NATIONAL SCIENCE FOUNDATION
Investing in Science, Engineering, and Education for the Nation's Future

Strategic Plan for 2014 – 2018
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NSF Strategic Plan for 2014 – 2018

The National Science Foundation (NSF) is an independent Federal agency that supports fundamental research at the frontiers of knowledge, across all fields of science and engineering (S&E) and S&E education. With an annual budget of about $7.2 billion (fiscal year 2014), the agency is the funding source for approximately 24 percent of all federally supported fundamental research conducted by America's colleges and universities. Each year, NSF receives about 50,000 competitive requests for funding proposals for research, education, and training projects, and we make about 11,500 new funding awards. To ensure that proposals are reviewed in a fair, competitive, transparent, and in-depth manner, the agency developed a rigorous merit review process that is widely recognized as the "gold standard" of evaluation. NSF's merit review uses two criteria to evaluate the proposed activity—its intellectual merit (meaning the potential to advance knowledge) and the broader impacts (encompassing the potential to benefit society and contribute to achieving specific, desired societal outcomes).

In FY 2012, NSF funding reached all 50 states, primarily through grants to nearly 2,000 colleges, universities, and other institutions. An estimated 319,000 people, including researchers, postdoctoral fellows, trainees, teachers, and students were supported by NSF awards. In addition, NSF supports an advanced research infrastructure that includes research vessels, astronomical observatories, particle accelerators, seismic observatories, U.S. research stations in Antarctica, advanced cyberinfrastructure, and more. Over the years, NSF-funded research and education projects and world-class S&E infrastructure have led to many significant discoveries. More than 200 Nobel Prize winners received support from NSF at some point in their careers, and the highly acclaimed achievements of these laureates are but a small fraction of the advances enabled by NSF--advances that, in turn, have stimulated economic growth and improved the quality of life, health, and security for all Americans.

NSF is committed to the principles underlying open government, including transparency, public participation, and collaboration with other government agencies and private institutions. Our stakeholders include students, faculties, and administrators of academic institutions at all levels (K-12 schools, two-year and community colleges, and undergraduate and graduate colleges and universities); not-for-profit institutions such as zoos and museums; businesses and industries engaged in science, technology, engineering, and mathematics (STEM) research, development, and manufacturing; state and other government agencies; NSF staff; the National Science Board (NSB); Congress, the Administration and other science policy makers; and the American public. The agency uses advice from a broad spectrum of recognized deliberative bodies, including the NSB, the National Academies, our advisory committees, and the research and education

communities we serve. Through traditional means--such as program announcements and solicitations, conferences and workshops, advisory committees, congressional testimony, websites, press releases, and reports--and through new or emerging communications means such as social media, we inform advisers and stakeholders about what NSF is doing, and we incorporate their input into our programs and planning to achieve our mission.

Mission

Our mission was established by Congress in legislation that created the agency. The NSF Act of 1950 (Public Law 81-507) sets forth the mission: ***"to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."***

Investing in S&E has become widely recognized as an essential strategy to ensure the Nation's future prosperity. Discoveries made possible through NSF-supported fundamental S&E research are key to sustaining the health of the Nation's "innovation ecosystem," a concept that expresses the importance of an exponentially growing mix of ideas and techniques from all fields, together with highly trained knowledge workers capable of answering the two questions at the heart of innovation: What is needed, and what is possible? While certain S&E discoveries may be used directly to meet pressing societal needs, some discoveries may be combined with other fundamental advances, sometimes made decades apart, to produce new technologies that transform our lives. Examples of such technologies include the Global Positioning System (GPS), medical diagnostic and therapeutic technologies, and the cyber revolution. Still other S&E discoveries may have no apparent technological application, but still contribute in an important way to the knowledge base from which all innovation is derived.   Therefore, NSF's commitment to advance the frontiers of science and engineering ensures the sustained vigor of both fundamental research and the Nation's innovation ecosystem as a means to maintaining global leadership throughout the 21st century.

In order to unleash the Nation's innovation potential, a well-prepared knowledge workforce--one that is steeped in the expanding knowledge base and the advanced technology being generated by fundamental research activities--is essential. NSF meets this need by seamlessly integrating the education of future scientists, engineers, and educators into the broad portfolio of research that we support. This investment strategy generates not only groundbreaking S&E discoveries, but it also equips the future S&E workforce with the knowledge and experience to apply the most advanced concepts and technology to meet societal challenges.

NSF Vision

A Nation that creates and exploits new concepts in science and engineering and provides global leadership in research and education.

NSF Core Values

NSF's core values are essential and enduring tenets that guide everyone in the organization in support of our mission. NSF maintains the core values of:

Scientific Excellence – engaging the vision and expertise of our staff with that of the scientific community to create a portfolio of awards that support transformation and innovation*;*

Organizational Excellence – investing the resources entrusted to us optimally and efficiently, and realizing the full potential of our people in managing a capable, motivated, inclusive, and positive work environment;

Learning – continually identifying opportunities for learning and professional growth inside and outside the agency, and sharing our best insights with others;

Inclusiveness – seeking and embracing contributions from all sources, including underrepresented groups, regions, and institutions;

Accountability for Public Benefit – operating with integrity and transparency, and maintaining the highest standards of performance in administration, business processes, management, and oversight, thereby providing the best value to the U. S. taxpayer.

