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ABSTRACT Highlights for the fiscal year 1979 are reported of data on Federal obligations to individual universities and colleges from the 14 agencies with the largest programs in support of academic science. Trends are noted on total federal support for both science and nonscience activities and on academic science support from Federal agencies. The level of Federal obligations for academic research and development is also reported. Tables and charts present numerical data, explained within the text of the report. (CS)

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SCIENCE RESOURCES STUDIES

HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION

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Federal Academic Science Support Rose by 13% in FY 1979

The National Science Foundation (NSF) annually collects and analyzes data on Federal obligations to individual universities and colleges from the 14 agencies with the largest programs in support of academic science. Funding by these agencies represented over 99 percent of all Federal academic R&D obligations and about 95 percent of all Federal obligations to universities and colleges for all programs in FY 1979. (Unless otherwise specified, all years referred to are fiscal years.)

Highlights

- Between 1978 and 1979 Federal support for academic science activities rose to a new high of \$4.5 billion, a 13-percent increase, or 4 percent in real terms.¹ R&D support was the chief impetus behind this rise.
- The Department of Health, Education, and Welfare (HEW) accounted for the greatest proportion of the academic science increase, 61 percent; and the Department of Defense (DOD), for an additional 15 percent. Together with NSF, these leading agencies were responsible for nearly 90 percent of the 1978-79 growth in academic science funding.
- Support from Federal agencies to academic institutions for both science and nonscience activities dropped to \$6.2 billion in 1979 from a high of \$7.5 billion in 1978 — a decline of 17 percent, or 24 percent in real terms. A major factor in the decrease was a 49-percent drop in nonscience support by the Bureau of Student Financial Assistance within the Office of Education (OE).
- HEW supported over one-half of federally funded academic R&D activities and accounted for nearly two-thirds of the 14-percent increase (5 percent in constant dollars) in Federal R&D support in 1979.
- Federal support for academic R&D plant declined in 1979 by 7 percent to \$32 million.
- In 1979, funding for all other types of scientific activities increased for the third consecutive year in current dollars, this time by 6 percent, but declined in real terms by 2 percent. The major decrease was for fellowships and traineeships which in 1979 accounted for only one-third of the real-dollar amount obligated for these purposes in 1971. In contrast, constant-dollar R&D support was over 40 percent greater in 1979 than in 1971.

Total Federal Support

Total Federal academic obligations for both science and nonscience activities dropped to \$6.2 billion in 1979,

from a high of \$7.5 billion in 1978. The 17-percent current-dollar decline (down 24 percent in real terms) reflects a decrease in nonscience funding, largely because of a shift in emphasis by OE's Bureau of Student Financial Assistance from grants to student loans. Such loans, which grew from \$11 million in 1978 to \$2.4 billion in 1979, are made directly to students and therefore do not appear in agencies' records as support to institutions of higher education. Thus, nonscience support dropped to \$1.7 billion in 1979 from \$3.5 billion in 1978. In the 1975-78 period of rapid growth, Federal academic funding grew at an average annual rate of 10 percent in real terms. About three-fifths of the 1975-78 increase came from nonscience programs, mostly from grants for student aid (table 1).

In 1979, the leading 100 institutions accounted for 71 percent of all Federal funding to universities and colleges, up from 57 percent in 1978. This rise in funding concentration resulted from the sharp decline in nonscience funds. Changes in nonscience funds directly affect the distribution of total Federal funds to institutions of higher education, because nonscience support is obligated to a larger number of academic institutions than is R&D funding. Such an effect occurred also between 1975 and 1978 when nonscience funding increased at a 26-percent annual average rate and the concentration of total Federal obligations to the top 100 institutions fell from 65 percent to 57 percent.

