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ABSTRACT

This report contains a summary of the allocation of funds and manpower among the four sectors of the economy--federal government, industry, universities and colleges, and other nonprofit institutions. Funding data include basic research, applied research, and development, covering years 1953-75. Time series on R and D scientific and engineering manpower employed by each sector are presented for 1954-74. Highlights indicate: (1) total R and D spending in the U.S. is projected at $34.3 billion in 1975, 7 percent above the 1974 level of $32 billion; (2) in 1975 the U.S. is expected to devote 2.3 percent of its gross national product (GNP) to R and D activities; (3) the federal government will support 53 percent of the total U.S. R and D effort in 1975; two-thirds of this will be in areas of defense and space; (4) basic research spending is estimated at $4.1 billion in 1975; and (5) nearly 528,000 scientists and engineers were employed on a full-time-equivalent basis on R and D activities in 1974. (Author/EB)

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R&D RESOURCES

1953-1975

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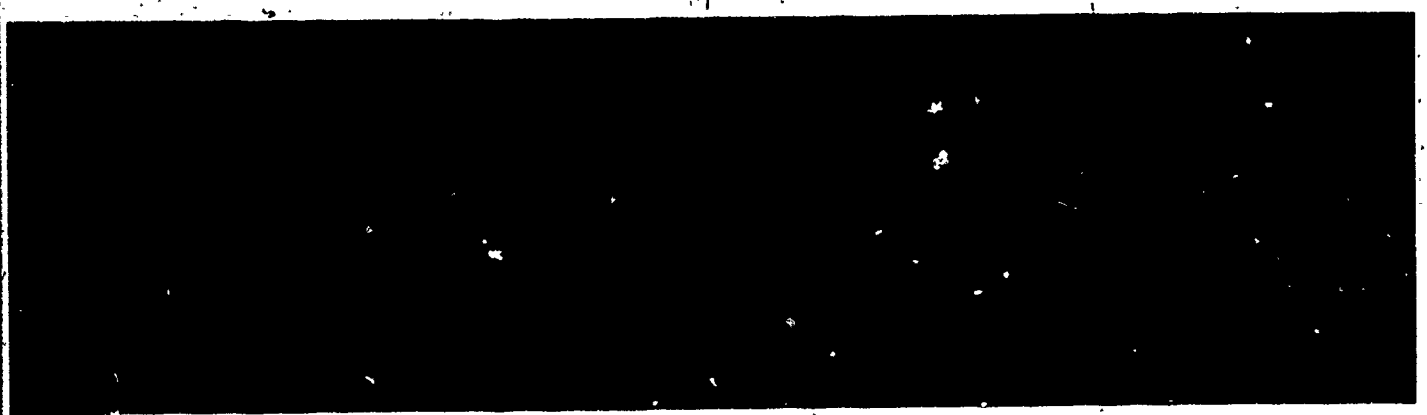

Funds & Manpower in the United States 1953-1975

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FOREWORD

This report contains information from a series of National Science Foundation surveys, generally conducted on an annual or biennial basis. It provides a summary of the allocation of R&D funding and manpower among the four sectors of the economy—Federal Government, industry, universities and colleges, and other nonprofit institutions.

R&D funding data include basic research, applied research, and development and cover the period 1953-75. Time series on R&D scientific and engineering manpower employed by each sector are presented for 1954-74.

The report was prepared in the Foundation's Division of Science Resources Studies, under the general guidance of Charles E. Falk, Director, and William L. Stewart, Head, R&D Economic Studies Section.

H. Guyford Stever
Director
National Science Foundation

April 1975

acknowledgments

This report was prepared under the supervision of Thomas J. Hogan, Study Director, Industry Studies Group. The analysis of the data and the writing of the report were performed by John R. Chirichiello, Cecelia H. Hilgert, and Robert O. Santos. Patricia L. Kirkpatrick assisted in the preparation of the material. Norman Seltzer, Study Director, and Morris Cobern, Manpower Utilization Studies Group, were responsible for the analysis and statistical materials for the manpower section.

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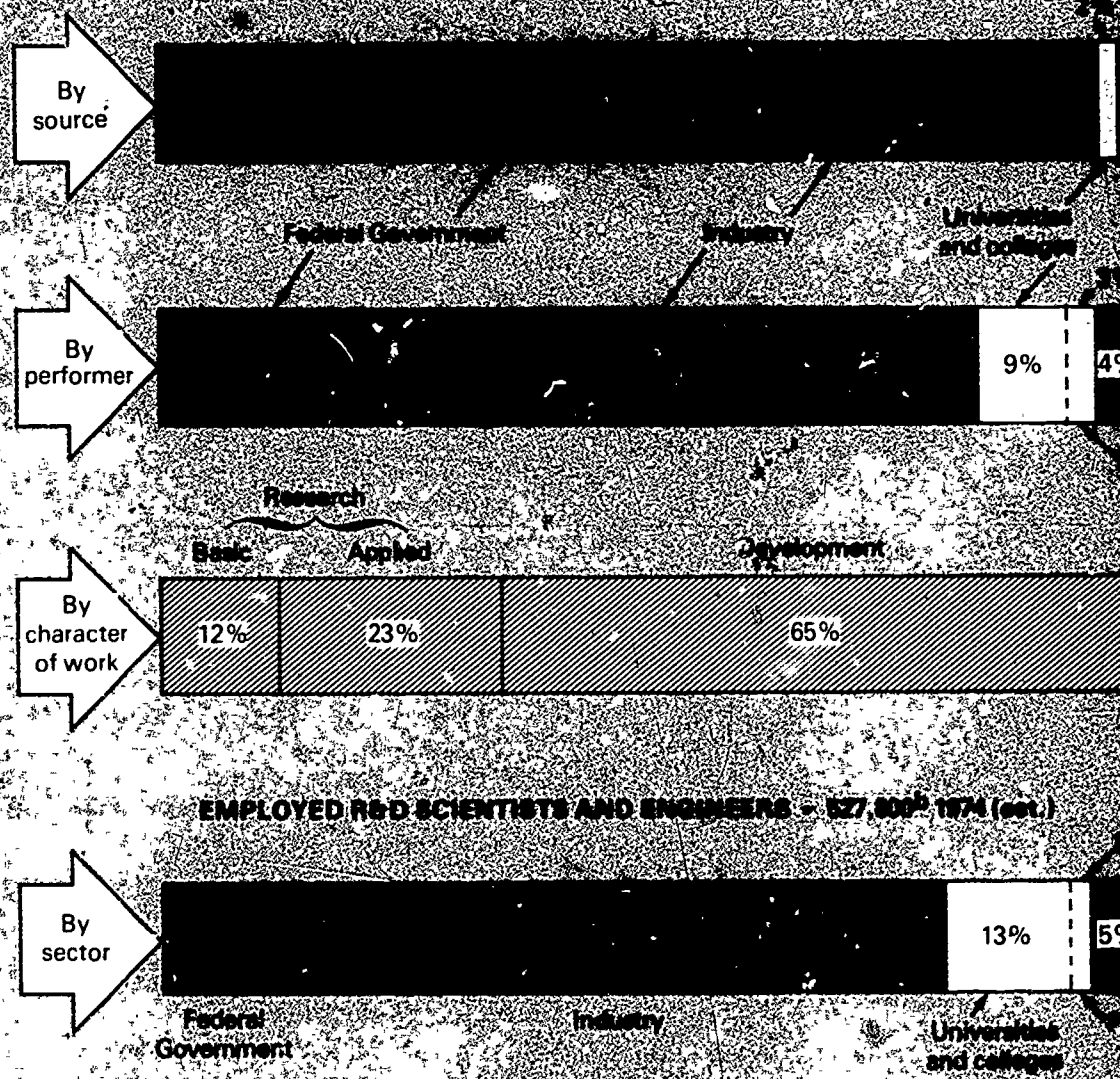
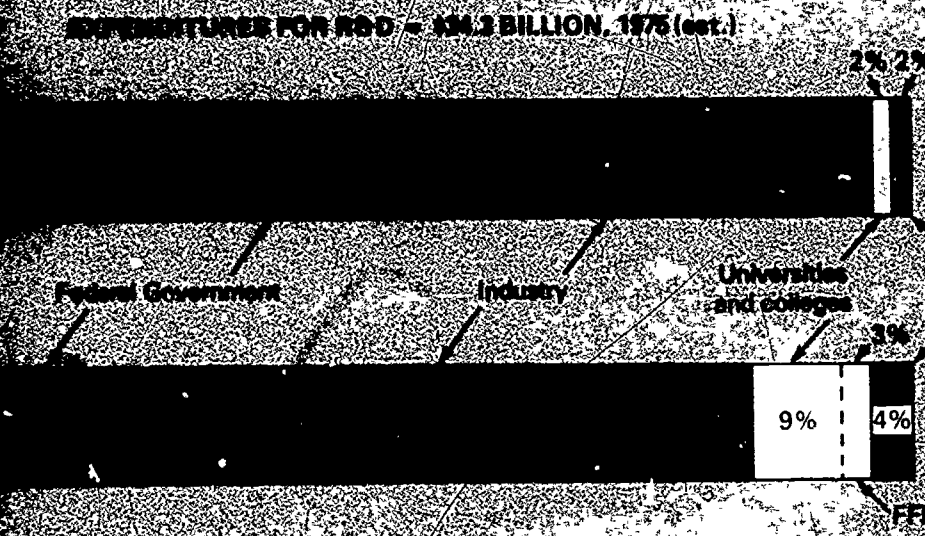
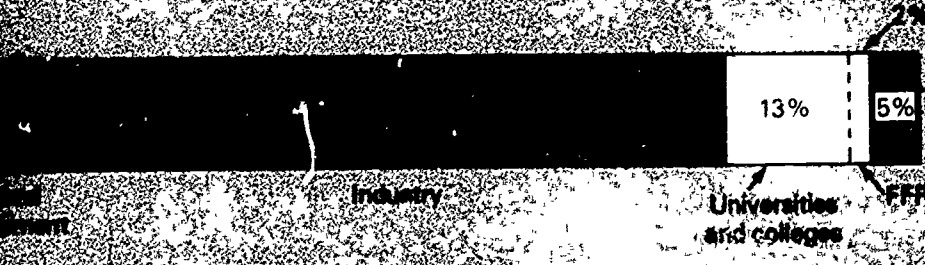
The national R&D effort



[a]Federally Funded Research and Development Centers administered by universities and colleges.
[b]Full-time equivalences.
SOURCE: National Science Foundation

The national R&D effort





and Development Centers administered by universities and colleges.

e Foundation.

HIGHLIGHTS

- Total R&D spending in the United States is projected at $34.3 billion in 1975, 7 percent above the 1974 level of $32 billion. In constant dollars, a 3-percent decrease is expected between the two years.
- In 1975 the United States is expected to devote 2.3 percent of its gross national product (GNP) to R&D activities, the same ratio as in 1974 but down from 2.4 percent in 1973 and 3.0 percent in 1964. The long-time decline of this ratio results primarily from the slowdown in growth of Federal R&D spending.
- The Federal Government will support 53 percent of the total U.S. R&D effort in 1975. Two-thirds of this Federal support will be in the areas of defense and space.
- Basic research spending is estimated at $4.1 billion in 1975, an increase of 2 percent over 1974. In constant dollars, there is an expected 8-percent decrease between the two years.
- Nearly 528,000 scientists and engineers were employed on a full-time-equivalent basis on R&D activities in 1974, 1 percent more than in 1973. This was the second straight year in which R&D professional employment increased.

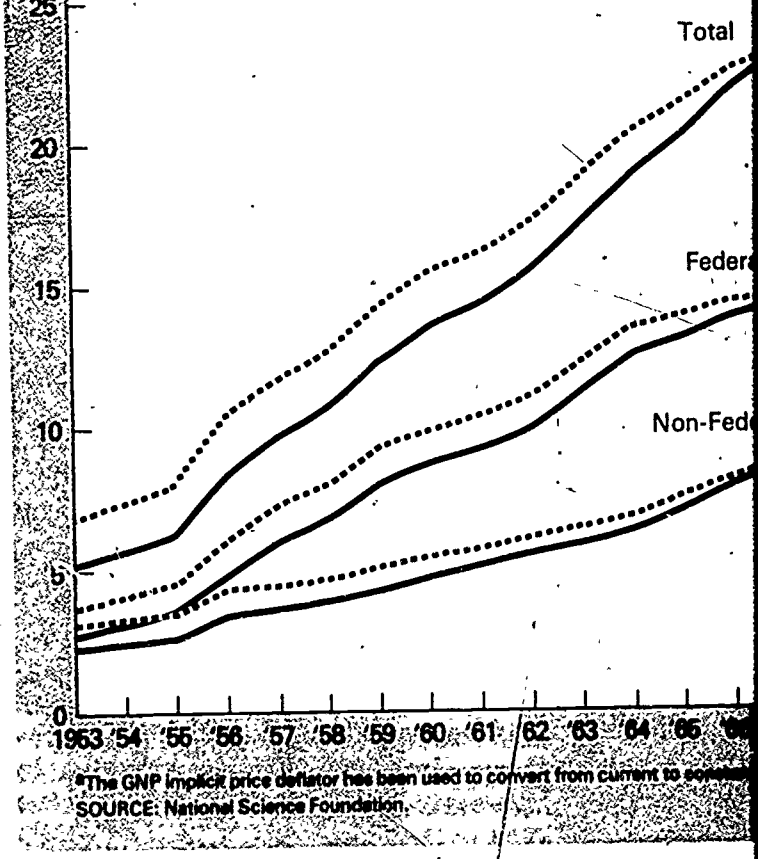
R&D FUNDING PATTERNS

Research and development spending in the United States continues its pattern of growth. In 1975, $34.3 billion is expected to be spent on R&D activities by all sectors of the economy. This is an increase of 7 percent over the 1974 level. After adjustments for an 11-percent inflation rate, however, there is a projected 3-percent decrease between the two years. The Federal Government is expected to spend $18.2 billion on R&D programs in 1975, up 7 percent over 1974. The major increases in the Federal R&D effort between the two years will be in the areas of defense and energy.

R&D funding trends: 19

(Billions of dollars)

Year	Average annual rate of change					
	Current			Constant		
	Total	Federal	Non-Federal	Total	Federal	Non-Federal
1953-61	13.7%	16.3%	10.0%	11.3%	13.9%	7.7%
1961-67	8.3	7.7	9.6	6.3	5.6	7.4
1967-75	5.0	2.9	7.9	−1.0	−3.0	1.8



*The GNP implicit price deflator has been used to convert from current to constant
SOURCE: National Science Foundation.

