

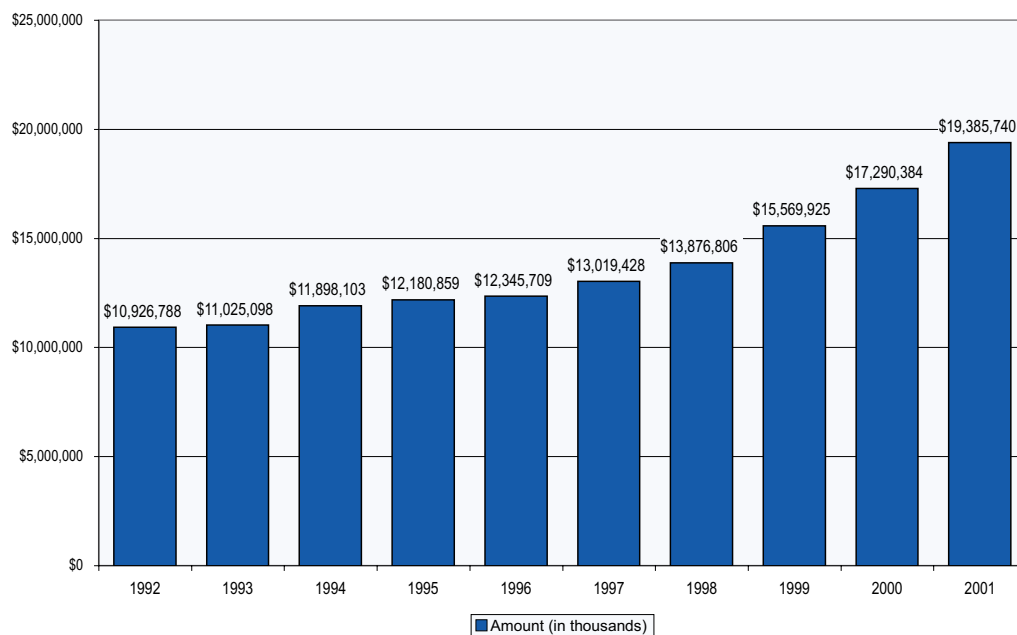
Because research universities are valuable to local, regional, and global economies, national public officials and industry leaders have widely recognized those benefits and have invested in improving the nation's research capacity. Over the past decade federal research funding has grown at record rates, and national senators and representatives have extolled the importance of investing in science, technology, and university research. Industry leaders have also supported university research and partnerships, with a \$10 billion investment since 2000.