Academic Science Activities

Academic science support from Federal agencies increased in 1979 by 13 percent in current dollars (4 percent in constant dollars), the third consecutive year that such support showed real growth. Between 1975 and 1979, support grew at an average annual rate of 5 percent

(Prepared in the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies)

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Table 1. Federal obligations to universities and colleges by type of activity: FY 1975-79

(Dollars in millions)

Type of activity	1975	1976	1977	1978	1979
Total	\$4,547	\$5,403	6,490	\$7,472	\$6,196
Academic science	2,806	2,960	3,351	3,960	4,470
Research and development	2,239	2,423	2,789	3,364	3,846
R&D plant	45	24	36	34	12
Facilities and equipment for instruction	12	11	18	27	33
Fellowships, traineeships, and training grants	201	175	185	206	205
General support for science	46	74	76	74	92
Other science activities	262	252	248	255	261
Nonscience	1,741	2,443	3,138	3,512	1,726

Source: National Science Foundation

in real terms, nearly three times the average growth between 1963 and 1975. As in previous years, R&D funding accounted for nearly all of the increase (chart 1).

RESEARCH AND DEVELOPMENT

For the fourth consecutive year, the level of Federal obligations for academic research and development rose in current dollars (14 percent) and real dollars (5 percent). Between 1975 and 1979, increases in R&D obligations averaged 14 percent annually — 7 percent in real terms — an amount considerably higher than the 9-percent annual average (4 percent in real dollars) which occurred between 1963 and 1975. The increased Federal support of academic research and development in recent years reflects an effort by Federal policymakers to raise the level of support for basic research. Between 1975 and 1979, Federal obligations for basic research to all sectors grew from \$2.5 billion to \$4.1 billion — an average annual rate of 13 percent; about one-half of these funds were obligated to academic institutions.²

Two of the six major agencies surveyed — DOD and HEW — reported increases in 1979 for academic research and development that exceeded the average growth rate for all agencies. DOD's R&D obligations grew by 17 percent and HEW's by 19 percent — largely from NIH. Only 9 agencies reported growth in R&D support in 1979, compared to all 14 agencies in 1978.

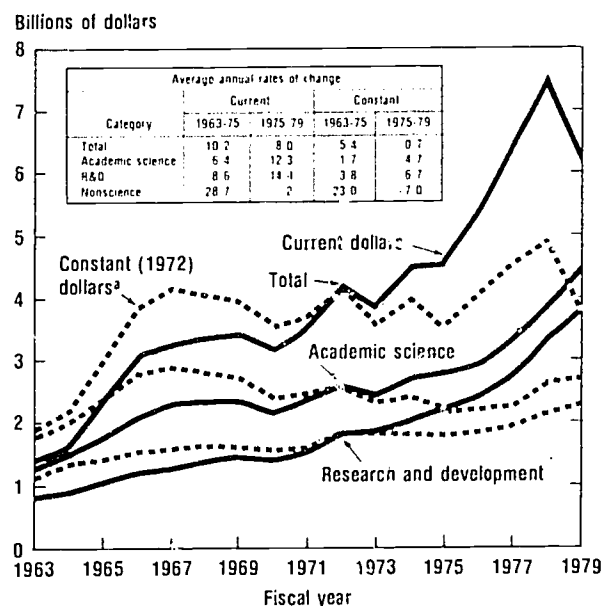
The nature and variety of missions assigned to R&D-sponsoring Federal agencies has led to differences in the proportions of their total R&D budgets allocated to academic institutions, as indicated by NSF's *Federal Funds for Research and Development* survey series. NSF, whose mission is the advancement of knowledge in science and

engineering, obligated 76 percent of its total R&D funding to universities and colleges; HEW followed with 55 percent. By contrast, agencies whose major emphasis tends toward development, such as DOD and the Department of Energy (DOE), allocated less than 10 percent of their total obligations to the academic sector.¹