PATTERNS

R&D funding trends: 1953-75

(Billions of dollars)

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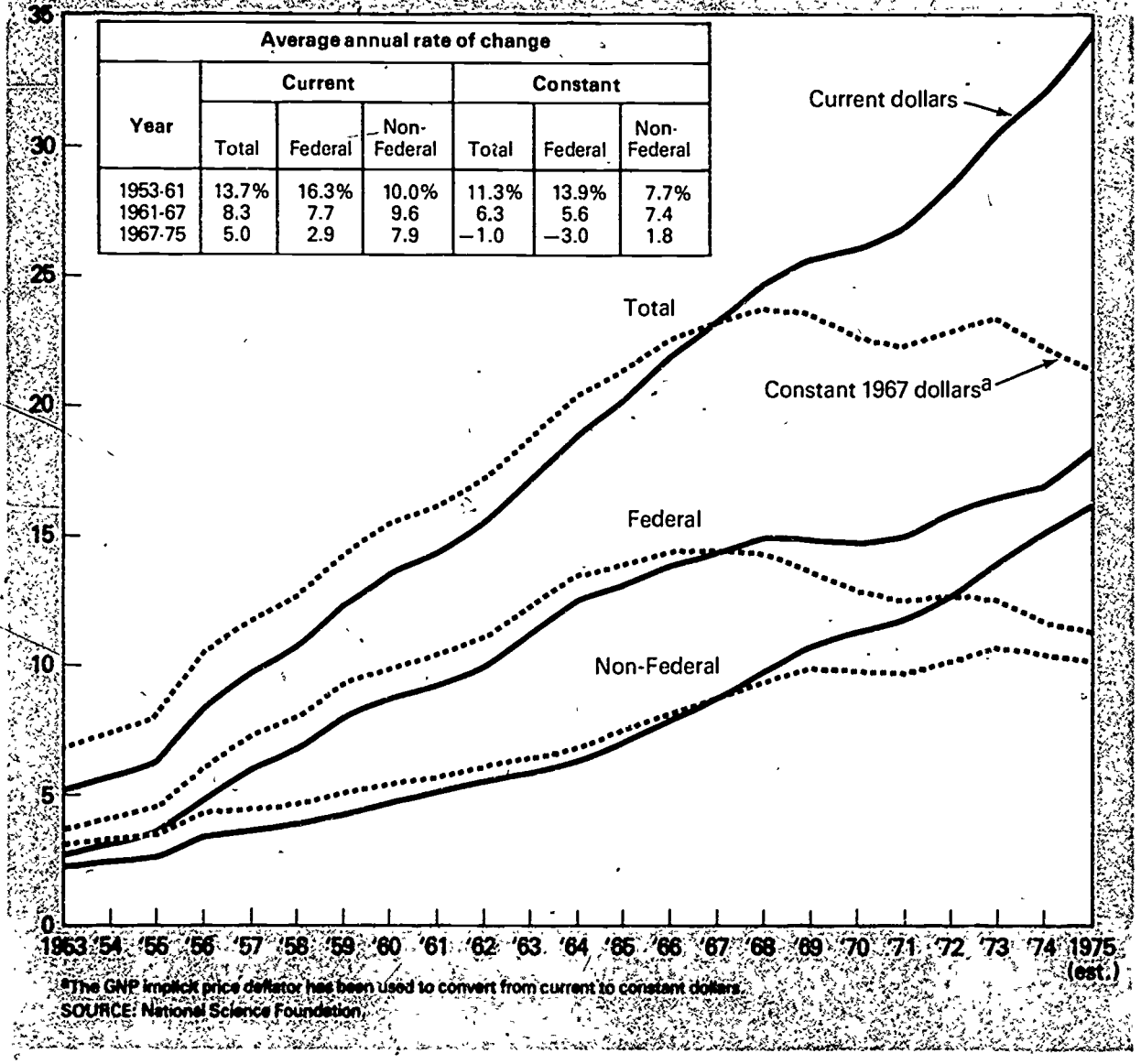

[a]The GNP implick price deflator has been used to convert from current to constant dollars.

SOURCE: National Science Foundation.

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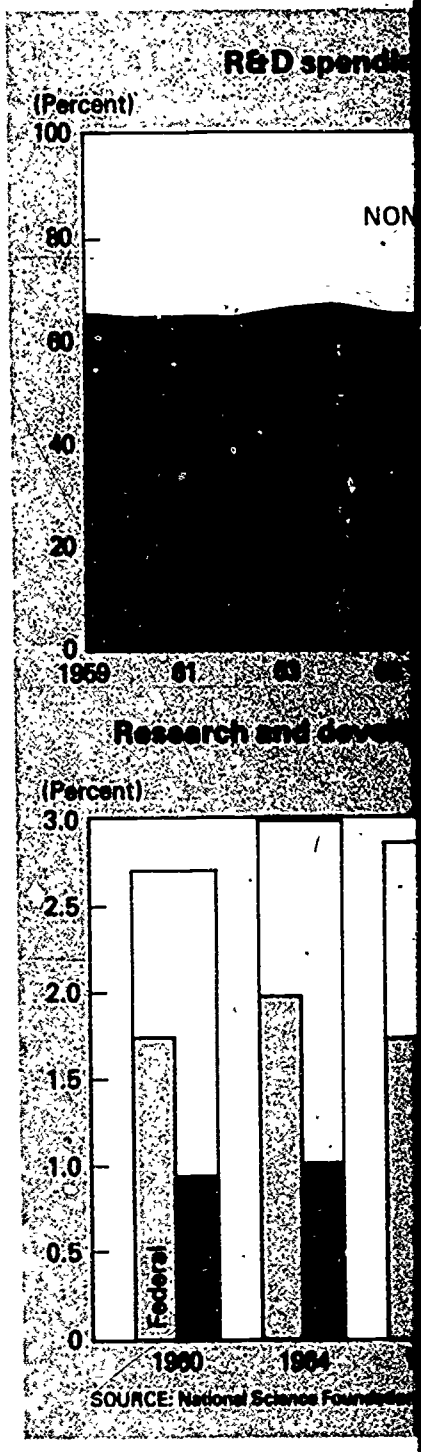
R&D by Selected Objective

Defense and space-related activities, while increasing in absolute terms, are expected to continue to decline as a percentage of total R&D spending in the United States in 1975. They are anticipated to account for 36 percen , decreasing each year since the period 1956-66 when they represented over one-half of the Nation's R&D investment. Actual spending for defense and space-related activities will be $12.3 billion during 1975.

Other Federal R&D funding is expected to total $5.9 billion, or 17 percent of the total in 1975. The major activities included in this total are health, energy resources, and environment. Federal expenditures in this area have remained a relatively constant proportion of the overall U.S. total since 1970—between 15 percent and 17 percent. They have risen at an average annual rate of 13.5 percent during the past 20 years.

Non-Federal support of R&D activities will account for slightly less than one-half of the total in 1975—$16.1 billion, or 47 percent. This represents an increase of 7 percent over the 1974 dollar level.



Research and Development/Gross National Product

Overall expenditures for research and development will comprise the same portion of the gross national product (GNP) in 1975 as in 1974—2.3 percent. This is the first year this ratio has not declined since 1967 when research and development accounted for 2.9 percent of the GNP. The steady decline can be attributed to the Federal share of R&D funding which has decreased as a percentage of the GNP during the past 11 years; by contrast, the non-Federal sector of R&D support has been a constant fraction of GNP, remaining between 1.0 percent and 1.1 percent for the past 20 years.

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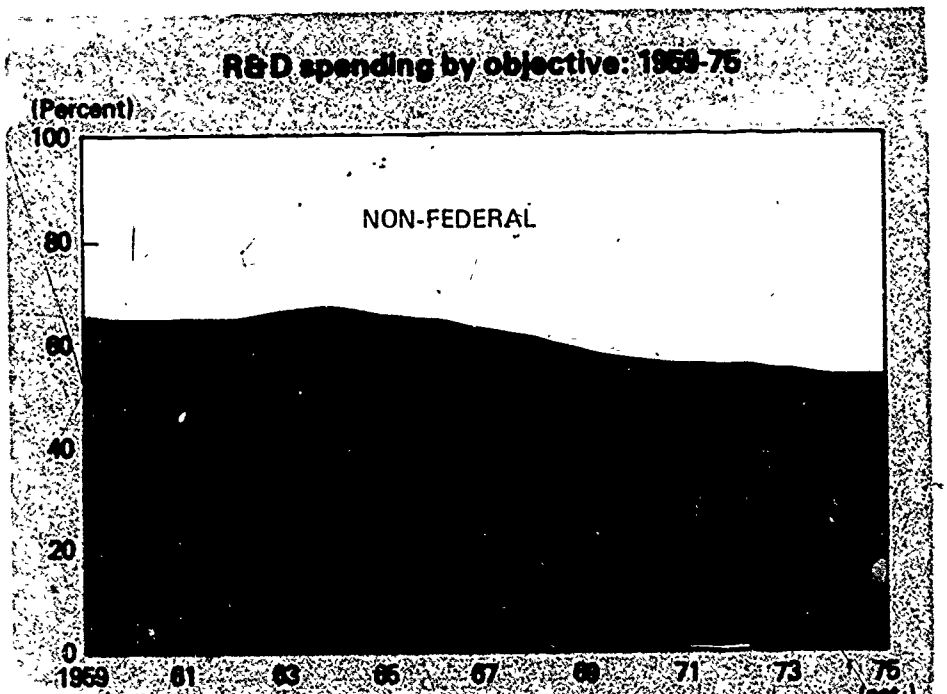

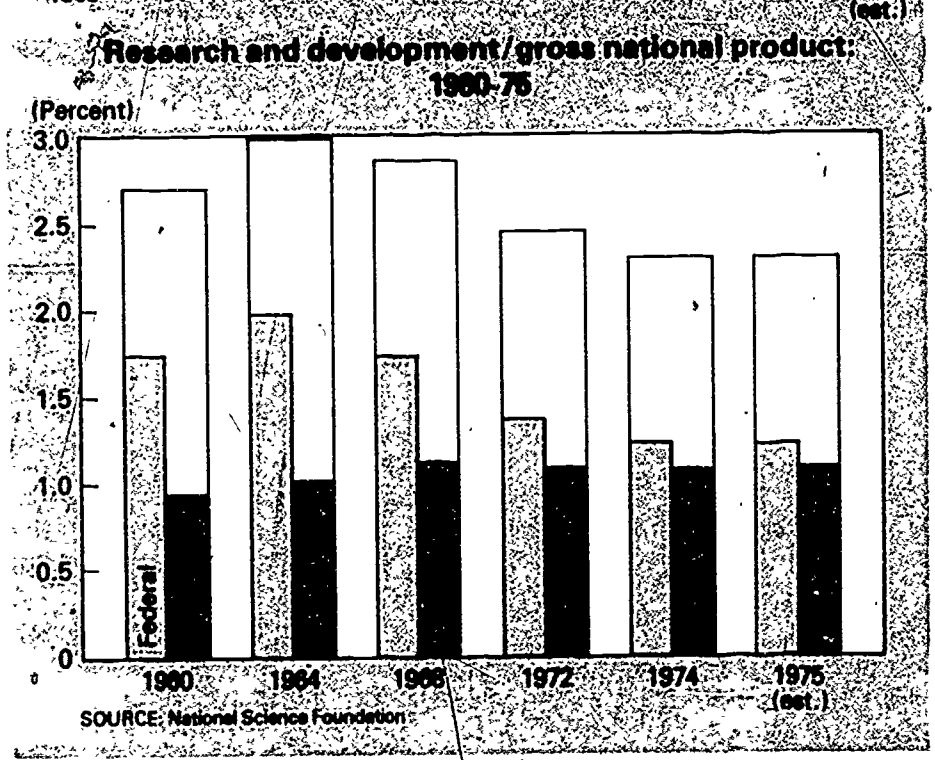

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Transfers of Funds

The following tables present estimated 1975 data on intersectoral transfers of funds by source and performance for total research and development, as well as basic research, applied research, and development, and permit comparisons of the various sectors of the economy.

Federal agencies are expected to contribute 54 percent of all R&D funds in 1975, over one-half of which will be performed by industry. Although the rate of growth of Federal R&D support has been leveling off in recent years, this sector continues to be the largest source of R&D funding. Between 1967 and 1975, however, its share of the national R&D effort dropped from 62 percent to 53 percent.

The industry sector, second in size in support of R&D activities, is expected to show a 7-percent increase in funding between 1974 and 1975. In contrast to the wide distribution given Federal monies, intramural research and development in the industry sector will account for $14.7 billion of the $14.9 billion allocated by private enterprise to research and development.

The largest performers of basic research continue to be the universities and colleges who along with their associated Federally Funded Research and Development Centers (FFRDC's) will spend an estimated $2.5 billion for these activities in 1975.[1] This sector accounts for over 60 percent of all basic research performance.

The industrial sector—the largest performer of both applied research and development—is expected in 1975 to perform $4.4 billion and $18.8 billion, or 55 percent and 85 percent, respectively, of the total. Of the $8.0 billion total allocated to applied research, industry will provide $3.3 billion or 41 percent; of the $22.3 billion allocated to development, industry will provide $11.0 billion, or 50 percent.

[1] Excludes departmental research, which is considered an integral part of instructional programs, and for which separate data are frequently not maintained. This represents a change from previously reported data. See technical notes section in "Revision of R&D Time Series Since February 1974."

Table 1. Intersectoral transfers of funds used for p development, basic research, applied research, and d

RESEARCH AND DEVELOPMEN

[Dollars in millions]

Sources of funds	Performers			
	Federal Government	Industry[2]	Universities and colleges[3]	Assoc FFR
Federal Government	5,200	9,150	2,050	9
Industry	—	14,710	100	
Universities and colleges	—	—	[5]730	
Other nonprofit institutions	—	—	220	
Total	5,200	23,860	3,100	9
			4,010	
Percent distribution, performers	15.1	69.5	9.0	2
			11.7	

BASIC RESEARCH[1]

[Dollars in millions]

Sources of funds	Performers			
	Federal Government	Industry[2]	Universities and colleges[3]	Assoc FFRD
Federal Government	655	135	1,035	30
Industry	—	525	65	—
Universities and colleges	—	—	[5]445	—
Other nonprofit institutions	—	—	140	—
Total	655	660	2,185	30
			2,490	
Percent distribution, performers	16.0	16.1	53.5	7.
			61.0	

[1] All data are estimated from reports by performers

[2] Expenditures for Federally Funded Research and Development Centers (FFRDC s) administered by both industry and by nonprofit institutions are included in the totals of their respective sectors. FFRDC's are organizations exclusively or substantially financed by the Federal Go vide major facil

NOTE: Because of State and loc In 1973, this amo

Table 1. Intersectoral transfers of funds used for performance of research and development, basic research, applied research, and development: 1975 (estimated)

RESEARCH AND DEVELOPMENT[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDC's[4]	Other nonprofit institutions[2]		
Federal Government	5,200	9,150	2,050	910	850	18,160	52.9
Industry	—	14,710	100	—	125	14,935	43.5
Universities and colleges	—	—	[5]730	—	—	730	2.1
Other nonprofit institutions	—	—	220	—	[5]300	520	1.5
Total	5,200	23,860	3,100	910	1,275	34,345	
			4,010				
Percent distribution, performers	15.1	69.5	9.0	2.7	3.7		100.0
			11.7				

BASIC RESEARCH[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDC's[4]	Other nonprofit institutions[2]		
Federal Government	655	135	1,535	305	135	2,765	67.7
Industry	—	525	65	—	35	625	15.3
Universities and colleges	—	—	[5]445	—	—	445	10.9
Other nonprofit institutions	—	—	140	—	[5]110	250	6.1
Total	655	660	2,185	305	280	4,085	
			2,490				
Percent distribution, performers	16.0	16.1	53.5	7.5	6.9		100.0
			61.0				

[1]All data are estimated from reports by performers.

[2]Expenditures for Federally Funded Research and Development Centers (FFRDC's) administered by both industry and by nonprofit institutions are included in the totals of their respective sectors. FFRDC's are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and training purposes.

