# The Science Budget: A Dose of Austerity

## *Military R&D would get huge increases; the physical sciences would fare relatively well; belt-tightening is in store elsewhere*

The Reagan Administration, facing a $222-billion deficit this year, has proposed a budget for fiscal year (FY) 1986 that attempts to freeze overall government spending. The freeze is highly selective, however, for military outlays and spending on social security would rise sharply while many other programs would be slashed or eliminated entirely. Science and technology are no exception. Military R&D would get huge increases, and most other areas would be given a dose of austerity.

Overall, the budget for R&D would rise from $51 billion this year to $57.6 billion in FY 1986. Military R&D, including weapons programs funded by the Department of Energy, would climb by $7.2 billion, while total spending on all other R&D would drop by more than $500 million. If these proposals are agreed to by Congress, which is unlikely, military programs would claim more than 72 percent of the federal R&D budget next year, up from about 50 percent when the Reagan Administration took office 4 years ago (see graph on page 727).

Part of this reduction would come in applied research and development, such as mass transit R&D and some energy programs. But basic research, which has been given large increases in previous Reagan budgets, would not be exempt. Again, military research is an exception, with a proposed increase of 16 percent. In contrast, basic research in physical sciences and engineering funded by agencies other than the Defense Department would grow by only 3.3 percent, while the life sciences would drop by 4.9 percent. The sharp decline in support for the life sciences is largely a result of an attempt to spread over 2 years some of the hefty increases approved by Congress for the National Institutes of Health (NIH) for this year (see below). (These figures do not take into account inflation, which is projected to be 4.3 percent in 1986.)

In view of this austerity, no new nonmilitary R&D programs have been proposed and several major projects would be slowed down or deferred in order to provide operating funds for existing facilities. These include the Very Long Baseline Array, a radioastronomy network whose construction would proceed at a slower pace than originally planned; design studies for the space station, which would be stretched out; construction of an electron accelerator in Virginia, which would be deferred; and the magnetic fusion program, which will be slowed down for the second year in a row.

In relation to many other nondefense programs in the budget, however, science and technology have fared relatively well. Putting the overall R&D proposals in their best light, George A. Keyworth, II, President Reagan's science adviser, noted that "after four years of near-historic funding increases, there's now plenty of momentum in the system to maintain healthy progress." A year of austerity, he suggested, will "help sharpen priorities."

However, in testimony before the House Science and Technology Committee on 5 February, the day after the budget was delivered to Congress, he said, "I won't hide my concern about the vitality of U.S. science over the longer term." Noting that "even the most optimistic forecasters warn us of several years of lean funding until we get the deficit to a level where it doesn't dominate federal budgeting," he suggested that "our real challenges will come in fiscal years 1987 and 1988, when we simply will have to find ways to ensure our ability to pursue—and pursue vigorously—new avenues of research."

Underlying those remarks are projections made in this budget that, even if Congress goes along with the overall spending plan, the federal deficit will decline only to $144 billion in 1988—the year in which Reagan had promised to have a balanced budget. Consequently, there is concern that the austerity proposed for 1986 will extend to 1987 and beyond, and that some tough priority choices will have to be made if new projects are to be started.

One particularly worrysome aspect of a prolonged fiscal drought in R&D is that potential commitments to big-ticket items such as the space station, the superconducting super collider, and major synchrotron facilities could squeeze out some project support, just as development of the space shuttle curbed space science in the 1970's.

How is Congress likely to treat the R&D proposals? If past years are any guide, it is likely to reorder the priorities toward civilian programs by reducing the totals proposed for military R&D and putting more funds into politically popular areas such as biomedical research and environmental programs. Last year, for example, Congress boosted the Administration's request for basic research

