

## R&D Budget Faces High Hurdles

*For the White House to get its way on research and development spending, Congress will have to cap other federal program budgets and find additional revenue*

**I**N a final gesture of support for the science community and the industrial sector, President Reagan has sent Congress a budget for fiscal year 1989 that could increase federal support for civilian and military research and development programs to \$62.5 billion. The proposal to hike spending by \$2.5 billion is not insignificant considering the tight spending caps adopted at last November's budget summit between congressional leaders and the White House.

On its face, the package of requests for R&D looks great. But many of the new initiatives and program expansions on the President's agenda are likely to be reshaped, delayed, or discarded as Congress seeks to hold the deficit to less than \$146 billion.

The Administration's plans for the civilian side of the R&D ledger include moving forward with costly new programs such as the Space Station, the Superconducting Super Collider (SSC), and the National Science Foundation's (NSF) science and technology centers initiative. At the same time the President wants to increase operating budgets for ongoing efforts in medical research, high energy physics, materials science, and other basic science endeavors. In total, nondefense R&D would rise by \$1.6 billion.

The request for defense R&D, which in

1988 was twice that spent across the rest of the federal government, would climb by \$900 million to an estimated \$41.2 billion. Although the Department of Defense (DOD) is having to abandon some research programs in response to spending ceilings, the National Aerospace Plane and the Strategic Defense Initiative (SDI) would get larger budgets.

As part of the budget summit Congress agreed to sharply reduce growth in defense spending and to cut overall federal spending by \$46 billion in 1989. After accounting for entitlement payments for social programs and farmers, there is room for just \$3.3 billion in new spending across all discretionary federal programs. The White House budget totals \$1.233 trillion—\$299.5 billion for defense and \$934 billion for nondefense expenditures, including \$145 billion in interest payments on the national debt.

■ **Gramm-Rudman.** The Administration's spending plans are largely consistent with what was mapped at the budget summit. Analyses by the House and Senate budget committees, however, suggest that the deficit could well exceed the \$136 billion threshold imposed by the Gramm-Rudman-Hollings deficit control legislation, which Congress revised last fall (*Science*, 30 Octo-

ber, p. 604). The committees note that \$10 billion in proposed asset sales cannot be claimed for deficit reductions. Also in question are other Administration plans for cutting costs and raising revenues.

As a result, there is the potential for the dreaded automatic sequester mechanism to be triggered next fall after the Office of Management and Budget (OMB) makes a final estimation of the deficit for (FY) 1989. If the estimate exceeds \$146 billion, across-the-board reductions would be leveled evenly against defense and nondefense accounts to lower the deficit to \$136 billion.

The Congressional Budget Office (CBO) is projecting that the actual deficit for 1989 could reach \$176 billion. CBO's estimate differs from that of OMB because of lower tax revenues, which are attributed to a slowdown in economic growth. The Administration is more optimistic, projecting that the gross national product will grow at 3.1% as opposed to the 2.6% projected by CBO. The difference translates to \$11.5 billion.

Even so, it is unlikely that Congress will attempt to tackle the deficit issue head on. Instead, it appears that the leadership in the House and Senate will try to skate through this election year by accepting OMB's projections for the deficit. "We'll spend all year masking the problem," comments Senator Ernest F. Hollings (D-SC).

The downside of this approach, of course, is that the national debt will grow that much larger and federal programs will face even tighter spending limits in FY 1990. To meet 1990 deficit reduction targets imposed under the Gramm-Rudman-Hollings law, an additional \$60 billion in budget reductions could be required, James L. Blum, CBO's acting director, told members of the House Budget Committee on 17 February. The next administration, says Hollings, "will have some very difficult choices to make."

Nevertheless, this year congressional budget squabbles are expected to center largely around the spending priorities in the President's budget. Highlights of the Administration's recommendations for research and development are described below.