Strategic Planning In a Dynamic, Global Context

NSF has the responsibility to be a steward of the Nation's research and education enterprise in the midst of changing conditions that materially affect its success. External factors that affect the enterprise include the 2008-2009 global economic crisis; the increased need for a creative, expert, and adaptable STEM workforce; and growing capabilities abroad. New opportunities are emerging and technologies are arising across all disciplines. These include crowdsourcing; new materials and sensors; breakthroughs in neuroscience, data analysis, and cloud and mobile computing--all are critical for advancing national research. In formulating the strategic goals, objectives, strategies and means, and assessment sections that follow, NSF maintains a strong focus on carrying out our mission in a way that is sufficiently flexible to meet the changing requirements of the research and education enterprise as well as to address emerging and pressing societal challenges.

At stake is the competitive strength of the Nation in the coming decades. NSF is not alone in this view. Many authoritative and diverse accounts of the increasing need to meet global challenges to U.S. economic and scientific leadership have drawn attention to the importance of continuing to invest in science that will yield new knowledge and improve the human condition.

Stakeholder Engagement

The process of developing this strategic plan involved obtaining input from NSF's many stakeholder communities. To help shape the plan's approach and strategic directions, NSF sought input from our staff at all levels and our numerous advisory committees that represent the scientific community. The NSB was briefed on several occasions and had opportunities to provide comments. In addition, congressional staff were given an opportunity to provide comments on the draft plan.

To the extent possible, this plan draws on quantitative and qualitative inputs derived from on-going data collections and evaluations of NSF's core business practices (e.g., proposal dwell time and numbers of virtual panels) as well as from reports from Committees of Visitors, NSF Advisory Committees, the NSB, the National Research Council, and others. Looking ahead, there are a number of aspects of the process of developing this plan that we will use to inform the development of future such plans for NSF. For example, the agency explored innovative approaches to engaging our staff and seeking feedback on key aspects of the plan; these included interactive poster sessions and a variety of town-hall types of settings. These efforts were also informed by the increasing NSF-wide emphasis on evaluation and the systematic monitoring of performance. The new approaches were undertaken to ensure that the agency is well-positioned to implement the new requirements for the structured reviews of the strategic objectives (below) established in the plan.

Strategic Goals

NSF uses three strategic goals--Transform the frontiers of science and engineering; Stimulate innovation and address societal needs through research and education; and Excel as a Federal Science Agency--to guide the individual and collective efforts involved in achieving the agency's mission. The first two goals embody the dual nature of NSF's mission--(1) advancing the progress of science while (2) benefitting the Nation--and reflect the primary means by which NSF ensures the preeminence of the research and development (R&D) enterprise that is so essential to the Nation's future. Our approach to accomplishing strategic goals one and two is based on investing in fundamental research and education projects that are recommended for NSF support by the S&E communities using our gold standard merit review selection process. NSF's policies and procedures maintain an open system of competition that identifies and enables pursuit of the most promising ideas for major advances. The third goal, to excel as a Federal science agency, directs NSF to hold ourselves accountable for achieving excellence in how we carry out our mission. Each strategic goal is supported by a number of strategic objectives, performance goals, and performance indicators to describe more fully the agency's operations and business plan.

Strategic Goal 1: Transform the Frontiers of Science and Engineering

The first part of NSF's mission is "*to promote the progress of science*" in order to expand and explore the frontiers of human knowledge, to enhance the ability of the Nation to meet the challenges it faces, and to create new paradigms and capabilities for scientific, technological, and (consequently) economic leadership in an increasingly fast-paced, competitive world. NSF supports fundamental, interdisciplinary, high-risk, and potentially transformative research in science and engineering, and the education of the next generation of the STEM workforce to continue this transformation. NSF welcomes proposals for original research, from both individuals and groups, and for novel discovery tools in the form of advanced instrumentation, data analysis, computation, and facilities. By relying on the insight and creativity of the Nation's research communities, the merit review process, and efforts to broaden participation, NSF strives to create opportunities for major transformational advances. Proposals, whether submitted in response to open funding opportunities or for formal targeted solicitations, are competitively merit reviewed for intellectual merit and broader impacts by independent subject matter experts. Investment in competitively selected proposals continually expands the knowledge base from which innovation springs, in keeping with mandates from the National Science Board, Congress, and the Administration. The special role of NSF is to encourage broadly creative efforts that may not fit within those fields that are the domain of specific mission agencies, e.g., energy, defense, health, or agriculture. This strategy has a long and proven record of producing new ideas, developing important new fields of research, and, periodically, transforming the way we do science, education, and business, and changing the way we live. Instrumental to the creation of new knowledge is the preparation of future research leaders and tomorrow's STEM workforce who are equipped with up-to-date knowledge and the experience needed to address society's current and future challenges. Investing in the development of the next generation of researchers, scholars, and knowledge workers is one of NSF's most important approaches to transforming the frontiers of science and engineering.

Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education

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.*" While several topics in this broad charge are primary missions of other agencies, NSF makes a unique contribution. Through targeted solicitations and core programs, the agency is able to focus the attention of the broader S&E community on fundamental aspects of high priority national challenges. We guide the community to open up new avenues to address these priorities and we provide funding to pursue promising approaches. This strategic goal echoes the "broader impacts" merit review criterion which was developed by the NSB, and it explicitly requires NSF to engage the community in addressing particularly urgent challenges. The strategy often necessitates the formation of partnerships with industry, other agencies, and international sponsors to build capacity, leverage resources, and increase the speed of translation from discovery to innovation. The educational dimension is a key aspect of this strategic goal. NSF supports research and development on STEM education and learning to prepare a diverse, globally competent STEM workforce and a STEM-literate citizenry.

Strategic Goal 3: Excel as a Federal Science Agency

This goal directs that NSF will integrate mission, vision, and core values to efficiently and effectively execute our activities and provide the flexibility and agility required to meet the quickly evolving challenges associated with the first two strategic goals. Accomplishing goal three entails blending strong scientific leadership with robust organizational leadership, both characterized by vision and flexibility, and also supporting the staff with the information and other resources that are essential to carry out the agency's activities. This goal incorporates a culture of continuous improvement to ensure effective, inclusive, and accountable programs and merit review processes that provide the greatest value for taxpayer dollars. NSF's core strength is our people, and the agency is committed to recruiting, retaining, and deepening the expertise and capabilities of our entire workforce. Our idea of inclusiveness embraces a diverse and continually changing workforce. NSF's commitment to the innovative management of agency operations leverages the creativity of NSF staff with the opportunities provided by advances in information technology. NSF aims to drive improvements in our programs, processes, and systems, while providing high-quality service and support to all of our stakeholders. NSF also strives to align operational plans, budgets, and management practices with agency goals and priorities to create a common vision that permeates the many functions of NSF and enhances the performance of both individuals and internal organizations. Through this strategic goal, NSF will address any management challenges identified by the Inspector General.

Strategic Objectives

Strategic Goal 1 (G1): Transform the Frontiers of Science and Engineering

Strategic Objective 1 (G1/O1): Invest in fundamental research to ensure significant continuing advances across science, engineering, and education.

This objective encompasses NSF's largest and most important function – awarding grants to support research. This investment objective has a clear record of producing major new paradigms and technology disruptions that have the power to change our world and impact individual lives. Investments have led to major discoveries recognized by the most highly prized international awards. These types of investments have potentially high payoffs, but are not without risk, as major advances cannot result from every grant. It is rarely possible to predict whether any specific award will generate outcomes with important societal implications. Rather, fundamental research will generate new knowledge that may in the future contribute, often in unpredictable ways, to addressing a national challenge.   Often, a long period of incremental advances in knowledge is needed to set the stage for the creative leaps that produce game-changing innovation.

It is vital to the successful realization of this strategic objective that NSF places a high priority on cultivating strong communities of fundamental researchers and intellectual pioneers across the globe, working both as individuals and in a variety of collaborative ways. It is also important that NSF balance its portfolio with a mix of programs and funding

modalities to ensure fundamental research is conducted across a wide variety of fields of science, engineering, and education.

Strategic Objective 2 (G1/02): Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities.

The global competitiveness of the United States in the 21st century depends directly on the readiness of the Nation's STEM workforce. Educational institutions around the country must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. One of NSF's most enduring contributions to the national innovation ecosystem is the integration of education and research in the activities we support. When students participate in cutting-edge research activities under the guidance of the Nation's most creative scientists and engineers, the students can gain the up-to-date knowledge and practical, hands-on experience needed to develop into creative contributors who can engage in innovative activities throughout all sectors of society. The successive cadres of high-tech workers, each armed with practical knowledge of the most advanced thinking and technology of the day, create the flow of highly adaptable human capital needed to power discovery and innovation. NSF also supports the development of a strong STEM workforce by investing in building the knowledge that informs improvements in STEM teaching and learning. Such improvements include effective curricular and teaching strategies for increased student learning, as well as new approaches enabled by advanced classroom technologies. Investments in social science and education research in learning, teaching, and institutions can have major impacts when derived insights are applied to the education of the STEM workforce.

The transformation of the frontiers of science and engineering requires dramatic change in the diversity of S&E communities. The demographic evolution in the United States is reflected in a strong, growing workforce whose makeup is changing rapidly. Women and members of minority groups represent an expanding portion of the country's potential intellectual capital. NSF is committed to increasing access for currently underrepresented groups to STEM education and careers through our investments in research and education. The resulting enhancement of diversity is essential to provide the strength that comes from diverse perspectives, as well as to assure development of the Nation's intellectual capital.

Strategic Objective 3 (G1/O3): Provide world-class research infrastructure to enable major scientific advances.

