



Federal R&D Obligations Increase 3% in FY 2017: Research Obligations Decrease Slightly While Those for Development Increase 7%

by Christopher Pece¹

Federal obligations for research and development increased to an estimated \$118.3 billion in FY 2017, up 2.8% from \$115.0 billion in FY 2016. Obligations for R&D plant increased by 23.6% to \$3.0 billion during the same period. Total obligation funding for research declined by 0.3% to \$66.5 billion in FY 2017. Basic research remained stable at \$32.3 billion in FY 2017, while obligations for applied research declined by 0.8% to \$34.2 billion. Obligations for experimental development increased by 7.2% to \$51.8 billion in FY 2017 (table 1).

Data are from the latest edition of the Survey of Federal Funds for Research and Development, sponsored by the National Center for Science and Engineering Statistics within the National Science Foundation (NSF). Data for FY 2016 are actual amounts, and the FY 2017 data are preliminary.

Federal Funding for Research

In FY 2017, obligations for research accounted for 56.2% of all federal R&D obligations. The Department of Health and Human Services (HHS) accounted

for the largest share of federal research obligations (48.4%) with \$32.2 billion in FY 2017 (table 2). The Department of Energy (DOE) accounted for 14.9% (\$9.9 billion) of total FY 2017 federal research obligations, followed by the Department of Defense (DOD) with 11.3% (\$7.5 billion), NSF with 8.5% (\$5.7 billion), the National Aeronautics and Space Administration (NASA)

with 6.0% (\$4.0 billion), and the Department of Agriculture (USDA) with 3.4% (\$2.3 billion). Agency shares of total research obligations in FY 2016 were similar to those in FY 2017.

Funding for Basic Research

Federal obligations for basic research (\$32.3 billion) remained stable between FY 2016 and FY 2017,

TABLE 1. Federal outlays and obligations for research, development, and R&D plant, by type of R&D: FYs 2016–17
(Dollars in millions)

Type of R&D	Preliminary		% change 2016–17
	2016	2017	
Outlays	110,772.6	112,762.3	1.8
R&D	108,544.5	109,973.0	1.3
R&D plant	2,228.1	2,789.3	25.2
Obligations	117,481.4	121,310.2	3.3
R&D	115,040.4	118,294.2	2.8
Research	66,722.4	66,504.1	-0.3
Basic research	32,286.6	32,331.7	0.1
Applied research	34,435.8	34,172.4	-0.8
Experimental development	48,318.0	51,790.1	7.2
Advanced technology	5,467.2	5,928.6	8.4
Major systems	32,129.4	32,548.9	1.3
R&D plant	2,441.0	3,016.0	23.6

NOTES: Because of rounding, detail may not add to total. Percentages are calculated using actual dollars reported.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Federal Funds for Research and Development, FYs 2016–17.

increasing 0.1% (table 1). Universities and colleges were the largest recipients of federal obligations for basic research (48.5%) at \$15.7 billion in FY 2017 (table 3), up 1.0% from \$15.5 billion in FY 2016. Federal intramural performance accounted for the second largest category of basic research performance at 19.4%, or \$6.3 billion in FY 2017. This represents an increase of 2.6% from \$6.1 billion in FY 2016.

Six agencies accounted for 97.5% (\$31.5 billion) of the basic research total. HHS funded nearly half (49.1%, or \$15.9 billion) of all federal obligations for basic research in FY 2017. NSF funded \$4.9 billion (15.2%), followed by DOE with \$4.6 billion (14.1%), NASA with \$2.9 billion (9.0%), DOD with \$2.3 billion (7.2%), and USDA with estimated obligations of \$1.0 billion (3.0%).

Funding for Applied Research

Federal obligations for applied research decreased 0.8% between FY 2016 and FY 2017 to \$34.2 billion (table 1).

