

FY 2016 Performance and Financial Highlights

Who We Are and What We Do

- The mission of the National Science Foundation (NSF) is to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense.
- NSF's vision is of a Nation that creates and exploits new concepts in science and engineering and provides global leadership in advancing research and education.
- NSF supports research and workforce development programs that help drive future economic growth and enhance our Nation's security and global competitiveness.
- NSF seeks high-risk, potentially transformative research that will generate pioneering discoveries and advance exciting new frontiers in science.
- NSF funds advanced instrumentation and facilities; Arctic and Antarctic research and operations; cooperative research between universities and industry; and U.S. participation in international scientific efforts.



NSF by the Numbers	
\$7.5 billion	FY 2016 Appropriations (does not include mandatory accounts)
1,883	Colleges, universities, and other institutions receiving NSF funding in FY 2016
49,300	Proposals evaluated in FY 2016 through a competitive merit review process
11,900	Competitive awards funded in FY 2016
225,000	Proposal reviews conducted in FY 2016
362,000	Estimated number of people NSF supported directly in FY 2016 (researchers, postdoctoral fellows, trainees, teachers, and students)
53,800	Students supported by NSF Graduate Research Fellowships since 1952

From the Director



Credit: NSF/Stephen Voss

I am pleased to present NSF's *FY 2016 Performance and Financial Highlights*, our annual report that provides key financial and performance information to our stakeholders and the American people. NSF's mission is to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense. For nearly seven decades,

NSF has stayed true to its mission by playing a critical role in establishing U.S. leadership in science and engineering fields, fostering innovations that drive the economy and supporting the best tools to address threats, whether natural or manmade. In addition, NSF has supported efforts to find and train new talent and improve science education at every level.

Often, the long-term returns on NSF investments lead to new technologies, new understandings of our world, and new insights into the human condition. These discoveries keep our Nation at the forefront of the world's science and engineering enterprise. FY 2016 provided an opportunity to witness the effects of NSF investments: In February 2016, we announced that researchers at the Laser Interferometer Gravitational-Wave Observatory (LIGO) detected gravitational waves coming from colliding black holes 1.3 billion lightyears away. This discovery, made possible by decades of NSF support, has opened up a new way to observe and understand our universe.

With funding received from NSF in FY 2016, engineers are exploring and modeling new water technologies and systems for water treatment, distribution, reuse, and recovery to address the growing demand for water. Neuroscientists and bioengineers funded by NSF are researching cutting-edge technologies to better understand the brain—innovations that could lead to solutions that replace or compensate for lost function. And, NSF-supported researchers are working to understand and be prepared for extreme events, such as tornados, floods, earthquakes, and landslides.

Financial accountability and effective business processes are key to the success of NSF's programmatic activities and crucial to the achievement of the agency's mission. This report includes summary information about NSF's performance during FY 2016. NSF fully achieved five of eight performance goals with targets in the past fiscal year. Available performance data were independently verified and validated using guidelines for completeness and reliability from the Government Accountability Office. NSF's *Annual Performance Report* contains a discussion of NSF's data validation, including any limitations, and progress toward its annual performance goals.

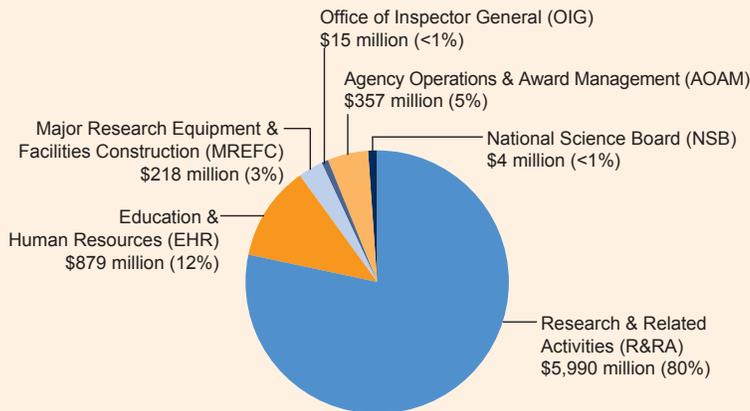
I invite you to review NSF's *FY 2016 Agency Financial Report* and our website at www.nsf.gov to learn more about NSF's investments in science and engineering research and education that create knowledge and transform our future.

