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ABSTRACT

This pocket guide presents data on research and development (R&D) funding, human resources, and international science and technology (S&T) indicators. Among the R&D funding data provided are: national R&D funding by source and performer; federal R&D obligations by agency and character of work; industrial expenditures by sources of funds and character of work; and academic R&D expenditures by source (FY 1984), by field (FY 1982), and by character of work. Data on human resources include: employed scientists and engineers by field (1982), sector (1983), primary work activity (1982), and highest degree (1982); females and racial minorities in the S&T work force; retention rates; and supply as represented by degrees awarded in all science and engineering fields and by full-time graduate students in doctorate-granting institutions. Data on international S&T indicators include: scientists and engineers engaged in R&D per 10,000 labor force by country; R&D/GNP (gross national product) by country; nondefense R&D/GNP; United States patents granted to inventors from selected countries by year of grant and country of inventor; U.S. international transactions in royalties and fees; U.S. trade balance in R&D-intensive manufactured produce groups; and U.S. scientific and technical (S/T) publications as a percent of all S/T publications. (JN)

DATA BOOK

science and technology DATA BOOK

Division of Science Resources Studies
National Science Foundation
Washington, D.C. 20550

foreword

The National Science Foundation's Division of Science Resources Studies (SRS), a division of the Directorate for Scientific, Technological, and International Affairs, is publishing this pocket Data Book as a handy reference for information on the funding, staffing, and impacts of the Nation's scientific and technological activities. These data were compiled by SRS in fulfilling its responsibilities to collect, interpret, and analyze data on scientific and technical resources in the United States.

Comments and suggestions as to the materials presented are requested. Please contact the Editorial and Inquiries Unit, SRS, National Science Foundation, 1800 G Street, N.W., Washington, D.C. 20550, phone (202) 634-4622.

Edward A. Knapp

Edward A. Knapp
Director
National Science Foundation

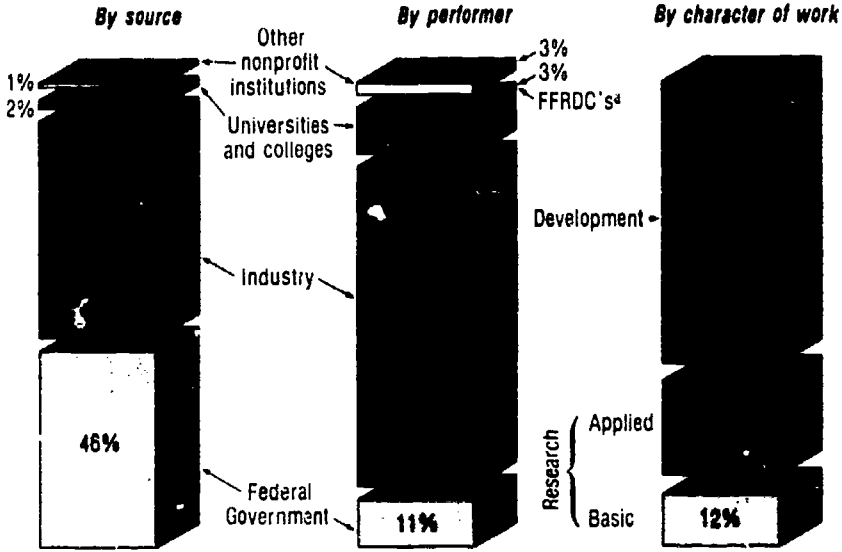
October 1983

contents

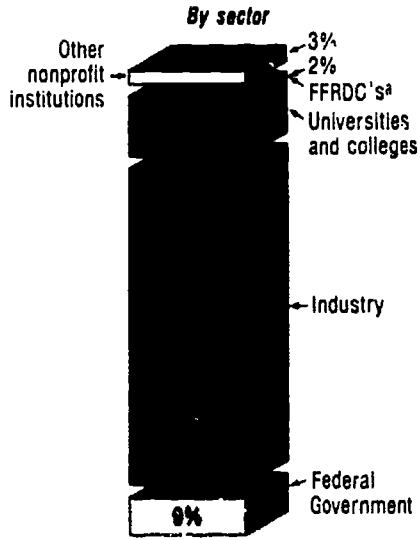
R&D FUNDING

The national R&D effort

Expenditures for research and development = $97.9 billion, 1984 (est.)



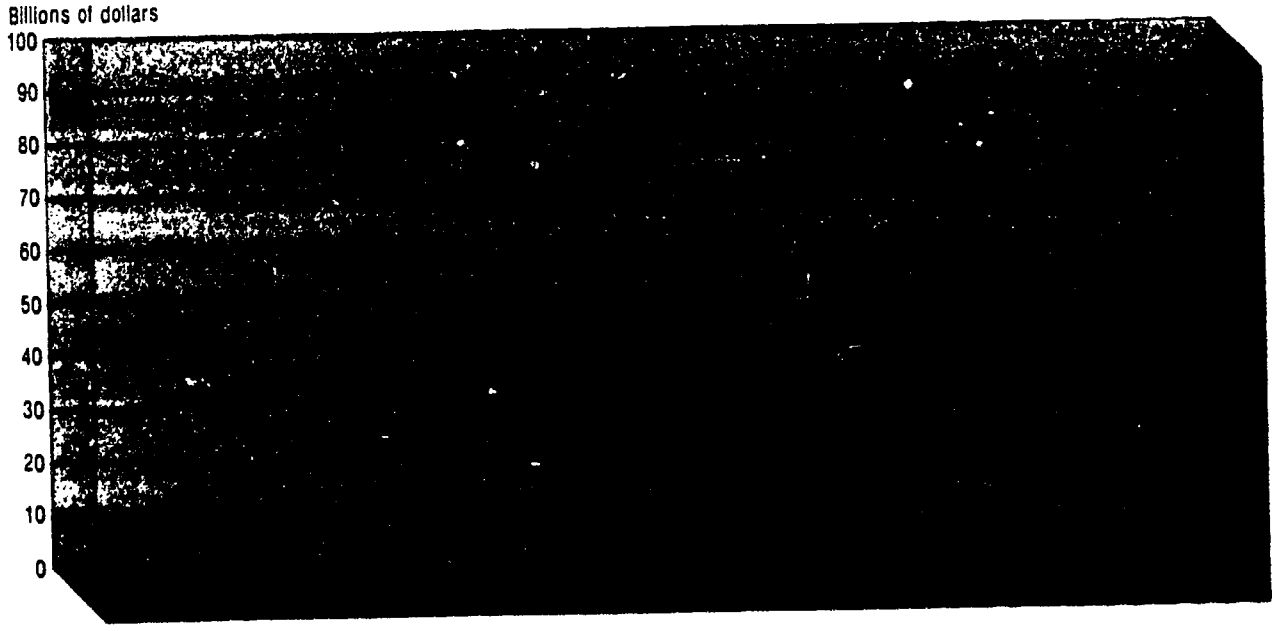
Employed R&D scientists/engineers = 765,000,[b] 1983 (est.)



[a] Federally funded research and development centers administered by universities and colleges

[b] Full-time equivalent.

National R&D funding by source



...on GNP implicit price deflator
National Science Foundation

National R&D funding by performer

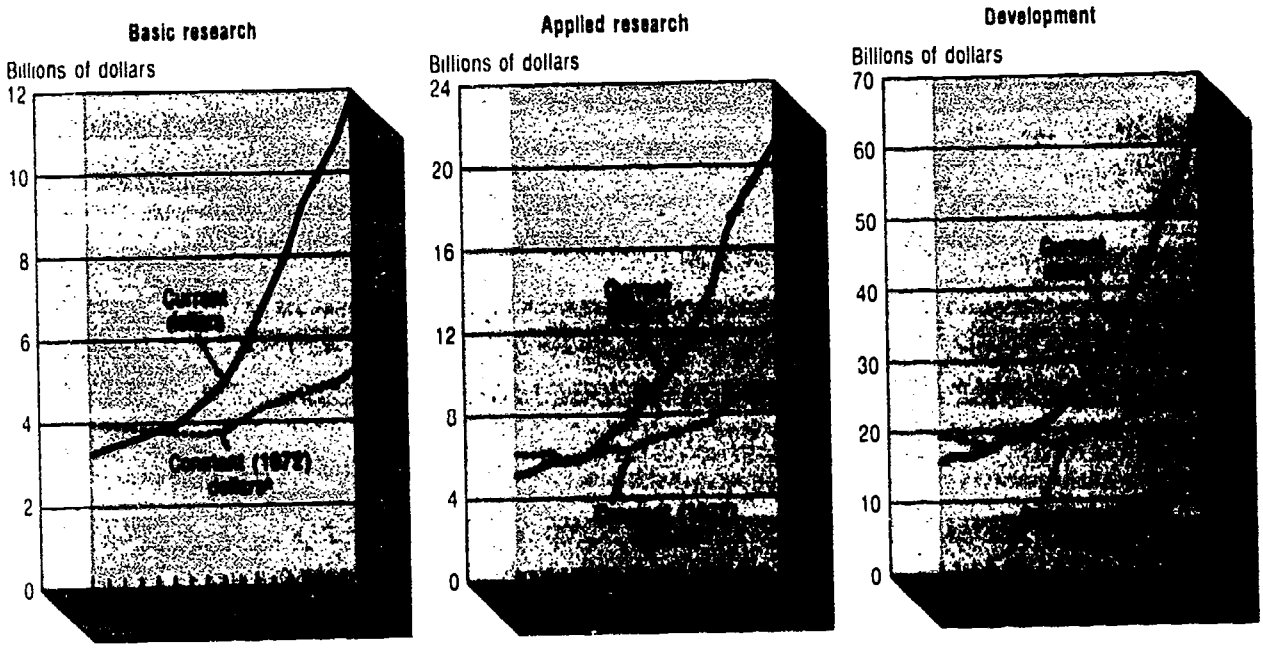
[Dollars in millions]

Year	Current dollars					Constant (1972) dollars*				
	Total	Federal Government	Industry	Universities/ colleges	Other performers	Total	Federal Government	Industry	Universities/ colleges	Other performers
1953	$ 5 124	$ 1.010	$ 3 630	$ 231	$ 255	$ 8.677	$1.692	$ 6.171	$ 428	$ 386
1967	23 146	3 396	16 385	1.921	1 444	29.241	4.276	20.725	2.417	1.823
1975	35 213	5 354	24.187	3.409	2.263	28.153	4.344	19.229	2.766	1.814
1980	62 618	7.632	44.505	6.060	4.421	35.136	4.297	24.944	3.412	2.483
1983	88 193	10 228	65 000	7 675	5.250	40.764	4.697	30 139	3 525	2.423
(est.)										
1984 (est.)	97 895	10 970	73 000	8.375	5.550	43.329	4 827	32.365	3.685	2.452

*Based on [illegible]

SOURCE: [illegible]

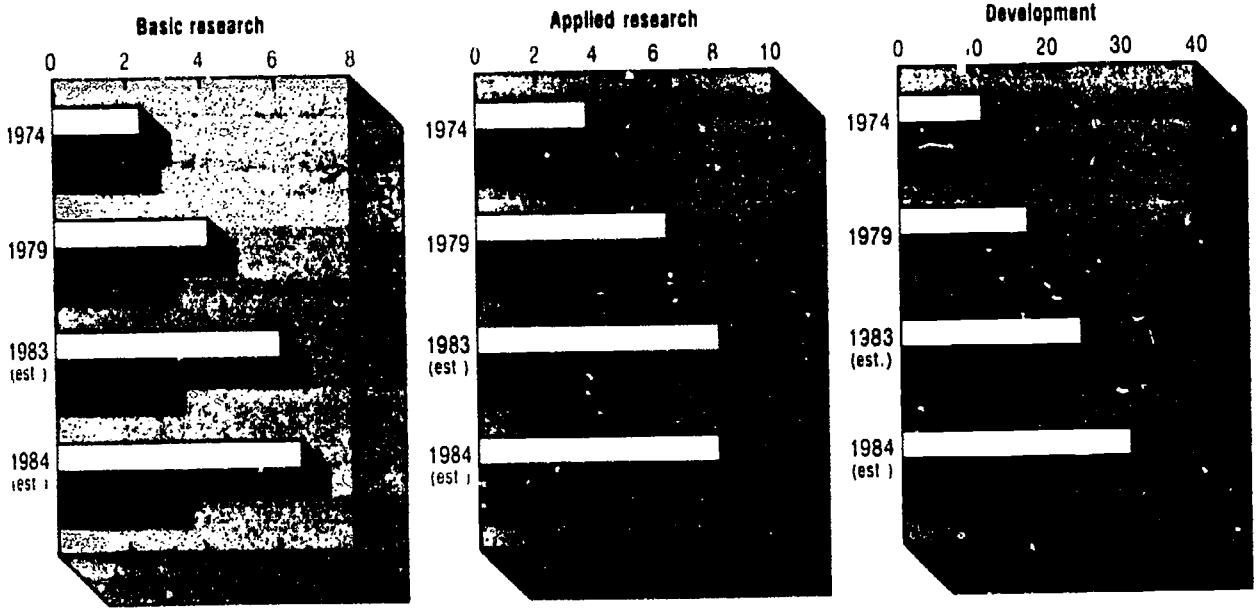
National R&D spending by character of work