■ **Biomedical research.** Despite the hostile budgetary climate, the Administration is

### CONDUCT OF RESEARCH AND DEVELOPMENT BY MAJOR DEPARTMENTS AND AGENCIES

(In millions of dollars)

Department or agency	Obligations			Outlays		
	1987 actual	1988 estimate	1989 estimate	1987 actual	1988 estimate	1989 estimate
Defense—Military functions.....	36,088	37,899	38,787	34,581	33,776	37,023
Health and Human Services.....	6,643	7,174	7,938	5,733	6,561	7,446
(National Institutes of Health).....	(5,850)	(6,318)	(6,229)	(4,956)	(5,643)	(6,181)
National Aeronautics and Space Administration.....	3,787	4,779	5,416	3,250	3,962	4,820
Energy.....	4,724	5,071	5,165	4,682	4,941	5,082
National Science Foundation.....	1,464	1,524	1,827	1,410	1,492	1,618
Agriculture.....	946	1,018	985	921	968	961
Interior.....	403	419	396	389	420	393
Environmental Protection Agency.....	348	350	374	326	340	335
Transportation.....	322	325	317	324	352	341
Commerce.....	405	408	312	308	360	333
Veterans Administration.....	210	216	216	195	209	202
Agency for International Development.....	223	208	199	230	243	198
All other <sup>1</sup> .....	527	560	585	513	539	563
<b>Total.....</b>	<b>56,089</b>	<b>59,952</b>	<b>62,517</b>	<b>52,862</b>	<b>54,162</b>	<b>59,314</b>

<sup>1</sup> Includes the Departments of Education, Justice, Labor, Housing and Urban Development and Treasury, the Tennessee Valley Authority, the Smithsonian Institution, the Corps of Engineers, and the Nuclear Regulatory Agency.

Source: OMB

proposing an overall increase for the National Institutes of Health (NIH) of 5.4%, for a total of \$6.5 billion, excluding funding for the acquired immunodeficiency syndrome (AIDS). AIDS research is slated at \$587 million, a 26% boost over this year. Altogether, the combined NIH budget will top \$7 billion for the first time.

The total number of research grants would climb to an all-time high of 20,600 (excluding AIDS grants). But this number is somewhat deceptive. Actual budget growth for most of the institutes is modest. As a result the number of new and competing grants that the agency awards annually will continue to fall in FY 1989.

In 1987, NIH funded 6278 new grants; in 1988 the figure drops to an estimated 5865. NIH projects that only 5611 new grants will be awarded in 1989, a decline of 667 compared to 2 years ago.

Furthermore, NIH budget officers say researchers can expect to enter into "downward negotiations" on funding of approved grants that are up for routine renewal. Ongoing grants may be cut in the neighborhood of 10%, while new grants may be paid at as much as 13% below amounts study sections approve. These reductions are not likely to be applied in a uniform fashion, but would be set at the discretion of the individual institutes. It is not clear at this time whether Congress will act to increase the

number of new awards, or restore proposed reductions in the size of grants.

Once again, the Administration is proposing to consolidate all AIDS funding, including NIH's share, in the office of the assistant secretary for health in the Department of Health and Human Services. But there is no apparent support for this move at NIH, and Congress rejected a similar proposal last year. If AIDS research had an institute all its own, it would now rank fourth in the NIH constellation, with \$588 million for research that is spread among a number of institutes.

The cancer institute remains the richest of the NIH institutes, with a budget request of nearly \$1.5 billion—a raise of \$90 million. The heart institute continues to rank second, with a budget total of slightly more than \$1 billion. Third is the National Institute of General Medical Sciences with a proposed budget of \$676 million. This includes \$28 million for the controversial program to map the human genome, a boost of \$11 million over 1988.

Funding for the National Institute of Mental Health is expected to rise from \$356 million to \$373 million in 1989. The research budget would climb from \$253.6 million in 1988 to \$271.7 million. Most of these funds will go to support research conducted outside the agency at universities and by contractors. Total extramural spending at the agency would rise from \$191

million this year to \$206 million in 1989.