France A. Córdova
May 23, 2017

Following the Money

Where It Comes From

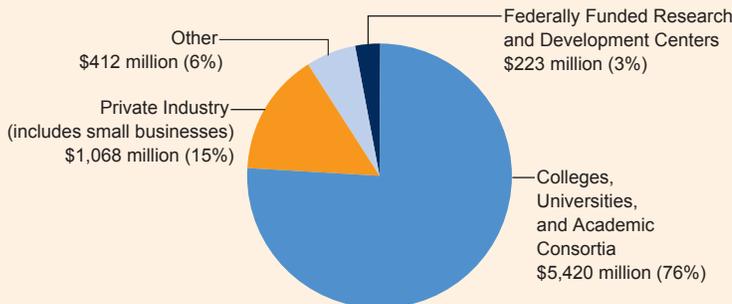
FY 2016 Appropriations by Account—\$7,463 million



Notes: AOAM includes \$27 million in transfers for NSF headquarters relocation expenses. Transfers to AOAM were as follows: R&RA (\$24 million), EHR (\$1 million), and MREFC (\$2 million). MREFC includes \$20 million transferred from R&RA to fund NEON construction. These transfers were authorized by P.L. 114-113, Consolidated Appropriations Act, 2016. Totals may not add due to rounding.

Where It Goes

Institutions Funded by NSF
FY 2016 Obligations for Research and Education Programs—\$7,124 million

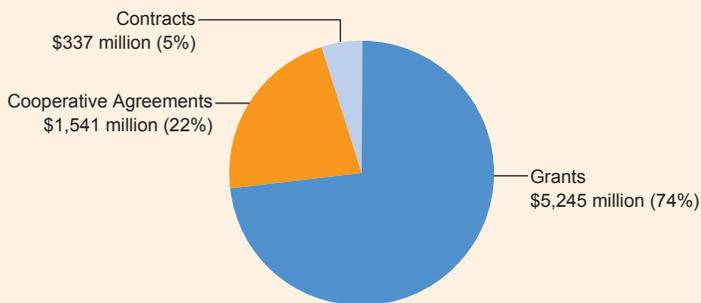


Notes: NSF Research and Education Programs include Research & Related Activities, Education & Human Resources, and Major Research Equipment & Facilities Construction appropriations. Other institutions funded include Federal, State, and local governments; nonprofit organizations; and international organizations. Totals may not add due to rounding.

How It Gets There

NSF Award Mechanisms

FY 2016 Obligations for Research and Education Programs—\$7,124 million

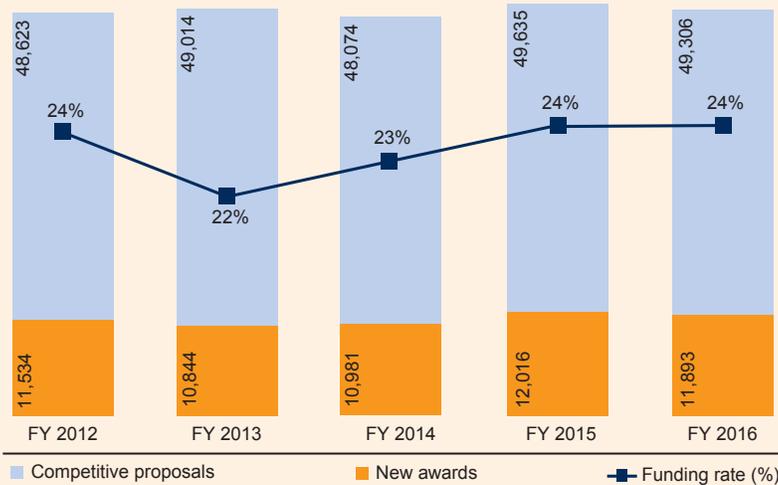


Notes: NSF Research and Education Programs include Research & Related Activities, Education & Human Resources, and Major Research Equipment & Facilities Construction appropriations. Totals may not add due to rounding.

