



InfoBrief

Universities Report Largest Growth in Federally Funded R&D Expenditures since FY 2011

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Michael T. Gibbons

Research and development spending by academic institutions totaled \$89.9 billion in FY 2021, an increase of \$3.4 billion (4.0%) from FY 2020 ([table 1](#)). R&D expenditures funded from federal sources accounted for \$3.0 billion of the total increase. Federally funded R&D expenditures had not increased by \$3 billion or more since FY 2011, when the American Recovery and Reinvestment Act of 2009 supplemented the flow of R&D support dollars.¹ University-funded R&D expenditures were 2.1% greater (\$459 million) than in FY 2020 due largely to several institutions' improved accounting of internally funded R&D through new financial systems and reorganizations.² Universities reported \$149 million more in R&D expenditures funded from state and local governments, an increase of 3.2% from FY 2020. R&D expenditures funded by nonprofit organizations (-2.6%, -\$150 million) and businesses (-1.3%, -\$68 million) decreased, while R&D funded by all other sources was virtually flat (0.2% increase, \$6 million increase). The data discussed in this report are from the Higher Education Research and Development (HERD) Survey, sponsored by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF). For more information on the survey, see "[Data Sources, Limitations, and Availability](#)."

Table 1

Higher education R&D expenditures, by source of funds: FYs 2010–21

(Millions of current dollars)

Fiscal year	All R&D expenditures	Source of funds					
		Federal government	State and local government	Institution funds	Business	Nonprofit organizations	All other sources
2010	61,287	37,478	3,887	11,943	3,202	3,730	1,048
2011	65,274	40,768	3,851	12,580	3,183	3,854	1,038
2012	65,873	40,217	3,744	13,625	3,279	4,037	970
2013	67,145	39,510	3,706	14,974	3,515	3,903	1,537

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(Millions of current dollars)

Fiscal year	All R&D expenditures	Source of funds					
		Federal government	State and local government	Institution funds	Business	Nonprofit organizations	All other sources
2014	67,351	38,032	3,916	15,781	3,734	3,978	1,911
2015	68,694	37,911	3,864	16,638	4,009	4,236	2,037
2016	71,911	38,858	4,053	17,944	4,219	4,632	2,204
2017	75,291	40,320	4,187	18,887	4,439	5,157	2,303
2018	79,174	41,935	4,326	20,221	4,725	5,456	2,511
2019	83,643	44,540	4,520	21,115	5,064	5,702	2,702
2020	86,445	46,196	4,596	22,023	5,187	5,754	2,688
2021	89,872	49,228	4,745	22,482	5,119	5,604	2,694

Note(s):

Because of rounding, detail may not add to total. Includes all institutions surveyed in the fiscal years shown.

Source(s):

National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.

R&D Expenditures, by Federal Funding Sources

Federally funded R&D at universities surpassed \$49 billion in FY 2021, which accounted for 55% of total R&D ([table 2](#)). This is slightly higher than the 53% share from FY 2018 to FY 2020. The largest federal source of R&D expenditures for higher education institutions was the Department of Health and Human Services (HHS)—which includes the National Institutes of Health—at \$27.5 billion, up \$2.1 billion from FY 2020. HHS accounted for 56% of FY 2021 federally funded R&D and 71% of the overall FY 2021 increase in federally funded R&D. HHS funds supported over \$24 billion in life sciences R&D, which notably includes biological and biomedical sciences and health sciences ([figure 1](#)).³ HHS funds also supported more than \$1 billion in engineering R&D expenditures. The Department of Defense (DOD) (\$7.4 billion total, \$285 million increase) and the Department of Energy (DOE) (\$2.2 billion total, \$180 million increase) were the only other agencies where funded R&D expenditures increased by more than \$100 million in FY 2021. These two agencies also supported significant engineering R&D in FY 2021: \$3.7 billion funded by DOD and \$960 million funded by DOE. R&D expenditures funded by the Department of Agriculture (USDA) (\$1.3 billion total, \$54 million increase) were overwhelmingly devoted to life sciences (\$1.1 billion), which includes agricultural sciences as well as natural resources and conservation. The National Aeronautics and Space Administration (NASA) (\$1.8 billion total, \$11 million increase) contributed to the growth with \$560 million funding in engineering R&D and \$453 million funding in geosciences, atmospheric sciences, and ocean sciences R&D. R&D expenditures funded by the National Science Foundation (\$5.4 billion total) decreased \$5 million from FY 2020, while all other federal sources (\$3.5 billion total) increased 11% or \$345 million. NSF funded over a billion dollars of R&D in both engineering (\$1.4 billion) and physical sciences (\$1.1 billion).

