UNITED STATES
National Science Foundation

FY 2019
BUDGET REQUEST TO CONGRESS

MISSION: To promote the progress of science; to advance the national health, prosperity, and welfare; secure the national defense; and for other purposes.

—*From the National Science Foundation (NSF) Act of 1950 (P.L. 81–507)*

VISION: A Nation that is the global leader in research and innovation.

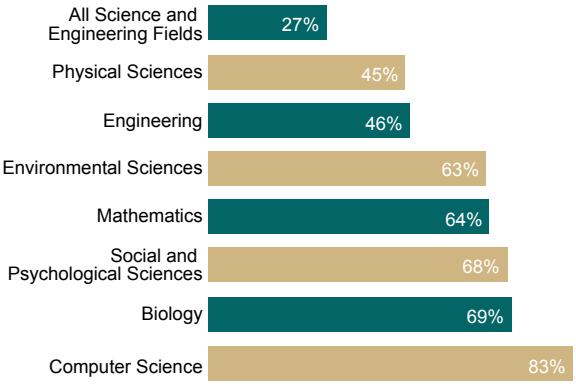
—*From* Building the Future: Investing in Discovery and Innovation *NSF's Strategic Plan for FY 2018–2022*

ABOUT NSF

- Established by Congress in 1950 as an independent federal agency to promote American science and engineering (S&E).
- The only federal agency that funds basic non-biomedical research and education across all fields of S&E and at all levels of education.
- Funds advanced instrumentation and facilities, Arctic and Antarctic research and operations, cooperative research partnerships between universities and industry, and U.S. participation in international scientific efforts.
- Ninety-three percent of appropriated funds directly support research and science, technology, engineering, and mathematics (STEM) education, seventy-eight percent of it at our Nation's colleges and universities.
- Has supported 231 Nobel Laureates since its inception.

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 and Development, FY 2015.

For More Information:

NSF FY 2019 Budget Request to Congress
www.nsf.gov/about/budget

Research and Education Results Supported by NSF
www.nsf.gov/discoveries

NSF Budget and Performance
www.nsf.gov/about/performance

Building the Future: Investing in Discovery and Innovation
NSF Strategic Plan for 2018–2022
www.nsf.gov/about/performance/strategic_plan.jsp

Driving Federal Performance
www.performance.gov

Investing in Discovery and Innovation

FY 2019 BUDGET REQUEST

NSF Budget by Appropriation (dollars in millions)					
	FY 2017 Actual	FY 2018 Annualized CR	FY 2019 Request	Change Over FY 2017 Actual	
				Amount	Percent
Research and Related Activities	$6,007	$5,993	$6,151	$144	2%
Education and Human Resources	$873	$874	$873	*	*
Major Research Equipment and Facilities Construction	$223	$208	$95	-$128	-58%
Agency Operations and Award Management	$382	$328	$334	-$48	-13%
National Science Board	$4	$4	$4	*	1%
Office of Inspector General	$15	$15	$15	*	2%
TOTAL	**$7,504**	**$7,421**	**$7,472**	**-$32**	*

Note: Totals may not add due to rounding. * indicates <$500,000 or <0.5%.

FY 2019 BUDGET HIGHLIGHTS

- NSF's $7.5 billion in funding in FY 2019 will support approximately 8,400 new research grants.
- Continues NSF's commitment to basic research that contributes to human knowledge and provides the scientific understanding necessary to spur innovation across all fields of S&E.
- Provides the first year of funding for the Antarctic Infrastructure Modernization for Science construction project to modernize major facilities at McMurdo Station ($104 million).
- Continues funding construction of three major research equipment and facilities projects: Daniel K. Inouye Solar Telescope, Large Synoptic Survey Telescope, and Regional Class Research Vessels ($94 million).
- Supports advances in the scientific foundations underlying cybersecurity ($161 million).
- Supports investments in students and a future-focused workforce by funding CyberCorps®: Scholarship for Service ($55 million) and Advanced Technological Education ($66 million) and other education and workforce programs.
- As part of NSF's Agency Reform Plan, NSF will establish two Convergence Accelerators—new organizational structures intended to leverage external partnerships to facilitate convergent and translational activities in areas of national importance.

NSF'S 10 BIG IDEAS

In 2019, NSF will support 10 Big Ideas, which are bold ideas that identify areas for future, long-term investment at the frontiers of science and engineering. Six of the Big Ideas focus on research, building on earlier investments in fundamental research. Four of the Big Ideas focus on process, which address NSF practices that could be altered or enhanced to capture the best research and expand the Nation's science and engineering community.

