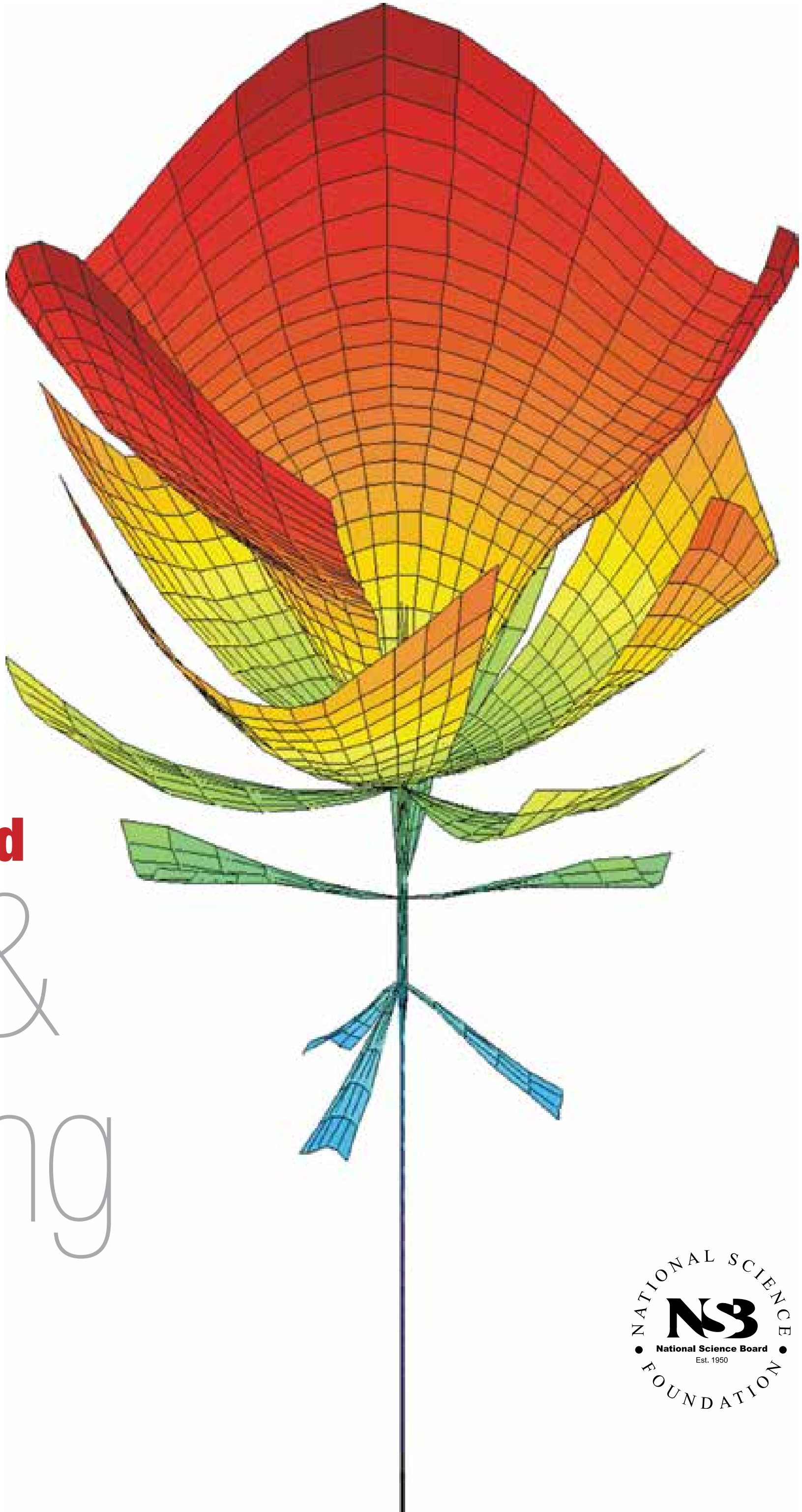
NATIONAL SCIENCE FOUNDATION

2014 DIGEST



National Science Board

Science & Engineering Indicators

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PREFACE

The National Science Board (Board) is required under the National Science Foundation (NSF) Act, 42 U.S.C. § 1863 (j) (1) to prepare and transmit the biennial *Science and Engineering Indicators (SEI)* report to the President and to the Congress every even-numbered year. The report is prepared by the NSF National Center for Science and Engineering Statistics (NCSES) under the guidance of the Board. It is subject to extensive review by Board members, outside experts, interested federal agencies, and NCSES internal reviewers for accuracy, coverage, and balance.

Indicators are quantitative representations relevant to the scope, quality, and vitality of the science and engineering (S&E) enterprise. *SEI* is a factual and policy-neutral source of high-quality U.S. and international data; it neither offers policy options nor makes policy recommendations. The indicators included in the report contribute to the understanding of the current S&E environment.

This digest of key S&E indicators draws from the Board's *Science and Engineering Indicators 2014*, the 21st volume of this biennial series. The digest serves to draw attention to important trends and data points from across *SEI 2014* and to introduce readers to the data resources available in the report. Readers are invited to explore each of the key indicators presented here in more detail in the full report. To that end, each indicator presented in this digest refers to the *SEI 2014* chapter or chapters from which it was drawn. The complete *SEI 2014* report and related resources are available on the Web at www.nsf.gov/statistics/indicators/.

Readers may also be interested in the online resources associated with *SEI 2014*. A list and description of these products appears at the end of this digest. The Board hopes that readers will take advantage of these rich sources of information.

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INTRODUCTION

The United States holds a preeminent position in science and engineering (S&E) in the world, derived in large part from its long history of public and private investment in S&E research and development and education. Investment in R&D, science, technology, and education correlate strongly with economic growth and with the development of a safe, healthy, and well-educated society.

Many other nations, recognizing the economic and social benefits of such investment, have increased their R&D and education spending. These trends are by now well-established and will challenge the world leadership role of the United States.

Major S&E Indicators

The National Science Board has selected 41 S&E indicators for inclusion in this digest. These indicators have been grouped into seven themes. Although each stands alone, collectively these seven themes are a snapshot of U.S. R&D capacity and outputs in the context of global trends affecting them. Exploration of areas that indicate capacity for innovation is a thread common to many of the themes presented here. As economies worldwide grow increasingly knowledge-intensive and interdependent, capacity for innovation becomes ever more critical.

Three themes provide a worldwide view, picturing R&D spending, research outputs, and STEM education. Four others share a domestic focus, providing information on U.S. R&D funding and performance, federal R&D support, the U.S. S&E workforce, and public research universities. Indicators may vary in successive volumes of the *Science and Engineering Indicators* series as different S&E policy issues emerge.

What These Indicators Tell the Nation

By selecting a set of indicators, the Board seeks to contribute to the assessment of the state of U.S. science and engineering and to highlight issues of current opportunity or concern. These measures address an emerging set of trends of particular interest to planners and policymakers at all levels whose decisions affect our national S&E enterprise.

GLOBAL R&D: MEASURING COMMITMENT TO INNOVATION

WHY IS THIS IMPORTANT?

Innovation in the form of new goods, services, or processes builds new knowledge and technology, contributes to national competitiveness, improves livings standard, and furthers social welfare. Research and development is a major driver of innovation. R&D expenditures indicate the priority given to advancing science and technology relative to other national goals.