TABLE 2. Federal obligations for research, by agency and type of research: FYs 2016–17 (Dollars in millions)

Agency	2016	Preliminary	
		2017	% change 2016–17
All agencies	66,722.4	66,504.1	-0.3
Department of Agriculture	2,155.9	2,287.8	6.1
Basic research	934.9	980.0	4.8
Applied research	1,221.0	1,307.7	7.1
Department of Defense	7,152.0	7,509.7	5.0
Basic research	2,238.7	2,313.3	3.3
Applied research	4,913.3	5,196.4	5.8
Department of Energy	9,234.1	9,877.9	7.0
Basic research	4,579.4	4,554.0	-0.6
Applied research	4,654.7	5,323.9	14.4
Department of Health and Human Services	32,128.6	32,159.8	0.1
Basic research	15,645.3	15,865.7	1.4
Applied research	16,483.3	16,294.0	-1.1
National Aeronautics and Space Administration	5,613.2	4,004.2	-28.7
Basic research	3,280.8	2,926.0	-10.8
Applied research	2,332.3	1,078.1	-53.8
National Science Foundation	5,589.4	5,650.0	1.1
Basic research	4,829.3	4,900.0	1.5
Applied research	760.1	750.0	-1.3
All other departments and agencies	4,849.2	5,014.7	3.4
Basic research	778.0	792.6	1.9
Applied research	4,071.0	4,222.2	3.7

NOTES: Because of rounding, detail may not add to total. Percentages are calculated using actual dollars reported.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Federal Funds for Research and Development, FYs 2016–17.

TABLE 3. Preliminary federal obligations for basic research, by agency and performer: FY 2017 (Dollars in millions)

Agency	Total	Intramural ^a	Extramural							Foreign
			United States and U.S. territories							
			Industry-administered	Universities and colleges	University-administered FFRDCs	Other nonprofits	Nonprofit-administered FFRDCs	State, local governments		
All agencies	32,331.7	6,276.7	2,399.4	495.4	15,692.3	2,719.5	3,211.4	1,277.1	77.6	182.5
Department of Agriculture	980.1	647.0	3.6	0.0	317.5	0.0	8.2	0.0	2.6	1.1
Department of Defense	2,313.3	517.2	429.3	28.2	1,128.3	6.7	135.8	8.6	1.6	57.8
Department of Energy	4,554.0	432.8	231.8	221.7	647.1	1,761.7	20.0	1,232.7	5.0	1.2
Department of Health and Human Services	15,865.7	3,353.1	709.6	243.1	8,962.7	8.7	2,442.2	10.1	40.4	95.8
National Aeronautics and Space Administration	2,926.0	527.5	784.5	1.0	580.8	734.1	271.7	20.7	2.9	2.9
National Science Foundation	4,900.0	100.0	225.1	0.0	3,995.1	208.3	321.6	5.0	21.5	23.3
All other departments and agencies	792.6	699.0	15.4	1.4	60.8	0.0	12.0	0.0	3.7	0.4

FFRDC = federally funded research and development center.

^a Intramural activities cover costs associated with the administration of intramural R&D programs and extramural R&D procurements by federal personnel as well as actual intramural performance.

NOTE: Because of rounding, detail may not add to total.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Federal Funds for Research and Development, FYs 2016–17.

Similar to basic research funding, universities and colleges accounted for the largest share of applied research obligations (table 4), increasing 0.5% from FY 2016 to \$11.4 billion in FY 2017. Obligations for federal intramural performance showed a similar trend, increasing 0.2% in FY 2017 to \$9.8 billion. However, federal applied research obligations to industry showed a sharper decline, from \$5.9 billion in FY 2016 to \$5.5 billion in FY 2017, a decrease of 6.8%.

HHS funded 47.7% of all federal obligations for applied research in FY 2017 (\$16.3 billion of \$34.2 billion). This amount was followed by funding from DOE at \$5.3 billion (15.6%), DOD at \$5.2 billion (15.2%), USDA with \$1.3 billion (3.8%), NASA with \$1.1 billion (3.2%), and NSF at \$750 million (2.2%).

Research Funding by Fields of Science and Engineering

Life sciences accounted for the largest share of research funding, 48.2%, or \$32.0 billion of the \$66.5 billion total

research spending in FY 2017, while engineering accounted for 19.1%. The remaining shares were reported for the physical sciences (8.9%), other sciences (6.4%), computer and mathematics (6.4%), environmental sciences (6.2%), psychology (3.1%), and social sciences (1.7%) (figure 1).

