UNITED STATES
National Science Foundation

FY 2020
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.

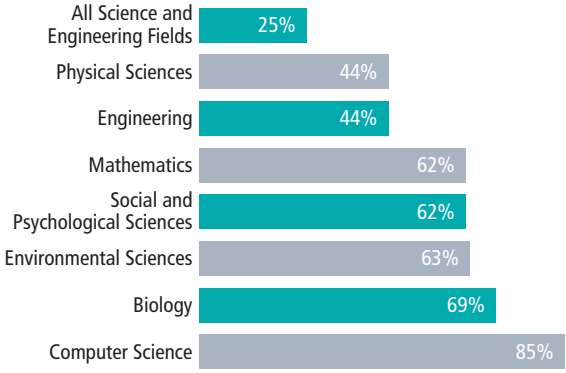
—From "Building the Future: Investing in Discovery and Innovation" NSF's Strategic Plan for FY 2018–2022

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, 77 percent of it at our Nation's colleges and universities.
- Has supported 236 Nobel Laureates since its inception.

NSF Support of Academic Basic Research in Selected Fields

(as a percentage of total federal support)



Note: 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 2016.

For More Information

NSF FY 2020 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 2020 BUDGET REQUEST

NSF Budget by Appropriation (Dollars in Millions)					
Account	FY 2018 Actual	FY 2019 Enacted	FY 2020 Request	Change Over FY 2018 Actual	
				Amount	Percent
Research and Related Activities	$6,380	$6,520	$5,663	-$717	-11%
Education and Human Resources	$904	$910	$823	-$80	-9%
Major Research Equipment and Facilities Construction	$186	$296	$223	$37	20%
Agency Operations and Award Management	$329	$330	$337	$8	3%
National Science Board	$4	$4	$4	*	-5%
Office of Inspector General	$15	$15	$15	*	2%
TOTAL (NSF)	**$7,818**	**$8,075**	**$7,066**	**-$752**	**-10%**

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

FY 2020 BUDGET HIGHLIGHTS

- NSF's $7.1 billion in funding in FY 2020 will support approximately 8,000 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.
- Funds NSF investments in the S&E foundations for quantum information science ($106 million).
- Invests in transformative research in artificial intelligence ($492 million).
- Provides funds to enhance understanding and application of microelectronics and semiconductors ($68 million).
- Provides the first year of funding for the construction of the High Luminosity – Large Hadron Collider Upgrade ($33 million).
- Provides ongoing support for the Antarctic Infrastructure Modernization for Science construction project to modernize major facilities at McMurdo Station ($98 million), and funding for the Large Synoptic Survey Telescope major research facility construction project ($46 million).
- Supports investments in students and a future-focused workforce by funding CyberCorps®: Scholarship for Service ($55 million) and Advanced Technological Education ($75 million) and other education and workforce programs.

NSF'S 10 BIG IDEAS

In FY 2020, NSF continues support for its 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 changes in NSF practices to capture the best research and expand inclusion and opportunity in 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

Enabling Big Ideas

- NSF INCLUDES
- Growing Convergence Research at NSF
- Mid-scale Research Infrastructure
- NSF 2026

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.
- Give the United States the competitive edge to remain a global leader.

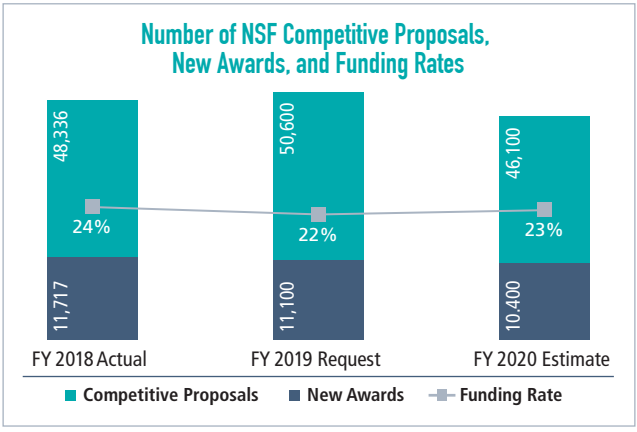
NSF by the Numbers	
$7.8 billion	FY 2018 Actual
1,800	Colleges, universities, and other institutions receiving NSF funding in FY 2018
48,300	Proposals evaluated in FY 2018 through a competitive merit review process
11,700	Competitive awards funded in FY 2018
223,800	Proposal reviews conducted in FY 2018
386,000	Estimated number of people NSF supported directly in FY 2018 (researchers, postdoctoral fellows, trainees, teachers, and students)
57,700	Students supported by NSF Graduate Research Fellowships since 1952

FY 2020 PERFORMANCE GOALS

For FY 2020, NSF has set seven performance goals so that NSF can strategically monitor and oversee progress being made towards its larger aims. NSF also assesses progress through an annual process of strategic reviews of the objectives in its strategic plan.

In FY 2020, NSF will monitor the following goals.

