



With Help from ARRA, Universities Report \$61 Billion in FY 2010 Total R&D; New Details from Redesigned Survey

by Ronda Britt¹

University spending on research and development in all fields increased 6.9% between FY 2009 and FY 2010 to \$61.2 billion, according to FY 2010 data from the National Science Foundation (NSF) Higher Education Research and Development (HERD) Survey (table 1).² When adjusted for inflation, higher education R&D rose by 6.0% in FY 2010.

This increase was due in large part to the \$2.7 billion in reported expenditures funded by the one-time American Recovery and Reinvestment Act of 2009 (ARRA).³ As a result of ARRA, the percentage of academic R&D funded by the federal government rose to 61% in FY 2010, constituting \$37.5 billion of the \$61.2 billion total.

The FY 2010 data come from the first fielding of a redesigned and expanded academic R&D survey. Previously known as the Survey of R&D Expenditures at Universities and Colleges, the FY 2010 Higher Education R&D Survey contained several significant changes.⁴ The most notable change to the survey was the inclusion of R&D within non-science and engineering (S&E) fields, such as business, educa-

tion, and law, into the overall reported totals. These non-S&E R&D totals had been collected since 2003 but were reported separately until now. With the revised survey design in 2010, the non-S&E totals are now combined with the S&E totals, although field-specific details are still available.

Unless otherwise indicated, references to dollar amounts or percentages for the remainder of this InfoBrief are in current dollars.

R&D Expenditures by Field

Among the 10 broad fields collected, life sciences account for the largest share by far (\$34.9 billion of the \$61.2 billion total). Engineering was the next largest broad field with \$9.3 billion in reported R&D expenditures. Among subfields, medical sciences continued to hold the largest share of the total (31% or \$19.2 billion in FY 2010). All of the broad fields saw an increase in the reported expenditures between 2009 and 2010 except for social sciences, which declined by more than 4%. Some of this decline may be due to institutional changes in R&D field classifications, because non-S&E fields are now fully incorporated into the

survey totals. Some R&D previously reported as social sciences might now be reported in the non-S&E fields. In fact, R&D within non-S&E fields had the largest percentage increase of all of the broad fields from FY 2009 to FY 2010 (\$2.4 billion to \$2.9 billion).⁵

R&D Spending by Federal Agency Sources

The largest source of federal funding to universities continues to be the Department of Health and Human Services (HHS), including its National Institutes of Health. In FY 2010, HHS funding represented 56% (\$21.1 billion) of the \$37.5 billion federally funded total (table 2). HHS serves as the primary federal funding source for medical research, contributing 94% to the \$12.1 billion total federally funded medical science expenditures. NSF contributed the next largest amount of the government-wide funding total in FY 2010 (\$4.7 billion). Its support was spread across a wide mix of fields. The Department of Defense (DOD) provided \$4.5 billion, almost half in support of engineering R&D. Of the \$3.2 billion listed from other agencies, the largest named sources were the Department of Education with \$602

TABLE 1. Higher education R&D expenditures, by R&D field: FY 2009–10
(Millions of current dollars)

Field	FY 2009	FY 2010	% change 2009–10
All R&D fields ^a	57,289	61,235	6.9
Science	46,215	48,994	6.0
Computer sciences	1,600	1,658	3.6
Environmental sciences	2,923	2,990	2.3
Atmospheric sciences	417	428	2.6
Earth sciences	1,020	1,085	6.4
Oceanography	1,078	1,022	-5.2
Environmental sciences, nec	410	455	11.0
Life sciences	32,779	34,903	6.5
Agricultural sciences	3,056	2,984	-2.4
Biological sciences	10,146	10,947	7.9
Medical sciences	18,230	19,164	5.1
Life sciences, nec	1,348	1,807	34.1
Mathematical sciences	547	599	9.5
Physical sciences	4,283	4,625	8.0
Astronomy	578	573	-0.9
Chemistry	1,583	1,751	10.6
Physics	1,870	2,003	7.1
Physical sciences, nec	252	298	18.3
Psychology	972	1,077	10.8
Social sciences	2,081	1,993	-4.2
Economics	380	353	-7.1
Political sciences	369	373	1.1
Sociology	408	416	2.0
Social sciences, nec	924	852	-7.8
Sciences, nec	1,029	1,150	11.8
Engineering	8,649	9,344	8.0
Aeronautical/astronautical engineering	614	625	1.8
Bioengineering/biomedical engineering	648	741	14.4
Chemical engineering	696	797	14.5
Civil engineering	980	1,064	8.6
Electrical engineering	1,844	2,012	9.1
Mechanical engineering	1,244	1,434	15.3
Metallurgical/materials engineering	688	908	32.0
Engineering, nec	1,934	1,762	-8.9
Non-science and engineering ^a	2,425	2,897	19.5
Business and management	344	360	4.7
Communications, journalism, and library science	107	157	46.7
Education	916	987	7.8
Humanities	255	259	1.6
Law	108	96	-11.1
Social work	138	175	26.8
Visual and performing arts	73	64	-12.3
Non-science and engineering, nec	484	798	64.9