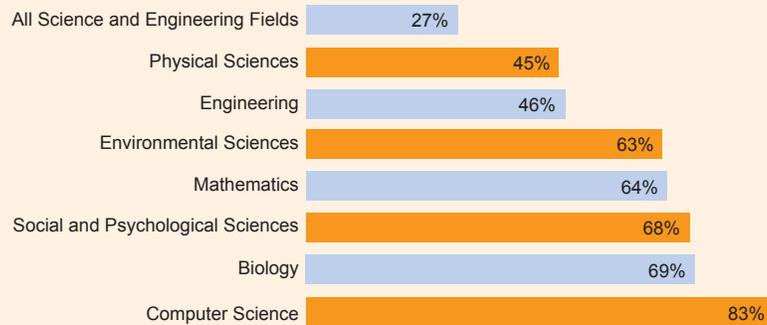
- NSF is funded primarily through six congressional appropriations, which totaled \$7,463 million in FY 2016. R&RA, EHR, and MREFC fund the agency's programmatic activities and account for 95 percent of NSF's total appropriations. The AOAM appropriation provides funds to administer and manage those programmatic activities. Separate appropriations are provided to support the activities of the OIG and NSB. (Appropriations acronyms are spelled out in chart to the left.)
- In FY 2016, 90 percent of research funding was allocated based on competitive merit review. Over 34,000 members of the science and engineering community participated in the merit review process as panelists and proposal reviewers. Awards were made to 1,883 institutions in 50 States, the District of Columbia, and 3 U.S. territories. These institutions employ America's leading scientists, engineers, and educators, and they train the leading innovators of tomorrow.
- Seventy-six percent of support for research and education programs (\$5,420 million) was to colleges, universities, and academic consortia. Private industry, including small businesses, accounted for 15 percent (\$1,068 million), and support to Federally Funded Research and Development Centers accounted for 3 percent (\$223 million). Other recipients (\$412 million) included Federal, State, and local governments; nonprofit organizations; and international organizations. A small number of awards funded were for international research collaborations that add value to the U.S. scientific enterprise.
- Most NSF awards (over 95 percent) were funded through grants or cooperative agreements. Grants can be funded either as standard awards, in which funding for the full duration of the project is provided in a single fiscal year, or as continuing awards, in which funding for a multiyear project is provided in increments. Cooperative agreements are used when the project requires substantial agency involvement (e.g., research centers, multi-use facilities). Contracts are used to acquire products, services, and studies (e.g., program evaluations) required primarily for NSF or other government use.

How It's Spent

Number of NSF Competitive Proposals, New Awards, and Funding Rates



NSF Support of Academic Basic Research in Selected Fields (as a percentage of total federal support)



Notes: Biology includes Biological Sciences and Environmental Biology. Biology and Psychological Sciences exclude National Institutes of Health funding from the total amount of Federal support.

Source: NSF/National Center for Science and Engineering Statistics, Survey of Federal Funds for Research & Development, FY 2015

- Between FY 2015 and FY 2016, the number of competitive proposal actions was stable and in excess of 49,000.
- The number of new awards in both FY 2015 and FY 2016 was approximately 12,000.
- The overall funding rate in FY 2016 stayed level with FY 2015, at 24 percent.
- In FY 2016, an estimated 362,000 people were directly involved in NSF programs and activities, receiving salaries, stipends, or participant support. Beyond this, NSF programs indirectly impact millions of people. These programs reach kindergarten through 12th-grade students and teachers, the general public, and researchers through activities including workshops; informal science activities such as museums, television, videos, and journals; outreach efforts; and dissemination of improved curricula and teaching methods.
- NSF accounts for approximately 27 percent of the total Federal budget for basic research conducted at U.S. colleges and universities, and this share increases to approximately 60 percent when medical research supported by the National Institutes of Health is excluded. In many fields, NSF is the primary source of Federal academic support.