NOTE. Because of limited survey data, intramural R&D expenditures of State and local governments have not been included in this report In 1973, this amounted to an estimated $225 million.

Table 1. Intersectoral transfers of funds used for performance of research and development, basic research, applied research, and development: 1975 (estimated)—Con.

APPLIED RESEARCH[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDC's[4]	Other nonprofit institutions[2]		
Federal Government	1,955	1,185	445	280	430	4,295	53.7
Industry	—	3,185	25	—	55	3,265	40.9
Universities and colleges	—	—	[5]245	—	—	245	3.1
Other nonprofit institutions	—	—	65	—	[5]120	185	2.3
Total	1,955	4,370	780	280	605	7,990	
			1,060				
Percent distribution, performers	24.5	54.7	9.7	3.5	7.6		100.0
			13.2				

DEVELOPMENT[1]

[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[2]	Universities and colleges[3]	Associated FFRDC's[4]	Other nonprofit institutions[2]		
Federal Government	2,590	7,830	70	325	285	11,100	49.8
Industry	—	11,000	10	—	35	11,045	49.6
Universities and colleges	—	—	[5]40	—	—	40	.2
Other nonprofit institutions	—	—	15	—	[5]70	85	.4
Total	2,590	18,830	135	325	390	22,270	
			460				
Percent distribution, performers	11.6	84.6	.6	1.5	1.7		100.0
			2.1				

[3]Includes agricultural experiment stations; excludes departmental research.

[4]Federally Funded Research and Development Centers (FFRDC's) administered by individual universities and colleges and by university consortia.

[5]Includes State and local government funds.

NOTE: Because of limited survey data, intramural R&D expenditures of State and local governments have not been included in this report. In 1973, this amounted to an estimated $225 million.

SOURCE: National Science Foundation.

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DEVELOPMENT[1]

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[5]Includes State and local government funds.

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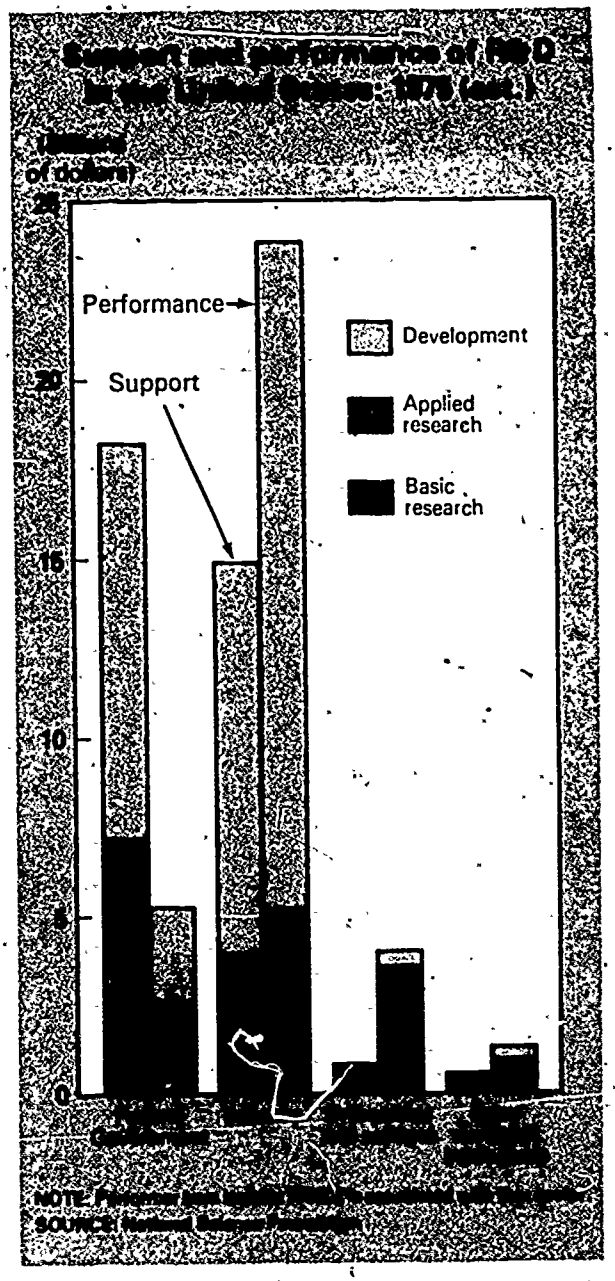
SOURCE: National Science Foundation.

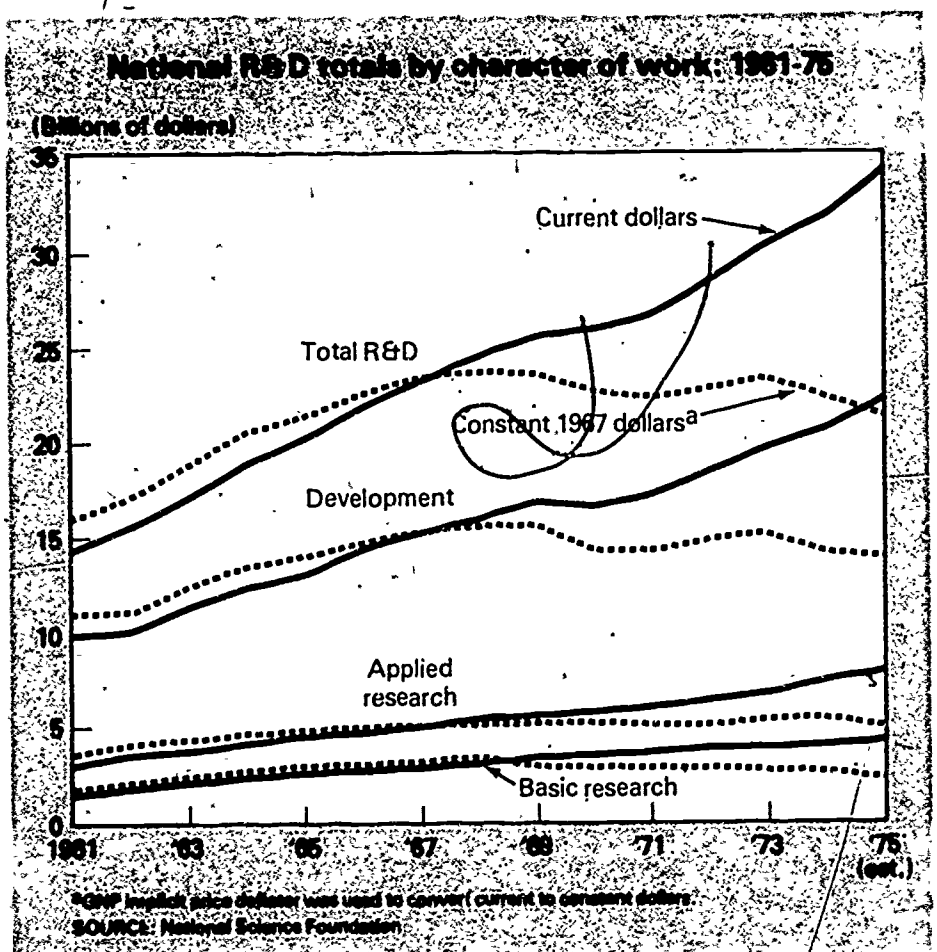


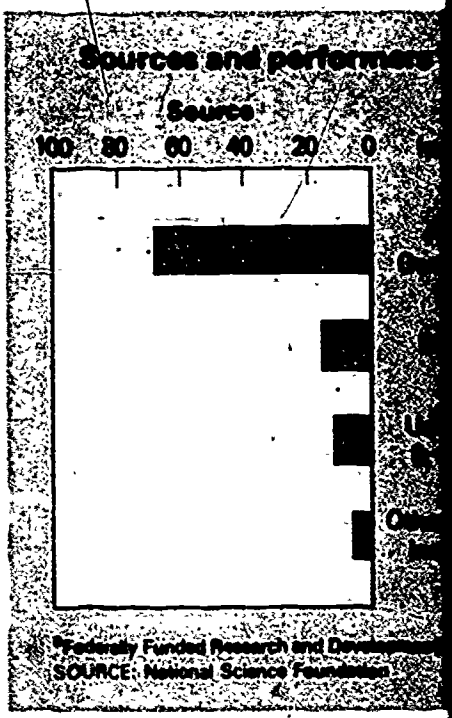
Character of R&D Work

BASIC RESEARCH

Total expenditures for basic research performance will reach $4.1 billion in 1975, rising 2 percent over 1974. In constant dollars, however, there is an estimated 8-percent decrease between the two years. Basic research is anticipated to be almost 12 percent of the total R&D effort in 1975, which is a slightly smaller share than in previous years.

The Federal Government will fund $2.8 billion of basic research in 1975, accounting for two-thirds of the total. This proportion of support has remained at abou. the same l is expected to be $1.3 billion; ap down in the annual rate of gro averaging nearly a 6-percent ris





Universities and colleges Nation's basic research. Universi their entire R&D outlays to this expected to conduct 54 percent o 1975, and their associated FFRD The Federal Government and in cent of basic research and other

APPLIED

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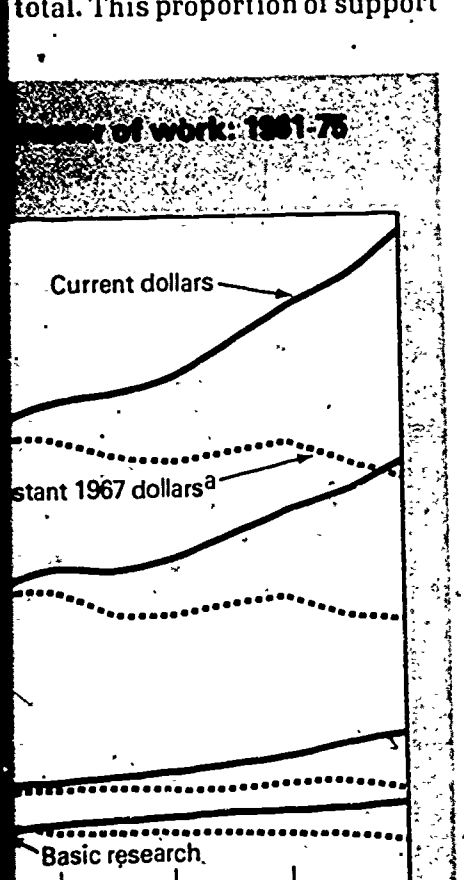
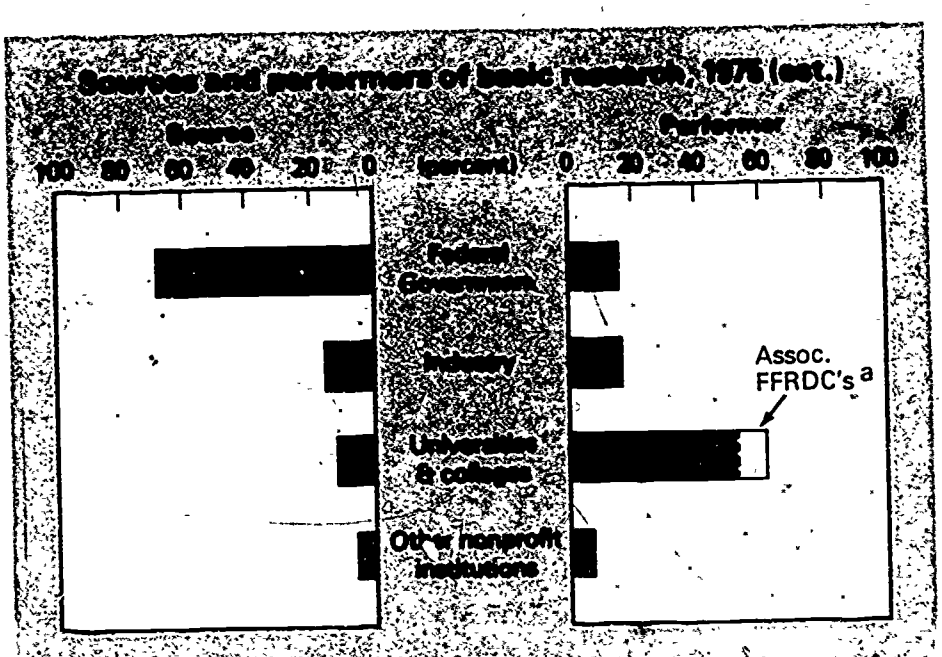




has remained at about the same level since 1962. Non-Federal funding is expected to be $1.3 billion, up 4 percent from 1974. This is a slowdown in the annual rate of growth for this sector, which had been averaging nearly a 6-percent rise yearly during the 1965-74 period.

Universities and colleges are the primary performers of the Nation's basic research. Universities and colleges devote 61 percent of their entire R&D outlays to this particular type of research. They are expected to conduct 54 percent of total basic research performance in 1975, and their associated FFRDC's will represent another 7 percent. The Federal Government and industrial sectors each perform 16 percent of basic research and other nonprofit institutions 7 percent.

APPLIED RESEARCH

Funds for applied research activities are expected to reach $8 billion in 1975, an increase of 7 percent over 1974 and above the average rate of growth in the past 10 years (6 percent annually). This type of support accounts for 23 percent of all R&D activity—the same representation as in 1974.

The Federal Government will fund more than one-half of the applied research effort in 1975, with $4.3 billion. This Federal portion will be a slightly greater share of the total than in recent years. The industrial sector will support $3.3 billion, and together these two segments of the economy will finance 95 percent of applied research. Universities and colleges are expected to support $245 million and other nonprofit institutions $185 million.

Industry is the biggest single performer of applied research. These projects will reach $4.4 billion, comprising 55 percent of the total applied research in 1975. The Federal Government will utilize one-quarter of the funds; the Department of Defense (DOD), the Department of Health, Education, and Welfare (HEW), and the National Aeronautics and Space Administration (NASA) are expected to perform 72 percent of the intramural Federal obligations for applied research.

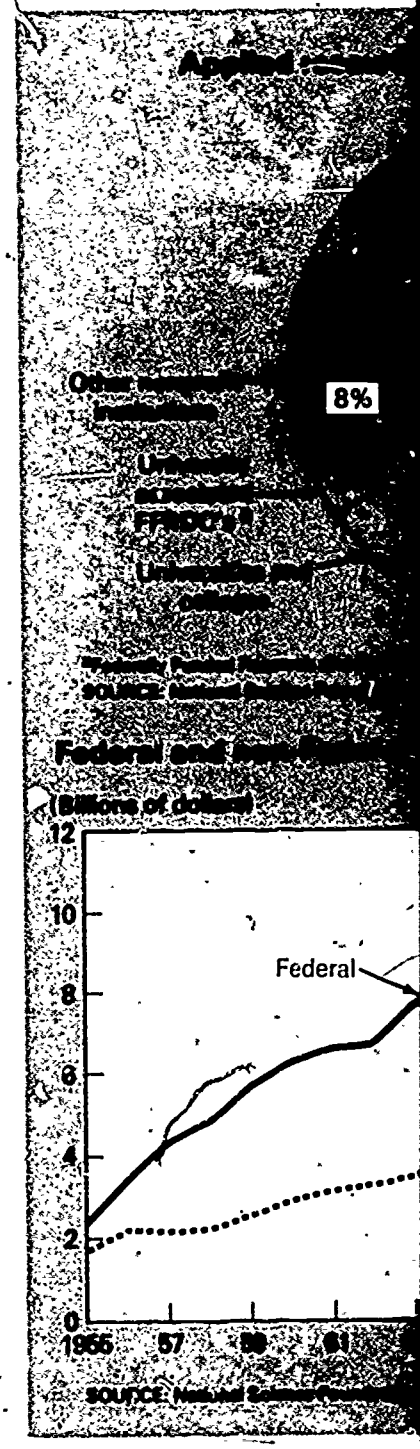
DEVELOPMENT

Expenditures for development are estimated to be $22.3 billion in 1975, or 8 percent higher than in 1974. This gain is the largest recorded in recent years. Development will represent two-thirds of the Nation's entire R&D activities in 1975.