nec = not elsewhere classified.

^a For FY 2009, the overall total and the total for non-science and engineering (S&E) are lower-bound estimates because the National Science Foundation did not attempt to estimate for nonresponse on the non-S&E R&D expenditures item. Non-S&E R&D data were provided by 97.4% of responding institutions in FY 2009.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.

million, the Department of Commerce with \$460 million, and the Department of Transportation with \$330 million.⁶

R&D Spending by Nonfederal Sources

Universities themselves have long been the second largest source of their R&D funding, spending \$11.9 billion in FY 2010 and representing half of the total funded by nonfederal sources (table 3). The FY 2010 survey requested a new breakout of this internally funded R&D into three categories: direct internal funding for research, cost sharing on federal and nonfederal grants, and unrecovered indirect costs.⁷ Of the \$11.9 billion, 52% (\$6.1 billion) was in the form of direct funding for faculty or student research projects, 9% (\$1.1 billion) was devoted to cost sharing, and almost 40% (\$4.7 billion) represented unrecovered indirect costs (figure 1).

Two other key changes to the FY 2010 survey were the addition of nonprofit organizations as a specific funding source and the request for a field breakdown for each of the nonfederal funding sources. Universities reported \$3.8 billion in nonprofit-funded R&D expenditures in FY 2010, the majority devoted to medical and biological sciences. State and local governments supplied \$3.9 billion of the total, with the majority of support going toward agricultural sciences, medical sciences, and engineering. Business, or for-profit organizations, funded \$3.2 billion of the academic R&D total, and also focused its funding on medical sciences and engineering projects. Finally, institution's own funding was primarily in support of biological and medical sciences. However, institutions also provided the largest funding source for the non-S&E fields of R&D (43% of the \$2.9 billion total spent on non-S&E R&D).

TABLE 2. Federally funded higher education R&D expenditures, by federal agency and R&D field: FY 2010

(Millions of current dollars)

Field	All agencies	DOD	DOE	HHS	NASA	NSF	USDA	Other ^a
All R&D fields	37,488	4,486	1,552	21,094	1,476	4,734	954	3,192
Computer sciences	1,175	429	44	84	19	479	3	118
Environmental sciences	2,014	230	134	87	309	710	70	475
Life sciences	21,686	664	197	18,586	80	695	767	698
Agricultural sciences	956	20	53	85	7	95	526	169
Biological sciences	7,564	238	100	6,277	37	513	189	211
Medical sciences	12,066	371	30	11,324	35	54	32	218
Life sciences, nec	1,100	35	14	899	1	32	20	99
Mathematical sciences	419	76	15	42	6	237	4	39
Physical sciences	3,380	524	532	592	559	1,040	7	126
Psychology	760	53	1	549	14	75	4	65
Social sciences	897	91	9	298	10	139	39	311
Sciences, nec	439	109	32	91	8	128	3	67
Engineering	5,732	2,236	575	581	462	1,058	46	776
Non-science and engineering	984	74	13	185	11	173	12	516

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; USDA = U.S. Department of Agriculture.

^a Includes all other agencies reported.

