BUILDING THE FUTURE INVESTING IN DISCOVERY AND INNOVATION: NSF Strategic Plan for Fiscal Years (FY) 2018-2022

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National Science Foundation (NSF)

Description:
The National Science Foundation (NSF) is an independent Federal agency that supports fundamental research across virtually all fields of science, engineering, and education.

Stakeholder(s):
France A. Córdova:
Director, National Science Foundation

NSF Programs

Biological Sciences (BIO) Program:
This activity promotes scientific progress in biology through support of research on all levels, including molecules, cells, organisms, and ecosystems, and interactions across these levels of organization. The Divisions within the Directorate for Biological Sciences are:

- Biological Infrastructure (BIO/DBI)
- Environmental Biology (BIO/DEB)
- Emerging Frontiers (BIO/EF)
- Integrative Organismal Systems (BIO/IOS)
- Molecular and Cellular Biosciences (BIO/MCB)


Computer and Information Science and Engineering (CISE) Program:
This activity supports investigator-initiated research in all areas of computer and information science and engineering that advances society, helps develop and maintain advanced cyberinfrastructure to enable and accelerate discovery and innovation across all disciplines, and contributes to the training of the next generation of computer and information scientists and engineers with skills essential for success in the increasingly competitive global market. The divisions and offices within the Directorate for Computer and Information Science and Engineering are:

- Office of Advanced Cyberinfrastructure (OAC)
- Computing and Communication Foundations (CISE/CCF)
- Computer and Network Systems (CISE/CNS)
- Information & Intelligent Systems (CISE/IIS)
- Information Technology Research (CISE/ITR)


Engineering (ENG) Program:
Research supported by this activity aims to increase U.S. engineering capability and strength, and focus that capability and strength on areas that are relevant to national problems and long-term needs. This activity also includes small business innovation research. The Divisions within the Engineering Directorate are:

- Chemical, Bioengineering, Environmental, and Transport Systems (ENG/CBET)
- Civil, Mechanical, and Manufacturing Innovation (ENG/CMMI)
- Electrical, Communications, and Cyber Systems (ENG/ECCS)
- Engineering Education and Centers (ENG/EEC)
- Emerging Frontiers in Research and Innovation (ENG/EFRI)
- Industrial Innovation and Partnerships (ENG/IIP)


Geosciences (GEO) Program:
This activity supports research and associated infrastructure to advance knowledge of the properties and dynamics of the planet on which we live. Research includes understanding the causes and implications of climate change, as well as disruptive processes such as earthquakes and storms. The divisions within the Geosciences Directorate are:

- Atmospheric and Geospace Sciences (GEO/AGS)
- Earth Sciences (GEO/EAR)
- Integrative and Collaborative Education and Research (GEO/ICER)
- Ocean Sciences (GEO/OCE)

Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG1. Expand knowledge in science, engineering, and learning.
Stakeholders (continued)


Mathematical and Physical Sciences (MPS) Program:
This activity supports research and infrastructure directed at increasing understanding of natural laws and phenomena across the astronomical sciences, chemistry, materials sciences, mathematical sciences, and physics. The divisions within the Mathematical and Physical Sciences Directorate are:

- Astronomical Sciences (MPS/AST)
- Chemistry (MPS/CHE)
- Materials Research (MPS/DMR)
- Mathematical Sciences (MPS/DMS)
- Physics (MPS/PHY)

Office of Multidisciplinary Activities (OMA) Program:

Social, Behavioral, and Economic Sciences (SBE) Program:
This activity supports research and infrastructure in the social, behavioral, cognitive, and economic sciences and funds the collection and dissemination of statistics on the science and engineering enterprise. The Divisions within the Social, Behavioral, and Economic Sciences Directorate are:

- Social and Economic Sciences (SBE/SES)
- Behavioral and Cognitive Sciences (SBE/BCS)
- Office of Multidisciplinary Activities (SBE/OMA)

National Center for Science and Engineering Statistics (SBE/NCSER) Program:

Office of International Science and Engineering (OISE) Program:
This activity promotes an integrated strategy for international science and engineering that complements and enhances NSF’s broader research and education goals and facilitates international collaboration. Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG1. Expand knowledge in science, engineering, and learning. SG2. Advance the capability of the Nation to meet current and future challenges. SG3. Enhance NSF’s performance of its mission.

