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**ABSTRACT**

This document summarizes data from the National Science Foundation (NSF) report on An Analysis of Federal Research and Development Funding by Function, Fiscal Years 1969-1978. Highlights include: (1) 1978 expenditures are estimated at \$26.3 billion, a 7.6% increase over 1977; (2) funding between 1974 and 1978 represents an increase of 3.4% in constant dollars; (3) most expenditures have been in the areas of defense and energy; and (4) expenditures in energy for 1978 are estimated to grow 17% over 1977. (SL)

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# SCIENCE RESOURCES STUDIES

# HIGHLIGHTS

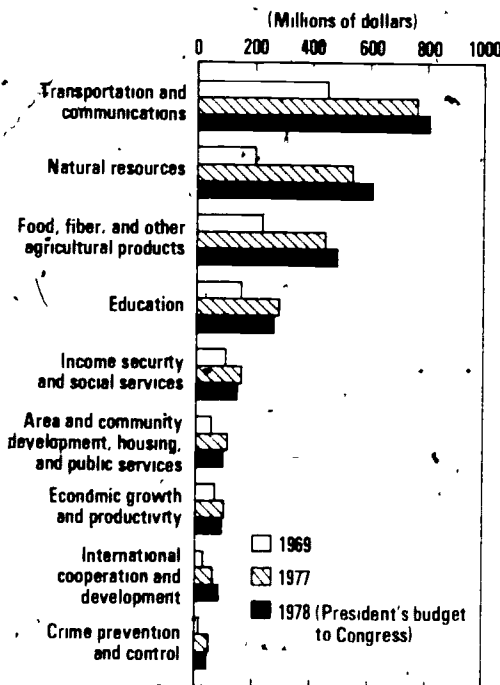
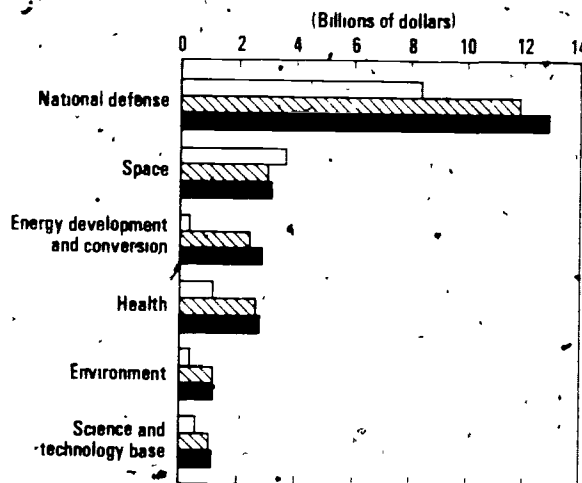
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## Defense and Energy Spur Federal R&D Growth From FY 1974 to FY 1978

Data discussed below are taken from a forthcoming report, "An Analysis of Federal R&D Funding by Function, Fiscal Years 1969-1978." The 15 functional categories were chosen to make possible the chief objectives reflected by R&D programs in the 1978 budget. Data are additive to 100 percent, and these back programs can appear only under the function that embraces its primary purpose and not under functions that relate to secondary purposes.

- In fiscal year 1978 Federal R&D obligations will amount to an estimated \$26.3 billion, a figure 7.6 percent above 1977 but only a slight increase in real terms, assuming a 6-percent rate of inflation.
- Federal R&D funding grew so slightly between 1969 and 1974 that it represented a decline in real terms, but between 1974 and 1978 the annual average growth rate is 10.9 percent or an increase of 3.4 percent in constant dollars.
- Between 1974 and 1978 most of the expansion (92 percent) has been generated by gains in six leading functional areas, especially those of defense and energy.
- In 1978 energy development and conversion is expected to grow by 17 percent over 1977, more than any major function. Science and technology base will increase an estimated 41 percent, and defense an estimated 8 percent. Each of these functions probably will show a gain in real performance, assuming a 6-percent inflation rate for the whole economy.
- The other three leading functions—space, health, and environment—all will probably reflect declines in the real level of effort.
- Of the next three largest R&D functions transportation and communications is also scheduled for an apparent 1978 decline in real terms, whereas natural resources and food, fiber, and other agricultural products appear to be scheduled for real increases following a recent period of significant growth.