In 1975 the Federal Government and the industrial sector will share in the major funding of development: the total for the Government will be $11.1 billion and $11.0 billion for industry, which are increases of 8 percent over 1974 for both sectors. In the last decade non-Federal spending for development has grown at a yearly rate of 9.5 percent, while Federal funding has risen at an average of 2.7 percent annually.

The industrial sector will continue to be the leading performer of development, utilizing almost $19 billion, or 84 percent of the total. This segment of the economy has represented over 80 percent of development funds expended since 1953. In 1975 industrial firms are expected to spend three-quarters of their total R&D outlays or development, compared to 22 percent on applied research and 4 percent on basic research.

The Federal Government will devote 61 percent of its R&D total to development in 1975. DOD and NASA together will represent nine-tenths of the intramural Federal obligations for development; DOD will allocate 71 percent of its 1975 R&D total to development.



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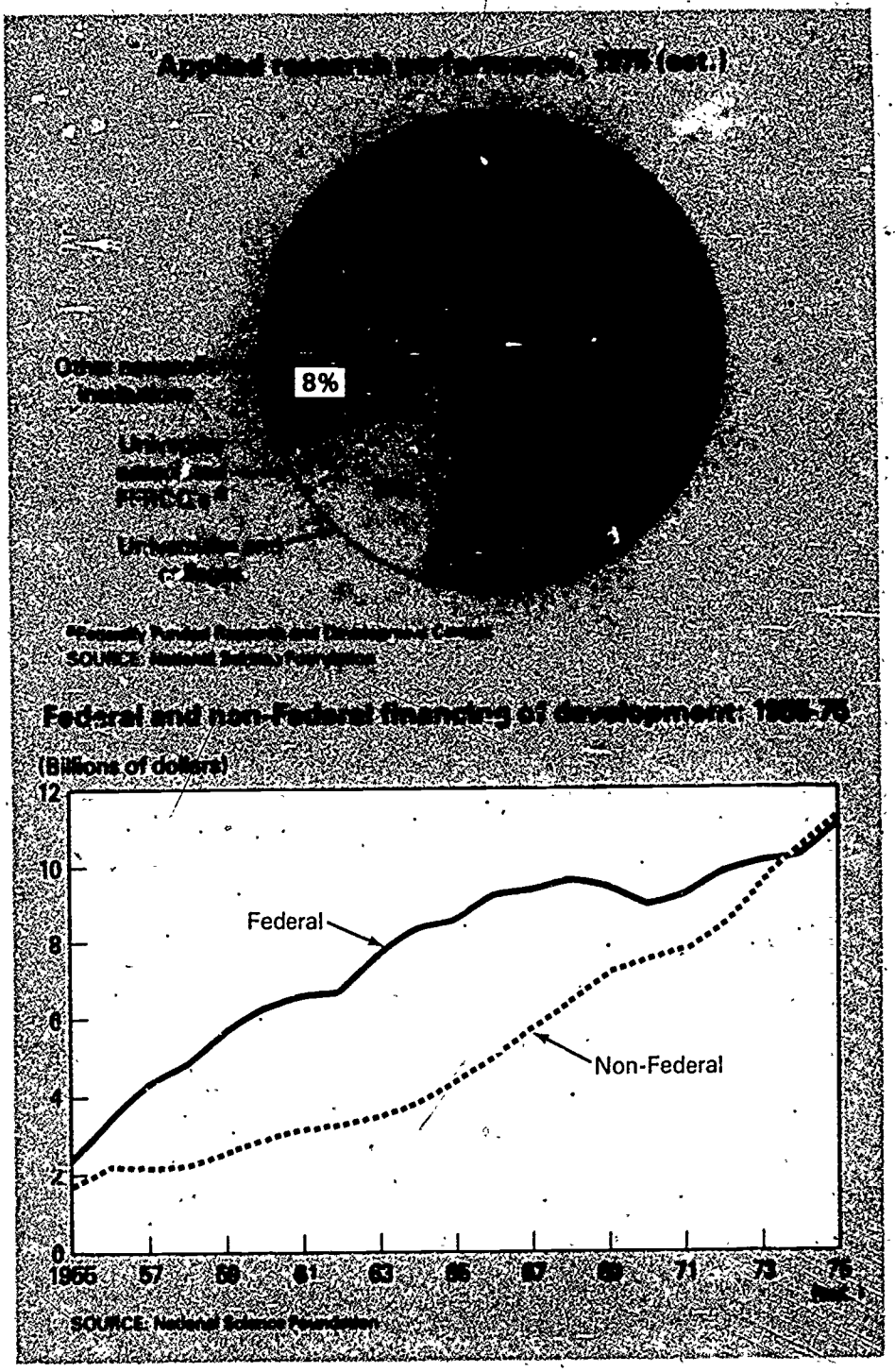
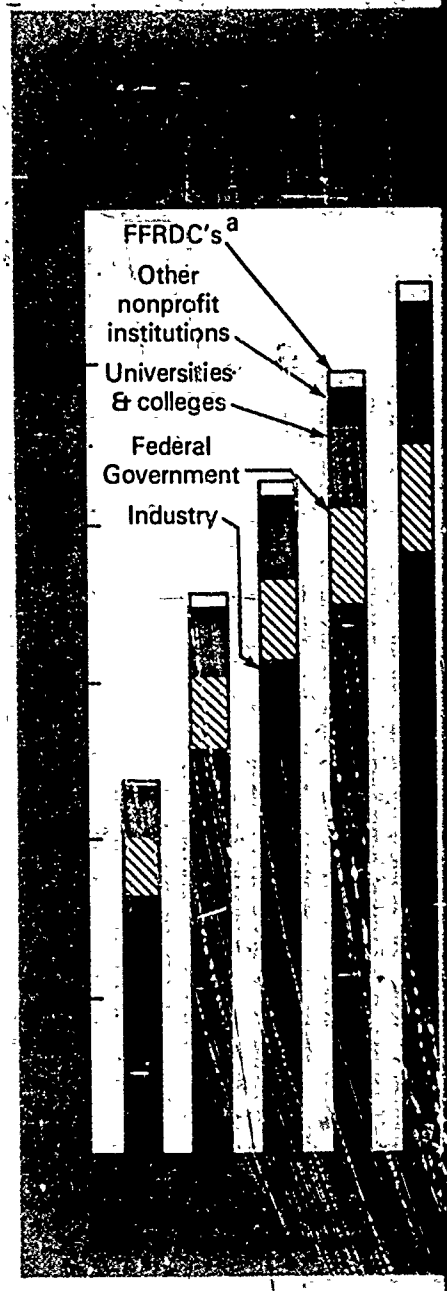


R&D MANPOWER

In 1974 about 528,000 scientists and engineers were engaged in R&D activities on a full-time-equivalent (FTE) basis in all sectors of the economy (excluding State and local governments). The number continues to account for about one-third of the estimated total employment of scientists and engineers. The accompanying chart and appendix table B-10 present information on the distribution on these 528,000 personnel among the different economic sectors. It should be noted that these data represent primarily yearly averages whereas the figures shown for each sector in the remainder of this section are based on employment surveys for a single month of the year.

During the past two decades the employment of R&D-performing scientists and engineers grew at an average annual rate of 4.1 percent, slightly faster than all professional and related workers, and 1.6 times the rate for all workers. R&D scientist and engineer employment declined, however, at an average annual rate of 22.2 percent from the 1969 peak to 1972. In the last two years, an average increase of less than 1 percent resulted in a rise of 7,000 personnel from the low point in 1972. The decline from 1969 to 1972, and the subsequent increase over the next two years resulted primarily from changes in industrial employment.

In the 20 years between 1954 and 1974 the share of R&D scientists and engineers employed by each major sector has shown little change. The private industry component has ranged from 68 percent to 73 percent of total employment, and the Federal Government from 12 percent to 16 percent. The colleges' and universities' share increased from about 10 percent in the fifties to nearly 13 percent in the seventies, while Federally Funded Research and Development Centers remained at 2 percent throughout the two decades. Nonprofit research organizations exhibited the largest proportionate growth in the period, rising from a 2-percent share in the fifties to almost 5 percent by the seventies as a result of increased Federal funding of social science and health-related research which many of these institutions perform.



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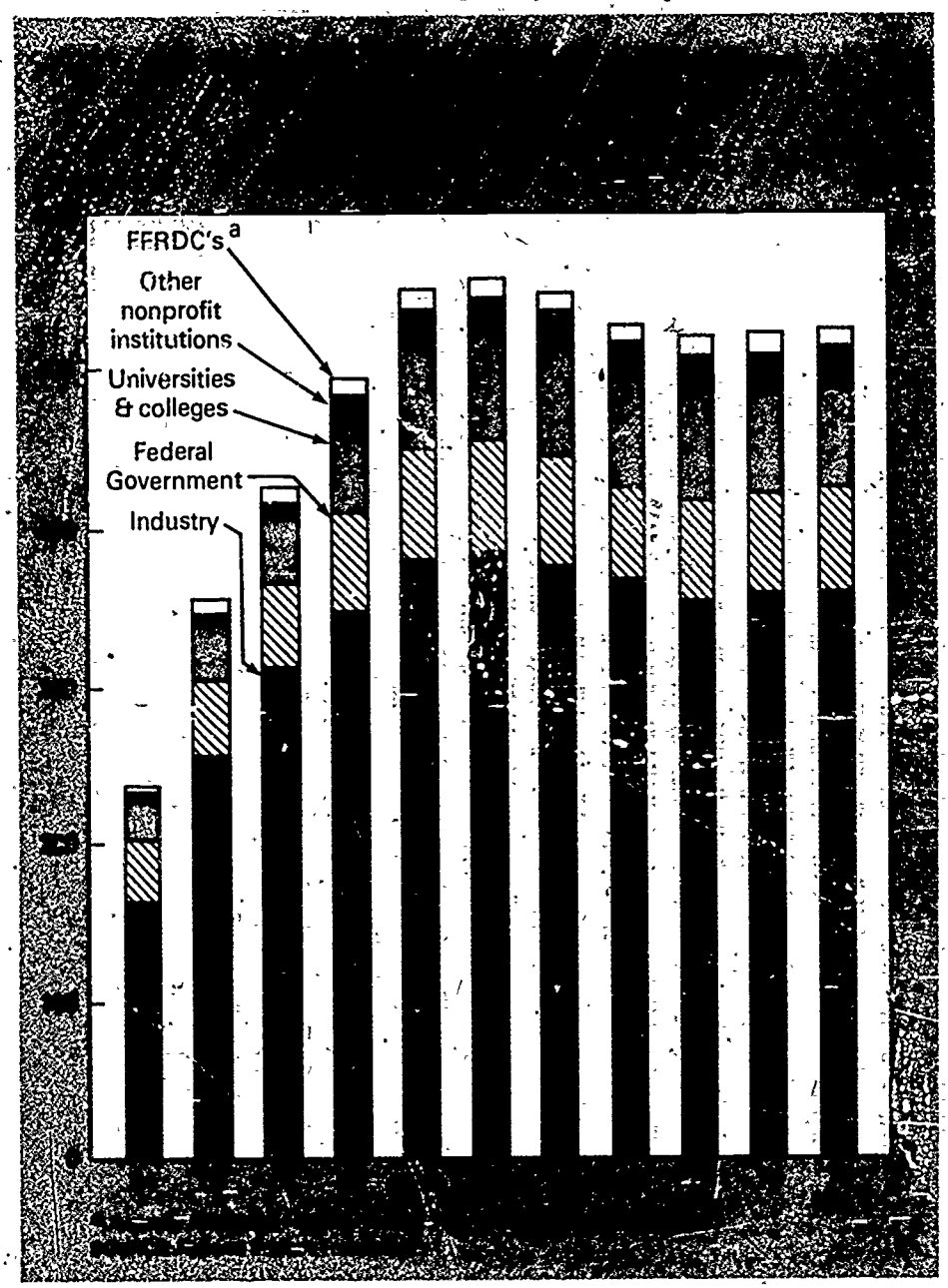

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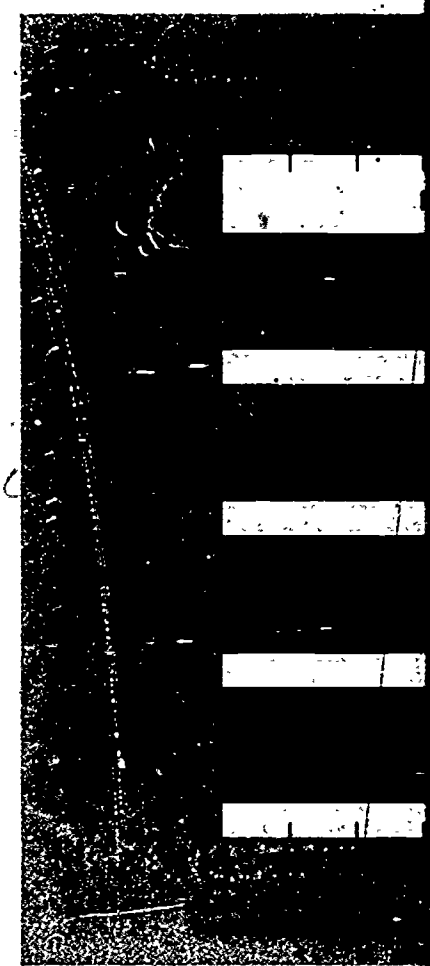
Scientists and engineers with doctorate degrees are a significant component of the Nation's R&D manpower resources. In 1973 103,000 of these workers spent the majority of their working time engaged in R&D-related activities including basic and applied research, development, and the management and administration of research and development.[2] These workers represented about one of every five R&D scientists or engineers. Of these doctorate holders engaged in research and development, 38,000 were physical scientists, 30,000 were life scientists, 20,000 were engineers, 11,000 were social scientists, and 4,000 were mathematicians.

More than 60 percent of these doctorates in research and development were engaged in research (basic and applied), another 30 percent in administration and management of research and development, and the remainder in development. Engineering was the only field in which research activities accounted for fewer workers than development and administration of research and development combined.



[2] Included are about 5,000 who were administering or managing activities other than research and development as well as research and development.

