Chapter 1

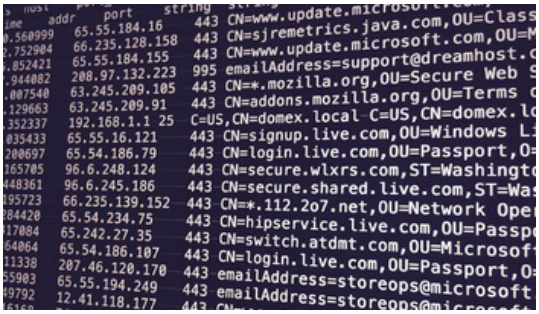
Management's Discussion and Analysis

Agency Overview

Mission and Vision

The mission of the National Science Foundation (NSF) is, "To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."[1] In a report widely credited as establishing the basis for NSF, the prominent American scientist and advisor to then-President Franklin D. Roosevelt, Vannevar Bush, said that: "It is in keeping with the American tradition—one which has made the United States great—that new frontiers shall be made accessible for development by all American citizens. Moreover, since health, well-being, and security are proper concerns of Government, scientific progress is, and must be, of vital interest to Government."[2] Over the course of NSF's 65-year history, NSF investments have promoted scientific progress and advanced exciting new frontiers in science by supporting basic research and education in every science and engineering (S&E) discipline. Discoveries made possible by NSF ensure the Nation's future prosperity, and NSF's investments in the development of an S&E-literate workforce inspire the next generation of innovators and entrepreneurs while keeping U.S. researchers and research institutions at the leading edge of scientific discovery in an increasingly interdisciplinary and global marketplace of innovation and ideas.

Supercomputer Cybersecurity: Computer networks at national labs, scientific computing facilities, universities, and large companies identify and block hundreds of thousands of hostile intrusions every month, thanks to a freely available cybersecurity software advanced by NSF-funded computer scientists at the University of California, Berkeley. The programmable "Bro" code analyzes a network's unique data traffic patterns and tailors its defenses as needed, depending on the anomalies detected. The code played a critical role in identifying hackers trying to sell access to federal supercomputers. The NSF-funded Bro Center of Expertise provides resources for users to protect their cyberinfrastructure.



The Bro Network Security Monitor protects many scientific computing networks. *Credit: Bro Center of Expertise.*

Many discoveries made possible by NSF support have transformed the frontiers of science and engineering, enabling a broad array of new innovations and technologies that address important societal challenges and improve quality of life. These discoveries include the Global Positioning System (GPS), the Internet and Web Browsers, Doppler Radar, Magnetic Resonance Imaging (MRI), and Three-Dimensional (3-D) Printing. In 2015, NSF-supported scientists used renewable feedstock chemicals to transform the way plastics are made; explored the potential impacts of hydraulic fracturing on local ecology, human health, and energy sustainability; and developed smart bandages capable of monitoring and communicating to health professionals all of the vital signs of a patient's healing process. NSF-supported researchers also developed next generation robots that learn from, and are more responsive to, human behavior. Not all scientific discoveries have an obvious, near-term technological application. However, sustained NSF investment in basic research provides a steady pipeline of new ideas and techniques that, together with a highly trained S&E workforce,[3] contribute to the health of the Nation's "innovation

[1] National Science Foundation Act of 1950 (P.L. 81–507).

[2] *Science: The Endless Frontier*; see www.nsf.gov/od/lpa/nsf50/vbush1945.htm.

[3] For more information on the state of the Nation's S&E workforce, see *Revisiting the STEM Workforce: A Companion to Science and Engineering Indicators 2014* at www.nsf.gov/pubs/2015/nsb201510/nsb201510.pdf.

ecosystem."[4] NSF's mission affirms our commitment, through investment in these discoveries, to advancing the frontiers of science and engineering, ensuring the sustained vigor of both fundamental research and the Nation's innovation ecosystem as a means to maintaining global leadership in the 21st century.[5]

NSF's vision is of a Nation that capitalizes on new concepts in science and engineering and provides global leadership in advancing research and education.[6] NSF's core values articulate the essential qualities that staff are encouraged to embody in support of the agency's mission. Among these core values are a dedication to scientific excellence, learning, stewardship, inclusiveness, and stakeholder accountability.[7] NSF strives to excel as a federal agency by investing in priorities that address important national challenges while promoting economic growth, innovation, and new scientific advancements. NSF's current Strategic Plan, *Investing in Science, Engineering, and Education for the Nation's Future*, identifies three interrelated strategic goals to achieving the agency's mission: (1) transform the frontiers of science and engineering, (2) stimulate innovation and address societal needs through research and education, and (3) excel as a federal science agency. These strategic goals represent a roadmap for NSF's success. A detailed discussion of NSF's Strategic Plan can be found in the Performance section, beginning on page I-10.

PBS Series Engages Latino Children in Math and Science: Peep and the Big Wide World, an Emmy award-winning Public Broadcasting Service (PBS) series, developed an outreach campaign to encourage greater family involvement, particularly among Latino families, in children's exploration of math and science. A Spanish-speaking character, "Splendid Bird from Paradise," was added to the animated cast, and parents, including Spanish speakers, are now featured in the live-action videos. A multipronged study found that Spanish-speaking parents who used Peep resources with their preschool-age children were better equipped to facilitate science and math exploration. The parents reported feeling more inclined to do math and science activities with their preschoolers and said the resources are easy to understand, fun, and help them learn science alongside their children.

Animation still from Peep and the Big Wide World. *Credit: WGBH Education Foundation*.

NSF promotes scientific progress and advances scientific frontiers by making awards and managing award portfolios of the highest quality. NSF awards reflect national priorities, keep U.S. researchers and research institutions at the forefront of innovation, and distinguish the United States as a leader in the rapidly changing global landscape of scientific research and discovery. In doing so, NSF pursues transformational work, new fields of scientific inquiry, and new theoretical paradigms. Increasingly, NSF awards are made where scientific disciplines converge, which reflects the increasingly interdisciplinary nature of modern science and engineering.

[4] *National Science Foundation Strategic Plan for 2014–2018: Investing in Science, Engineering, and Education for the Nation's Future*, page 3; see www.nsf.gov/pubs/2014/nsf14043/nsf14043.pdf.

[5] *Ibid.*

[6] *Ibid.*

[7] *Ibid.*, page 4.

NSF is the funding source for 24 percent of all the federally supported basic scientific research conducted by America's colleges and universities, and this share increases to nearly 60 percent when medical research supported by the National Institutes of Health is excluded.[8] A cornerstone of NSF investment in the development of a world-class workforce is the Graduate Research Fellowship Program, which has funded nearly 51,800 Graduate Research Fellows since 1952. The ranks of NSF Fellows include numerous individuals who have made transformative breakthroughs in science and engineering research. Many of them have become leaders in their chosen careers—over 450 have become members of the National Academies of Sciences or Engineering, and 43 have been honored as Nobel laureates. In fact, 217 Nobel Prize winners have received NSF support at some point in their careers. These investments are a critical means by which NSF identifies, nurtures, and invests in scientific potential.

Hunting for Gravitational Waves: NSF in May 2015 helped dedicate the Advanced Laser Interferometer Gravitational-Wave Observatories (LIGO) in Washington State. Researchers using the facilities seek to observe and record gravitational waves for the first time. Those discoveries would allow us to learn more about the phenomena that generate the waves, such as supernovae and colliding black holes. The Advanced LIGO project represents a major upgrade expected to enhance the sensitivity of LIGO's instruments by a factor of at least 10 and can see a volume of space more than 1,000 times greater than the initial LIGO. The existence of gravitational waves is a crucial prediction of the General Theory of Relativity, so far unverified by direct observation.

Image of the LIGO Observatory in Hanford, Washington, where astronomers completed a major upgrade in a quest to understand the extraordinary mysteries of our universe. *Credit: Cfoellmi via Wikimedia Commons*.

For 65 years, NSF has supported basic research and education across all fields of science and engineering. NSF's investments seamlessly connect research and education to support the development of a world-class scientific workforce that can engage fully and contribute imaginatively in the 21st century, when leaders increasingly rely on technology to meet challenges, identify possibilities, and leverage opportunities. The legacy of NSF's long history of support is an innovation ecosystem that cultivates scientists and engineers who are able to extend their focus beyond the laboratory and make contributions to the 21st century S&E enterprise at the very leading edge of scientific discovery. The scientific discoveries of today, in turn, become the foundation of our Nation's future—contributing to the Nation's health, prosperity, and well-being while inspiring new and more diverse generations of Americans to push the scientific frontiers of tomorrow to new and unprecedented heights.

Following the Money

NSF is funded primarily through six congressional appropriations, which totaled $7,344 million in FY 2015 (Figure 1).[9] Budget authority in FY 2015 was 2.4 percent above the prior year FY 2014 budget authority of $7,172 million. Research and Related Activities (R&RA), Education and Human Resources

[8] NSF, National Center for Science and Engineering Statistics. 2014. *Federal Funds for Research and Development: Fiscal Years 2012–14*; see www.nsf.gov/statistics/nsf14316/content.cfm?pub_id=4418&id=2.

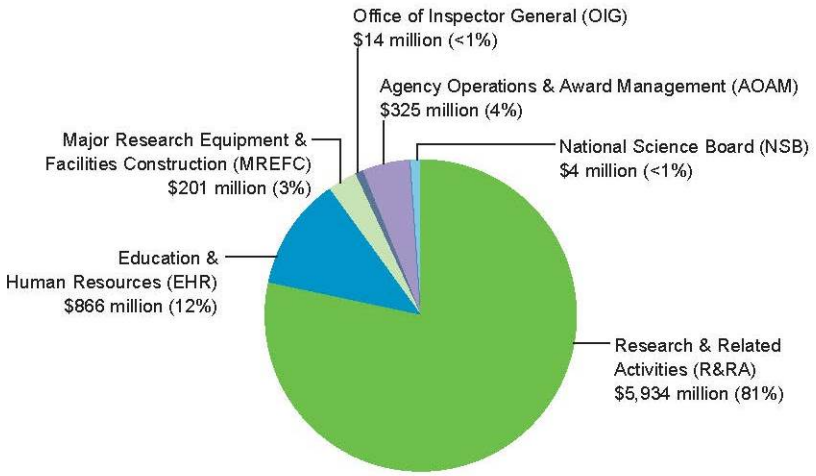
[9] In Figure 1, FY 2015 Appropriations by Account of $7,344 million plus Donations ($35 million) and H1-B Nonimmigrant Petitioner Receipts ($143 million) equal Appropriations (Discretionary and Mandatory) of $7,522 million as shown in the Statement of Budgetary Resources.