Federal R&D obligations by function, FY 1969, 1977 (est.) and 1978 (est.)



SOURCE: National Science Foundation

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Federal R&D obligations by function: fiscal years 1969-78  
(Dollars in millions)

Function	Estimated									
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Total	\$15,641	\$17,340	\$15,645	\$16,498	\$16,800	\$17,415	\$19,013	\$20,759	\$24,465	\$26,337
National Defense	8,354	7,476	8,106	8,898	8,998	8,975	9,621	10,346	11,917	12,907
Space	1,732	1,510	2,893	2,714	1,601	2,478	2,511	2,863	2,622	3,140
Energy development and conversion	626	317	324	484	442	605	1,110	1,388	2,190	2,798
Health	1,127	1,126	1,336	1,589	1,624	2,096	2,177	2,366	2,623	2,683
Environment	315	354	465	531	651	693	817	899	1,101	1,098
Science and technology base	513	525	524	607	603	695	782	839	953	1,060
Transportation and communications	458	590	774	613	630	703	641	636	764	805
Natural resources	201	238	326	354	341	341	445	489	547	610
Food, fiber, and other agricultural products	225	241	247	291	297	297	349	388	444	488
Education	155	147	166	191	214	173	149	142	284	269
Income security and social services	97	106	128	125	157	134	148	133	157	146
Area and community development, housing and public services	49	91	84	67	97	66	102	104	111	99
Economic growth and productivity	56	86	99	63	75	72	67	84	98	97
International cooperation and development	7	32	32	29	63	27	30	45	53	71
Crime prevention and control	5	9	16	25	37	36	46	36	49	44

R&D plant excluded

The inclusion of R&D plant obligations for energy would add \$267 million in 1976, \$509 million in 1977, and \$552 million in 1978.

NOTE: Data may not add because of rounding.  
SOURCE: National Science Foundation.

Another is planned for the Air Force B-1 bomber (procurement of which has been discontinued by the President while development goes forward). Full-scale development will begin on the Air Force M-X intercontinental ballistic missile. Two cruise missiles—one Navy, one Army—will continue in full-scale development.

Technology base reflects planned growth of 10 percent to the \$1.9 billion level in 1978. This is in line with a DOD policy initiated in the 1976 budget to reverse a real long-term decline.

Intelligence and communications is scheduled for an 11-percent rise to \$1.2 billion to cover improvements in capabilities in this area.

Advanced technology development will show an estimated 6-percent increase.

Defense-related atomic energy programs, entirely conducted by ERDA, are scheduled to increase 7 percent in 1978.

- In 1978 the increase in funds directed to space is not great enough to reverse the downward trend in the share of this function in the Federal R&D total. In 1969 the share was 24 percent, but in 1978 it is an estimated 12 percent. Space is the only function to show lower funding in 1978 than in 1969.

The largest program is the NASA space shuttle, on which development will continue. Another program within manned space flight is space transportation system (STS) operations capability development scheduled for a fivefold increase in 1978. Under space sciences large relative increases are planned for physics and astronomy, including the start of development by NASA of a 2.4-meter space telescope. A Jupiter orbiter/probe will also be initiated in 1978.

- Gains in energy development and conversion have been unprecedentedly high for a major function ever

since 1974. From 1969-74 the average annual growth rate for this function was 13.0 percent, from 1974-78 an estimated 47 percent. In 1978 the dollar gain will account for more than one-fifth of the total Federal R&D dollar increase. As a share of Federal R&D programs those in energy have grown from 2 percent in 1969 to an estimated 11 percent in 1978.

In 1978 nuclear programs make up more than one-half of the energy total. As a group they are scheduled for a 15-percent increase. Among them considerable growth is shown for ERDA fuel cycle R&D, NRC reactor safety research, and ERDA laser and magnetic fusion programs, but obligations for the ERDA liquid metal fast breeder reactor are down.

