

## INDUSTRIAL FUNDING OF ACADEMIC R&D CONTINUES TO DECLINE IN FY 2004

by Ronda Britt

Industrial funding for research and development in academic science and engineering (S&E) dropped by 2.6 percent in FY 2004, the third consecutive year of declining support from this sector, according to data from the National Science Foundation (NSF) Survey of Research and Development Expenditures at Universities and Colleges (table 1). The industrial sector is the first source of academic R&D funding to show a multiyear decline since the survey began, in FY 1953. Industry's FY 2004 percentage decline was more substantial than its percentage reductions in previous years (1.1 percent in 2003, 1.5 percent in 2002). Industrial support was \$2.1 billion in FY 2004, down from a high of \$2.2 billion

in FY 2001. Industry's share of academic R&D support in FY 2004 equaled its share in FY 1983, at 4.9 percent.

Overall, universities and colleges reported R&D expenditures of \$42.9 billion in FY 2004, 7.2 percent more than the previous year (\$40.1 billion). This increase represents a slowdown in the growth of academic R&D expenditures after 2 years of double-digit growth (10.9 percent in FY 2002, 10.2 percent in FY 2003). When adjusted for inflation, academic R&D rose 4.7 percent in FY 2004.

### Other Sources of R&D Funding

Federal funding, which reached \$27.4 billion, or 64 percent of total academic R&D support, fueled most of the FY 2004 growth in total academic R&D.

Federally financed R&D grew by 10.7 percent in FY 2004, representing the third consecutive year of double-digit growth (13.7 percent in FY 2002, 13.1 percent in FY 2003). R&D expenditures financed by state and local government funding grew by 7.4 percent in FY 2004, to \$2.8 billion, continuing the moderate but steady growth shown each year by this source.<sup>1</sup> However, FY 2004 institutional funding of \$7.8 billion represents an increase of only 1.5 percent, a leveling off after an average annual increase of 9 percent within the previous 7 years (rising from \$4.2 billion in FY 1996 to \$7.7 billion in FY 2003).

TABLE 1. Science and engineering R&D expenditures at universities and colleges: FY 1999–2004

(Millions of current dollars)

Source and character of work	1999	2000	2001	2002	2003	2004
All R&D expenditures	27,531	30,069	32,794	36,367	40,057	42,945
Source of funds						
Federal government	16,102	17,536	19,222	21,863	24,744	27,379
State and local government	2,021	2,200	2,320	2,505	2,650	2,847
Industry	2,033	2,156	2,220	2,187	2,163	2,107
Institutional funds	5,381	5,924	6,607	7,126	7,659	7,771
All other sources	1,994	2,254	2,425	2,687	2,842	2,841
Character of work						
Basic research	20,365	22,453	24,372	27,276	29,961	32,308
Applied research and development	7,166	7,616	8,422	9,091	10,095	10,638

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

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2004.

<sup>1</sup> Figures reported for state and local government support of academic R&D exclude general-purpose funds that schools receive from these sources and devote to R&D activities. These funds are included in figures reported as institutional funds.



### Funding by Field and Federal Agency

Including all sources of funding, the medical sciences (\$14.0 billion) and biological sciences (\$7.8 billion) accounted for the largest field shares of academia's FY 2004 R&D performance total. Together, these two fields accounted for about one-half of R&D at universities and colleges (table 2). The fields showing the largest percentage increases for FY 2004 were bioengineering/biomedical engineering (18.0 percent), earth

TABLE 2. R&D expenditures at universities and colleges, by science and engineering field: FY 2003–04  
(Millions of current dollars)

Field	FY 2003	FY 2004	% change 2003–04
All R&D expenditures	40,057	42,945	7.2
Computer sciences	1,305	1,405	7.7
Environmental sciences	2,190	2,354	7.5
Atmospheric sciences	396	416	5.0
Earth sciences	724	830	14.5
Oceanography	766	776	1.4
Environmental sciences, nec	305	332	9.1
Life sciences	23,746	25,650	8.0
Agricultural sciences	2,552	2,695	5.6
Biological sciences	7,379	7,840	6.3
Medical sciences	12,787	14,041	9.8
Life sciences, nec	1,027	1,074	4.6
Mathematical sciences	428	450	5.0
Physical sciences	3,277	3,545	8.2
Astronomy	392	420	7.2
Chemistry	1,227	1,317	7.3
Physics	1,418	1,522	7.4
Physical sciences, nec	240	286	19.0
Psychology	769	782	1.8
Social sciences	1,659	1,670	0.6
Economics	313	317	1.1
Political sciences	289	302	4.4
Sociology	370	355	-4.0
Social sciences, nec	687	696	1.3
Sciences, nec	690	777	12.6
Engineering	5,993	6,312	5.3
Aeronautical/astronautical engineering	402	440	9.4
Bioengineering/biomedical engineering	314	370	18.0
Chemical engineering	453	493	8.8
Civil engineering	776	789	1.7
Electrical engineering	1,401	1,438	2.6
Mechanical engineering	821	867	5.7
Metallurgical/materials engineering	548	565	3.1
Engineering, nec	1,278	1,350	5.6

nec = not elsewhere classified.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2004.

sciences (14.5 percent), and physical sciences not elsewhere classified (19.0 percent).