(EHR), and Major Research Equipment and Facilities Construction (MREFC) fund the agency's programmatic activities and accounted for 95 percent of NSF's total appropriations in FY 2015.

Figure 1

NSF Budget Structure

FY 2015 Appropriations by Account—$7,344 million



Note: Totals may not add due to rounding.

- R&RA, which supports basic research and education activities at the frontiers of science and engineering, including high-risk and transformative research, accounted for 81 percent of FY 2015 funding. The FY 2015 R&RA appropriation of $5,934 million was $132 million, or 2.3 percent above its prior year FY 2014 level of $5,802 million.
- EHR, which supports activities that ensure a diverse, competitive, and globally engaged U.S. science, technology, engineering, and mathematics (STEM) workforce and a scientifically literate citizenry is NSF's second largest appropriation, accounting for 12 percent of the agency's budget. The FY 2015 appropriation of $866.0 million was $20.6 million, or 2.4 percent above its prior year FY 2014 level of $845.4 million.
- The MREFC appropriation, which supports the construction of unique national research platforms and major research equipment that enable cutting-edge research, accounted for 3 percent of the agency's total appropriations. The FY 2015 funding of $200.8 million is a $0.8 million, or 0.4 percent increase from its prior year FY 2014 level of $200.0 million.
- The Agency Operations and Award Management (AOAM) appropriation of $325.0 million supports NSF's administrative and management activities and accounted for about 4 percent of the agency's FY 2015 funding. This level is a 6.1 percent ($18.7 million) increase from its FY 2014 level of $306.3 million.
- Separate appropriations support the activities of the Office of Inspector General (OIG) and National Science Board (NSB); each accounts for less than 1 percent of NSF's FY 2015 budget. The FY 2015 OIG appropriation of $14.4 million is a $0.2 million, or 1.4 percent, increase from its prior year FY 2014 appropriation of $14.2 million. The NSB appropriation of $4.4 million in FY 2015 is a $0.1 million, or 2.3 percent, increase from its prior year FY 2014 funding of $4.3 million.

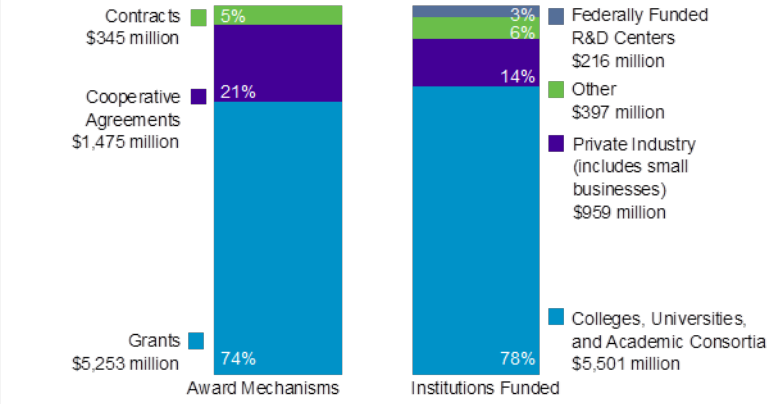
- In FY 2015, 89 percent of research funding was allocated based on competitive merit review.[10] Over 35,000 members of the science and engineering community participated in the merit review process as panelists and proposal reviewers.[11] Awards were made to 1,859 institutions in 50 states, the District of Columbia, and 4 U.S. territories. These institutions employ America's leading scientists, engineers, and educators, and they train the leading innovators of tomorrow. In FY 2015, an estimated 350,000 people were directly involved in NSF programs and activities, receiving salaries, stipends, or participant support. Beyond these figures, NSF programs indirectly impact millions of people. These programs reach K-12 students and teachers, the general public, and researchers through activities including workshops; informal science activities such as museums, television, videos, and journals; outreach efforts; and the dissemination of improved curricula and teaching methods.

In FY 2015, NSF funded 12,016 new awards, mostly to academic institutions. As shown in Figure 2, 78 percent of support for research and education programs ($5,501 million) was to colleges, universities, and academic consortia. Private industry, including small businesses, accounted for 14 percent ($959 million), and support to Federally Funded Research and Development Centers (FFRDCs) accounted for 3 percent ($216 million). Other recipients included federal, state, and local governments; nonprofit organizations; and international organizations. A small number of awards fund research in collaboration with other countries, which adds value to the U.S. scientific enterprise.

Figure 2

NSF Award Mechanisms and Institutions Funded

FY 2015 Obligations for Research and Education Programs ($7,073 million)



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

Most NSF awards (95 percent) were funded through grants or cooperative agreements (Figure 2). Grants can be funded either as standard awards, in which funding for the full duration of the project is provided in a single fiscal year, or as continuing awards, in which funding for a multiyear project is provided in

[10] NSF does not require merit review for certain kinds of proposals, including proposals for international travel grants and some conferences, symposia, and workshops.

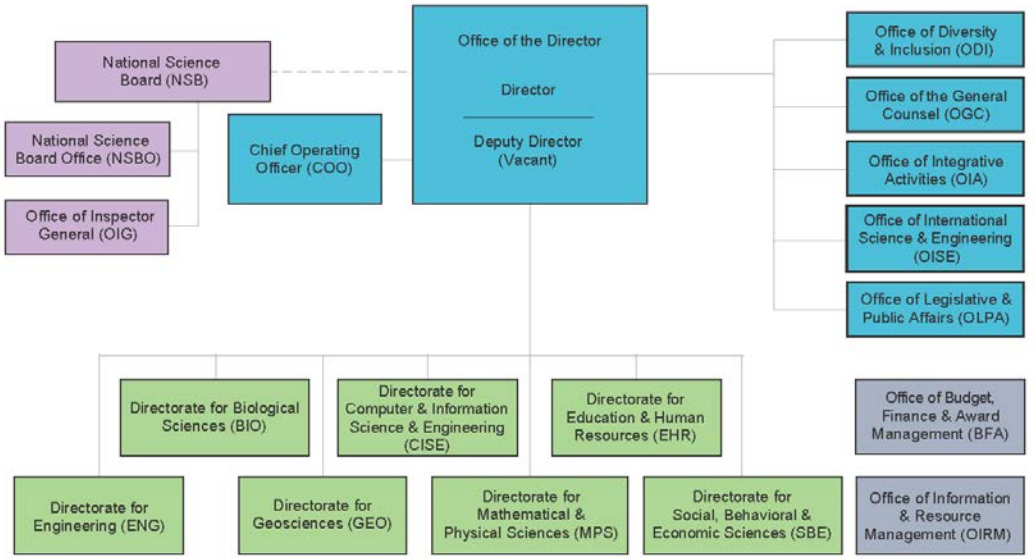
[11] For more information about NSF's merit review process, see www.nsf.gov/bfa/dias/policy/merit_review and *Report to the National Science Board on the National Science Foundation's Merit Review Process, Fiscal Year 2014* (NSB-2015-14) at http://www.nsf.gov/nsb/publications/2015/nsb201514.pdf.

increments. Cooperative agreements are used when the project requires substantial agency technical involvement during the project performance period (e.g., research centers, multi-use facilities). Contracts (procurement instruments) are used to acquire products, services, and studies (e.g., program evaluations) required primarily for NSF or other government use.

Organizational Structure

NSF is an independent federal agency headed by a Director appointed by the President and confirmed by the U.S. Senate.[12] The 25-member NSB meets five times a year to establish the overall policies of the agency. NSB members are appointed by the President and are prominent contributors to the S&E research and education community.[13] The NSF Director is a member *ex officio* of the Board. The Director and the other NSB members serve 6-year terms. NSF is also served by a Deputy Director, a position that is appointed by the President and Senate confirmed.[14] The NSF workforce includes nearly 1,374 permanent staff.[15] NSF also regularly recruits visiting scientists, engineers, and educators as rotators who work at NSF for up to four years.[16] The blend of permanent staff and rotators who infuse new talent and expertise into the agency is reflective of our core values and integral to effectuating NSF's mission to support the entire spectrum of science and engineering research and education at the frontier. As shown in Figure 3, NSF's organizational structure aligns with the major fields of science and engineering (www.nsf.gov/staff/organizational_chart.pdf).

Figure 3
NSF FY 2015 Organization Chart



[12] The Director's biography is available at www.nsf.gov/news/speeches/cordova/cordova_bio.jsp.

[13] A list of NSB members is available at www.nsf.gov/nsb/members.

[14] The Deputy Director position remained vacant through FY 2015. The Chief Operating Officer, appointed by the Director, has been nominated to fill the Deputy Director position.

[15] Full-time equivalents.

[16] As of September 30, 2015, temporary appointments included 171 under the Intergovernmental Personnel Act.

In addition to the agency's headquarters located in Arlington, Virginia, NSF maintains offices in Brussels[17], Tokyo, and Beijing to facilitate its international activities, and an office in Christchurch, New Zealand, to support the U.S. Antarctic Program (USAP). NSF is scheduled to relocate its headquarters from Arlington to Alexandria, Virginia, in 2017.