Source: GNP implicit price deflator
Basic: National Science Foundation

Federal R&D obligations by character of work

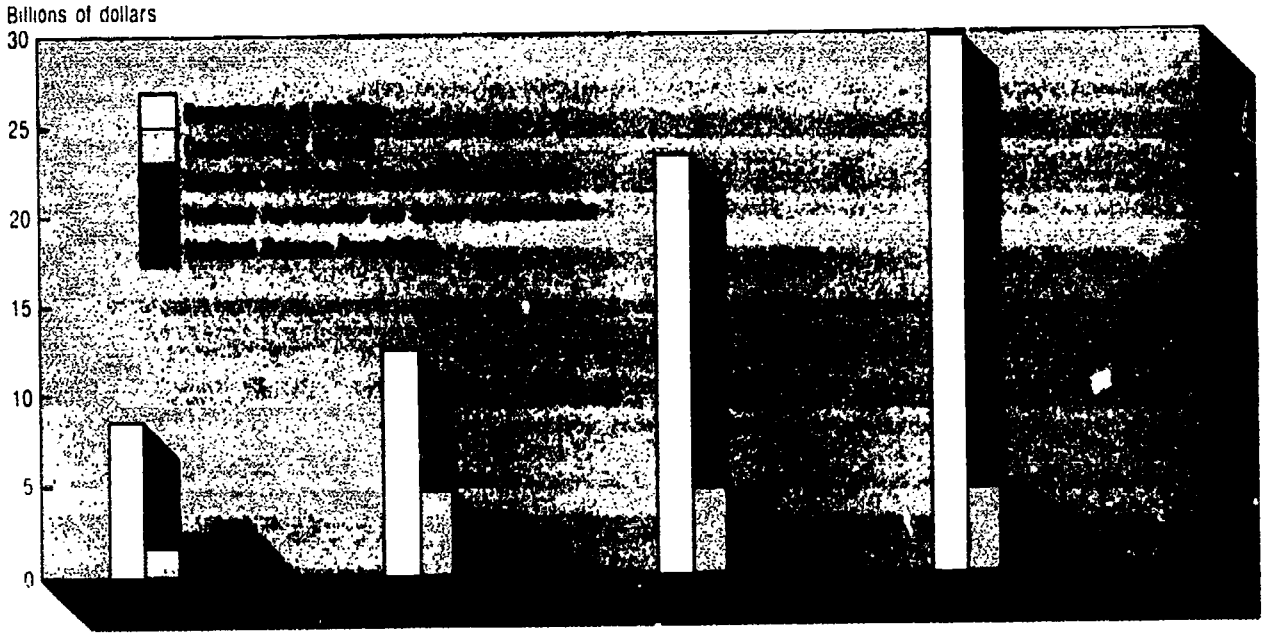
Billions of dollars



Current dollars

Constant (1972) dollars[a]

Federal R&D obligations by agency



[illegible] adjusted to reflect only health and human services programs (without education)
[illegible] National Science Foundation

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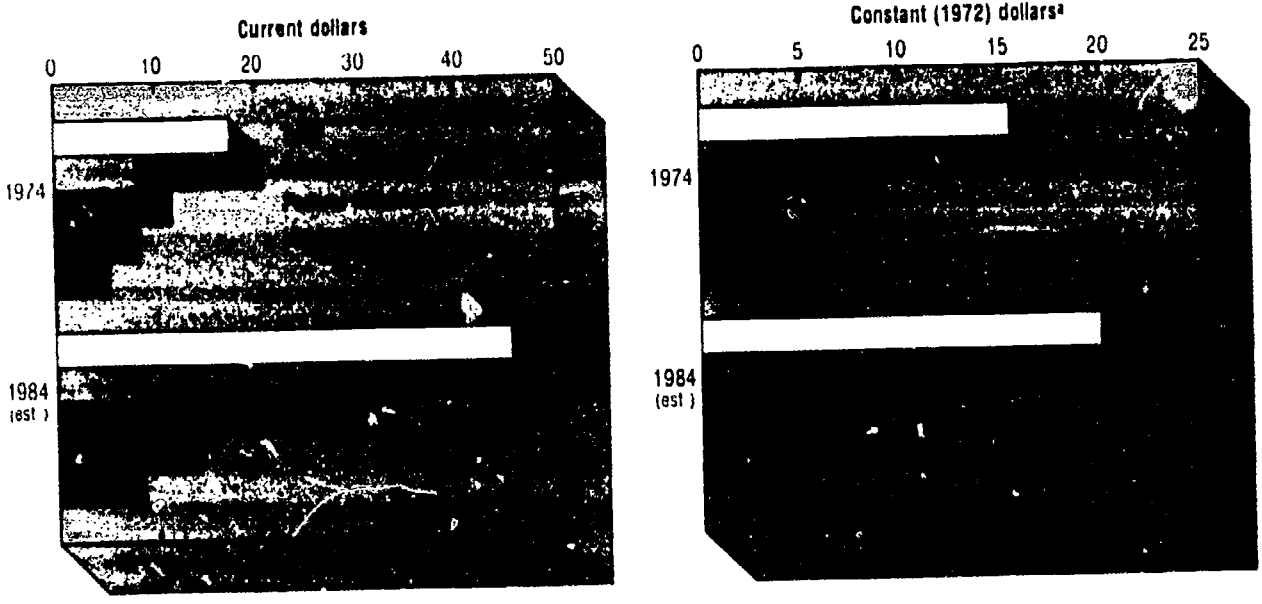
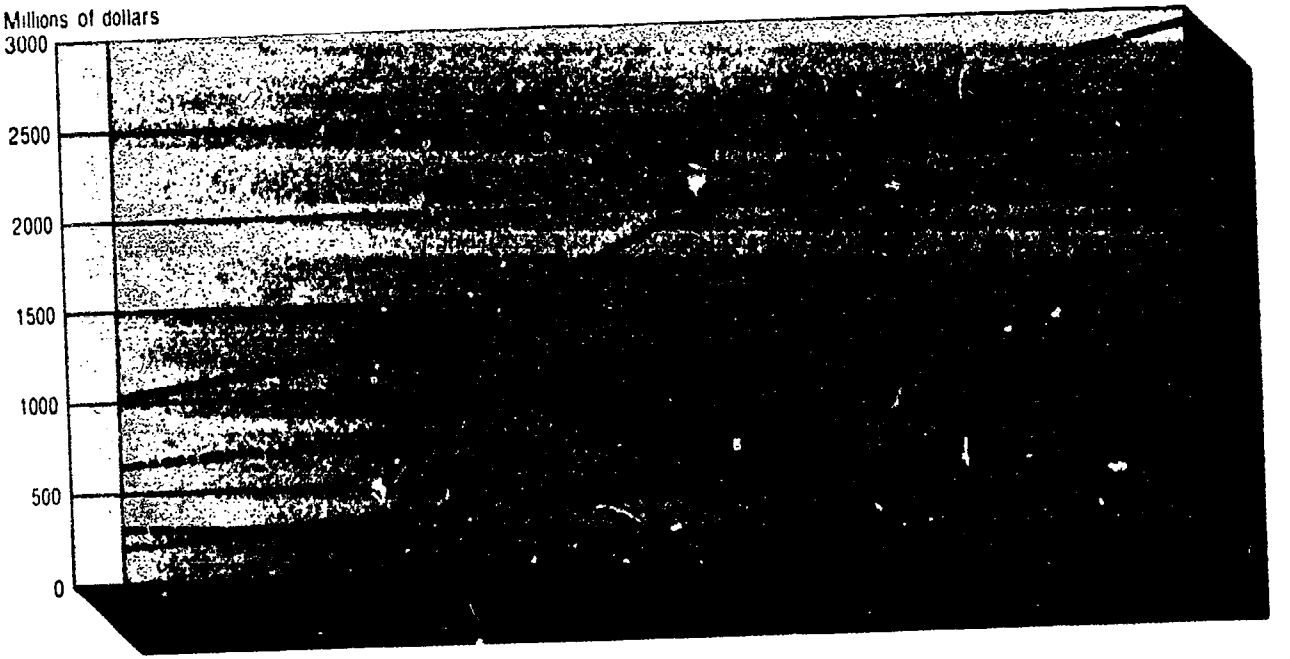
Federal R&D obligations by major performer

Billions of dollars



Federal obligations for basic research by major field of science



Source: National Science Foundation

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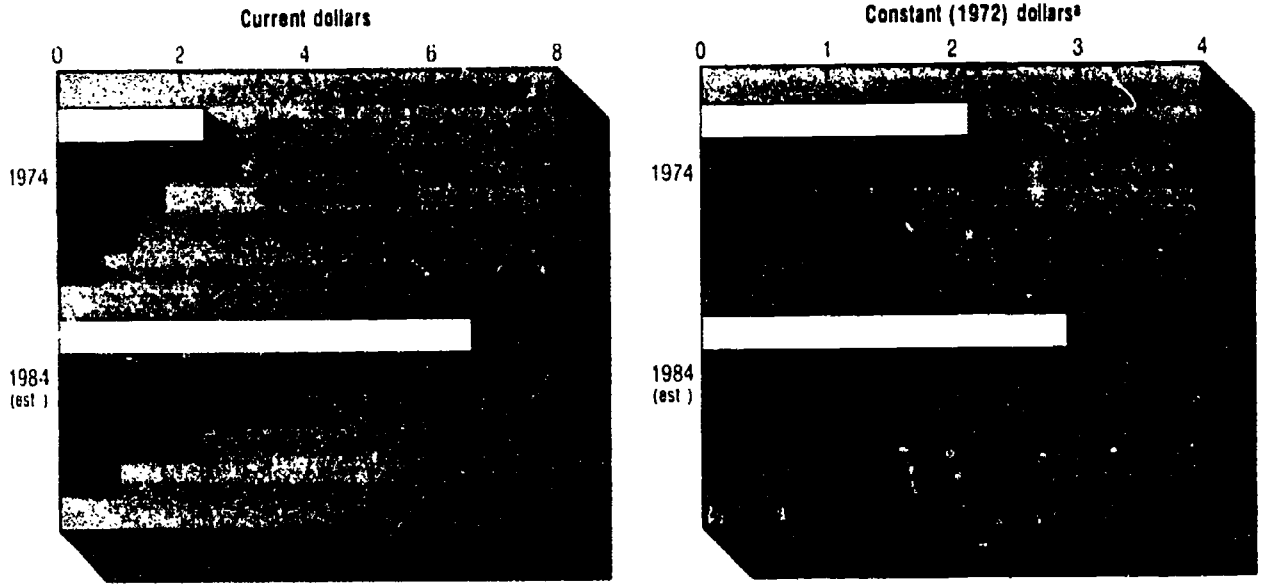
Federal obligations for basic research by major performer

