Federal Support for Academic Research

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Summary

From the time of Vannevar Bush and his 1945 report on U.S. science policy, academic research has played a role in the nation's economy. Vannevar Bush's report, *Science the Endless Frontier*, maintained that major investments in research should be made to the nation's universities. He stated that the research capacity of the colleges and universities was significantly important to long-term national interests. Currently, some Members of Congress have expressed concern about the health and competitiveness of the nation's colleges and universities. There are those who continue to maintain that the long-term competitiveness of the nation is linked to the strength of the academic research infrastructure. It has been shown that academic research is integrated into the economy and impacts at both the local and national level. By one estimate, approximately 80% of leading industries have resulted from research conducted at colleges and universities.

Colleges and universities are the primary performers of basic research, with the federal government being the largest funding source. In FY2008, the federal government provided approximately 60% of an estimated $51.9 billion of research and development funds expended by academic institutions. When measured in current dollars, federal academic support increased by 2.5% between FY2007 and FY2008. When inflation is taken into account, it equates to an increase of 0.2% from FY2007 to FY2008 following two years of decline in constant dollars since FY2005. An issue before the 112th Congress is that with further budget reductions expected, how does the nation best reduce the budget while adjusting the support for research conducted at colleges and universities?

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Introduction

From the time of Vannevar Bush and World War II, academic research has played a role in the nation's economy.[1] Vannevar Bush, national science advisor to both Presidents Franklin Roosevelt and Harry Truman, stated that major investments in research should be made to the nation's universities.[2] His position was that the research capacity of colleges and universities was significantly important to long-term national interests.[3] Currently, some Members of Congress have expressed concern about the health and competitiveness of U.S. colleges and universities, specifically research institutions. The federal government provides more than half of the funding for U.S. academic research. The nation's current economic situation, debt, and budget deficit are placing increased focus on cutting discretionary spending, the source of funding for U.S. academic research. Congress is faced with difficult spending decisions that may affect the health and competitiveness of the research capabilities of U.S. colleges and universities.

There are those who contend that the long-term competitiveness of the nation is linked to the strength of the academic research infrastructure. It has been reported that academic research is integrated in the local economy, contributes to industrial applications, and provides benefits at both a local and national level.[4] In addition, academic researchers have contributed to developing various technologies, becoming a "strong catalyst for U.S. economic growth."[5] This challenge comes at a time when the nation is facing low economic growth, high unemployment, and increased global competition. While investments in academic research may address these concerns in the long-term, short-term budget considerations may constrict such an investment. Other sources of funding for U.S. academic research are also constrained. In FY2009, self-funding by colleges and universities provided approximately 20.4% of the support for academic research funding, but many institutions are struggling financially.[6] States and local government provided approximately 6.6%,[7] but, like the federal government, most state budgets are under severe constraints.

[1] "Federal Funding for Academic Research – A Brief History of Federal Involvement in University-Based Research, Key Federal Agencies", http://education.stateuniversity.com/pages/1987/Federal-Funding-Academic-Research.html.

[2] A report to the President by Vannevar Bush, Director, Office of Research and Development, July 1945, http:///.nsf.gov/od/pa/nsf50/vbush1945.htm. See also Cole, Jonathan R., *The Great American University – Its Rise to Preeminence, Its Indispensable National Role, Why It Must Be Protected*, 2009, Columbia University, New York, pp. 86-106.

[3] Ibid.

[4] See for example ibid.; Cole, Jonathan R., *The Great American University*, pp. 193-298; Berdahl, Robert M., "Research Universities: Their Value to Society Extends Well Beyond Research," April 2009, 9 pp.; Mendez, Michael, "University Social Responsibility: Balancing Economic and Societal Benefits of University Research, *The Journal of Science Policy and Governance*, 25 pp, http://www.sciencepolicyjournal.org/uploads/5/4/3/4/5434385/university_social_responsibility_pdf; and Thrift, Nigel, "What Responsibilities Should Universities Bear?" *The Chronicle of Higher Education*, January 19, 2012, http://chronicle.com/blogs/worldwise/what-responsibilities-should-universities-bear/29061.

[5] Litan, Robert E., Lesa Mitchell, and E.J. Reedy, "The University as Innovator: Bumps in the Road," *Issues in Science and Technology*, Summer 2007, http://www.issues.org/23.4/litan.html.

[6] National Science Foundation, "Universities Report $55 Billion in Science and Engineering R&D Spending for FY2009: Redesigned Survey to Launch in 2010," *InfoBrief*, NSF10-329, September 2010, Arlington, VA, p.1.

[7] Ibid.

According to a 2010 report of the National Academy of Sciences, the nation enjoys a disproportionate share of the world's highly ranked research universities.[8] In addition, a report of the Times Higher Education revealed that six U.S. universities are ranked among the top ten in the world.[9] However, some analysts assert that U.S. colleges and universities' position has "slipped" over the past decade.[10]

While basic research is considered by many to be important to long-term national interests, through stimulating technological advancements and contributing to the growth of new industries, it has not been heavily supported by the private sector because it is not always viewed as being cost-effective.[11] As more countries are doing cutting-edge research, there is discussion that the technological strength of the United States could be improved and enhanced by increasing the support for basic research at these institutions.[12] Shirley Ann Jackson, President, Rensselaer Polytechnic Institute, stated that

> Game-changing ideas tend to arise out of basic research, which pushes the boundaries of human knowledge. Universities are critical players here, because basic research dovetails magnificently with our educational mission. The primary contribution of universities to our ecosystem is the education of bright, motivated people, who ask questions that may take decades to answer. Furthermore, the endpoints of basic research in terms of commercial technologies often cannot be envisaged—even by the researchers themselves. Yet, history shows that out of such open exploration, thriving industries are born.
>
> When we fund basic research, we are funding serendipity. Even a sober, frugal, post-recession United States must invest in serendipity, because without it, there is no vitality in the innovation ecosystem. Indeed, there is no innovation.[13]

The following sections will discuss a number of factors that are considered to be important contributors to the nation's economic development and health of the nation's science and technology enterprise. They include the research mission in academia, university-industry partnerships, and the distribution of funding for academic research.

[8] The National Academies, *Rising Above the Gathering Storm, Revisited. Rapidly Approaching Category 5*, Members of the 2005 "Rising Above the Gathering Storm," Committee, Washington, 2010, p .38.

[9] Top 200 World Universities, Times Higher Education, http://www.timeshighereducation.co.uk/Rankings2009-Top200.html; Academic Ranking of World Universities, http://www.arwu.org/ARWU2009.jsp. See also Berdahl, Robert M., President, Association of American Universities, "Research Universities: Their Value to Society Extends Well Beyond Research," April 2009, p. 1.

[10] Berdahl, Robert M., President, Association of American Universities, Meeting of the President's Council of Advisors on Science and Technology, January 7, 2010, p. 2. See also Atkinson, Robert D. and Luke A. Stewart, "University Research Funding: The United States is Behind and Falling," The Information Technology and Innovation Foundation, May 2011, 18 pp., and Carlson, Toby N., "Current Funding Practices in Academic Science Stifle Creativity," Dupont Summit 2008, pp. 631-642.