FY 2016 Financial Management Performance Results

	Results
Financial Statement Audit* <ul style="list-style-type: none"> • Unmodified opinion (19th consecutive “clean” opinion) • Material weaknesses 	Yes None
Management Assurances <ul style="list-style-type: none"> • Effective internal control over operations, reporting, and compliance (FMFIA §2 and §4) • Compliance with Section 803(a) of FFMIA: system requirements, accounting standards, and U.S. General Ledger at transaction level 	Yes No lack of compliance noted
Improper Payments Elimination and Recovery Act of 2010	Compliance
Federal Risk and Management Authorization Program (FedRAMP) certification of financial systems	Yes

* NSF's FY 2016 Independent Auditors' Report is in NSF's FY 2016 Agency Financial Report.

FMFIA: Federal Managers Financial Integrity Act of 1982

FFMIA: Federal Financial Management Improvement Act of 1996

How We Are Doing: Performance Results

In FY 2016, NSF tracked progress toward the three strategic goals in its Strategic Plan, *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. Nine performance goals were tracked, of which two were Agency Priority Goals (APGs).

- The Strategic Plan contains seven Strategic Objectives, which are comprehensive of all agency program activities. These Objectives underwent an annual Strategic Review in FY 2016.
- NSF set two APGs in FY 2016 for achievement in FY 2017; only one of the two APGs had performance targets for FY 2016. APGs monitor progress in specific areas where near-term focus on agency execution can have the most impact.
- Of the eight goals with targets in FY 2016, five fully achieved their targets and three did not achieve one or more targets. The APG with no targets in FY 2016 is on track for achievement in FY 2017.

NSF's *FY 2016 Annual Performance Report (APR)* in the *FY 2018 Budget Request to Congress* provides a full description of the strategic review process and all of the agency's performance measures, including descriptions of the metrics, methodologies, results, and trends, along with a list of relevant external reviews.

Goal Type	Strategic Goal	Strategic Objective
Mission-oriented	Transform the Frontiers of Science and Engineering	Invest in fundamental research to ensure significant continuing advances across science, engineering, and education.
		Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities.
		Provide world-class research infrastructure to enable major scientific advances.
	Stimulate Innovation and Address Societal Needs through Research and Education	Strengthen the links between fundamental research and societal needs through investments and partnerships.
Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.		
Management	Excel as a Federal Science Agency	Build an increasingly diverse, engaged, and high-performing workforce by fostering excellence in recruitment, training, leadership, and management of human capital.
		Use effective methods and innovative solutions to achieve excellence in accomplishing the agency's mission.

FY 2016 Performance Goal	Result
1. Agency Priority Goal: Improve Graduate Student Preparedness. By September 30, 2017, NSF will fund at least three summer institutes and 75 supplements to existing awards to provide STEM doctoral students with opportunities to expand their knowledge and skills to prepare themselves for a range of careers.	✓
2. Agency Priority Goal: Invest Strategically in Public Participation in STEM Research. Build the capacity of the Nation to solve research challenges and improve learning by investing strategically in crowdsourcing and other forms of public participation in science, technology, engineering, and mathematics research (PPSR). By September 30, 2017 NSF will implement mechanisms to expand and deepen the engagement of the public in STEM research.	No FY 2016 targets. On track for FY 2017 achievement.
3. Ensure that key FY 2016 NSF-wide program investments are implemented and on track.	✓
4. Ensure program integrity and responsible stewardship of major research facilities and infrastructure.	✗
5. Use evidence-based reviews to guide management investments.	✓
6. Inform applicants whether their proposals have been declined or recommended for funding within 182 days, or 6 months, of deadline, target, or receipt date, whichever is later.	✓
7. Foster a culture of inclusion through change management efforts resulting in change leadership and accountability.	✗
8. Enable consistent evaluation of the impact of NSF investments with a high degree of rigor and independence.	✓
9. Increase the percentage of proposal review panelists that participate virtually while maintaining the quality of the merit review process.	✗

✓ = all FY 2016 targets met/ ✗ = did not achieve one or more targets

STEM: Science, Technology, Engineering, and Mathematics. Available performance data have been independently verified and validated. Verification and validation was not completed on Goal 7 because the activity was postponed until 2017; for more information see NSF's FY 2016 *Annual Performance Report*.