Federal Support for Research Universities

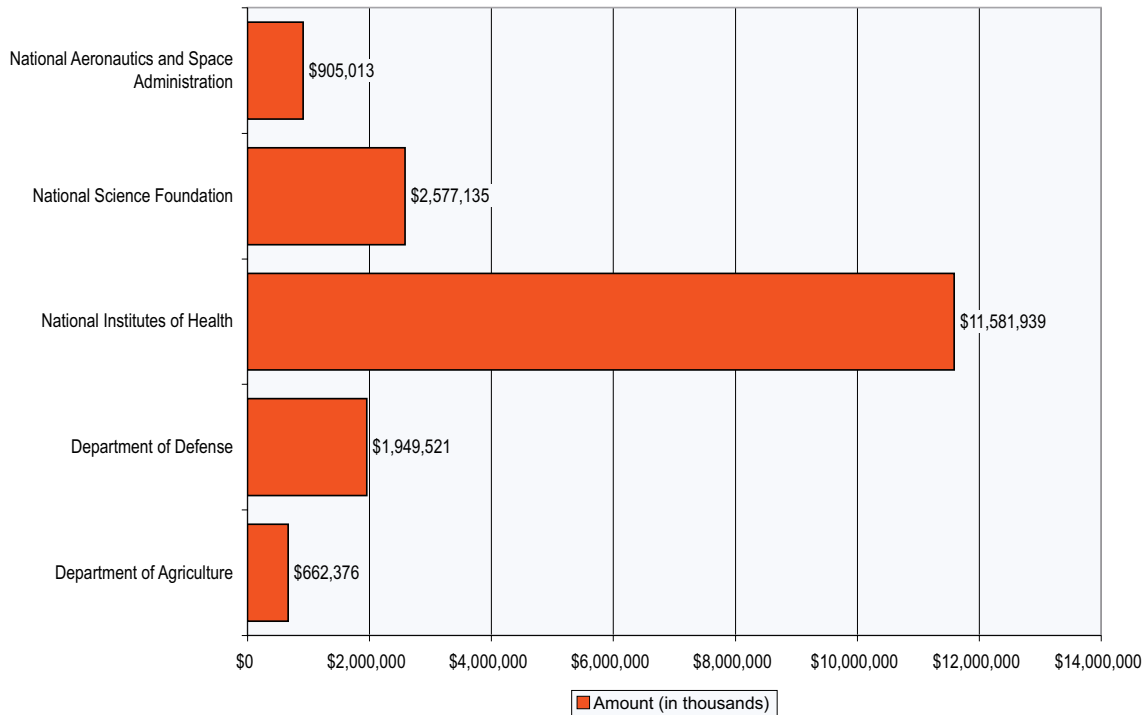
Federal Research Funding

Over the past decade, Federal funding for research has grown substantially. John Marburger, Director of the Office of Science and Technology policy, stated: "...the President provides an unprecedented level of investment in Federal R&D, marking the first time in history that a President has requested an R&D budget greater than \$100 billion. At \$112 billion in FY2002, up 8 percent overall from last year, this is the largest request increase for R&D in over a decade."¹

Federal Obligations for Academic R&D



R&D Funding, Selected Federal Agencies, 2001



Source: NSF WebCASPAR

The National Institutes of Health, the nation's largest sponsor of research, recorded the most substantial funding increases, with many of its program budgets doubling between 1998 and 2003.²

Major public investment in the National Institutes of Health (NIH), which has seen its budget double in the last 5 years to nearly \$27 billion for FY02 alone, has enabled the United States to both create a science and technology base in biotechnology and leverage substantial private investment in product and process applications.³

The National Science Foundation, which pays for 40 percent of all non-medical research projects at academic institutions, has been promised similar gains.⁴

Thanks to increases in Federal research spending, most universities across the country have been able to post significant gains in their overall research expenditures. This money has been used to increase the nation's overall research activity and innovation productivity.

A more conservative growth pattern, however, is anticipated in the coming years for Federal research spending.⁵ Despite the slower growth in funding for future Federal research, overall, many programs have experienced dramatically increased funding. For example, research spending at the Department of Homeland Security is scheduled to rise by 15 percent in 2005.⁶

No matter the level of Federal research funding, it is vital to maintain a foothold of research grants and contracts in diverse disciplines. Research grants are a major artery of university livelihood and regional economic health. Austere predictions of research funding should only steel a state's resolve to be more competitive in securing those research grants from diverse sources.

Budget forecasts also indicate that strong partnerships with industry are more important than ever. Relationships with industry partners can help diversify research funding.

Legislative and Agency Support for Research Universities

United States legislators and other government officials, recognizing the benefits of research universities to their home states and districts, have worked to ensure strong Federal funding for research. The following are selected remarks about the value of investments in science, technology, and university research:

U.S. Representative Sherwood Boehlert (R-NY):

Our research universities are such a vital national resource and I hope to ensure that they continue to play a significant role in our nation's scientific endeavors.⁷

U.S. Senator Kit Bond (R-MO):

Science in Missouri is extremely important. In this century, we're going to lead the way in developing life sciences breakthroughs that will not only contribute to improved human health, but a cleaner environment and help hungry people around the world.⁸

U.S. Senator Pete Domenici (R-NM):

Basic research is the engine that makes our national defense, homeland security, and economic security possible.⁹

U.S. Senator Kay Bailey Hutchison (R-TX):

The [research] money coming into our state means better students and faculty at our universities, greater opportunity within our communities, and more diverse industries for our state.

