

ALONG WITH GAINS FOR R&D IN 1991 COME ILLUSORY RISES AND GRIM REVERSES

For most of the summer and fall it seemed the nation's founders had invented a government marvelously perfected for paralysis. Congress's on-again-off-again budget duel with the White House finally became a deal for the House just before dawn on Sunday, 28 October, and for the Senate at dusk that same day, nearly a full month after the official start of fiscal 1991. By then the thoughts of exhausted lawmakers centered on other matters—notably, for nearly all House members and a third of the Senate, their own reelections, not to mention the continuing sluggishness of the economy and the military buildup in the Middle East. The new five-year deficit-reduction package and the 13 appropriations bills agreed on by the 101st Congress contained R&D budgets that were much better than expected for some agencies, considering the dire predictions of across-the-board cuts and Gramm-Rudman-Hollings budget-balancing reductions. While Defense Department research programs and the National Institute of Standards and Technology got more than President Bush had asked for, there were illusory gains in research accounts at the Department of Energy and the National Science Foundation and, much more disturbing, real reverses in DOE's magnetic fusion program and NSF's proposed Laser Interferometer Gravitational Wave Observatory, commonly called LIGO.

NASA, the largest of the science agencies, fared well in physics and astronomy, and even better in Earth sciences because of the Global Climate Change initiative that Congress is ready to underwrite at almost any cost. But the President's request for the space station was cut by \$551 million, to \$1.9 billion. Congress is so soured by the project's delays, redesigns and soaring cost estimates that it refuses to sweeten the budget. In fact, the House-Senate conference report accompanying NASA's total \$13.9 billion appropriation decreed that the station can only grow by 10%

per year, including inflation, up to an annual maximum of \$2.6 billion.

To emphasize the fiscal rigors ahead, Congress "zeroed out" President Bush's pet megaproject, the Moon-Mars mission, for a saving of some \$300 million. On the plus side, the House-Senate conference restored all but \$3 million to the \$148 million requested for the CRAF-Cassini paired probes to Comet Kopff and to Saturn. The Senate had suggested a \$50 million cut, but last-minute lobbying by planetary scientists apparently found a receptive audience in the House.

Until the final weeks of the budget imbroglio, NSF stood to gain about 13%, with a giant leap in the education account and a respectable 8.9%

increase for research programs. Then the White House Office of Management and Budget objected to the budget "scorekeeping" by the House and Senate appropriations committees, which would require the Pentagon to reimburse NSF for logistical support in the Antarctic scientific station. In the end, NSF lost \$40 million—all of it taken from the research account, reducing the increase to 6.4%. But because the foundation must continue to support the diversity of research centers it created in the 1980s, the divisions that fund principal investigators will be squeezed once again. Accordingly, physics, chemistry and mathematics will only go up 4.1%.

The budget for Defense Department

Bottom lines: Research budgets* in fiscal 1991

	FY 90 estimate	FY 91 request	FY 91 enacted	Percentage gain (loss)
	(millions of dollars)			
National Science Foundation	2083.6	2383.0	2316.1	11.1
Research and related activities	1592.4	1809.2	1694.2	6.4
Science education**	220.5	273.3	322.4	46.2
Research facilities modernization	20.0	20.0	20.5	2.5
Department of Energy				
General science and research	1093.3	1273.7	1148.7	5.1
Superconducting Super Collider	217.0	317.9	242.9	11.9
Magnetic fusion	331.0	325.3	275.3	(-16.8)
Inertial fusion	169.2	166.8	175.0	3.4
Biological and environmental research	308.7	338.8	396.4	28.4
Basic energy sciences	582.5	648.7	716.3	23.0
Department of Commerce				
National Institute of Standards & Technology	161.8	198.4	215.3	33.1
Oceanic and atmospheric research	172.8	199.5	207.0	19.8
NASA				
Research and development	5227.8	7074.0	6023.6	15.2
Physics and astronomy	861.4	985.0	1014.0	17.7
Planetary exploration	391.7	485.2	452.2	15.4
Earth sciences and applications	439.3	661.5	674.5	53.5
Space Station Freedom program	1749.6	2451.0	1900.0	8.6
Department of Defense				
Army research sciences	172.6	179.5	175.5	1.6
Navy research sciences	341.6	374.4	371.4	8.7
Air Force research sciences	182.2	193.2	195.2	7.1
University research initiatives	96.0	98.7	174.2	81.5
Strategic Defense Initiative	3819.1	4663.3	2890.0	(-24.3)
Defense Advanced Research Projects Agency	1227.0	1078.0	1400.0	14.1

* Detailed breakouts of line items are not yet available.

** Adjusted for restructuring into the NSF Education and Human Resources Directorate.

research sciences, which appear in the 6.1 account, meets the President's request. Congress also increased the appropriation for the Defense Advanced Research Projects Agency by more than \$320 million, to accommodate the funding of high-tech projects that promise to improve US economic competitiveness. (See the following story.) The conferees agreed to the full \$20 million requested for the DOD Graduate Fellowship Program and accepted the House proposal to add \$50 million for new graduate programs to be used "in the best manner to increase and maximize the quantity of scientists and engineers resulting from Defense-sponsored research."