Billions of dollars

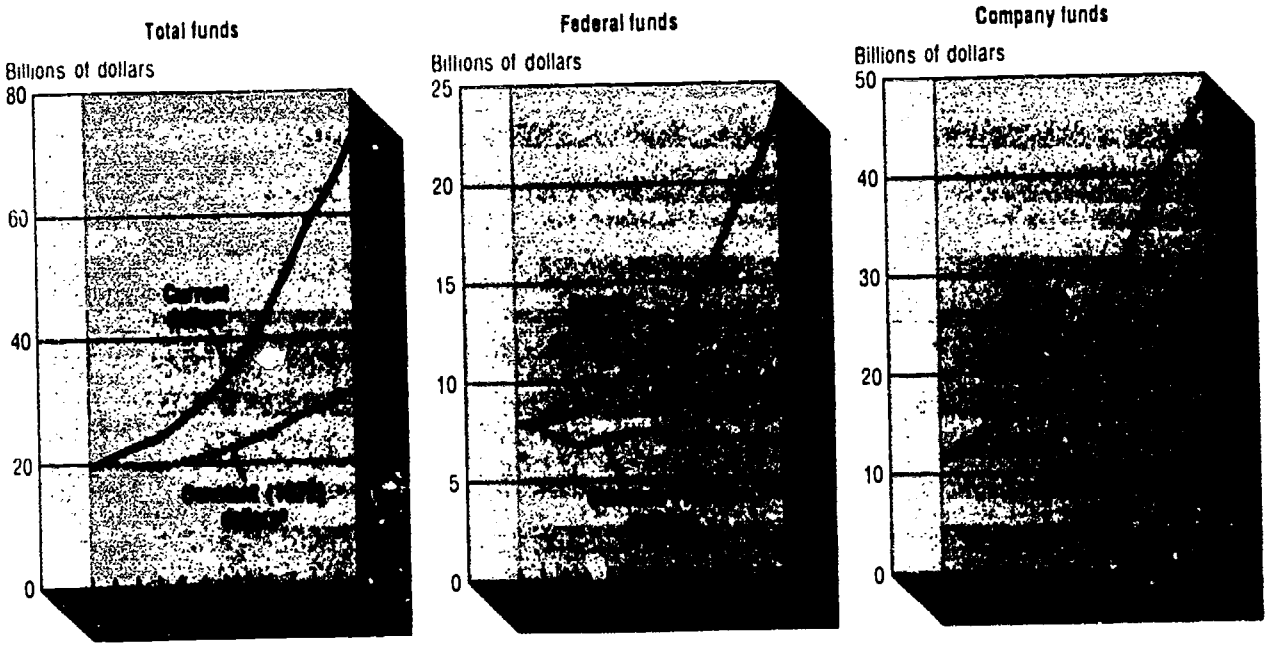


[a] [illegible] current dollars

[illegible] development centers

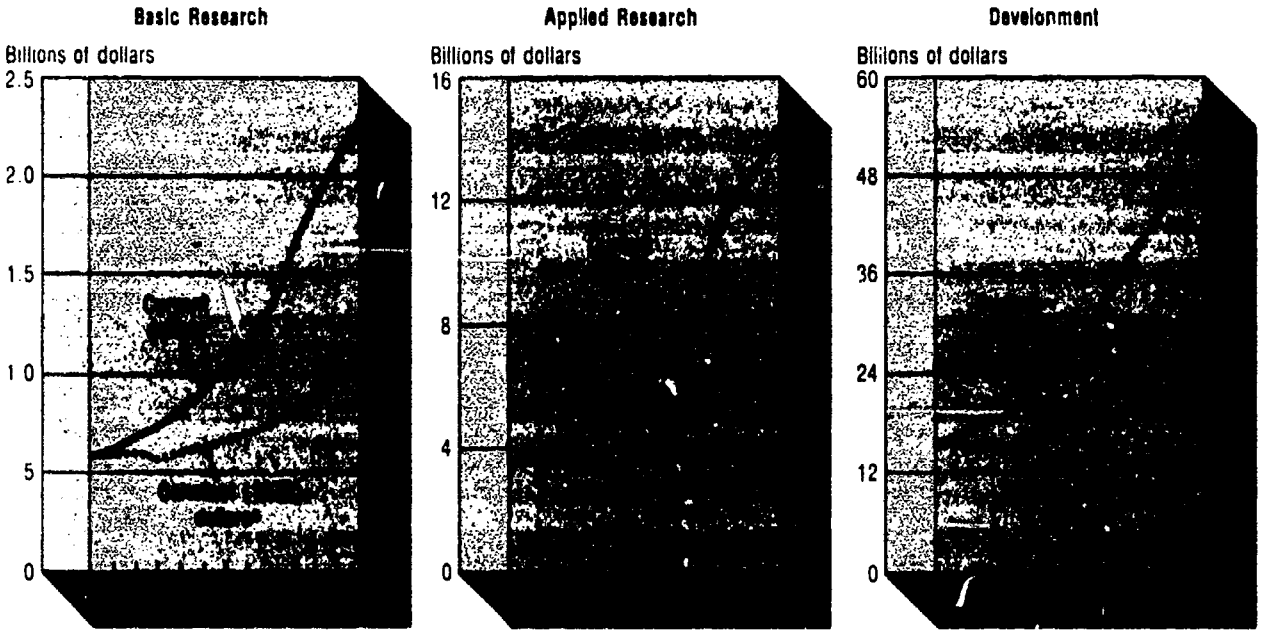
[illegible]

Industrial R&D expenditures by source of funds



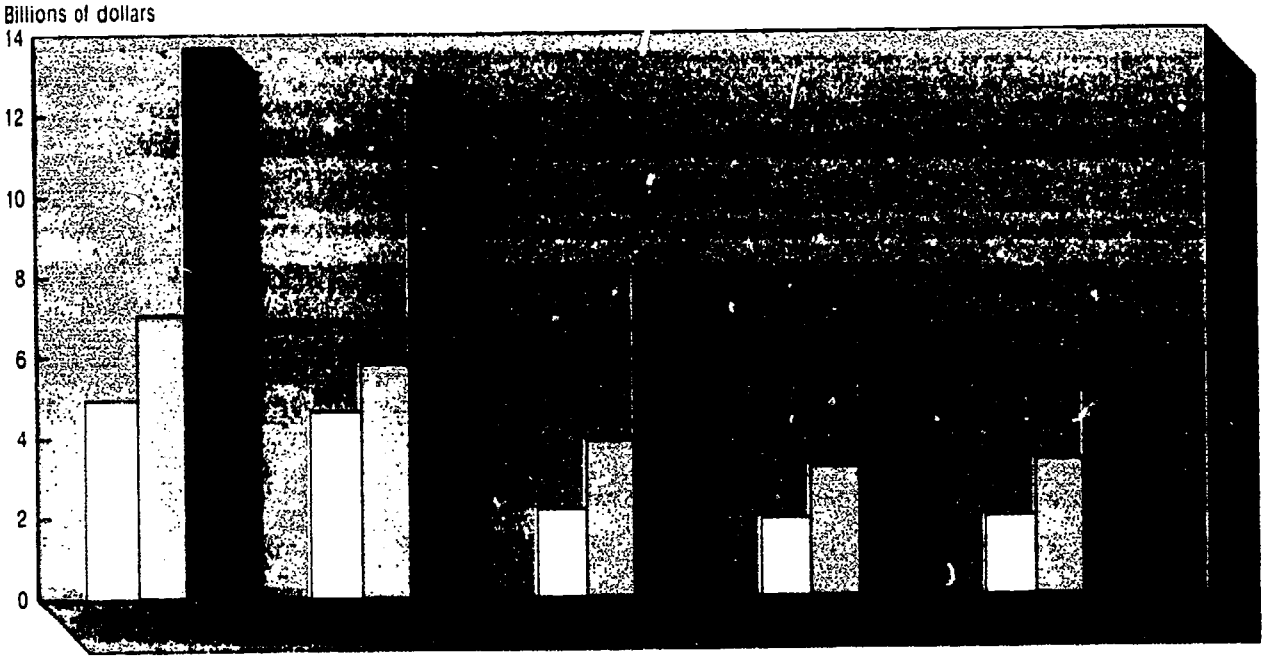
est. = NSF mid-range estimate
SOURCE: National Science Foundation

Industrial R&D expenditures by character of work

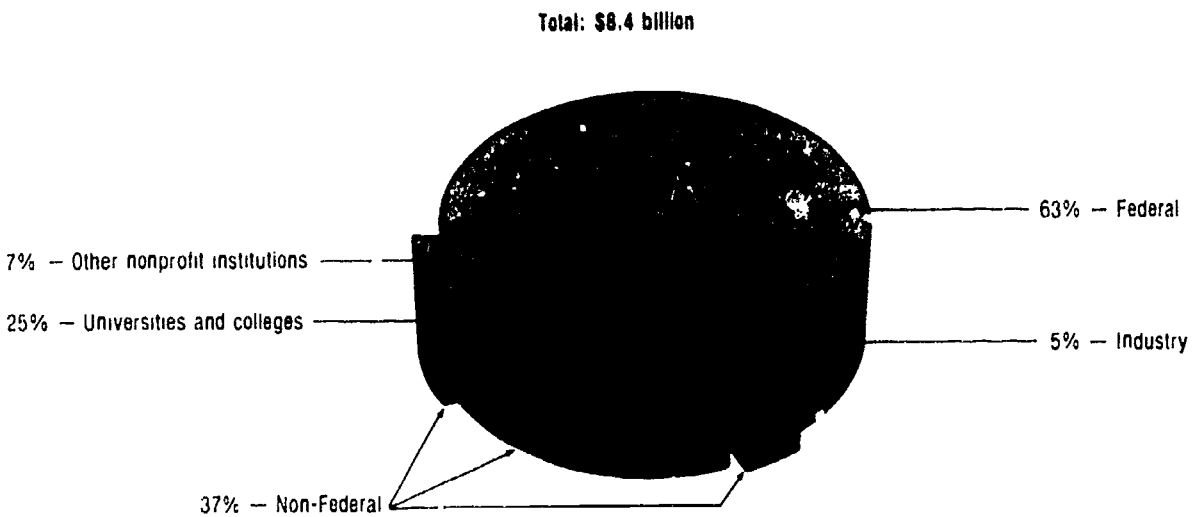


*Based on GNP implicit price deflator
SOURCE: National Science Foundation

Total R&D expenditures of five leading industries

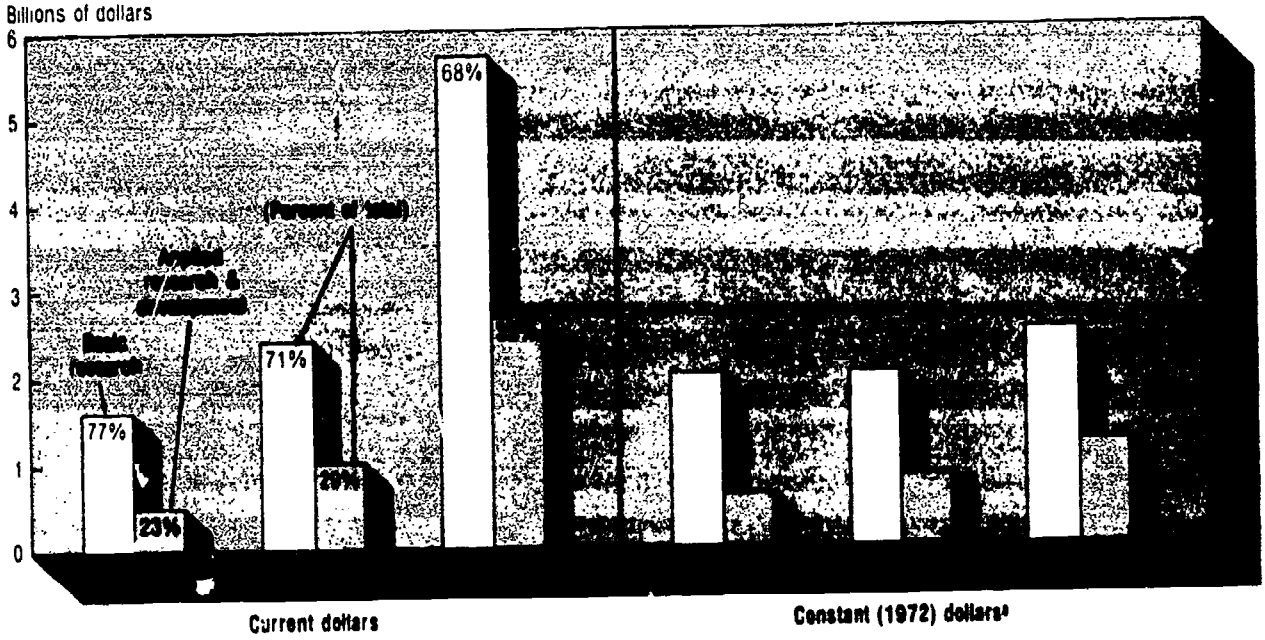


Academic R&D expenditures by source: FY 1984



...the Federal portion of academic R&D expenditures has ranged between 63 percent and 69 percent during the 1970-84 period.
...National Science Foundation