Management Challenges

For FY 2015, the OIG identified six major management and performance challenges facing the agency: (1) establishing accountability over large cooperative agreements, (2) improving grant administration, (3) managing the U.S. Antarctic Program, (4) moving NSF headquarters to a new building, (5) managing programs and resources in times of budget austerity, and (6) encouraging the ethical conduct of research.[18]

Management's report on the significant activities undertaken in FY 2015 to address these challenges is included in this report as Appendix 3B. The report also discusses activities planned for FY 2016 and beyond. Some of the significant actions the agency took in FY 2015 to address the challenges are highlighted below:

- **To establish accountability over large cooperative agreements:** NSF has focused on implementing enhancements to its pre-award and post-award budget and cost review processes for large research facility cooperative agreements to include additional analyses of awardee cost proposal budget information and the utilization of incurred cost audits, to the extent appropriate based on risk. These strengthened procedures include requirements for an independent assessment of the recipient's cost proposal. The agency has also published policy and guidance on the planning and use of budget contingency in large facility cooperative agreements in the most recent revision of the Large Facilities Manual. Also in that manual, NSF published policy on management fee in large facility cooperative agreements and implemented the new policy on seven such agreements. The agency's work in FY 2015 notably included a detailed contingency review for the Large Synoptic Survey Telescope (LSST) project following the newly developed NSF requirements on contingency.

Control of Soot Formation in Flames: Environmental soot, which is associated with respiratory illness and cancer, is a deadly pollutant and a leading man-made contributor to global warming. A ternary flame system developed to study soot oxidation could save thousands of lives and contribute to a cleaner environment. This novel flame system, developed by researchers at the University of Maryland, College Park, allows complicated flame processes to be separated and controlled. In ordinary flames, soot formation and oxidation regions overlap, preventing either process from being studied independently. The ternary system will allow soot oxidation to be studied in a region without soot formation, which could lead to more accurate computer models used in the design of engines and other combustors.

Soot oxidation will be studied in the yellow flame at the top of the ternary flame system seen in this image. *Credit: Haiqing Guo and Peter B. Sunderland, University of Maryland, College Park*.

[17] The NSF Europe Office was relocated from Paris to Brussels effective October 1, 2015.

[18] The NSF Inspector General's memorandum on Management Challenges for NSF in FY 2015 can be found in NSF's *FY 2014 Agency Financial Report* (www.nsf.gov/pubs/2015/nsf15002/pdf/nsf15002.pdf), Appendix 3A.

- **To improve grant administration:** NSF has leveraged its investments in technology designed to strengthen its business infrastructure. iTRAK, NSF's new financial system, went live in FY 2015, providing increased transparency and capacity for processing and reporting data needed for decision-making and oversight. iTRAK built on the success of the Award Cash Management $ervice (ACM$), the agency's redesigned awardee payment process that has enabled NSF to obtain more timely, award-specific expenditure data. Also in FY 2015, the agency began to specify requirements for an updated award management system that will be implemented incrementally over the next several years. To strengthen transparency and accountability in connection with the merit review process over the past fiscal year, NSF convened the Transparency and Accountability Working Group (TAWG 2) to address the recommendation from an FY 2014 working group to clarify the roles and responsibilities of the Division Director. The agency also implemented the TAWG 2 recommendations by way of NSF's internal policies and procedures guide, the Proposal & Award Manual (PAM). Additionally, in FY 2015, NSF met the schedule for full implementation of the *Uniform Guidance: Cost Principles, Audit, and Administrative Requirements for Federal Awards* and has continued to support the Office of Management and Budget (OMB) Council on Financial Assistance Reform (COFAR) in its government-wide implementation. The agency also recruited for two additional cost analysts to join the Cost Analysis and Audit Resolution (CAAR) Branch to support oversight priorities and timely audit resolution.

- **To manage the U.S. Antarctic Program:** NSF continued progress on activities in accordance with the agency's official initial response (March 2013) to the Blue Ribbon Panel (BRP) report. The agency also continued development of the Antarctic Infrastructure Modernization for Science (AIMS), a potential MREFC project to address major infrastructure upgrades recommended by the BRP report for McMurdo and Palmer Stations. To control program costs, NSF improved review and oversight of invoices from its subcontractors. The agency also conducted its annual multitier evaluation of the contractor's performance, which included an assessment of overall technical, cost, and business performance. NSF also established a coordination group to work with executive management from the USAP prime contractor regarding the potential sale or spinoff of the business unit of the prime contractor currently supporting USAP.

- **To move NSF headquarters to a new building:** NSF continued to work collaboratively with the U.S. General Services Administration (GSA) to formulate schedule strategies that address NSF's relocation objectives. The agency and the American Federation of Government Employees (AFGE) Local 3403 underwent formal negotiations,

Cosmic Confirmation: Researchers using a massive, NSF-funded instrument buried deep in the ice at the South Pole observed high-energy neutrinos from beyond our solar system—and beyond our galaxy. Billions of the subatomic particles known as *neutrinos* pass through Earth every day but are difficult to detect. The IceCube Neutrino Observatory, a cubic-kilometer-sized detector sunk into the South Pole ice sheet, allows researchers to see byproducts of neutrino interaction with ice. A 2015 observation confirmed the discovery of high-energy neutrinos IceCube made in 2013. "Cosmic neutrinos are the key to yet unexplored parts of our universe and might be able to finally reveal the origins of the highest energy cosmic rays, including the rare 'Oh-My-God' particles," said IceCube Collaboration spokesperson Olga Botner.

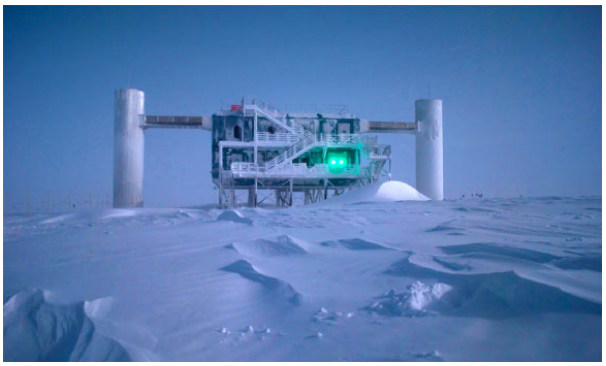
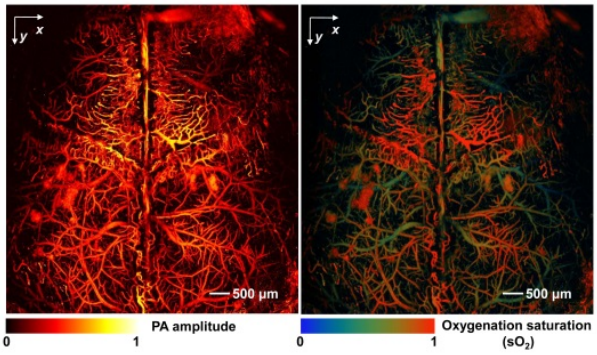


Photo of IceCube, a neutrino observatory whose detectors are buried more than 1 mile below the surface of the South Pole. *Credit: Emanuel Jacobi, National Science Foundation*.

which resulted in obtaining a decision from the Federal Service Impasses Panel (FSIP). NSF implemented the FSIP decision relating to office and workstation sizes. The agency also negotiated the financial impact of the FSIP order with the new building owner, reducing NSF's liability from an estimated $54 million down to $14.5 million, which included a revised negotiated project schedule that reduced project delay by 8 months. The agency also completed the collection of FY 2017 panel meeting projections in order to discuss and propose a final relocation and move operations approach, determining that panel meetings can continue throughout the move at either location or both.

- **To manage programs and resources in times of budget austerity:** NSF continued to reduce certain administrative costs by identifying and implementing efficiencies, by prioritizing work, by eliminating or scaling back the scope of some activities, and by exploring new ways of getting the job done. The agency expanded training for panel moderators, providing increased support resulting in larger scale use of virtual meeting technology. Virtual panels reviewed 27 percent of proposals competitively reviewed in FY 2015. In the travel arena, NSF increased its use of nonrefundable airline tickets for Federal Advisory Committee Act meetings, resulting in almost $750,000 in savings. The agency also realized savings in other areas—including conferences, printing, and telecommunications—through such measures as continuing to utilize Blanket Purchase Agreements for light refreshments; developing a comprehensive Managed Print Services Strategy that will centralize the approval, acquisition, and maintenance of all NSF printing devices; and expanding the use of Telecommunications Expense Management Services to 100 percent agency participation. NSF is also continuing to monitor Intergovernmental Personnel Act (IPA) costs, and in FY 2015 developed a document for institutions outlining the benefits to institutions of allowing their staff to come to NSF as IPAs. NSF also reached the highest percentage of IPA awards with cost sharing ever achieved. More than 40 percent of all active agreements have cost sharing, which is double the rate in previous years.

Imaging the Brain in Real Time: Overcoming the light-scattering effects of tissue, NSF-funded researchers at Washington University in St. Louis (WUSTL) use laser light to peer into the brain to unprecedented depths (nearly 3 inches). The approach they pioneered, termed photoacoustic imaging, combines laser light and sound waves. The technique allows the study of biological material, from cells to tissues and organs, in its natural environment, free of imaging agents. It detects single red blood cells as well as fats and proteins. The researchers are integrating the technique into a system to capture images every 1/1,000th of a second—fast enough to image action potentials (changes in electrical potential along a nerve fiber when a nerve impulse is transmitted).



This mouse brain was visualized using label-free photoacoustic microscopy. *Credit: Junjie Yao and Lihong Wang, WUSTL.*

- **To encourage the ethical conduct of research:** NSF continued to manage the Cultivating Cultures for Ethical STEM (CCE STEM) program. CCE STEM focuses on cultivating climates that expect and encourage academic and research integrity at all levels. The agency oversaw year 1 of the 5-year cooperative agreement with the National Academies to develop their Online Ethics Center to include material relevant to all fields that NSF supports. The agency also established a global presence in this area by organizing collaborative workshops with the Japan Society for the Promotion of Science (JSPS) and with the American Association for the Advancement of Science (AAAS) on research integrity.

Performance

This discussion of NSF's FY 2015 performance management activities focuses on the agency's efforts related to the Government Performance and Results Act of 1993 (GPRA) and the GPRA Modernization Act of 2010[19] and on the agency's workload and management metrics.