Table 2**Higher education R&D expenditures, by source of funds: FYs 2011–21**

(Millions of current dollars)

Source of funds	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	% change 2020–21
All R&D expenditures	65,274	65,729	67,013	67,199	68,550	71,768	75,147	79,023	83,487	86,300	89,723	4.0
All federal R&D expenditures	40,768	40,142	39,446	37,961	37,847	38,789	40,249	41,861	44,461	46,114	49,143	6.6
DOD	4,814	4,908	5,023	4,927	5,090	5,313	5,634	5,892	6,652	7,078	7,363	4.0

Table 2**Higher education R&D expenditures, by source of funds: FYs 2011–21**

(Millions of current dollars)

Source of funds	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	% change 2020–21
DOE	1,866	1,955	1,876	1,805	1,710	1,772	1,821	1,819	1,940	2,038	2,218	8.8
HHS	22,995	21,916	21,211	20,298	19,994	20,663	21,627	22,837	24,408	25,372	27,532	8.5
NASA	1,423	1,331	1,332	1,329	1,418	1,491	1,406	1,516	1,644	1,758	1,769	0.6
NSF	5,140	5,276	5,393	5,127	5,120	5,115	5,207	5,271	5,333	5,416	5,411	-0.1
USDA	1,006	1,094	1,092	1,062	1,119	1,209	1,223	1,186	1,224	1,248	1,302	4.3
Other	3,524	3,663	3,519	3,414	3,397	3,226	3,330	3,339	3,260	3,203	3,548	10.8

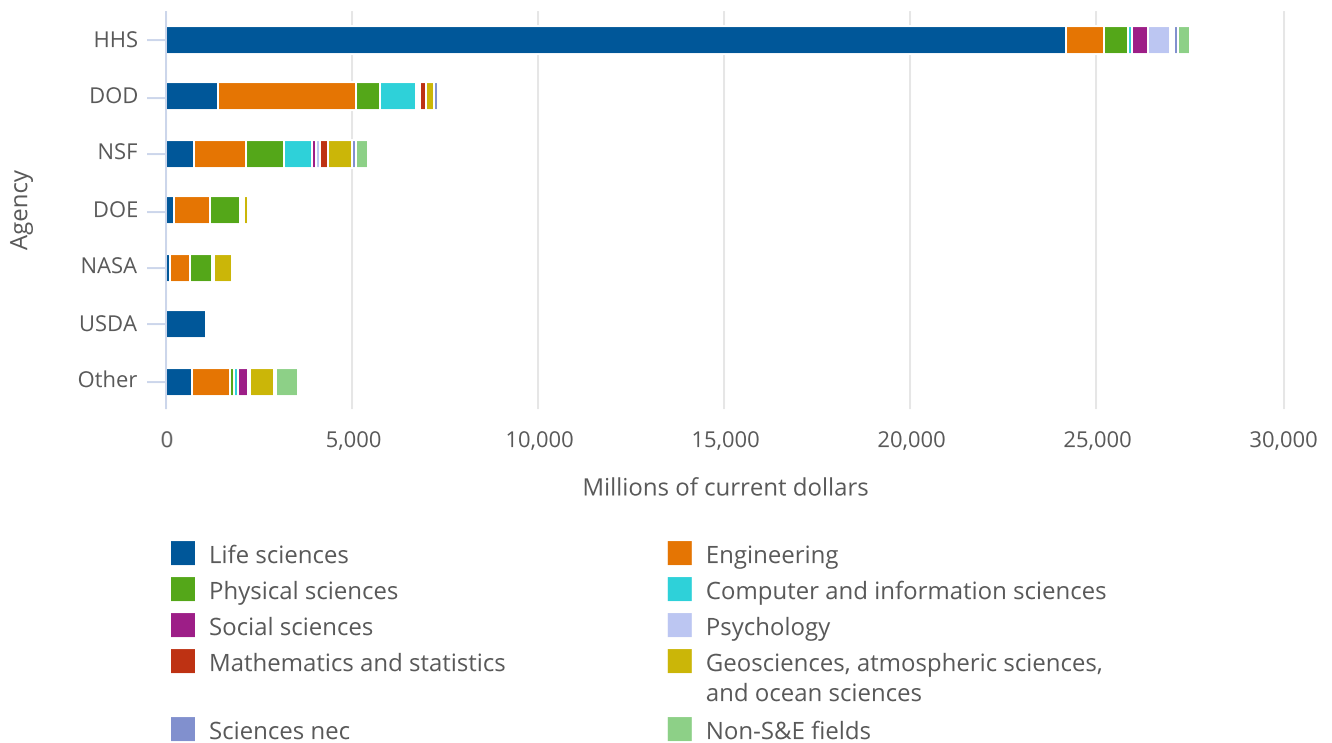
DOD = Department of Defense; DOE = Department of Energy; HHS = Department of Health and Human Services; NASA = National Aeronautics and Space Administration; NSF = National Science Foundation; USDA = Department of Agriculture.