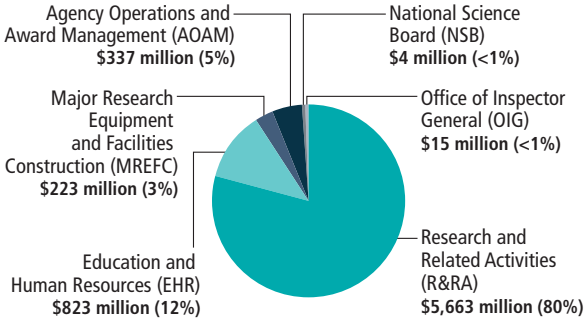
Goal	Goal Statement
Ensure that Key Program Investments are on Track	Ensure that key NSF-wide program investments are implemented and on track.
Ensure that Infrastructure Investments are on Track	Ensure program integrity and responsible stewardship of major research facilities and infrastructure.
Make Timely Proposal Decisions	Inform applicants whether their proposals have been declined or recommended for funding within six months.
Improve Review Quality	Improve the quality of written reviews of NSF proposals.
Foster a Culture of Inclusion	Foster a culture of inclusion through change management efforts.
Align Job Requirements with Competencies	Ensure that employee job requirements are aligned with competencies and skills needed for the future.
Improve User Interactions with IT Systems	Streamline and simplify user interactions with IT systems and functions that support the merit review process.



NSF FUNDING: APPROPRIATIONS AND INVESTMENTS

Where It Comes From

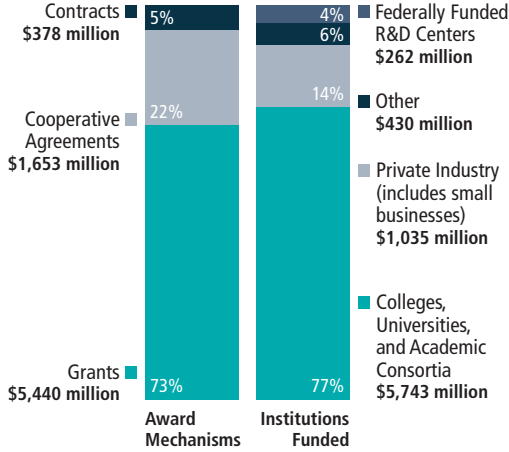
FY 2020 NSF Budget Request by Account—$7.1 billion



Note: Totals may not add due to rounding.

Where It Goes and How It Gets There

FY 2018 Obligations for Research and Education Programs—$7.5 billion



This chart shows the distribution of NSF's obligations by institution type and funding mechanism. While the data shown are based on FY 2018, the relative shares should provide a good indication of the FY 2020 distribution.

Note: 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

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NSF 19–005

RESEARCH AND EDUCATION HIGHLIGHTS

Artificial Intelligence Research Inspired by Human Visual Learning Accelerates Drug Discovery

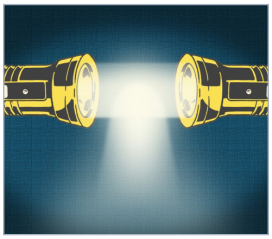
NSF-funded researchers combined nuclear magnetic resonance spectroscopy with artificial intelligence (AI) to more quickly assess the uniqueness of natural compounds, from which new drugs are often derived. The researchers developed a deep learning system, called Small Molecule Accurate Recognition Technology (SMART), that could streamline by 10-fold the process of identifying the chemical structure of new compounds, leading to faster drug discovery. The tool embraces techniques developed from an NSF-funded researcher's work on face-recognition and visual expertise. It is an example of biologically-inspired machine learning, which is being used to help researchers analyze structures of new compounds.

Mystery Solved: Where High-Energy Cosmic Neutrinos Begin

Credit: NSF IceCube Neutrino Observatory

An international team of researchers recently discovered the first evidence of one source of high-energy cosmic neutrinos. They initially used data gathered from NSF's IceCube Neutrino Observatory in Antarctica. Detectors, buried deep in the ice, captured the signature blue light, that results when neutrinos, particles smaller than an atom, interact with ice molecules. The detection initiated a global alert to a network of ground- and spaced-based telescopes. The team traced the neutrino source to a blazar, a giant galaxy with a massive black hole at its core and a jet of elementary particles and light that shoots out from the core. The discoveries of multi-messenger astrophysics open a new way to explore the mysteries of the universe.

New Form of Light Could Enable Quantum Computing



Credit: Christine Daniloff, MIT

Extremely fast quantum computers will require the controlled interaction of light particles called photons. But photons don't naturally interact with each other. For years, physicists tested ways to encourage photon mingling. The efforts paid off in 2013 when NSF-funded researchers observed pairs of photons interacting and binding together. In 2018, the same scientists reported witnessing groups of three photons melding together. The behavior occurred during an experiment in which a very weak laser beam shone through a dense cloud of ultracold rubidium atoms. Rather than exiting the cloud singly, the photons left in pairs or triplets. The next step is to see if photons can interact in other ways. If successful, they may be harnessed to perform extremely fast, highly complex quantum computations.