

CONGRESS ENACTS 1995 R&D BUDGETS, WITH NIST AND NSF THE BIG WINNERS

All things considered, the contentious 103rd Congress found it relatively easy to complete action on 5 of the 13 regular appropriations bills for fiscal 1995. Before the members returned from an abbreviated summer break on 12 September, they had enacted the budget bills for the Departments of Commerce and Energy, each containing appropriations for R&D activities, and they had virtually completed negotiating the budgets of the National Science Foundation, NASA, the Environmental Protection Agency and the Office of Science and Technology Policy. With Congress determinedly deadlocked on health-care legislation and exhausted by acerbic haggling on the crime-control bill, it was with a sense of relief that most of the R&D money bills were enacted before the new fiscal year began on 1 October and that some agencies and programs fared so well.

For a few agencies, the results exceeded all expectations. This was in sharp contrast to the whole Federal budget, in which all discretionary funding was frozen for fiscal 1995. With tight caps imposed by an agreement between the White House and Congress in 1991 and fixed for five years thereafter, there seemed little hope of exceeding any budget increase amounting to more than the 2.8% rate of inflation. As it turned out, the 13.8% rise for the NSF over its appropriation for fiscal 1994 and the whopping 64% jump for the National Institute of Standards and Technology startled just about everyone at those agencies and at the White House. But the grand total for each agency needs to be scrutinized closely. The big boosts at both NSF and NIST were in programs that had little to do with scientific research, let alone physics and its related fields.

Rewarding NSF's director

A House-Senate conference committee agreed to more than double President Clinton's requested increase for NSF, handing the agency \$3.36 billion for its research, education and facilities modernization activities. One reason NSF did so well is that Senator Barbara Mikulski, the Maryland Democrat who heads the Senate appropriations subcommittee that handles NSF's budget, decided to reward the foundation and its director, Neal Lane, for meeting her demands to demonstrate that the agency's re-

search programs will attempt to benefit more directly the economic and social needs of the country.

The assertive statements in Mikulski's committee report issued on 14 July strengthen the position she took on NSF's "strategic research" in last year's report on the agency's budget bill (PHYSICS TODAY, October 1993, page 109). The new report commends Lane and the National Science Board for embracing her challenge to NSF to "emphasize support for research and education in strategically important areas; strengthen its partnership with industry, state and local governments and other Federal agencies; address the issue of modernizing the nation's academic research infrastructure; and develop performance milestones that will be used to judge the effectiveness of the agency's programs and initiatives." Mikulski notes that partnerships and relationships with industry and other government agencies are improving and that Lane and the science board are already drafting a "comprehensive long-range strategic plan" for the agency that they will submit to Congress by 1 November.

Mikulski's subcommittee has already done some of the work for Lane and the board. The conference report leaves little to chance—or for that matter, for NSF to change. In giving the foundation the largest increase for any department or agency in the \$90 billion allocation for all the budgets in the appropriations bill for Veterans Affairs, Housing and Urban Development and sundry independent agencies, Congress was specific: Within NSF's research account, \$10 million more than the agency had requested was assigned for manufacturing research, \$10 million extra for civil engineering infrastructure, \$6 million additional for studies of the human consequences of global climate change, \$2 million to establish a National Center for Environmental Research and \$2 million to set up an interdisciplinary center to investigate violent behavior. But the conference also proved the old adage that Congress can give but also taketh away: It slashed \$33 million from the global climate change program, \$15 million from the high-performance computing initiative and \$54.3 million as a general reduction to be made by NSF's director from research programs, which could wreak havoc in such traditional fields as physics and chemistry.

In addition, Congress gave pointed directions on how NSF was to spend increases in the education account: \$5.8 million for advanced technology education at community colleges, \$4 million more for graduate traineeships, \$3 million extra for the pre-college urban science and math education program launched in fiscal 1994, \$1 million more for a rural pre-college program and \$2 million to create a competitive, merit-reviewed program for states to develop electronic libraries. To make up some of the cost of the new outlays, NSF's director was instructed to cut \$5 million from the education directorate at his discretion.

Reinvigorating LIGO

NSF's account for major research equipment received a boost, to a total of \$126 million. After rescinding \$35 million in fiscal 1994 from the account for the embattled Laser Interferometer Gravitational Wave Observatory, Congress reapportioned the same amount for LIGO in 1995. Funding LIGO is a significant step to reinvigorate a project that has endured management changes, location problems and acrimonious scientific differences.