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

(In millions of dollars)

| Department or agency | Obligations | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1984 actual | 1985 estimate | 1986 estimate | 1984 actual | 1985 estimate | 1986 estimate |
| Defense-Military functions | 26,408 | 32,318 | 39,426 | 23,583 | 28,539 | 34,860 |
| Health and Human Services | 4,836 | 5,472 | 5,159 | 4,449 | 4,995 | 5,239 |
| (National Institutes of Health) | (4,252) | (4,835) | (4,561) | (3,960) | (4,408) | (4,654) |
| Energy | 4,642 | 4,805 | 4,712 | 4,702 | 4,826 | 4,714 |
| National Aeronautics and Space Administration | 2,877 | 3,506 | 3,730 | 3,539 | 3,260 | 3,564 |
| National Science Foundation | 1,203 | 1,354 | 1,447 | 1,108 | 1,313 | 1,403 |
| Agriculture | 868 | 940 | 882 | 867 | 901 | 882 |
| Transportation | 446 | 480 | 362 | 342 | 481 | 377 |
| Interior | 362 | 378 | 335 | 393 | 371 | 339 |
| Environmental Protection Agency | 261 | 312 | 327 | 266 | 282 | 317 |
| Commerce | 361 | 384 | 271 | 330 | 368 | 291 |
| Agency for International Development | 192 | 217 | 225 | 139 | 225 | 239 |
| Veterans Administration | 190 | 227 | 190 | 186 | 224 | 187 |
| Nuclear Regulatory Commission | 191 | 150 | 138 | 196 | 152 | 141 |
| All other [1] | 363 | 417 | 396 | 418 | 396 | 407 |
| **Total** | **43,199** | **50,958** | **57,598** | **40,518** | **46,331** | **52,958** |

[1] 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 Federal Emergency Management Agency.

by 5 percent, largely by adding substantially to the total proposed for NIH, according to an analysis by the AAAS.

This year, however, concern over the deficit is at a much higher pitch. This is likely to result in a reduction in the massive increases proposed for military R&D, but continued large increases in congressionally favored programs are much less certain.

The following are among the highlights of the proposals:

• **Military Programs.** The combined spending by the Departments of Defense and Energy on military R&D is slated to reach $41.7 billion in FY 1986, a 21 percent increase over this year. The bulk of this money would go to applied research and development of weapons systems, such as the Trident II missile, a new fighter engine, upgrades of the F16 and A6 aircraft, and a small intercontinental ballistic missile.

One of the largest percentage increases in military programs would go to the Strategic Defense Initiative, which is popularly known as the "Star Wars" program. This is earmarked for a whopping 164 percent boost, from $1.4 billion to $3.7 billion. In addition to these funds from the Defense Department, $280 million is included in the budget for the Department of Energy for Star Wars-related research. The overall goal is to prepare for a decision on whether to deploy a system in 1989–90, with actual deployment in the mid-1990's. The research program is expected to stabilize at $5 billion to $6 billion in the late 1980's.

In past years, basic research in the Department of Defense has received relatively modest increases. Last year, however, Defense Secretary Caspar Weinberger distributed a memo to top department officials calling for a boost of at least 8 percent in real terms in this area. The actual proposal has achieved this and then some: basic military research is slated to rise from $829 to $962 million, $25 million of which would go into a new program of university-based research. If Congress goes along with this, the Defense Department would overtake the Department of Energy to become the second largest federal supporter of basic research in physics and engineering, just behind the National Science Foundation (NSF).

• **Biomedical Sciences.** While funds appear to be flowing into the Defense Department in a torrent, they appear to be trickling out of NIH. The budget proposed for NIH in FY 1986, $4.853 billion, is $287 million less than Congress approved for FY 1985. This represents a new phase in the continuing battle between the Administration and Congress over biomedical research funding. In previous years, the Administration has proposed a level budget for NIH, partly on the assumption that Congress would add to it. This year, the Administration has upped the ante by proposing an actual decrease.

In reality, what is being proposed is somewhat complicated. The budget approved by Congress for FY 1985 would have enabled NIH to fund some 6500 new and competing grants, about 1500 more than in the previous year. The Office of Management and Budget (OMB), correctly perceiving that this would create a built-in escalator in the budget because all those new grants would have to be continued in succeeding years, has therefore devised a plan to hold the total number of new and competing grants to 5000.

In essence, OMB has directed NIH to fund some research projects and research centers for both 1985 and 1986 out of 1985 funds—a clever way of spreading the total NIH increase for 1985 over 2 years (*Science*, 1 February, p. 498). OMB's budget analysis even touts this legerdemain as a "decision to restore stability to [NIH] R&D activities."

NIH's supporters, who include a lot of powerful lobbyists, regard it as a straightforward raid on the biomedical research budget, however, and they have been noisily taking their case to Capitol Hill. Congress is likely to agree with them, but it remains to be seen how much will be restored in a year when reducing the deficit is the chief game in town.

