

R&D as a Percent of GDP is Highest in Six Years

by Steven
Payson

In 1998, Federal support for R&D is expected to grow slightly in real terms, but continue to shrink as a proportion of the Nation's funding total.

By current projections, total annual research and development (R&D) expenditures in the United States will be \$220.6 billion in 1998—a 7.3-percent increase over the \$205.6 billion estimated for 1997. In turn, the 1997 estimate represents a 4.9-percent increase over 1996, and the 1996 level was a 7.1-percent increase over 1995. In inflation-adjusted terms, R&D annual increases are 5.3 percent for 1998, 2.8 percent for 1997, and 4.7 percent for 1996.

The entire economy of the United States, as measured by gross domestic product (GDP), adjusted for inflation, increased an estimated 2.7 percent in 1998, 3.8 percent in 1997, and 2.8 percent in 1996. Consequently, R&D as a share of GDP will reach 2.61 percent in 1998, up from 2.54 percent in 1997, and 2.57 percent in 1996. This 1998 share is the highest since 1992's 2.64 percent, and reflects a continuation of a general upturn that began in 1994 after a three-year decline from 1991-94 (figure 1). Despite this recent in-

crease, the R&D share is still below levels reached in the early 1990s. The historic high since 1957 for the Nation's R&D/GDP ratio was reached in 1964 at 2.87 percent; the low was 2.12 percent in 1978.

Of the projected \$220.6 billion spent on R&D in 1998, \$34.4 billion (or 15.6 percent) is expected to be for basic research, \$49.8 billion (22.6 percent) for applied research, and \$136.4 billion (61.8 percent) for development. In comparison with 1997, R&D performance in 1998 reflects a 2.4-percent "real" (adjusted for inflation) increase in basic research, a 6.2-percent real increase in applied research, and a 5.8-percent real increase in development.

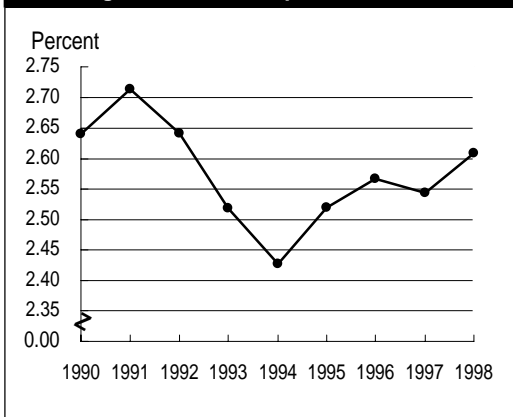
Funding Patterns

Since 1980, industry has provided the largest share of financial support for R&D, projected to reach \$143.7 billion in 1998, or 65.1 percent of the total (table 1). This funding represents a 7.7-percent increase in real terms over the preliminary 1997 level. Of these funds, nearly all (\$140.8 billion) will be devoted to R&D performed by industry itself, with the remainder directed toward academic R&D (\$1.8 billion) and R&D performed by other nonprofit organizations (\$1.0 billion).

Federal R&D support in 1998 is expected to be \$66.6 billion, a 0.8-percent increase in real terms over 1997. The Federal share of support for the Nation's R&D first fell below 50 percent in 1978, and it remained between 45 and 50 percent until 1988. It then fell steadily, dropping from 42.6 percent in 1988 to a current all-time low of 30.2 percent projected for 1998.

Other R&D funds will be provided by universities and colleges, state and local governments, and other nonprofit institutions. These

Figure 1. R&D as a percent of GDP



NOTES: These data are based on reports from R&D performers. Data for 1997 and 1998 are preliminary.

SOURCE: National Science Foundation, Division of Science Resources Studies

Electronic Dissemination

SRS data are available through the World Wide Web (<http://www.nsf.gov/sbe/srs/>). For more information about obtaining reports, contact pubs@nsf.gov or call (301) 947-2722. For NSF's Telephonic Device for the Deaf, dial (703) 306-0090.