[11] Ibid., Atkinson, Richard C. and Patricia A. Pelfrey, "Science and the Entrepreneurial University."

[12] Jaffe, Adam B., "Real Effects of Academic Research," *The American Economic Review*, vol. 79, December 1989, p. 6.

[13] Rice Centennial Lecture, Rice University, Presentation by Shirley Ann Jackson, President, Rensselaer Polytechnic Institute, "Valuing Science: Exploring Our Past, Securing Our Future," October 11, 2012, http://rpi.edu/president/speeches/ps101112-rice_lecture.html.

Higher Education and the Research Mission

Colleges and universities, in addition to their research missions, train and educate future scientific researchers. In general, professors must allocate their time between their role as educator and as researcher. Some assert that many professors short-change their teaching duties to focus more on research. It has been found that at some institutions, those in academia who are more focused on research and who have a record of publications and citations, are rewarded more (in terms of advancements and promotions) than those whose primary activities are teaching.[14]

There are those in the academic community who contend that a culture should be created that values both research and teaching.[15] However, in many institutions, research is rewarded disproportionately. This research is more highly rewarded and valued because it brings additional revenue to the institution. Therefore, generating research and obtaining grants is a measure of researchers' productivity. Teaching excellence, as opposed to obtaining external grants, is not as highly rewarded. Stakeholders ask how does an institution sustain a research program while simultaneously contributing to teaching excellence? Could there be a requirement for excellence in teaching for promotion as there is for obtaining outside funds for research? How can research and teaching be made to be complementary activities? Does the role of federal R&D funding distort priorities?

As one example, a group of research scientists at Howard Hughes Medical Institute (HHMI) maintain that

> [R]esearch and teaching need not be mutually exclusive but are instead intertwined and can interact synergistically to increase the effectiveness of both. The distinction between research and teaching is somewhat artificial; professors teach students how to learn from sources in the classroom, but also how to create new knowledge in their research laboratories.[16]

These professors and biomedical research scientists who receive support from HHMI, represent a range of institutional types,[17] and have argued that research and teaching should be viewed as "equally valuable and mutually reinforcing."[18] These academicians contend that the culture of universities does not put an equal emphasis on valuing and rewarding effective teaching—while outstanding research conducted at an institution is recognized both locally and nationally with salary increases and promotions, it is rare for teaching to be recognized outside the walls of the institution. The professors and researchers maintain that

[14] See for example Marsh, Herbert W. and John Hattie, "The Relation Between Research Productivity and Teaching Effectiveness: Complementary, Antagonistic, or Independent Constructs?" *The Journal of Higher Education*, vol. 73, September/October 2002, pp. 603-641; and Anderson, W.A., U. Banerjee, C.L. Drennan, S.C.R. Elgin, I.R. Epstein, J. Handelsman, G.F. Hatfull, R. Losick, D.K. O'Dowd, B.M. Olivera, S.A. Strobel, G.C. Walker, I.M. Warner, "Changing the Culture of Science Education at Research Universities," *Science*, vol. 331, January 14, 2011, pp. 152-153.

[15] Ibid., Marsh, Herbert W. and John Hattie, "The Relation Between Research Productivity and Teaching Effectiveness: Complementary, Antagonistic, or Independent Constructs?"

[16] Ibid., Anderson, W.A., U. Banerjee, C.L. Drennan et al.

[17] The researchers represent a diversity of institutions – characterized as ranging from major private institutions to underfunded state universities.

[18] Ibid., p. 152.

> The continued vitality of research universities requires that we foster a culture in which teaching and research are no longer seen as being in competition, but as mutually beneficial activities that support two equally important research achievements and ability to obtain successive grants.[19]

Some in the academic community maintain that the value of higher education is primarily based on the research being conducted, and to not focus on research would equate to "diluting" or "diminishing" the value of a degree.[20] But that position is countered by those who contend that at some institutions that focus on research, many of the academic researchers are not actually doing the bulk of the teaching or instructing the class—their teaching assistants instead perform these duties. These same individuals advocating for more of a balance between research and teaching assert that if academia put a higher value on teaching, it would result in a more well-rounded student.[21]

University Research-Industry Partnerships

University research-industry partnerships allow for interaction between the two, sharing both intellectual capital and access to emerging technologies.[22] Collaborations between various industries and academic institutions have resulted in the pooling of resources. Potential benefits to industry include more research-intensive activities and increased involvement in high-risk research activities. Linkages with industries have enabled those institutions with limited research infrastructure to extend their research capabilities.[23]

Several National Science Foundation (NSF) programs promote both university-industry relations and knowledge transfer, including the Engineering Research Centers (ERCs), the Science and Technology Centers (STCs), and the Industry/University Cooperative Research Centers (I/UCRs). They provide funding for up to 10 years for research in areas of industrial interest. These centers are usually multidisciplinary in character. A common requirement of the programs is that both undergraduates and graduates be involved in research. Reviews of these programs found sustained, uninterrupted funding was important for conducting high quality research.

Universities are collaborating and competing in a global environment, with U.S. academic researchers conducting more research with scientists from other countries. An analysis of internationally co-authored journal articles shows that in 2008, approximately 30% of U.S. articles were internationally coauthored, up from 20% in 1998. U.S.-based researchers authored

[19] Ibid.

[20] Mangan, Katherine, "In Texas Debate Over Research vs. Teaching, Students Champion Value of Research", *The Chronicle of Higher Education*, April 25, 2011, http://chronicle.com/article/In-Texas-Debate-Over-Research/127260/.

[21] See for example Henderson, Bruce B., "Just Because We're Not Publishing Doesn't Mean We're Not Working," *The Chronicle of Higher Education,* June 11, 2012, http://chronicle.com/article/Just-Because-Were-Not/132183, Marsh, Herbert W. and John Hattie, "The Relationship Between Research Productivity and Teaching Effectiveness: Complementary, Antagonistic, or Independent Constructs?," *The Journal of Higher Education*, vol. 73, September/October 2002, pp. 603-641.

[22] See for example Hall, Bronwyn H., "University-Industry Research Partnerships and Intellectual Property", National Science Foundation Workshop, October 2001, pp. 1-7.

[23] For expanded discussion of university-industry partnerships, see for example Taylor, E. Jennings and Cherri M. Pancake, Co-Chairs, Report from the Engineering Advisory Committee Subcommittee on Industry-University Partnerships, "Encouraging Industry-University Partnerships," April 10, 2008, 15 pp.