• **National Science Foundation.** NSF has emerged from the budget squeeze if not unscathed, at least in better shape than most other civilian science agencies. Its total budget request, $1.57 billion, is 4.4 percent higher than this year's figure.

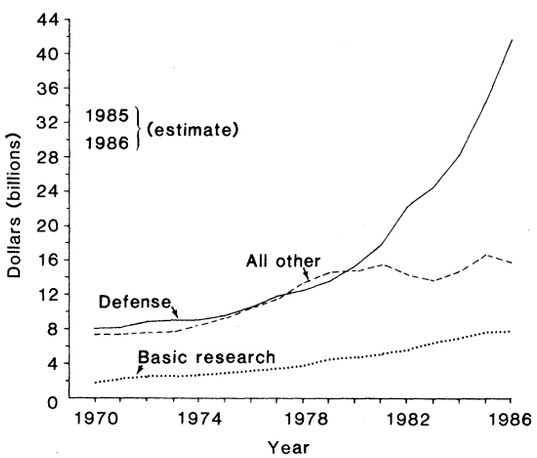
Within the total, however, research would get a 7 percent increase, while several other programs, deemed to be of lower priority, would be trimmed or terminated. The reordering of priorities reflected in NSF's budget is said to be largely the work of Erich Bloch, the foundation's new director, who has moved quickly to put his stamp on the place.

Among the disciplines favored with relatively large increases are mathematics (15 percent), engineering (13.3 percent), earth sciences (12 percent), and arctic research (11 percent). Somewhat surprisingly, in view of the Reagan Administration's previous parsimony toward the social sciences, social and economic research would get a 19 percent increase, primarily for economic research with emphasis on the development and analysis of large-scale data bases.

One of the largest percentage increases will go to NSF's new engineering centers program. An attempt to establish multidisciplinary research programs on university campuses with substantial input from industry, the program has been budgeted $25 million next year, up from $10 million this year. A total of 140 proposals have been submitted, from which 10 will be selected in April (*Science*, 4 January, p. 38).

Areas that would be trimmed to make room for growth elsewhere in NSF include a raft of small programs concerned with policy analysis, the Ethics and Values in Science and Technology program, which will be terminated, and several international programs.

The foundation's science and engineering education program would get $82 million, including $31.5 million left over from FY 1985. This large pot of unspent money in part reflects the fact that the program has been revamped in the past year and is only now getting into full swing. But it also reflects a conscious




***The militarization of R&D***

*Out of every dollar the federal government spends on R&D, 72 cents now goes to defense programs. [Basic research is included in the totals for defense and nondefense spending.]*

decision to hold down the rate of growth, according to Bloch.

• **Space Programs.** A year ago, the National Aeronautics and Space Administration (NASA) scored a major victory by securing a Presidential endorsement of its proposal to build a space station. The agency still seems to be in favor in the White House. Its budget request of almost $7.9 billion represents more than a cost-of-living increase, and all its major programs would be left intact.

The research and design phase of the space station will be stretched from 18 to 21 months, a slowdown that will not affect the launch date, which is tentatively planned for 1992.

Although no new starts have been approved for FY 1986 in space science, all currently planned projects are essentially on target. They include launch of the Galileo Mission, a spacecraft which will reach Jupiter in December 1988 to study the planet and its satellites and send a probe into its atmosphere; launch of the space telescope; and launch of the International Solar Polar Mission (now called Ulysses).

NASA even has one new program: a start will be made on development of an Orbital Maneuvering Vehicle, an unmanned, remotely piloted spacecraft that will ride in the shuttle bay and be used to retrieve satellites up to 1500 miles from the shuttle.

• **High Energy and Nuclear Physics.** In past years, the Reagan Administration has come through with a substantial boost in support for particle accelerators and other nuclear physics facilities. This year, the field seems to have fallen out of favor. Operating funds for high energy physics facilities are scheduled to drop from $546 million to $510 million, and as a result, utilization of the accelerators will fall to between 55 percent and 45 percent of capacity. Similarly, nuclear physics funding is slated to decline from $183 million to $173 million, with utilization of the facilities hovering around 45 percent.

No new construction projects will be started, although upgrades of accelerators at Fermilab and Brookhaven will continue. In particular, construction of an electron accelerator planned for Newport News, Virginia, will be deferred for a year. The Administration has requested R&D but no construction funds for the machine.