Academic R&D expenditures by character of work



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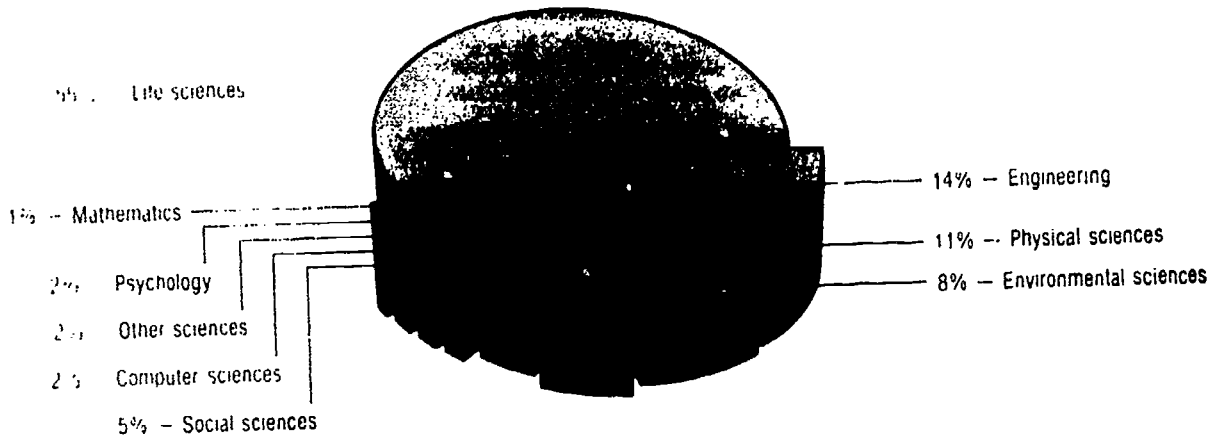
Academic R&D expenditures by field: FY 1982

Total: $7.3 billion



1988 was essentially the same as in FY 1982

Federal obligations to universities and colleges by type of activity[1]

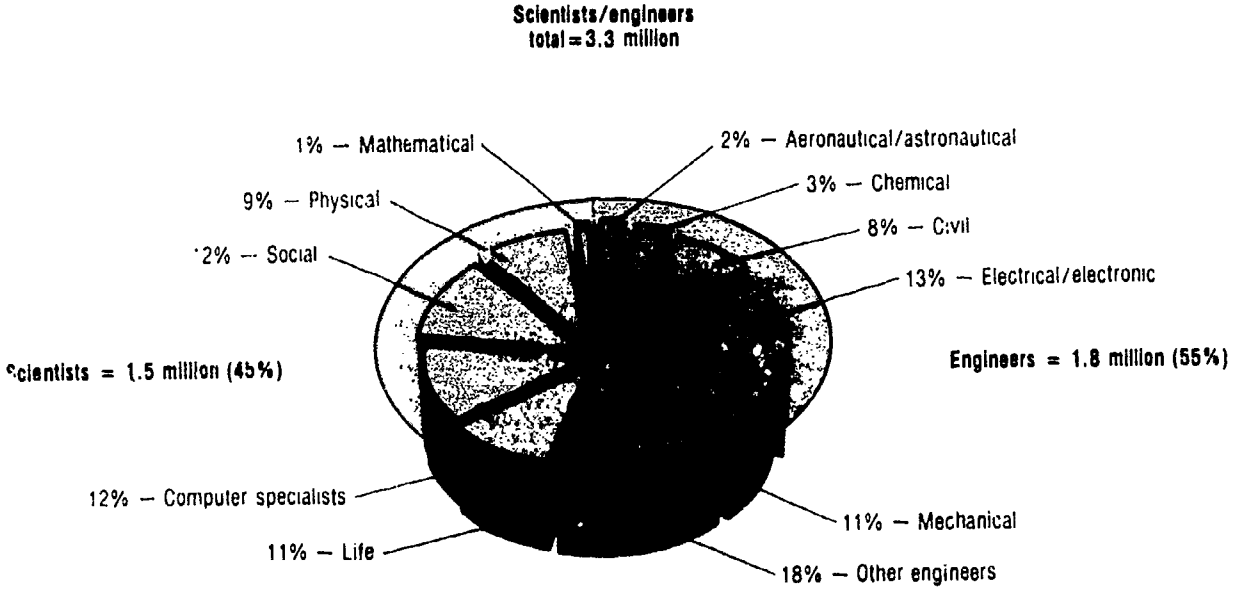
[Dollars in millions]

Fiscal year	Total obligations	Academic science/engineering					
		Total	Research and development[2]	R&D plant	Fellowships, traineeships, and training grants	All other	Non-science/ engineering
1968	$3,387	$2,350	$1,398	$96	$441	$414	$1,037
1976	5,403	2,960	2,431	24	175	330	2,443
1980	8,298	4,803	4,160	38	223	383	3,495
1981	7,720	5,088	4,410	44	215	419	2,632
1982	8,702	5,277	4,584	31	234	428	3,425

Data may not add to total because of rounding.
[2]Academic research and development is estimated at $5.0 billion for 1983 and $5.3 billion for 1984. Separate data for the other components of academic science/engineering and non-science/engineering are not available.
SOURCE: National Science Foundation

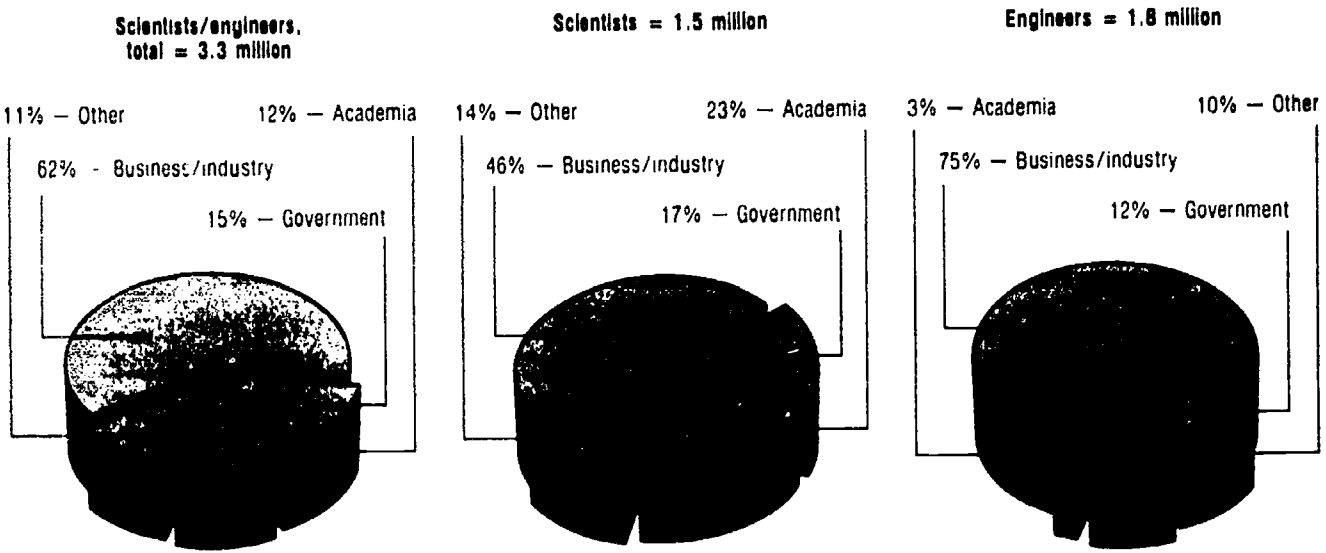
HUMAN RESOURCES

Employed scientists/engineers by field: 1982[a]



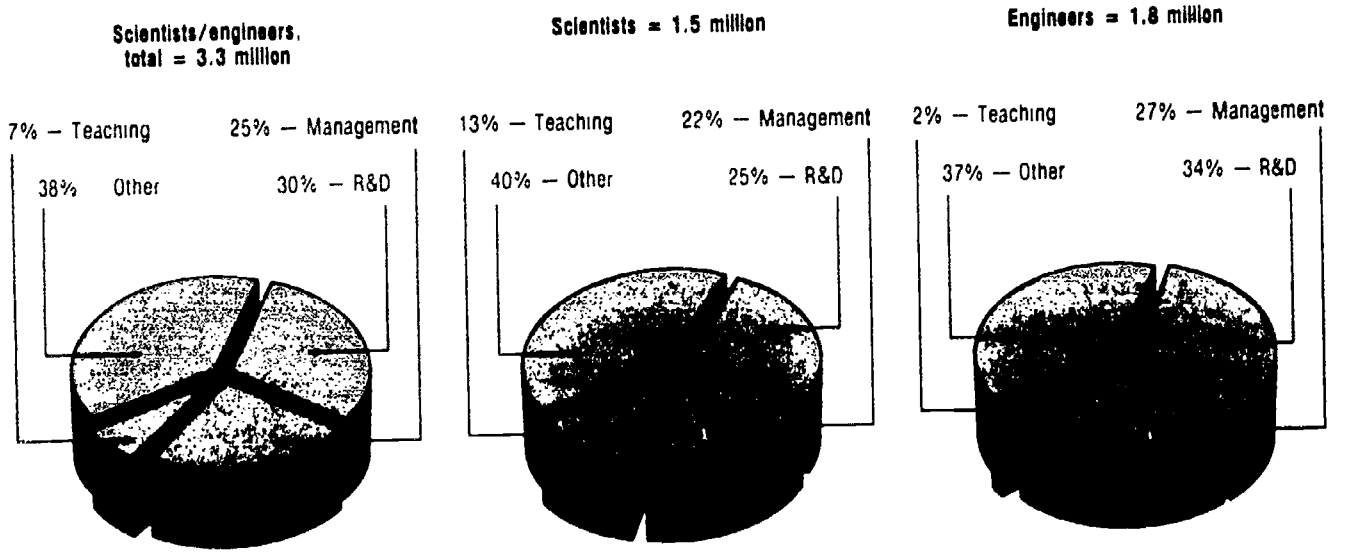
Data subject to revision
National Science Foundation

Employed scientists and engineers by sector: 1982[a]



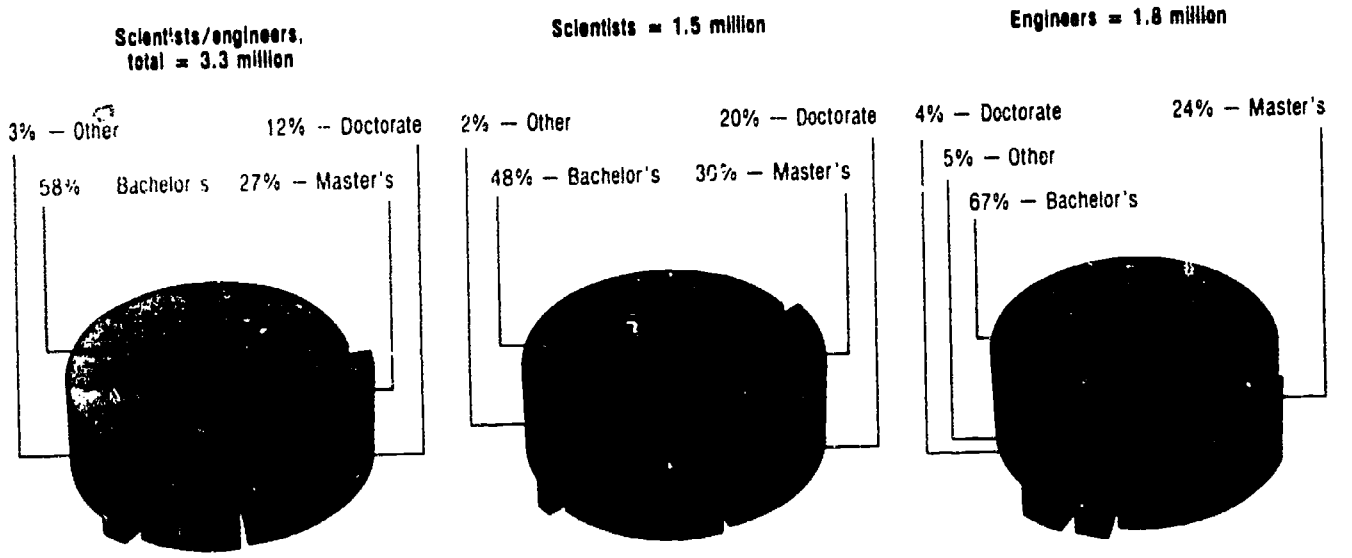
data subject to revision
National Science Foundation