NOTE: Not all subfields reported in this table.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

TABLE 3. Nonfederally funded higher education R&D expenditures, by sources of funds and R&D field: FY 2010

(Millions of current dollars)

Field	All nonfederal	State and local government	Business	Nonprofit organizations	Institution funds	All other sources
All R&D fields	23,747	3,854	3,209	3,764	11,897	1,023
Computer sciences	483	71	79	43	266	23
Environmental sciences	976	172	128	108	510	58
Life sciences	13,216	2,148	1,817	2,487	6,126	638
Agricultural sciences	2,028	856	136	118	859	59
Biological sciences	3,383	499	326	664	1,756	138
Medical sciences	7,098	712	1,282	1,585	3,106	412
Life sciences, nec	707	80	72	120	406	29
Mathematical sciences	180	32	11	17	115	5
Physical sciences	1,244	121	124	165	785	49
Psychology	317	51	17	50	191	8
Social sciences	1,096	200	67	226	564	38
Sciences, nec	711	122	64	72	437	16
Engineering	3,612	689	821	313	1,648	140
Non-science and engineering	1,912	248	80	283	1,255	47

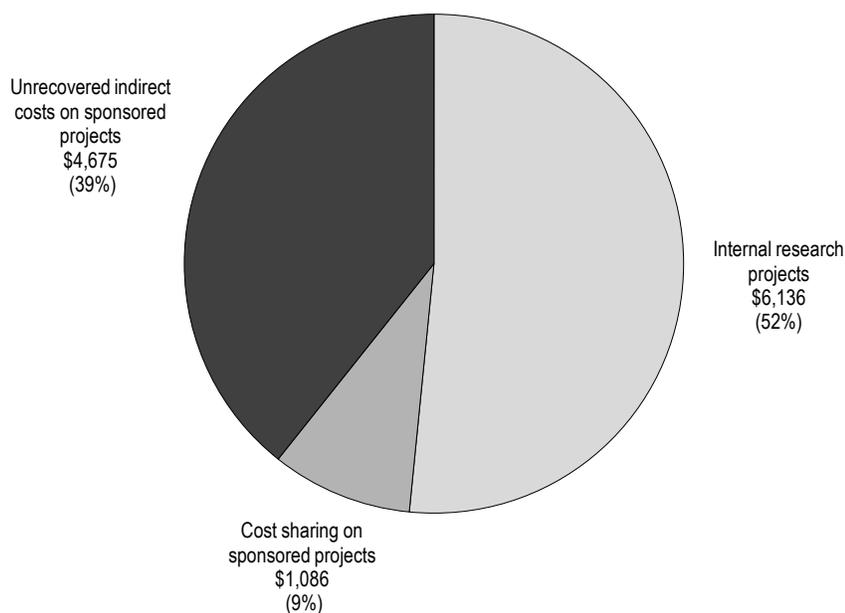
nec = not elsewhere classified.

NOTE: Not all subfields reported in this table.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

FIGURE 1. Institutionally funded higher education R&D expenditures, by type: FY 2010

(Millions of current dollars)



SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

R&D by Character of Work

For the first time, the HERD survey asked institutions to categorize their expenditures by basic research, applied research, or development. The question provided definitions and examples to aid institutions in this classification. This represented a major change in reporting; previously the survey requested only the percentage of the total devoted to basic research.

Of the \$61.2 billion spent on academic R&D in FY 2010, 67% was categorized as basic research, 25% as applied research, and 9% as development (table 4). The percentage classified as basic is a substantial decrease from the 74%–76% reported for each year of the past decade. Many factors may be responsible for this decrease, including the addition of non-S&E R&D to the total and the explicit inclusion of clinical trials and research training grants

as R&D. However, based on explanations provided by many institutions, the most important factor was the change to the survey question. Because the question requested actual expenditures for the three different categories rather than a single percentage and provided examples of projects for each category, some institutions worked to improve the estimation they had been using.⁸

The proportion of basic research, applied research, and development was virtually the same for both public and private institutions; however, bachelors and masters (nondoctoral) institutions reported a lower percentage of their \$1 billion total as basic research (57%) when compared with doctoral institutions (67%).

R&D Spending for Top 25 Performers

Beginning with FY 2010, each institution campus headed by its own administration (i.e., a campus level president or chancellor) was asked to report separately. Previously institutional rankings were based on a mix of reporting conventions. Some institutions were ranked on the basis of multi-campus totals. For others, their independent campus totals were ranked individually.