We need the engineers to come from our Texas universities. We want to attract the great minds and we want to keep them there. It also creates role models and mentors for our young people to also go into science and engineering.¹⁰

U.S. Senator Joseph Lieberman (D-CT)

Innovation comes from our universities, laboratories and private businesses, not from the government. But a government that neglects innovation neglects the economic future of America.... For innovation touches every corner of our economy. Technological advancements enable workers and companies do what they do better, faster and more efficiently.... Government can spark innovation by directly supporting basic and applied research.¹¹

U.S. Senator Patty Murray (D-WA):

Increased funding for research programs will lead to better products and to bigger markets for Washington.... Especially now, we must do all we can to support industries which will provide jobs and economic growth.¹²

U.S. Senator Pat Roberts (R-KS):

I believe strongly in the need for science and technology research as a tool to improve quality of life for all Americans. And after September 11, this research is not only vital for thriving in an economically competitive world, it must be vigorously pursued.... Research

is important. Every Federal and state dollar spent today will pay economic and social dividends many times over in coming years.... A renewed commitment today to our institutions of higher education and especially to science, engineering and technology research is a commitment to our nation's future.

*If you do not have the basic research or the basic infrastructure to support that research, you do not go ahead with the technology you need to keep the best and brightest at home and provide employment opportunities. It's as simple as that.*¹³

U.S. Senator Rick Santorum (R-PA):

*America is not going to be an economy that's going to survive on using existing technology. We're going to survive and we're going to grow by creating new technology and being at the forefront. We can't be a follower; we have to be a leader.*¹⁴

U.S. Senator James Sensenbrenner (R-WI):

*Basic science research is the engine of increased productivity for the American economy. Basic science research means more exports which means more jobs for the people of Wisconsin.*¹⁵

U.S. Representative Lamar Smith (R-TX):

*I think a focus on science is the smart thing. Science is the future, and high-tech jobs are the backbone of our economy.*¹⁶

U.S. Representative Zach Wamp (R-TN):

*For the dollars we invest at the Federal level, we get enormous benefits that far outweigh the investment.... Academia is actually the laboratories of ideas out there. It's competitiveness, new breakthroughs.*¹⁷

U.S. Senator Ron Wyden (D-OR):

There is nothing more important to me...than my work to help revive Oregon's flagging economy. I believe research universities are the sparkplugs of economic activity. With adequate research funding we can build a strong economy for Oregon for the 21st century.¹⁸

Research and the U.S. Commission on National Security/21st Century

The bi-partisan Hart-Rudman Commission on National Security to 2025 was established to redefine national security and to do so in a more comprehensive fashion than any other similar effort since 1947. The third phase of the commission report points out that one of the primary threats to our national security is the failure to invest in science, math, and engineering education:

In this Commission's view, the inadequacies of our systems of research and education pose a greater threat to U.S. national security over the next quarter century than any potential conventional war that we might imagine. American national leadership must understand these deficiencies as threats to national security. If we do not invest heavily and wisely in rebuilding these two core strengths, America will be incapable of maintaining its global position long into the 21st century.¹⁹

The Commission believes the fact that the nation's scientific and technological prowess is falling relative to other nations is a serious threat:

Our systems of basic scientific research and education are in serious crisis, while other countries are redoubling their efforts. In the next quarter century, we will likely see ourselves surpassed, and in relative decline, unless we make a conscious national commitment to maintain our edge.²⁰

There is also, however, opportunity in today's technological climate. Says the Commission:

We also face unprecedented opportunity. The world is entering an era of dramatic progress in bioscience

The world is entering an era of dramatic progress in bioscience and materials science as well as information technology and scientific instrumentation.

*and materials science as well as information technology and scientific instrumentation. Brought together and accelerated by nanoscience, these rapidly developing research fields will transform our understanding of the world and our capacity to manipulate it. The United States can remain the world's technological leader if it makes the commitment to do so.*²¹

Hart-Rudman Commissioner Newt Gingrich expounded on opportunities in science, technology, and the economy, and how research universities bring them together:

*My sense of the scale of the scientific revolution in the next 25 years is...if you are not in a position to have people who are first rate, you're just not going to be in the game. And so I would argue...every state...ought to be looking at what does it cost us to sustain a first-rate capability in science.... [In] Georgia for example, despite the fact that for a long time it was relatively poor and very agrarian, the existence of Georgia Tech and the Georgia Tech research facilities around the state really made a difference and is now really paying off in North Atlanta. And I think that kind of approach is one I would recommend to every single state in the country.*²²

Alan Greenspan

Alan Greenspan, chair of the Federal Reserve through an unprecedented four presidencies, is one of the foremost experts on the strength and nature of the U.S. economy. Greenspan is a champion of the research university, citing it as a primary component and catalyst of the country's economy and its transition into the information age.