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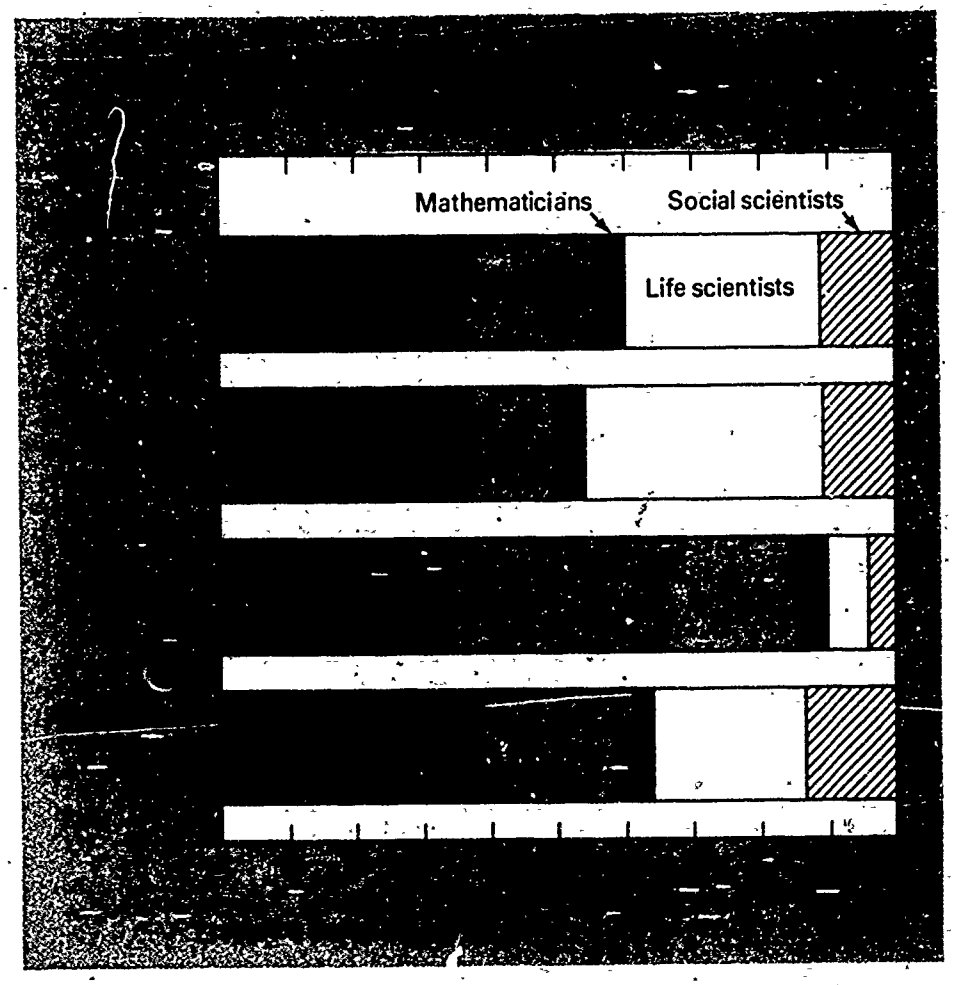

ministering or managing activities other than
and development.

Private Industry

Private industries employed 363,100 FTE R&D scientists and engineers in January 1974, slightly more than a year ago (table 2). Machinery and instrument manufacturing firms—both employing more R&D personnel than ever before, and the electrical equipment manufacturers, which have recouped almost one-half the 15,000 jobs lost between 1970 and 1972—contributed to the increased employment.

Aircraft, missile, and motor
largest losses of R&D employmen
industries gained or lost no n
engineers during the year.

Table 2. Full-time-equivalent number of R&D scientists and engineers, by industry: Januar

[in thousands]

Industry	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1
Total	229.4	243.8	268.4	292.0	312.1	312.0	327.3	340.2	343.6	353.2	367.2	376.7	3
Chemicals and allied products	29.4	31.0	33.5	36.1	37.0	36.5	38.3	35.3	37.9	38.6	36.9	38.9	
Petroleum refining and extraction	6.9	7.4	7.7	9.2	9.0	9.1	8.9	8.1	8.7	8.9	8.7	9.2	
Rubber products	4.7	4.7	4.8	5.3	5.5	5.6	5.8	6.0	5.8	5.7	5.8	6.1	
Stone, clay, and glass products	[2]	[2]	[2]	[2]	3.6	3.7	3.8	3.3	3.5	3.1	3.3	4.1	
Primary metals	5.1	5.2	5.7	6.9	6.9	6.0	5.2	5.1	5.5	5.5	5.9	5.9	
Fabricated metal products	8.4	8.3	8.9	7.4	8.6	7.4	6.8	7.0	6.6	6.3	6.3	5.6	
Machinery	24.9	27.4	29.4	32.1	33.0	31.5	31.4	27.3	29.4	30.5	33.6	37.4	
Electrical equipment and communication	42.9	47.9	54.8	72.1	79.2	82.3	85.8	89.5	87.8	92.0	98.6	98.4	1
Motor vehicles and other transportation equipment	13.6	15.0	16.8	17.8	19.1	20.8	21.1	23.3	24.1	24.8	25.2	24.3	
Aircraft and missiles	58.7	58.6	65.9	72.4	78.5	79.4	90.7	101.1	99.2	99.3	100.4	101.1	
Professional and scientific instruments	10.2	11.0	12.0	10.0	11.1	9.8	9.4	10.8	11.5	12.5	13.0	14.1	
Other manufacturing industries	[3] 24.6	[3] 27.3	[3] 28.9	[3] 22.6	12.9	11.7	11.9	13.6	14.0	14.3	15.4	16.5	
Other nonmanufacturing industries					7.5	7.0	8.2	9.8	9.6	11.7	14.1	15.1	

[1] Excludes social scientists.

[2] Data included in the "other manufacturing" group.

[3] For years 1957-60, other manufacturing and nonmanufacturing combined. Other manufacturing industries include food and kindred products, textiles, appare
ducts; tobacco products, printing and publishing, leather products and miscellaneous manufacturing.

SOURCE: National Science Foundation

3,100 FTE R&D scientists and more than a year ago (table 2). cturing firms—both employing re, and the electrical equipment almost one-half the 15,000 jobs buted to the increased employ-

Aircraft, missile, and motor vehicle manufacturers sustained the largest losses of R&D employment during 1973, while other individual industries gained or lost no more than 300 R&D scientists and engineers during the year.

-time-equivalent number of R&D scientists and engineers, by industry: January 1957-74[1]

[in thousands]

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
243.8	268.4	292.0	312.1	312.0	327.3	340.2	343.6	353.2	367.2	376.7	387.1	384.1	366.8	352.3	362.5	363.1
31.0	33.5	36.1	37.0	36.5	38.3	35.3	37.9	38.6	36.9	38.9	40.3	40.2	42.8	41.4	42.0	42.1
7.4	7.7	9.2	9.0	9.1	8.9	8.1	8.7	8.9	8.7	9.2	10.0	9.9	9.2	8.2	8.1	8.3
4.7	4.8	5.3	5.5	5.6	5.8	6.0	5.8	5.7	5.8	6.1	6.3	6.8	5.9	5.9	5.8	5.7
([2])	([2])	([2])	3.6	3.7	3.8	3.3	3.5	3.1	3.3	4.1	4.2	4.6	4.1	3.8	3.9	4.2
5.2	5.7	6.9	6.9	6.0	5.2	5.1	5.5	5.5	5.9	5.9	6.2	6.3	6.3	6.0	5.7	5.7
8.3	8.9	7.4	8.6	7.4	6.8	7.0	6.6	6.3	6.3	5.6	6.6	5.9	6.9	6.8	7.1	6.9
27.4	29.4	32.1	33.0	31.5	31.4	27.3	29.4	30.5	33.6	37.4	39.4	41.4	40.5	41.1	42.7	45.8
47.9	54.8	72.1	79.2	82.3	85.8	89.5	87.8	92.0	98.6	98.4	101.6	102.4	95.2	87.7	93.0	94.7
15.0	16.8	17.8	19.1	20.8	21.1	23.3	24.1	24.8	25.2	24.3	25.0	25.1	27.8	29.5	29.6	28.4
58.6	65.9	72.4	78.5	79.4	90.7	101.1	99.2	99.3	100.4	101.1	99.9	92.6	78.3	72.7	74.3	69.7
11.0	12.0	10.0	11.1	9.8	9.4	10.8	11.5	12.5	13.0	14.1	15.1	14.8	15.1	14.8	15.8	16.7
[3]27.3	[3]28.9	[3]22.6	12.9 7.5	11.7 7.0	11.9 8.2	13.6 9.8	14.0 9.6	14.3 11.7	15.4 14.1	16.5 15.1	17.4 15.1	17.8 16.3	19.1 15.6	18.5 15.9	18.8 15.7	19.4 15.5

ufacturing combined. Other manufacturing industries include food and kindred products, textiles, apparel, lumber and wood products, paper and allied pro- products and miscellaneous manufacturing.

Other Sectors

In early 1974, 48,100 scientists and engineers were primarily employed in R&D activities in colleges and universities (excluding affiliated FFRDC's); this was 1,600 more than a year previously and less than 200 fewer than the peak employment in 1971. The employment of physical scientists reached an all time high of 8,200 with chemistry accounting for virtually all of the gain. Except for engineering, all of the other fields gained over the 1973 employment levels, but none surpassed levels reached in 1969 or 1971. Table 3 depicts the numbers of faculty members primarily engaged in research and development from 1965 to 1974. Total scientists and engineers primarily engaged in research and development represented 17 percent of the professional staffs in their fields in 1974, compared with 18 percent in 1973. The largest proportions primarily engaged in research and development to total staff were in the life and physical sciences—each with more than 20 percent, while the smallest proportions were in mathematics.

In 1974 the number of graduate students in the sciences and engineering employed part-time in research and development by universities was 36,500—1,900 more than in 1973.

Table 3—Numbers of scientists and engineers primarily engaged in research and development in universities and colleges, by field of specialization: for January of selected years

Field of specialization	1965	1969	1971	1973	1974
All fields	40,003	47,118	48,268	46,481	48,091
Engineering	4,153	4,976	4,839	4,998	4,767
Physical sciences	5,927	6,970	7,314	7,896	8,244
Chemistry	2,335	2,685	2,579	2,781	3,084
Physics	2,132	2,394	2,411	2,474	2,497
Other	1,460	1,891	2,324	2,641	2,663
Mathematics	932	1,669	1,446	1,310	1,543
Life sciences	24,995	28,307	30,433	27,867	28,870
Social sciences and psychology[1]	4,036	5,196	4,236	4,410	4,667

[1]Social sciences excludes history.
SOURCE: National Science Foundation

Table 4—Numbers of graduate students engaged part time in research and development, by field of specialization: for January of selected years

Field of specialization	1965	1969	1971	1973	1974
Total	27,200	35,800	37,200	34,600	36,500
Engineering	6,400	7,900	8,900	8,400	9,100
Physical sciences	8,100	10,600	10,500	8,800	9,200
Mathematics	900.	1,600	1,500	1,500	1,500
Life sciences	8,500	10,000	11,200	10,500	10,600
Social sciences and psychology[1]	3,300	5,700	5,100	5,400	6,100

[1]Social sciences exclude history.
SOURCE: National Science Foundation

Between 1973 and 1974 all fields except mathematics experienced increases, with engineering and the social sciences exceeding the previous high employment levels of 1971. These student workers represented the equivalent of approximately 17,000 full-time employees, and they accounted for 40 percent of the graduate science and engineering students working for universities in positions related to their studies. Table 4 compares the 1971, 1973, and 1974 levels of employed graduate students engaged in research and development.

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Field of specialization	1965	1969	1971	1973	1974
Total	27,200	35,800	37,200	34,600	36,500
Engineering	6,400	7,900	8,900	8,400	9,100
Physical sciences	8,100	10,600	10,500	8,800	9,200
Mathematics	900	1,600	1,500	1,500	1,500
Life sciences	8,500	10,000	11,200	10,500	10,600
Social sciences and psychology[1]	3,300	5,700	5,100	5,400	6,100

[1]Social sciences exclude history.
SOURCE: National Science Foundation

Between 1973 and 1974 all fields except mathematics experienced increases, with engineering and the social sciences exceeding the previous high employment levels of 1971. These student workers represented the equivalent of approximately 17,000 full-time employees, and they accounted for 40 percent of the graduate science and engineering students working for universities in positions related to their studies. Table 4 compares the 1971, 1973, and 1974 levels of employed graduate students engaged in research and development.

In the 21 FFRDC's administered by universities, 11,900 scientists and engineers were primarily employed in R&D activities, in 1974, 300 fewer than in 1973. Most of the decrease resulted from the change of status of 14 centers which were previously totally funded by the Office of Education, now considered nonprofit research organizations. Engineers, representing about one-half the scientists and engineers in the FFRDC's, continued to be the largest employment field, reaching a new high in 1974. Physical scientists, representing approximately 40 percent of employment, also reached a new high in 1974, surpassing the previous peak of 1965. These organizations also employed 500 graduate students and 6,200 technicians associated with research and development. About 70 percent of the technicians were engineering technicians while most of the graduate students were in the fields of chemistry and physics (table 5).

Table 5—Number of scientists and engineers primarily engaged in research and development in Federally Funded Research and Development Centers[1], by field of specialization: for January of selected years

Field of specialization	1965	1969	1971	1973	1974
Total	11,113	11,263	11,118	12,169	11,905
Engineering	4,914	4,960	5,034	5,631	5,675
Physical science	4,563	4,294	4,225	4,434	4,585
Chemistry	1,409	1,221	1,175	1,189	1,133
Physics	2,454	2,634	2,589	2,737	2,797
Other	700	439	461	508	655
Mathematics	940	1,085	1,083	1,149	1,010
Life sciences	656	414	376	527	468
Social sciences and psychology[2]	187	510	400	428	167

[1]Administered by universities & colleges.
[2]Social sciences exclude history.
SOURCE: National Science Foundation.

The Federal Government employed an estimated 47,800 civilian R&D scientists and engineers in 1973, the most recorded since data on R&D activities have been collected. New highs were reached by DOD, HEW, and the Department of Agriculture (UDSA), while NASA continued to experience a declining level of employment.

As it has done for the past five years, DOD continued to employ more than one-half of these workers while NASA, the second largest R&D employer, had its share decline from 16 percent to 13 percent between 1969 and 1973.

In 1973, 444 nonprofit organizations (excluding those employed at State-affiliated institutions, such as hospitals, museums, etc.) employed 23,100 scientists and engineers, who were performing research and development, more than in any previous year in which a survey was made. Engineering and life sciences employment reached new highs in 1973 while employment in other fields declined from previous highs recorded in 1967 or 1970 (table 6). In 1973 these organizations also employed 11,500 R&D technicians. More than one-half of these were in medical or health-related research and development.

State governments employed the full-time equivalent of 4,900 R&D scientists and engineers in the 1973 fiscal year, 32 percent more than in 1968. Two-fifths of these workers were engaged in research and development related to natural resources—agriculture, environmental protection, and energy development and conservation, the only major function increasing faster than the average during the 5-year period (table 7). In addition to the 4,900 scientists and engineers, the States employed 3,300 technicians in R&D activities.

Table 6—Numbers of scientists and engineers primarily engaged in research and development in nonprofit institutions, by field of specialization: for selected years

Field of specialization	1965[1]	1967[1]	1970[1]	1973[2]
All fields	18,499	22,129	21,556	23,129
Engineering	3,745	4,740	4,746	5,087
Physical science	2,991	3,571	3,370	3,196
Mathematics	2,065	2,172	1,366	1,439
Life sciences	6,600	7,338	7,274	8,981
Social sciences and psychology[3]	3,098	4,308	4,800	4,426

[1]January
[2]October
[3]Social science includes economics and sociology.
SOURCE: National Science Foundation.