To fulfill our core mission of "promoting the progress of science," NSF must provide the research community with advanced and powerful tools and capabilities to keep the Nation's research enterprise at the global forefront. These tools and capabilities include major research facilities, mid-scale instrumentation, advanced computational and data resources, and cyberinfrastructure. In addition, it is essential to prepare the next-generation workforce to develop, maintain, and employ the infrastructure to advance science. Large facilities hold the promise of major discoveries and revolutionary advances that can propel whole fields forward, thereby justifying significant investment costs. These facilities also are training grounds for the scientists and engineers of tomorrow. Smaller, so-called "mid-scale"

instruments are increasingly critical for enabling fundamental research in the experimental sciences; there is an urgent need to adequately provide this category of instrumentation. Advanced computational and data resources and cyberinfrastructure take many forms and are essential to S&E research. Balancing investments in the development and operation of these tools and capabilities with the rest of NSF's portfolio is a challenging management responsibility. Special challenges derive from life cycle planning, human capital development, and the curation, distribution, and management of the explosion of data being produced in all fields of research. As with all NSF awards, infrastructure projects must meet extremely high standards of scientific merit and broader impacts, and comparable standards of project planning and execution.

Strategic Goal 2 (G2): Stimulate Innovation and Address Societal Needs through Research and Education

Strategic Objective 1 (G2/O1): Strengthen the links between fundamental research and societal needs through investments and partnerships.

The first part of NSF's mission, as expanded 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. We also must connect new knowledge to innovations that address societal needs above and beyond the need for advancement in science. This strategic objective is aimed at developing connections between new insights and global challenges (often involving essential interdisciplinary collaborations, prototypes, and technologies). It also entails educating a workforce capable of using and adapting discoveries to meet society's needs.

One approach to developing these connections is through partnerships involving other government agencies and private and international entities. Such partnerships leverage NSF resources and help ensure that fundamental research outcomes are translated into benefits to society.

Strategic Objective 2 (G2/02): Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.

NSF has the opportunity and responsibility to leverage our research and education activities to engage the public and help citizens develop a better understanding of science-- one that can inform opinions about issues faced in daily living, in participation in the democratic process, and in helping to advance science. Formal education through the Nation's K-12 schools provides the foundation for citizens' understanding of STEM and its uses in addressing the needs of society. This learning continues for those who further their education in the Nation's colleges and universities. Informal education is another powerful means to provide learning and instill interest in STEM topics in everyone throughout their lives. Technology holds promise for new pathways to learning, including personalized learning. By investing in research and development on STEM education and learning, NSF extends the reach of our programs to the public.

Strategic Goal 3 (G3): Excel as a Federal Science Agency

Strategic Objective 1 (G3/O1): Build an increasingly diverse, engaged, and high-performing workforce by fostering excellence in recruitment, training, leadership, and management of human capital.

NSF is only as capable as the people who make up the organization. Therefore, recruiting and retaining the best staff in all of our organization's roles is of utmost importance. This strategic objective focuses on those aspects of recruitment, skill enhancement, leadership, and management of human capital that serve as the foundation for effective support of NSF's people and mission. NSF recognizes the importance of building diversity in our staff, and ensuring that our staff stays current to match priority mission responsibilities. As an agency at the cutting edge of research and education, NSF also understands that the skills needed to carry out the agency's work are constantly changing, and, as a result, on-going training is necessary for functions needed today and in the future. An excellent organization requires both vision and direction from our leadership, as well as a constant dialogue with the staff about potential change. It must be a dialogue in which all voices are heard and all contributions are valued. NSF looks to these dimensions of human capital management in order to share with all employees how they play a vital part in maximizing NSF's performance.

Strategic Objective 2 (G3/O2): Use effective methods and innovative solutions to achieve excellence in accomplishing the agency's mission.

NSF can accomplish our mission only when our operational and administrative enterprise functions work seamlessly with the front-line organizations they support. A wide range of services--including human resources; performance management; information technology (IT); financial, procurement, and administrative support--provide the wherewithal for the agency's program staff and leadership to make critical investments in science, research, engineering, and education.

The agency uses three key strategies to achieve organizational excellence: openness, inclusion, and effectiveness. Openness and inclusion are achieved when we conduct business in a transparent, collaborative, and participatory manner with all stakeholders. Continuous, clear communication with all parties is a hallmark of openness and inclusion. An organization is effective when all business processes work to optimize administrative efficiencies, provide business intelligence for data-driven decision making, and enable organizational agility.

An essential mechanism that NSF uses to accomplish our mission is the competitive merit review of research proposals. We have developed a strong business and operations model that is emulated around the world. This model uses frontline U.S. researchers who have the best sense of where opportunities for major advances lie to evaluate proposals for original research. NSF accepts proposals in a manner that represents an open portal for new ideas in all fields, including interdisciplinary proposals. Whether they are submitted in response to open funding opportunities or for formal targeted solicitations, the proposals undergo merit

review, with the subject matter experts (peers) assessing the intellectual merits and broader impacts of the proposed research. This merit review may take many forms, but all are designed to provide NSF program officers with the information they need to make award recommendations from among the (usually) large number of high-quality possibilities. The agency's IT systems are critical to the process, facilitating the flow of proposals through the merit review, award, and oversight processes. External members of the research community periodically assess the quality of the merit review process as a means of accountability for NSF management and staff. Construction and operation of large scientific instruments and infrastructure efforts present added challenges. NSF requires extensive project execution plans, including detailed work scope, milestone schedules, and risk management; progress is monitored continually by NSF staff using extensive Earned Value Management (EVM) data, supplemented by in-depth external reviews conducted at least once a year.