Other barometers of academic research and development have paralleled the course of Federal obligations in recent years. Total R&D expenditures at universities and colleges rose at an average rate of 3 percent per year in real dollars between 1975 and 1979, the same growth rate as in federally financed academic R&D expenditures. Throughout this period, the Federal Government consistently supplied about two-thirds of all funding for R&D expenditures at academic institutions. Also during this period, the number of federally supported graduate research assistants averaged a 5-percent growth rate and during the 1975-80 period, academic employment of full-time-equivalent scientists and engineers engaged in research and development increased at an average rate of 2 percent per year.⁴

Historically, the proportion of all Federal academic R&D support to the leading R&D universities has varied little. Research projects are awarded on a merit basis to the relatively small number of institutions possessing (1) significant concentrations of highly qualified scientists and engineers, and (2) the facilities to conduct research. Of the 667 academic institutions receiving Federal R&D support in 1979, the leading 100 universities

Chart 1. Federal obligations to universities and colleges by type of activity



²Based on GNP implicit price deflator.
SOURCE: National Science Foundation

Table 2. Federal obligations to the 100 universities and colleges receiving the largest amounts: FY 1979¹

[Dollars in thousands]

Rank	Institution	Total, all activities	Research and development	R&D rank
United States Total		6,195,596	3,846,321	
1	Johns Hopkins Univ	291,020	274,143	1
2	Howard Univ	130,047	5,718	133
3	Mass Inst of Technology	124,731	110,033	2
4	Univ of Washington	112,537	88,037	4
5	Stanford Univ	109,710	93,596	3
6	Univ of Cal-Los Angeles	102,686	86,698	5
7	Univ of Wis Madison	99,171	75,597	8
8	Univ of Minnesota	97,903	64,263	12
9	Univ of Cal San Diego	96,091	85,464	6
10	Harvard University	93,457	75,802	7
Total 1st 10 institutions		1,257,353	959,351	
11	Columbia Univ Main Div	88,954	73,759	9
12	Cornell Univ	86,048	68,927	10
13	Univ of Michigan	81,729	62,800	14
14	Univ of Pennsylvania	80,346	65,179	11
15	Yale Univ	75,950	63,079	13
16	Univ of Cal San Francisco	72,967	59,395	15
17	Univ of Cal Berkeley	66,746	52,568	16
18	Pennsylvania State Univ ²	52,623	44,044	20
19	Univ of Southern Cal	61,440	50,144	18
20	Univ of Chicago	60,046	50,693	17
Total 1st 20 institutions		1,994,702	1,549,939	
21	Univ of Ill Urbana	58,057	43,954	21
22	Univ of NC at Chapel Hill	57,478	40,179	23
23	Washington Univ	56,794	47,943	19
24	Ohio State Univ	56,271	33,325	31
25	Univ of Colorado	54,993	35,765	26
26	Duke Univ	51,668	41,728	22
27	New York Univ	51,186	38,891	24
28	Gallaudet College ³	45,757	164	361
29	Univ of Texas at Austin	45,525	37,472	25
30	Univ of Utah	44,341	35,251	29
Total 1st 30 institutions		2,516,209	1,904,611	
31	Yeshiva Univ	43,678	35,305	28
32	Univ of Rochester	43,663	35,427	27
33	Michigan State Univ	43,597	27,021	41
34	Univ of Pittsburgh	43,376	31,317	33
35	Univ of Iowa	43,010	33,033	32
36	Univ of Miami	41,199	27,336	40
37	Purdue Univ	41,175	30,832	35