R&D as a Percent of GDP is Highest in Six Years—page 2

Table 1. Preliminary national expenditures for research and development, by performing sector and source of funds: 1998

Performers	Total	Sources of funds				Percent distribution, by performer
		Industry	Federal Government	Universities and colleges	Other nonprofit institutions	
All R&D: Basic Research, Applied Research and Development (millions of current dollars)						
Total.....	220,617	143,714	66,636	6,819	3,449	100.0
Industry.....	163,328	140,847	22,481	--	--	74.0
Industry-administered FFRDCs.....	2,418	--	2,418	--	--	1.1
Federal Government.....	16,936	--	16,936	--	--	7.7
Universities and colleges.....	25,672	1,829	15,247	6,819	1,778	11.6
U&C-administered FFRDCs.....	5,529	--	5,529	--	--	2.5
Other nonprofit institutions.....	5,928	1,038	3,219	--	1,671	2.7
Nonprofit-administered FFRDCs.....	807	--	807	--	--	0.4
Percent distribution by sources.....	100.0%	65.1%	30.2%	3.1%	1.6%	
Basic Research Only (millions of current dollars)						
Total.....	34,426	8,795	19,523	4,314	1,793	100.0
Industry.....	7,845	7,161	684	--	--	22.8
Industry-administered FFRDCs.....	745	--	745	--	--	2.2
Federal Government.....	2,867	--	2,867	--	--	8.3
Universities and colleges.....	17,606	1,157	11,009	4,314	1,125	51.1
U&C-administered FFRDCs.....	2,688	--	2,688	--	--	7.8
Other nonprofit institutions.....	2,564	478	1,418	--	668	7.4
Nonprofit-administered FFRDCs.....	111	--	111	--	--	0.3
Percent distribution by sources.....	100.0%	25.5%	56.7%	12.5%	5.2%	

KEY: FFRDC=Federally funded research and development center; U&C=Universities and colleges

NOTES: State and local government support to industry is included in industry support for industry performance.
State and local government support to U&Cs is included in U&C support for U&C performance.

SOURCE: National Science Foundation, Division of Science Resources Studies

funds, in combination, are expected to reach \$10.3 billion in 1998, reflecting a 3.4-percent real increase over their 1997 level.

R&D Performance Patterns

Industry—including industry-administered federally funded research and development centers (FFRDCs)—is expected to perform 75.1 percent of the Nation's total R&D in 1998. The projected \$165.7 billion in R&D performance by industry represents an 8.5-percent real increase over the preliminary 1997 level. Of this industrial R&D performance in 1998, 85.0 percent will be supported by industry's own funds; Federal funding will account for the remaining 15.0 percent. The Federal share of industry's performance total has fallen considerably from its all-time high of 32 percent in 1987.

The Federal Government is expected to perform \$16.9 billion of R&D in 1998, a real increase of 0.2 percent from 1997. Federal agencies are estimated to account for 7.7 percent of national R&D performance in 1998, reflecting, again, a continual decline in the Federal performance share, which began in the mid-1970s. Universities and colleges, excluding academically administered FFRDCs, are expected to account for 11.6 percent (\$25.7 billion) of national R&D performance in 1998; this is a moderate real increase (3.1 percent) over 1997.

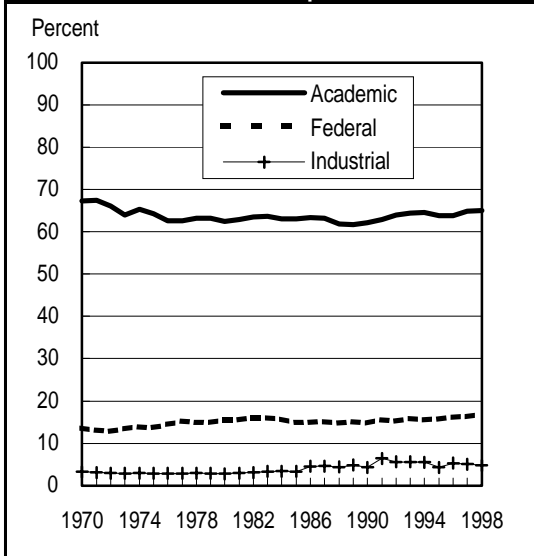
Basic Research Patterns

The amount of basic research conducted as a proportion of R&D varies enormously by sector. From 1970-98, basic research was between 62 and 67 percent of all university and college R&D (including university and college administered FFRDCs) (figure 2).