FY 2015 Strategic Framework

NSF is subject to GPRA and the GPRA Modernization Act of 2010, as well as related performance reporting guidance issued by OMB.[20] NSF's Strategic Plan, *Investing in Science, Engineering, and Education for the Nation's Future,*[21] lays out the following strategic goals:

- The first mission-focused goal, *Transform the Frontiers of Science and Engineering,* derives from the first part of NSF's mission, "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.
- The second mission-focused goal, *Stimulate Innovation and Address Societal Needs through Research and Education*, 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 targeted solicitations and core programs, NSF is able to focus the attention of the broader science and engineering community on fundamental aspects of high-priority national challenges.
- The management-focused goal, *Excel as a Federal Science Agency,* directs that NSF will integrate mission, vision, and core values to efficiently and effectively execute its activities and provide the flexibility and agility required to meet the quickly evolving challenges associated with the first two strategic goals.

These three strategic goals are associated with seven specific objectives (Figure 4). Objectives are intended to be comprehensive of agency program activities. Progress toward these objectives is monitored in several ways—through annual performance goals (seven goals in FY 2015), Agency Priority Goals (three goals in FY 2014–FY 2015), and Strategic Reviews (see next section).

In addition to these strategic goals and objectives, which are intended to monitor agency performance against its entire mission, NSF set three Agency Priority Goals for FY 2014–FY 2015 to monitor progress in specific areas in which near-term focus on agency execution can have the most impact. In FY 2015, NSF continued its practice of having agency leaders conduct quarterly data-driven performance reviews for each of the three Agency Priority Goals. NSF also participates actively in Cross-Agency Priority (CAP) Goals relevant to its mission and execution of that mission. Figure 4 shows NSF's FY 2015 Annual Priority Goals and CAP Goals.

[19] See www.whitehouse.gov/omb/mgmt-gpra/index-gpra.

[20] OMB Circular A-11, *Preparation, Submission, and Execution of the Budget*, Part 6; see www.whitehouse.gov/omb/circulars_a11_current_year_a11_toc.

[21] www.nsf.gov/about/performance/strategic_plan.jsp.

Figure 4

NSF Performance Framework

NSF 2014–2018 Strategic Goals	
Strategic Goal	**Strategic Objectives**
G1: Transform the Frontiers of Science and Engineering	O1: Invest in fundamental research to ensure significant continuing advances across science, engineering, and education.
	O2: Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities.
	O3: Provide world-class research infrastructure to enable major scientific advances.
G2: Stimulate Innovation and Address Societal Needs through Research and Education	O1: Strengthen the links between fundamental research and societal needs through investments and partnerships.
	O2: Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.
G3: Excel as a Federal Science Agency	O1: Build an increasingly diverse, engaged, and high-performing workforce by fostering excellence in recruitment, training, leadership, and management of human capital.
	O2: Use effective methods and innovative solutions to achieve excellence in accomplishing the agency's mission.

NSF FY 2014–FY 2015 Priority Goals		
Type of Goal	**Goal Header**	**Goal Statement**
Agency Priority Goal	Ensure Public Access to Publications	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	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	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.
Cross-Agency Priority (CAP) Goal	STEM Education	Improve science, technology, engineering and mathematics (STEM) education by implementing the federal STEM Education 5-Year Strategic Plan, announced in May 2013, specifically: • Improve STEM instruction. • Increase and sustain youth and public engagement in STEM. • Enhance STEM experience of undergraduate students. • Better serve groups historically under-represented in STEM fields. • Design graduate education for tomorrow's STEM workforce. • Build new models for leveraging assets and expertise. • Build and use evidence-based approaches.
	Lab-to-Market	Increase the economic impact of federally funded research and development by accelerating and improving the transfer of new technologies from the laboratory to the commercial marketplace.

The following discussion of NSF's performance goals and results summarizes information available to date. NSF's *FY 2015 Annual Performance Report* (APR) will provide a fuller discussion of all the agency's performance measures, including descriptions of the metrics, methodologies, results, and trends, along with a list of relevant external reviews. All of NSF's FY 2015 performance goals have undergone an independent verification and validation review by an external consultant using U.S. Government Accountability Office (GAO) guidance.[22] More detailed information about NSF's GPRA verification and validation review will be part of the APR. NSF's FY 2015 APR will be included in the agency's *FY 2017 Budget Request to Congress*, which will be available at www.nsf.gov/about/performance.

Strategic Objectives and Strategic Reviews

In the spring of 2015, NSF conducted its second Strategic Review process in response to the requirement of the GPRA Modernization Act of 2010, Section 1116(f). OMB Circular A-11 (Section 270.2) specifies that: "Annually, agency leaders should review progress on each of the agency's strategic objectives established by the agency Strategic Plans and updated annually in the Annual Performance Plan. These reviews should inform strategic decision-making, budget formulation, and near-term agency actions, as well as preparation of the Annual Performance Plan and Annual Performance Report." NSF's approach was to conduct a strategic and focused crosscutting analysis using the results of existing assessment processes, evaluations, and reports as well as other sources of evidence. The following provides information on the focus of the Strategic Reviews for each of the strategic objectives in the Strategic Plan.

- ***G1/O1: Invest in fundamental research to ensure significant continuing advances across science, engineering, and education.*** The Strategic Review examined mechanisms that NSF can use to overcome the barriers of our traditional discipline-based organizational structure to advance science at the intersections of disciplines.
- ***G1/O2: Integrate education and research to support development of a diverse STEM workforce with cutting-edge capabilities.*** The Strategic Review examined the strengths and weaknesses of NSF's three primary graduate support mechanisms—research assistantships, fellowships, and traineeships.
- ***G1/O3: Provide world-class research infrastructure to enable major scientific advances.*** The Strategic Review examined NSF investments in networks, cyberinfrastructure, and distributed human capital infrastructure to identify barriers to supporting "Next Generation Research Infrastructure" (NGRI).
- ***G2/O1: Strengthen the links between fundamental research and societal needs through investments and partnerships.*** The Strategic Review considered how access to large-scale, NSF-funded data repositories advances national health, prosperity, and welfare, and the critical barriers to making NSF-funded scientific data more broadly available and enduring.
- ***G2/O2: Build the capacity of the Nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.*** The Strategic Review examined the role that Public Participation in STEM Research (PPSR) can play in advancing science and engineering and in increasing the participation of the U.S. population in science and engineering broadly.
- ***G3/O1: Build an increasingly diverse, engaged, and high-performing workforce by fostering excellence in recruitment, training, leadership, and management of human capital.*** The Strategic Review considered the changes in the Project Director (PD) job and workforce over the last 15 years and examined factors impacting recruitment, selection, and retention of PDs. Workload was identified as a significant challenge affecting PD retention.

[22] U.S. Government Accountability Office. 1998. *The Results Act: An Evaluator's Guide to Assessing Agency Annual Performance Plans* (GAO/GGD-10.1.20); see www.gao.gov/special.pubs/gg10120.pdf.

- ***G3/O2: Use effective methods and innovative solutions to achieve excellence in accomplishing the agency's mission.*** The Strategic Review examined what customer service means to NSF, with particular attention paid to the use of NSF's dwell time goal (of processing 75 percent of proposals within 6 months) as a metric of customer service.

More information, including information about the specific "Opportunities for Action or Improvement" recommended by the Strategic Reviews, will be published with NSF's *FY 2017 Budget Request to Congress.*

FY 2015 Progress Toward Goals

In FY 2015, NSF tracked progress toward its three strategic goals through seven annual performance goals and three Agency Priority Goals. All program activities within the agency were covered by the goals. Results will be published in the Annual Performance Report of the FY 2017 Budget Request.

Mission-Oriented Strategic Goals

Three performance goals supported all objectives under both mission-oriented goals, *Transform the Frontiers of Science and Engineering* and *Stimulate Innovation and Address Societal Needs through Research and Education*. The FY 2015 performance goals in this area were:

- Meet critical targets for key program investments.
- Ensure program integrity and responsible stewardship of major research facilities and infrastructure.
- Enable consistent evaluation of the impact of NSF investments with a high degree of rigor and independence.

Management Strategic Goals

In FY 2015, NSF had four performance goals to support the management-oriented strategic goal, *Excel as a Federal Science Agency*, focused on customer service and human resources development. The FY 2015 goals in this area were:

- Foster an environment of diversity and inclusion while ensuring compliance with the agency's EEO and civil rights programs.
- Use evidence-based reviews to guide management investments.
- Inform applicants whether their proposals have been declined or recommended for funding within 182 days, or six months, of deadline, target, or receipt date, whichever is later.
- Identify new approaches to keep NSF's world-renowned merit review process innovative, effective, and efficient.

Agency Priority Goals and Cross-Agency Priority Goals

In FY 2015, NSF tracked progress toward three Agency Priority Goals:

- Increase the Nation's Data Science Capacity
- Ensure Public Access to Publications
- Optimize the Award Process to Level Workload

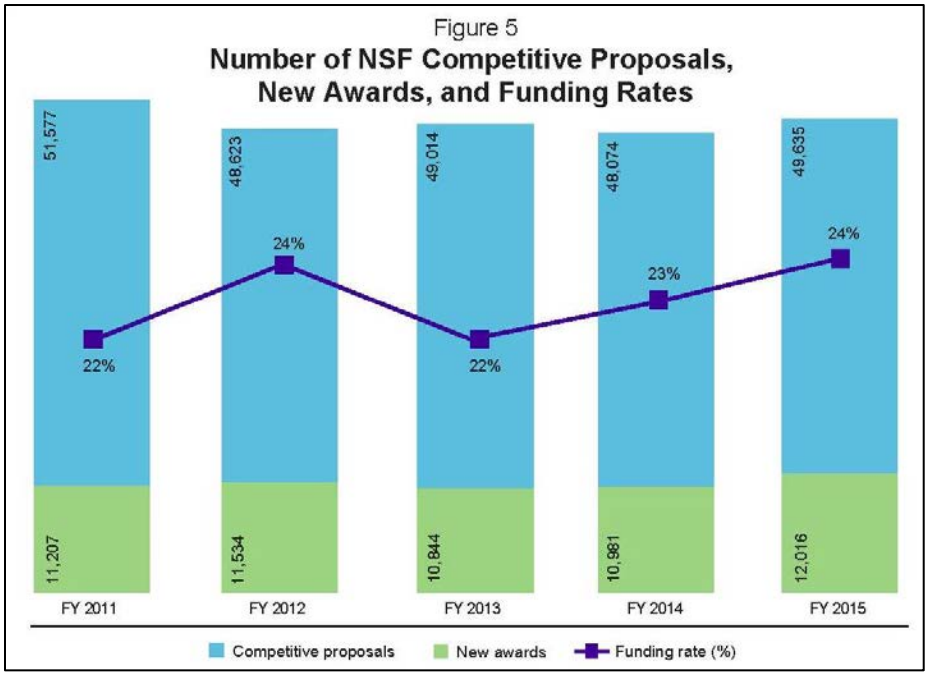
For current information about Agency and Cross-Agency Priority Goals, please see www.performance.gov.