38	Univ of Arizona	40,777	29,876	36
39	Texas A&M Univ	40,479	26,232	43
40	Univ of Cal Davis	39,324	33,441	30
Total 1st 40 institutions		2,936,488	2,214,407	
41	Northwestern Univ	38,521	31,087	34
42	Univ Alabama Birmingham	37,984	26,776	42
43	Case Western Reserve Univ	37,706	29,189	39
44	Cal Inst of Tech	35,442	29,574	38
45	Univ of Florida	34,807	22,052	48
46	Baylor Col of Med	33,268	29,806	37
47	Boston Univ	32,893	20,925	52
48	Univ of New Mexico	31,858	20,048	55
49	Univ of Virginia	31,167	22,619	47
50	Univ Tennessee Knoxville	30,870	18,704	61
Total 1st 50 institutions		3,281,004	2,465,187	
51	Univ of Missouri Columbia	29,863	16,471	66
52	Univ of Hawaii Manoa	29,475	23,843	45
53	Colorado State Univ	29,147	21,135	50
54	Univ of Connecticut	29,001	18,661	59
55	Univ of Cincinnati	28,073	16,615	65
56	Univ of Kentucky	28,044	13,421	81
57	Oregon State Univ	28,012	23,075	46
58	Univ of Kansas	27,694	18,948	58
59	Univ of Md College Park	27,454	20,818	53
60	Univ of Md Balt Prof Sch	27,108	18,374	62
Total 1st 60 institutions		3,564,875	2,656,738	
61	U Tex Hlth Sci Ctr Dallas	26,796	20,270	54
62	N C State Univ at Raleigh	26,535	15,621	69
63	Vanderbilt Univ	26,111	21,747	49
64	Rutgers the St Univ of NJ	25,832	14,520	75
65	Cuny Mt Sinai Sch of Med	25,446	21,131	51
66	Louisiana State Univ	25,440	14,644	72
67	Georgia Institute of Tech	25,354	24,038	44
68	Va Polytech Inst & St Univ	24,965	15,964	68
69	Univ of Georgia	23,532	14,057	78
70	Temple Univ	23,061	12,851	82
Total 1st 70 institutions		3,817,947	2,831,583	
71	Univ of Ill Med Ctr Chgo	22,928	10,651	93
72	Princeton Univ	22,772	19,269	56
73	George Washington Univ	22,731	15,208	70
74	Wayne State Univ	22,230	12,196	84
75	Univ of Alaska Fairbanks	21,715	18,721	60
76	Virginia Commonwealth Univ	21,351	14,339	76
77	Indiana Univ Bloomington	21,299	12,090	85
78	Iowa St Univ Sci & Tech	20,573	11,283	89
79	Emory Univ	20,060	14,241	77
80	SUNY at Buffalo	19,776	14,524	74
Total 1st 80 institutions		4,033,382	2,974,155	
81	Woods Hole Oceanographic Inst	19,613	19,019	57
82	Univ of Mass at Amherst	19,069	11,514	88
83	Georgetown Univ	19,040	9,412	100
84	Univ of Tex Cancer Center	18,938	17,467	63
85	Rockefeller Univ	18,619	17,163	64
86	SUNY at Stony Brook	18,114	14,629	73
87	Univ of California	18,104	13,739	79
88	Carnegie Mellon Univ	17,962	16,336	67
89	Univ of Vt & St Agric Col	17,526	11,855	87
90	Tufts Univ	17,474	9,738	98
Total 1st 90 institutions		4,217,841	3,115,327	
91	Brown Univ	16,772	13,515	80
92	Washington State Univ	16,602	10,098	96
93	Col of Med & Dent of NJ	16,553	9,016	101
94	Kans St Univ Ag & App Sci	16,456	9,747	97
95	U Tex Hlth Sci Ctr Houston	16,326	12,394	83
96	New Mexico State Univ	16,135	11,050	90
97	Mississippi State Univ	15,987	9,153	104
98	West Virginia Univ	15,850	8,108	114
99	Auburn Univ	15,631	5,838	110
100	Univ of Nebraska Lincoln	15,608	8,152	113
Total 1st 100 institutions		4,379,761	3,210,038	

¹Amounts shown represent awards to individual institutions. Awards to the administrative office of university systems are excluded from totals for individual institutions because that allocation of funds is unknown, but those awards are included in "United States Total."