As for the superconducting super collider, a behemoth with a circumference of up to 100 miles and a price tag of $3 billion, the Administration has requested R&D funds with completion of a design planned for 1987. Keyworth, in his 5 February congressional testimony gave the machine his personal endorsement: "I won't conceal my opinion that it would be a serious blow to U.S. scientific leadership if that facility were built in another country," he said.

• **Energy Research.** In many respects, the proposals for energy research follow the Reagan Administration's past spending blueprints in this area. R&D on fossil fuels, energy conservation, and solar power would be cut sharply, and funding for nuclear technologies would get a modest reduction. There has, however, been some reordering of priorities within the nuclear program, with a sharp reduction in support for breeder reactor technologies and an increase in funding for development of improved light water reactors.

For the second year running, the magnetic fusion program is scheduled for surgery, reflecting a continuing move away from prototype development and toward basic research. It would drop from $437 million to $390 million.

• **Environmental Research.** With the exception of programs supported by the National Oceanic and Atmospheric Administration (NOAA), environmental research would fare relatively well. The Environmental Protection Agency would get a 6 percent increase, from $306 million to $325 million, with programs on acid rain, hazardous wastes, and pesticides getting the lion's share of the additional funds. The Department of Energy's environmental research programs would receive some $230 million, about the same as FY 1985.

NOAA is a different story. The agency's R&D budget would plummet from $256 million to $170 million, a drop of about 33 percent. This would include elimination of undersea research, weather modification studies, and the Sea Grant Program, and major cuts in a variety of other atmospheric and marine programs. So anxious is the Administration to kill off the Sea Grant Program that it has proposed to eliminate some $19.5 million in unspent funds for the current fiscal year. Similar Draconian measures have been proposed in each of the past 4 years, but Congress has consistently refused to go along with them.

• **Agriculture.** The Administration is easing up on a decade-long effort to expand the competitive grants program in the U.S. Department of Agriculture. It has proposed a budget of $46 million for competitive grants in FY 1986, the same amount as this year. Overall, the department's research budget would decline from $940 million to $882 million. This means that competitive grants would account for a mere 5.2 percent of the agricultural research budget, up from 4.9 percent last year.—**COLIN NORMAN**

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

(In millions of dollars)

| Department or agency | Obligations | | | Outlays | | |
|---|---|---|---|---|---|---|
| | 1984 actual | 1985 estimate | 1986 estimate | 1984 actual | 1985 estimate | 1986 estimate |
| Agencies supporting primarily physical sciences and engineering: | | | | | | |
| National Science Foundation | 1,132 | 1,273 | 1,366 | 1,042 | 1,235 | 1,325 |
| Defense—Military functions | 847 | 829 | 962 | 720 | 768 | 852 |
| Energy | 827 | 912 | 934 | 820 | 904 | 937 |
| National Aeronautics and Space Administration | 713 | 801 | 834 | 729 | 825 | 818 |
| Interior | 120 | 130 | 119 | 133 | 128 | 120 |
| Commerce | 21 | 22 | 18 | 21 | 21 | 18 |
| Other Agencies | 9 | 9 | 10 | 8 | 9 | 10 |
| Subtotal | 3,668 | 3,976 | 4,241 | 3,473 | 3,891 | 4,078 |
| Agencies supporting primarily life and other sciences: | | | | | | |
| Health and Human Services | 2,812 | 3,225 | 3,049 | 2,587 | 2,938 | 3,087 |
| (National Institutes of Health) | (2,625) | (3,022) | (2,847) | (2,441) | (2,753) | (2,896) |
| Agriculture | 393 | 440 | 418 | 394 | 410 | 407 |
| Smithsonian Institution | 61 | 65 | 64 | 56 | 63 | 66 |
| Environmental Protection Agency | 30 | 37 | 40 | 26 | 24 | 28 |
| Veterans Administration | 16 | 15 | 16 | 16 | 16 | 16 |
| Education | 10 | 12 | 12 | 28 | 9 | 11 |
| Other Agencies | 16 | 17 | 22 | 14 | 17 | 19 |
| Subtotal | 3,337 | 3,810 | 3,621 | 3,120 | 3,476 | 3,633 |
| Total | 7,005 | 7,786 | 7,862 | 6,593 | 7,367 | 7,712 |