INFOBRIEF
SRS Science Resources Statistics

National Science Foundation
Directorate for Social, Behavioral, and Economic Sciences

NSF 04-319
May 2004

U.S. ACADEMIC R&D CONTINUES TO GROW AS MORE UNIVERSITIES AND COLLEGES EXPAND THEIR R&D ACTIVITIES

by Brandon Shackelford

More universities and colleges reported increased research and development (R&D)[1] expenditures in FY 2002 than in any of the prior six years, according to data from the National Science Foundation's (NSF's) Survey of Research and Development Expenditures at Universities and Colleges. This broad-based growth resulted in total U.S. academic R&D topping $36.3 billion in FY 2002—an increase of 10.9 percent over the FY 2001 figure of $32.8 billion. The FY 2002 R&D expenditures are nearly 50 percent higher than those reported only five years earlier, in FY 1997.

As academic R&D expenditures grew over this period, more and more institutions expanded their R&D activities. Using data from universities and colleges that reported or estimated their total R&D expenditures in two consecutive years, it is possible to generate a "sea change" indicator by taking the ratio of the number of such institutions that increased their R&D expenditures from the prior year and the number that did not (figure 1). In FY 1997 approximately 1.4 institutions reported increased R&D expenditures over FY 1996 for each institution that reported either unchanged or decreased R&D expenditures. In FY 2002, however, more than 2.6 institutions increased their R&D expenditures for each institution that did not. The trend toward expanding R&D expenditures is even more apparent among the 200 institutions with the largest R&D expenditures.[2] Among these institutions, the sea change indicator was 3.3 in FY 1997 and 12.1 in FY 2002.

A shift of a similar magnitude is evident even when comparing institutions that increased their R&D expenditures by more than 3 percent over the prior year and those that did not.[3] The sea change indicator using this stricter criterion grew from 1.0 in FY 1997 to 2.2 in FY 2002. Among the 200 institutions with the greatest R&D expenditures, the sea change indicator using the stricter criterion was 1.7 in FY 1997 and 6.8 in FY 2002.

Sources of R&D Funding

Federal funding, which supported 60 percent of the R&D expenditures reported by universities and colleges, fueled the growth of total academic R&D in FY 2002 (table 1). In that year, federally financed academic R&D grew at its fastest rate since 1979—increasing 13.6 percent over FY 2001. In contrast, R&D expenditures funded by non-Federal sources increased by 7.0 percent (or slightly less than $1 billion) over FY 2001. The largest source of non-Federal funding, universities and colleges (reported as institutional funds), increased by 7.9 percent. Academic R&D supported directly by state and local governments increased

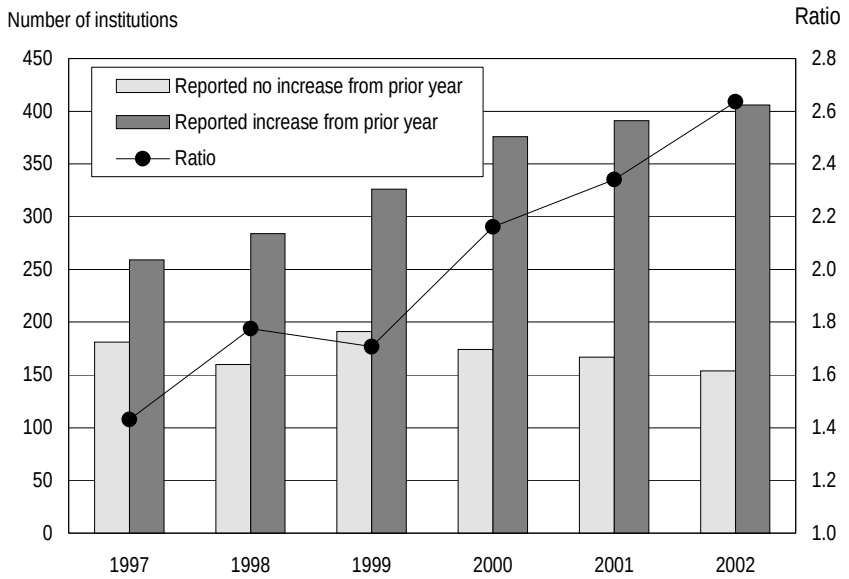
[1]Universities and colleges report separately budgeted R&D expenditures. This category includes all funds expended for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. Expenditures analyzed in this report refer to science and engineering R&D activities only.

[2]For this analysis institutions were ranked according to their average R&D over the period FY 1997 to FY 2002.

[3]Inflation averaged less than 2 percent per year over the period discussed.

Information and data from the Division of Science Resources Statistics are available on the web at http://www.nsf.gov/sbe/srs/. To request a printed copy of this report go to http://www.nsf.gov/home/orderpub.htm or call (703) 292-PUBS (7827). For NSF's Telephonic Device for the Deaf, dial toll-free (800) 281-8749 or (703) 292-5090.

FIGURE 1. Indicators of university and college R&D trends: FY 1997–2002



NOTE: The ratio shown is the number of institutions reporting increased total R&D expenditures from the prior year divided by the number of instititutions reporting either unchanged or decreased R&D expenditures from the prior year.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2002.

by 8.0 percent.[4] R&D funded by industry sources, at $2.2 billion, declined by 1.2 percent from the FY 2001 figure. This reported decline in industry funding of academic R&D is the first since 1964. Academic R&D supported by all other non-Federal sources (including private foundations and donations) increased 10.8 percent over FY 2001 (table 1).