■ **National Science Foundation.** The Administration proposes to increase the National Science Foundation's (NSF) budget by 19%, bringing it to \$2.05 billion. Director Erich Bloch has not abandoned his 1988 proposal to double the agency's budget from its 1987 level of \$1.62 billion within the next 4 years. Legislators rejected NSF's bid for a 17% increase this year, allowing just 6% growth instead.

Passage of the President's 1989 budget request, he says, would get things "back on track." With the Reagan Administration about to expire, however, Bloch notes that the goal of doubling NSF's budget by 1992 will not be realized unless Congress takes up the cause.

Three strategic themes are emphasized in the agency's budget: education and human resources, strong disciplinary research programs and supporting facilities, and science and technology centers and groups. Among NSF's major programs, science and engineering education in 1988 got the largest percentage increase, 40%, raising its funding to \$139 million. In the proposed 1989 budget, education is scheduled for a 12% boost to \$156 million. The major portion of the increase, some \$18 million, is designated for precollege education—bringing the program's funding to \$108 million.

Funding for research and related activities, the largest portion of the agency's budget, would rise 10% to \$1.6 billion. Individual researchers will continue to claim about two-thirds of the total research activities budget with the remainder going to the agency's existing research centers.

Bloch is again trying to win congressional approval to start 12 to 15 new science and technology centers, a program first endorsed by the Administration in FY 1987 (*Science*, 3 April 1987, p. 18). He is asking Congress to provide the agency with \$150 million in budget authority, which would be carried on a separate line on NSF's books, apart from the research activities account.

This funding approach, agency officials argue, would ensure that the centers could be established over the next 4 or 5 years. It also would help assure program stability and encourage states and industry to enter into cost-sharing agreements for the centers. Actual outlays in 1989 would be about \$15 million.

■ **Department of Defense.** The budget agreement negotiated late last year between the congressional leadership and the Reagan Administration will, if honored, result in a budget of \$299.5 billion for defense programs in FY 1989. That is \$33 billion less

#### CONDUCT OF BASIC RESEARCH BY MAJOR DEPARTMENTS AND AGENCIES

(In millions of dollars) <sup>1</sup>

Department or agency	Obligations			Outlays		
	1987 actual	1988 estimate	1989 estimate	1987 actual	1988 estimate	1989 estimate
Agencies supporting primarily physical sciences and engineering: <sup>2</sup>						
National Science Foundation.....	1,382	1,439	1,734	1,329	1,404	1,526
National Aeronautics and Space Administration.....	1,014	1,229	1,374	865	1,017	1,223
Energy.....	1,061	1,185	1,265	1,040	1,175	1,259
Defense—Military functions.....	904	892	906	844	837	874
Interior.....	124	131	125	121	132	125
Commerce.....	26	27	27	26	25	27
Other Agencies <sup>3</sup> .....	8	7	6	9	11	6
Subtotal.....	4,519	4,911	5,437	4,233	4,601	5,039
Agencies supporting primarily life and other sciences: <sup>4</sup>						
Health and Human Services.....	3,859	4,160	4,260	3,282	3,767	4,204
(National Institutes of Health).....	(3,578)	(3,854)	(3,965)	(3,007)	(3,429)	(3,891)
Agriculture.....	446	471	470	430	443	450
Smithsonian Institution.....	72	77	77	70	76	73
Environmental Protection Agency.....	31	32	31	30	30	27
Veterans Administration.....	17	18	18	16	16	18
Other Agencies <sup>5</sup> .....	19	20	12	18	19	15
Subtotal.....	4,444	4,777	4,868	3,845	4,352	4,787
Total.....	8,963	9,689	10,306	8,078	8,953	9,826

<sup>1</sup> Amounts reported in this table are included in totals for conduct of R&D.

<sup>2</sup> Includes mathematics and computer sciences.

<sup>3</sup> Includes the Corps of Engineers, the Tennessee Valley Authority, and the Department of Transportation.

<sup>4</sup> Includes psychology and social sciences.