Workload and Management Trends

NSF continuously monitors key portfolio, workload, and financial measures to understand short- and long-term trends and to help inform management decisions. For an analysis of the long-term trends in competitive proposals, awards, funding rate, and other portfolio metrics, see the *Report to the National Science Board on the National Science Foundation's Merit Review Process, Fiscal Year 2014* (NSB-2015-14) at www.nsf.gov/nsb/publications/2015/nsb201514.pdf.

- In FY 2015, the number of competitive proposals reviewed by NSF rose 3.2 percent—an increase of 1,561, to 49,635 (Figure 5).

Figure 5
Number of NSF Competitive Proposals, New Awards, and Funding Rates



- The number of new awards increased in FY 2015 by 9.4 percent (1,035), to 12,016. That, accompanied by an 8.9 percent reduction to the average annual award size in FY 2015, resulted in NSF making 7.8 percent more awards in FY 2015 than the 11,142 average annual number of awards made between FY 2011 and FY 2014.
- The 9.4 percent increase in new award actions, along with the 8.9 percent reduction to the average annual award size offset against a 3.2 percent increase in the number of competitive proposals, resulted in a 1-percentage-point increase in the funding rate, to 24 percent. This is higher than the 23 percent average funding rate that prevailed in the previous 4-year period, from FY 2011 to FY 2014.
- As shown in Figure 6, the average annual award size of competitive awards decreased 8.9 percent, from $180,507 in FY 2014 to $164,526 in FY 2015. This decrease in average award size is driven by NSF issuing relatively fewer large awards in FY 2015 rather than an overall decrease in award size. As noted in the FY 2014 Merit Review Process report, "Adequate award size and duration are important for enabling science of the highest quality and ensuring that the proposed work can be accomplished as planned. Larger award size and longer award duration may also permit the

participation of more students and allow investigators to devote a greater portion of their time to conducting research."[23]

Figure 6

Workload and Management Trends

Measure		FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	Percent Change (FY 2015–FY 2014)	Average (FY 2011–FY 2014)
Portfolio	Competitive proposal actions	51,577	48,623	49,014	48,074	49,635	3.2%	49,322
	Competitive award actions	11,207	11,534	10,844	10,981	12,016	9.4%	11,142
	Average annual award size (competitive awards)	$172,533	$169,217	$169,107	$180,507	$164,526	-8.9%	$172,841
	Funding rate	22%	24%	22%	23%	24%	1- percentage point	23%
Workload	Number of employees (FTE, usage)	1,415	1,415	1,414	1,390	1,374	-1.2%	1,409
	Number of active awards*	56,414	56,432	55,542	53,546	53,967	0.8%	55,484
	Proposal reviews conducted	262,005	235,654	233,116	225,847	231,450	2.5%	239,156
Financial	Number of grant payments	29,214	28,016	27,649	27,978	22,860	-18.3%	28,214
	Award expenses incurred but not reported at 9/30 ($ in millions)**	$1,679	$1,769	$344	$250	$398	59.2%	$1,011

FTE = full-time equivalents. FY = fiscal year.

* Active awards include all active awards regardless of whether funds were received during the fiscal year.

** FY 2015 number reflects an accrual, and all other years reflect actuals.

- In FY 2015, NSF's workforce in terms of full-time equivalents (FTE) was at 1,374, a decrease of 16 from the prior year and the lowest over the last 5 years. The drop in FTEs was primarily due to a lag time in hiring replacements after a high number of retirements during FY 2014. The situation is now improving.
- The number of active awards increased 0.8 percent (by 421) in FY 2015, from 53,546 in FY 2014 to 53,967 in FY 2015. This increase reflects a combination of factors including the 8.9 percent decrease in the average annual award size and the 9.4 percent increase in the number of FY 2015 competitive award actions made offset by the expiration of the remaining 300 grants funded through the American Recovery and Reinvestment Act of 2009 (ARRA)—and the fact that the number of new awards made in the years following ARRA has dropped back to levels observed in pre-ARRA years.

[23] *Report to the National Science Board on the National Science Foundation's Merit Review Process, Fiscal Year 2014*, page 19.

- During FY 2015, NSF completed its second full year with grantees using ACM$ for all payment activity. In the ACM$ environment, all NSF awardee institutions are required to submit payment requests at the award level. Award expenses are posted to the NSF financial system at the time of the payment request. In FY 2015, NSF awardees submitted approximately 556,000 award level disbursement and expense transactions.
- Implementation of NSF's new financial system has enabled next-day deposit of grantee payments, reduced the number of staff resources required for the payment process, and provided opportunities to include more NSF grant activities in standard payment functions. Additionally, new payment processes introduced with the financial system have reduced the number of grant payments from 27,978 in FY 2014 to 22,860 in FY 2015. When grantees submit multiple ACM$ payment requests in a day, those payment requests are now combined into a single deposit to the grantee's bank account. In past years, multiple payments requests in a day generated multiple grantee deposits.
- ACM$ has significantly improved the timeliness of grant financial data. In prior years, as of September 30th, NSF awardee institutions using quarterly expense reporting processes had approximately $1.7 billion in award expenses that they had incurred but not yet reported to NSF. Under ACM$, the amount of incurred but not yet reported award expenses has decreased to under $400 million each of the last 3 years.

Geometry Playground: A 4,500-square-foot traveling exhibition for science museums combines novel playground climbing with tabletop hands-on exhibits to engage boys, girls, and adults in spatial reasoning about geometric shapes. The exhibit—designed, built, and evaluated by the Exploratorium in San Francisco—promotes spatial reasoning (the ability to think about objects in three dimensions, visualize objects from different angles, etc.). Spatial reasoning is critically important for learning math, science, and engineering. Playground design firm Landscape Structures Inc., the Science Museum of Minnesota, and artists in residence participated in the project.

Museum visitors explore the Geometry Playground. *Credit: Thomas Rockwell, Exploratorium.*

Financial Discussion and Analysis

In FY 2015, NSF continued its commitment to an aggressive set of initiatives designed to increase the efficiency of its financial operations. By focusing on improving how the agency manages its finances, NSF made substantive progress in increasing the accuracy of the agency's financial information and modernizing its systems and processes.

On September 30, 2015, NSF completed its first full year of operations with its new financial management system, iTRAK. As with any new system, the agency overcame many challenges to accomplish the integration of users, data, and reporting, while maintaining compliance with government-wide requirements for federal financial systems. The iTRAK system has improved internal controls over financial information. iTRAK's goals are to enable the seamless flow of financial information for relevant and timely decision making; to improve the effectiveness and efficiency of financial and business processes; and to enhance financial and business accountability and integrity.

In accordance with the Chief Financial Officers Act of 1990 and the Government Management Reform Act of 1994, NSF prepares financial statements in conformity with U.S. generally accepted accounting principles (GAAP) for U.S. federal entities. The financial statements present NSF's detailed financial information relative to its mission and the stewardship of those resources entrusted to the agency. It also provides readers with an understanding of the resources that NSF has available, the cost of our programs, and the status of resources at the end of the fiscal year. NSF subjects its financial statements to an independent audit to ensure that they are free from material misstatement and can be used to assess NSF's financial status and related financial activity for the years ending September 30, 2015 and September 30, 2014.

For FY 2015, NSF received its 18th consecutive unmodified audit opinion. The audit report noted no material weaknesses but included one significant deficiency. The prior year significant deficiency related to the monitoring of construction type cooperative agreements was repeated. NSF made progress in this area in FY 2015, and the agency will continue to work to strengthen its controls for awarding and overseeing these agreements in FY 2016. The Independent Auditors' Report can be found on page II-3. Management's response to the Independent Auditors' Report can be found on page II-19.

In FY 2015, NSF undertook a number of significant activities to address the FY 2014 significant deficiencies related to the agency's grant accrual accounting estimation process and its monitoring of construction type cooperative agreements. Also in FY 2015, NSF commenced a set of activities to support the agency's implementation of the Digital Accountability and Transparency Act (DATA Act) and worked with the OIG to improve the agency's management of its Government Travel Charge Card program. These advancements, which are detailed in the following subsections, have served to strengthen agency controls on the use of federal funds and to ensure NSF's continued sound stewardship of the public trust.

Grant Accrual Accounting Estimation Process

NSF worked with its auditors to complete extensive analyses over the past two fiscal years. As a result, the grant accrual process is no longer a significant deficiency. In FY 2015, NSF made great advances in obtaining more consistent and reliable historical grantee spending pattern data, which led to the development of a new linear regression methodology (LRM) based on historical Federal Financial Report (FFR) data. NSF used the new LRM to estimate the "incurred but not reported" (IBNR) portion of its annual grant cost at June 30th. During July, the estimated amount of IBNR grant expenses for June 30th was validated to be within 6.9 percent of the grant expense amount. As the year progressed, NSF continued to refine the IBNR estimation process by incorporating the last three IBNR statistical validation results (FY 2013 Quarter 4, FY 2014 Quarter 4, and FY 2015 Quarter 3) into the LRM model for the FY 2015 Quarter 4 IBNR estimate. The updated LRM produced an estimated amount of IBNR grant expenses of $398 million. NSF plans to validate the IBNR liability as necessary to continue to refine its

methodology and estimation process. For future years, NSF is considering using only the most recent 20 quarters of data as inputs for the LRM, which will place more emphasis on more recent grantee drawdown activity and IBNR validations than on IBNR reported on the FFR.