Employed scientists and engineers by primary work activity: 1982[a]



[a] ...ary data subject to revision
...National Science Foundation

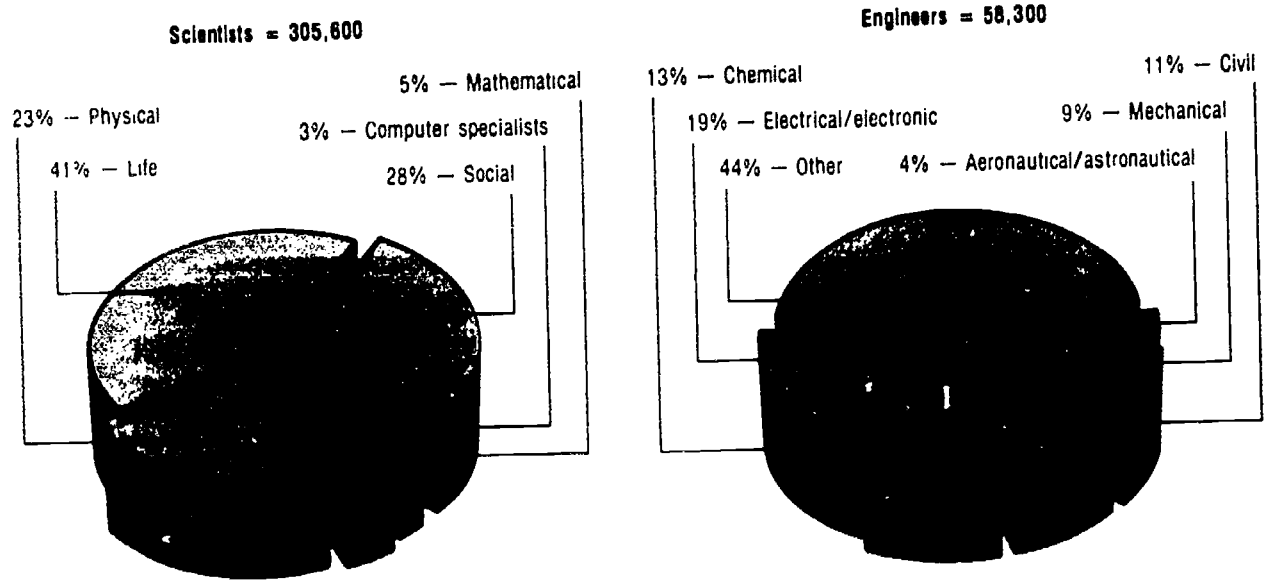
Employed scientists and engineers by highest degree: 1982[a]



Data subject to revision
National Science Foundation

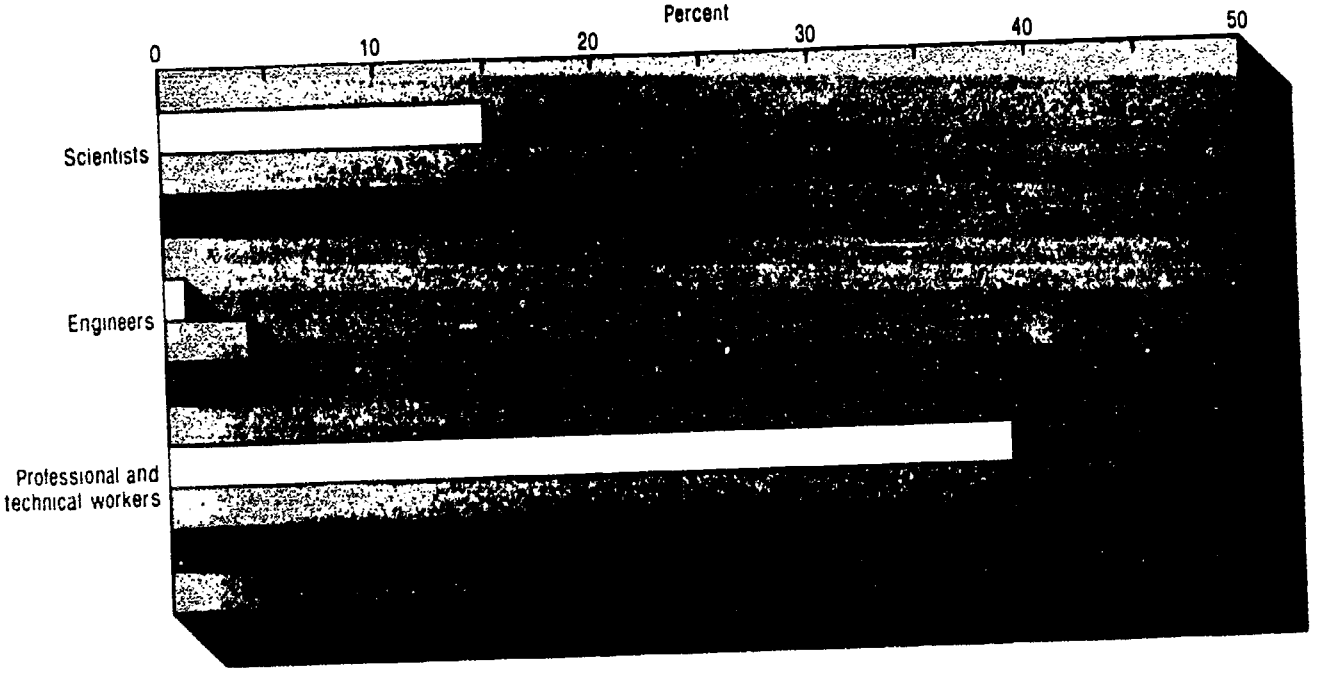
Employed doctorates in science and engineering by field: 1981

Scientists/engineers, total = 363,900



National Science Foundation

Women as a proportion of all employed scientists, engineers, and professional and technical workers



SOURCES: National Science Foundation and Department of Labor

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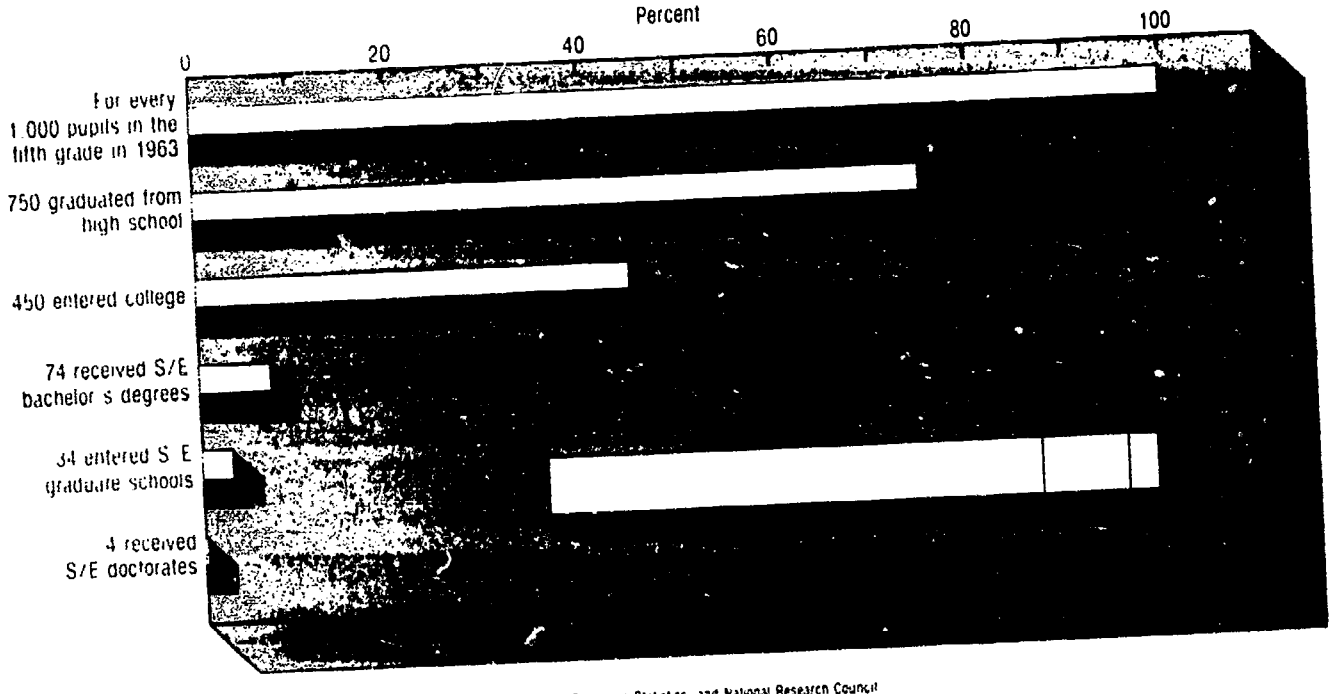
Racial minorities as a percent of technical work force

Technical work force	1972		1982	
	Black (Percent of total)	Asian (Percent of total)	Black (Percent of total)	Asian (Percent of total)
Professional and technical workers	6	NA	6	NA
Total scientists and engineers	1	3	3	5
Scientists	2	2	3	4
Engineers	1	2	2	5

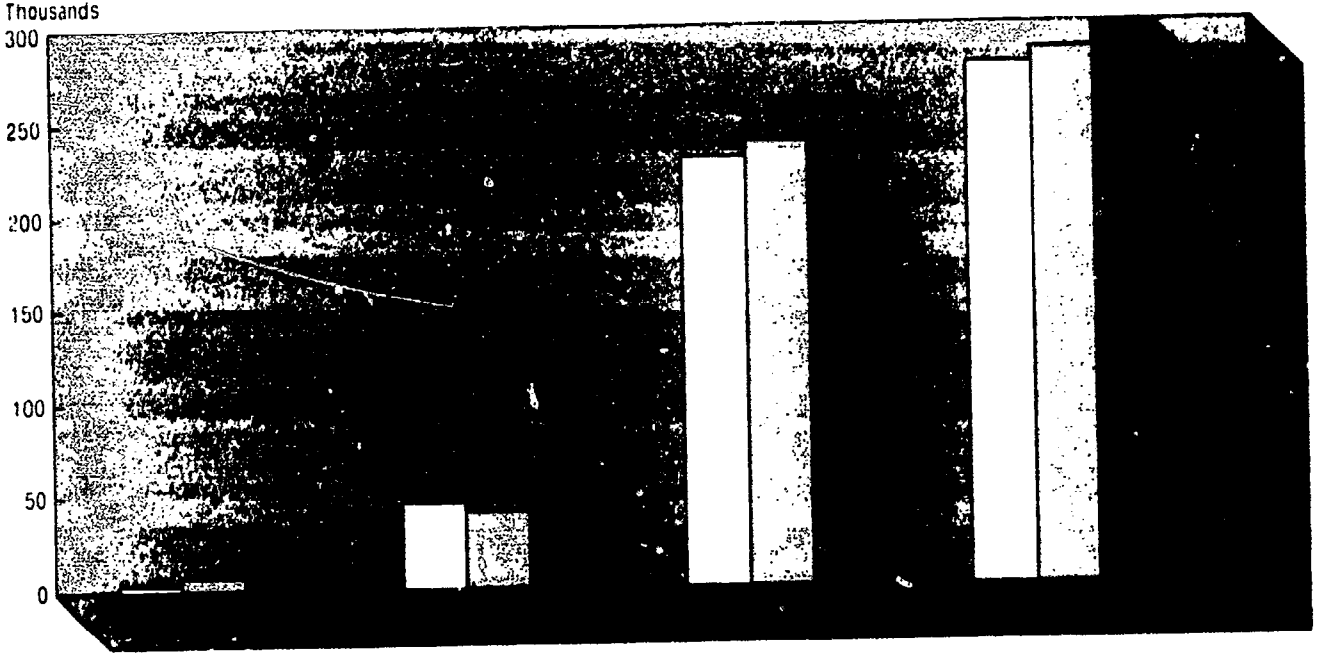
NOTE: NA = not available
SOURCE: National Science Foundation