For another NSF project, the twin Gemini 8-meter telescopes, the lawmakers appropriated \$41 million in what they termed "forward funding." With the optical-infrared telescopes now being constructed in Hawaii and Chile, the money is designated for a two-year period, in which the US contribution to the project will be fulfilled. (The other partners in the telescopes are Britain, Canada and three South American countries—Argentina, Brazil and Chile.) The accounting gimmick of forward funding allows Congress to appropriate in fiscal 1995 but not to obligate half of the money to be spent until the following fiscal year, which begins 1 October 1996. By doing this, Congress is able to stay within its budget allocation this year.

As an encore, Congress performed another accounting trick in giving the foundation \$250 million for academic research infrastructure. NSF had requested \$55 million for the program but the lawmakers apparently considered that sum paltry. In the conference report, the lawmakers expressed their "deep concern" about the "staggering need" to come to grips with outdated and outclassed buildings,

laboratories and equipment at the nation's colleges and universities. This problem was identified in 1986, when David Packard and D. Allan Bromley, then serving on the White House Science Council, estimated that dealing with the situation might cost as much as \$10 billion over a decade (PHYSICS TODAY, March 1986, page 65). Since then an NSF survey of the problem has found that modernizing academic research buildings and labs would cost between \$8 billion and \$10 billion.

Of the \$250 million for 1995, Congress approved spending \$118 million this fiscal year for NSF facilities and for the agency's present instrument modernization program, leaving the remaining \$132 million for a new interagency program for facilities and instrumentation that is to be managed by the foundation. The catch is that the funds will not be made available until the last month of fiscal 1995 and, what's more, will be "automatically" rescinded if the President's budget request for NSF in fiscal 1996 does not include \$250 million for improving the academic research infrastructure. By holding off on actual outlays, Congress maintains the spending cap. Congress also asked the President's Cabinet-level National Science and Technology Council to prepare a five-year interagency plan for repairing and replacing the academic infrastructure. The conference proposed using merit-review procedures to select the institutions that would benefit most—a technique that would help lessen the use of "earmarks" for colleges and universities. (Earmarking is also called "pork" by opponents, who argue that the practice avoids peer review and legislative debate and also tends to reduce the amount of money in agency budgets for research that has been approved by merit procedures and authorized by Congressional committees.) If NSF gets the job of choosing which schools are worthy of being funded for new or upgraded infrastructure, the agency is likely to suffer Excedrin headaches or worse.

Worrying about DOE projects

The Energy Department has headaches of its own. These result from its magnetic fusion program, high-energy physics and the basic energy sciences. While magnetic fusion was appropriated \$372.6 million, the amount requested last February, Congress is clearly worried about the future of the program. "It is the intent of the conferees," says the House-Senate report on 4 August, "that the Tokamak Physics Experiment project [to be constructed at the Princeton