R&D as a Percent of GDP is Highest in Six Years—page 3

Almost no change is expected in total Federal R&D performance in 1997-98, but Federal basic research is expected to rise by 4 percent.

Figure 2. Basic research of academic, Federal and industrial performers as a percent of the R&D that each performs



NOTES: These data are based on reports from R&D performers. Data for 1997 and 1998 are preliminary.
SOURCE: National Science Foundation, Division of Science Resources Studies

For industry R&D (excluding industry-administered FFRDCs), it has ranged between only 3 and 6 percent, and for Federal intramural R&D, it has ranged between 13 and 17 percent. This maximum of 17 percent for basic research as a percentage of Federal R&D is expected for 1998, reflecting an upward trend that has been occurring since 1988.

Industry and industry-administered FFRDCs, combined, are expected to account for 25.0 percent (\$8.6 billion) of the Nation's basic research performance in 1998. Universities and colleges are expected to account for 51.1 percent (\$17.6 billion), and their FFRDCs for another 7.8 percent (\$2.7 billion). The remaining basic research performance will be carried out by the Federal Government, comprising 8.3 percent (\$2.9 billion) of the total, and by other nonprofit organizations and their affiliated FFRDCs—7.8 percent (\$2.7 billion). While Federal Government performance of all R&D is expected to rise only 0.2 percent in real terms (as described above), Federal performance of basic research is expected to rise 4.2 percent.

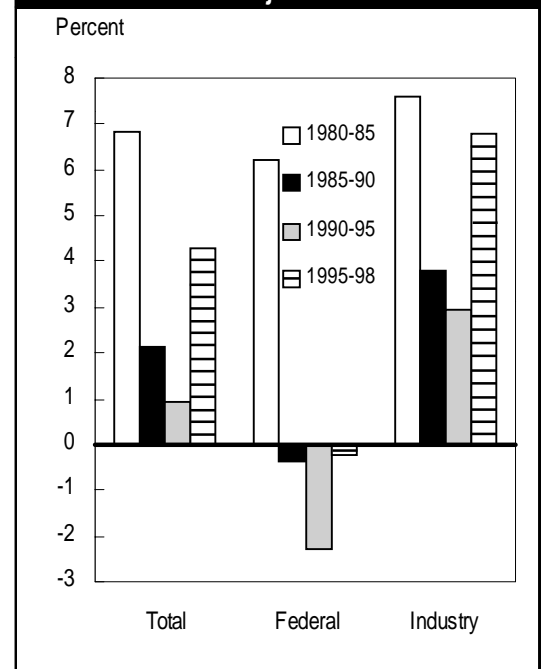
U.S. R&D Expenditure Trends

Growth in total U.S. R&D expenditures was relatively slow in the early 1990s, but is now accelerating. In the past, annual R&D growth had been much higher—e.g., from 1980-85 it averaged 6.8 percent in real terms. That rate then slowed to 2.2 percent in 1985-90, and to 0.9 percent in 1990-95. However, annual real R&D growth in 1995-98 is expected to average 4.3 percent (figure 3). Almost all of the recent growth in national R&D expenditures is the result of a resurgence of industrial R&D.

International R&D Spending

Due to the size of its economy, the United States spends more on R&D than any other country, though it does not spend as high a proportion of its economy on R&D as some other countries. In 1996, the most recent year for which comparable international data generally are available, the U.S. spent 2.57 percent of its GDP on R&D, compared to 2.77 percent spent by Japan in 1995 (the latest year's data available for that country), 2.32 by

Figure 3. Average annual rates of change in U.S. R&D support, based on inflation-adjusted dollars



NOTES: These data are based on reports from R&D performers. Data for 1997 and 1998 are preliminary.
SOURCE: National Science Foundation, Division of Science Resources Studies

R&D as a Percent of GDP is Highest in Six Years—page 4

France, 2.28 by Germany, 1.94 by the United Kingdom, 1.66 by Canada, and 1.03 by Italy. Nondefense R&D as a percent of GDP was 2.11 for the United States in 1996, which was

lower than for Germany (2.20), and Japan (2.73 in 1995); but higher than for France (2.04 in 1995), the United Kingdom (1.71), Canada (1.63), and Italy (0.98 in 1995) (figure 4).