²Data for Johns Hopkins University include \$200,057 obligated to the Applied Physics Laboratory, considered a federally funded research and development center (FFRDC) until FY 1978.

³Data for Pennsylvania State University include \$13,411 obligated to the Applied Research Laboratory, considered a federally funded research and development center (FFRDC) until FY 1978.

⁴Howard University and Gallaudet College receive substantial appropriations from Congress each year for general operating expenses; their relative rankings thus reflect the magnitude of their nonscience programs.

SOURCE: National Science Foundation

accounted for 84 percent, and the top 10 accounted for 27 percent of all Federal R&D funding. The leading 100 institutions received 91 percent of all DOD funding for research and development to universities and colleges and 81 percent of all HEW's academic R&D funds, but 67 percent of all Department of Agriculture (USDA) obligations for academic research and development. The DOD proportion is high because support for Johns Hopkins University includes funds for the Applied Physics Laboratory. The concentration of USDA funding is relatively low because several of the land-grant institutions which perform most of the Nation's agricultural research are outside the top 100.

Johns Hopkins University, the leading 1979 recipient of all Federal funding, was also the leading recipient of R&D funds as in 1978 (table 2). Of the \$274 million received for research and development by this institution, however, \$200 million was allocated to the Applied Physics Laboratory. Until 1978 this component was considered a federally funded research and development center, and obligations to it were reported separately.

R&D PLANT

Federal academic support for R&D plant in 1979 declined in current dollars by 7 percent, to \$32 million. The level of Federal support for facilities and equipment at universities has declined in 10 of the 14 years since 1965, when such support was at its peak of \$126 million.

During the seventies, concern over growing difficulties in maintaining and replacing obsolete scientific equipment and instrumentation was expressed in a number of studies.

OTHER SCIENCE ACTIVITIES

Federal obligations for all other science activities increased in 1979 in current dollars for the third consecu-

tive year, this time by 6 percent to a level of \$591 million. Two of the four categories of support — "Facilities and equipment for instrumentation" and "general support" — showed increased funding levels of nearly 25 percent each between 1978 and 1979. Funding for fellowships, traineeships, and training grants, however, declined by \$1 million. Support for all four categories together averaged a 3-percent annual growth rate in current terms between 1975 and 1979.

* * * * *

The final report, *Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1979*, including statistical tables presenting the survey findings in detail, will be released later in 1981.

Footnotes

¹In the absence of a reliable R&D cost index, the gross national product (GNP) implicit price deflator was used to convert current dollars to constant 1972 dollars. The GNP deflator can only indicate approximate changes in costs of R&D performance.

²National Science Foundation, *Federal Funds for Research and Development, Fiscal Years 1979, 1980, and 1981*, volume XXIX (Detailed Statistical Tables) (NSF 80-118) (Washington, D.C., 20550).

³National Science Foundation, *Federal Funds for Research and Development*, volume XXIX, *op. cit.*, table C-7; and *Fiscal Years 1978, 1979, and 1980*, volume XXVIII, (Detailed Statistical Tables) (NSF 79-318), table C-7, (Washington, D.C., 20550).

⁴National Science Foundation, *Academic Science, 1972-77: R&D Funds, Scientists and Engineers, and Graduate Enrollment and Support* (NSF 80-313), tables B-3, B-27, B-17, *Academic Science: Graduate Enrollment and Support, Fall 1979* (Detailed Statistical Tables) (NSF 80-321), table B-33, *Academic Science: R&D Funds, Fiscal Year 1979* (Detailed Statistical Tables) (NSF 81-301), table B-3, and *Academic Science: Scientists and Engineers, January 1980* (Detailed Statistical Tables) (NSF 81-307), table B-21 (Washington, D.C., 20550) in press.

⁵National Science Foundation, *Academic Science: Graduate Enrollment and Support, Fall 1979, op. cit.*, table B-25, and *Fall 1972* (NSF 73-315), table A-11 (Washington, D.C., 20550).

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