43% of the world's total international coauthored journal articles in 2008, a slight decline from the 44% in 1998.[24]

The Organisation for Economic Co-operation and Development (OECD) examined the transformation of university research and its role in national R&D efforts and global economic competition. The report noted that university research has become internationalized, primarily due to the "globalization process and progress in electronic communications and related technologies, which multiply opportunities for co-operation but also intensify the competitive climate at world level."[25] The OECD report further states that

> [I]n many countries, industry-university research partnerships are increasingly attractive. In short, knowledge transfer is now regarded as an important and legitimate function of universities, in addition to their more traditional roles of producing knowledge (research) and transmitting it (teaching and training).[26]

There has been an increase in the patenting and licensing by the academic sector as a result of their research. According to the NSF, one factor in this increase was the enactment of the Bayh-Dole Act, 1980, which allowed institutions to retain title to inventions as a result of federal research support.[27] Patenting by academic institutions is highly concentrated among a select number of colleges and universities. NSF reports that the number of patents received by academic institutions ranged from 2,950 to 3,700 for the period 1998-2008.[28] Two hundred academic research institutions, less than 10% of the total number of institutions that received patents from 1998-2008, accounted for 96% of all patents awarded to academic institutions. Nineteen institutions alone received more than half of all patents awarded. NSF reports that patent activity differed by field of science. Of those patents awarded, approximately half were granted in the areas of biotechnology, chemicals, and pharmaceuticals.[29]

The share of scientific papers authored by academic researchers at institutions is another measure of the concentration and level of research being conducted at that institution. Approximately 42% of the publication output for the period 2005 to 2009 was concentrated at two dozen universities. This represents an increase from the 31% for these institutions during the period 1981 to 1985. Two examples may be illustrative. Harvard University maintained the top spot in both time periods. Texas A&M University System which had a 0.72% share of scientific publication in the period 1981 to 1985, had a 1.2% share in the period 2005 to 2009. The following table provides a listing of institutions and their publication output.

[24] *Science and Engineering Indicators 2010*, pp. 5-35 to 5-38.

[25] Organisation for Economic Co-operation and Development, *University Research in Transition*, 1998, p. 10.

[26] *University Research in Transition*, p. 71.

[27] See for example CRS Report RL32076, *The Bayh-Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology*, by Wendy H. Schacht. NOTE: In 1985, approximately 500 patents were awarded to U.S. research institutions by the U.S. Patent and Trademark Office. Since the passage of the Bayh-Dole Act, in 2008, 3,280 U.S. patents were awarded to U.S. institutions, and 648 new products were introduced, and 595 new companies were created as a result of university inventions. Berdahl, Robert M., President, Association of American Universities, Remarks to American Academy of Arts and Sciences, November 16, 2010, p. 7.

[28] *Science and Engineering Indicators 2010*, p. 5-42.

[29] National Science Board, *Science and Engineering Indicators 2010*, p. 5-43.

Table 1. Scientific Publication Output

Total papers	Share U.S. (%)	Institution	Total papers	Share U.S. (%)
1981-1985			2005-2009	
25,630	2.65	Harvard University	68,146	4.22
13,071	1.35	University of Michigan system	33,084	2.05
10,567	1.09	Johns Hopkins University	31,503	1.95
16,941	1.75	University of California, Los Angeles	31,108	1.93
12,841	1.33	University of Washington System	30,320	1.88
13,366	1.38	Stanford University	28,318	1.75
10,248	1.06	University of California, San Diego	27,265	1.69
15,176	1.57	University of California, Berkeley	27,021	1.67
11,656	1.20	University of Pennsylvania	26,579	1.65
10,691	1.10	Columbia University	26,427	1.64
10,219	1.06	University of Maryland System	25,844	1.60
14,419	1.49	University of Minnesota System	25,497	1.58
13,919	1.44	University of Wisconsin, Madison	24553	1.52
14,222	1.47	Cornell University	23,483	1.45
10,166	1.05	University of Florida	23,226	1.44
7,483	0.77	University of Pittsburgh	22,457	1.39
9,490	0.98	University of California, Davis	22,362	1.38
7,880	0.81	Duke University	21,954	1.36
8,715	0.90	Penn State University System	21,689	1.34
11,150	1.15	Yale University	21,676	1.34
8,792	0.91	Ohio State University	21,380	1.32
8,889	0.92	University of Colorado System	21,066	1.30
10,027	1.04	University of California, San Francisco	20,691	1.28
11,651	1.20	Massachusetts Institute of Technology	20,609	1.28
6,975	0.72	Texas A&M University System	19,432	1.20

Source: Mervis, Jeffrey, "Handful of U.S. Schools Claim Larger Share of Output," *Science*, vol. 330, November 19, 2010, p. 1032.

A November 2010 report that examined the changing landscape of the global research base and the geography of who published in internationally influential journals determined that

> [T]he US is no longer the Colossus of Science, dominating the research landscape in its production of scientific papers, that it was 30 years ago. It now shares this realm, on an increasingly equal basis, with the [European Union nations, EU27] and Asia-Pacific. In terms of relative citation impact—an indicator of utility, influence, significance and similar concepts—the US still holds a commanding but eroding peak position. Europe is beginning

to match US performance in citation impact, and analysts are likely to be tempted to predict that, in a decade or two, Asian nations will do so as well.[30]

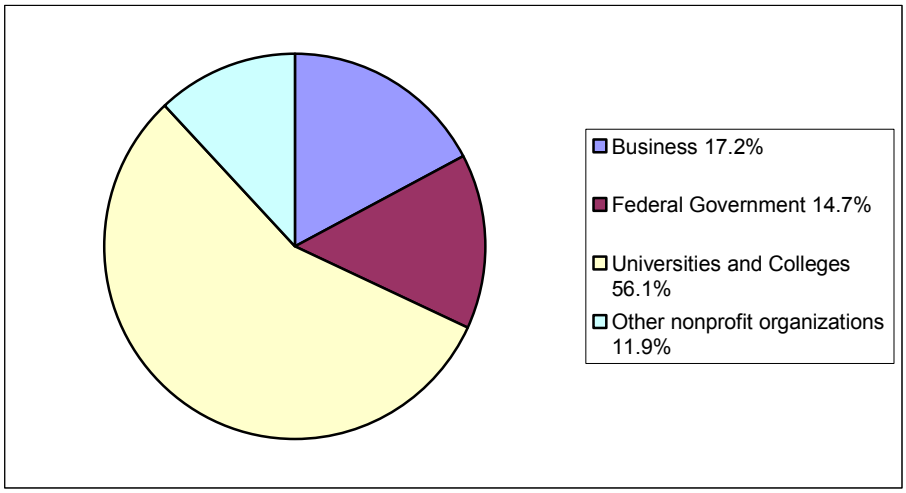
The Changing Institutional Context of Research

Sources and Composition of Research Funds for Universities

Historically, the federal government has been the primary source of funding for basic research at colleges and universities. In FY2008, the federal government provided approximately 60% of an estimated $51.9 billion of R&D funds expended by academic institutions.[31] In current dollars, federal support for academic research increased by 2.5% between FY2007 and FY2008. When inflation is taken into account, federal funding increased 0.2% from FY2007 to FY2008 following two years of decline in constant dollars since FY2005.[32]

Data from the NSF reveal that federal funding of research and development has focused more on basic than applied research, while private sector funding support has focused on development.[33] NSF found that in FY2008, institutions of higher education performed approximately 56% of the nation's basic research.[34] See **Figure 1**.

Figure 1. Basic Research by Performing Sector, FY2008



Source: *Science and Engineering Indicators 2010*, p. 4-15.

Note: NSF and the National Institutes of Health funded the majority of basic research.

[30] Adams, Jonathan and David Pendlebury, *Global Research Report-United States*, Thomson Reuters, November 2010, p. 5.