A. HOW MUCH?

R&D expenditures worldwide are estimated to have exceeded $1.4 trillion in 2011, up from $753 billion a decade earlier.

B. WHERE?

Global R&D expenditures are highly concentrated in three regions: Asia, North America, and Europe.

The seven countries with the largest R&D expenditures together accounted for nearly three-fourths of total global R&D in 2011. The United States remains the largest R&D performer and accounted for almost one-third of worldwide R&D total in 2011. China is now the second largest R&D performing nation, accounting for about 15% of the worldwide total.

C. GROWTH

Asian countries have led the growth in worldwide R&D expenditures over the past decade, with China accounting for about one-fourth of the total global growth.

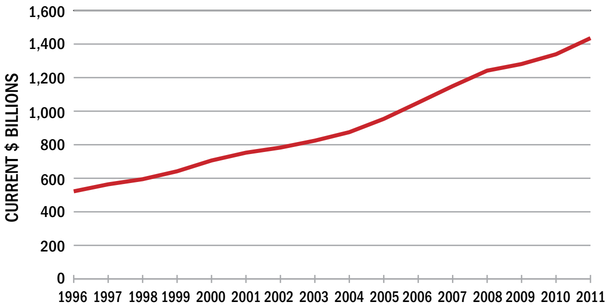
Asian countries have led the pace of R&D expansion as well. Between 2001 and 2011, China's R&D expanded the most rapidly followed by South Korea. By comparison, the pace of growth has been much slower in the United States and the European Union. Rapid R&D growth in Asia overall reflects private spending by domestic and foreign firms as well as increased public R&D spending.

D. INTENSITY

R&D intensity is the proportion of a country's economic activity (gross domestic product) devoted to R&D investment. Historically, Japan has had higher R&D intensity than most other large economies, but South Korea recently surpassed it.

China's R&D intensity has increased sharply since the mid-1990s, as growth in R&D outpaced a rapid expansion in GDP. China's R&D intensity is approaching that of the European Union but remains well below South Korea, Japan, and the United States.

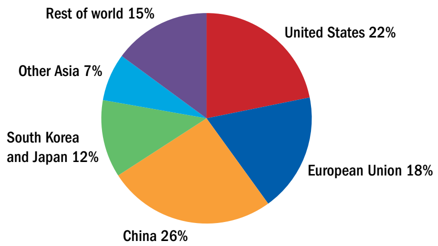
Estimated R&D expenditures worldwide: 1996–2011



SEI 2014: **Global Pattern of R&D Expenditures**, Chapter 4.

A

Contributions of selected countries/regions/economies to growth of worldwide R&D expenditures: 2001–11

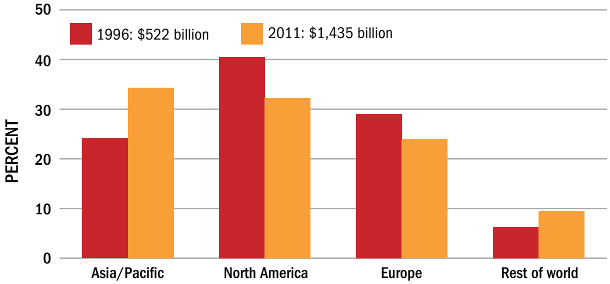


NOTE: Other Asia includes India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, and Thailand.

SEI 2014: **Global Pattern of R&D Expenditures**, Chapter 4.

C1

Regional share of worldwide R&D expenditures: 1996 and 2011

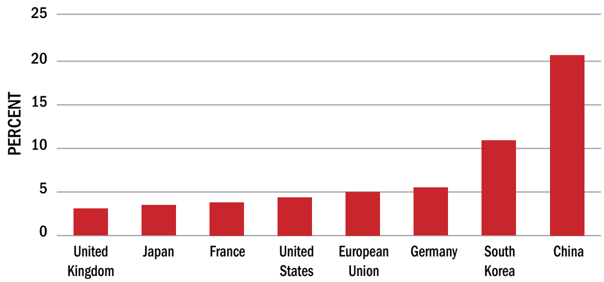


NOTE: Asia/Pacific includes China, Taiwan, Japan, South Korea, Singapore, Malaysia, Thailand, Indonesia, Philippines, India, Pakistan, and Sri Lanka.

SEI 2014: **Global Pattern of R&D Expenditures**, Chapter 4.

B1

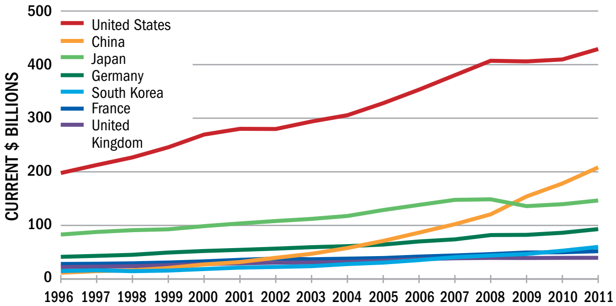
Average annual growth in domestic R&D expenditures of selected countries/economies: 2001–11



SEI 2014: **Global Pattern of R&D Expenditures**, Chapter 4.

C2

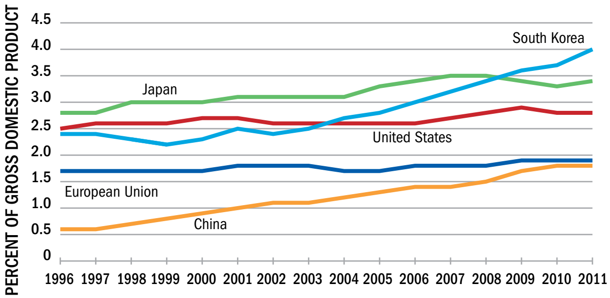
Domestic R&D expenditures for selected countries: 1996–2011



SEI 2014: **Global Pattern of R&D Expenditures**, Chapter 4.

B2

R&D expenditures as a share of economic output for selected countries/economies: 1996–2011



SEI 2014: **Comparison of Country R&D Intensities**, Chapter 4.

D

U.S. R&D: FUNDING AND PERFORMANCE

WHY IS THIS IMPORTANT?

Businesses, government, academia, and nonprofit organizations all fund and perform R&D. The outcomes and benefits depend not only on the total funds devoted to R&D but also on the types of R&D these funds support—basic research, applied research, and development.

A. TRENDS

U.S. R&D support exceeded $424 billion in 2011. R&D support rose in 2011, following a decline in 2010 in the aftermath of the economic downturn. Overall, U.S. R&D investment grew by half in the last decade (21% after adjusting for inflation).

Industry, long the nation's largest supporter of R&D, increased its 2011 funding, offsetting a decline in federal R&D funding.

B. DEVELOPMENT AND APPLIED RESEARCH

Resources for development and applied research—work that aims at practical application, new products, or novel processes—rose in 2011, propelled by a nearly $21 billion increase in industry funding. Industry provides the largest share of funding for development and applied research.

Industry also performs the largest share by far of the nation's development and applied research. The federal government and academic and other nonprofit institutions perform the remainder.

C. BASIC RESEARCH

Basic research is directed primarily toward increasing knowledge or understanding and has long relied on federal government support. Federal funding for basic research, however, has mostly dropped since 2004. Although funding from academic and other nonprofit institutions combined has exceeded that from industry throughout the past decade, industry funding for basic research has risen overall since 2006.