Monitoring of Construction Type Cooperative Agreements

During FY 2015, NSF made substantial enhancements to its policies and procedures related to the monitoring and oversight of construction type cooperative agreements. The agency published a revised Large Facilities Manual (LFM) in June 2015. The manual includes strengthened standards for the planning and use of budget contingency for the construction stage, an NSF cost analysis at each stage-gate review during design, and a more robust policy for management fee. The revised LFM also codified the use of an agency-wide Integrated Project Team approach to oversight and assurance. Furthermore, NSF strengthened and standardized its monthly reporting format for projects in construction for improved consistency and clarity across its Large Facilities portfolio.

Another area of improvement was revised internal guidance for NSF's documentation of its analysis of recipient proposal cost estimates. NSF also developed additional guidance on pre- and post-award cost monitoring procedures for large facilities projects that addresses the use of auditing in cooperative agreement oversight and closeout. The annual review to determine which facilities will undergo Business System Reviews has fully adopted a risk-based approach. Finally, the agency is expanding its policy on audits of awardees' accounting systems and practices prior to entering into large facility construction cooperative agreements.

NSF has been employing the majority of these policies and procedures as part of its end-to-end cost surveillance efforts and applying them to cooperative agreements for both existing and new construction projects, as appropriate. Effective September 15th, additional cost monitoring policies were also applied to large facility operations awards. These enhancements, coupled with the agency's continued dialogue with its OIG concerning monitoring and oversight of construction type cooperative agreements, have strengthened NSF's controls over awarded funds.

Digital Accountability and Transparency (DATA) Act

In FY 2015, NSF commenced implementation activities relating to the DATA Act. An amendment to the Federal Funding Accountability and Transparency Act of 2006 (FFATA), the DATA Act directed federal agencies to standardize and publish a wide variety of reports and data compilations related to spending: financial management, payments, budget actions, procurement, and assistance. Implementation of the DATA Act is a major government-wide initiative led by the U.S. Department of the Treasury and OMB, and the Act authorized them to establish government-wide financial data standards for any federal funds made available to or expended by federal agencies and entities receiving federal funds. Building on NSF's government-wide leadership in federal financial assistance management, NSF will implement the DATA Act by May 2017. The existing linkage between NSF's financial assistance award system and iTRAK places the agency in a strong position for implementation success.

Travel Charge Card Program

NSF worked with its OIG during FY 2015 to strengthen its Travel Charge Card Program. The agency implemented tracking mechanisms in its training system to remind cardholders that they must re-take the travel card training every three years. The new mechanisms also identify individuals who fail to complete the training, which alerts the agency to take appropriate action. Furthermore, NSF developed new tracking mechanisms to document card misuse and temporary account changes, such as credit limit changes.

Going forward, NSF will execute a plan to better track the mandatory use of the travel cards for frequent travelers. Included in this process will be a plan to track travelers and work with program officials to comply with travel card policy. Additionally, NSF will continue to improve monitoring procedures to prevent misuse and ensure travel transportation charges are incurred against the correct accounts.

Understanding the Financial Statements

The following discussion of our financial condition and results of operations should be read together with the financial statements and the accompanying notes.

NSF's FY 2015 financial statements and notes are presented in accordance with OMB Circular A-136, *Financial Reporting Requirements*. NSF's current year financial statements and notes are presented in a comparative format. The Stewardship Investment schedule presents information over the last five years. Figure 7 summarizes the changes in NSF's financial position in FY 2015.

Figure 7

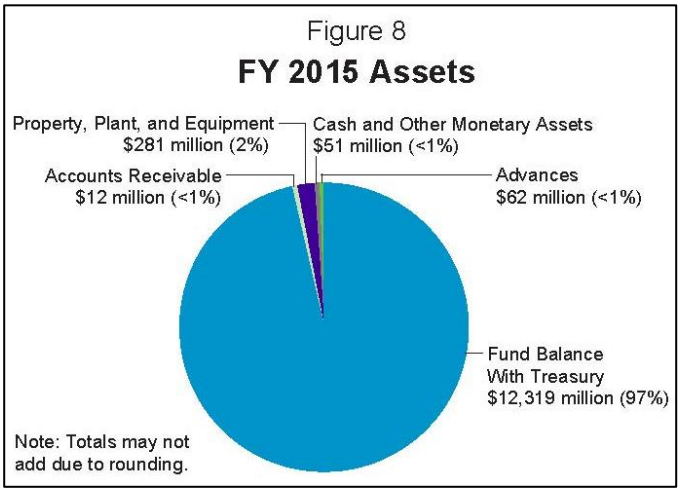
Changes in NSF's Financial Position in FY 2015 (dollars in thousands)

Net Financial Condition	FY 2015	FY 2014	Increase/(Decrease)	% Change
Assets	$12,724,668	$12,131,850	$592,818	4.9%
Liabilities	$518,809	$380,259	$138,550	36.4%
Net Position	$12,205,859	$11,751,591	$454,268	3.9%
Net Cost	$6,980,344	$7,256,651	($276,307)	-3.8%

Balance Sheet

The Balance Sheet presents the total amounts available for use by NSF (assets) against the amounts owed (liabilities) and amounts that comprise the difference (net position). NSF's total assets are largely composed of *Fund Balance with Treasury*. A significant balance also exists in the *General Property, Plant, and Equipment* account.

Figure 8



In FY2015, Total Assets (Figure 8) increased 4.9 percent from FY 2014. The bulk of the change occurred in the *Fund Balance with Treasury* account, which increased by $538.3 million in FY 2015. *Fund Balance with Treasury* is funding available from which NSF is authorized to make expenditures and pay amounts due through the disbursement authority of the Department of Treasury. It is increased through appropriations and collections and decreased by expenditures and rescissions.

In FY 2015, Total Liabilities (Figure 9) increased 36.4 percent from FY 2014. This change is primarily related to a $90.5 million increase in *Accrued Liabilities−Grants* in FY 2015. *Accrued Liabilities – Grants* is estimated utilizing a linear regression model based on the statistical correlation of NSF grantee's historical unliquidated obligation balances and expenses incurred but not yet reported. In FY 2015 the unliquidated obligations balance for grantees increased by $565.3 million, resulting in a higher *Accrued Liabilities – Grants* as compared to FY 2014.

Statement of Net Cost

The Statement of Net Cost presents the annual cost of operating NSF programs. The net cost of each specific NSF program operation equals the program's gross cost less any offsetting revenue. Intragovernmental earned revenues are recognized when related program or administrative expenses are incurred. *Earned revenue* is deducted from the full cost of the programs to arrive at the *Net Cost of Operation.*

Approximately 95 percent of all current year NSF Net Costs of Operations incurred were directly related to the support of the Research and Related Activities (R&RA), Education and Human Resources (EHR), Major Research Equipment and Facilities Constructions (MREFC) programs; and Donations and Dedicated Collections. Additional costs were incurred for indirect general operation activities (e.g., salaries, training, and activities related to the advancement of NSF information systems technology) and activities of the NSB and the OIG. These costs were allocated to R&RA, EHR, MREFC, and Donations and Dedicated Collections and account for 5 percent of the total current year Net Cost of Operations (Figure 10). These administrative and management activities are focused on supporting the agency's program goals.

Figure 9
FY 2015 Liabilities

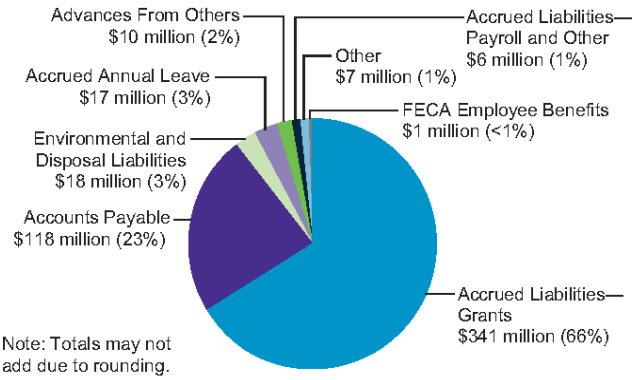
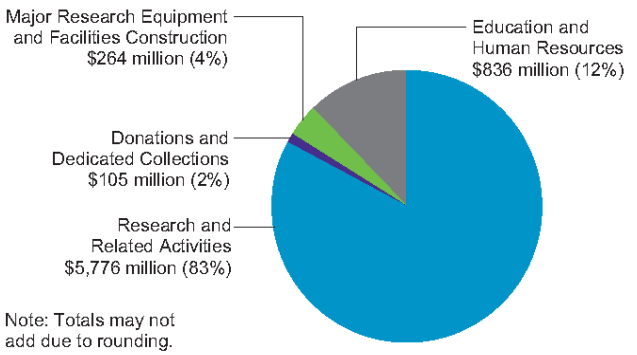


Figure 10
FY 2015 Net Cost



Statement of Changes in Net Position

The Statement of Changes in Net Position presents the agency's cumulative net results of operation and unexpended appropriations for the fiscal year. NSF's Net Position increased by 3.9 percent, or $454.3 million, in FY 2015.

Statement of Budgetary Resources

This statement provides information on how budgetary resources were made available to NSF for the year and the status of those budgetary resources at year end. For FY 2015, *Total Budgetary Resources* increased by $343.5 million. *Budgetary Resources—Appropriations* for the R&RA, EHR, and MREFC accounts were $5,933.6 million, $866.0 million, and $200.8 million, respectively. The combined *Budgetary Resources—Appropriations* in FY 2015 for the NSB, OIG, and AOAM accounts totaled $343.8 million. NSF also received funding via warrant from the H-1B Non-immigrant Petitioner Fees Accounts (H-1B) in the amount of $143.0 million, and via donations from foreign governments, private companies, academic institutions, nonprofit foundations, and individuals in the amount of $34.8 million. In FY 2015, the *Budgetary Resources—Appropriations* line was also affected by H-1B sequestration in the amount of $7.3 million.