Research Big Ideas

- Harnessing the Data Revolution for 21st-Century Science and Engineering
- The Future of Work at the Human-Technology Frontier
- Windows on the Universe: The Era of Multi-messenger Astrophysics
- The Quantum Leap: Leading the Next Quantum Revolution
- Understanding the Rules of Life: Predicting Phenotype
- Navigating the New Arctic

Process Big Ideas

- NSF INCLUDES: Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
- Growing Convergence Research at NSF
- Mid-scale Research Infrastructure
- NSF 2026 Fund

RESEARCH TO RESULTS

NSF is vital because it invests in basic research and the people who make the discoveries that transform our future. These investments—

- Spur innovation and robust job creation.
- Have led to innovations that have added billions of dollars to the U.S. economy through businesses and technologies like QUALCOMM, Google, the iPhone, 3-D printing, and self-driving cars.
- Support our military and lead to discoveries that keep our troops safer, such as better bullet-proof vests; more accurate GPS; more functional, durable, and reliable prosthetics; and tools to counter violent extremism, detect explosives, and predict conflict.
- Provide understanding of all aspects of natural disasters: from improving weather prediction to increasing resilience in housing, infrastructure, and the human response to disasters.
- Lead to new knowledge of the nature of the universe, including the detection of gravitational waves from merging black holes by the Laser Interferometer Gravitational-wave Observatory.
- Give the United States the competitive edge to remain a global leader.

NSF by the Numbers	
$7.5 billion	FY 2017 Enacted Budget
2,000	Colleges, universities, and other institutions receiving NSF funding in FY 2017
49,000	Proposals evaluated in FY 2017 through a competitive merit review process
11,000	Competitive awards funded in FY 2017
203,000	Proposal reviews conducted in FY 2017
359,000	Estimated number of people NSF supported directly in FY 2017 (researchers, postdoctoral fellows, trainees, teachers, and students)
55,700	Students supported by NSF Graduate Research Fellowships since 1952

NSF STRATEGIC PLAN FOR FY 2018–FY 2022

Building the Future: Investing in Discovery and Innovation

Strategic Goal #1

Expand knowledge in science, engineering, and learning.

Strategic Objective 1.1—Knowledge

- Advance knowledge through investments in ideas, people, and infrastructure.

Strategic Objective 1.2—Practice

- Advance the practice of research.

Strategic Goal #2

Advance the capability of the Nation to meet current and future challenges.

Strategic Objective 2.1—Societal Impacts

- Support research and promote partnerships to accelerate innovation and to provide new capabilities to meet pressing societal needs.

Strategic Objective 2.2—STEM Workforce

- Foster the growth of a more capable and diverse research workforce and advance the scientific and innovation skills of the Nation.

Strategic Goal #3

Enhance NSF's performance of its mission.

Strategic Objective 3.1—Human Capital

- Attract, retain, and empower a talented and diverse workforce.

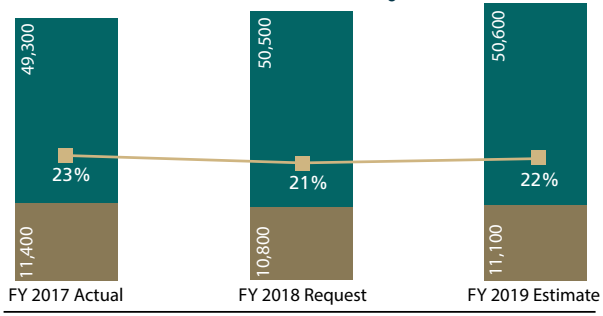
Strategic Objective 3.2—Processes and Operations

- Continually improve agency operations.

Agency Priority Goal

Expand public and private partnerships to enhance the impact of NSF's investments and benefit society.

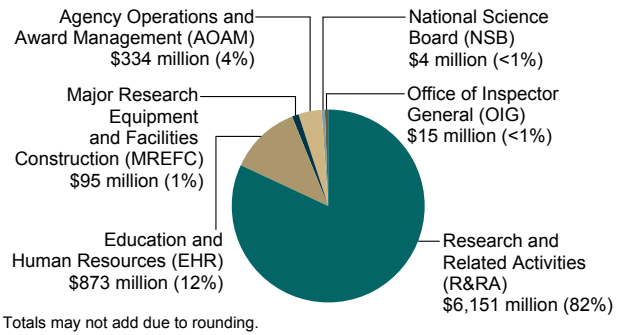
Number of NSF Competitive Proposals, New Awards, and Funding Rates