Office of Polar Programs (OPP):
This activity supports Arctic and Antarctic research and operational science support and other related activities for United States polar research programs, including the funding to reimburse Federal agencies for logistical and other related activities supported by the United States Antarctic Program (USAP). Research investments span the range of all NSF research Directorates. In addition, the USAP provides critical support that enables research and scientific observations in the Antarctic sponsored by NASA, NOAA, USGS, DOE, and DOD (Comprehensive Test Ban Treaty monitoring). Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG1. Expand knowledge in science, engineering, and learning. SG2. Advance the capability of the Nation to meet current and future challenges. SG3. Enhance NSF’s performance of its mission.

Integrative Activities (IA) Program:
This activity supports emerging cross-disciplinary research efforts, major research instrumentation, capacity-building, planning, and policy support. This activity also provides support for the Science and Technology Policy Institute. The Established Program to Stimulate Competitive Research broadens participation of States and regions in science and engineering by helping institutions expand their research capacity and competitiveness. The subactivities housed within the Office of Integrative Activities are:

- Evaluation and Assessment Capability (EAC)
- Established Program to Stimulate Competitive Research (EPSCoR)
- Graduate Research Fellowships (GRF)
- HBCU Excellence in Research (HBCU EIR)
- Major Research Instrumentation (MRI)
- Planning and Policy Support
- Science and Technology Centers (STC)
- Science and Technology Policy Institute (STPI)


United States Arctic Research Commission (USARC):
The United States Arctic Research Commission promotes Arctic research and recommends national Arctic research policies to guide Federal agencies in developing and implementing their research programs in the Arctic region. Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG1. Expand knowledge in science, engineering, and learning. SG2. Advance the capability of the Nation to meet current and future challenges. SG3. Enhance NSF’s performance of its mission.

Education and Human Resources (EHR) Program:
This activity supports a comprehensive set of programs in all areas of science, technology, engineering, and mathematics (STEM), at all levels, inside and outside of school, to build a diverse, globally competitive STEM workforce and a STEM-literate citizenry. EHR invests in research and development on STEM education and learning, and in scholarships and fellowships to build the STEM workforce. The divisions within the Education and Human Resources Directorate are:

- Research on Learning in Formal and Informal Settings (EHR/DRL)
- Graduate Education (EHR/DGE)
- Human Resource Development (EHR/HRD)

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Stakeholders (continued)


Major Research Equipment and Facilities Construction (MREFC) Program:
The Major Research Equipment and Facilities Construction activity supports the acquisition, construction, and commissioning of unique national research platforms and major research facilities and equipment. Performance of each construction project is measured against an established baseline at regular intervals and at major milestones. Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG1. Expand knowledge in science, engineering, and learning. SG3. Enhance NSF’s performance of its mission.

Agency Operations and Award Management (AOAM) Program:
This account funds NSF’s scientific, professional, and administrative workforce, the physical and technological infrastructure necessary for a productive, safe, and secure work environment, and the essential business operations critical to NSF’s administrative processes. Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG1. Expand knowledge in science, engineering, and learning. SG2. Advance the capability of the Nation to meet current and future challenges. SG3. Enhance NSF’s performance of its mission.

Office of the National Science Board (NSB):
This appropriation provides policy-making and related responsibilities for NSF, and provides guidance on significant national policy issues in science and engineering research and education, as required by law. Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG1. Expand knowledge in science, engineering, and learning. SG2. Advance the capability of the Nation to meet current and future challenges. SG3. Enhance NSF’s performance of its mission.

Office of Inspector General (OIG):
This appropriation provides agency-wide audit and investigative functions to identify and correct management and administrative deficiencies that create conditions for existing or potential instances of fraud, waste, and mismanagement, consistent with the Inspector General Act of 1978, as amended (5 U.S.C. App. 3). Current information about the activity can be found at https://nsf.gov/about/budget/. Supported Strategic Goals: SG3. Enhance NSF’s performance of its mission.
Vision
A Nation that is the global leader in research and innovation.

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

Values

**Excellence**: We maintain the highest standards in merit review, financial management, and award administration. We use rigorous review by experts to ensure that only the best ideas are funded and that our investments further the national interest.