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Table 7—Fill-time-equivalent number of R&D scientists and engineers in State governments, by function: fiscal years 1968, 1972, and 1973

Function	1968	1972	1973	Percent change 1968-73
Total	3,733	4,610	4,899	31.2
Health and hospitals	1,377	1,702	1,812	31.6
Natural resources[1]	1,325	1,858	2,007	51.5
Education	369	235	206	-44.2
Crime prevention	85	69	104	22.4
Transportation	387	454	477	23.3
All other	190	292	293	54.2

[1]Includes environment, energy development and conservation, and agriculture.

SOURCE: National Science Foundation.

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SOURCE: National Science Foundation.

R&D performance in State governments is highly concentrated. The two most populous States—New York and California, accounting for 19 percent of the U.S. population—employed one-third of all State government R&D scientists and engineers. The five States employing the largest numbers of R&D workers (adding Florida, Illinois, and Virginia) accounted for more than one-half of all R&D scientists and engineers employed by States. In total, 30 percent of the Nation's population resided in these five States in 1973.

APPENDIXES

A. Basis for Sectoring and Technical Notes

B. Statistical Tables

APPENDIX A

Basis for Sectoring

The National Science Foundation follows a four-sector division in surveying R&D funds and personnel and maintaining the time series for expenditures and employment. This division is based on an approach that attempts to take account of both the legal nature and major functions of organizations active in financing and performing basic research, applied research, and development. Grouping diverse types of organizations into discrete sectors, however, requires certain arbitrary judgments because of the mixed nature of many organizations, particularly those in the university and other nonprofit sectors.

The *Federal sector* is made up of the agencies of the Federal Government. The *industry sector* consists of both manufacturing and nonmanufacturing companies. Manufacturing is classified in major industry groupings; and nonmanufacturing, which includes organizations such as those in selected service industries, is treated as a unit. Federally Funded Research and Development Centers (FFRDC's) administered by industrial firms are also included.

The *universities and colleges sector* is composed of all institutions of higher education, both public and private. The term "universities and colleges" is used in this report to refer to the academic institutions as a group without the associated FFRDC's administered by the schools for various Federal agencies. The universities and colleges comprise the following:

Colleges of liberal arts; schools of arts and sciences; professional schools, such as engineering and medical schools, including affiliated hospitals; associated research institutions, and similar organizations, which are integral parts of the universities and colleges; agricultural experiment stations, and associated schools of agriculture.

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The *Federal sector* is made up of the agencies of the Federal Government. The *industry sector* consists of both manufacturing and nonmanufacturing companies. Manufacturing is classified in major industry groupings; and nonmanufacturing, which includes organizations such as those in selected service industries, is treated as a unit. Federally Funded Research and Development Centers (FFRDC's) administered by industrial firms are also included

The *universities and colleges sector* is composed of all institutions of higher education, both public and private. The term "universities and colleges" is used in this report to refer to the academic institutions as a group without the associated FFRDC's administered by the schools for various Federal agencies. The universities and colleges comprise the following:

Colleges of liberal arts; schools of arts and sciences; professional schools, such as engineering and medical schools, including affiliated hospitals; associated research institutions, and similar organizations, which are integral parts of the universities and colleges; agricultural experiment stations, and associated schools of agriculture.

Funds used at the universities and attributed to the universities sector as a source consist of several components: (1) State and local government funds separately budgeted for research and development, and (2) unrestricted or general funds which the institutions themselves have been free to allocate for research. Funds from the Federal Government, industry, or other nonprofit institutions, which are supplied in the form of grants or contracts for research or development at a university, are credited to the appropriate source in the performance of research and development by universities and colleges. Thus, research contracts from industry are treated as university performance funded by industry as the source, whereas funds given to the institution by industry for general educational purposes and used by the school, at its discretion, for research, are treated as university performance financed with the university's own funds.

Institutions in the other nonprofit sector fall into two general groups: (1) organizations that are primarily granting in nature, namely private philanthropic foundations and voluntary health agencies, and (2) public and private organizations that are involved in performing research and development, comprising separately incorporated nonprofit research institutes, professional societies, academies of science, museums, zoological gardens, botanical gardens, arboretums, nonprofit hospitals, and FFRDC's administered by nonprofit organizations.

In this report, both the university and the other nonprofit sectors contain private and public institutions—the latter are closely associated with State or local governments. A number of organizations in both sectors, as well as in industry, also receive State and local government funds.

Technical Notes

CONCEPTS AND DEFINITIONS

Research and development in this report consists of basic and applied research in the sciences (including medical sciences) and in engineering and activities in development, all defined below. In terms of fields, the natural sciences—life, physical, and engineering—as well as the social and psychological sciences are covered in the Federal, universities, and other nonprofit sectors. Industry coverage is limited, at present, to the natural sciences.

Research, which encompasses both basic and applied, is systematic, intensive study directed toward fuller scientific knowledge of the subject studied.

Basic research. For three of the sectors—Federal Government, universities and colleges, and other nonprofit institutions—the definition of basic research stresses that it is directed toward increases of knowledge in science with "...a fuller knowledge or understanding of the subject under study, rather than a practical application thereof." To take account of an individual industrial company's commercial goals, the definition for the industry sector is modified to indicate that basic research projects represent "...original investigations for the advancement of scientific knowledge...which do not have specific commercial objectives, although they may be in fields of present or potential interest to the reporting company."

Applied research. The following is the core definition in the NSF questionnaire sent to the universities and colleges: "Applied research is directed toward practical application of knowledge." Here again, the definition for the industry survey takes account of the characteristics of industrial organizations. It covers "...research projects which represent investigations directed to discovery of new scientific commercial objectives with respect to either products or processes." By this definition, applied research in industry differs from basic research chiefly in terms of objectives of the reporting company.

Development. The NSF survey concept of development may be summarized as "...the systematic use of scientific knowledge directed toward the production of useful materials, devices, systems or methods, including design and development of prototypes and processes."

FUNDS

Current operating costs

Funds used for research and development, reported in this study, refer to current operating costs, consisting of both direct and indirect costs including depreciation, insofar as this information is available to respondents. Capital expenditures are excluded by definition and this is followed by the industry, universities and colleges, and other nonprofit sectors. Under the accounting practices of some Federal agencies—particularly the Department of Defense—data on Federal R&D funds, which are available in detail only in terms of obligations rather than expenditures, do not include an allowance for depreciation but do include some obligations for capital items.

Performer-reporting basis

In the Foundation's surveys, respondents in all four sectors indicate the amounts they spend on research and development in their own sector and the sources of these funds. The National Science Foundation bases all national totals on data as reported by performers because institutions doing research and development are in the best position to: (a) indicate how much they spent in the actual conduct of research and development in a given year, (b) classify their work as basic, applied, etc., and (c) identify the sector of the economy in which their financing originated. The use of performer reporting throughout also reduces the possibility of double counting. Because the national time series on Federal funds spent in research and development are based on expenditures reported by organizations which have actually performed the research and development, they differ from the series in the *Federal Funds for Research, Development, and Other Scientific Activities* on agency obligations for research and development to be performed in the non-Federal sectors. Federal agency obligations are used in the series only for intramural performance in agency laboratories where they are treated as the equivalent of expenditures. Expenses of Federal personnel engag-

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There have been surveys in all four sectors thus far in the NSF time series for the following years: 1953-54, 1957-58, 1964, 1966, and 1973. In general, the Federal Government and industry have been surveyed every year, but it has not been possible to maintain the same frequency for the universities and other nonprofit institutions. National data for other years are based on survey data on the performance of total research and development, basic research, applied research, and development from the Federal and industry sectors and on estimates for the university and other nonprofit sectors.

Single-year designation for national totals

Data for calendar year 1953 for industry and nonprofit institutions are combined with Federal intramural and university data for fiscal year 1953 (that is, July 1952 through June 1953) in the R&D funds series. The sector data for the years following 1953 are grouped accordingly and the annual national totals are based on this phasing.

Defense-space classification

Defense expenditures consist of all R&D spending by DOD and a proportion of Energy Research and Development Administration (ERDA) funds (formerly AEC). Space R&D expenditures are those of NASA. The space activities of DOD are included as spending on defense. The space activities of other Federal agencies are not included; it is estimated they account for less than 5 percent of all space R&D spending. This series has been revised to include R&D performance reporting where available.

Revisions of R&D time series since February 1974

Federal Government. Data were revised based on the NSF annual survey of R&D activities by Federal agencies covering fiscal years 1973, 1974, and 1975, and the 1976 Federal Budget, Special Analysis P.

Industry. Data were revised for 1972 on the basis of the annual "shuttle" questionnaire that enables respondents to revise the figure reported for the preceding year when they report on the current year. Data for 1973 were obtained from the 1973 industrial R&D survey.

Universities and colleges. Data for 1971-73 were revised based on information obtained in the 1973 survey. Data for institutions' own funds were revised back to 1953 to exclude departmental research, which is considered to be an integral part of instructional programs, and, for which, separate data are frequently not maintained.

Other nonprofit institutions. Data for 1964-73 were based on the 1964, 1966, 1969, and 1973 surveys and on detailed information from the National Institutes of Health on voluntary nonprofit hospitals for years prior to 1969.

Data for 1973 are classified as preliminary because a final report on intramural performance of research and development was available only for the Federal, universities and colleges, and other nonprofit institutions sectors. In addition, preliminary data from the 1973 industrial R&D survey and the 1974 universities and colleges R&D survey were available. Estimates for 1974 and 1975 are extensions of the regular time series, taking into account trends shown in *Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1973, 1974, and 1975,* Vol. XXIII[1] as well as other related information.

[1] National Science Foundation. *Federal Funds for Research, Development, and Other Scientific Activities. Fiscal Years 1973, 1974, and 1975.* Vol. XXIII (NSF 74-320) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office, 1975).

MANPOWER

Full-time-equivalent (FTE) number of scientists and engineers

The concept of the FTE provides a common denominator for combining the number of full-time employees with an FTE number of part-time employees to achieve a quantitative measure of manpower input. The minimum standard for inclusion of scientists and engineers was the performance of professional scientific or engineering work in research and development, requiring a bachelor's degree, or its equivalent, in science or engineering. In the industry, university, and other nonprofit sectors, both the manpower and expenditures data for each year were obtained in the same surveys; in the Federal sector, data on expenditures and civilian scientists and engineers were reported in different inquiries, and estimates of military scientists and engineers were obtained separately.

Revisions of R&D time series since February 1974

Data for 1973 were based on surveys of Federal Government personnel as of October 1973, industry as of January 1973 and January 1974, other nonprofit organizations as of October 1973, and universities and colleges as of January 1973 and other related sources. Data for 1974 are estimated except for the universities and colleges sector. Survey results as of January 1974 for this sector are included.

APPENDIX B
Statistical Tables

Table B–1. Transfers of funds expended annually for performance of research and development by sector, distributed

[Dollars in millions]

Year	Total R&D	Federal Government		Industry[2]			Universities and colleges				Ass FF
		Total funds used	Source	Total funds used	Source		Total funds used	Source			Total funds used
			Federal Government		Federal Government	Industry[2]		Federal Government	Industry	Universities and colleges	
1953	5,128	1,010	1,010	3,630	1,430	2,200	$255	136	19	72	121
1954	5,651	1,020	1,020	4,070	$1,780	$2,288	290	160	22	80	141
1955	6,182	905	905	4,640	$2,180	$2,460	$312	165	25	88	180
1956	8,375	1,040	1,040	6,605	3,328	3,277	$372	213	29	86	194
1957	9,791	1,220	1,220	7,731	4,226	3,505	$410	229	34	108	240
1958	10,734	1,374	1,374	8,389	4,798	3,591	456	264	36	121	293
1959	12,384	1,640	1,640	9,618	5,836	3,782	$526	300	38	134	338
1960	13,551	1,726	1,726	10,508	6,031	4,477	$646	405	40	140	360
1961	14,346	1,874	1,874	10,908	6,240	4,668	$763	500	40	143	410
1962	15,426	2,098	2,098	11,464	6,439	5,025	$904	618	40	186	470
1963	17,093	2,279	2,279	12,630	7,270	5,360	$1,081	760	41	257	530

funds expended annually for performance of research and development by sector, distributed by source, 1953–75[1]

[Dollars in millions]

	Industry[2]			Universities and colleges				Associated FFRDC's[3]		Other nonprofit institutions[2]			
		Source			Source				Source		Source		
	Total funds used	Federal Government	Industry	Total funds used	Federal Government	Industry	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions[4]
1953	3,630	1,330	2,300	$255	138	19	72	121	121	112	60	20	32
1954	4,070	$1,780	$2,290	290	160	27	90	141	141	$130	67	25	38
1955	4,640	$2,190	$2,450	$312	196	26	60	180	180	$145	75	28	42
1956	6,605	3,228	3,377	$372	213	30	94	194	194	$164	94	29	39
1957	7,731	4,291	3,440	$410	229	34	109	240	240	190	96	30	66
1958	8,389	4,799	3,590	456	264	38	121	293	293	$222	111	31	80
1959	9,618	5,636	3,982	$526	305	39	134	338	338	$262	140	36	87
1960	10,509	6,081	4,428	$646	406	40	140	360	360	$310	160	40	90
1961	10,908	6,240	4,668	$763	500	40	195	410	410	$391	240	41	110
1962	11,464	6,435	5,029	$904	613	40	195	470	470	$490	310	45	135
1963	12,630	7,270	5,360	$1,081	700	41	207	530	530	$573	380	48	145

Table B–1. Transfers of funds expended annually for performance of research and development by sector, distributed

[Dollars in millions]

Year	Total R&D	Federal Government		Industry[3]		Universities and colleges				To fu us
		Total funds used	Federal Government	Total funds used	Federal Government	Industry	Total funds used	Federal Government	Industry		
1964	18,894	2,838		13,512			1,275				
1965	20,091	3,093		14,185			[5]1,474				
1966	21,894	3,220		15,548			1,715				
1967	23,205	3,396		16,385			[5]1,921				
1968	24,669	3,493		17,429			2,149				
1969	25,686	3,503		18,308			[5]2,220				
1970	26,047	3,855		18,062			2,335				
1971	26,745	4,156		18,311			[5]2,500				
1972	28,402	4,482		19,371			2,675				
1973	30,427	4,619		20,937			2,934				
1974 .... (est.)	32,045	4,900		22,026			3,008				
1975 .... (est.)	34,345	5,200		23,860			3,100				

[1]All data are based on reports by performers.

[2]Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.

[3]FFRDC's administered by individual universities and colleges and by university-consortia.

[4]Includes State and local government funds.

[5]Estimates derived from related information beca item was not obtained in survey.

ūnds expended annually for performance of research and development by sector, distributed by source, 1953–75[1] – Cont.