Most support for individual fields often is provided by one or two agencies. Federal obligations from HHS accounted for 83.6% (\$26.8 billion of \$32.0 billion) of total obligations for life sciences. The USDA followed with 5.8% (\$1.9 billion) of all life sciences obligations. While life sciences makes up the largest share of federal research obligations and is highly concentrated in funding from HHS, other fields show similar patterns of federal investment. For example, in FY 2017, obligations for computer science and mathematics research totaled \$4.2 billion, with 35.3% of funding from the DOD (\$1.5 billion), 27.7% from DOE (\$1.2 billion), and 25.6% from NSF (\$1.1 billion). The share of obligations for engineering

(\$12.7 billion) are supported largely by DOE (36.7%, or \$4.7 billion) and DOD (25.0%, or \$3.2 billion). Support for physical sciences (\$5.9 billion) come largely from DOE (35.9%, or \$2.1 billion), NASA (21.2%, or \$1.3 billion), and NSF (15.7%, or \$928 million).

Experimental Development

Although the DOD's share of obligations for research constituted 10.7% of total federal research obligations (\$7.2 billion) in FY 2016, their share of obligations for experimental development were much larger at 77.8% (\$37.6 billion of the \$48.3 billion total). FY 2017 estimated obligations show similar amounts for DOD at a 11.3% share of all research (\$7.5 billion of the \$66.5 billion total) and a 74.3% share of all experimental development (\$38.5 billion of the \$51.8 billion total). NASA's contribution to experimental development increased from \$6.8 billion FY 2016 to \$9.4 billion in FY 2017. These totals represent 14.1% and 18.1% of total experimental development for FY 2016 and FY 2017, respectively. The DOE was the third

TABLE 4. Preliminary federal obligations for applied research, by agency and performer: FY 2017 (Dollars in millions)

Agency	Total	Extramural								
		United States and U.S. territories								Foreign
		Intramural ^a	Industry	Industry-administered FFRDCs	Universities and colleges	University-administered FFRDCs	Other nonprofits	Nonprofit-administered FFRDCs	State, local governments	
All agencies	34,172.4	9,832.1	5,487.5	3,216.1	11,367.7	367.0	2,830.4	506.2	334.5	230.9
Department of Agriculture	1,307.7	700.4	25.6	0.0	556.8	0.0	14.8	0.0	9.1	1.0
Department of Defense	5,196.4	2,014.7	2,301.9	50.9	571.9	66.9	115.3	38.5	1.1	35.2
Department of Energy	5,323.9	595.8	962.3	2,904.7	259.7	161.3	28.4	410.5	1.2	0.0
Department of Health and Human Services	16,294.0	3,736.0	880.6	227.5	8,751.5	15.1	2,378.6	23.4	160.8	120.4
National Aeronautics and Space Administration	1,078.1	292.3	497.9	0.0	122.6	111.9	48.4	2.2	2.0	1.0
National Science Foundation	750.0	0.8	165.5	0.0	513.0	2.5	67.6	0.0	0.3	0.3
All other departments and agencies	4,222.2	2,492.0	653.8	32.9	592.2	9.4	177.2	31.5	160.0	73.1

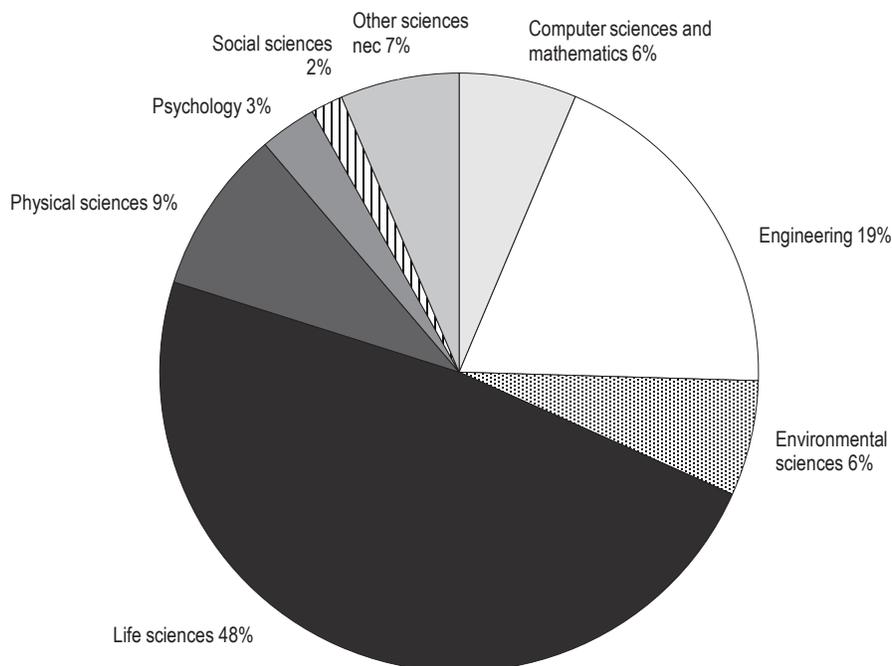
FFRDC = federally funded research and development center.