**Public Service**: We proudly value our role as public servants, enabling the research community to blaze new paths for expanding knowledge and addressing societal challenges.

**Learning**: We take advantage of opportunities to improve our skills and we provide all staff members with opportunities to develop. We question our assumptions; we evaluate our activities; we learn what is effective and what can be improved.

**Inclusion**: We strive to maintain a staff that is representative of the broader national community. We endeavor to support outstanding researchers and innovative thinkers from across our Nation’s diversity of regions, types of organizations, and demographic groups.

**Collaboration**: We work in a collaborative enterprise in which teamwork is essential. We value the perspectives and values of our fellow team members and recognize that combining our knowledge enables us to find more robust solutions; we acknowledge the contributions that we each make to our shared success; we are committed to listening, communicating effectively, and working collegially.

**Integrity**: We hold each other and our awardees to the highest standards of ethical behavior. We strive to ensure the trustworthiness of the results of NSF-funded research by promoting the responsible conduct of research.

**Transparency**: We operate with transparency and openness.
1. Science, Engineering & Learning

*Expand knowledge in science, engineering, and learning.*

The first part of NSF’s mission is “to promote the progress of science.” By expanding human knowledge, NSF-funded researchers provide the Nation with the capability to maintain scientific, technological, and economic leadership in a competitive world.

**1.1. Knowledge**

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

NSF’s core objective is to improve the collective understanding of the universe we inhabit. To achieve this, we invest in people who are curious, courageous, and collaborative. We seek the best research ideas, both those that advance current understanding and those that disrupt it. We support emerging paradigms such as convergence research. We support world-class scientific facilities for the Nation’s researchers at home and abroad. We support the development and acquisition of research platforms and tools such as advanced instrumentation and cyberinfrastructure.

**1.2. Practice**

*Advance the practice of research.*

NSF seeks to advance the state of the art in research by encouraging smart risk-taking, cultivating an inclusive research culture of exploration, embracing the adoption of convergence as an approach to discovery, and supporting new modes of research practice.
2. Capabilities

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

Stakeholder(s)

I-Corps

NSF’s Innovation Corps (I-Corps) program prepares scientists and engineers to extend their focus beyond the laboratory, and broadens the impact of select, NSF-funded, basic-research projects.

This goal flows from the latter part of the NSF mission statement — “to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.” Through workshops, targeted solicitations, and core programs, NSF helps focus the attention of the research community on fundamental aspects of high-priority national challenges. We support researchers in identifying particularly urgent questions and opening up new avenues to address these priorities. We provide funding to pursue better understanding of specific challenges that confront society. We enable collaborative teams to apply the methods of convergence research. These approaches promote impact-driven, use-inspired research.

2.1. Societal Impacts

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

The first part of NSF’s mission, as expounded by the first strategic goal, is to create new knowledge and expand the Nation’s intellectual capital. However, NSF’s mission does not end there. In order to fulfill the second part of our mission, to advance the national prosperity, we must continue to invest in fundamental research that: (1) connects new knowledge to innovations that drive the Nation’s competitiveness, thereby fueling the Nation’s economic growth; and (2) addresses present and emerging societal needs. NSF will continue to pursue connections between new insights and global challenges (often involving essential interdisciplinary collaborations, prototypes, and technologies).

Stakeholder(s):

PAWR:

The Platforms for Advanced Wireless Research (PAWR) program is an NSF-led public-private partnership to advance the development of next-generation wireless technologies and services. In 2016, NSF convened a consortium of over 30 leading companies and industry associations in the wireless sector, to include networking vendors, device manufacturers, and wireless carriers. Beginning in 2017, NSF is investing $50 million over 7 years, together with an additional $50 million in cash and in-kind contributions from the industry consortium, to design, develop, deploy, and operate four wireless research platforms.

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.