Note(s):

Because of rounding, detail may not add to total. Beginning in FY 2012, institutions reporting less than \$1 million in total R&D expenditures completed a shorter version of the survey questionnaire, and those totals are not reflected here. Total expenditures from institutions reporting less than \$1 million in R&D in FY 2021 was \$149 million. Total federally funded R&D for these institutions was \$85 million.

Source(s):

National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.

Figure 1**Federally financed academic R&D expenditures, by agency and field: FY 2021**

DOD = Department of Defense; DOE = Department of Energy; HHS = Department of Health and Human Services; NASA = National Aeronautics and Space Administration; NSF = National Science Foundation; nec = not elsewhere classified; S&E = science and engineering; USDA = Department of Agriculture.

Note(s):

Other includes all other agencies reported.

Source(s):

National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.

R&D Expenditures, by Field

R&D expenditures in all science fields combined increased \$2.7 billion (4.1%) in FY 2021, reaching \$70.3 billion (table 3). Engineering R&D expenditures (\$14.3 billion total) increased 4.3% (\$586 million) and non-science and engineering R&D (\$5.1 billion total) increased 1.8% (\$90 million). R&D expenditures in the life sciences subfields of health sciences (up \$1.9 billion to \$29.9 billion) and biological and biomedical sciences (up \$793 million to \$16.6 billion) accounted for 78% of the total growth in FY 2021. This share is substantially greater than in recent years: FY 2020 (39%), FY 2019 (53%), and FY 2018 (67%).⁴

R&D expenditures in three major science fields decreased in FY 2021: social sciences (down 3.8%), mathematics and statistics (down 3.4%), and psychology (down 2.6%). R&D in three other fields grew only slightly in FY 2021: physical sciences (up 1.2%); computer and information sciences (up 0.9%); and geosciences, atmospheric sciences, and ocean sciences (up 0.4%).

Table 3

Higher education R&D expenditures, by R&D field: FYs 2020–21

(Thousands of current dollars)

Field	2020	2021	% change 2020–21
All R&D fields	86,300,399	89,723,447	4.0
Science	67,569,466	70,316,530	4.1
Computer and information sciences	2,925,725	2,951,923	0.9
Geosciences, atmospheric sciences, and ocean sciences	3,281,457	3,295,883	0.4
Atmospheric science and meteorology	612,784	624,579	1.9
Geological and earth sciences	1,159,846	1,242,339	7.1
Ocean sciences and marine sciences	1,136,023	1,035,519	-8.8
Geosciences, atmospheric sciences, and ocean sciences nec	372,804	393,446	5.5
Life sciences	49,622,337	52,364,596	5.5
Agricultural sciences	3,625,448	3,548,896	-2.1
Biological and biomedical sciences	15,764,528	16,557,201	5.0
Health sciences	28,001,450	29,884,728	6.7
Natural resources and conservation	901,667	934,765	3.7
Life sciences nec	1,329,244	1,439,006	8.3
Mathematics and statistics	800,322	772,935	-3.4
Physical sciences	5,671,806	5,740,630	1.2
Astronomy and astrophysics	780,356	741,127	-5.0
Chemistry	1,929,674	1,999,546	3.6
Materials science	252,521	285,931	13.2
Physics	2,434,432	2,463,331	1.2
Physical sciences nec	274,823	250,695	-8.8
Psychology	1,360,904	1,326,030	-2.6
Social sciences	2,953,545	2,842,033	-3.8
Anthropology	119,869	109,546	-8.6
Economics	558,825	549,132	-1.7
Political science and government	425,776	425,661	0.0
Sociology, demography, and population studies	594,688	552,551	-7.1
Social sciences nec	1,254,387	1,205,143	-3.9
Sciences nec	953,370	1,022,500	7.3

Table 3**Higher education R&D expenditures, by R&D field: FYs 2020–21**

(Thousands of current dollars)