[31] National Science Foundation, "Universities Report $55 Billion in Science and Engineering R&D Spending for FY2009: Redesigned Survey to Launch in 2010," *InfoBrief*, NSF10-329, September 2010, p.1.

[32] *Science and Engineering Indicators 2010*, pp. 5-9 to 5-10.

[33] While universities are the primary supporters of basic research, as they enter into partnerships or relationships with the private sector and business, they have become more involved in applied research and technology.

[34] *Science and Engineering Indicators 2010*, p. 4-13.

Many colleges and universities, especially state schools, are experiencing declining revenues, due to reductions in state support, endowments, and in some instances, tuition.[35] According to one source, it is estimated that approximately 35 states have experienced a decline in revenue for FY2012, with many states operating in a deficit.[36] As a result, state funding for universities has fallen in many states. Some colleges are considering deferring maintenance projects and proposing increases in tuition. While states are cutting funding to address revenue declines and decreases in their operating budgets, these same institutions are simultaneously viewed as partners in further developing the economy of their respective states.

Federal stimulus spending provided additional revenues for some institutions for the past few years. Several institutions have reported that they used stimulus monies[37] provided under American Recovery and Reinvestment to improve their operational efficiencies.[38] Stimulus funding, however, is now coming to an end. [39] The end of stimulus funding for many academic institutions equates to a loss of operating support.

Moody's Investors Service has portrayed a bleak picture for colleges and universities. In a January 2011 report it noted that many colleges and universities are far too dependent on state support, tuition and other income.[40] The report notes that

> Although the infusion of ARRA funding for research created a temporary increase in available federal research funding, overall federal research funding has leveled off and become increasingly competitive to secure. We expect that the largest, nationally prominent research universities and independent research organizations will be best positioned to increase grant submission volume and win rate and secure multi-year funding. These organization's strong market positions attract top faculty and typically more diversity of research funding sources. Further, these top-tier research institutions may benefit from further revenue diversification, as they invest in research commercialization and growth of technology transfer revenue. We expect that smaller organizations hoping to expand their

[35] See, for example, Selingo, Jeff, "The Fiscal Cliff for Higher Education," *The Chronicle of Higher Education*, August 12, 2012; Medina, Jennifer, "California Cuts Threaten the Status of Universities," *The New York Times*, June 1, 2012, DeVise, Daniel, "Investment in Public's Ivory Towers is Eroding," *The Washington Post*, December 27, 2011, p. A1, A5; Kelderman, Eric, "State Support for Colleges Falls 7.6% in 2012 Fiscal Year," *The Chronicle of Higher Education*, January 23, 2012, http://chronicle.com/article/State-Support-for-Higher/130414/?sid=cc&utm_source=cc&ut; Roller, Emma, "State Budget Cuts for Research Universities Imperil Competitiveness, Report Says," *The Chronicle of Higher Education*, January 17, 2012, http://chronicle.com/article/State-Budget-Cuts-for-Research/130369/?sid=pm& utm_source; Kelderman, Eric, "Recession Pushed State and Local Higher-Ed Spending to 25-Year Low in 2010," *The Chronicle of Higher Education*, March 8, 2011, http://chronicle.com/article/Recession-Pushed-State-and/126647; and Padilla, Art, "States Can Reap Rewards by Supporting Research," *The Chronicle of Higher Education*, January 30, 2011, http://chronicle.com/article/States-Can-Reap-Rewards-by/126076.

[36] Kelderman, Eric, "Colleges to Confront Deep Cutbacks," *The Chronicle of Higher Education*, January 2, 2011, http://chronicle.com/article/Higher-Education-Faces-Deep/125782, p. 2.

[37] The American Recovery and Reinvestment Act, 2009 (P.L. 111-5) was an economic stimulus package enacted in February 2009.

[38] See, for example, "Pennsylvania Governor Proposes 50% Budget Cut for State Colleges, *The Chronicle of Higher Education*, March 8, 2011, http://chronicle.com/blogs/ticker/pennsylvania-governor-proposes-50-budget-cut-for-state-colleges/31143, and Kelderman, Eric, "In Colorado, Public Colleges Peer Over a $600-Million Stimulus 'Cliff'," *The Chronicle of Higher Education*, April 10, 2011, http://chronicle.com/article/Colorado-Public-Colleges-Peer/127049/.

[39] Stimulus funding—American Recovery and Reinvestment Act (ARRA), FY2009 provided funding for the period FY2009-FY2011. For expanded discussion of the ARRA see for example CRS Report R40537, *American Recovery and Reinvestment Act of 2009 (P.L. 111-5): Summary and Legislative History*, by Clinton T. Brass et al.

[40] Moody's Investors Service, U.S. Public Finance, Industry Outlook, "2011 Outlook for U.S. Higher Education," January 14, 2011, 18 pp.

research enterprises will be much more challenged in this environment to attract and retain top researchers and grow their research enterprises.[41]

Federal Financing of Academic Research

Academic research is dependent on federal funding even with the receipt of support from other sources. Institutions obtain support not only from their own institutions, but from industry and the private sector (foundations, trustees, alumni), and state and local government. In FY2009, the federal government accounted for 59.3% of all R&D funding at colleges and universities; this is a decrease from the 63.9% received in FY2004 and the 63.1% in FY2006. Institutional support received by colleges and universities was 20.4% in FY2009, compared to 17.9% in FY2004 and 19.0% in FY2006. And industry, which provided 5.8% support for academic research in FY2009, had provided 4.9% in FY2004 and 5.0% in FY2006. (See **Table 2** and **Figure 2**.)

Table 2. Science and Engineering R&D Expenditures at Universities and Colleges: FY2004-FY2009

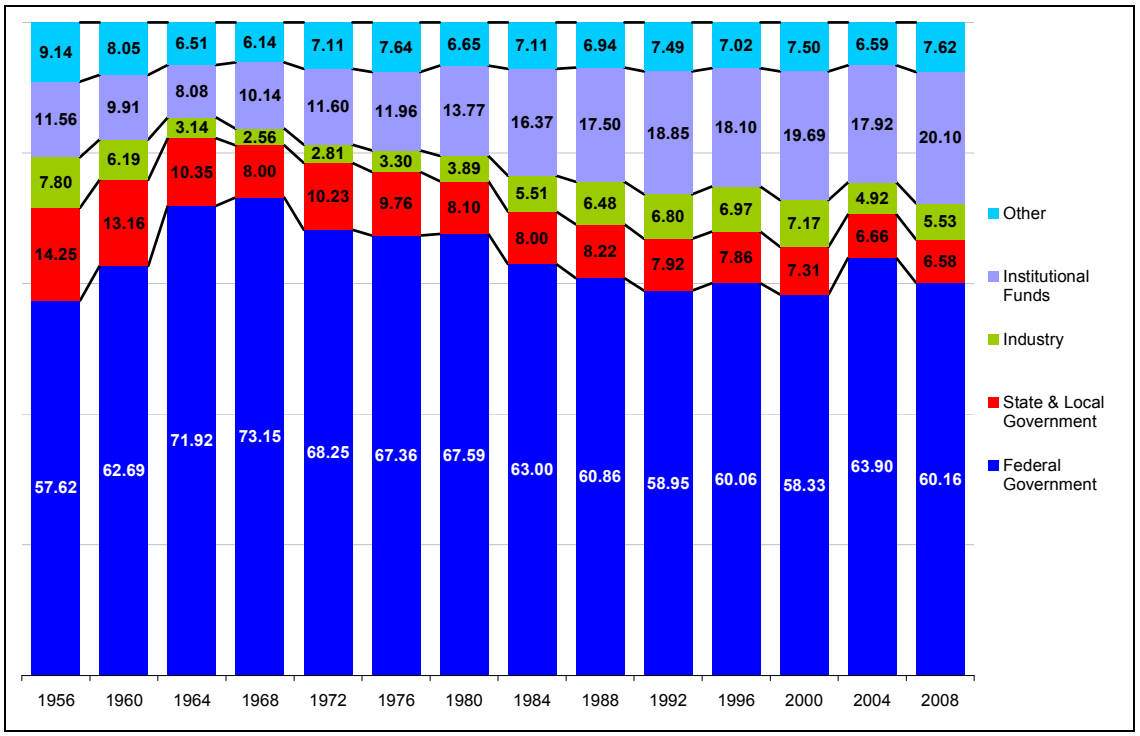
(dollars in millions)