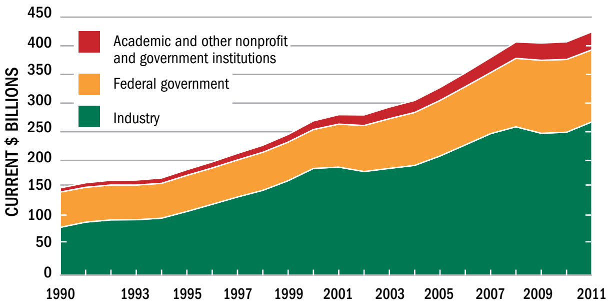
Universities and colleges are the prime performers of the nation's basic research, a role they uniquely combine with the training of new researchers. Industry's share of basic research performance has recently risen after years of decline; the federal government's share has gradually diminished.

D. ACADEMIC R&D

Most of the R&D performed by the academic sector is basic research. Funding sources for academic R&D have been relatively stable for nearly two decades, with the federal government continuing to fund about 60% of academic R&D, and institutions' own funds constituting the next largest share.

A

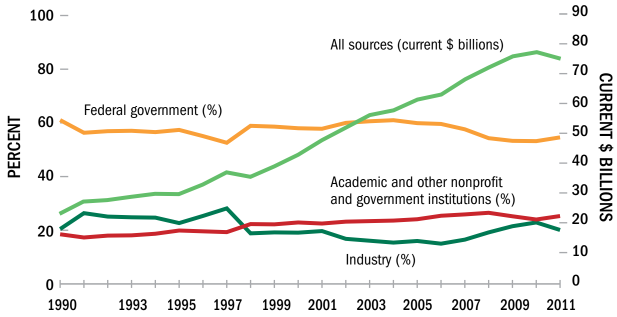
U.S. R&D expenditures, by source of funds: 1990–2011



SEI 2014: **Sources of R&D Funding**, Chapter 4.

C1

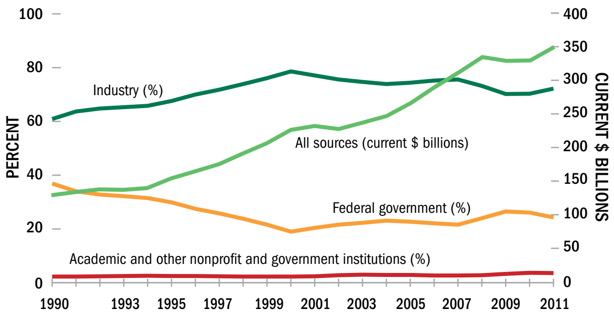
Funding sources for U.S. basic research: 1990–2011



SEI 2014: **Sources of R&D Funding** and **R&D, by Character of Work**, Chapter 4.

B1

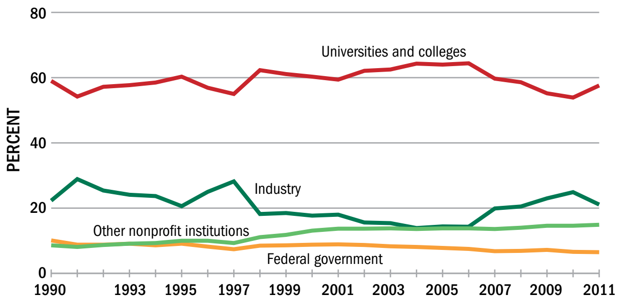
Funding sources for U.S. development and applied research: 1990–2011



SEI 2014: **Sources of R&D Funding** and **R&D, by Character of Work**, Chapter 4.

C2

Performers of U.S. basic research: 1990–2011

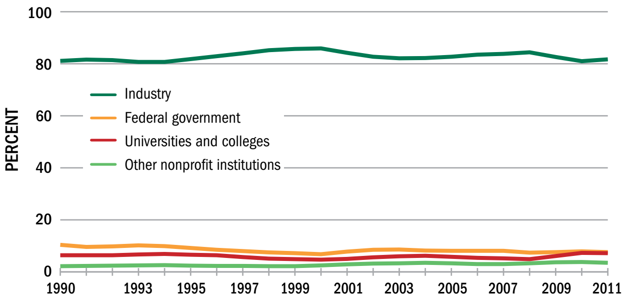


NOTE: The data for federal government are intramural only.

SEI 2014: **Performers of R&D** and **R&D, by Character of Work**, Chapter 4.

B2

Performers of U.S. development and applied research: 1990–2011

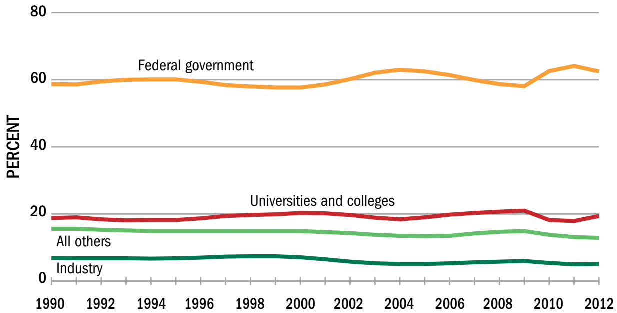


NOTE: The data for federal government are intramural only.

SEI 2014: **Performers of R&D** and **R&D, by Character of Work**, Chapter 4.

D

Funding sources for U.S. academic R&D: 1990–2012



SEI 2014: **Expenditures and Funding for Academic R&D**, Chapter 5.

U.S. R&D: FEDERAL PORTFOLIO

WHY IS THIS IMPORTANT?

The distribution of R&D funds by the U.S. federal government provides insight into the nation's broad mission priorities for public expenditures.

A. TRENDS

Federal investment in R&D declined in 2010 and 2011, reaching $126 billion in 2011. However, federal R&D support increased consistently during the decade of the 2000s, rising by more than two-thirds overall between 2001 and 2011 (34% after adjusting for inflation).

B. FOCUS

The majority of the federal R&D budget is devoted to defense. About half of the federal nondefense R&D budget is devoted to health and is funded primarily through the National Institutes of Health. In the past 20 years, as a proportion of all nondefense R&D, health and general science accounts have risen the most. The 2009 boost in nondefense, health, and general science accounts was driven by federal stimulus funds.

C. PERFORMERS

Different institutions bring different perspectives and approaches to R&D. Academic and other nonprofit institutions, which tend to concentrate on basic research, have generally received steadily increasing federal support. Industry, heavily focused on development and applied research, has seen a doubling of federal funding (not adjusting for inflation) since 2001 after a decade of no growth.

D. TYPE OF WORK

For nearly 20 years, funding of basic and applied research has accounted for at least half of federal funding of R&D.

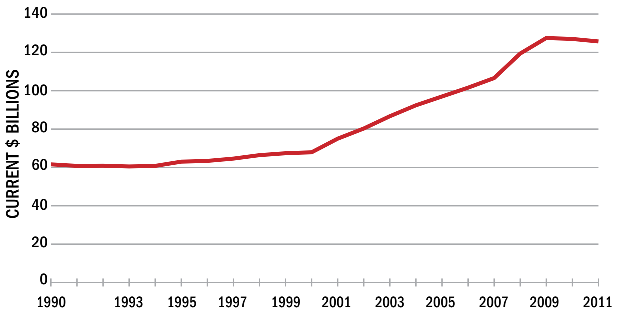
During the 2000s, federal funding of development activities grew more than federal funding of basic and applied research, driven primarily by federal stimulus funds and reversing the trend seen in the previous decade.