[Dollars in millions]

Industry[3]			Universities and colleges					Associated FFRDC's[3]		Other nonprofit institutions[3]			
Total funds used	Source: Federal Government	Source: Industry	Total funds used	Source: Federal Government	Source: Industry	Source: Universities and colleges	Source: Other nonprofit institutions	Total funds used	Source: Federal Government	Total funds used	Source: Federal Government	Source: Industry	Source: Other nonprofit institutions
13,512	[illegible]	[illegible]	1,275	[illegible]	[illegible]	[illegible]	[illegible]	629	[illegible]	640	[illegible]	47	[illegible]
14,185	[illegible]	[illegible]	[5]1,474	[illegible]	41	[illegible]	[illegible]	629	[illegible]	[5]710	[illegible]	[illegible]	[illegible]
15,548	[illegible]	7,216	1,715	[illegible]	[illegible]	[illegible]	[illegible]	630	[illegible]	781	[illegible]	[illegible]	[illegible]
16,385	[illegible]	[illegible]	[5]1,921	[illegible]	[illegible]	[illegible]	119	673	[illegible]	[5]830	577 (?)	[illegible]	[illegible]
17,429	[illegible]	[illegible]	[5]2,149	[illegible]	[illegible]	[illegible]	121	719	719	[5]879	[illegible]	[illegible]	[illegible]
18,308	[illegible]	[illegible]	[5]2,220	[illegible]	[illegible]	[illegible]	[illegible]	725	[illegible]	930	[illegible]	[illegible]	[illegible]
18,062	7,770 (?)	[illegible]	2,335	[illegible]	[illegible]	[illegible]	[illegible]	737	[illegible]	[5]1,058	[illegible]	[illegible]	[illegible]
18,311	[illegible]	[illegible]	[5]2,500	1,724 (?)	[illegible]	[illegible]	177	716	[illegible]	[5]1,062	[illegible]	[illegible]	[illegible]
19,371	[illegible]	[illegible]	2,675	[illegible]	[illegible]	[illegible]	[illegible]	764	[illegible]	[5]1,110	[illegible]	[illegible]	[illegible]
20,937	[illegible]	[illegible]	2,934	[illegible]	[illegible]	[illegible]	220 (?)	817	817	1,120	[illegible]	114	271
22,026	8,320 (?)	13,700	3,00[illegible]	2,018 (?)	[illegible]	[illegible]	211	865	[illegible]	1,252	[illegible]	120 (?)	[illegible]
23 860	9,150	14,710	3,100	2,0[illegible]0	100	730	220	910	910	1,275	[illegible]	125 (?)	300

[4]Includes State and local government funds.

[5]Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

…opment Centers administered by both industry and by …pective sectors.

…eges and by university-consortia.

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Table B–2. Transfers of funds expended annually for performance of basic research by sector, distributed by so

[Dollars in millions]

Year	Total basic research	Federal Government		Industry[2]		Universities and colleges		Ass FF
		Total funds used		Total funds used		Total funds used		Total funds used
1953	426	101		151		$110		33
1954	478	102		$166		136		39
1955	530	90		$189		$159		49
1956	661	104		253		$200		51
1957	760	122		271		$240		65
1958	864	126		295		281		78
1959	1,030	173		320		$343		92
1960	1,183	160		376		$433		97
1961	1,378	206		395		$536		115
1962	1,695	251		488		$659		136
1963	1,974	299		522		$814		159

...rs of funds expended annually for performance of basic research by sector, distributed by source, 1953–75[1]

[Dollars in millions]

Industry[2]			Universities and colleges				Associated FFRDC's[3]		Other nonprofit institutions[3]		
Total funds used	[illegible]	[illegible]	Total funds used	[illegible]	[illegible]	[illegible]	Total funds used	[illegible]	Total funds used	[illegible]	[illegible]
151	[illegible]	[illegible]	$110	[illegible]	[illegible]	[illegible]	33	[illegible]	31	[illegible]	[illegible]
$166	[illegible]	[illegible]	136	[illegible]	[illegible]	[illegible]	39	[illegible]	$35	[illegible]	[illegible]
$189	[illegible]	[illegible]	$159	[illegible]	[illegible]	[illegible]	49	[illegible]	$43	[illegible]	[illegible]
253	[illegible]	[illegible]	$200	[illegible]	[illegible]	[illegible]	51	[illegible]	$53	[illegible]	[illegible]
271	[illegible]	[illegible]	$240	[illegible]	[illegible]	[illegible]	65	[illegible]	62	[illegible]	[illegible]
295	[illegible]	[illegible]	281	[illegible]	[illegible]	[illegible]	78	[illegible]	$84	[illegible]	[illegible]
320	[illegible]	[illegible]	$343	[illegible]	[illegible]	[illegible]	92	[illegible]	$102	[illegible]	[illegible]
376	[illegible]	[illegible]	$433	[illegible]	[illegible]	[illegible]	97	[illegible]	$117	[illegible]	[illegible]
395	[illegible]	[illegible]	$536	[illegible]	[illegible]	[illegible]	115	[illegible]	$126	[illegible]	[illegible]
488	[illegible]	[illegible]	$659	[illegible]	[illegible]	[illegible]	136	[illegible]	$161	[illegible]	[illegible]
522	[illegible]	[illegible]	$814	[illegible]	[illegible]	[illegible]	159	[illegible]	$180	[illegible]	[illegible]

Table B–2. Transfers of funds expended annually for performance of basic research by sector, distributed by so

[Dollars in millions]

Year	Total basic research	Federal Government	Industry[3]	Universities and colleges	A F
		Total funds used	Total funds used	Total funds used	Tot fun use
1964	2,301	364	549	1,003	19
1965	2,572	424	592	$1,138	20
1966	2,825	445	624	1,303	22
1967	3,029	472	629	$1,457	25
1968	3,286	502	642	1,649	27
1969	3,378	565	618	$1,707	27
1970	3,548	646	629	1,796	26
1971	3,544	535	610	$1,914	26
1972	3,705	607	579	2,024	25
1973	3,800	585	605	2,058	29
1974 .... (est.)	3,991	635	640	2,151	29
1975 .... (est.)	4,085	655	660	2,185	30

[1]All data are based on reports by performers.

[2]Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.

[3]FFRDC's administered by individual universities and colleges and by university consortia.

[4]Includes State and local government funds.

[5]Estimates derived from related information because eit item was not obtained in survey.

ers of funds expended annually for performance of basic research by sector, distributed by source: 1953–75[1] — Cont.

[Dollars in millions]

Industry[2]		Universities and colleges		Associated FFRDC's[3]		Other nonprofit institutions[2]	
Total funds used		Total funds used		Total funds used		Total funds used	
549		1,003		191		194	
592		$1,138		208		$210	
624		1,303		227		$226	
629		$1,457		250		$221	
642		1,649		276		$217	
618		$1,707		275		213	
629		1,796		269		$208	
610		$1,914		260		$225	
579		2,024		250		$245	
605		2,058		297		255	
640		2,151		291		274	
660		2,185		305		280	

[4]Includes State and local government funds.

[5]Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

opment Centers administered by both industry and by
pe s.
eg niversity-consortia.

Table B–3. Transfers of funds expended annually for performance of applied research by sector, distributed by

[Dollars in millions]

Year	Total applied research	Federal Government		Industry[2]			Universities and colleges				As FF
		Total funds used	Source	Total funds used	Source		Total funds used	Source			
			Federal Government		Federal Government	Industry[3]		Federal Government	Industry	Universities and colleges[4]	Other non-profit institutions	Total funds used
1953	1,301	$345	345	$726	288	438	$130	57	6	57	10	44
1954	1,413	$349	349	$814	322	492	$137	61	7	59	10	51
1955	1,506	$310	310	$928	368	560	$136	59	8	60	10	65
1956	1,916	$356	356	1,268	$474	$794	$147	66	9	60	11	71
1957	2,405	$417	417	1,670	$678	$992	$145	62	11	61	11	86
1958	2,730	$474	474	1,911	$774	$1,137	148	64	12	61	11	102
1959	2,934	$558	558	1,991	$813	$1,178	$155	67	12	64	12	119
1960	3,057	$595	595	2,029	$833	$1,196	$179	88	13	66	12	122
1961	3,115	$634	634	1,977	$812	$1,165	$192	88	13	69	12	135
1962	3,727	$702	702	2,449	1,011	1,438	$205	109	13	70	13	155
1963	3,825	730	730	2,457	1,007	1,450	$227	128	14	72	13	170

fers of funds expended annually for performance of applied research by sector, distributed by source: 1953–75[1]

[Dollars in millions]

	Industry[2]			Universities and colleges				Associated FFRDC's[3]		Other nonprofit institutions[2]			
		Sources			Sources				Source		Sources		
	Total funds used	Federal Government	Industry[4]	Total funds used	Federal Government	Industry	Universities and colleges[5]	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions[6]
	$726	288	438	$130	57	6	57	10	44	44	56	36	11	9
	$814	322	492	$137	61	7	59	10	51	51	$62	39	13	10
	$928	388	540	$136	56	8	62	10	65	65	$67	41	15	11
	1,268	$474	$794	$147	68	9	59	11	71	71	$74	43	17	14
	1,670	$678	$992	$145	92	11	81	11	86	75	87	49	17	21
	1,911	$774	$1,137	148	94	12	81	11	102	102	$95	54	17	24
	1,991	$813	$1,178	$155	97	12	94	12	119	119	$111	67	16	28
	2,029	$833	$1,196	$179	98	13	96	12	122	122	$132	87	18	26
	1,977	$812	$1,165	$192	98	13	89	12	135	135	$177	125	19	33
	2,449	1,011	1,438	$205	109	13	70	13	155	155	$216	150	22	44
	2,457	1,007	1,450	$227	128	14	72	13	170	170	$241	170	23	48

Table B–3. Transfers of funds expended annually for performance of applied research by sector, distributed by so

[Dollars in millions]

Year	Total applied research	Federal Government		Industry[2]			Universities and colleges				A R
		Total funds used	Source	Total funds used	Sources		Total funds used	Sources			
			Federal Government		Federal Government	Industry[4]		Federal Government	Industry	Universities and colleges	Other nonprofit institutions	Tot fun use
1964	4,238	928	928	2,600	1,040	1,560	232	127	14	77	14	20
1965	4,470	1,030	1,030	2,658	1,038	1,620	[5]279	157	13	88	21	20
1966	4,747	1,047	1,047	2,843	1,039	1,804	328	194	13	89	32	20
1967	4,968	1,102	1,102	2,915	1,066	1,849	[5]374	222	15	102	35	21
1968	5,356	1,204	1,204	3,124	1,043	2,081	404	264	16	97	37	23
1969	5,533	1,201	1,201	3,287	1,015	2,272	[5]406	248	16	106	36	21
1970	5,892	1,378	1,378	3,399	1,048	2,350	427	268	16	99	44	21
1971	6,047	1,477	1,477	3,384	974	2,410	[5]474	282	19	115	48	21
1972	6,272	1,481	1,481	3,473	941	2,532	540	339	19	132	50	21
1973	6,839	1,613	1,613	3,759	996	2,763	705	460	22	158	65	21
1974 .... (est.)	7,460	1,834	1,834	4,025	1,025	3,000	734	436	25	214	59	21
1975 .... (est.)	7,990	1,955	1,955	4,370	1,185	3,185	780	445	25	246	65	21

[1]All data are based on reports by performers.

[2]Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.

[3]FFRDC's administered by individual universities and colleges and by university-consortia.

[4]Includes State and local government funds.

[5]Estimates derived from related information beca item was not obtained in survey

of funds expended annually for performance of applied research by sector, distributed by source: 1953–75[1] – Cont.

[Dollars in millions]

	Industry[2]			Universities and colleges					Associated FFRDC's[3]		Other nonprofit institutions[2]			
		Sources			Sources					Source		Sources		
	Total funds used	Federal Government	Industry[4]	Total funds used	Federal Government	Industry	Universities and colleges	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions[4]
	2,600	1,040	1,560	232	127	14	77	14	202	202	276	208	22	46
	2,658	1,038	1,620	[5]279	157	13	88	21	204	204	299	224	25	50
	2,843	1,039	1,804	328	184	13	99	32	207	207	[5]322	242	27	53
	2,915	1,096	1,819	[5]374	222	15	102	35	219	219	[5]358	265	31	62
	3,124	1,043	2,081	404	254	16	97	37	231	231	[5]393	288	35	70
	3,287	1,015	2,272	[5]406	246	16	106	40	210	210	429	311	39	79
	3,399	1,039	2,360	427	268	16	98	45	216	216	[5]472	347	40	85
	3,384	974	2,410	[5]474	292	19	115	48	210	210	[5]502	360	47	95
	3,473	941	2,532	540	338	19	132	50	226	226	[5]552	400	50	102
	3,759	996	2,763	705	460	22	158	66	226	226	536	375	50	111
	4,025	1,025	3,000	734	436	25	214	59	271	271	596	426	56	115
	4,370	1,185	3,185	780	445	25	245	65	280	280	605	430	55	120

opment Centers administered by both industry and by
pective sectors.
eges and by university-consortia.

[4]Includes State and local government funds.

[5]Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

Table B–4. Transfers of funds expended annually for performance of development by sector, distributed by

[Dollars in millions]

Year	Total development	Federal Government		Industry[2]		Universities and colleges				To fun us
		Total funds used		Total funds used		Total funds used				
1953	3,401	$564		$2,753		$15				
1954	3,760	$569		$3,090		17				
1955	4,146	$505		$3,523		$17				
1956	5,798	$580		5,084		$25				
1957	6,626	$681		5,790		$25				
1958	7,140	$774		6,183		27				1
1959	8,420	$909		7,307		$28				1
1960	9,311	$971		8,104		$34				1
1961	9,853	$1,034		8,536		$35				1
1962	10,004	$1,145		8,527		$40				1
1963	11,294	1,250		9,651		$40				2

nsfers of funds expended annually for performance of development by sector, distributed by source: 1953–75[1]

[Dollars in millions]

Industry[2]			Universities and colleges				Associated FFRDC's[3]		Other nonprofit institutions[2]		
Total funds used			Total funds used				Total funds used		Total funds used		
$2,753			$15				44		25		
$3,090			17				51		$33		
$3,523			$17				66		$35		
5,084			$25				72		$37		
5,790			$25				89		41		
6,183			27				113		$43		
7,307			$28				127		$49		
8,104			$34				141		$61		
8,536			$35				160		$88		
8,527			$40				179		$113		
9,651	8,116		$40	22	2	14	201		$152	116	11

Table B–4. Transfers of funds expended annually for performance of development by sector, distributed by sour

[Dollars in millions]

Year	Total development	Federal Government		Industry[2]		Universities and colleges			A F
		Total funds used		Total funds used		Total funds used			Tot fun use
1964	12,355	1,546		10,363		40			23
1965	13,049	1,639		10,935		$57			21
1966	14,322	1,728		12,081		84			19
1967	15,208	1,822		12,841		$90			20
1968	16,027	1,787		13,663		96			21
1969	16,775	1,737		14,403		$107			24
1970	16,607	1,831		14,034		112			25
1971	17,154	2,144		14,317		$112			24
1972	18,425	2,394		15,319		111			28
1973	19,788	2,421		16,573		171			29
1974 .... (est.)	20,594	2,431		17,355		123			30
1975 .... (est.)	22,270	2,590		18,830		135			32

[1]All data are based on reports by performers.

[2]Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of the respective sectors.

[3]FFRDC's administered by individual universities and colleges and by university consortia.

[4]Includes State and local government funds.

[5]Estimates derived from related information becaus item was not obtained in survey.

s of funds expended annually for performance of development by sector, distributed by source: 1953–75[1] – Cont.