Bottom lines: Research budgets for fiscal 1995

	FY 94 estimate	FY 95 request	FY 95 enacted	Percentage gain (loss)
(millions of dollars)				
National Science Foundation	2982.8	3199.0	3395.6	13.8
Research and related activities	2163.7	2348.3	2280.0	5.4
Academic research infrastructure modernization	105.0	55.0	250.0	138
Major research facilities	52.0	70.0	126.0	142
Laser Interferometer Gravitational Wave Observatory	35.0	50.0	35.0	0
Gemini 8-meter telescopes	17.0	20.0	21.0	23
Education and human resources	569.6	586.0	606.0	6.4
Department of Energy				
General science and research	1615.1	1076.6	984.0	(39)
High-energy physics	617.5	621.9	646.9	4.8
SLAC B Factory	36.0	44.0	44.0	22
Fermilab main injector	25.0	43.0	43.0	72
Superconducting Super Collider termination costs	640.0	143.5	0	
Nuclear physics	348.6	300.8	334.7	(4)
Brookhaven Relativistic Heavy Ion Collider	78.0	70.0	70.0	(10)
CEBAF, Newport News, Virginia	16.0	1.0	1.0	(94)
Basic energy sciences	790.4	741.3	747.3	(5)
Argonne 6-7-GeV synchrotron light source	107.0	58.4	58.4	(45)
Oak Ridge advanced neutron source	17.0	40.0	21.0	23
Fusion energy	343.6	372.6	372.6	8.4
Solar and renewable energy	345.9	409.7	388.1	12
University and science education	58.0	60.5	65.5	13
Defense activities	10740.9	10523.1	10300.8	(4)
Inertial fusion	185.1	176.5	176.5	(5)
Weapons research, development and testing	1698.8	1563.2	1524.9	(10)
Environmental restoration and waste management	5181.8	5194.4	5092.7	(2)
National Institute of Standards and Technology	520.2	935.0	854.7	64
Scientific and technical research and services	226.0	316.0	265.0	17
Industrial technology services	232.5	519.0	525.0	126
Advanced Technology Program	199.5	451.0	431.0	116
Manufacturing Extension Partnership	30.2	30.2	90.6	200
Quality outreach	2.8	6.9	3.4	21
Construction of research facilities	61.7	100.0	64.7	5
NASA	14527.4	14240.7	14376.7	(1)
Science, aeronautics and technology	NA	5901.2	5901.2	
Human space flight	NA	5719.9	5573.9	
Space station	2.1	2.1	2.1	0
Mission support	NA	2662.6	2554.6	
National Oceanographic and Atmospheric Administration	1694.8	1743.0	1850.0	9
Oceanic and atmospheric research and facilities	226.8	238.0	242.4	7
Office of Science and Technology Policy	4.5	5.0	5.0	12

Plasma Physics Laboratory] proceed with design activity only, including industrial participation in the engineering design and research and development." In the meantime the Tokamak Fusion Test Reactor, which was supposed to be shut down by last month, should continue to operate for another year, when Congress might see fit to approve building TPX. The report observes that the conference members "recognize the very significant scientific accomplishments of the deuterium-tritium experiments on the TFTR," which produced more than 6 million watts of fusion power in December 1993 (see PHYSICS TODAY, January, page 17). Since then the TFTR has achieved 9.2 million watts in a D-T run, and the Princeton fusion team is determined to surpass 10 million watts during fiscal 1995.

DOE had asked for \$66.9 million to continue designing and to begin building TPX in 1995, but Congress instead allotted \$42 million for its

design and gave \$65 million to carry on operating TFTR for another year. In fact, a DOE committee sent to review the TFTR found that it was safe and sound enough to continue operating as long as the money didn't run out.

But Senator J. Bennett Johnston, the influential Louisiana Democrat who chairs his chamber's energy and water appropriations subcommittee, has voiced his worries about the department's plans for magnetic fusion. In his report on the energy bill, issued 26 May, Johnston noted that DOE views TPX as an important step leading to the International Thermonuclear Experimental Reactor, now being designed by a collaboration of scientists and engineers from the US, Russia, Japan and the European Community. He states in his report that DOE has ignored Congress's directive for two years running to provide details on the milestones and budgets for building ITER and on the

process for selecting the site for the huge demonstration plant, which is supposed to start being built in 1998.

In the report Johnston argues that the department's unwillingness to respond to this Congressional directive jeopardizes the future of the ITER project and the US fusion program. Because ITER would most likely cost \$10 billion to build and another \$10 billion to operate over its lifetime, and, he claims, the host country might be expected to foot 60% or 70% of the total bill, Johnston considers it "imperative" that Congress and the White House be fully committed to fund the project to its conclusion. Accordingly, Johnston calls for "a eye-wide-open debate" and a political commitment to the project. So while the Senate appropriations committee supports TPX and ITER, says the report, "we strongly believe we should not pursue TPX unless and until both the President and the Congress have made a full commitment to ITER. To proceed without such a commitment is to invite another SSC debacle."

In addition to funds for TPX and TFTR, Congress gave \$52 million to upgrade and operate the DIII-D tokamak at General Atomics in San Diego and \$8.7 million to support the unclassified nondefense inertial confinement fusion program, which is now seeking to build a massive \$10 billion National Ignition Facility at Lawrence Livermore National Laboratory (see PHYSICS TODAY, September, page 17). Because of the large budget requirements to develop fusion, which the DOE conference report calls "an attractive energy source," the lawmakers urge President Clinton's newly appointed Advisory Council on Science and Technology to "undertake a review and evaluation" of magnetic fusion and inertial confinement fusion and to "issue a report that will help shape the direction of the nation's effort" on these technologies.

