on the development of the space station, now consuming almost one in every three NASA R&D dollars. The lawmakers have required the agency to submit a less costly design for the space station by February, and has restricted increases for this program to no more than 10 percent a year (regardless of inflation) and a total of \$2.6 billion annually.

Though Congress killed plans to launch new programs aimed at sending human missions to the moon and Mars — a much-publicized goal of President Bush — the lawmakers did provide \$263 million for one new project. Known as Mission to Planet Earth, this program aims to study Earth's climate from orbiting platforms and small spacecraft.

EPA: Congress increased the Environmental Protection Agency's overall R&D funding to an estimated \$433.6 million, a figure that did not keep pace with inflation. The 25 percent increase (to about \$18.6 million) in the agency's global climate change programs increased at five times the inflation rate. And for the first time in EPA's history, research spending in its Superfund (toxic-waste cleanup) program suffered a decline — of \$5.6 million, or roughly 12.5 percent after inflation. Congress did appropriate \$400,000 for one new program: an independent evaluation of the nation's environmental research — a possible first step toward creating a national environmental institute akin to NIH.

DOD: The \$35.9 billion that Congress appropriated for defense research, development, test and evaluation programs represents about \$2 billion less than the President had requested — and a decrease of roughly 7 percent in spending power, after accounting for inflation. Lawmakers saved their single largest R&D cut for DOD's Strategic Defense Initiative. Though the President had sought \$4.5 billion, Congress appropriated only \$2.89 billion — 19 percent less than last year — and directed DOD to reevaluate this program with an eye toward cutting costs and boosting efficiency. Congress also approved the appointment of a joint DOD/civilian commission to analyze DOD's options for cutting costs and reorganizing the Pentagon's 72 R&D labs.

Although the President had sought to cut funding for DOD's Advanced Research Projects Agency by 12 percent, Congress boosted that agency's budget by 14 percent, to \$1.4 billion. This figure targets increases for advanced submarine technology and X-ray lithography, and money to create a \$50 million program aimed at developing new technologies. The new budget package also directs DOD to spend \$20 million more on graduate training, \$50 million to establish an engi-

neering training institute and \$150 million to launch a Strategic Environmental Research Program that will share DOD's environmental and global-change data with other U.S. agencies.

DOE: The 1 percent increase (\$74.7 million) Congress approved for the Department of Energy's total R&D budget — \$6.9 billion — does not keep pace with inflation. Moreover, most of the increase is earmarked for projects "that amount to pork-barrelling," says DOE spokesman Jeff Sherwood. That leaves only about \$191 million — the amount being cut from the agency's defense programs — for reallocation elsewhere in DOE's civilian programs.

The Superconducting Super Collider received just \$242.9 million (including \$25 million held over from the 1990 budget), a "paper" increase over 1990's allocation. Solar energy programs, by contrast, reaped a real bonanza — an increase of 46 percent above 1990, to \$131 million. Fossil energy programs, primarily coal research, also increased notably — to \$459 million, an increase of 11.8 percent. Congress slashed "hot" fusion funds to \$275 million, however, for a decrease of 15 percent.

NIST: The 31 percent increase Congress slated for R&D programs at the National Institute of Standards and Technology

exceeds that for any other agency, and will allow NIST to launch several new programs: a \$900,000 "intelligent processing of materials" initiative, a \$1.48 million "intelligent machines" venture and a \$1.5 million advanced semiconductor program. Funding for its chemical measurements and standards program more than tripled (to \$1.4 million); its Manufacturing Technologies Centers received almost a tripling in funds (\$11.9 million); its lightwave technology program more than doubled (to \$4.23 million); and a computer-security program focusing on "viruses" increased by 40 percent (to \$3.5 million).

As the White House prepares to release its 1992 budget request in January, a Nov. 13 update of a Congressional Research Service report warns that things look less rosy for science over the next two fiscal years. The 1991 Budget Reconciliation Act limits the annual growth for all "non-defense discretionary funding" to 4.7 percent in 1992 and 3.7 percent in 1993. "This will place severe limits on future increases for civilian R&D funding and could force the restructuring of a number of big science projects," the report concludes. But Presidential Science Adviser D. Allan Bromley says that for now at least, "Congress had done very well by science and technology." □

Continued from p.377

Johns Hopkins University in Baltimore, where John Hesla and his colleagues use a variation on Cohen's grinding method.

Hesla's group first placed rabbit eggs in a sugar solution to enlarge the perivitelline space. Taking care not to damage the eggs themselves, the researchers speared the zona with a microneedle and mechanically ground away a portion of the zona shell. Then they mixed the altered eggs with rabbit semen containing a high concentration of sperm. At the infertility conference, Hesla reported an 80 percent fertilization rate — comparable to that achieved when the team incubated unaltered rabbit eggs with high concentrations of sperm.

With sperm concentrations, the fertilization rate for unaltered eggs dropped to 7.5 percent, whereas the zona-opened eggs showed a much better rate of 36 percent, he says.

"The technique, if perfected, could be a new dimension for *in vitro* fertilization," Hesla suggests.

Stillman and others speculate that if researchers can improve on their fertilization rates and adapt the still-experimental techniques for widespread human use, zona opening might offer hope not only to couples with sperm insufficiencies but also to those whose infertility results from other factors, such

as zona abnormalities that block the entry of sperm.

The new micromanipulation techniques do raise some safety concerns, however. Richard D. Amelar of New York University, a specialist in male infertility, suggests that such methods might give an edge to genetically defective sperm. He wonders whether immobile or feeble sperm — which normally don't stand much chance of penetrating the egg's inner sanctum — might be more likely to harbor serious DNA mutations than their more vigorous counterparts. "Are we creating embryos that are genetically abnormal?" Amelar asks.

So far, researchers have reported no evidence of such problems. Cohen says he finds no correlation between poorly swimming sperm and genetic abnormalities, and Lippi says her group did not detect an increase in genetic problems when comparing embryos fertilized by needle with those produced in the standard IVF procedure, in which the sperm do the work of cracking the zona.

In any case, clinicians remain cautious about recommending the experimental procedures to infertile couples, noting that investigators have yet to achieve significant success rates in humans.

"Unfortunately, progress to date has been disappointing. We would have liked, over the last three or four years, a bit more of a breakthrough," says Stillman. "It may come, but we haven't seen it yet."

Cohen adds, "I think there's hope." □