NSF FUNDING: APPROPRIATIONS AND INVESTMENTS

Where It Comes From

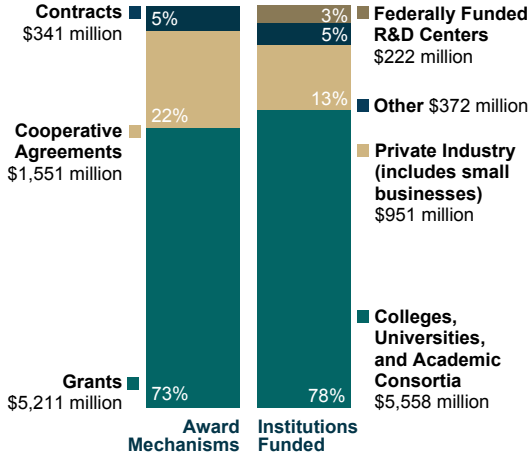
FY 2019 NSF Budget Request by Account—$7,472 million



Totals may not add due to rounding.

Where It Goes and How It Gets There

FY 2017 Obligations for Research and Education Programs—$7,103 million



This chart shows the distribution of NSF's obligations by institution type and funding mechanism. While the data shown are based on FY 2017, the relative shares should provide a good indication of the FY 2019 distribution.

Notes: NSF Research and Education Programs include R&RA, EHR, and MREFC appropriations. Other institutions funded include federal, state, and local governments; nonprofit organizations; and international organizations. Totals may not add due to rounding.

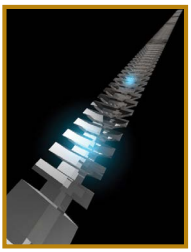
R&D = Research and Development

2415 Eisenhower Avenue, Alexandria, VA 22314
Phone 703-292-5111
FIRS 800-877-8339 TDD 800-281-8749
www.nsf.gov

NSF 18–022

RESEARCH HIGHLIGHTS

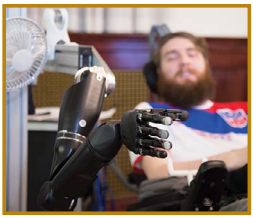
First On-Chip Nanoscale Optical Quantum Memory Developed



Credit: Ella Maru Studio

NSF-funded researchers have built the first nanoscale optical quantum memory device that could one day be used to create more reliable and secure internet communications. Quantum memory stores information in a similar fashion to the way traditional computer memory does, but on individual quantum particles—in this case, photons of light. This method takes advantage of the peculiar features of quantum mechanics to store data more efficiently and securely. The use of individual photons to store and transmit data has long been a goal of engineers and physicists because of the potential to carry information reliably and securely. Because photons lack charge and mass, they can be transmitted across a fiber optic network with minimal interactions with other particles.

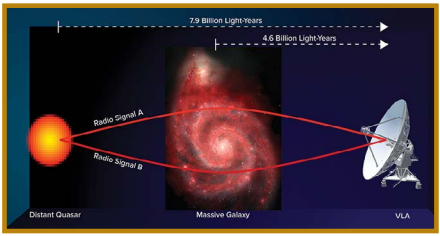
Quadriplegic 'Feels' Again Thanks to Brain-Computer Interface and Robotic Arm Combination



Credit: University of Pittsburgh Medical Center/Pitt Health Sciences

From buttoning a shirt to grasping a cup, the ability to manipulate objects is aided by the sense of touch, which is why traditional prosthetics can only provide patients with very limited functions. Earlier this year, a quadriplegic man experienced the sense of touch again through a robotic arm connected to a brain-computer interface (BCI) implanted in his head that allowed him to "feel" pressure on the robotic hand. The blueprint for the BCI-robotic arm system came from NSF-funded basic research that examined the neural activity of monkeys as they manipulated objects. The advancement is paving the way for future touch-sensitive prosthetics.

VLA Reveals Distant Galaxy's Magnetic Field



Credit: Bill Saxton, NRAO/AUI/NSF; NASA, Hubble Heritage Team, STScI/AURA), ESA, S. Beckwith (STScI). Additional Processing: Robert Gendler

With the help of a gigantic cosmic lens, astronomers have measured the magnetic field of a galaxy nearly 5 billion light-years away. The achievement is giving them important new clues about a problem at the frontiers of cosmology—the nature and origin of the magnetic fields that play an important role in how galaxies develop over time. The scientists used NSF's Karl G. Jansky Very Large Array (VLA) to study a star-forming galaxy that lies directly between a more-distant quasar and Earth. The galaxy's gravity serves as a giant lens, splitting the quasar's image into two separate images as seen from Earth. The radio waves coming from this quasar, nearly 8 billion light-years away, are preferentially aligned, or polarized. This discovery provides an important clue about how galactic magnetic fields are formed and evolve over time.