E. S&E FIELDS

The life sciences have accounted for about half of the federal research portfolio (basic and applied research) since 2001.

Over the past decade, federal research funding has varied little in most S&E fields. The environmental sciences saw the largest decline in federal research dollars. Starting from a low base and propelled by psychology, the combined category of social sciences and psychology saw the largest increase.

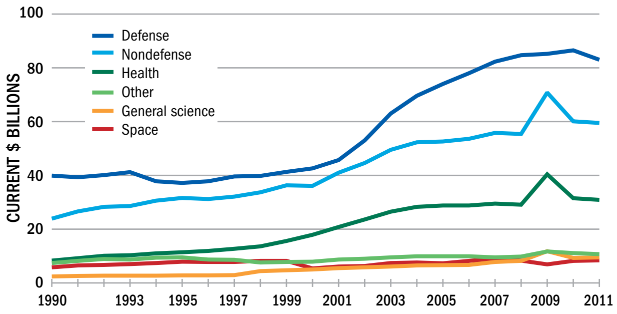
Federal spending on R&D: 1990–2011



SEI 2014: **Sources of R&D Funding**, Chapter 4.

A

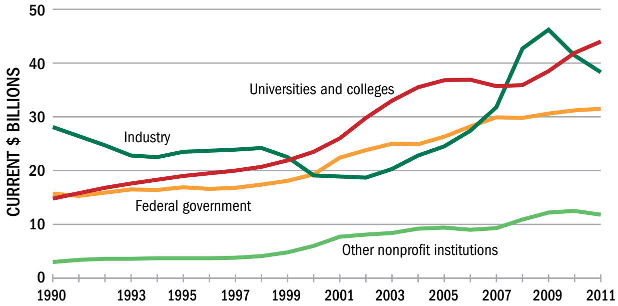
Federal R&D budget, by national objectives: FYs 1990–2011



SEI 2014: **Federal R&D Budget, by National Objectives**, Chapter 4.

B

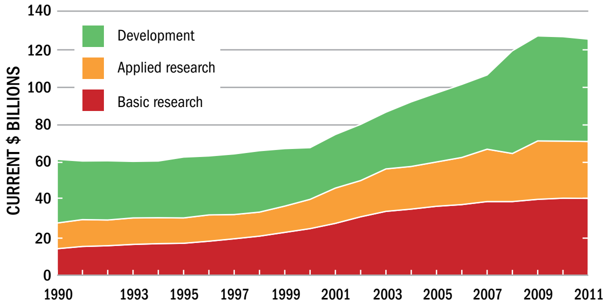
Federal spending on R&D, by performer: 1990–2011



NOTE: The data for federal government are intramural only.
SEI 2014: **R&D Funding by the Federal Government**, Chapter 4.

C

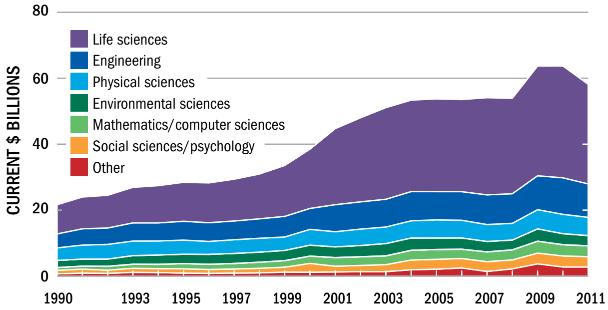
Federal R&D funds, by type of work: 1990–2011



SEI 2014: **R&D, by Character of Work**, Chapter 4.

D

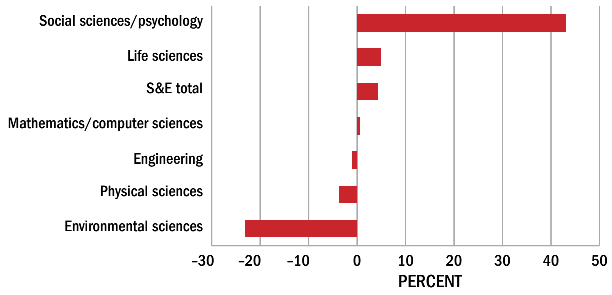
Federal basic and applied research funds, by S&E field: 1990–2011



SEI 2014: **Federal Spending on Research, by Field**, Chapter 4.

E1

Inflation-adjusted change in federal basic and applied research funds, by S&E field: 2001–11



SEI 2014: **Federal Spending on Research, by Field**, Chapter 4.

E2

U.S. AND GLOBAL STEM EDUCATION

WHY IS THIS IMPORTANT?

Education at all levels in science, technology, engineering, and mathematics—STEM—develops, preserves, and disseminates knowledge and skills that convey personal, economic, and social benefits. Higher education provides the advanced work skills needed in an increasingly knowledge-intensive, globally-integrated, and innovation-based economic landscape.

A. K-12 MATHEMATICS AND SCIENCE

Over the past two decades, U.S. students' mathematics scores on national assessments have modestly improved.

U.S. 15-year olds tend to score slightly lower than the international average in mathematics and have scores about equal to the international average in science.

B. U.S. BACCALAUREATES

U.S. output of total bachelor's degrees has increased by more than half over two decades, reflecting a rising trend in college attendance. Natural sciences and engineering degrees have consistently constituted about one-sixth of the total.

The increases in certain natural sciences degrees—physical sciences and mathematics—and in engineering degrees generally reflect the size of the college-age cohort rather than a rise in the number of students who major in those fields. In contrast, the number of biological and agricultural sciences degrees rose during most of the last two decades. Computer sciences degrees rose through the dot.com bubble and then declined and leveled off during the second half of the 2000s.

C. INTERNATIONAL BACCALAUREATES

The number of degrees in natural sciences and engineering fields has risen much faster in China than in the United States.

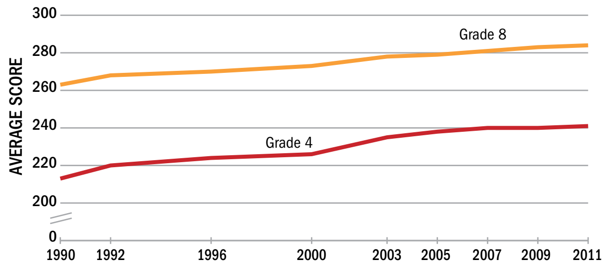
Natural sciences and engineering fields account for a much larger proportion of all bachelor's degrees in China than in the United States. In 2010, these fields accounted for 44% of all bachelor's degrees in China, compared with 16% of all bachelor's degrees in the United States.

D. INTERNATIONAL DOCTORATES

Advanced training towards the doctorate has expanded in recent years. The numbers of doctoral degrees in natural sciences and engineering have risen dramatically in China, whereas the numbers awarded in the United States, South Korea, and many European countries have risen more modestly.

In 2010, China graduated the largest number of doctorate recipients in natural sciences and engineering of any individual country, followed by the United States. In the United States, however, only 57% of these doctorates were earned by citizens or permanent residents, and temporary visa holders earned the remainder.