Retention Rates, fifth grade through receipt of S/E doctorate: 1963-82

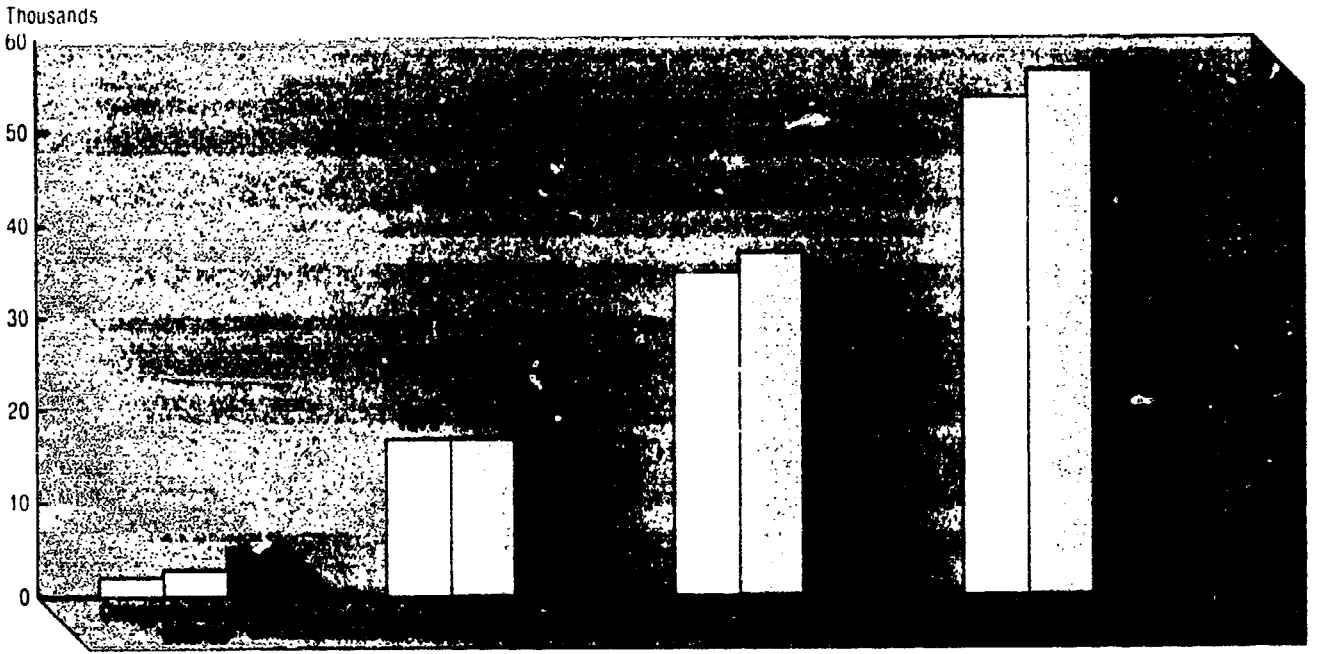


... National Science Foundation, National Center for Education Statistics, and National Research Council

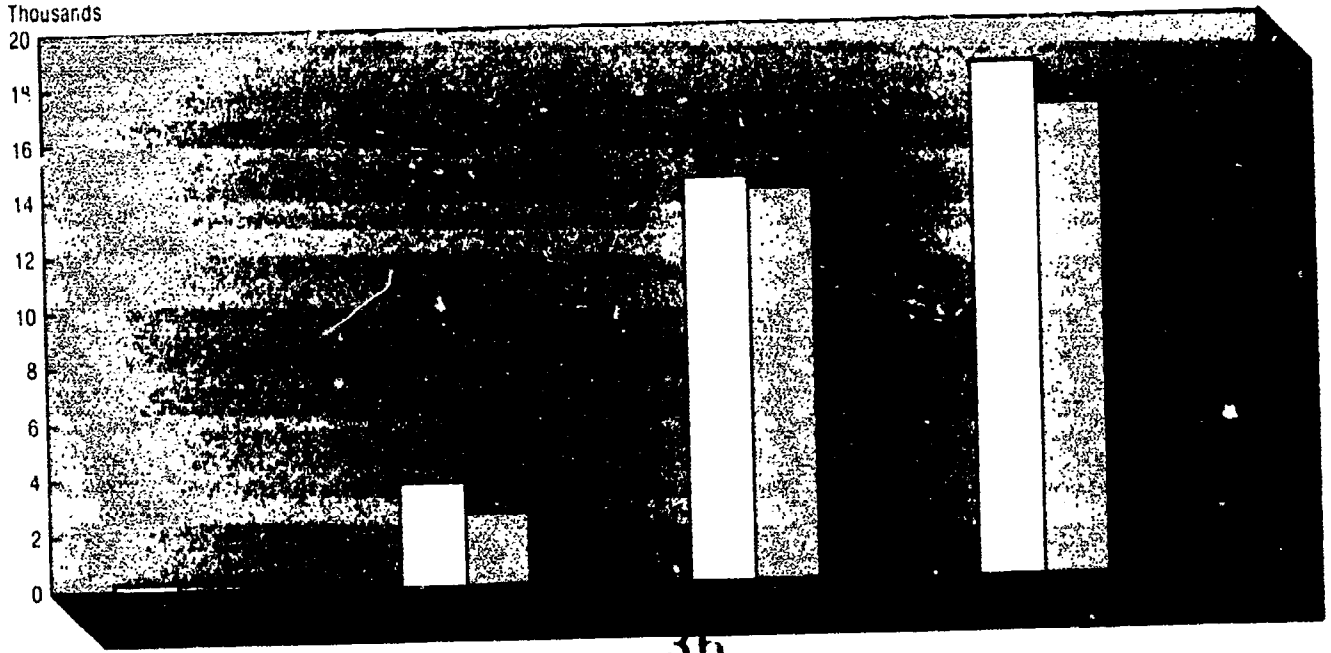
Bachelor's degrees awarded in major science and engineering (S/E) fields



Master's degrees awarded in major science and engineering (S/E) fields



Doctoral degrees awarded in major science and engineering (S/E) fields



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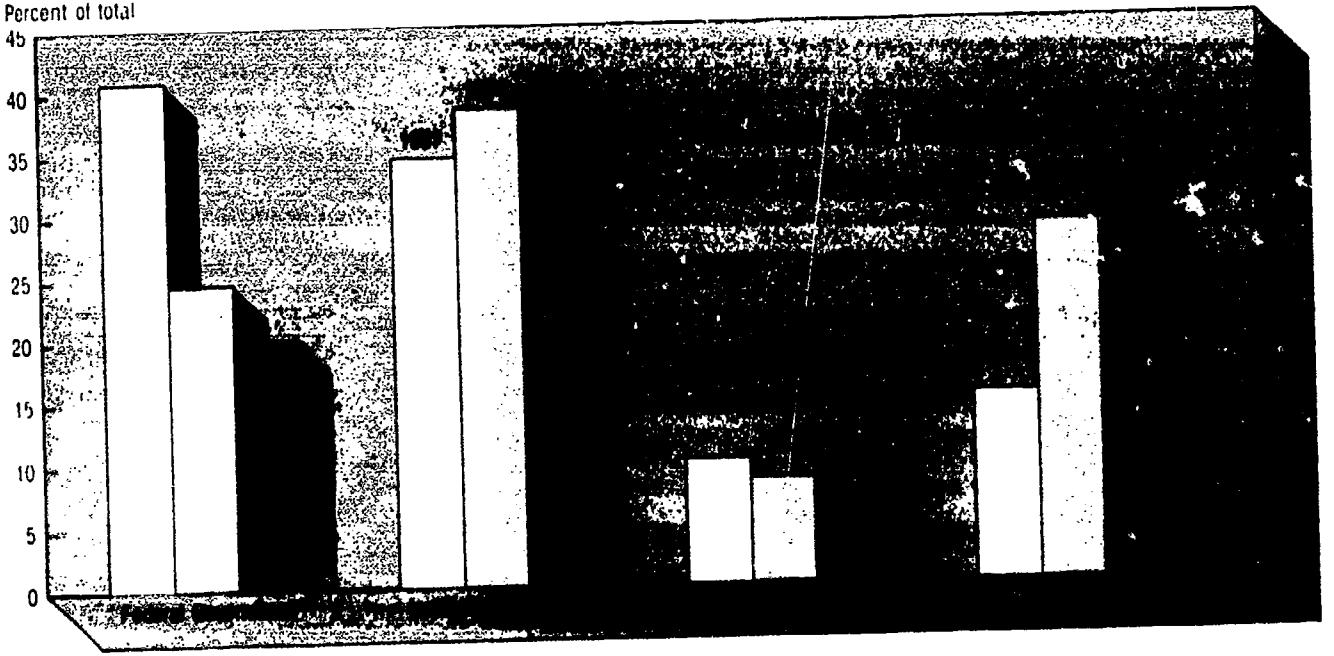
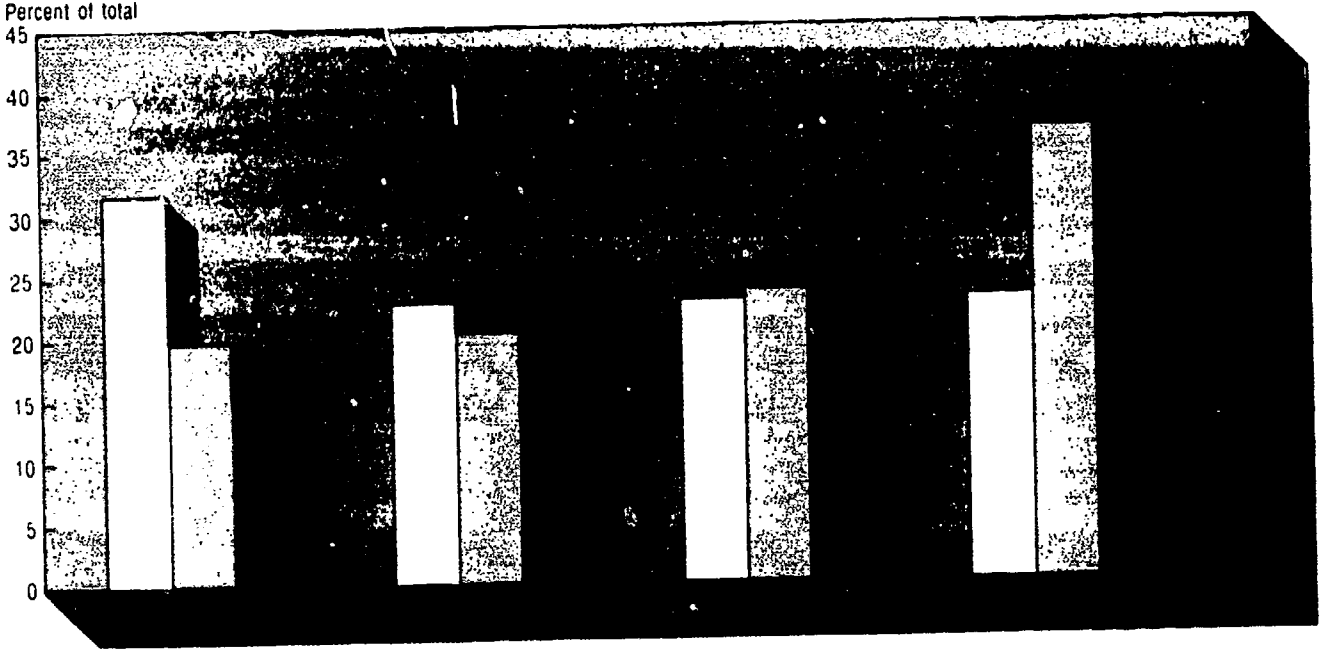
SOURCE: National Science Foundation