Source of Funds and Character of Work	2004	2005	2006	2007	2008	2009	% change 2008-2009
All R&D expenditures	$43,258	$45,799	$47,751	$49,493	$51,934	$54,935	5.8
Source of funds							
Federal Government	27,644	29,209	30,128	30,443	31,281	32,588	4.2
State and Local Government	2,879	2,940	2,962	3,143	3,452	3,647	5.7
Industry	2,129	2,291	2,402	2,670	2,865	3,197	11.6
Institutional Funds	7,753	8,266	9,062	9,705	10,408	11,198	7.6
Other	2,852	3,093	3,196	3,533	3,928	4,305	9.6

Source: National Science Foundation, "Universities Report $55 Billion in Science and Engineering R&D Spending for FY2009: Redesigned Survey to Launch in 2010," *InfoBrief*, NSF 10-329, September 2010, Arlington, VA, p. 1.

[41] Ibid., p. 12. See also Carlson, Scott, "Financial Outlook is Brighter for Some Colleges, but Still Negative for Most," *The Chronicle of Higher Education*, January 16, 2011, http://chronicle.com/article/Financial-Outlook-Is-Brighter/125973.

Figure 2. Science and Engineering R&D at Colleges and Universities, by Source of Funding, FY1956-FY2008



Source: Berdahl, Robert M., President, Association of American Universities, "Renewing the Partnership," A presentation to the National Academy's Board on Higher Education and Work Force, November 16, 2009, p. 11.

Distribution of Funding for Academic Research and Development

Research and Development Support to the Top 100 Institutions

Congress has expressed concern about the funding patterns of federal academic support to academic institutions.[42] This extends beyond examining support for public or private or the top research institutions to include support at a more disaggregated level—including minority-serving institutions—Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions, and tribal colleges and universities. Minority-serving institutions, which compete with other institutions to improve their research infrastructure, are seeking a broader distribution and greater allocation of federal funding. In addition to minority-serving institutions, those states that historically have received limited federal R&D funds are seeking ways to strengthen and improve the quality of research conducted at their colleges and universities through the Experimental Program to Stimulate Competitive Research (EPSCoR) program. This section provides an overview of funding by top institutions, HBCUs, other minority-serving institutions, and the EPSCoR program.

[42] Mervis, Jeffrey, "Fewer Dollars, Forced Choices," *Science,* vol. 334, November 11, 2011, pp. 750-752.

The top 100 academic institutions (in terms of receipt of federal R&D funds) accounted for 82.6% of total federal R&D support for science and engineering to colleges and universities in FY2007.[43] There has been no measurable change in the concentration of federal R&D support to these top 100 institutions in the past decade. The majority of the institutions in the top positions in FY1997 remained in the top 100 recipients for FY2007, but in different ordinal positions. In FY1997, the top 100 institutions garnered 82.5% of federal support.[44] Johns Hopkins University had the ranking of number one in both FY1997 and FY2007. The University of Pittsburgh ranked number 10 in FY2007 after ranking number 17 in FY1997.[45] The University of Michigan ranked number 3 in FY2007 following a ranking of number 6 in FY1997. And the University of South Florida enjoyed the ranking of 70 in FY2007 after having ranked 95 in FY1997. The University of Oklahoma and Iowa State University, in positions 98 and 99 respectively in FY2007, did not appear in the top 100 listing of institutions in FY1997. (See **Appendix A** and **Appendix B** for federal support to the top 100 institutions for FY2007 and FY1997, respectively.

Historically Black Colleges and Universities and Other Minority-Serving Institutions

HBCUs[46] and other minority-serving institutions[47] have faced and continue to face substantial challenges in attempting to enhance their academic and research capabilities and develop programs to compete with other institutions of higher education. Some of these minority institutions have a myriad of problems—aging infrastructures, limited access to computer resources and digital network technology, absence of state of the art equipment, small endowments, and limited funds for faculty development and new academic programs for students.[48] There has been considerable variability in institutional ranking among HBCUs and other minority-serving institutions over the years. For these institutions, HBCUs and other minority-serving institutions, the funding level is provided for all levels of science and engineering obligations.[49] See **Table 3**.

[43] National Science Foundation, *Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions: FY2007*, Detailed Statistical Tables, NSF09-315, September 2009, Arlington, VA, Table 7. Note: For a narrowed view discussing the top 10 research performing institutions, please see National Science Foundation,

[44] National Science Foundation, *Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions: FY2000*, Detailed Statistical Tables, NSF02-319, April 2002, Arlington, VA, Table B-6.

[45] Ibid., Table B-6.

[46] For expanded discussion of HBCUs see for example CRS Report RL34435, *Federal Research and Development Funding at Historically Black Colleges and Universities*, by Christine M. Matthews.

[47] These minority-serving institutions include Hispanic-serving institutions and tribal colleges and universities (TCU), and those institutions that have a minority enrollment of at least 50% of the total student body.

[48] See, for example, Wilson Jr., John Silvanus, "A Multidimensional Challenge for Black Colleges," *The Chronicle of Higher Education*, September 18, 2011, http://chronicle.com/article/A-Multidimensional-Challenge/129046/; and Harmon, Noel, *The Role of Minority-Serving Institutions in National College Completion Goals*, Institute for Higher Education Policy, January 2012, 9 pp.

[49] There are six funding categories of federal science and engineering support: R&D; R&D plant; facilities and equipment for science and engineering instruction; fellowships, traineeships, and training grants; general support for science and engineering; and other science and engineering activities.