<sup>5</sup> Includes the Departments of Education, Labor, Justice, and Treasury, and the Agency for International Development.

Source: OMB

than the Administration was originally planning to spend. The budget proposed last week conforms to the agreed level by cutting manpower levels, terminating some weapons programs, and limiting spending on research and development to an increase that will barely keep pace with inflation.

For the first time in the Reagan years, the share of the federal R&D budget scheduled to go to military programs is set to decline slightly, from 67 to 66%. DOD is planning to spend \$38.7 billion on research, development, test, and evaluation next year, of which \$906 million—a mere 2.3%—is designated as basic research. In fact, DOD's basic research budget is slated to increase by only 1.5%. In addition, the Department of Energy (DOE) is planning to spend \$2.4 billion on weapons-related R&D, about the same as in FY 1988.

The Strategic Defense Initiative (SDI) is now the largest item in DOD's research and development budget. Congress appropriated about \$3.9 billion for the total SDI research program for FY 1988, including \$353 million to be spent by DOE. The Administration is requesting some \$4.95 billion for FY 1988, an increase of about 27%. As hefty as these numbers are, they still fall well short of what the White House had hoped to spend on SDI. The request for FY 1988 was \$5.8 billion and the original plan for FY 1989 was \$6.6 billion.

Defense department officials acknowledge that the cuts will delay by a year or more the 1992 target date for deciding on whether to go ahead with engineering development of a missile defense system. About half of the SDI budget would be devoted to technologies that could be deployed in a first phase of defense, such as space-based and ground-based interceptors, and about 40% will be devoted to longer term projects such as directed-energy weapons.

The most prominent weapons program slated for termination is the development of a small mobile intercontinental ballistic missile. Commonly dubbed "Midgetman," the weapon has been a favorite of Congress and many in the arms control community. In its place, Defense Secretary Frank Carlucci is proposing a cheaper option of ultimately building a force of 100 ten-warhead MX missiles based on rail cars. Carlucci announced, however, that \$200 million will be provided to keep the Midgetman program alive long enough for the next Administration to decide whether to save it or kill it.

■ **Department of Energy.** The proposed budget for basic science research in DOE, which includes nuclear and high energy physics, would rise from \$1.367 billion this year to \$1.713 billion in FY 1989—a 25%

increase. The totals are heavily influenced by several factors that obscure what is really happening, however.

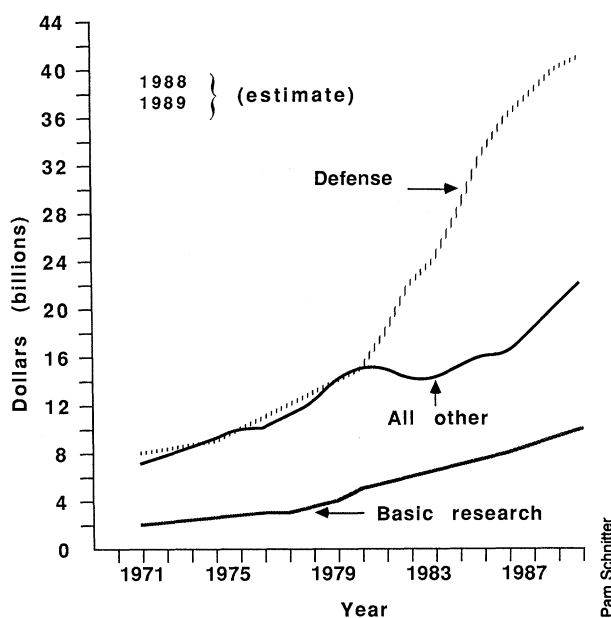
First, spending on the SSC is scheduled to jump from \$25 million this year to \$363 million next year, thereby accounting for the lion's share of the total increase. The funds would be spent on superconducting magnet research and development, and construction-related activities.

A second factor is the impact of the \$126 million in university pork-barrel projects that Congress stuffed into DOE's FY 1988 budget (*Science*, 22 January, p. 344). No funds have been included in the 1989 bud-

uled to rise from \$10.7 million to \$18.5 million.