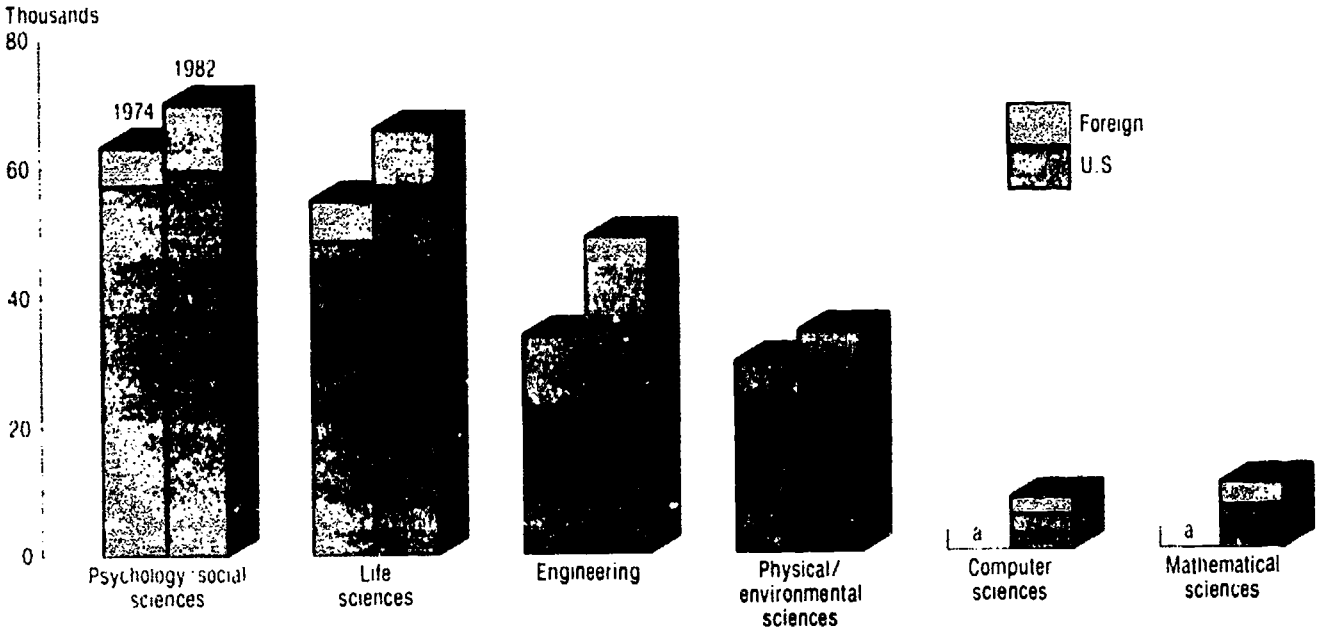
Full-time science and engineering graduate students in doctorate-granting institutions by source of major support



Full-time science and engineering graduate students in doctorate-granting institutions by type of major support

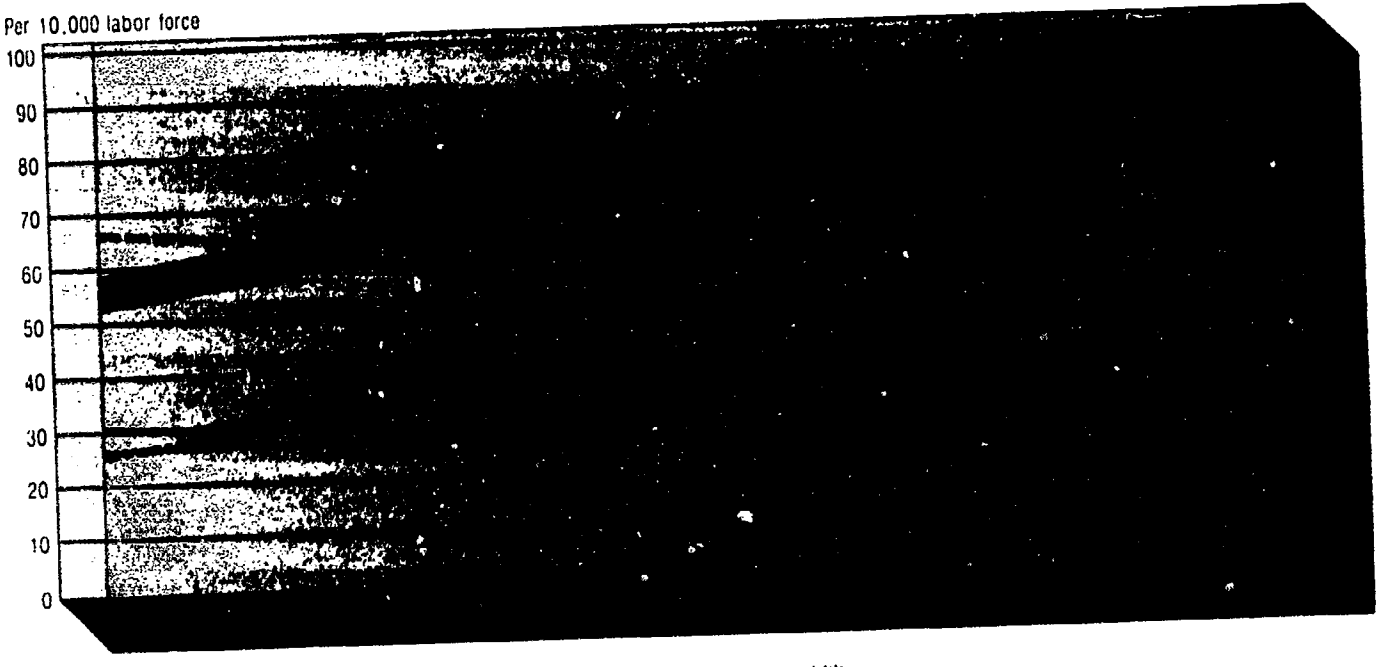


Full-time science and engineering graduate students in doctorate-granting institutions by field and citizenship



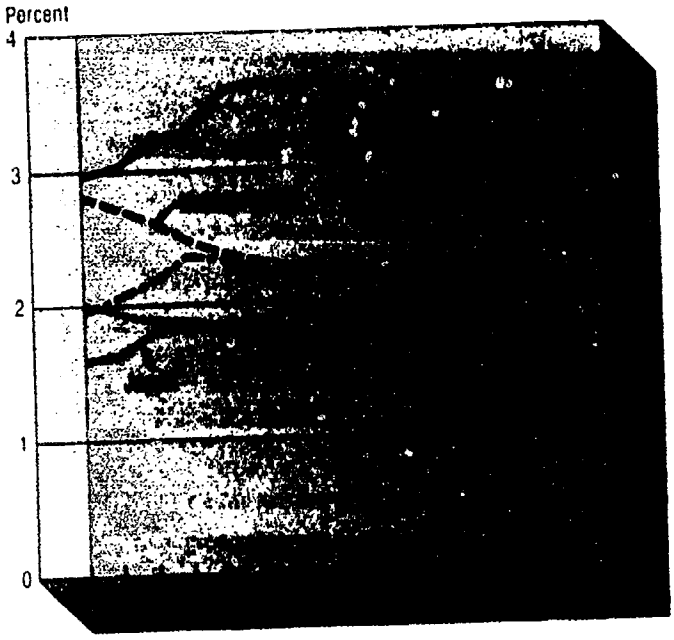
INTERNATIONAL S/T INDICATORS

Scientists and engineers engaged in R&D per 10,000 labor force by country

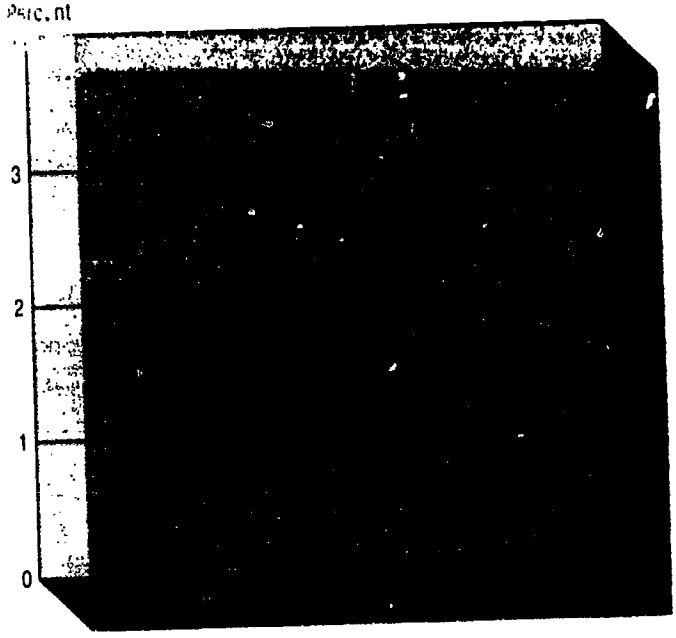


[illegible] has been provided for the U.S.S.R. because of the difficulties inherent in comparing Soviet scientific personnel data
[illegible] National Science Foundation, Organisation for Economic Cooperation and Development, and Dr. Robert Campbell (Indiana University)

R&D/GNP ratios by country



Nondefense R&D/GNP ratios by country[a]



[a] ... data for nondefense R&D ... U.S. R ... are not available.
... National Science Foundation; Organisation for Economic Cooperation and Development; and Dr. Robert Campbell (Indiana University)

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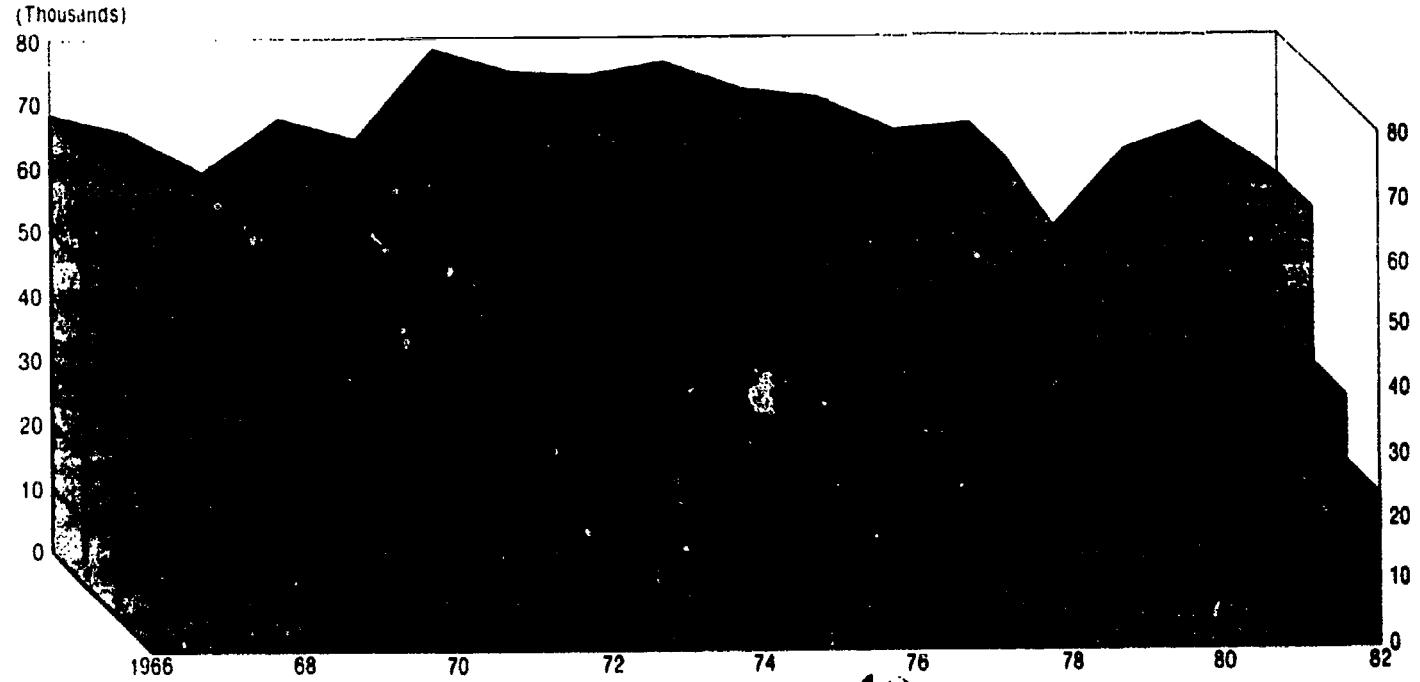
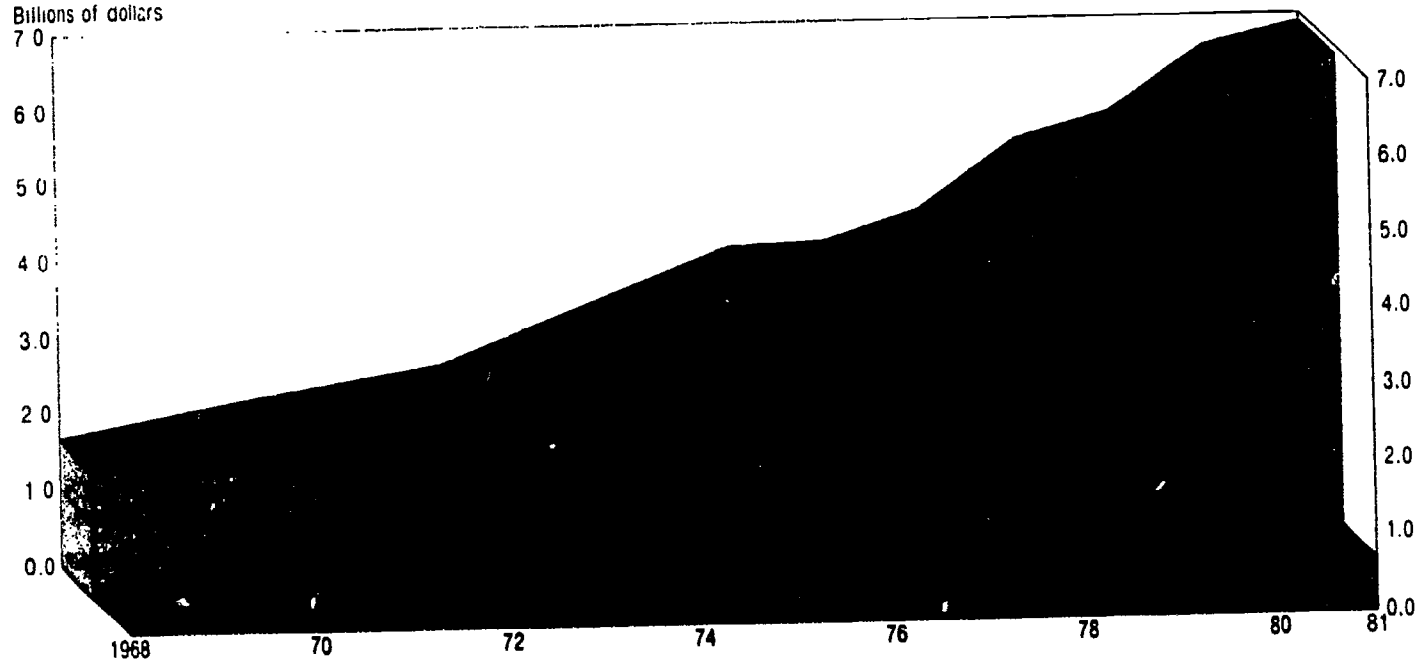
U.S. patents granted to U.S. and foreign inventors by year of grant