Agency Priority Goals (APG) and Long-term Performance Goals

NSF has identified three agency priority goals for FY 2015: increase public access to NSF-funded peer-reviewed publications; improve agency and awardee efficiency by leveling the award of grants across the fiscal year; and build multi-institutional partnerships to increase the number of U.S. data scientists and the usefulness and ease of use of data infrastructure. Below are brief descriptions of the APGs. Complete descriptions can be found in NSF's Annual Performance Plan.

Priority Goal 1: Increase public access to NSF-funded peer-reviewed publications.

Progress in science and technology--and the associated benefits for the American people--thrives in an environment of open communication. Therefore, NSF seeks to enable increased access to the results of our investments in research by reducing barriers to communication of research results, while ensuring the integrity of the research record, protection of sensitive information, and consistency with existing laws. To this end and to fulfill the goals of the Office of Science and Technology Policy (OSTP) memorandum, *Increasing Access to the Results of Federally Funded Scientific Research* (February 22, 2013), NSF will articulate a strategy and develop plans that will require peer-reviewed publications that were supported by NSF funding to be publicly accessible.

Priority Goal 2: Improve the nation's capacity in data science by investing in the development of human capital and infrastructure.

The rapidity of data creation is outpacing the development of new tools to process rapidly growing, complex data sets. There is a pressing need both for new tools and for people with the expertise to develop and use those tools. NSF is in the beginning stages of creating mechanisms to catalyze the development of infrastructure and people to address the challenges posed by this new flood of data.

Using the agency's ability to convene diverse sets of stakeholders, NSF will promote multi-stakeholder partnerships through supporting workshops and follow-on activities that bring together representatives of industry, academia, not-for-profit organizations, and other entities

to address current and future big-data challenges. NSF will also leverage existing programs to support the creation of more researchers and students competent in the deep analytical and technical skills required to address those challenges. NSF intends to achieve this priority goal by September 30, 2015.

Priority Goal 3: Improve agency and awardee efficiency by leveling the award of grants across the fiscal year.

NSF typically completes half of its nearly 20,000 funding actions on new and continuing awards in the fourth quarter due to the fact that almost 75 percent of proposals and funding requests are recommended for award during the last half of the fiscal year. This unbalanced award workload is partly a result of clustered proposal deadlines, and the NSF program staff practice of making funding decisions late in the fiscal year. Issuing such a high volume of awards in a compressed time period at the end of the fiscal year not only strains NSF's workforce and other resources such as IT business systems and meeting space for conducting review panels, but it also increases risk and places added pressure on awardee capabilities coinciding with these peak workload periods. Achieving this priority goal will benefit the nation's scientific research community, and support NSF's strategic goal to excel as a Federal science agency. By September 30, 2015, NSF will meet targets to level distribution of awards across the fiscal year and subsequently improve awardee capacity to effectively manage research funding.

A Performance Plan has been developed in concert with this Strategic Plan. Each of the performance goals is associated with one or more strategic objective(s) in the draft Strategic Plan and will be reviewed annually in the new Strategic Reviews as well as in quarterly performance reviews. In FY 2015, NSF continues its new (FY 2014) performance framework for strategic monitoring of key program, infrastructure, and management investments (performance goals 1-3). Together with NSF's enduring performance goal to make timely award decisions, these performance goals provide the foundation of NSF's Performance plan. They 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, and key management initiatives. Below are brief descriptions of a few exemplar Performance Goals from NSF's Annual Performance Plan.

1. We will meet critical targets for key program investments. Major NSF-wide investments will be strategically monitored using a set of common metrics and indicators.
2. We will ensure program integrity and exercise responsible stewardship of key research facilities. NSF has tracked the performance of its construction projects as a performance goal for over a decade.
3. NSF will use evidence-based reviews to guide management investments. This goal captures NSF's commitment to using two government-wide processes, Portfolio Stat and HR Stat, which aim to ensure that decisions regarding resource investments are made through formal processes involving cross-agency decision-makers.

Appendix I - Strategies and Means

NSF supports our mission by promoting the advance of science, preparing the STEM scholars of tomorrow, and continuously strengthening the Nation's innovation ecosystem including the leveraging of partnership opportunities. This work is both exciting and challenging. NSF receives tens of thousands of proposals each year from a community comprising on the order of 1 million researchers, educators, and students in all areas of S&E. The agency can only fund a fraction of the meritorious proposals, and we must make awards that keep the entire S&E community vigorous and always expanding the limits of human knowledge. The review and decision process must be carried out with integrity and transparency in order to maintain trust that the resulting decisions are fair, forward-looking, and the optimum use of limited resources.

NSF's enabling legislation provides much wisdom as to how to accomplish the agency's mission; over the years, a robust menu of strategies and means have been developed by NSF staff under the oversight of the NSB and Congress, and in concert with the communities NSF serves. The result has been the development of a research enterprise that is unrivaled in the world. Efforts by other advanced countries to elevate their research capabilities to approach those of the U.S. are well-known. This favorable position notwithstanding, the global competition for S&E excellence is unrelenting, and the NSF is ever in search of means of continuous improvement. Within this context, the core strategies and means by which NSF addresses our mission are summarized below.