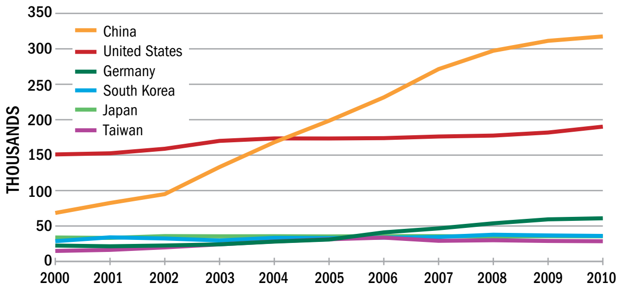
Average NAEP mathematics scores of U.S. students in grades 4 and 8: 1990–2011



NAEP = National Assessment of Educational Progress.
SEI 2014: **Mathematics and Science Performance in Grades 4 and 8**, Chapter 1.

A1

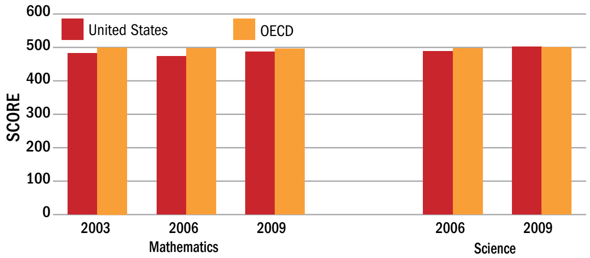
Bachelor's degrees in natural sciences, by selected country/economy: 2000–10



SEI 2014: **First University Degrees in S&E Fields**, Chapter 2.

C1

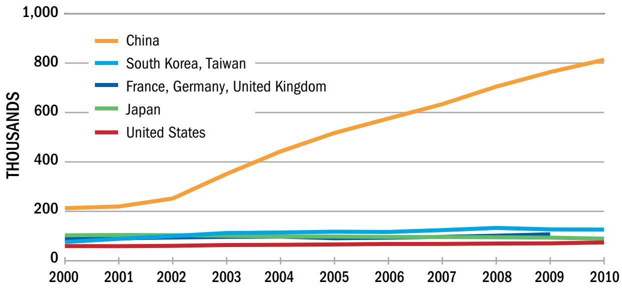
Average mathematics and science PISA test scores of U.S. and OECD 15-year olds: 2003–09



PISA = Program for International Student Assessment; OECD = Organisation for Economic Co-operation and Development.
SEI 2014: **International Comparisons of Mathematics and Science Performance**, Chapter 1.

A2

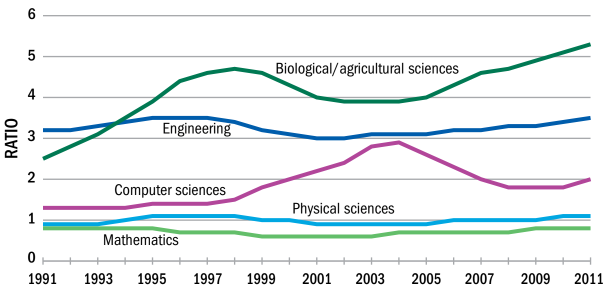
Bachelor's degrees in engineering, by selected country/economy: 2000–10



SEI 2014: **First University Degrees in S&E Fields**, Chapter 2.

C2

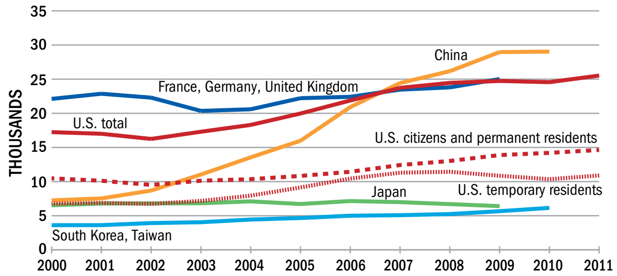
U.S. bachelor's degrees in selected S&E fields per 1,000 20–24-year olds: 1991–2011



SEI 2014: **Undergraduate Degree Awards**, Chapter 2.

B

Doctoral degrees in natural sciences and engineering, by selected country/economy: 2000–11



SEI 2014: **Global Comparison of S&E Doctoral Degrees**, Chapter 2.

D

U.S. S&E WORKFORCE: TRENDS AND COMPOSITION

WHY IS THIS IMPORTANT?

Workers with S&E expertise are an integral part of a nation's innovative capacity. Their high skill level and inventiveness provide them with the ability to not only advance basic scientific knowledge, but also to transform that knowledge into useful products and services.

A. WORKFORCE GROWTH

The U.S. S&E workforce—made up of chemists, mathematicians, economists, engineers, and other such workers—has grown faster over time than the workforce overall. Over the past 50 years it has grown fivefold and now represents more than 4% of all U.S. jobs.

During and after the 2007–09 recession, employment in S&E or S&E related jobs was generally more resilient than was overall employment.

B. UNEMPLOYMENT

For decades, workers in S&E occupations have almost always had lower unemployment than workers in other types of jobs. The unemployment rate for college-graduate workers in S&E occupations is generally lower than it is for college-graduate workers in non-S&E occupations, and it is far lower than the overall unemployment rate. However, S&E workers are not immune to overall business cycles, as the spikes in S&E unemployment in the 2001 and the 2007–09 recessions illustrate.

C. WOMEN AND UNDERREPRESENTED MINORITIES

Despite accounting for nearly half of the college-educated workforce, women in 2010 accounted for less than one-third of S&E employment. Although the number of women in S&E jobs has risen significantly in the past two decades, the disparity has narrowed only modestly.

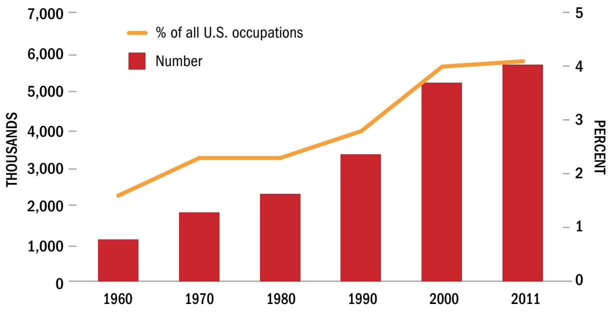
Similarly, although underrepresented minorities—blacks, Hispanics, and American Indians or Alaska Natives—have made substantial strides, their representation in S&E jobs remains below their proportion in the population.

For both women and underrepresented minorities, growth in participation slowed during the 2000s. Women's presence varies widely across S&E occupations. For underrepresented minorities, variation among occupations, although present, is much less pronounced.

D. IMMIGRANTS

Foreign-born scientists and engineers, whether educated in the United States or abroad, are a critical part of the U.S. S&E workforce. Among individuals with their highest degree in an S&E field, 33% of master's degree holders and 42% of doctorate holders are foreign born. Reliance on foreign-born scientists and engineers is greatest on those with engineering and mathematics and computer sciences degrees. More than half of the doctorate holders in these fields are foreign born.