User Notes

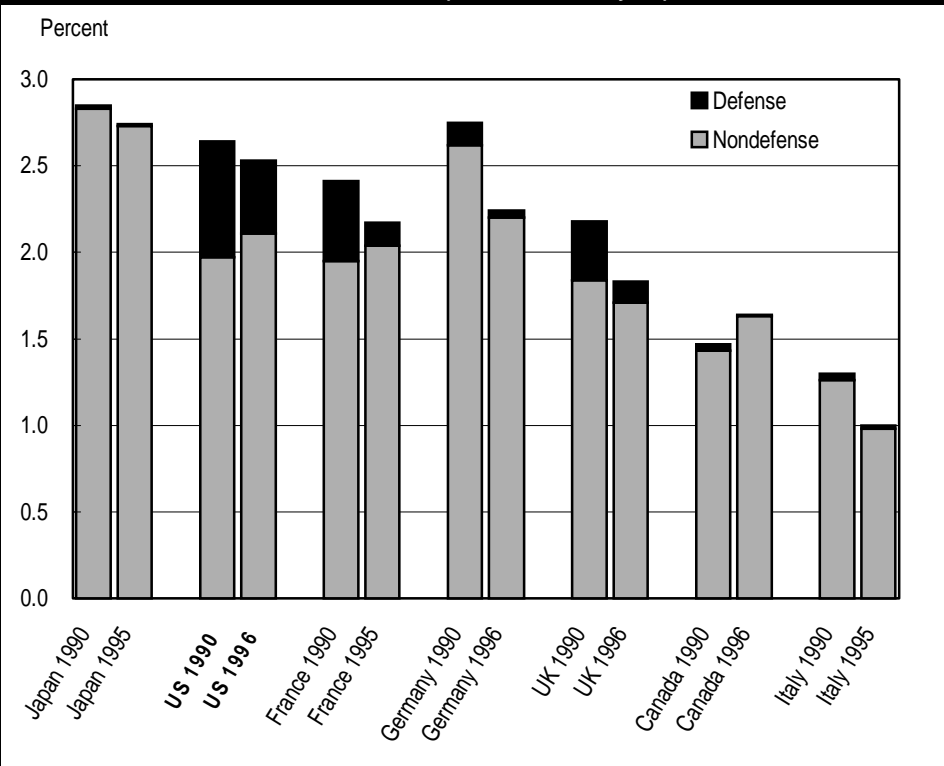
U.S. R&D expenditures data were assembled from several NSF surveys. Projections for 1998 and preliminary tabulations for 1997 were based in part on time-series modeling techniques. Foreign R&D expenditure data are derived from national and international sources.

R&D expenditure levels from Federal sources, presented here based on performer-reported surveys, differ from Federal R&D funding totals reported by the Federal agencies that provide those funds. During the past several years, these differences have widened. The difference in the Federal R&D totals appears to be concentrated in the funding of industry R&D by the Department of Defense. See *National Patterns of R&D Resources: 1996* (NSF 96-333) and the forthcoming *National Patterns of R&D Resources: 1998* for detailed discussion and documentation of these differences.

This Data Brief was prepared by:

Steven Payson
Division of Science Resources Studies
National Science Foundation
4201 Wilson Boulevard, Suite 965
Arlington, VA 22230
703-306-1772 Ext. 7209

Figure 4. R&D/GDP ratios for the "Group of Seven" countries: 1990 and 1996 (or most current year)



SOURCES: Organisation for Economic Co-operation and Development, Main Science and Technology Indicators database, and National Science Foundation, Division of Science Resources Studies

NSF 99-302

RETURN THIS COVER SHEET TO ROOM P35 IF YOU DO NOT WISH TO RECEIVE THIS MATERIAL, OR IF CHANGE OF ADDRESS IS NEEDED. INDICATE CHANGE INCLUDING ZIP CODE ON THE LABEL (DO NOT REMOVE LABEL).

OFFICIAL BUSINESS
 PENALTY FOR PRIVATE USE \$300

NATIONAL SCIENCE FOUNDATION
 ARLINGTON, VA 22230

BULK RATE
POSTAGE & FEES PAID
National Science Foundation
 Permit No. G-69