Core Strategies

- *Envision the future of science and engineering through the eyes of the world's front-line researchers.*
- *Maintain a balanced portfolio that provides opportunities for original research in all fields of S&E.*
- *Maintain a balanced portfolio with regard to the mechanisms of support.*
- *Selectively invest in targeted areas of research related to high priority societal needs.*
- *Foster the development of fundamental research and innovation.*
- *Integrate research and education to equip the continuous flow of STEM graduates with the latest ideas, technological know-how, and networks of contacts.*
- *Ensure diversity is at the forefront of all of NSF's internal and external activities to develop the Nation's intellectual potential.*
- *Maintain the public's trust by operating with transparency, accountability, integrity, and ethical conduct.*
- *Maintain NSF's reputation as the gold standard of merit review, while welcoming constructive criticism and seeking continuous improvement.*

Means for Carrying Out Core Strategies

- *Align budget and other major decisions with the Strategic Plan.*
- *Make difficult choices and set priorities in the context of strategic goals.*
- *Interact with NSF stakeholders proactively and efficiently.*

- *Partner with other science sponsors and professional organizations to achieve goals.*
- *Be responsive to proposals that pursue new ideas, including interdisciplinary proposals.*
- *Maintain an open and widely discussed strategic portfolio balance among S&E fields and among different modalities of research.*
- *Maintain extensive documentation, tracking, and public dissemination of performance indicators.*
- *Develop, where appropriate, quantitative or evidence-based evaluation of outcomes.*
- *Maintain up-to-date digital tools and business systems.*
- *Complement the expertise of NSF's permanent staff with the knowledge and up-to-date experience of temporary staff drawn from among leading researchers and educators in the broader community.*

Measuring Performance

The desire to improve the performance of Federal agencies and to realize the maximum value from public investments has led to an increasing emphasis on performance measurement of the outputs and outcomes of all agencies. This is reflected in the Government Performance and Results Act (GPRA) of 1993 and the GPRA Modernization Act of 2010. Evaluation methodologies are challenging for activities such as research that depend upon individual creativity aimed at outcomes that are unpredictable, or dependent on parallel research, or whose major impact occurs far outside the planning and management timeframes of the evaluation process. Moreover, intrinsic to the notion of supporting "high risk, high potential payoff" research is the fact that efforts to make transformational discoveries or advances meet with many dead ends and even failure.

The suite of assessment tools described below is designed to be suitable for the nature of the activity, taking into account the actual outputs and outcomes sought and the timeframes over which they are realized. For research activities aimed at results that are expected to be achieved on about the timescale of the award period, specific milestones and metrics can be identified. For activities that typically produce results on much longer timescales and for which ultimate impacts may occur beyond the planning horizon, assessments by independent experts in the field and benchmarking against analogous research activities in other laboratories and other countries are specified. Expert judgment does not lend itself to quantification, but can be used to assess the success or failure of certain categories of research. Benchmarking provides a way of determining the relative quality and health of a research portfolio measured against the world standard.

The core approaches and attempts to develop new methods for measuring the performance of the NSF portfolio are described below. The core methodologies are applied singly and in combination, as appropriate, to provide the most rigorous and independent measurement possible for each program. The development and testing of the new approaches will take place during the timeframe of this Strategic Plan.

Core Approaches for Measuring Performance

To gauge progress toward NSF's strategic and performance goals, this plan establishes a framework for evaluation and assessment that builds upon longstanding NSF processes and also embraces new approaches.

- Merit Review: All NSF funding decisions are based on merit review by subject matter experts. This is a leading indicator of performance, rather than an assessment of performance outputs/outcomes, but it is the primary assessment that is used to ensure the impact of NSF's programs.

- Committee of Visitor (COV) assessments: NSF Programs undergo an external assessment by a COV every three years. COVs assess the quality and integrity of the merit review process, program operations, and program-level technical and managerial matters pertaining to proposal decisions.

- Portfolio Metrics: NSF maintains an extensive data base describing metrics that characterize our portfolio of awards. This includes dozens of parameters, from numbers of proposals/awards to numbers of investigators/students to diversity statistics to success rates. These metrics are good indicators for many of the performance goals.

- Performance Metrics: Data on a number of performance indicators are also kept to monitor performance relevant to many of the performance goals, e.g., cost/schedule performance for facility construction, proposal processing time, hiring statistics, and performance of the awards and contracting process.

- Independent Audits: Independent audits of NSF's financial performance provide accountability to stakeholders; NSF has a clean audit record over the last 15 years. The Government Accountability Office (GAO) and the agency Inspector General (IG) also conduct audits of NSF activities.

- Benchmarking: For programs whose ultimate outcomes occur over time frames longer than grant periods, NSF can benchmark against similar organizations worldwide to assure the strength of our programs as a measure of future performance. This assessment is conducted by external subject-matter experts with knowledge of the international context of a given program. It is based upon information provided by the program in the form of a self-assessment as well as the general knowledge of the assessment team.

- Advisory Committees: The Federal Advisory Committee Act (FACA) provides a means to receive consensus advice from carefully vetted advisory committees of external experts. NSF has a FACA advisory committee for each directorate, and additional FACA committees advise two or more agencies on matters pertaining to select fields or crosscutting activity. These committees and their *ad hoc* subcommittees provide both advice and feedback from the community on the performance of NSF programs, all of which is posted on the NSF website.