On another front, the magnetic confinement fusion budget would rise for the first time in several years, from \$335 million to \$360 million. This largely reflects a decision to prepare for construction of the Compact Ignition Tokamak at Princeton, for which \$37 million is being proposed.

In the energy technology research area, DOE is planning to spend \$525 million next year as part of a 5-year, \$5-billion clean coal initiative that will be funded jointly with industry. Otherwise, the budget proposals for fossil fuel research, energy conser-



### Military R&D takes a turn downward

*Military R&D spending would decline as a percent of overall federal spending for research for the first time in the Reagan presidency. Nonmilitary R&D would receive about 34% of the total. [Basic research funds are included in the totals for defense and other programs.]*

get to continue funding these projects. This bulge in the 1988 figure masks the growth being proposed for some other DOE basic research activities next year.

Finally, the budget outlook for many programs is not readily discernible, in part because the department proposes to adopt a new accounting structure. It plans to include funding for the SSC and other major research projects in a new budget category along with major national laboratory research centers. If one returns to last year's ledger system, it appears that basic energy science programs and high energy physics will be held to increases of roughly 5%, assuming that Congress does not add any earmarks of its own.

The most prominent new construction project in the basic research programs other than the SSC is the 6- to 7-billion-electron-volt synchrotron to be built at Argonne National Laboratory. Expenditures to support research on high-temperature superconductors would increase from \$67 million to \$95 million. Also, DOE's share of the human genome sequencing project is sched-

uled to rise from \$10.7 million to \$18.5 million.

■ **Space flight and exploration.** NASA seems to have some powerful allies within the White House this year. Its budget request of \$11.5 billion is up nearly \$2.5 billion from FY 1988—a 27% increase.

As expected, about \$1 billion of this hike is earmarked for the space shuttle, which NASA wants to start flying again this summer after a 2½ year hiatus. The budget request anticipates seven flights in fiscal 1989 and ten flights in 1990. In addition, NASA wants funding to develop an advanced solid rocket motor, which will allow the shuttle to lift heavier cargoes into orbit.

A second major driver in the NASA budget is the space station project, which is scheduled to move into full-scale hardware development. The Administration wants to increase the station's budget from \$400 million to \$1 billion in FY 1989. Over the next 3 years NASA wants \$6.1 billion fun-

neled in the space station project. But it is not clear whether the space station can survive the next few years of deficit-cutting.

Meanwhile, NASA Administrator James C. Fletcher plans to solicit competitive proposals to lease space on "a commercially developed space facility to be built by a private company for microgravity research and manufacturing." The winner of that "competition" will almost certainly be the Industrial Space Facility, which is built by the Houston-based startup, Space Industries, Inc. NASA, which fears that what is now called "the Commercially-Developed Space Facility" will undercut its own space station, agreed to use it only after intense lobbying from commercialization-of-space advocates elsewhere in the Administration and in Congress.

Overall funding for the agency's space science and applications programs also would rise by 18% under the Administration's request. NASA is asking for \$27 million to proceed with a new project, the Advanced x-ray Astrophysics Facility (AXAF), which has been a top priority in the astronomical community for nearly a decade. AXAF would be the third of NASA's "Great Observatories," after the Hubble Space Telescope and the Gamma Ray Observatory. Also penciled in is nearly \$110 million to continue procurement of expendable launch vehicles to get the science missions off the ground.

On another front, NASA also is proposing to expand its Civilian Space Technology Initiative, which is intended to reverse years of neglected research in such critical areas of space technology as propulsion and power. At the same time, the agency is asking for \$100 million to begin the Pathfinder technology program to conduct research to support human and robotic exploration of the solar system.

■ **Environmental protection.** R&D expenditures at the Environmental Protection Agency (EPA) would rise 6% to \$375 million. The \$23 million increase would be divided among several programs. About a third of the new money would go for new research in stratospheric ozone depletion. Another third is for risk assessment methodology related to human health. The remainder would be spent on solving technical problems connected with cleaning up contaminated sites and disposing of hazardous wastes.