Universities were asked to identify specific agency sources of federal funding (table 3). Once again, the largest amount of funding by far (\$14.1 billion) was provided by the Department of Health and Human Services, primarily in support of the medical and biological sciences. NSF provided the second largest amount of federal funding (\$3.2 billion), most of it in support of the fields of engineering and the biological, computer, environmental, and physical sciences (\$0.3 to \$0.7 billion each).

### Top Academic Research Performers

Academic R&D remains highly concentrated in the largest research institutions. Of the 612 institutions surveyed, the top 20 in terms of total R&D expenditures accounted for almost one-third (30 percent) of total academic R&D spending (table 4). The top 100 research performers accounted for 80 percent of all R&D dollars in FY 2004.

Only one change occurred from FY 2003 to FY 2004 in the list comprising the top 20 institutions. The University of Colorado, which ranked 24th in FY 2003, entered the list at number 20 for FY 2004. Baylor College of Medicine, which ranked 20th in FY 2003, dropped to number 22 in FY 2004. The Massachusetts Institute of Technology had the most notable change of rank among the top 20 institutions, climbing from 17th in FY 2003 to 12th in FY 2004.

### Passed-Through Funds

One way to estimate the growth of collaborative relationships among institutions is to measure total S&E R&D expenditures that are passed through to a subrecipient. The survey instructs respondents to report the amount of total and federally funded expenditures that were either passed through to a subrecipient or received as a subrecipient from another entity. The data continue to show that an increasing amount of the university and college R&D totals have passed through one institution to others.

Academic R&D expenditures that were reported as passed through to higher education subrecipients increased from \$1.1 billion in FY 2003 to \$1.3 billion in FY 2004. R&D expenditures that were passed through

TABLE 3. R&D expenditures at universities and colleges, by source of funds and science and engineering field: FY 2004  
(Millions of current dollars)

Field	Federal R&D	USDA	DOD	DOE	HHS	NASA	NSF	Other <sup>a</sup>
All R&D expenditures	27,379	761	2,478	940	14,083	1,098	3,232	3,145
Computer sciences	1,028	2	303	32	27	39	411	119
Environmental sciences	1,596	44	140	68	31	232	521	474
Life sciences	15,744	618	390	129	12,062	105	484	1,261
Agricultural sciences	868	430	12	19	81	15	97	188
Biological sciences	5,504	161	121	66	4,247	45	347	308
Medical sciences	9,372	27	257	44	7,734	45	40	765
Mathematical sciences	319	2	31	7	50	5	154	25
Physical sciences	2,567	7	307	365	431	337	720	208
Psychology	587	0	27	0	435	10	46	56
Social sciences	695	35	24	5	249	15	97	233
Engineering	3,902	34	1,205	306	225	346	720	613

<sup>a</sup> Includes all reported agencies other than the six listed here.

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 = U.S. Department of Agriculture.

NOTES: Not all fields are reported in this table. Also, agency data do not add to total federal expenditures because some institutions did not break out their federal expenditures by agency.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2004.

to non-higher education subrecipients increased from \$0.8 billion in FY 2003 to \$1.0 billion in FY 2004. More than 90 percent (\$1.1 billion) of the funds passed through to higher education subrecipients and 82 percent (\$0.8 billion) of the funds to non-higher education subrecipients originated from federal sources.

Universities also reported an increase in R&D expenditures received as a subrecipient from other higher education pass-through entities, from \$1.1 billion in FY 2003 to \$1.4 billion in FY 2004.<sup>2</sup> Likewise, R&D expenditures received as a subrecipient from non-higher education entities increased from \$1.1 billion in FY 2003 to \$1.3 billion in FY 2004. More than 90 percent (\$1.2 billion) of the funds received from higher education pass-through entities and 88 percent (\$1.1 billion) of the funds from non-higher education entities originated from federal sources.