Table 3. HBCUs and Other Minority-Serving Institutions—Federal Support for Science and Engineering, FY2001-FY2007

(dollars in thousands)

	All Colleges and Universities	HBCUs[a]	Hispanic-Serving Institutions[b]	Tribal Colleges[c]
FY2001	$22,491,561	$404,252	$509,234	$30,389
FY2005	28,381,213	479,205	590,098	36,125
FY2006	28,634,346	444,193	603,308	28,744
FY2007	28,519,932	406,116	593,733	24,959

Source: National Science Foundation, "Federal S&E Obligations to Three Types of Minority-Serving Institutions Decline in FY2007," InfoBrief, NSF09-319, September 2009, Arlington, VA, p. 2; and National Science Foundation, "FY2005 Federal S&E Obligations Reach Over 2,400 Academic and Non-Profit Institutions; Data Presented on Minority-Serving Institutions," NSF-07-326 (revised) October 2007, Arlington, VA, 8 pp.

a. HBCUs are those degree-granting institutions established prior to 1964 and have as their principal mission the education of black students.

b. High-Hispanic enrollment institutions are those whose full-time equivalent enrollment of undergraduate students is at least 25% Hispanic, according to fall 2006 enrollment data self-reported by institutions in the Integrated Postsecondary Education Data System, ED. It should be noted that the exact number of high-Hispanic enrollment institutions can differ from year to year.

c. Tribal colleges and universities are those from the White House Initiative on Tribal Colleges and Universities. Tribal college and universities are designated in Section 2 of the Tribally Controlled College University Assistance Act of 1978. See for example http://www.2.ed.gov/about/inits/list/whtc/edlite-telist.html.

Experimental Program to Stimulate Competitive Research (EPSCoR)

EPSCoR is designed to help achieve broader geographical distribution of federal R&D support by improving the research infrastructure of those states that historically have received limited federal R&D funds.[50] It is a joint program of NSF and selected states and territories. EPSCoR's goal is to build competitive science by developing science and technology (S&T) resources through partnerships involving state universities, industry, government, and the federal R&D enterprise. The program is a partnership between the NSF and a state to improve the R&D competitiveness through the state's academic S&T infrastructure. The mission of EPSCoR is to raise the capability of a research institution or to assist in making a less-competitive institution more research intensive.[51] Eventually, EPSCoR supporters hope those states receiving limited federal support would gain some level of equity in competing for federal and private sector funds through the regular grant system. Currently, EPSCoR operates in 29 jurisdictions, including 27 states,[52] the Commonwealth of Puerto Rico, and the U.S. Virgin Islands.

[50] For an expanded discussion of EPSCoR see for example CRS Report RL30930, *U.S. National Science Foundation: Experimental Program to Stimulate Competitive Research (EPSCoR)*, by Christine M. Matthews.

[51] Approximately 30% of minority-serving colleges institutions are in EPSCoR jurisdictions. This includes 50% of historically black colleges and universities, 60% of tribal colleges and universities, and 30% of Hispanic serving institutions.

[52] The participating states are: Arkansas, Maine, Montana, South Carolina, West Virginia, Alabama, Nevada, Oklahoma, Vermont, Kentucky, North Dakota, Wyoming, Idaho, Louisiana, Mississippi, South Dakota, Kansas, (continued...)

The National Academies' Committee on Research Universities

As previously stated, U.S. colleges and universities are experiencing a decline in their financial support at the federal, state, and private sector levels. All of this is occurring in a climate when the operating costs are increasing and, in many cases, student tuition and fees are increasing. At the request of Congress,[53] the National Academies, Board on Higher Education and Workforce Committee, was charged with examining the state of the U.S. research institutions and reporting on how to maintain the health of these institutions. The panel examined various topics, including the commercialization of research with industry, time to degree for students in the institutions, and the employment of additional technology. Congress had asked the Academies to offer 10 actions that could be undertaken by institutions, state governments, and Congress itself to enable colleges and universities to "compete, prosper, and achieve national goals in health, energy, the environment, and global security."[54] The questions before the Board included: What are the ways to sustain the strength of research universities? What needs to be done, or done differently, to make certain that universities have the regulatory framework and resources to fulfill their missions?

The report by the National Academies, *Research Universities and the Future of America*, was released in the spring of 2012.[55] The report noted that even though U.S. research institutions enjoy an impressive global ranking, their survival has been put in jeopardy because of their dwindling financial support. The report states that

> [T]heir financial health is endangered as each of their major sources of revenue has been undermined or contested. Federal funding for research has flattened or declined; in the face of economic pressures and changing policy priorities, states are either unwilling or unable to continue support for their public research universities at world-class levels; endowments have deteriorated significantly in the recent recession; and tuition has risen beyond the reach of many American families. At the same time, research universities also face strong forces of change that present both challenges and opportunities: demographic shifts in the U.S. population, transformative technologies, changes in the organization and scale of research, a global intensification of research networks, and changing relationships between research universities and industry.[56]

The report recommended 10 actions that research universities could take to strengthen their institutions' education and research capacity. The report noted that these institutions must

(...continued)

Nebraska, Alaska, Hawaii, New Mexico, Delaware, New Hampshire, Rhode Island, Tennessee, Iowa, and Utah.

[53] The requesting Members were Senator Lamar Alexander, Senator Barbara Mikulski, Representative Bart Gordon, and Representative Ralph Hall.

[54] Mervis, Jeffrey, "Panel Explores What It'll Take to Keep Universities Strong," *Science*, vol. 329, July 9, 2010, p. 126.

[55] National Research Council, Board on Higher Education and Workforce, *Research Universities and the Future of America-Ten Breakthrough Actions Vital to Our Nation's Prosperity and Security*, Washington, 2012. See also Basken, Paul, "Nation's Research Universities Are Offered Hope of Fatter Budgets-at a Price," *The Chronicle of Higher Education,* June 14, 2012, http://chronicle.com/article/nations-research-univeristies/132285/?sid=pm&utm_source=.

[56] National Research Council, *Research Universities and the Future of America*, pp.3-4.

maintain and strengthen their partnerships with the federal government, the states, and business and industry. Four of the 10 recommendations are

- Provide greater autonomy for public research universities so that these institutions may leverage local and regional strengths to compete strategically and respond with agility to new opportunities. At the same time, restore state appropriations for higher education, including graduate education and research, to levels that allow public research universities to operate at world-class levels.
- Strengthen the business role in the research partnership, facilitating the transfer of knowledge, ideas, and technology to society and accelerate "time to innovation" in order to achieve our national goals.
- Improve the capacity of graduate programs to attract talented students by addressing issues such as attrition rates, time to degree, funding, and alignment with both student career opportunities and national interests.
- Secure for the United States the full benefits of education for all Americans, including women and underrepresented minorities, in science, mathematics, engineering, and technology.[57]

The National Academies acknowledged that these and other recommendations offered by the committee would require significant policy changes, investments, and support from all of the stakeholders in a "revitalized" research partnership. However, the recommendations, as the report noted, would result in significant returns not only to research institutions, but to the nation as a whole.

Policy Considerations

Colleges and universities are recognized by most as essential to the knowledge-based economy. As previously stated, some research indicates that approximately 80.0% of leading industries result from research conducted at academic institutions.[58] While most in higher education call for increased support for research at the federal level, there are those in the academic community who contend that academia does not necessarily need increased funding, instead declaring that there are benefits in having researchers in institutions compete for limited funding.[59] Those who hold such a position suggest that what is actually needed is "fewer but better" research institutions.[60]

President Obama placed a priority on academic research in the FY2012 budget submission, and proposed increases for those agencies that are the leading funding sources for academic research.[61] The President stated that "[T]he nations' current economic troubles only reinforce the

[57] Ibid., pp. 9-18

[58] Atkinson, Richard C. and Patricia A. Pelfrey, "Science and the Entrepreneurial University," *Issues in Science and Technology*, Summer 2010, p. 1, http://www.issues.org/26.4/atkinson.html.