- Other Reviews and Evaluations: NSF pays careful attention to the advice offered in reports by the National Academies, national and international science organizations, professional societies, workshops, interagency working groups, and the NSB. NSF also employs a range of approaches to gain feedback on the efficiency and effectiveness of its systems and processes. Formal approaches include the testing of NSF IT systems

against Federal standards such as those established by the Federal Information Security Management Act (FISMA). Other methods used include periodic surveys of applicants for NSF funding to gauge overall satisfaction, as well as surveys of NSF staff for feedback on NSF's internal services, systems, and working environment.

New Approaches to Evaluation and Assessment

In addition to these longstanding inputs and processes, this Strategic Plan establishes a commitment to innovation and experimentation to strengthen the assessment process:

- New Strategic Review (SR): A new assessment process has been established in response to the GPRA Modernization Act of 2010. Its implementation is described in OMB Circular A-11, Part 6. The new process, the Strategic Review (SR), is based on an agency-level self-assessment of each strategic objective in this plan. A report of the annual SR will be submitted to OMB as part of the annual budget process.

- NSF Evaluation Initiative: The Administration has emphasized the need to use evidence-based assessment methodology in budget, management, and policy decisions to make government work effectively. In response, NSF has launched the NSF Evaluation Initiative to expand the agency's capability in the area of evidence-based evaluation. The effort will be staffed to carry out an agency-wide coordination of data gathering and development of evaluation capabilities, and to conduct pilots for selected programs.

Appendix II - Contributing Programs for Strategic Objectives

The GPRA Modernization Act of 2010 requires each agency to develop an inventory of all federal programs. In response to this requirement, NSF categorized its federal programs by initial topic area of investment. This approach mirrors its budget structure, and the programs presented here are consistent with the program activity (PA) lines presented in the President's Budget Appendix. This aligns to the way the agency executes its budget and is complementary with the expectations of external stakeholders. The ordering of this list follows the budget structure, with programs funded through the two program accounts (Research and Related Activities and Education and Human Resources) listed first, followed by Major Research Equipment and Facilities Construction, Agency Operations and Award Management, National Science Board, and Office of Inspector General.

The following tables, which constitute NSF's federal program inventory, have been updated to map to the agency's new 2014 –2018 Strategic Plan.

List of NSF Strategic Goals and Objectives
2014-2018

Strategic Goal G1: Transform the Frontiers of Science and Engineering

Strategic Objective 1 (G1/O1): Invest in fundamental research to ensure significant continuing advances across science, engineering, and education.

Strategic Objective 2 (G1/02): Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities.

Strategic Objective 3 (G1/O3): Provide world-class research infrastructure to enable major scientific advances.

S**trategic Goal G2: Stimulate Innovation and Address Societal Needs through Research and Education**

Strategic Objective 1 (G2/O1): Strengthen the links between fundamental research and societal needs through investments and partnerships

Strategic Objective 2 (G2/02): Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.

Strategic Goal G3: Excel as a Federal Science Agency

Strategic Objective 1 (G3/O1): Build an increasingly diverse, engaged, and high-performing workforce by fostering excellence in recruitment, training, leadership, and management of human capital.

Strategic Objective 2 (G3/O2): Use effective methods and innovative solutions to achieve excellence in accomplishing the agency's mission.

FY 2014-2015 NSF Priority Goals

Goal Short Title	Type of goal	Goal Statement
Ensure Public Access to Publications.	Agency	Increase public access to NSF-funded peer-reviewed publications. By September 30, 2015, NSF-funded investigators will be able to deposit versions of their peer-reviewed articles in a repository that will make them available to the public.
Increase the Nation's Data Science Capacity.	Agency	Improve the nation's capacity in data science by investing in the development of human capital and infrastructure. By September 30, 2015, implement mechanisms to support the training and workforce development of future data scientists; increase the number of multi-stakeholder partnerships to address the nation's big-data challenges; and increase investments in current and future data infrastructure, extending data-intensive science into more research communities.
Optimize the Award Process to Level Workload.	Agency	Improve agency and awardee efficiency by leveling award of grants across the fiscal year. By September 30, 2015, NSF will meet targets to level distribution of awards across the fiscal year and subsequently improve awardee capacity to effectively manage research funding.

List of Programs

Biological Sciences (BIO)

Program Title	Biological Sciences (BIO)
Program Description	This activity promotes scientific progress in biology through support of research on all levels, including molecules, cells, organisms, and ecosystems. This activity also supports a comprehensive research initiative on plant genomes, including research on economically significant crops. 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) Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/17_fy2014.pdf.
Supported Strategic Goals	Transform the Frontiers of Science and Engineering Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/O1; G1/O2; G1/O3 G2/O1; G2/O2
Supported Agency Priority Goals	Optimize the Award Process to Level Workload Increase Data Scientists and Data Infrastructure Ensure Public Access to Publications

Computer and Information Science and Engineering (CISE)