Of the 742 institutions surveyed, the top 25 in terms of R&D expenditures in all fields accounted for 35% of total academic R&D spending (table 5).

Despite the changes to the survey, there was remarkable consistency in the institutions comprising the top 25 in 2009 and 2010.

The University of Colorado dropped from the top 25 in FY 2010 due to the survey's reporting unit changes. The University of Colorado's R&D expenditures are now divided between

TABLE 4. Higher education R&D expenditures, by character of work, highest degree granted, and institutional control: FY 2010

(Percent)

Type of institution and control	All R&D expenditures (current \$millions)	Basic research	Applied research	Development
All institutions	61,235	66.5	24.9	8.6
Doctorate	60,220	66.7	24.8	8.5
Nondoctorate	1,015	57.0	31.2	11.8
Public	41,180	66.5	25.0	8.5
Private	20,055	66.6	24.7	8.8

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

TABLE 5. Twenty-five institutions reporting the largest FY 2010 R&D expenditures in all fields, by source of funds: FY 2010
(Millions of current dollars)

Rank	Institution	All R&D expenditures	Federal government	local government	Business	Nonprofit organizations	Institution funds	All other sources
	All institutions	61,235	37,488	3,854	3,209	3,764	11,897	1,023
	Leading 25 institutions	21,519	13,683	1,043	1,423	1,555	3,324	488
1	Johns Hopkins U., The ^a	2,004	1,737	10	68	91	77	21
2	U. MI-Ann Arbor	1,184	748	3	39	48	339	8
3	U. WI Madison	1,029	545	97	12	131	208	36
4	U. WA Seattle	1,023	830	23	92	NA	44	34
5	Duke U.	983	514	27	234	90	113	4
6	U. CA, San Diego	943	580	35	68	102	111	47
7	U. CA, Los Angeles	937	539	26	54	91	156	70
8	U. CA, San Francisco	936	515	28	51	129	137	76
9	Stanford U.	840	593	23	61	81	79	2
10	U. PA	836	642	34	39	60	60	0
11	U. Pittsburgh main campus	822	595	12	10	22	184	0
12	Columbia U. in the City of New York	807	572	12	36	67	95	25
13	U. MN Twin Cities	786	426	65	28	70	177	20
14	PA State U. University Park and Hershey Medical Ctr.	770	465	63	64	38	139	1
15	U. NC Chapel Hill	755	546	10	26	57	117	0
16	OH State U.	755	400	106	120	29	83	16
17	Cornell U.	750	448	67	23	71	139	2
18	Washington U. St. Louis	696	469	19	37	46	90	35
19	U. CA, Berkeley	694	313	68	86	87	121	20
20	TX A&M U.	690	288	139	47	18	191	6
21	U. FL	682	280	99	23	20	252	8
22	U. CA, Davis	680	332	60	37	87	160	3
23	MA Institute of Technology	677	458	0	103	69	12	35
24	Yale U.	624	476	7	19	39	69	14
25	GA Institute of Technology	616	372	10	46	12	171	5

NA = not available.

^a The Johns Hopkins University includes the Applied Physics Laboratory, with \$1,080 million in total R&D expenditures in FY 2010.

NOTES: Because of rounding, detail may not add to total. Institutions ranked are geographically separate campuses headed by a campus-level president or chancellor.

SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

its campuses at Boulder (ranked 62), Denver (ranked 48), and Colorado Springs (ranked 323). The other institution no longer in the top 25 was the University of Texas M.D. Anderson Cancer Center, which moved to number 27 for FY 2010. Yale University and Georgia Institute of Technology were new additions to the top 25 in 2010, ranked 24 and 25, respectively.

Cost Categories of R&D Expenditures

The FY 2010 survey asked institutions to report for the first time the portions of their total R&D expenditures devoted

to salaries, wages and fringe benefits versus other types of costs. Institutions reported 42% of the R&D expenditures, or \$25.9 billion, were for salaries, wages, and fringe benefits (figure 2). Twenty-five percent (\$15.1 billion) represented the indirect costs associated with sponsored projects (both recovered and unrecovered). Almost \$5 billion (8%) was reported as passed through to other recipients for collaborative R&D projects.