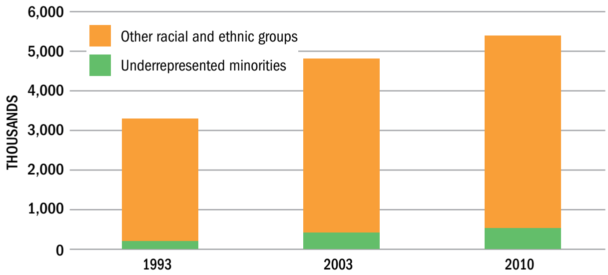
Individuals in S&E occupations in the United States: 1960–2011



SEI 2014: **Growth of the S&E Workforce**, Chapter 3.

A

Underrepresented minorities in S&E occupations: 1993, 2003, and 2010

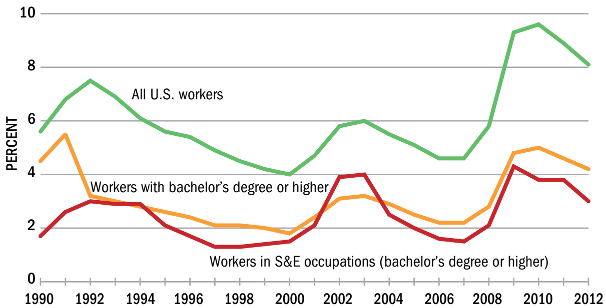


NOTE: Underrepresented minorities comprise blacks, Hispanics, and American Indians and Alaska Natives in 2003 and 2010 and blacks and Hispanics in 1993.

SEI 2014: **Women and Minorities in the S&E Workforce**, Chapter 3.

C2

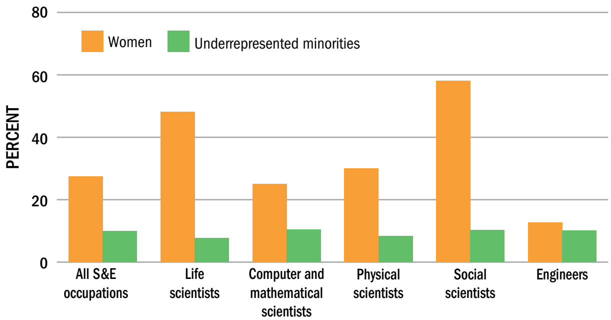
Unemployment rates for selected groups of workers: 1990–2012



SEI 2014: **S&E Labor Market Conditions**, Chapter 3.

B

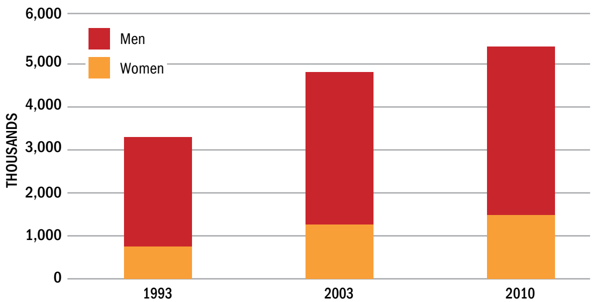
Women and underrepresented minorities in S&E occupations: 2010



SEI 2014: **Women and Minorities in the S&E Workforce**, Chapter 3.

C3

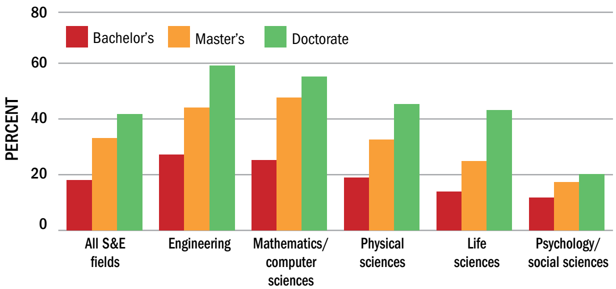
Men and women in S&E occupations: 1993, 2003, and 2010



SEI 2014: **Women and Minorities in the S&E Workforce**, Chapter 3.

C1

Foreign-born graduates whose highest degree is in S&E, by level and field of degree: 2010



SEI 2014: **Immigration and the S&E Workforce**, Chapter 3.

D

RESEARCH OUTPUTS: PUBLICATIONS AND PATENTS

WHY IS THIS IMPORTANT?

Research produces new knowledge, products, or processes. Research publications reflect contributions to knowledge, patents indicate useful inventions, and citations on patents to the scientific and technical literature indicate the linkage between research and practical application.

A. PUBLICATIONS

The United States publishes more S&E articles than any other country. The combined output of the European Union, however, is larger than that of the United States.

Asia's S&E research article output is approaching parity with the United States and the European Union. Between 1997 and 2011, Asia's output more than doubled, led primarily by China. In 2011, China produced 11% of the world's S&E articles, more than any country except the United States.

B. ENGINEERING ARTICLES

Engineering is vital to knowledge-intensive and technologically advanced economies, and many Asian economies are building their engineering capabilities.

In 2011, China published 17% of the world's engineering articles, equaling the U.S. share. U.S. publications, however, continue to receive more citations. Asia as a whole published more than twice as many engineering articles as the United States and 50% more than the European Union in 2011. The output of engineering articles is rising in the European Union and, more gradually, in the United States.

C. PATENTS

Patents protect the property rights of inventors. As knowledge-intensive economic activities expand worldwide, patent awards are rising. Inventors from around the globe seek patent protection in the United States because of its large and open market. U.S. inventors now account for just under half of all U.S. patents. Inventors in the European Union and Japan receive most of the U.S. patents awarded to non-U.S. inventors, with growing numbers of U.S. patents awarded to inventors in Taiwan and South Korea. Although growing, U.S. patents awarded to inventors in China and India remain modest.

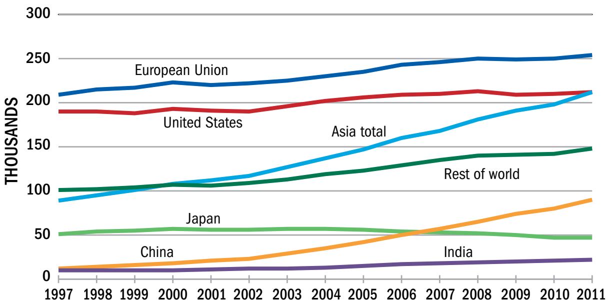
Information and communications technologies (ICT) and health-related technologies account for nearly half of all U.S. patents granted. During the last decade, the number of ICT patents climbed much more steeply than the number of health-related patents.

D. SCIENCE-PATENT LINKAGE

Patents cite the prior scientific and technological knowledge on which they are built. A growing proportion of U.S. patents, whether awarded to U.S. or foreign inventors, cites research in published scientific articles as an influence.

A

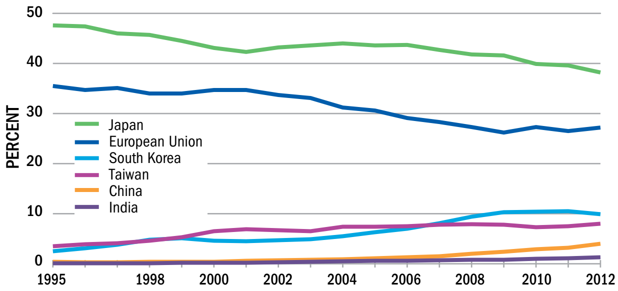
S&E articles, by selected country/region/economy: 1997–2011



NOTE: Asia total includes China, India, and Japan.
SEI 2014: **S&E Article Output**, Chapter 5.