Investing in the development of future generations of researchers and a scientifically skilled workforce is one of NSF’s most important approaches to advancing the discovery and innovation skills of the Nation. The Nation’s global competitiveness depends critically on the readiness of the Nation’s STEM workforce. NSF will continue to invest in programs that directly advance the STEM workforce. It will also invest in research on what the workforce of the future will require and on improved methods to provide the requisite skills and diversity.
Stakeholder(s):
STEM Workforce

NSF Graduate Research Fellowship Program:
Through its Graduate Research Fellowship Program (GRFP), NSF has funded thousands of graduate researchers, many of whom have made important discoveries while still in graduate school. For example, an NSF Graduate Research Fellow developed a touch screen to recognize multi-finger gestures for computer input — using two fingers on a screen to zoom in and out — a breakthrough technology that is now ubiquitous in smartphones and other mobile devices. Since 1952, this program has supported 42 students who went on to win Nobel Prizes.

NSF Scholarships for Service Program:
Since the Sept. 11 terrorist attacks, NSF has supported the training of 2,200 cybersecurity experts through the CyberCorps®: Scholarships for Service program, which seeks to recruit and train the next generation of information technology professionals.
3. Performance

*Enhance NSF’s performance of its mission.*

The first two strategic goals are associated with quickly evolving challenges. Meeting these and effectively fulfilling NSF’s mission requires blending strong scientific leadership with robust organizational leadership. Both are characterized by vision and flexibility. NSF will provide its staff with the resources that are essential to carry out the agency’s activities. NSF’s management objectives have the goal of achieving organizational excellence through a continuous emphasis on efficiency and efficacy. NSF’s employees strive to ensure that NSF’s programs are effective and accountable, that the merit review process is of high quality and integrity, and that financial management and award oversight are rigorous without undue administrative burden.

3.1. Human Capital

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

Excellence as a federal agency begins with a workforce that is engaged, highly capable, and diverse. While NSF strives to help prepare a diverse, globally competitive STEM national workforce and STEM-literate citizenry, these goals are also reflected inward. As an agency, NSF cultivates an increasingly adaptable, highly skilled, and engaged workforce that harnesses the diverse perspectives and creativity needed to achieve high levels of efficiency and effectiveness. This will ensure that the agency’s workforce matches its current and future needs.

3.1.1. Adaptation

*Adapt the NSF Workforce to the Work*

Systematically reviewing the NSF workforce from top to bottom will enable NSF to revise position descriptions that are outdated or that do not reflect current and future work responsibilities. In this modernization effort, NSF will identify the portfolio of skills needed in today’s work environment and the opportunities created by new, emerging skills. The results of the review will provide a framework for planning workforce hiring, training, and development that will enhance the ability of our workforce to meet the NSF mission efficiently and effectively.

**Stakeholder(s):**

NSF Workforce

3.2. Processes & Operations

*Continually improve agency operations.*

In order to accomplish its mission in research and education while maintaining its outstanding stewardship of taxpayer resources, NSF requires a wide range of operational and administrative services. These include human resource management, procurement, information technology (IT), financial management, program management, project management, and administrative support. Built on a commitment to openness and transparency, we will follow a strategy of continuous improvement in business processes, financial management, and associated infrastructure. This may include the pursuit of partnerships and shared services as a means of promoting excellence and efficiency, as well as innovation in support of a mobile workforce and the use of remote work practices.
3.2.1. IT

*Make Information Technology Work for Us*

New information technologies and systems are available to drive our science and engineering mission forward in a more nimble, efficient structure. Cloud resources and shared service providers offer the potential for new efficiencies. New developments in software offer potential improvements in our core processes such as merit review and financial management. To continue funding cutting-edge science, engineering, and education research, we will exploit leading-edge information technology solutions that can adapt easily and quickly to our needs.

3.2.2. Streamlining, Standardization & Simplification

*Streamline, Standardize, and Simplify Programs and Processes*

NSF is committed to promoting efficiency and effectiveness by streamlining, standardizing, and simplifying programs and processes. This encompasses both our internal operations and the administrative and compliance requirements associated with our programs.

3.2.3. Partnerships

*Expand Public and Private Partnerships*

As noted in Strategic Objective 2.1, partnerships are one means to accelerating innovation and providing new capabilities to meet pressing societal needs. Partnerships with other federal agencies, private industry, foundations, and international organizations are an important means for NSF to maximize the scientific, economic, and societal impacts of its investments. Partnerships are increasingly essential to advancing convergence science. The benefits of the expanded partnerships include leveraging expertise and resources in pursuit of innovations; enhancing research, education, and workforce capacity; and improving translation from discovery to products and services that benefit society. Partnerships among federal agencies enable synergies in areas where agency missions intersect. Engagements with private industry and foundations have the potential to accelerate areas of mutual interest and enhance the preparation of the next-generation workforce.