Saved from the chopping block is EPA's Human Adipose Tissue Survey, a program for monitoring human exposure to toxic chemicals by analyzing fat samples. The agency was set to kill the effort in 1988, but has now decided to continue funding it at

about \$1 million annually.

Overall, the agency is requesting a total operating budget for FY 1989 of \$1.63 billion, a modest spending increase of 3% or \$48 million (excluding Superfund and construction grants). Agency spending for cleaning up hazardous waste sites, an activity known as Superfund because it is paid for through fees imposed on industry, would rise by \$200 million to \$1.7 billion.

Virtually all of EPA's major programs would be held to 1988 levels. And there are no major shifts in priority. EPA is, however, requesting \$60 million for the transportation, storage, and disposal of canceled or suspended pesticides. The agency is spending just \$8 million for this in 1988, but its

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costs are escalating dramatically as a result of regulatory actions restricting or banning the use of toxic chemicals such as EDB, 2,4,5-T, Silvex, and dinoseb. Federal law requires EPA to compensate companies the value of the product inventories that are affected as well as to absorb storage and disposal costs.

■ **Agricultural research.** Funding for research and development at the U.S. Department of Agriculture (USDA) would decline under the Administration's budget proposal from \$1.018 billion to \$985 million. The budget for the Cooperative State Research Service (CSRS) would decline from \$306.3 million to \$275.5 million in response to the elimination of a series of noncompetitive grants for research ranging from animal health to aquaculture.

At the same time, funding for competitive grants issued by CSRS would climb by \$12 million to \$54.5 million. The increase would be used partly to enhance ongoing efforts utilizing biotechnology in plant and animal research. The remaining \$7.4 million is earmarked for studies to examine how depletion of stratospheric ozone may affect crops and forests.

Total spending for research conducted within USDA through the Agricultural Research Service (ARS) also is slated to decline from \$603 to \$577 million. But the reduction is attributed to a lower construction budget. The department is proposing to hike ARS's research budget by \$20.3 mil-

lion to \$565.9 million.

More than half these funds would be spent on ground-water, animal, and plant research. Some \$4 million of the additional funds would go to enhance repair and maintenance of ARS research facilities. Another \$11 million would be provided to construct a new national seed storage laboratory at Fort Collins, Colorado.

■ **Geological Survey.** The Interior Department is proposing to cut the U.S. Geological Survey's budget from \$448 million to \$425 million next year. Reductions in research would lower the program budget for R&D by \$12 million to \$224 million.

The cutbacks would occur in what the department calls "low priority" programs. This includes geologic surveys of energy resources, research grants supporting water resources research, monitoring of active geologic fault zones and volcanoes, and nuclear waste hydrology studies. No R&D money is provided for the side-looking airborne radar.

■ **Oceans and atmosphere.** The Commerce Department wants to drastically reduce R&D costs at the National Oceanic and Atmospheric Administration (NOAA) in FY 1989 to \$180 million, a \$102-million cut from current levels.

Within the Office of Oceanic and Atmospheric Research (OAR), NOAA plans to terminate the \$38-million National Sea Grant College Program and the \$11-million National Undersea Research Program. OAR would add \$10.8 million, however, to its climate and air quality research program, primarily to bolster studies on global warming and climate change.

Program budgets for operation, acquisition, and launching needs of the polar orbiting, geostationary, and Landsat earth resources satellite systems would rise by \$135 million. Part of these costs would be offset by discontinuing operations of Landsat satellites 4 and 5. On another front, information and research activities of the National Marine Fisheries Service would be slashed from \$102 million to \$64 million under NOAA's 1989 budget plan.

In the past, Congress has come to the rescue of research-related agencies at the Commerce Department such as NOAA, the National Bureau of Standards, and the National Technical Information Service. It remains to be seen, however, whether Congress will override the proposed cuts at NOAA in this budgetary climate. ■

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