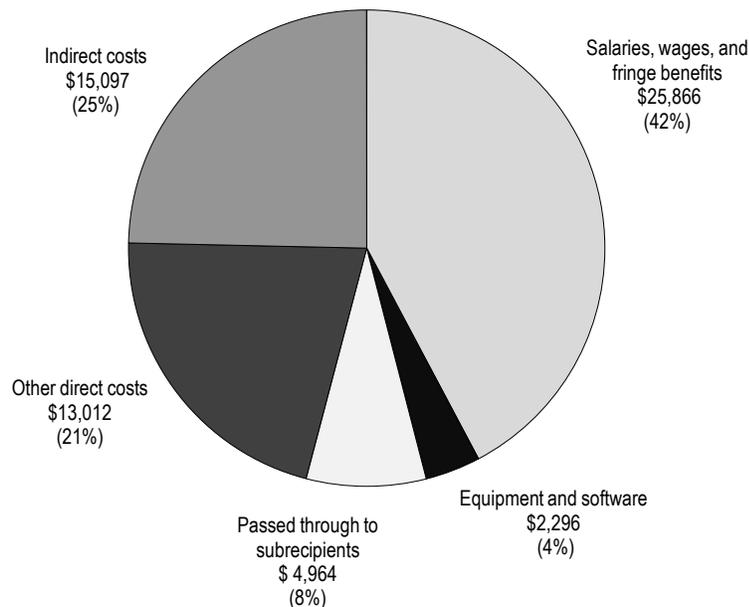
Data Sources, Limitations, and Availability

The higher education R&D expenditures data presented in this InfoBrief

were obtained from 742 universities and colleges that grant bachelors or higher degrees and expended at least \$150,000 in R&D in the survey period. The amounts reported include all funds expended for activities specifically organized to produce research outcomes and sponsored by an outside organization or separately budgeted using institution funds. R&D expenditures at university-administered federally funded research and development centers (FFRDCs) are collected in a separate survey. Data from the FFRDC R&D Survey are available at <http://www.nsf.gov/statistics/ffrdc/>.

FIGURE 2. Higher education R&D expenditures, by type of cost: FY 2010

(Millions of current dollars)



SOURCE: National Science Foundation/National Center for Science and Engineering Statistics, Higher Education Research and Development Survey, FY 2010.

The full set of detailed tables from this survey will be available in the report Higher Education Research and Development: Fiscal Year 2010 at <http://www.nsf.gov/statistics/rdexpenditures/>. Individual detailed tables from the 2010 survey may be available in advance of publication of the full report. For further information, please contact the author.

Notes

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2. The fiscal year referred to throughout this report is the academic fiscal year; for most institutions FY 2010 represents the period 1 July 2009 through 30 June 2010.

3. Two changes to the survey's definition of R&D also contributed to the R&D increase, to a lesser extent: the explicit inclusion of clinical trials and research training grants. The true effect these changes had on the total is unknown because the survey did

not request totals for either of these categories prior to FY 2010, but it is estimated to be fairly small given the size of the overall increase.

4. A listing of each of the changes is provided in the FY 2010 Higher Education R&D Survey questionnaire, http://www.nsf.gov/statistics/srvyherd/surveys/srvyherd_2010.pdf.

5. Some of this increase can be attributed to the change in survey methodology for FY 2010. Imputed R&D is now distributed among both S&E and non-S&E fields for those institutions who did not complete the survey in FY 2010, and the imputed total for non-S&E R&D expenditures was \$99 million. In previous years only S&E R&D was imputed.

6. A complete listing of other agency sources will be provided in the forthcoming detailed statistical tables report; see "Data Sources, Limitations, and Availability."

7. Unrecovered indirect costs are the portion of indirect costs incurred as a result of conducting sponsored research that are not reimbursed by the project sponsor. Direct cost sharing refers to the portion of direct project costs paid for by the institution on an externally funded project. This amount is negotiated and agreed upon with the sponsor at the time of the project award. The data provided for these categories are kept confidential at the institutional level and only reported in aggregate form.

8. Many institutions also opted not to complete this question on the FY 2010 survey because of the additional detail requested. The breakdown was imputed for these institutions based on the proportions reported by their peer institutions.

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