Management Challenges

For FY 2016, the NSF Office of the Inspector General (OIG) identified seven management and performance challenges facing the agency:

- Establishing accountability over large cooperative agreements and validating policies are effective.
- Managing NSF's business operations in the areas of payments, IT, new government-wide data reporting requirements, and government records.
- Managing and providing oversight of the program that brings external researchers and educators (called 'rotators' or 'IPAs') to work temporarily at NSF.
- Moving NSF's headquarters efficiently and on time.
- Managing a world-class scientific research program in Antarctica, with a focus on cost control and health & safety.
- Improving grant administration and ensuring grant funds are spent as intended.
- Encouraging the ethical conduct of research through providing oversight and guidance on the implementation of responsible conduct of research.

OIG's memorandum on FY 2016 Management Challenges can be found in NSF's *FY 2015 Agency Financial Report*. Management's report on the significant activities undertaken in FY 2016 to address these challenges is included in NSF's *FY 2016 Agency Financial Report*.

For More Information

NSF Budget and Performance Website
<https://www.nsf.gov/about/performance>

NSF FY 2016 Agency Financial Report
<https://www.nsf.gov/pubs/2017/insf17002/index.jsp>

NSF FY 2016 Annual Performance Report
See *Performance chapter of NSF FY 2018 Budget Request to Congress*
<https://www.nsf.gov/about/performance>

Report to the National Science Board on NSF's Merit Review Process FY 2015
<https://www.nsf.gov/nsb/publications/2016/nsb201641.pdf>

NSF Research and Education Discoveries
<https://www.nsf.gov/discoveries>

NSF FY 2016 Progress Report on OIG Management Challenges (See Appendix 3B)
<https://www.nsf.gov/pubs/2017/insf17002/index.jsp>

Investing in Science, Engineering, and Education for the Nation's Future, NSF Strategic Plan for 2014–2018
https://www.nsf.gov/about/performance/strategic_plan.jsp

FY 2016 NSF Senior Management

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Diane L. Souvaine, Vice Chair

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James L. Olds, Assistant Director

Directorate for Computer & Information Science & Engineering
James F. Kurose, Assistant Director

Directorate for Education & Human Resources
Joan Ferrini-Mundy, Assistant Director

Directorate for Engineering
Grace Wang, Assistant Director (Acting)

Directorate for Geosciences
Roger Wakimoto, Assistant Director

Directorate for Mathematical & Physical Sciences
Fleming Crim, Assistant Director

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Lawrence Rudolph, General Counsel

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Joanne S. Tornow, Head

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Performance Improvement Officer
Martha A. Rubenstein (Office of Budget, Finance, & Award Management)

Chief Human Capital Officer
Joanne S. Tornow (Office of Information & Resource Management)

Chief Technology Officer
José Muñoz

Chief Information Officer
Amy Northcutt (Office of Information & Resource Management)

NSF Affirmative Action Officer
Rhonda Davis (Office of Diversity & Inclusion)

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University of Oregon

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California Institute of Technology