Greenspan has noted that the United States economy is rapidly changing. "With the rapid adoption of information technology," he says, "the share of output that is conceptual rather than physical continues to grow." Much of this transformation, says Greenspan, is due to new innovation, especially in technology. He says: "Indeed, it is the proliferation of information technology throughout the economy that makes the current period appear so different from preceding decades.... As a result, information technologies have begun to alter significantly how we do business and create economic value, often in ways that were not foreseeable even a decade ago."²³

According to Greenspan, research universities are necessary to facilitate these sweeping economic changes on both the macro and micro levels, because they are uniquely

positioned to respond to new demands on human capital, technology innovation, and business development. He says:

*The advent of the twenty-first century will certainly bring new challenges for our society and for our education system.... [W]e can be certain that our institutions of higher education will remain at the center of the endeavor to comprehend those profound changes and to seize the opportunities to direct them toward ever-rising standards of living and quality of life.*²⁴

Throughout history, the nation's education systems, and research universities specifically, have helped its students gain the skills needed to operate in a changing economy. "The scale and scope of higher education in America was being shaped by the recognition that research—the creation of knowledge—complemented teaching and training—the diffusion of knowledge." This has been the case throughout the nation's development.²⁵

Today's economy is demanding an even higher standard: "Workers must be equipped not simply with technical know-how but also with the ability to create, analyze, and transform information and to interact effectively with others."²⁶ With the current conditions of an ever-changing economy, and two-thirds of high school graduates enrolling in college, with many adults reentering education, "our institutions of higher learning increasingly bear an important responsibility for ensuring that our society is prepared for the demands of rapid economic change," says Greenspan.²⁷

Universities must also accommodate rapid economic change on the technological front. Again, Alan Greenspan:

*In a global environment in which prospects for economic growth now depend importantly on a country's capacity to develop and apply new technologies, our universities are envied around the world. The payoffs—in terms of the flow of expertise, new products, and startup companies, for example—have been impressive.*²⁸

One of the greatest payoffs of research universities, according to Greenspan, is the tech cluster, or what he calls "significant centers of commercial innovation and entrepreneurship."²⁹ In these clusters, "creative ideas flow freely between local academic scholars and those in industry. State support, both for the university system and for small business, has been an important element in the vitality of these centers," Greenspan says.³⁰