Though Clinton's budget request for fiscal 1995 sought \$40 million to begin constructing the \$2.9 billion Advanced Neutron Source at Oak Ridge National Laboratory, Congress instead provided \$20 million for operating expenses and \$1 million for capital equipment. A similar request to build the machine last year was also turned down by Congress. This time the lawmakers Congress insisted that DOE line up industry to take part in the engineering design and in R&D for the ANS.

Terminating the SSC

No new funds were provided for the SSC's "orderly termination," though \$65 million in previously appropri-

ated funds can be made available as a one-time contribution if the Energy Secretary determines that the money will "assist the maximization of the value of the investment made in the facilities and is in furtherance of a settlement of claims" that Texas holds against the US in connection with cancelling the project. Congress is adamant on one point: Nothing can be spent for SSC operations of any sort.

Congress gave DOE-funded high-energy physics \$646.9 million, the amount recommended by the House and \$25 million more than the Administration's request. Nuclear physics got \$334.7 million, \$34 million more than the department sought. Basic energy sciences received \$747.3 million, \$6 million above the request, but \$43 million below 1994's appropriation. The 1995 figure for basic energy sciences is about \$100 million less than the appropriation in 1993. This can be accounted for by some \$95 million that members of Congress had added in unrequested slices of pork.

These are parlous times for DOE research programs. Attempts by some Republican members of Congress to place an upper bound on DOE's energy programs have sounded a warning of what the research community can expect if, as is widely predicted, Republicans make substantial gains in Congressional elections in November. An effort was made by Robert Walker of Pennsylvania, the senior Republican on the House Committee on Science, Space and Technology, to impose a cap of \$4.3 billion for the next four years on the budget of DOE's general science and research activities, which include high-energy and nuclear physics, fusion R&D, basic energy sciences and environmental restoration and waste management. Walker's hard freeze until fiscal 1999 wouldn't even allow increases for inflation. Walker's idea is in an amendment to HR 4908, the Hydrogen Fusion and High Energy and Nuclear Physics Act, a House authorization bill that has little chance of passage in the few remaining weeks of the 103rd Congress. If Congress buys Walker's cap, however, it would have a devastating effect on DOE's R&D program and might force the department to curtail some programs and close some facilities. A substitute amendment to the same bill, introduced by Representative Sherwood Boehlert, a New York Republican who is an important member of the House science committee, would add \$50 million to the Walker cap, but only for three years. This would have the effect of providing \$50 million in each of the next three years—a recommen-

dation for DOE's high-energy physics program made by a subpanel of the High-Energy Physics Advisory Panel, led by Sidney Drell of SLAC (see PHYSICS TODAY, July, page 51).

As expected, the big winner in the 1995 appropriations marathon was NIST. As the standard-bearer of the Clinton Administration's industrial policy, the little agency that was once known as the National Bureau of Standards got an overall 64% increase. The intramural research program, which covers most of the agency's traditional work, received \$265 million, a 17% increase over 1994 but \$49 million less than the President's request. In this account, physics was given \$27.5 million, nearly \$1 million more than in the last fiscal year, and chemistry and materials science did much better than in 1994. The industrial technology services did best by far. The Advanced Technology Program, initiated in 1990 with a \$10 million allotment, received \$431 million for fiscal 1995. The appropriation is \$20 million below the Administration's request but still a 126% improvement over 1994. The Clinton Administration has stated its intention to recommend annual increases for ATP, up to \$750 million in fiscal 1997. The broad objective of ATP is to promote rapid commercialization of high-risk technologies by assisting American companies to adopt new technologies and manufacturing processes and to raise productivity and improve quality.

Funding the space station

The battle over NASA's space station ended with unexpectedly lopsided votes of confidence in the House and Senate on the beleaguered project. During the Senate debate, Dale Bumpers, a Democrat of Arkansas who has been the project's most ardent opponent for years, argued that the price tag to build and operate the station would eventually be more than \$70 billion. He claimed that it was essentially a jobs program, with the benefits going to three states and that it would have little or no commercial or scientific value. During the Senate debate, which consumed more than five hours over two days, Senator Herb Kohl, a Wisconsin Democrat, probably contributed the most memorable one-liner: "The space station is a project that does not do what it is supposed to do, and it does not do it at a very high price."

In the end, Congress provided \$2.1 billion for the station in 1995—equal to both the request and the 1994 funding.

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