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# UNIVERSITY RESEARCH: UNDERSTANDING ITS ROLE

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- The University of Wisconsin-Madison
- Vanderbilt University
- Washington University in St. Louis

Since World War II, the federal government has maintained a partnership with the nation's research universities, based on the bipartisan consensus that (1) the nation needs to invest its resources in curiosity-driven, competitively awarded basic research, and (2) basic research is best conducted at the nation's universities. As a result of that partnership, the federal government supports 60 percent of the research performed at universities.

While U.S. colleges and universities perform just 13 percent of total national research and development (R&D) funded by government and the private sector, they perform 56 percent of the nation's basic research, an element critical to the success of the overall enterprise.

Basic research creates the building blocks of future products and processes—some of which may be developed quickly and some of which may be developed decades or more down the road. Along with creating new knowledge, universities use their research activities to educate students who will become the next generation's scientists, engineers, teachers, and leaders in government and industry.

This fusion of education and cutting-edge research has been a unique feature of the U.S. university research system. The traditional European research model, for example, focuses research in special institutes that are not part of universities. The success of the U.S. model has made the nation's universities the envy of the world, and the model is now widely emulated. The U.S. continues to attract a significant number of the most talented international students for the extraordinary educational and training opportunities offered by the nation's research-intensive universities.

## Research and Development Categories

About 40 percent of total [R&D](#) expenditures by government and the private sector in the United States support research; about 60 percent support development. Research is typically divided into two categories: basic and applied. Although there is increasing overlap between basic and applied research, these designations are useful in explaining the two major functions of research.

**Basic Research** is aimed at gaining more comprehensive knowledge or understanding of the subject under study, without specific applications in mind. A few general examples of basic research would be research on the chemical properties of bacteria, analysis of the interaction of the oceans with the atmosphere, and investigation of neural pathways in the human brain.

**Applied Research** is aimed at gaining the knowledge or understanding to meet a specific, recognized need. Following on the examples of basic research, parallel examples of applied research would be using bacteria to inoculate plants against particular diseases, developing computer models of the atmosphere to improve weather forecasting, and creating drug therapies for brain-related illnesses.

**Development** is the transformation of research findings or knowledge into plans for new or improved products or processes. This includes product design, testing, creation of prototypes, and pilot projects. Development includes not only civilian products and processes, but also national defense weapons and systems.

## How Is U.S. R&D Organized and Funded?

While many observers focus on government spending for **R&D**, the largest sponsor and performer of R&D in the U.S. actually is private industry. In 2008, industry accounted for more than two-thirds of the total \$398 billion in R&D spending in the U.S., and performed 73 percent of the work. **However, nearly three-fourths of industry R&D spending is for development, not research.**

The federal government provides most of the rest of the funding for U.S. R&D. Federally funded R&D is performed primarily by industry, universities, and federal laboratories.

Despite its considerable size, the federal R&D enterprise is diffuse and highly competitive, with no centralized management. Within the federal government, there is no separately funded R&D budget. However, the White House Office of Management and Budget (OMB) tracks R&D spending across the federal agencies and agencies must follow government-wide management and financial regulations.

In the annual budget process, the President proposes funding levels and policy directions for federal R&D programs as part of the regular budget plans for each federal agency that sponsors research. These budget plans are developed through OMB, based on agency requests and on various political and financial considerations. The plans for R&D programs are reviewed by the President's Office of Science and Technology Policy (OSTP), which also coordinates White House interagency R&D projects, such as the National Nanotechnology Initiative.

The President's R&D proposals for each federal agency are then considered by the various committees of jurisdiction in Congress, which then approve, disapprove, or change them through authorization and appropriations bills. Thus, the nation's R&D enterprise—both public and private—is both decentralized and flexible. Many analysts believe decentralization is a major reason for the tremendous vitality and innovation that characterizes the U.S. R&D system.

## Where Does University Research Fit In?

University research is a vital building block of the nation's R&D enterprise. Universities performed 56 percent of the nation's basic research in 2008, or about \$39 billion of the national total of \$69 billion. For applied research, universities performed 12 percent of the nation's total in 2008, or about \$11 billion of the national total of \$89 billion.

## Who Funds University Research?

Universities receive research funding from many sources, including state and local governments, companies, and nonprofit organizations. By far the largest supporter of university research is the federal government. In 2009, the federal government provided \$33 billion, or about 60 percent, of the \$55 billion spent by universities on R&D. The next largest source was universities' own funding at \$11 billion, or 20 percent, followed by other nonprofit organizations at \$4.3 billion, or eight percent.

## **Six Key Federal Research Agencies**

A number of federal agencies support university research projects, but the six largest university research grantors are the National Institutes of Health (NIH) in the Department of Health and Human Services, the National Science Foundation (NSF), the National Aeronautics and Space Administration, and the Departments of Agriculture, Defense, and Energy.

Federal agencies support university research to further their agency missions. For example, NIH supports research to advance the understanding of biological systems, improve the control of disease, and enhance human health, while the Defense Department supports computer science and materials research to improve surveillance, operations, and weapons systems and to sustain national security. The exception is [NSF](#), whose mission is to fund fundamental research and education across all scientific and engineering disciplines, and which operates no laboratories of its own. Other federal agencies that fund university research include the Department of Homeland Security, the National Oceanic and Atmospheric Administration, and the National Institute of Standards and Technology.

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Funding figures from:

[New NSF Estimates Indicate that U.S. R&D Spending Continued to Grow in 2008](#), National Science Foundation, January, 2010.

[Universities Report \\$55 Billion in Science and Engineering R&D Spending for FY 2009](#), National Science Foundation, September, 2010.

***--Association of American Universities, January, 2011***