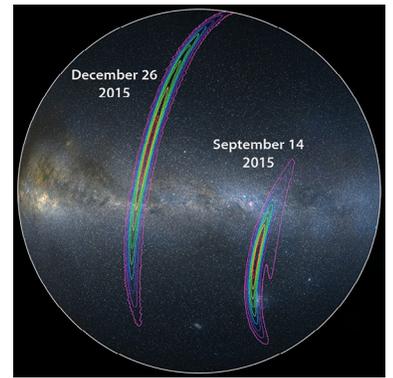
Robert J. Zimmer
University of Chicago

Member ex officio:
France A. Córdoba
National Science Foundation

Michael L. Van Woert
Executive Officer, National Science Board Office

Research and Education Highlights

Gravitational waves detected from a second pair of colliding black holes. In December 2015, almost 3 months after the initial confirmation of the existence of gravitational waves in the universe, the NSF-funded Laser Interferometer Gravitational-Wave Observatory (LIGO) captured a second set of waves from another black hole merger 1.4 billion lightyears away. For the first time, researchers confirmed that one of the black holes was spinning, indicating that the black hole experienced some dynamic process before the merger. NSF was the initial funder of the LIGO project 40 years ago, and its continued commitment to LIGO's high-risk, high-reward research now makes possible an entirely new way to observe some of the most energetic events in our universe. This new astrophysical information is changing the way we understand the universe.



Credit: Axel Mellinger, LIGO.

Foldable robots for the clinic. Retrieving a tiny button battery from a child's stomach is challenging, yet every year 3,500 button batteries are swallowed in the U.S. If left in the body, ingested batteries can burn the digestive tract. To give doctors an option other than surgery, NSF-funded researchers at the Massachusetts Institute of Technology (MIT) have developed a tiny foldable robot the size of a small pill. Once swallowed, the robot unfolds and moves toward its target via external magnetic field. Besides foreign object retrieval, similar devices can patch wounds and deliver medicine. After completing their mission, the robots dissolve. The researchers plan to redesign the robot, adding sensors so that it can control itself rather than relying on external manipulation.



Credit: Melanie Gonick, MIT.

Early detection of dyslexia. Between 10 percent and 17 percent of the U.S. population suffers from dyslexia. With early detection and quick intervention, however, researchers can more effectively help and treat dyslexic children. In studying the brain activity of children as they read, an NSF-funded researcher at New York's Binghamton University has discovered a way to predict early on which children will have reading disabilities such as dyslexia. This earlier detection allows caregivers to intervene at a crucial stage and design treatment plans to help children become successful readers. The researcher is currently developing a screening test able to identify a reading problem a full 2 years before it emerges, leaving time for effective intervention. The same brain research may also have applications in security and identification verification, as researchers study whether brain signatures can act as a brain-based biometric.



Credit: Sarah Laszlo, Binghamton University.

Early-career astronomers detect new worlds. Two early-career researchers added two more exoplanets to the trove of nearly 3,000 exoplanets now known to exist. A first-year graduate student from the University of Arizona supported by NSF's Graduate Research Fellowship Program (GRFP) detected—and directly imaged—a planet in a multistar system 340 lightyears from Earth. Estimated to be 16 million years old, the exoplanet is among the youngest discovered. Another GRFP-supported graduate student leading a team at Caltech also detected *the* youngest known, fully formed exoplanet, aged between 5 million and 10 million years. Both exoplanet discovery teams included additional members currently and formerly supported by NSF's GRFP. The discoveries of these and other exoplanets help scientists better understand the life cycles of planetary systems, including our own.



Credit: L. Calçada, ESO.

Ancient monkey fossil provides insights into biological history of the Americas. In Panama, researchers funded by NSF's Partnerships in International Research and Education program unearthed a 21 million-year-old monkey fossil that upends conventional thinking about when and how species dispersed from South America to North America. Scientists previously thought species used a 4 million-year-old land bridge, called the Isthmus of Panama, to move between continents. The discovery of the ancient fossil (closely related to living South American monkeys) on the North American landmass, however, suggests the species moved northward long before the land bridge formed—nearly 17 million years earlier. The fossil was found during the expansion of the Panama Canal, which exposed fossil-bearing rock strata for the first time.



Credit: Aldo Rincon, Florida Museum of Natural History.



4201 Wilson Boulevard, Arlington, VA 22230
USA Tel: 703-292-5111 FIRS: 800-877-8339 TDD: 800-281-8749
www.nsf.gov

We welcome your comments on how we can make this report more informative. Please submit them to Accountability@nsf.gov.