Field	2020	2021	% change 2020–21
Engineering	13,707,821	14,293,487	4.3
Aerospace, aeronautical, and astronautical engineering	1,293,452	1,451,964	12.3
Bioengineering and biomedical engineering	1,470,038	1,560,381	6.1
Chemical engineering	1,001,458	1,024,301	2.3
Civil engineering	1,424,780	1,482,377	4.0
Electrical, electronic, and communications engineering	3,051,845	3,080,363	0.9
Industrial and manufacturing engineering	586,908	573,915	-2.2
Mechanical engineering	1,817,413	1,881,551	3.5
Metallurgical and materials engineering	818,665	841,196	2.8
Engineering nec	2,243,262	2,397,439	6.9
Non-S&E	5,023,112	5,113,430	1.8
Business management and business administration	880,567	934,020	6.1
Communication and communications technologies	190,252	186,003	-2.2
Education	1,602,246	1,616,705	0.9
Humanities	563,400	556,694	-1.2
Law	267,655	282,662	5.6
Social work	307,106	319,273	4.0
Visual and performing arts	173,191	179,563	3.7
Non-S&E nec	1,038,695	1,038,510	0.0

nec = not elsewhere classified; S&E = science and engineering.

Note(s):

This table includes only institutions reporting \$1 million or more in total R&D expenditures in FY 2020. Institutions reporting less than \$1 million in total R&D expenditures in FY 2020 completed a shorter version of the survey form in FY 2021, and that form did not collect R&D expenditures by detailed field. Total expenditures from institutions reporting less than \$1 million in R&D in FY 2021 was \$149 million.

Source(s):

National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.

Top University Research Performers

The top 30 institutions in terms of R&D expenditures accounted for 42% of the total spent on R&D within the higher education sector in FY 2021, which is consistent with the preceding years ([table 4](#)). Twenty-four institutions reported at least \$1 billion in R&D during FY 2021. Nineteen institutions crossed that reporting threshold in FY 2019. Sixteen of the top 30 were public institutions, accounting for \$20.2 billion in total R&D expenditures, and 14 were private institutions accounting for \$17.9 billion. Institutions with medical schools were well-represented in this group; 27 of the top 30 reported medical school R&D expenditures.⁵

Vanderbilt University and Vanderbilt University Medical Center moved onto the list of top 30 universities with the highest R&D totals in FY 2021, at number 24, following accounting changes at the institution. The University of California, Berkeley moved off the list. Similarly, Ohio State University began more effectively accounting for internally funded R&D through a new financial system and other organizational changes. Consequently, Ohio State University moved from number 24 in FY 2020 to number 12 in FY 2021.⁶ The University of Minnesota moved down 2 positions to number 22, although their R&D total increased by \$31 million. The Massachusetts Institute of Technology moved down 6 positions to number 29 after reporting \$39 million less in FY 2021 R&D.

Table 4**Thirty institutions reporting the largest FY 2021 R&D expenditures in all fields: FYs 2019–21**

(Millions of current dollars)

Institution	Rank	2019	2020	2021	% change 2020–21
All institutions	-	83,487	86,300	89,723	4.0
Leading 30 institutions	-	35,404	36,646	38,126	4.0
Johns Hopkins U. ^a	1	2,917	3,110	3,181	2.3
U. California, San Francisco	2	1,595	1,651	1,710	3.6
U. Michigan, Ann Arbor	3	1,676	1,674	1,640	-2.0
U. Pennsylvania	4	1,506	1,579	1,632	3.4
U. Washington, Seattle	5	1,426	1,457	1,489	2.2
U. California, Los Angeles	6	1,306	1,393	1,455	4.5
U. California, San Diego	7	1,354	1,404	1,425	1.5
U. Wisconsin-Madison	8	1,297	1,364	1,380	1.2
Stanford U.	9	1,204	1,204	1,274	5.8
Harvard U.	10	1,240	1,240	1,254	1.1
Duke U.	11	1,227	1,197	1,238	3.4
Ohio State U.	12	929	968	1,236	27.7
U. North Carolina, Chapel Hill	13	1,154	1,160	1,206	4.0
Cornell U.	14	1,145	1,190	1,184	-0.5
Yale U.	15	1,072	1,094	1,165	6.5
Texas A&M U., College Station and Health Science Center	16	952	1,131	1,148	1.5
U. Maryland ^b	17	1,097	1,103	1,142	3.5
U. Pittsburgh, Pittsburgh	18	1,081	1,106	1,135	2.6
U. Texas M. D. Anderson Cancer Center	19	969	1,051	1,125	7.0
Georgia Institute of Technology	20	960	1,049	1,114	6.2
Columbia U. in the City of New York	21	1,004	1,033	1,099	6.4
U. Minnesota, Twin Cities	22	1,013	1,042	1,073	3.0
New York U.	23	935	947	1,064	12.4
Vanderbilt U. and Vanderbilt U. Medical Center	24	777	825	1,019	23.5
Washington U., Saint Louis	25	887	920	989	7.5
Pennsylvania State U., University Park and Hershey Medical Center	26	950	992	971	-2.1
U. Florida	27	929	942	960	1.9
U. Southern California	28	910	941	956	1.6
Massachusetts Institute of Technology	29	1,009	988	949	-3.9
Northwestern U.	30	857	875	913	4.3

^a Johns Hopkins University includes the Applied Physics Laboratory, with \$1,950 million in total R&D expenditures in FY 2021.