Top Research Performers

Although more and more institutions are increasing their R&D expenditures, academic R&D remains highly concentrated in the larger research institutions. Of the 625 institutions surveyed, the top 100 in terms of federally financed R&D expenditures accounted for 82 percent of federally financed R&D spending and the top 100 in terms of total R&D expenditures accounted for 80 percent of all R&D dollars in FY 2002. The 20 research performers with the highest federally financed R&D expenditures represented 35 percent of federally sponsored expenditures. The 20 leading research performers in terms of total R&D expenditures accounted for 31 percent of total academic R&D spending (table 2). These concentrations have changed little over the past five years, indicating that the recent growth in R&D expenditures is reflective of increased R&D activities across a broad spectrum of academic institutions rather than in a select few.

Most of the universities that ranked in the top 20 in FY 2002 also ranked among the leading 20 academic performers in FY 2001. Several changed rank positions in FY 2002: Duke University, which ranked 21 in FY 2001, reentered the list, and Baylor College of Medicine, which ranked 20 in FY 2001, dropped out (table 2).

Data Notes

The academic R&D expenditures data presented in this *InfoBrief* were obtained from 625 universities and colleges that grant degrees in the sciences or engineering and expend at least $150,000 in research in the surveyed fiscal year. The FY 2002 Survey of

[4]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 for institutional funds.

TABLE 1. R&D expenditures at universities and colleges: FY 1997–2002
(Millions of current dollars)

Item	1997	1998	1999	2000	2001	2002
Total expenditures	24,369	25,854	27,528	30,063	32,767	36,333
Source of funds						
Federal Government	14,314	15,150	16,086	17,518	19,213	21,834
State and local governments	1,909	1,944	2,020	2,198	2,316	2,501
Industry	1,737	1,888	2,030	2,153	2,214	2,188
Institutional funds	4,698	5,002	5,399	5,940	6,587	7,109
All other sources	1,712	1,870	1,994	2,254	2,438	2,701
Character of work[1]						
Basic research	16,598	18,789	20,350	22,243	24,273	26,959
Applied research and development	7,771	7,065	7,178	7,820	8,494	9,374

[1]Character of work estimation procedure for university and college R&D was revised for 1998 and later years; data for these years are not directly comparable to data shown for 1997.

NOTE: Details do not add to totals because of rounding.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2002.

TABLE 2. Twenty institutions reporting the largest FY 2002 academic R&D expenditures in the sciences and engineering: FY 2001–02
(Millions of current dollars)

	Total		Federal	
Institution	2001	2002	2001	2002
Total R&D expenditures[1]	32,767	36,333	19,213	21,834
Leading 20 institutions	10,171	11,158	6,109	6,871
1. Johns Hopkins U. [2]	999	1,140	880	1,023
2. U. CA Los Angeles	694	788	313	367
3. U. MI all campuses	601	674	396	444
4. U. WI Madison	604	662	304	345
5. U. WA	590	627	435	487
6. U. CA San Francisco	525	597	277	327
7. U. CA San Diego	557	585	343	359
8. Stanford U.	483	538	384	427
9. U. PA	470	522	352	398
10. Cornell U. all campuses	444	496	240	271
11. U. MN all campuses	462	494	264	295
12. PA State U. all campuses	458	493	246	285
13. U. CA Berkeley	446	475	208	217
14. U. CA Davis	432	457	155	177
15. MA Institute of Technology	435	455	304	330
16. Duke U.	375	442	218	261
17. TX A&M U. all campuses	407	437	149	163
18. OH State U. all campuses	391	432	161	178
19. U. IL Urbana-Champaign	391	427	195	214
20. Washington U. St. Louis	407	417	285	303
All other institutions	22,596	25,175	13,104	14,963

[1]Data do not include R&D performed by university-administered federally funded research and development centers.

[2]Includes R&D expenditures for Applied Physics Laboratory (APL). For FY 2002, APL reported $560 million in total and $540 million in federally financed R&D expenditures.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Research and Development Expenditures at Universities and Colleges, FY 2002.

Research and Development Expenditures at Universities and Colleges detailed statistical tables will be available on the NSF Web site at http://ww.nsf.gov/sbe/srs.

In an attempt to capture all academic R&D expenditures, the NSF Academic R&D Survey instructs respondents to "include research funds for which an outside organization, educational or other, is a subrecipient." In FY 2002, 8.1 percent of all federally funded academic R&D was passed through to subrecipients, compared with 2.1 percent of all nonfederal sources of funds.[5]

NSF makes available computer-generated institutional profiles for individual doctorate-granting institutions and institutions of higher education with science and engineering (S&E) departments that grant master's degrees. 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. Current and historical data from the three surveys are also available on the World Wide Web (http://www.nsf.gov/sbe/srs/stats.htm) by individual survey and from the Computer-Aided Science Policy Analysis and Research (WebCASPAR) database system, a Web tool for retrieval and analysis of statistical data on academic science and engineering resources (http://caspar.nsf.gov).

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

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[5]Data from the Academic R&D Survey and other surveys are used to analyze patterns of R&D activity in the United States. For this analysis, the most recent data update of the report *National Patterns of R&D Resources* adjusts university and college R&D performance to net out R&D expenditures reported as passed through to educational subrecipients beginning with FY 1998. National Patterns reports and data updates are on the NSF Web site at http://www.nsf.gov/sbe/srs/nprdr/start.htm.

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