^a Intramural activities cover costs associated with the administration of intramural R&D programs and extramural R&D procurements by federal personnel as well as actual intramural performance.

NOTE: Because of rounding, detail may not add to total.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Federal Funds for Research and Development, FYs 2016–17.

FIGURE 1. Preliminary federal obligations for research by fields of science and engineering: FY 2017



nec = not elsewhere classified.

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SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Federal Funds for Research and Development, FYs 2016–17.

largest contributor to federal obligations for experimental development, and its share of the total experimental development decreased from 4.9% in FY 2016 (\$2.4 billion) to 4.3% in FY 2017 (\$2.2 billion).

Data Sources and Limitations

Data were from 29 federal agencies (15 federal departments and 14 independent agencies) that had obligations for R&D during FY 2016 or FY 2017. Since multiple subdivisions of some federal departments completed the survey, there were 75 agency-level responses: five federal departments, 56 agencies (within another 10 federal departments), and 14 independent agencies. The survey collects data on outlays for total R&D and R&D plant; obligations for R&D by type of R&D, by science

and engineering fields, by performer, and by state and area; and obligations for R&D plant. The survey is a census of all federal agencies that fund R&D programs, as identified from information in the president’s budget submission to Congress. Federal agencies that fund R&D are identified in the budget’s Analytical Perspectives chapter and the detailed budget estimates by agency section of the appendix.

Volume 66 of the Survey of Federal Funds for Research and Development collected two fiscal years of data, FY 2016 and FY 2017. Data reported for FY 2017 are estimated fiscal year-end obligations, as data were collected during FY 2017; as such, these data are subject to revision when collected under next year’s volume 67 of the survey. Typically, the survey collects data for 3

fiscal years. However, for this cycle, the president’s budget year (FY 2018) was not included due to the delayed FY 2018 budget formulation process.

Beginning with volume 66 of the Survey of Federal Funds for Research and Development (FYs 2016 and 2017), the totals reported for development obligations and outlays represent a refinement to this category by more narrowly defining it to be “experimental development” to align with federal R&D budget formulation as per the Office of Management and Budget’s Circular A-11, Section 84. As a result, totals for experimental development do not include the DOD budget activity 7 (Operational Systems Development) obligations and outlays. Those funds, previously included in DOD’s development totals, support the development

efforts to upgrade systems that have been fielded or have received approval for full-rate production and anticipate production funding in the current or subsequent fiscal year. Therefore, the development data and total R&D data are not directly comparable with totals reported in previous years.

Obligations represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated and when future payments of money

are required. This includes funds from direct appropriations, trust funds, special accounts, fees and charges, and other federal sources for the year of the obligation. Obligations include the full cost of R&D, both specific project costs and overhead costs. Interagency transfers for R&D are reported by the transferring agency as R&D or R&D plant, not by the agency receiving the funds.

The full set of data tables for volume 66 of the Survey of Federal Funds for Research and Development (FYs 2016 and 2017) will be available online

at <https://www.nsf.gov/statistics/srvyfedfunds/#tabs-2>. Individual tables may be available in advance of the full report. For more information, please contact the author.

Note

1. Christopher Pece, Research and Development Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 2415 Eisenhower Ave., Suite W14200, Alexandria, VA 22314 (cpece@nsf.gov; 703-292-7788).