[59] Basken, Paul, "As Universities Fend Off Budget Cuts, Some Researchers See Possible Benefits," *The Chronicle of Higher Education*, April 3, 2011, http://chronicle.com/article/As-Univerisites-Fend-Off/127000/, and Sarewitz, Daniel, "Double Trouble? To Throw Cash At Science Is a Mistake," *Nature*, vol. 468, November 11, 2010, p. 135.

[60] Ibid, Basken, p. 3.

[61] See for example Basken, Paul, "Obama Holds Out Research as Rare Exception From Budget Cuts," *The Chronicle of* (continued...)

need to emphasize research so Americans can out-innovate, out-educate, and out-build the rest of the world."[62] President Obama's *Plan for Science and Innovation* contained a proposal to double the budget of three federal agencies—the NSF, the Department of Energy's Office of Science, and the National Institute of Standards and Technology.[63] This position countered that of the chairman of the House Budget Committee who maintained that funding for scientific research should "join austerity measures and undertake severe cuts."[64]

Many collaborative research projects or research efforts on college campuses may be delayed or cancelled if federal funding is reduced in response to the nation's current deficit.[65] Will some universities have to have a concentrated research program in a particular set of disciplines and eliminate others because of budget constraints? Are there, as some in academia have advocated, benefits to forcing academic researchers to compete for fewer dollars?[66] Would the nation be better served to have fewer but better research universities? Can colleges and universities make do with less funding? Can a national strategy be developed to ensure the strength of the nation's research universities?

Additional questions are being asked that are specific to minority-serving institutions—HBCUs, Hispanic-serving institutions, and tribal colleges. Will minority-serving institutions have to leverage their funding through partnerships and collaborative approaches with nonminority institutions in order to survive due to fiscal constraints? Will there be more proposals for institutional mergers—combining minority institutions with non-minority institutions—because of the existing funding patterns for minority institutions?[67] How best can minority-serving institutions produce more competitive proposals with the regulatory requirements in order to obtain funding for academic research? While many in academia contend that minority-serving institutions are undersourced, will they be able to continue to contribute to the community development efforts and research demands of their respective states?[68]

(...continued)

Higher Education, February 14, 2011, http://chronicle.com/article/Obama-Holds-Out-Research-as/126361, and Basken, Paul, "Obama's Budget, Though Generous, Still Signals Austerity for Colleges," *The Chronicle of Higher Education*, February 20, 2011, http://chronicle.com/article/Obamas-Budget-Though/126439.

[62] The White House, Office of the Press Secretary, Remarks by the President in State of Union Address, January 25, 2011, p. 2.

[63] http://www.whitehouse.gov/sites/default/files/doubling%2011%20final.pdf.

[64] Editorial, "Budgeting for the Long Run," *Nature Materials*, vol. 10, June 2011, p. 407. See also House Committee on the Budget, *The Path to Prosperity-Restoring America's Promise*, Fiscal Year 2012 Budget Resolution, pp. 28-31 and Sarewitz, Daniel, "Science Agencies Must Bite Innovation Bullet," *Nature*, vol., 471, March 10, 2011, p. 137.

[65] See for example Chang, Kenneth, "Money for Scientific Research May Be Scarce with a Republican-Led House," *The New York Times*, November 4, 2010, p. B5. http://www.nytimes.com/2010/11/04/business/04research.html, and Mervis, Jeffrey, "How Science Eluded the Budget Ax-For Now," *Science*, vol. 332, April 22, 201, pp. 407-408.

[66] Basken, Paul, "As Universities Fend Off Budget Cuts, Some Researchers See Possible Benefits," *The Chronicle of Higher Education*, April 3, 2011, http://chronicle.com/article/As-Univerisites-Fend-Off/127000/.

[67] See, for example, Stewart, Pearl, "HBCU Merger Proposals Persist Despite Fervent Opposition," *Diverse Education*, March 11, 2011, http://diverseeducation.com/cache/print.php?articleId=14884; Desmond Harris, Jenee, "Another HBCU Down the Drain?" *The Root*, May 5, 2011, http://www.theroot.com/print/52162; and Minor, James T., Southern Education Foundation, "Merger Debates Waste Time," *Inside Higher Education*, http://www.insidehighered.com/views/2011/05/24/essay_arguing_that_black_colleges_are_best_helped_by_moving_beyond_merger_debates.

[68] Coleman, Toni and Joan Matthews, "Black Colleges Step Up Pursuit of Sponsored Research," *Diverse Education*, http://diverseeducation.com/cache/print.php?articleId=14582.

These are some of the questions being asked by many inside and outside of academia. A primary question before the 112th Congress is that with further budget reductions expected, how does the nation best reduce the deficit, balance the budget, strengthen the economy, and create jobs, while maintaining a strong national science and technology enterprise that promotes economic growth and job creation?

Appendix A. Federal Obligations for Science and Engineering R&D to the 100 Universities and Colleges Receiving the Largest Amounts, Ranked by the Total Amount Received in FY2007

(dollars in thousands)

Rank	Institution	All Agencies
	All institutions	$25,335,978
1	Johns Hopkins University	1,186,768
2	University of Washington	612,498
3	University of Michigan	501,837
4	University of Pennsylvania	498,549
5	University of California, Los Angeles	480,679
6	Duke University	470,842
7	University of California, San Diego	433,801
8	University of California, San Francisco	433,388
9	Harvard University	429,693
10	University of Pittsburgh all campuses	426,764
11	Columbia University, City of New York	426,399
12	Stanford University	425,931
13	Washington University, St Louis	407,809
14	Yale University	387,298
15	Massachusetts Institute of Technology	381,753
16	University of Minnesota	371,293
17	University of Wisconsin, Madison	369,310
18	Pennsylvania State University	355,300
19	University of North Carolina, Chapel Hill	353,478
20	Vanderbilt University	331,244
21	University of Colorado	330,323
22	Cornell University	326,385
23	Case Western Reserve University	278,897
24	University of Southern California	262,180
25	University of Rochester	255,201
26	Northwestern University	254,969
27	University of Chicago	248,571
28	Emory University	247,941
29	University of California, Davis	243,149