Stewardship Investments

NSF-funded investments yield long-term benefits to the general public. NSF investments in research and education produce quantifiable outputs, including the number of awards made and the number of researchers, students, and teachers supported or involved in the pursuit of science and engineering research and education. NSF incurs stewardship costs to empower the nation through discovery and

innovation. In FYs 2015 and 2014, these costs amounted to $329.7 million and $309.8 million, respectively.

Limitations of the Financial Statements

In accordance with the guidance provided in OMB Circular A-136, NSF discloses the following limitations of the agency's FY 2015 financial statements, which appear in Chapter 2 of this report: The principal financial statements have been prepared to report the financial position and results of operations of NSF, pursuant to the requirements of 31 U.S.C. 3515(b). While the statements have been prepared from NSF books and records in accordance with GAAP for federal entities and the format prescribed by OMB, the statements are in addition to the financial reports used to monitor and control budgetary resources, which are prepared from the same books and records. The statements should be read with the realization that they are for a component of the U.S. Government, a sovereign entity.

Other Financial Reporting Information

Debt Collection Improvement Act of 1996

Net Accounts Receivable totaled $11.6 million at September 30, 2015. Of that amount, $9.7 million is due from other federal agencies. The remaining $1.9 million is due from the public. NSF fully participates in the Department of the Treasury Cross-Servicing Program. In accordance with the Debt Collection Improvement Act, this program allows NSF to refer debts that are delinquent more than 120 days to the Department of the Treasury for appropriate action to collect those accounts. In FY 2004, OMB issued M-04-10, *Memorandum on Debt Collection Improvement Act Requirements,* which reminded agencies of their responsibility to comply with the policies for writing off and closing out debt. In accordance with this guidance, NSF has now incorporated the policy of writing off delinquent debt more than two years old. Additionally, NSF seeks Department of Justice concurrence for action items over $100.0 thousand.

Cash Management Improvement Act of 1990

In FY 2015, NSF had no awards covered under Cash Management Improvement Act Treasury-State Agreements. The timeliness of NSF's payments to grantees through its payment systems makes the timeliness of payment issue under the Act essentially not applicable to the agency. No interest payments were made in FY 2015.

Federal Civil Penalties Inflation Adjustment Act of 1990

In FY 2015, NSF had no civil monetary penalties covered under the Federal Civil Penalties Inflation Adjustment Act of 1990.

Systems, Controls, and Legal Compliance

National Science Foundation

FY 2015 Statement of Assurance

The National Science Foundation (NSF) management is responsible for improving the accountability and effectiveness of its program and operations by establishing, assessing, correcting, and reporting on internal controls to meet the objectives of the Federal Managers Financial Integrity Act of 1982 (FMFIA) and the Federal Financial Management Improvement Act of 1996 (FFMIA). The agency head is required to provide a statement on whether there is reasonable assurance the agency's controls are achieving their intended objectives and report any material weaknesses in the controls, as required by Section 2 and whether the agency's financial systems conform to government-wide requirements, as required by Section 4 of the FMFIA. Management is required to provide a separate assessment of the effectiveness of internal controls over financial reporting.

NSF's internal control program is designed to ensure full compliance with applicable laws and regulations: OMB Circular A-123, *Management's Responsibility for Internal Control*, including Appendix A—*Internal Control over Financial Reporting,* Appendix B—*Improving the Management of Government Charge Cards,* Appendix C—*Requirements for Effective Measurement and Remediation of Improper Payments,* Appendix D—*Compliance with the Federal Financial Management Improvement Act; Conducting Acquisition Assessments* under OMB Circular A-123*;* and OMB Circular No. A-130, *Management of Federal Information Resources*.

NSF completed its evaluations and carefully considered the appropriate balance between controls and risk in operations and the financial management system. Based on the results of these evaluations, NSF provides reasonable assurance that as of September 30, 2015, its internal control over operations and the financial management system were operating effectively to ensure compliance with applicable laws and regulations. No material weaknesses were identified in the design or operation of internal control under Section 2 of the FMFIA, and Section 4 of the FMFIA, and no system non-conformances were identified for compliance with the FFMIA.

In addition, NSF conducted its assessment of the effectiveness of internal control over financial reporting, which included the safeguarding of assets and compliance with applicable laws and regulations. Based on the results of this assessment for the period ending June 30, 2015, NSF provides reasonable assurance that internal control over financial reporting was operating effectively and no material weaknesses were identified in the design or operation of internal control over financial reporting.

For FY 2015, NSF is providing an unqualified statement of assurance that its internal control and the financial management system meet the objectives of the FMFIA, FFMIA, and financial reporting, as well as related laws and guidance.

/S/

FRANCE A. CÓRDOVA
Director

November 16, 2015

Management Assurances

NSF continues to improve transparency and accountability within the internal control system to enhance the achievement of its mission. Integral to NSF's continued improvements are the modernization efforts for implementing the Federal Managers Financial Integrity Act of 1982 (FMFIA)[24] based on the revised GAO *Standards for Internal Control in the Federal Government* (Green Book, September 2014),[25] and the OMB Circular A-123, *Management's Responsibility for Internal Control* and appendices.[26] The internal control system supports running operations effectively and efficiently, reporting reliable information about NSF's operations, and complying with applicable laws and regulations. NSF is also responsible for improving the accountability and effectiveness of its programs and operations by meeting the requirements of the Federal Financial Management Improvement Act of 1996 (FFMIA).

The internal control review process supports one of NSF's three strategic goals, to *Excel as a Federal Science Agency*. Excelling as a federal science agency is essential to achieving and carrying out NSF's mission and accomplishing its other strategic goals: (1) transforming the frontiers of science and engineering; and (2) stimulating innovation and addressing societal needs through research and education. The Statement of Assurance is management's assessment of the effectiveness of NSF's internal control. For FY 2015, NSF's internal control assessment provides reasonable assurance that the objectives of the FMFIA and FFMIA were achieved and also concludes that the internal controls over financial reporting are effective. NSF is submitting an unqualified Statement of Assurance for FY 2015.

Highlights from NSF's FY 2015 Internal Control Quality Assurance Program

The FY 2015 unqualified Statement of Assurance represents the continued efforts of NSF management for assessing the design, implementation, and operating effectiveness of internal control utilizing the Committee of Sponsoring Organizations of the Treadway Commission's (COSO) Internal Control—Integrated Framework to assure an effective internal control system.

Internal Control over Financial Reporting—OMB Circular A-123, Appendix A

To achieve an unqualified Statement of Assurance, NSF's FY 2015 Internal Control Quality Assurance (ICQA) Program review consisted of evaluating seven business processes for the period July 1, 2014, through June 30, 2015, to assess internal control over financial reporting. These process areas included Awards Management; Budget; Charge Card; External Property, Plant and Equipment (PP&E); Inter-Agency Agreements; Procure to Pay; and Travel Systems.

The FY 2015 internal control assessment consisted of assuring efficiency and effectiveness of operations, reliability of financial reporting, and compliance with laws and regulations. The NSF risk-based integrated internal control system supports the organization to adapt to new or revised federal mandates, resource constraints, and emerging priorities. In FY 2015, the ICQA team performed the following:

1. Updated process documentation (narratives and flow diagrams) for each key business process. For FY 2015, process documentation updates heavily focused on the new procedures related to the implementation of the new Oracle System (iTRAK).
2. Selected samples based on the frequency of performance of control from the universe of NSF controls performed during FY 2015, using a methodology that is risk based, statistically valid, and compliant with current OMB guidelines.

[24] For more information about FMFIA, see www.whitehouse.gov/omb/financial_fmfia1982.

[25] For more information about GAO *Standards for Internal Control in the Federal Government*, see www.gao.gov/products/GAO-14-704G.

[26] For more information about OMB Circular A-123, see www.whitehouse.gov/omb/circulars_a123_rev.

3. Conducted tests of all transactions selected in the samples and determined if the controls were designed adequately and operating effectively.
4. Conducted an entity-level review to assess both the design and operating effectiveness of key controls. The review focused on the establishment of entity-level and activity-level objectives, risk identification and analysis, and related control activities.
5. Prepared a final report that details the results of testing and assisted NSF in meeting the reporting requirements for its FY 2015 Statement of Assurance.

This approach leveraged various data collection techniques, including conducting interviews, administering surveys, and facilitating working sessions to "widen the lens," thus helping to ensure that mission-critical areas—that may not have a financial impact—are given adequate attention and consideration. In addition, the ICQA team noted the following improvements in FY 2015:

1. iTRAK: A commercial-off-the-shelf system that is hosted in a shared service (Accounting Federal Services) cloud environment. iTRAK handles transaction processing, account maintenance, transaction history, and rules processing. The new system includes extensive reporting capabilities and supports transaction input through iTRAK as well as from other systems that interface with iTRAK. iTRAK is NSF's primary business event driven accounting system.
2. External PP&E: IBM® Maximo® asset management system. Maximo is currently replacing the legacy databases and applications for USAP. Multiple phases of development are expected to integrate Maximo into Antarctic Support Contracts (ASC's) processes and procedures. As a result of the Phase 1 implementation in FY 2015, ASC is currently utilizing Maximo for the asset procurement process.

Based on the results of the assessment, NSF provides reasonable assurance that its internal control over financial reporting is operating effectively and no material weaknesses were identified.

Improving the Management of Government Charge Card Programs—OMB Circular A-123, Appendix B

In FY 2015, NSF conducted a review of the travel, purchase, and vehicle programs for compliance with OMB Circular A-123, Appendix B requirements in reducing risk of fraud, waste, and abuse of Government Charge Card Programs. Consistent with the application of the annual internal control methodology with Appendix A, the same process was applied to the NSF Government Charge Card Program.