### Non-S&E R&D Expenditures

For the second consecutive year, the survey reports information at the institution level on non-S&E R&D

<sup>2</sup> The total amount reported as passed through to higher education subrecipients (\$1.3 billion) does not equal the amount reported received by higher education subrecipients (\$1.4 billion) due to differences in the item response rates for these two survey questions.

expenditures in addition to expenditures on S&E R&D. In FY 2003, 81.7 percent of the survey respondents provided data on R&D expenditures by non-S&E field, reporting a total of \$1.4 billion in non-S&E R&D expenditures. In FY 2004 a slightly higher percentage of institutions provided data (85.3 percent), and the reported amount of non-S&E R&D expenditures increased to \$1.6 billion. This amount is in addition to the \$42.9 billion expended on S&E R&D. The largest amounts reported for individual non-S&E fields were in education (\$704 million), business and management (\$216 million), and humanities (\$157 million).

### Data Notes

The academic R&D expenditures data presented in this InfoBrief were obtained from 612 universities and colleges that grant degrees in the sciences or engineering and expend at least \$150 thousand in science and engineering R&D in the surveyed fiscal year. The survey asks universities and colleges to report their separately budgeted R&D expenditures within S&E fields. This includes all funds expended for S&E activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. Unless noted

TABLE 4. Twenty institutions reporting the largest FY 2004 academic R&D expenditures in the sciences and engineering: FY 2003–04 (Millions of current dollars)

Rank	Institution	2003	2004
	All R&D expenditures <sup>a</sup>	40,057	42,945
	Leading 20 institutions	12,254	12,888
1	Johns Hopkins U., The <sup>b</sup>	1,244	1,375
2	U. CA, Los Angeles	849	773
3	U. MI all campuses	780	769
4	U. WI Madison	717	764
5	U. CA, San Francisco	671	728
6	U. WA	685	714
7	U. CA, San Diego	647	709
8	Stanford U.	603	671
9	PA State U. all campuses	533	600
10	U. PA	565	597
11	Cornell U. all campuses	555	576
12	MA Institute of Technology	486	543
13	U. CA, Berkeley	507	526
14	Duke U.	520	521
15	OH State U. all campuses	496	518
16	U. MN all campuses	509	515
17	U. CA, Davis	482	512
18	U. IL Urbana-Champaign	494	506
19	Washington U. St. Louis	474	490
20	U. CO all campuses	437	483
	All other institutions	27,802	30,057

<sup>a</sup> Data do not include R&D performed by university-administered federally funded research and development centers.

<sup>b</sup> The Johns Hopkins University includes the Applied Physics Laboratory, with \$607 million and \$670 million, respectively, in total R&D expenditures in FY 2003 and FY 2004.

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

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2004.

differently, expenditures analyzed in this report refer to S&E R&D activities only. Non-S&E expenditures are reported separately in the survey and are not included in the overall expenditure totals.

Universities were also asked to identify specific agency sources of federal funding. In FY 2003 the sources identified represented 83 percent (\$20.5 billion) of the \$24.7 billion federal total. In FY 2004 this percentage increased to 94 percent (\$25.7 billion) of the \$27.4 billion federal total. Although the response to this question greatly increased from FY 2003 to FY 2004, the agency data reported here still represent a lower-

bound estimate of agencies' actual R&D support totals, since 66 of the 612 institutions surveyed did not respond to this question. Of the \$27.4 billion federally financed total, respondents did not report agency sources for \$1.6 billion. NSF did not attempt to allocate the undistributed amounts to individual agencies.

Data reported on non-S&E R&D expenditures are also lower-bound estimates for the national totals because (1) only 522 of the 612 surveyed institutions reported their non-S&E R&D expenditures and NSF did not attempt to estimate for item nonresponse, and (2) only institutions included in this S&E R&D performing sample were surveyed. The activities of institutions that do not perform S&E R&D (but may conduct substantial amounts of non-S&E R&D) are not reflected here.

The FY 2004 Survey of Research and Development Expenditures at Universities and Colleges detailed statistical tables will be available on the Web at <http://www.nsf.gov/statistics/rdexpenditures/>. NSF makes available computer-generated institutional profiles for individual doctorate-granting institutions and institutions of higher education with S&E departments that grant master's degrees or higher. The profiles contain data from this survey as well as from two other NSF academic S&E surveys: the Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions and the Survey of Graduate Students and Postdoctorates in Science and Engineering. Data from the three surveys are available on the Web (<http://www.nsf.gov/statistics/>) and on NSF's WebCASPAR database system, a web tool for retrieval and analysis of statistical data on academic S&E resources (<http://webcaspar.nsf.gov/>).

For more information related to the Survey of Research and Development Expenditures at Universities and Colleges, contact

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