Rank	Institution	All Agencies
30	University of Alabama, Birmingham	235,077
31	Baylor College of Medicine	227,876
32	University of California, Irvine	219,585
33	Ohio State University	217,570
34	University of California, Berkeley	214,549
35	University of Arizona	212,504
36	University of Illinois, Urbana-Champaign	210,499
37	Boston University	208,680
38	University of Iowa	208,394
39	Scripps Research Institute	199,031
40	University of Virginia	198,978
41	University of Texas, Southwestern Medical Center, Dallas	191,047
42	Oregon Health and Science University	189,660
43	Mt Sinai School of Medicine	187,319
44	University of Florida	183,795
45	New York University	178,245
46	Georgia Institute of Technology	174,486
47	University of Illinois, Chicago	172,492
48	University of Texas, Anderson Cancer Center	168,188
49	Indiana University	166,980
50	University of Utah	164,684
51	California Institute of Technology	155,763
52	University of Maryland, Baltimore	154,340
53	University of Texas, Austin	153,631
54	University of Miami	141,255
55	University of Maryland, College Park	137,420
56	Michigan State University	135,080
57	Rutgers State University	131,147
58	Yeshiva University	128,547
59	Purdue University, all campuses	125,622
60	University of Massachusetts, Worcester	121,898
61	University of Kentucky	119,892
62	University of Cincinnati	117,316
63	Carnegie Mellon University	114,737
64	Wake Forest University	113,251
65	University of New Mexico	110,620
66	Princeton University	108,522

Rank	Institution	All Agencies
67	University of Kansas, all campuses	107,621
68	University of Connecticut, all campuses	102,501
69	University of Texas, Health Science Center, San Antonio	102,042
70	University of South Florida	101,953
71	University of Texas, Medical Branch	100,440
72	Dartmouth College	99,116
73	University of Texas, Health Science Center, Houston	98,144
74	University of California, Santa Barbara	97,962
75	Colorado State University	97,690
76	Medical College of Wisconsin	96,972
77	University of Hawaii, Manoa	93,157
78	Georgetown University	93,127
79	Brown University	92,839
80	Virginia Polytechnic Institute & State University	91,626
81	Arizona State University	91,094
82	Wayne State University	90,738
83	Medical University, South Carolina	89,358
84	Louisiana State University, all campuses	89,300
85	State University of New York, Stony Brook	89,070
86	Utah State University	84,997
87	North Carolina State University	83,400
88	University of Missouri, Columbia	81,760
89	Florida State University	79,677
90	Tufts University	79,336
91	University of Georgia	78,866
92	George Washington University	77,659
93	Virginia Commonwealth University	77,446
94	University of Vermont	77,296
95	Oregon State University	75,229
96	University of Massachusetts, Amherst	75,039
97	University of Hawaii, system office	74,914
98	University of Oklahoma, all campuses	74,845
99	Iowa State University	74,088
100	Rockefeller University	73,667
	All other institutions	4,412,079

Source: National Science Foundation, Division of Science Resources Statistics, *Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions*, FY2007, Table 7.

Appendix B. Federal Obligations for Science and Engineering R&D to the 100 Universities and Colleges Receiving the Largest Amounts, Ranked by the Total Amount Received in FY1997

(dollars in thousands)

Institution and Ranking	1997
Total, all institutions	$13,019,428
1 Johns Hopkins University	587,484
2 University of Washington	314,938
3 University of California, Los Angeles	216,958
4 Stanford University	315,686
5 University of Pennsylvania	242,011
6 University of Michigan	270,858
7 University of California, San Diego	246,181
8 Harvard University	215,939
9 University of California, San Francisco	222,045
10 Washington University, St. Louis	194,615
Total 1st 10 institutions	2,826,715
11 University of Minnesota	225,460
12 Columbia University City New York	209,604
13 University of Colorado	203,721
14 University of Wisconsin, Madison	195,287
15 Yale University	205,272
16 Massachusetts Institute of Technology	228,287
17 University of Pittsburgh, all campuses	176,721
18 Cornell University	204,466
19 University of North Carolina, Chapel Hill	165,365
20 Duke University	186,892
Total 1st 20 institutions	4,827,790
21 Pennsylvania State University	176,872
22 University of Southern California	156,099
23 University of California, Berkeley	150,140
24 University of Alabama, Birmingham	151,204
25 Case Western Reserve University	143,194
26 Baylor College of Medicine	94,634
27 University of Arizona	117,055

Institution and Ranking	1997
28 University of California, Davis	105,924
29 University of Illinois, Urbana-Champaign	125,787
30 University of Rochester	119,407
Total 1st 30 institutions	6,168,106
31 Northwestern University	108,238
32 Emory University	92,272
33 University of Chicago	119,411
34 California Institute of Technology	107,597
35 Scripps Research Institute	103,387
36 Ohio State University	107,261
37 Boston University	97,015
38 Vanderbilt University	106,732
39 University of Iowa	100,489
40 University of Texas, Austin	94,607
Total 1st 40 institutions	7,205,115
41 University of Florida	89,709
42 Indiana University	99,164
43 New York University	95,235
44 University of Utah	93,190
45 University of Virginia	90,292
46 University of Maryland, College Park	90,461
47 University of Texas, Southwestern Medical Center, Dallas	92,547
48 Mt Sinai School of Medicine	68,789
49 University of Miami	82,435
50 Oregon Health Sciences University	67,210
Total 1st 50 institutions	8,074,147
51 Yeshiva University	80,171
52 University of Illinois, Chicago	58,852
53 University of California, Irvine	67,327
54 Michigan State University	67,060
55 Rutgers State University	72,763
56 University of Maryland, Baltimore	68,574
57 University of Texas, Anderson Cancer Center	59,250
58 University of Medicine & Dentistry of New Jersey	57,085
59 Princeton University	71,162
60 Carnegie Mellon University	98,277

Institution and Ranking	1997
Total 1st 60 institutions	8,774,668
61 University Corporation for Atmospheric Research	16,361
62 University of New Mexico	46,507
63 Georgetown University	59,782
64 Purdue University, all campuses	79,279
65 University of Kentucky	61,450
66 Louisiana State University, all campuses	66,507
67 State University of New York, Stony Brook	75,920
68 University of Texas, Health Science Center, Houston	66,250
69 University of Cincinnati	52,942
70 University of Massachusetts, Worcester	49,424
Total 1st 70 institutions	9,349,090
71 Wake Forest University	52,927
72 Wayne State University	61,571
73 University of California, Santa Barbara	60,257
74 University of Texas Health Science Center, San Antonio	43,333
75 University of Hawaii, Manoa	55,043
76 Thomas Jefferson University	50,263
77 Medical College of Wisconsin	37,341
78 Oregon State University	58,050
79 University of Connecticut	48,255
80 University of Missouri, Columbia	38,486
Total 1st 80 institutions	9,854,616
81 Dartmouth College	45,771
82 University of Georgia	39,237
83 Colorado State University	57,472
84 North Carolina State University	55,216
85 Texas A&M University	59,691
86 University of Texas Medical Branch Galveston	46,227
87 University of Kansas	42,817
88 Virginia Commonwealth University	41,296
89 Brown University	44,119
90 Woods Hole Oceanographic Institution	55,476
Total 1st 90 institutions	10,341,938
91 Rockefeller University	43,820
92 University of Vermont	33,417
93 Georgia Institute of Technology	61,004

Institution and Ranking	1997
94 Medical University, South Carolina	39,060
95 University of South Florida	23,796
96 Utah State University	34,676
97 Florida State University	45,808
98 Mississippi State University	25,997
99 Virginia Polytechnic Institute & State University	53,227
100 Tufts University	43,300
Total 1st 100 institutions	10,746,043

Source: National Science Foundation, Division of Science Resources Statistics, Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions, Fiscal Year 2000, Table B-6.

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