Program Title	Computer and Information Science and Engineering (CISE)
Program Description	This activity supports investigator initiated research in all areas of computer and information science and engineering, helps develop and maintain cutting-edge national computational and information infrastructure for research and education generally, and contributes to the education and training of the next generation of computer and computational engineers. The divisions within the Computer and Information Science and Engineering Directorate are: • Advanced Cyberinfrastructure (CISE/ACI) • Computing and Communication Foundations (CISE/CCF) • Computer and Network Systems (CISE/CNS) • Information & Intelligent Systems (CISE/IIS) • Information Technology Research (CISE/ITR) Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/18_fy2014.pdf.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03 G2/01, G2/02
Supported Agency Priority Goals	Increase Data Scientists and Data Infrastructure Optimize the Award Process to Level Workload Ensure Public Access to Publications

Engineering (ENG)

Program Title	Engineering (ENG)
Program Description	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)
	Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/19_fy2014.pdf.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering
	Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03
	G2/01, G2/02
Supported Agency Priority Goals	Increase Data Scientists and Data Infrastructure
	Optimize the Award Process to Level Workload
	Ensure Public Access to Publications

Geosciences (GEO)

Program Title	Geosciences (GEO)
Program Description	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. Additionally, 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. 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) • Polar Programs (GEO/PLR) Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/20_fy2014.pdf.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03 G2/01, G2/02
Supported Agency Priority Goals	Increase Data Scientists and Data Infrastructure Optimize the Award Process to Level Workload Ensure Public Access to Publications

Mathematical and Physical Sciences (MPS)

Program Title	Mathematical and Physical Sciences (MPS)
Program Description	Research in this activity is 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 (MPS/OMA) Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/21_fy2014.pdf.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03 G2/01, G2/02
Supported Agency Priority Goals	Increase Data Scientists and Data Infrastructure Optimize the Award Process to Level Workload Ensure Public Access to Publications

Social, Behavioral and Economic Sciences (SBE)

Program Title	Social, Behavioral, and Economic Sciences (SBE)
Program Description	This activity supports research, education, 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/SMA) • National Center for Science and Engineering Statistics (SBE/NCSES) Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/22_fy2014.pdf.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03 G2/01, G2/02
Supported Agency Priority Goals	Increase Data Scientists and Data Infrastructure Optimize the Award Process to Level Workload Ensure Public Access to Publications

International and Integrative Activities (IIA)

Program Title	International and Integrative Activities (IIA)
Program Description	This activity supports emerging cross disciplinary research efforts; major research instrumentation; and promotes an integrated strategy for international science and engineering that complements and enhances NSF's broader research and education goals and facilitates international collaboration. This activity also provides support for the Science and Technology Policy Institute. The Experimental 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 International and Integrative Activities are: • Communicating Science Broadly (CSB) • The Experimental Program to Stimulate Competitive Research (EPSCoR) • Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) • International Science and Engineering (ISE) • Major Research Instrumentation (MRI) • NSF Graduate Research Fellowships (NGRF) • NSF Research Traineeships (NRT) • Science and Technology Centers (STC) • Science and Technology Policy Institute (STPI) • Science and Technology for America's Reinvestment (STAR METRICS) Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/23_fy2014.pdf.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03 G2/01, G2/02
Supported Agency Priority Goals	Increase Data Scientists and Data Infrastructure Optimize the Award Process to Level Workload. Ensure Public Access to Publications

United States Arctic Research Commission (USARC)

Program Title	United States Arctic Research Commission (USARC)
Program Description	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.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering
Supported Strategic Objectives	G1/03
Supported Agency Priority Goals	Not applicable.

Note that USARC is an independent agency that is included in NSF's program inventory but not covered by the NSF strategic plan.

Education and Human Resources (EHR)

Program Title	Education and Human Resources (EHR)
Program Description	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 competent 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) • Undergraduate Education (EHR/DUE) Current information about the program can be found at http://nsf.gov/about/budget/fy2014/pdf/25_fy2014.pdf.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03 G2/01, G2/02
Supported Agency Priority Goals	Increase Data Scientists and Data Infrastructure Optimize the Award Process to Level Workload. Ensure Public Access to Publications

Major Research Equipment and Facilities Construction (MREFC)

Program Title	Major Research Equipment and Facilities Construction (MREFC)
Program Description	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.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering
Supported Strategic Objectives	G1/03
Supported Agency Priority Goals	Optimize the Award Process to Level Workload.

Agency Operations and Award Management (AOAM)

Program Title	Agency Operations and Award Management (AOAM)
Program Description	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.
Supported Strategic Goals	Strategic Goal 3: Excel as a Federal Science Agency
Supported Strategic Objectives	G3/01, G3/02
Supported Agency Priority Goals	Optimize the Award Process to Level Workload. Ensure Public Access to Publications

Office of the National Science Board (NSB)

Program Title	Office of the National Science Board (NSB)
Program Description	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.
Supported Strategic Goals	Strategic Goal 1: Transform the Frontiers of Science and Engineering Strategic Goal 2: Stimulate Innovation and Address Societal Needs through Research and Education
Supported Strategic Objectives	G1/01, G1/02, G1/03 G2/01, G2/02
Supported Agency Priority Goals	None

Office of Inspector General (OIG)

Program Title	Office of Inspector General (OIG)
Program Description	This appropriation provides agency-wide audit and investigative functions to identify and correct management and administrative deficiencies which 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).
Supported Strategic Goals	Strategic Goal 3: Excel as a Federal Science Agency
Supported Strategic Objectives	None
Supported Agency Priority Goals	None