C1

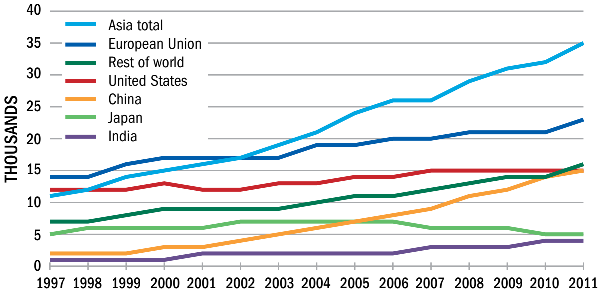
U.S. patents granted to non-U.S. inventors, by country/region/economy: 1995–2012



SEI 2014: **Global Trends in Patenting**, Chapter 6.

B

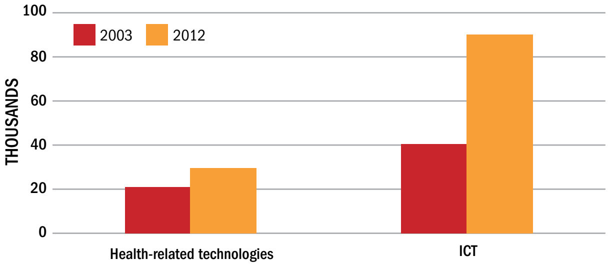
Engineering articles, by selected country/region/economy: 1997–2011



NOTE: Asia total includes China, India, and Japan.
SEI 2014: **S&E Article Output**, Chapter 5.

C2

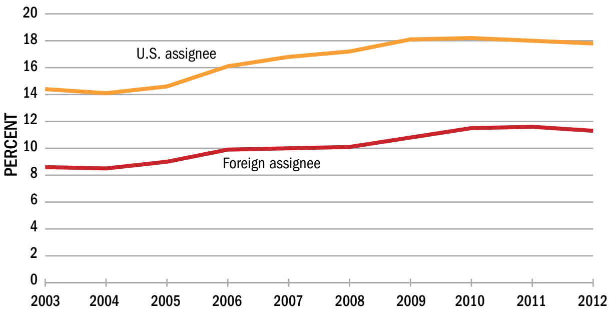
U.S. patents granted in ICT and health-related technologies: 2003 and 2012



ICT = information and communications technology.
SEI 2014: **U.S. Patent and Trademark Office Patents Granted, by Technology Area**, Chapter 6.

D

U.S. patents that cite S&E literature, by ownership: 2003–12



SEI 2014: **Citation of S&E Articles by USPTO Patents**, Chapter 5.

PUBLIC RESEARCH UNIVERSITIES

WHY IS THIS IMPORTANT?

Public and private research universities contribute to innovation and economic competitiveness. Public research universities play a special role in supplying S&T expertise to state and local governments and businesses and providing a broad cross section of students with access to high-quality STEM education in a research-oriented environment. Declining funding, increasing student enrollments, and rising costs pose formidable challenges to their mission.

A. ENROLLMENT AND DEGREES

Research universities are the leading producers of S&E degrees in the United States. Public research universities grant the majority of the S&E degrees awarded by these universities.

Public research universities also account for the majority of all research-university enrollment.

B. R&D

Along with their private counterparts, public research universities play an essential role in the production of academic research. Public universities account for the majority of all research-university R&D expenditures.

C. AFFORDABILITY

Public institutions have traditionally offered less-affluent students an avenue to a high quality, affordable education. In the last two decades, however, the cost of attending public research universities has risen steeply, coinciding with a decline in state and local appropriations, a significant source of institution revenue. Adjusted for inflation, tuition and fees per full-time student rose sharply between 1987 and 2010—143%—in the most research-intensive public universities; state and local appropriations per full-time student fell 28% in that period.

The sharp rise in tuition coincided with nearly stagnant household incomes. Between 1987 and 2010, median household income in the United States grew only 3% after adjusting for inflation.

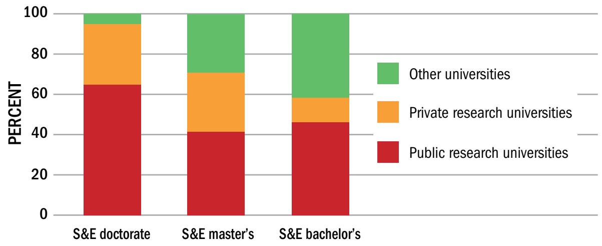
Despite their steep increase in tuition and fees, public research universities remain less expensive than private research universities.

D. INVESTMENT IN HIGHER EDUCATION

The sum of U.S. economic resources devoted to higher education remains competitive in the global context. Along with Canada and South Korea, the United States devotes a larger proportion of its gross domestic product to higher education than do other developed countries.

A1

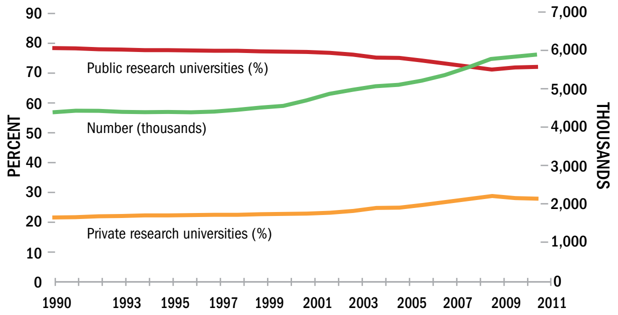
S&E degrees produced by research and other universities, by level of degree: 2011



NOTE: Other universities include master's- and bachelor's-awarding universities and colleges, special focus institutions, associates colleges, and tribal colleges.
SEI 2014: **Universities Providing S&E Education**, Chapter 2.

A2

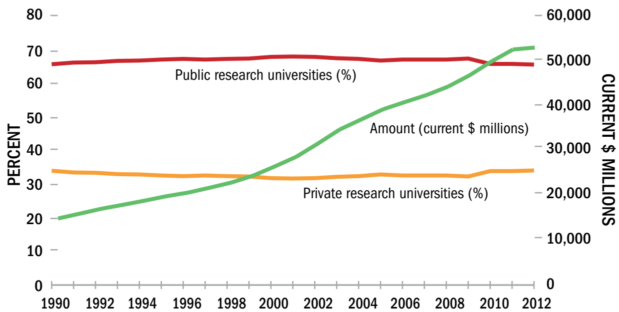
Enrollment in research universities: 1990–2011



SEI 2014: **The U.S. Higher Education System**, Chapter 2.

B

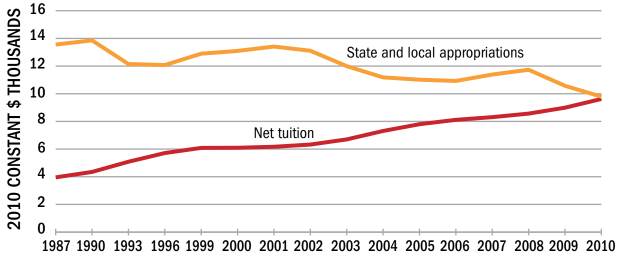
S&E R&D expenditures of research universities: 1990–2012



SEI 2014: **Expenditures and Funding for Academic R&D**, Chapter 5.