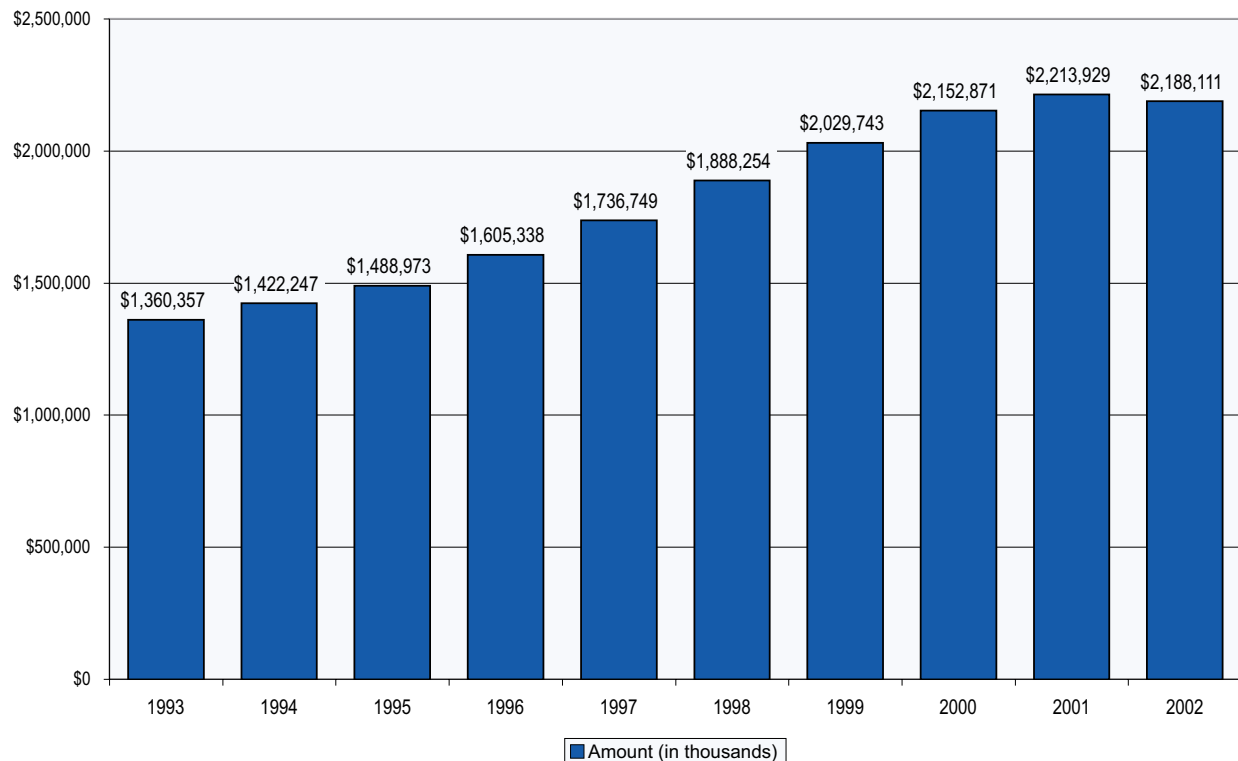
Greenspan also stresses the importance of state support for research universities. At the 92nd Annual Meeting of the National Governor's Association, Greenspan gave advice to state executives about operating in the new economy:

States with more flexible labor markets, skilled work forces, and a reputation for supporting innovation and entrepreneurship will be prime locations for firms at the cutting edge of technology.... Your leadership as policy-makers will be a key element in promoting an environment in which you join with others in business, labor, and education to realize the potential that technological change has for bringing substantial and lasting benefits to our economy.³¹

Industry Support for Research Universities

Since 2000, industry has sponsored more than \$10 billion in university research and development. Even after the dot-com meltdown and nationwide recession, industry investment in research has barely slowed and is expected to increase dramatically over the coming years. As more partnerships between business and universities develop, the pace of industry investment accelerates. Already, nationwide industry R&D expenditures for universities have nearly surpassed all R&D expenditures by state and local government.³²

Industry-financed Academic R&D Expenditures



Noting the benefits of research partnerships with universities, leading industry professionals and stakeholders have voiced their support for technology innovation, basic research, and support for higher education.

Microsoft / Bill Gates

Former Washington governors Daniel J. Evans (R) and Booth Gardner (D) recall an instance in 2002 when Microsoft Corp. Chairman Bill Gates was asked after a speech, “What is the most important single thing that can be done to assure a prosperous economic future?”

Gates’ reply: “Support your local university.”³³

Microsoft is one notable example of a high-tech company that is eagerly creating partnerships with university talent. Bill Gates has repeatedly emphasized the importance of research universities and the partnerships forged between them and industry.

A few examples from Bill Gates:

*[Aug. 2, 2004] Our commitment to higher education has been and will continue to be broad and strong. Academic institutions worldwide remain at the forefront of software innovation, driven by the possibilities of pure research and a limitless imagination.... Together, we’re exploring new research frontiers of innovation that will transform computing and create a better future for people around the world.*³⁴

*[July 28, 2003] The research and technologies coming out of university computer science, engineering and research facilities are truly amazing, which is why we continue to be so excited about our collaboration and investment with academia. And, like our academic partners, we are optimistic that the answers to the toughest computing questions are just beginning to take shape through new breakthroughs.*³⁵