3.2.4. Risk

*Manage risk*

We will encourage the use of methodical risk analysis across the Foundation, including: identification, ranking, analyzing, tracking, controlling, and mitigating risks; development of associated contingency management plans; and planning and implementation of strategies that effectively manage and mitigate risk factors. Management challenges identified by the Inspector General will be integrated into this risk management framework. NSF will continue to promulgate a highly consultative culture, in which appropriate stakeholders are engaged early and throughout risk management processes. As part of our risk management framework, we will develop and maintain a risk profile that provides an analysis of the most significant risks and opportunities bearing on our ability to achieve our strategic objectives.
Agency Priority Goal. Partnerships

Expand public and private partnerships to enhance the impact of NSF’s investments and contribute to American economic competitiveness and security.

AGENCY PRIORITY GOAL A Performance Plan for FY 2019 has been developed in concert with this Strategic Plan. It includes the following Agency Priority Goal. By September 30, 2019, NSF’s number of partnerships and/or award actions with other federal agencies, private industry, and foundations/philanthropies will grow by 5 percent, relative to the FY 2017 baseline, to make available infrastructure, expertise, and financial resources to the US scientific and engineering research and education enterprise. Partnerships with private industry, foundations, international organizations, and other federal agencies are an increasingly important means for NSF to maximize the scientific, economic, and societal impacts of its investments. In meeting this goal, NSF will improve the effectiveness of its investments by joining forces with industry and private foundations, and with other agencies with common goals, to optimize the development of scientific and engineering knowledge and its delivery to the economy. The benefits of expanded partnerships include leveraging expertise and resources in pursuit of innovations; enhancing research, education, and workforce capacity; and improving translation from discovery to products and services that benefit society. Partnerships among federal agencies enable synergies in areas where agency missions intersect. Engagements with private industry and foundations have the potential to accelerate areas of mutual interest and enhance the preparation of the next-generation workforce.
EXAMPLES OF LONG-TERM PERFORMANCE GOALS — The foundation of NSF's Performance Plan rests on a set of performance goals. Each of the performance goals in the Performance Plan is associated with one or more strategic objectives in the Strategic Plan and will be reviewed annually in the strategic reviews as well as in quarterly performance reviews. These performance goals were created to provide a means by which NSF leadership can provide strategic monitoring and oversight of progress being made on the Foundation's most important activities: our priority program investments, research infrastructure investments, the satisfaction of proposers and reviewers, and key management initiatives. In addition to the Agency Priority Goal described above, brief descriptions of three examples of long-term performance goals from NSF's FY 2019 Performance Plan are included here.

PG1. Program Investments

Ensure that key FY 2019 NSF-wide program investments are implemented and on track.

Each year, NSF highlights a number of cross-agency investments in the NSF-Wide Investments chapter of its Budget Request to Congress. Although the overall impact of these investments will not be realized for many years, tracking near-term indicators of implementation and progress can help the agency make formative changes or course corrections. This has been a goal since FY 2014. The list of monitored programs evolves based on investment priorities for a particular year.

PG2. Facilities & Infrastructure

Ensure program integrity and responsible stewardship of major research facilities and infrastructure.

NSF monitors the performance of major facility projects by monitoring cost and schedule variances using Earned Value, a standard measure of performance for construction projects.

PG3. Proposals

Inform applicants whether their proposals have been declined or recommended for funding in a timely manner.

An important factor for principal investigators is the time it takes NSF to process proposals - the amount of time that passes between receipt of a proposal and notification to the principal investigator about the funding decision. Too long a time period delays the progress of research, but too short a time period may weaken the merit review process by forcing premature decisions. The optimal dwell time depends on a number of factors including the complexity of the proposed activity, the need for co-review by more than one program, the need for site review, infrastructure requirements of the proposed activity, and the potential size of the award. Large, complex proposals require more time under review to ensure that taxpayer dollars are invested wisely.

Stakeholder(s):

NSF Applicants
**Administrative Information**

**Start Date:** 2018-10-01  
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