C1

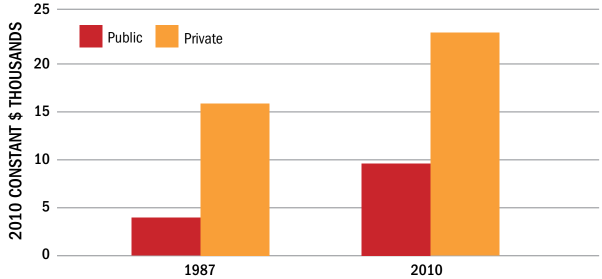
Tuition and state and local appropriations in U.S. public research universities: 1987–2010



NOTES: Data are per full-time equivalent student and for the most research-intensive universities. Net tuition data reflect tuition after subtracting institutional grant aid.
SEI 2014: **Trends in Higher Education Expenditures and Revenues**, Chapter 2.

C2

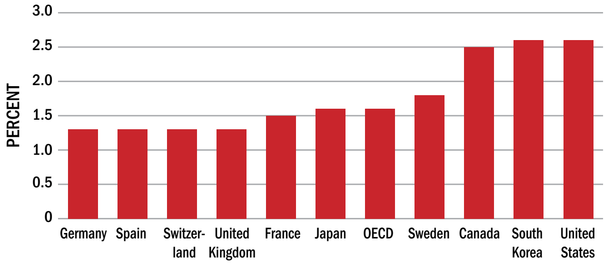
Tuition and fees in U.S. research universities: 1987 and 2010



NOTES: Data are per full-time equivalent student and for the most research-intensive universities. Net tuition data reflect tuition after subtracting institutional grant aid.
SEI 2014: **Trends in Higher Education Expenditures and Revenues**, Chapter 2.

D

Spending on higher education as a share of GDP for selected countries or country group: 2009



GDP = gross domestic product; OECD = Organisation for Economic Cooperation and Development.
NOTES: Data for Canada are for 2008. Data for Switzerland include public expenditures only.
SEI 2014: **Higher Education Expenditures**, Chapter 2.

GLOSSARY AND KEY TO ACRONYMS

Applied research. Systematic study to gain knowledge or understanding to meet a specific, recognized need.

Basic research. Systematic study to gain more comprehensive knowledge or understanding of the subject under study without specific applications in mind.

Development. Systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

GDP. Gross domestic product. The market value of all final goods and services produced within a country within a given period of time.

European Union (EU). As of June 2013, the EU comprised 27 member nations: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. Croatia joined the EU in July 2013. Unless otherwise noted, Organisation for Economic Co-operation and Development data on the EU include all 28 members; data on the EU from other sources are limited to the 27 nations that were members as of June 2013.

NCSES. National Center for Science and Engineering Statistics, National Science Foundation.

NSB. National Science Board.

NSF. National Science Foundation.

Natural sciences. Agricultural, biological, computer, and physical sciences (including earth, atmospheric, and ocean sciences), and mathematics.

R&D. Research and development.

R&D intensity. R&D as a proportion of gross domestic product.

Research university. The Carnegie Classification of Institutions of Higher Education considers *doctorate-granting universities* that award at least 20 doctoral degrees per year to be research universities. The 2010 Carnegie Classification includes three subgroups of research universities based on the level of research activity: very high research activity (108 institutions), high research activity (99 institutions), and doctoral/research universities (90 institutions).

S&E. Science and engineering.

S&E occupations. Biological, agricultural, and environmental life scientists; computer and mathematical scientists; physical scientists; social scientists; and engineers. S&E managers and technicians, and health-related occupations are categorized as S&E-related and are not included in S&E.

S&T. Science and technology.

SEI. Science and Engineering Indicators.

EXPLORE FURTHER

To read more about the themes presented in this digest, please see the Overview chapter as well as the more detailed analysis and fuller discussion of the related topics presented in *SEI 2014*. Each theme is matched with its source *SEI 2014* chapter or chapters in the list below. *SEI 2014* also provides a wealth of detailed information on public attitudes and understanding of science and engineering (Chapter 7) and state-level comparisons of selected science and engineering indicators (Chapter 8).

Global R&D: Measuring Commitment to Innovation

- Chapter 4. Research and Development: National Trends and International Comparisons

U.S. R&D: Funding and Performance

- Chapter 4. Research and Development: National Trends and International Comparisons
- Chapter 5. Academic Research and Development

U.S. R&D: Federal Portfolio

- Chapter 4. Research and Development: National Trends and International Comparisons

Global STEM Education

- Chapter 1. Elementary and Secondary Mathematics and Science Education
- Chapter 2. Higher Education in Science and Engineering

U.S. S&E Workforce: Trends and Composition

- Chapter 3. Science and Engineering Labor Force

Research Outputs: Publications and Patents

- Chapter 5. Academic Research and Development
- Chapter 6. Industry, Technology, and the Global Marketplace

Public Research Universities

- Chapter 2. Higher Education in Science and Engineering
- Chapter 5. Academic Research and Development

SEI 2014 ONLINE RESOURCES

The complete *SEI 2014* report and its related resources, described below, are available on the Web at www.nsf.gov/statistics/indicators/. An interactive version of this digest is available online at www.nsf.gov/statistics/digest/.

Companion piece. The Board's companion pieces are "companion" policy statements to *SEI 2014*. The Board focuses on trends that it believes raise important policy concerns and should be brought to the attention of the President, Congress, and the public.

State data tool. The state data tool allows interactive exploration of 59 indicators of state trends in science and technology education, workforce, finance, and R&D. Users have the ability to choose and explore a single indicator in depth, compare multiple indicators for preselected groups, customize their own graphics, or download data tables.

Presentation graphics. Presentation graphics, in PowerPoint slide and image (JPEG) formats and accompanied by their supporting data (Excel), are based on figures in the Overview chapter of *SEI 2014*.

Source data. Data supporting each figure, table, and appendix table in *SEI 2014* are available for download in Excel format. Links are provided on the *SEI 2014* main page to the lists of figures, tables, and appendix tables, each organized by chapter.

ACKNOWLEDGMENTS

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Proprietary data in "Research Outputs: Publications and Patents" were provided by Thomson Reuters, Science Citation Index and Social Sciences Citation Index, http://thomsonreuters.com/products_services/science/; analytical support for article and patent data was provided by The Patent Board™, http://patentboard.com/.

Cover image

The flower-like structure on the cover of *Science and Engineering Indicators 2014* is a graph that illustrates potential energy surfaces in a molecule called sym-triazine. The theoretical approach behind the graph is part of a larger effort that helped explain how sym-triazine can simultaneously break into three parts. Most molecules break apart one step at a time, so the phenomenon is rare. Researchers at the University of Southern California used computational chemistry tools to produce the graph, explaining the experimental results obtained by collaborators at the University of California, San Diego. The researchers reported their findings in the August 8, 2008, issue of the journal *Science*. This work was supported by the National Science Foundation under the auspices of the iOpenShell (Center for Computational Studies of Electronic Structure and Spectroscopy of Open-Shell and Electronically Excited Species). (Credit: *Vadim Mozhayskiy and Anna I. Krylov, Department of Chemistry, University of Southern California*.)

www.nsf.gov/statistics/digest/

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