[Dollars in millions]

Industry[2]			Universities and colleges				Associated FFRDC's[3]		Other nonprofit institutions[2]		
Total funds used			Total funds used				Total funds used		Total funds used		
10,363			40				236		170		
10,935			$57				217		$201		
12,081			84				196		$233		
12,841			$90				204		$251		
13,663			96				212		$269		
14,403			$107				240		288		
14,034			112				252		$378		
14,317			$112				246		$335		
15,319			111				288		$313		
16,573			171				294		329		
17,355			123				303		382		
18,830	7,820	11,000	135	70	10	49	325		390		

[4]Includes State and local government funds.

[5]Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

opment Centers administered by both industry and by
ective sectors.
ges and by university-consortia.

Table B—5. Sources of funds used for research and development, by sector: 1953—75[1]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	5,128	2,759	2,239	72	58
1954	5,651	3,138	2,367	80	66
1955	6,182	3,509	2,513	88	72
1956	8,375	4,859	3,336	96	84
1957	9,791	6,119	3,460	109	103
1958	10,734	6,791	3,700	121	122
1959	12,384	8,059	4,057	134	134
1960	13,551	8,752	4,508	149	142
1961	14,346	9,264	4,749	165	168
1962	15,426	9,926	5,114	185	201
1963	17,093	11,219	5,449	207	218
1964	18,894	12,553	5,880	235	226
1965	20,091	13,033	6,539	267	252
1966	21,894	13,990	7,317	303	284
1967	23,205	14,420	8,134	345	306
1968	24,669	14,952	8,997	391	329
1969	25,686	14,914	9,998	420	354
1970	26,047	14,764	10,434	461	388
1971	26,745	14,982	10,817	529	417
1972	28,402	15,875	11,508	576	443
1973	30,427	16,472	12,880	604	471
1974 (est.)	32,045	16,955	13,916	683	491
1975 (est.)	34,345	18,160	14,935	730	520

[1]Summary of R&D data in table B—1, by source.
SOURCE: National Science Foundation.

Table B—6. Sources of funds use

[Dolla

Year	Total	Federa Governm
1953	426	234
1954	478	265
1955	530	286
1956	661	345
1957	760	408
1958	864	460
1959	1,030	609
1960	1,183	693
1961	1,378	841
1962	1,695	1,091
1963	1,974	1,310
1964	2,301	1,595
1965	2,572	1,817
1966	2,825	1,986
1967	3,029	2,173
1968	3,286	2,327
1969	3,378	2,386
1970	3,548	2,469
1971	3,544	2,379
1972	3,705	2,528
1973	3,800	2,605
1974 (est.)	3,991	2,724
1975 (est.)	4,085	2,765

[1]Summary of basic research data in table B—2, by
SOURCE: National Science Foundation.

ed for research and development,
: 1953—75[1]

illions]

Industry	Universities and colleges	Other nonprofit institutions
2,239	72	58
2,367	80	66
2,513	88	72
3,336	96	84
3,460	109	103
3,700	121	122
4,057	134	134
4,508	149	142
4,749	165	168
5,114	185	201
5,449	207	218
5,880	235	226
6,539	267	252
7,317	303	284
8,134	345	306
8,997	391	329
9,998	420	354
10,434	461	388
10,817	529	417
11,508	576	443
12,880	604	471
13,916	683	491
14,935	730	520

Table B—6. Sources of funds used for basic research, by sector: 1953—75[1]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	426	234	148	10	34
1954	478	265	161	15	37
1955	530	286	183	21	40
1956	661	345	239	30	47
1957	760	408	256	39	57
1958	864	460	282	50	72
1959	1,030	609	280	60	81
1960	1,183	693	331	72	87
1961	1,378	841	350	85	102
1962	1,695	1,091	382	102	120
1963	1,974	1,310	414	121	129
1964	2,301	1,595	424	144	138
1965	2,572	1,817	448	164	143
1966	2,825	1,986	496	196	147
1967	3,029	2,173	477	223	156
1968	3,286	2,327	518	276	165
1969	3,378	2,386	519	298	175
1970	3,548	2,469	536	350	193
1971	3,544	2,379	556	400	209
1972	3,705	2,528	528	428	221
1973	3,800	2,605	561	416	218
1974 (est.)	3,991	2,724	594	434	239
1975 (est.)	4,085	2,765	625	445	250

[1]Summary of basic research data in table B—2, by source.
SOURCE: National Science Foundation.

Table B—7. Sources of funds used for applied research, by sector: 1953—75[1]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	1,301	770	455	57	19
1954	1,413	822	512	59	20
1955	1,506	842	583	60	21
1956	1,916	1,012	820	59	25
1957	2,405	1,292	1,020	61	32
1958	2,730	1,468	1,166	61	35
1959	2,934	1,624	1,208	64	38
1960	3,057	1,725	1,228	66	38
1961	3,115	1,804	1,197	69	45
1962	3,727	2,127	1,473	70	57
1963	3,825	2,205	1,487	72	61
1964	4,238	2,503	1,596	77	62
1965	4,470	2,653	1,658	88	71
1966	4,747	2,729	1,844	89	85
1967	4,968	2,874	1,895	102	97
1968	5,356	3,020	2,132	97	107
1969	5,533	2,982	2,327	105	119
1970	5,892	3,258	2,406	98	130
1971	6,047	3,313	2,476	115	143
1972	6,272	3,387	2,601	132	152
1973	6,839	3,670	2,835	158	176
1974 (est.)	7,460	3,992	3,080	214	174
1975 (est.)	7,990	4,295	3,265	245	185

[1] Summary of applied research data in table B—3, by source.
SOURCE: National Science Foundation.

Table B—8. Sources of funds us

[Doll

Year	Total	Feder Governm
1953	3,401	1,75
1954	3,760	2,05
1955	4,146	2,38
1956	5,798	3,50
1957	6,626	4,41
1958	7,140	4,86
1959	8,420	5,82
1960	9,311	6,33
1961	9,853	6,61
1962	10,004	6,70
1963	11,294	7,70
1964	12,355	8,45
1965	13,049	8,56
1966	14,322	9,27
1967	15,208	9,37
1968	16,027	9,60
1969	16,775	9,54
1970	16,607	9,03
1971	17,154	9,29
1972	18,425	9,96
1973	19,788	10,19
1974 (est.)	20,594	10,23
1975 (est.)	22,270	11,10

[1] Summary of development data in table B—4, by
SOURCE: National Science Foundation.

applied research, by sector: 1953–75[1]

millions]

Industry	Universities and colleges	Other nonprofit institutions
455	57	19
512	59	20
583	60	21
820	59	25
1,020	61	32
1,166	61	35
1,208	64	38
1,228	66	38
1,197	69	45
1,473	70	57
1,487	72	61
1,596	77	62
1,658	88	71
1,844	89	85
1,895	102	97
2,132	97	107
2,327	105	119
2,406	98	130
2,476	115	143
2,601	132	152
2,835	158	176
3,080	214	174
3,265	245	185

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Table B–8. Sources of funds used for development, by sector: 1953–75[1]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	3,401	1,755	1,636	5	5
1954	3,760	2,051	1,694	6	9
1955	4,146	2,381	1,747	7	11
1956	5,798	3,502	2,277	7	12
1957	6,626	4,419	2,184	9	14
1958	7,140	4,863	2,252	10	15
1959	8,420	5,826	2,569	10	15
1960	9,311	6,334	2,949	11	17
1961	9,853	6,619	3,202	11	21
1962	10,004	6,708	3,259	13	24
1963	11,294	7,704	3,548	14	28
1964	12,355	8,455	3,860	14	26
1965	13,049	8,563	4,433	15	38
1966	14,322	9,275	4,977	18	52
1967	15,208	9,373	5,762	20	53
1968	16,027	9,606	6,347	17	57
1969	16,775	9,546	7,152	17	60
1970	16,607	9,037	7,492	13	65
1971	17,154	9,290	7,785	14	65
1972	18,425	9,960	8,379	16	70
1973	19,788	10,197	9,484	30	77
1974 (est.)	20,594	10,239	10,242	35	78
1975 (est.)	22,270	11,100	11,045	40	85

[1] Summary of development data in table B–4, by source.

SOURCE: National Science Foundation.

Table B—9. Trends in defense, space, and all other R&D outlays, by source: 1953-75

Year	Defense-space outlays as a percent of total R&D			Nondefense-nonspace outlays as a percent of total R&D		
	Total	Defense related	Space related	Total	Non-Federal	Federal
1953	49.0	48.2	.8	51.0	46.2	4.8
1954	49.8	48.9	.9	50.2	44.5	5.7
1955	49.2	48.2	1.0	50.8	43.2	7.6
1956	50.2	49.3	.9	49.8	42.0	7.8
1957	53.8	52.9	.9	46.2	37.5	8.7
1958	53.7	52.6	1.1	46.3	36.7	9.6
1959	56.6	54.0	2.6	43.4	34.9	8.5
1960	55.4	52.2	3.2	44.6	35.4	9.2
1961	55.5	49.9	5.6	44.5	35.4	9.1
1962	54.6	47.7	6.9	45.4	35.6	9.8
1963	55.1	41.3	13.8	44.9	34.4	10.5
1964	55.5	36.7	18.8	44.5	33.6	10.9
1965	53.6	32.9	20.7	46.4	35.1	11.3
1966	51.8	32.5	19.3	48.2	36.1	12.1
1967	49.1	34.9	14.2	50.9	37.9	13.0
1968	47.9	34.5	13.4	52.1	39.4	12.7
1969	45.4	34.1	11.3	54.6	41.9	12.7
1970	43.1	32.8	10.3	56.9	43.3	13.6
1971	40.9	31.6	9.3	59.1	44.0	15.1
1972	40.8	32.7	8.1	59.2	44.1	15.1
1973	38.9	29.1	9.8	61.1	45.9	15.2
1974 (est.)	36.6	27.5	9.1	63.4	46.9	16.5
1975 (est.)	36.0	27.7	8.3	64.0	46.9	17.1

SOURCE: National Science Foundation

Table B—10. Full-time-equivalent (FTE) scientists and engineers employed in research and development, by sector: selected years[1]

[In thousands]

Sector	1954	1958	1961	1965	1968	1969	1970	1971	1972	1973	1974[2]
Total	237.1	354.6	425.7	494.1	550.4	558.2	549.5	529.7	521.5	523.1	527.8
Federal Government[3]	37.7	46.0	51.1	61.8	68.1	69.9	69.8	66.5	65.2	62.3	65.0
Industry[4,5]	164.1	256.1	312.0	348.4	381.9	385.6	375.4	358.3	352.6	359.2	359.5
Universities and colleges, total	25.0	36.5	42.4	53.4	66.0	68.3	68.5	68.4	66.5	64.6	66.8
Scientists and engineers	20.3	29.2	33.6	40.4	49.0	50.4	50.3	49.8	48.9	48.0	49.5
Graduate students[6]	4.7	7.3	8.8	13.0	17.0	17.9	18.2	18.6	17.6	16.6	17.3
University associated											

1963	56.1	41.3	15.6	47.5	37.4	10.0
1964	55.5	36.7	18.8	44.5	33.6	10.9
1965	53.6	32.9	20.7	46.4	35.1	11.3
1966	51.8	32.5	19.3	48.2	36.1	12.1
1967	49.1	34.9	14.2	50.9	37.9	13.0
1968	47.9	34.5	13.4	52.1	39.4	12.7
1969	45.4	34.1	11.3	54.6	41.9	12.7
1970	43.1	32.8	10.3	56.9	43.3	13.6
1971	40.9	31.6	9.3	59.1	44.0	15.1
1972	40.8	32.7	8.1	59.2	44.1	15.1
1973	38.9	29.1	9.8	61.1	45.9	15.2
1974 (est.)	36.6	27.5	9.1	63.4	46.9	16.5
1975 (est.)	36.0	27.7	8.3	64.0	46.9	17.1

SOURCE: National Science Foundation

Table B—10. Full-time-equivalent (FTE) scientists and engineers employed in research and development, by sector: selected years[1]

[In thousands]

Sector	1954	1958	1961	1965	1968	1969	1970	1971	1972	1973	1974[2]
Total	237.1	354.6	425.7	494.1	550.4	558.2	549.5	529.7	521.5	523.1	527.8
Federal Government[3]	37.7	46.0	51.1	61.8	68.1	69.9	69.8	66.5	65.2	62.3	65.0
Industry[4,5]	164.1	256.1	312.0	348.4	381.9	385.6	375.4	358.3	352.6	359.2	359.5
Universities and colleges, total	25.0	36.5	42.4	53.4	66.0	68.3	68.5	68.4	66.5	64.6	66.8
Scientists and engineers	20.3	29.2	33.6	40.4	49.0	50.4	50.3	49.8	48.9	48.0	49.5
Graduate students[6]	4.7	7.3	8.8	13.0	17.0	17.9	18.2	18.6	17.6	16.6	17.3
University associated FFRDC's, total	5.0	8.1	9.1	11.1	11.2	11.6	11.5	11.5	12.0	12.4	12.1
Scientists and engineers	4.9	7.9	8.8	10.7	10.7	11.1	11.0	11.0	11.6	12.1	11.8
Graduate students[6]	.1	.2	.3	.4	.4	.5	.5	.5	.4	.3	.3
Other nonprofit institutions[4,7]	5.3	7.9	11.1	19.4	23.2	22.8	24.3	25.0	25.2	24.6	24.4

[1]Number of full-time employees plus the FTE of part-time employees. Excludes scientists and engineers employed in State and local government agencies.

[2]Estimate.

[3]Includes both civilian and military service personnel and managers of R&D. Military R&D scientists and engineers in the Department of Defense were estimated at 7,000 in 1954, 8,400 in 1958, 9,200 in 1961, 12,000 in 1965, 13,000 in 1968, 14,000 in 1969 and 1970, 12,000 in 1971, 10,700 in 1972, 8,100 in 1973, and 7,600 in 1974.

[4]Includes professional R&D personnel employed at FFRDC's administered by organizations in the sector.

[5]Excludes social scientists.

[6]Numbers of FTE graduate students receiving stipends and engaged in R&D.

[7]Includes estimate for R&D scientists and engineers employed in State affiliated institutions such as hospitals, museums, etc.

NOTE: These figures represent yearly averages and may differ from other data in the text which is based upon surveys reporting the employment in a single month of the year. Data in the text exclude historians, political scientists, and other social scientists.

SOURCE: National Science Foundation.

Related Publications—Cont.

HIGHLIGHTS

"National Sample of Scientists and Engineers: Changes in Employment, 1970-72 and 1972-74"	75-309	——
"Separately Budgeted Academic R&D Expenditures Decline in Real Terms in FY 1974"	75-306	——
"The 1972 Scientist and Engineer Population Redefined"	75-305	——
"Graduate Enrollment Up in Biological Sciences, Fall 1974"	74-321	——
"20-Percent Increase in Energy Activity Paces Industrial R&D Spending in 1973"	74-319	——
"Federal Scientific and Technical Personnel Decline in 1973"	74-316	——
"Employment of Life Scientists Up in 1974—Accounts for Nearly All Growth of Scientists and Engineers in Doctorate-Granting Institutions"	74-315	——
"Immigration of Scientists and Engineers Drops Sharply in FY 1973; Physician Inflow Still Near FY 1972 Peak"	74-302	——
"Selected Characteristics of Five Engineering and Scientific Occupational Groups, 1972"	73-306	——
"NSF Forecasts Rise in Company-Funded Research and Development and R&D Employment"	73-301	——
"Changes in Graduate Programs in Science and Engineering, 1970-72 and 1972-74"	72-311	——
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