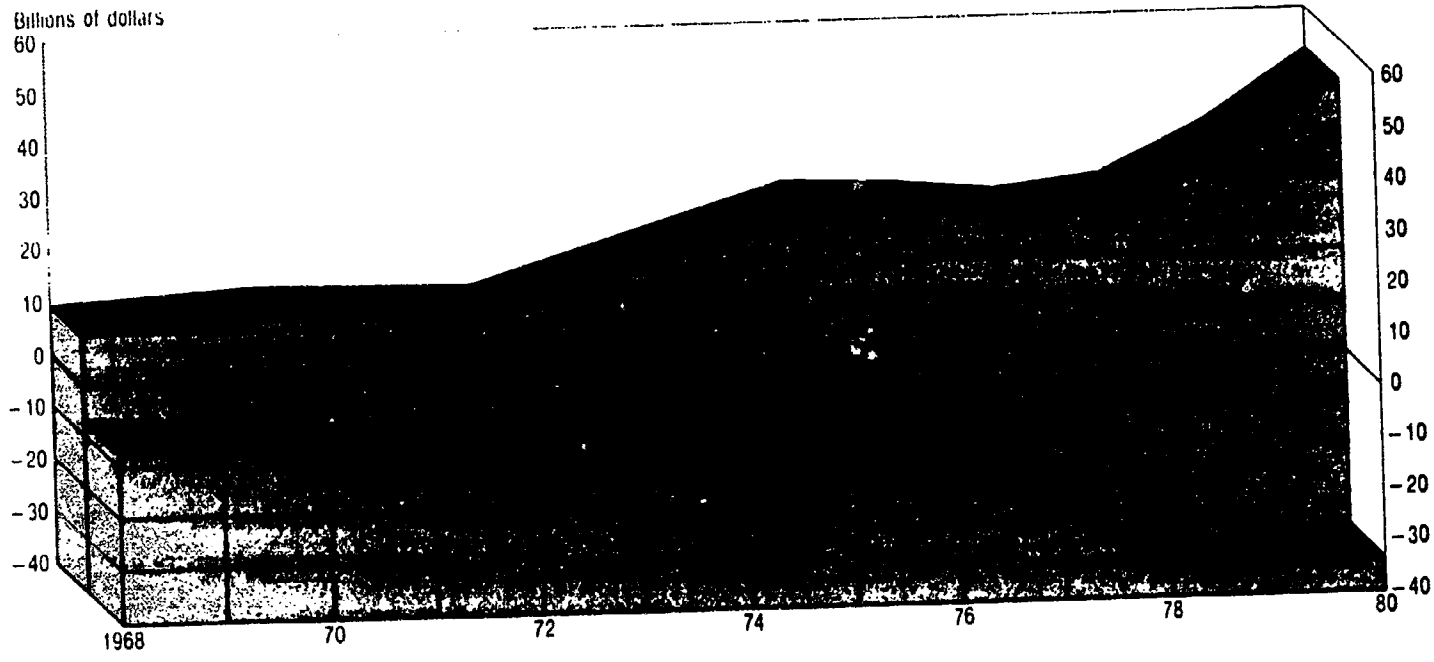
SOURCE: U.S. Patent and Trademark Office

U.S. international transactions in royalties and fees[a]



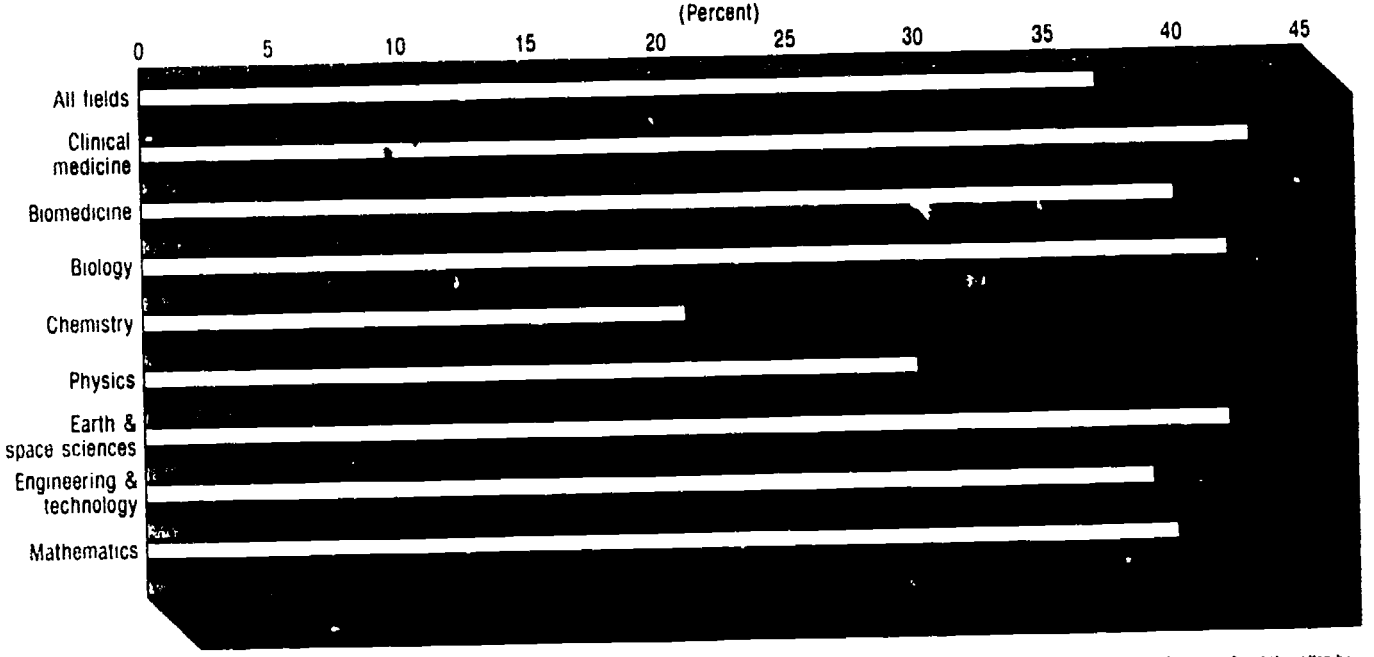
des Documentaires
U.S. Department of Commerce

U.S. trade balance[a] in R&D-intensive manufactured product groups



[a] Exports less imports
Source: Department of Commerce

U.S. scientific and technical (S/T) publications as a percent of all S/T publications: 1980



NOTE: These data are based on the articles, notes, and reviews in over 2,100 of the influential journals carried on the 1973 *Science Citation Index* of the Institute for Scientific Information. An article written by researchers from more than one country is prorated across the countries involved.

SOURCE: Computer Horizons, Inc.

Other Science Resources Publications

Science Resources Studies Highlights

	NSF No.	Price
R&D Funds		
"Defense and Economy Major Factors in 7% Real R&D Growth in National Expenditures"	83-316	--
"Company and Federal Support Produce 17% Industrial R&D Spending Increase in 1981"	83-313	--
"Federal Science/Engineering (S/E) Support To Universities and Colleges Rose by 6% in FY 1981; Non-S/E Support Down 25%"	83-306	--
"Real Growth Rate of Academic R&D Expenditures Slowed to 2% in FY 1981"	83-304	--
"Significant Increase Expected in Industrial R&D Performance of Federal R&D Programs in FY 1983"	82-329	--
Growth in Federal Basic Research Support in 1980-83 Moves at Slower Rate than in Previous Four Years"	82-325	--
"Companies Plan R&D Expenditure Increases for 1983; Growth Rate Down"	82-324	--
"Defense Leads R&D Growth in FY 1983 — Energy and Natural Resources and Environment Fall Sharply"	82-322	--
"National R&D Expenditures Expected to Reach $85 Billion in 1983"	82-311	--
S/E Personnel		
"Technical Employment Growth Accelerates in Selected Nonmanufacturing Industries"	83-321	--
"Academic Employment of Scientists Continued to Grow in 1982, But Slower than for Other Economic Sectors"	83-317	--
"Growth in Neuroscience May be Leveling Off"	83-314	--
Graduate Science/Engineering Enrollment Rose 2% in 1981, Mostly in 'High-Tech' Fields"	83-310	--
"Projected Employment Scenarios Show Possible Shortages in Some Engineering and Computer Specialties"	83-307	--
Manufacturing Employment Becoming Increasingly More Technological"	83-303	--
Growth in Science and Engineering Employment Accelerated in 1980 to 1981—But Demand May Have Slackened in 1982"	83-300	--
"Labor Market Slackens for New Science and Engineering Graduates"	82-331	--

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1990 R&D Funding Projections	82-315	$3.50
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Women and Minorities in Science and Engineering	82-302	$7.00
Activities of Science and Engineering Faculty in Universities and 4-Year Colleges, 1978/79	81-323	--
Young and Senior Science and Engineering Faculty: 1980	81-319	--
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Science and Engineering Employment: 1970-80	81-310	$2.75
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Composite		
National Patterns of Science and Technology Resources: 1982	82-319	$5.00
Science and Engineering Personnel: A National Overview	82-318	$5.00
Academic Science 1972-81 R&D Funds, Scientists and Engineers, Graduate Enrollment and Support	81-326	--
Science Indicators, 1980	NSB 81-1	$10.00