Although DOD's University Research Initiatives program received the full amount of the President's request, \$98.7 million, it also got an extra \$75 million for "pork barrel" projects, mainly at universities. During a heated debate on the legislation, Sam Nunn, the influential Georgia Democrat who heads the Senate armed services committee, supported by John Danforth, a Republican from Missouri, objected to the earmarking when the Senate hadn't discussed the matter, and promised to revisit the issue in the 102nd Congress.

After NASA, which took the cruellest hit from President Bush's request, the agency most affected by the new budget is DOE. Magnetic fusion research was funded at \$275.3 million, down nearly 17% from fiscal 1990. Layoffs are already taking place at the Princeton Plasma Physics Lab, and construction of the Compact Igni-

tion Tokamak is on hold for the time being at least. By contrast, inertial fusion, located in the DOE defense program, received additional sums for upgrading the Omega laser at the University of Rochester and the Nova laser at Lawrence Livermore.

The Superconducting Super Collider, which had been protected during most of the negotiations by Texas Senators Lloyd Bentsen and Phil Gramm, lost \$75 million from its \$318 million request—though these powerful forces were able to restore to the 1991 budget the \$25 million in "construction" funds enacted but withheld by Congress last year. Just before Congress adjourned, the Texas National Research Commission, which controls the \$1 billion set aside by the state for the SSC, agreed to release nearly \$150 million in two phases to make up any shortfalls in the project, which DOE now officially figures will to cost \$8.24 billion.

The Relativistic Heavy Ion Collider, to be built at Brookhaven, and the Continuous Electron Beam Accelerator Facility, nearing completion at Newport News, Virginia, were fully funded at \$15 million and \$65 million, respectively. But \$33 million was taken from the President's request for \$621 million for high-energy physics, and \$17 million was withdrawn from the \$331 million proposed for nuclear physics. These reductions are most likely to come from lab operations. Made in the final hours of the budget negotiations and without consultation with DOE officials or lab directors, the cuts angered SLAC Director Burton

Richter, who decried the "absentmindedness of weary conferees... who consider projects in a narrow box. With this budget the country's research enterprise is hurtling from stress to misery."

DOE's request for Basic Energy Sciences was increased by about \$68 million. This was done to compensate for most of the \$98.8 million in pork earmarks made by members of the House and Senate appropriations committees for specific academic research facilities in their home districts. The Basic Energy Sciences program will have to make up the difference of about \$20 million from its traditional programs, such as materials research and chemical science, or from construction funds at DOE laboratories. Congress also added \$22.2 million of pork into DOE's biological and environmental research program, mainly for laser instrumentation to be introduced at universities with medical centers.

In the end, the five-year budget law calls for caps on discretionary spending in defense, foreign aid and domestic programs, including science, allowing these to grow only by the projected inflation rate. However, the growth estimates are based on some especially optimistic economic assumptions that do not take into account the savings and loan debacle or the Persian Gulf military operation. The caps amount to 4.9% in 1992 and 3.7% in 1993—increases that suggest a nominal spending freeze on research programs and new projects in the next few years. —IRWIN GOODWIN

SEEKING TO IMPROVE COMPETITIVENESS, OSTP ISSUES FIRST US TECHNOLOGY POLICY

To understand US government policy about emerging technologies requires the combined talents of a lawyer, CEO, scientist, engineer, linguist and mind reader. Most people aren't sure a technology policy exists, mainly because the White House insisted for years that a free market economy doesn't need one and usually behaved in ways that made its position a self-fulfilling prophecy. So imagine the surprise elicited around the country when the Office of Science and Technology Policy released a document bearing the imposing title of "US Technology Policy" and carrying the great seal of the little White House agency.

Though it is the first statement on technology policy by any Administration, the 13-page policy paper appeared in October without the hype or

hoopla that usually accompanies such publications from the White House. Indeed, according to OSTP insiders, the policy document could just as easily carry the President's own seal, because it had the approval of nearly everyone of importance in the Bush Presidency—John H. Sununu, the White House chief of staff; Michael J. Boskin, chairman of the Council of Economic Advisers; Richard G. Darman, director of the Office of Management and Budget; Nicholas F. Brady, Secretary of the Treasury; and other Cabinet members and key advisers.

"We believe we've put together a Magna Carta of technology policy," William D. Phillips, OSTP associate director for industrial technology, told members of the President's Council of Advisers on Science and Technology at their 8 November meeting.

The document is more than a restatement of Bush's election manifesto, "Building a Better America." It advances some important new ideas, which may account for the eight months the paper took to be cleared for publication. Possibly its most significant paragraph recommends that the Federal government collaborate with private industry "in precompetitive research on generic, enabling technologies that have the potential to contribute to a broad range of government and commercial applications."

"In many cases," the paper continues, "these technologies have evolved from government-funded basic research, but technical uncertainties are not sufficiently reduced to permit assessment of full commercial potential. In precompetitive research,