^b University of Maryland includes expenditures from University of Maryland, Baltimore and University of Maryland, College Park campuses. In FY 2019, the two campuses began reporting as one research unit to reflect their new strategic partnership. This relationship was codified through the University of Maryland Strategic Partnership Act passed by the Maryland General Assembly in 2016. Prior to 2019, both campuses reported to the Higher Education Research and Development Survey as separate institutions.

Note(s):

Because of rounding, detail may not add to total. This table reflects the leading 30 institutions for FY 2021; the institutions listed may not be in the top 30 of prior fiscal years.

Source(s):

National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.

Data Sources, Limitations, and Availability

The higher education R&D expenditures data were collected from a census of 910 universities and colleges that grant a bachelor's degree or higher and expended at least \$150,000 in R&D in FY 2020. To reduce respondent burden, the HERD Survey requests abbreviated data from institutions reporting less than \$1 million in R&D expenditures during the previous fiscal year. Except for the totals reported in [table 1](#), all other totals shown in this InfoBrief exclude expenditures from the 262 institutions that completed a short-form version of the survey. The institutions completing the short-form survey accounted for \$149 million (0.2%) of total higher education R&D expenditures in FY 2021.

The fiscal year referred to throughout this report is the academic fiscal year. For most academic institutions, FY 2021 represents 1 July 2020 through 30 June 2021.

The amounts reported include all funds expended for activities specifically organized to produce research outcomes and sponsored by an outside organization or separately accounted for using institution funds. R&D expenditures at university-administered federally funded research and development centers (FFRDCs) are collected in a separate survey, the FFRDC Research and Development Survey, available at <https://www.nsf.gov/statistics/ffrdc/>.

The full set of data tables and technical information from this survey are available at <https://nces.nsf.gov/pubs/nsf23304>.

Notes

1 FY 2011 was the peak year for higher education R&D expenditures funded by the American Recovery and Reinvestment Act of 2009. For more details on those expenditures, see the NCSES InfoBrief *Higher Education R&D Expenditures Resume Slow Growth in FY 2013* (<https://www.nsf.gov/statistics/2015/nsf15314/>), and table 12 in the HERD FY 2014 data tables (<https://ncesdata.nsf.gov/herd/2014/>).

2 For example, Ohio State University did not previously include all internally funded R&D expenditures, including those within their Health System and Comprehensive Cancer Center, which are primarily categorized as medical school R&D. All R&D is now organized under the [Enterprise for Research, Innovation and Knowledge](#). The implementation of a new financial system, in addition to restructured internal organizations, allowed the university to identify previously unreported R&D expenditures. These changes contributed to the \$278 million increase they reported in institutionally funded R&D in FY 2021.

Similarly, the Vanderbilt University Medical Center (VUMC) reported very low institutionally funded R&D in past years as part of the Vanderbilt University and VUMC HERD submission. VUMC's new methodology captures non-sponsored R&D investments, funded institutionally, that are separately accounted for through R&D accounts. These changes contributed to the \$115 million increase Vanderbilt University and VUMC reported in institutionally funded R&D in FY 2021.

3 See [table 3](#) in this InfoBrief for the full breakdown of all R&D fields and subfields.

4 See table 10 in the [Higher Education Research and Development: Fiscal Year 2021 \(HERD21\)](#) data tables for expenditures by R&D field for FYs 2010–21.

5 See [HERD21](#): table 72, for R&D expenditures at institutions with a medical school and by institutional control.

6 See endnote number 2.

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Contact Us

Report Author

Michael T. Gibbons
Survey Manager
NCSES
Tel: (703) 292-4590
E-mail: mgibbons@nsf.gov

NCSES

National Center for Science and Engineering Statistics
Directorate for Social, Behavioral and Economic Sciences
National Science Foundation
2415 Eisenhower Avenue, Suite W14200
Alexandria, VA 22314
Tel: (703) 292-8780
FIRS: (800) 877-8339
TDD: (800) 281-8749
E-mail: ncsesweb@nsf.gov