[July 28, 2003] One thing that university research is fantastic for is that each different university, or groups within a university, can go off and take a new approach. We want to make sure that we’re a collaborator, helping out, providing tools, providing what we know, and then seeing which of the approaches are making the advances, and making sure that we, along with

*other companies like startups, can take that and make sure it has the impact in the marketplace that it should have.*³⁶

Microsoft has recently backed up Gates' words by establishing several formal university research partnerships, including programs to identify, recognize, and support exceptional computer researchers; programs that will work with universities to simplify code generation, optimization and program analysis issues; summits for the exchange of ideas among faculty researchers; and other research pursuits.³⁷

Top management at Microsoft also supports research partnerships with universities. Douglas Leland, worldwide director of the Microsoft Research University Relations group, says, "Our success as an industry depends on the tremendously talented people who graduate every year from universities. The relationship between industry and academia fuels a cycle of innovation, a 'virtuous cycle,' and we see it as a corporate imperative to engage in and nurture this cycle."³⁸

Anne Craib, director of international trade, Semiconductor Industry Association

*If you have a decrease in funding for universities, by definition what you're doing is lowering the quality of facilities and professors and basic infrastructure to educate your future engineers or technicians.*³⁹

Business and Finance Magazine

*In recent decades increasing attention at both local and national levels has been given to the subject of technology transfer. In the US, collaboration between industry and universities has led to some impressive results with universities such as Stanford leading the field. Indeed, most of the world's leading high-technology clusters are centered around such universities.*⁴⁰

Raymond Gilmartin, CEO of Merck & Co.

*Markets will not tolerate slower-moving regions that do not continue to innovate—and create environments conducive to innovations.*⁴¹

William R. Hambrecht, president, W.R. Hambrecht & Co., LLC

The competitive challenge for the future is likely to come not just from low-cost producers, but from low-cost innovators. Because the innovator club is growing, the United States must look to the fundamentals to sustain a competitive environment; support for basic research that creates the seedcorn for innovation, an assured talent pool, and the legal, regulatory, and accounting rules that can incent (or impede) industry investment in innovation.⁴²

Mark Hanny, IBM vice president

Companies must be prepared for disruption, and universities must devote sufficient resources and investment to getting ahead of the curve of this new era. IT must be an integral part of any company's new planning process. As such, we need a deeper partnership between academia and business to ensure that the students of today are qualified for the IT jobs of tomorrow.⁴³

Joint Resolution of the Semiconductor Industry Association board of directors

Funding for fundamental research in physical sciences and engineering performed at America's research universities is the single most important public-policy issue facing the industry today because of the long-term implications for both technology and workforce.⁴⁴

Ross Perot, founder of EDS and former U.S. presidential candidate

A significant factor impeding the productive capacity of the US is the lack of resources devoted to research. Germany and Japan are far ahead of us on non-defense research, and probably even farther ahead in applying it to productive purposes. The U.S. needs to place a greater emphasis on research that adds to our quality of life and has commercial value as well. The Federal government could facilitate this effort by [budgetary] spending priorities and changes in the tax laws to encourage private research.⁴⁵

Casey Porto, technology transfer expert and consultant, Case Western University

Any company that partners with the universities in these research areas is already leveraging millions and millions of dollars of state money. That is about as much risk mitigation as you can have in research.... When the company is spun out, it sounds like it's a new, risky endeavor, but the fact is the investors or the entrepreneurs spinning out the company at that point are leveraging all this Federal money that's gone into that research for years. That's why it's attractive for investors and entrepreneurs to start companies based on university technology. It didn't just get discovered yesterday. It's usually after many, many people have worked many years and spent millions of dollars.⁴⁶

Willem P. Roelandts, president and chief executive officer, Xilinx Inc.

Unless governments step in and restimulate the long-term research in universities, I believe we are not going to see the rate of innovation we have seen in previous years.... The government should work through universities to stimulate research. That is an area where the government can really play an important role.⁴⁷

David Tennenhouse, Intel Corp.'s director of research

Despite all that industry labs are doing to advance electronic devices, university research remains the key to future progress.... There is great science being done at universities.⁴⁸