Nonnuclear programs as a whole reflect a 19-percent increase. Among these fossil energy shows no growth because of lower emphasis on the ERDA coal utilization program, but ERDA solar energy development shows a rise of 9 percent and ERDA geothermal energy development a rise of 60 percent. Conservation programs are scheduled for an 88-percent increase. Chief among these is work by ERDA on end-use conservation.

- In 1978 the growth for health R&D programs is so slight (2 percent) as to reflect a decline in the real level of effort. Obligations for 1977 were high because of the effects of a congressional override of the President's veto of the 1976 HEW appropriation midway in the fiscal year, this caused an increase in obligations that continued into fiscal year 1977. Over the longer term, funds in the health area have grown substantially, the average annual growth rate from 1969-78 is 10.1 percent compared with 6.0 percent for all Federal R&D programs. The share of health in the total has risen from 7 percent in 1969 to an estimated 10 percent in 1978.

Biomedical research accounts for 9 out of 10 health dollars. A gain of 3 percent is shown for this subfunction.

**Federal R&D obligations by function Fiscal years 1969-78**  
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Most work is carried out by the National Institutes of Health (HEW) Institute programs showing real growth in 1978 are general medical sciences, allergy and infectious diseases, aging, and environmental health sciences

- **Environment** reveals a slight decrease in 1978 as a total area. Until 1978, however, this function has shown very strong growth between 1969-74, an average annual growth rate of 17.1 percent and between 1974-78, a comparable rate of 12.2 percent. The share of environment in the Federal R&D total is 4 percent in 1978 against 2 percent in 1969.

*Environmental health and safety* is scheduled for a 5-percent rise, chiefly influenced by ERDA's environmental R&D efforts. *Pollution control and environmental protection* will receive a decrease (of 9 percent) for the first time, largely resulting from declines in EPA water quality and energy-related environmental control programs, which were not offset by a large increase in ERDA nuclear materials security efforts. A 4-percent rise in *understanding, describing, and predicting the environment* is influenced by the large expansion of Interior mapping of earthquake geologic hazards and NSF earthquake engineering programs.

- **Science and technology base** maintained fairly level funding until 1974 when significant increases began to be shown. In 1978 the rise is an estimated 11 percent. From 1969-74, average annual growth of 6.2 percent was recorded, from 1974-78, the growth is 11.1 percent. The share within the Federal R&D total has grown from 3 percent in 1969 to 4 percent in 1978.

The largest individual programs within this function—high-energy physics (ERDA) and basic energy sciences (ERDA)—both reflect substantial increases in 1978 as do a

number of research support programs of NSF, notably those in materials, physiology, cellular and molecular biology, and behavioral and neural sciences.

- **Transportation and communications** is expected to gain by 5 percent in 1978, a decline in real performance overall. This function, has grown during the 1969-78 period at 6.5 percent on an average annual basis about the same rate as Federal R&D obligations as a whole. A 3-percent share of total was shown in 1969, the same as is estimated for 1978.

- **Natural resources** is scheduled for 12-percent growth in 1978. This function has shown such important gains over the long-term (1969-78) period that the average annual growth rate is 13.1 percent, more than twice that of total Federal R&D funding. The share of natural resources within the Federal R&D total in 1978 is an estimated 2 percent.

- **The food, fiber, and other agricultural products** function grew slowly between 1969 and 1974 but much more rapidly thereafter, an average annual growth rate of 5.3 percent for the earlier period compared with 13.8 percent in 1974-78. The share of this function in the Federal R&D total in 1978 is 2 percent.

The 10-percent rise in the food function in 1978 is mainly directed to research by USDA on animal and plant production, including the initiation of a 5-year program of competitive research grants.

- Six functions—*education, income security and social services, area and community development, housing, and public services, economic growth and productivity, international cooperation and development, and crime prevention and control*—together will account for an estimated 2.9 percent of all Federal R&D obligations in 1978.

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