Due to the implementation of NSF's new core financial system, iTRAK, many improvements and controls were implemented in FY 2015. These improvements allowed NSF to put controls in place beyond what the legacy system was capable of doing, including:

1. Separation of duties for approving employee transactions on purchase and vehicle cards.
2. Daily payment of charge card transactions: JPMorgan Chase, NSF's GSA SmartPay 2 program provider, submits a nightly batch of processed transactions via a query that is generated in iTRAK. iTRAK validates the transactions, which are then made available to the cardholder to verify the transactions, allowing NSF to pay the validated transactions on a daily basis.

In addition, the first year of implementation has led to many lessons learned. NSF is currently working on implementing additional edits that will secure these processes, to include the following:

1. Purchase and vehicle card supporting documentation: In order for purchase and vehicle card transactions to be submitted for approval by the approving official, supporting documentation must be uploaded into the system.

2. Budget Object Class (BOC) Code: A dropdown feature will allow the user to choose the appropriate BOC code for purchase card and vehicle card transactions, ensuring that NSF can accurately track expenses and prevent inefficient budget spending.

Based on the results of the assessment, NSF provides reasonable assurance that internal controls related to the Government Charge Card Program are operating effectively, and no material weaknesses were identified.

Improper Payment Initiative—OMB Circular A-123, Appendix C

NSF is currently working with OMB and the OIG to complete a qualitative risk assessment of improper payments for FY 2015. NSF completed an IPERA risk assessment during FY 2014 covering grants, contracts, and payroll payments. The risk assessment employed both a qualitative and quantitative approach in determining NSF's level of susceptibility to improper payments. The risk assessment did not indicate significant susceptibility to improper payments for NSF grants, contracts or payroll payments. During June 2015, the NSF OIG audit contractor completed an audit of NSF's compliance with IPERA. The auditors found that NSF did not comply with the reporting requirements of IPERA in the FY 2014 AFR. In response, NSF performed additional work in FY 2015. The agency updated its 2014 IPERA risk assessment report and completed follow-up activities for cooperative support agreements and graduate research fellowship grants. NSF also changed its reporting processes for recapture audits in FY 2015. The agency reached consensus with the NSF-OIG on how to move forward to address all audit report findings.

Compliance with the Federal Financial Management Improvement Act of 1996—OMB Circular A-123, Appendix D

NSF has established a comprehensive information technology (IT) security program that is consistent with the Federal Information Security Management Act (FISMA) of 2002 (as amended by the Federal Information Security Modernization Act of 2014) and industry best practices. NSF's IT controls are effective in maintaining a secure IT environment at NSF. NSF's IT environment is supported by a suite of comprehensive policies and procedures that incorporate federal mandates and guidance in all domains. Numerous controls have been implemented to protect agency financial information and information resources. Continuous monitoring verifies throughout the year that effective IT security controls are in place.

The new core financial system for NSF became operational in October 2014. iTRAK is NSF's implementation of Oracle U.S. Federal Financials Release 12. The commercial off-the-shelf (COTS) system, iTRAK, comes with established business processes and system controls. NSF established and documented user access controls, security documentation, and disaster recovery procedures. iTRAK is cloud-based and hosted by a commercial shared-service provider (SSP). Training is required to access iTRAK's business functions, and access is granted based on roles as appropriate. Online training and user guides have been developed for processes within iTRAK. The first year of operation included a number of transition activities to facilitate the change management process. Beginning in the second year, as operations normalize, the various NSF iTRAK and SSP documents will be compiled and updated to create an iTRAK system user manual.

Acquisition Assessment—OMB Circular A-123

The FY 2015 acquisition review consisted of addressing the four cornerstones and questions related to the GAO acquisition assessment framework standards to include: (1) Organizational Alignment and Leadership, (2) Policies and Processes, (3) Human Capital, and (4) Knowledge and Information Management.

Overall, NSF demonstrates the attributes of a strong acquisition organization and has many practices that are characteristic of a highly effective acquisition organization.

1. *Organizational Alignment and Leadership*—NSF's acquisition function is assigned the appropriate degree of responsibility and authority for strategic planning and management oversight of the agency's purchases of goods and services. NSF has robust acquisition processes and tools in place to complement the acquisition workforce. Acquisition roles and responsibilities are clearly defined and senior leadership provides direction and vision, facilitates the development of common processes and approaches, and is involved in identifying and assessing risk associated with meeting acquisition objectives.
2. *Policies and Processes*—NSF promotes coordination among stakeholders through the establishment of acquisition teams. NSF systematically identifies and analyzes agency-wide acquisitions with an automated tool, Advance Acquisition Planning, to ensure that contracting staff is informed of upcoming acquisitions early in the process. Cross-functional teams and integrated project teams are formed to promote coordination during the acquisition process and help drive success across the acquisition function.
3. *Human Capital*—NSF's human capital management strategies and activities engage all components within the agency, including acquisition officials. The agency develops a full suite of recurring reports and ad hoc reports to support the acquisition workforce. The agency also undertakes an annual workforce planning effort to partner with all parts of the agency to explore and address acquisition workforce issues. To ensure developing plans for the acquisition workforce consist of all stakeholders, NSF created an agency-wide group composed of senior executive officers and stakeholders across NSF to formulate and deliver an integrated, updated human capital strategy.
4. *Information Management and Stewardship*—NSF collects information on contract savings, strategic sourcing, reducing high-risk contracting, strengthening the acquisition workforce, attaining the best balance of contractors and federal employees, and increasing opportunities for small business. Controls are present within the contract management cycle to track the contracts from initiation through the closeout of the contract. NSF also maintains a SharePoint site, which serves as a repository for manuals and policies and procedures pertaining to the acquisition process.

Other Federal Reporting and Disclosures—GAO Financial Audit Manual Volume 3

Anti-Deficiency Act—There is no material loss of contingencies over $7 million or that in the aggregate exceed $11 million for NSF to report.

Federal Credit Reform Act of 1990, Pub, b. No. 101-508, 104 Stat. 1388-610—Not applicable.

Pay and Allowance System for Civilian Employees, provided primarily in Chapters 31–50 of Title 5, U.S.C.—NSF uses the Department of the Interior, Interior Business Center (IBC) as an SSP to perform many of its payroll functions. IBC's internal control over its shared-service offering is annually reviewed by auditors under the Statement on Standards for Attestation Engagements (SSAE). Annually, IBC's controls are found to be suitably designed and operating effectively. This conclusion is based partly on transactional testing.

Internally, NSF performs testing over its pay and benefit internal controls during the annual internal control review to identify any deficiencies that could result in a material misstatement on the agency's financial statements. There are no significant deficiencies noted.

Prompt Payment Act—NSF continues to inform its top 25 contractors of OMB Memorandum 12-16, *Providing Prompt Payment to Small Business Subcontractors*, and OMB Memorandum 14-10, *Extension of Policy to Provide Accelerated Payment to Small Business Subcontractors* requirements. The prompt pay requires temporarily acceleration of payments to all prime contractors—with a goal of paying them within 15 days of receipt of proper invoices—in order to allow them to provide prompt payments to small business subcontractors. NSF has accelerated all contract payments after approval, actively works to

improve invoice approval timeliness, and has seen marked improvement in payment processing times. The acceleration rate for NSF, as of June 30, 2015, was 97.11 percent.

Provisions Governing Claims of the U.S. Government (31 U.S.C. 3711–3720E) (Including the Debt Collection Improvement Act of 1996)—The Debt Collection Improvement Act of 1996 is addressed in "The Other Financial Reporting Information" section of this report.

Federal Information Security Management Act of 2002—FISMA is addressed in a previous section of the Management's Discussion and Analysis.

Single Audit Act of 1984, Pub L. No. 98-502, and the Single Audit Act Amendments of 1996, P.L. 104-156. (A-136, section II.2.8)—The Single Audit Act requires financial statement audits of non-federal entities receiving or administering grant awards of federal monies. Federal agency internal controls determine whether award expenditures are in compliance with laws and regulations. NSF, as are other federal agencies, is required to review the audit reports of recipients of its funding to determine whether corrective actions are adequate and implemented in response to audit report findings and recommendations. NSF utilizes guidance from the *OMB Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards* (*Uniform Guidance*) and *Audit Follow-up* (OMB Circular A-50) as a basis for its audit resolution and follow-up activities.[27]

During the period from July 1, 2014, through June 30, 2015, NSF resolved 245 single audit reports. The internal control review team assessed a random sample of 30 of these reports, reviewing supporting documentation, NSF management decision letters, and evidence of grantee-implemented corrective actions. During this performance period, at the invitation of the OMB COFAR, NSF continued as an active member of the interagency Uniform Guidance Working Group to develop Frequently Asked Questions (FAQs) needed to clarify federal requirements set forth in the *Uniform Guidance.*

NSF completed timely implementation of the *Uniform Guidance*, fully upgrading all relevant policies, procedures, and award terms and conditions. In June 2015, NSF allocated two additional staff whose recruitment will strengthen agency support for audit resolution. NSF also piloted conversion of audit and other work products to eRecords to strengthen information sharing and archiving. Also, NSF's internal tracking system includes a module that highlights issues and concerns identified through audit and other oversight activities to inform future interactions with awardees. These considerations affect weighting factors used in NSF's annual portfolio-based risk assessment.

Financial System Strategy and Framework

Financial System Strategy

iTRAK, NSF's new financial system, became operational in October 2014 and completed its first fiscal year on September 30, 2015. The implementation of iTRAK was one of the most complex and critical system implementations undergone by NSF in years. As with any new system implementation, NSF experienced its share of challenges in the first year of operations. Key challenges included integration with a new federal government travel system, Concur; steep learning curves for users working in the new iTRAK environment after performing their work in a 25 year old, custom built financial system; and users learning how to access data in the new system and interpret financial results. We are making great progress in overcoming these challenges through aggressive change management, communications, and training strategies. NSF has trained over 500 users in more than 100 classroom sessions; stood up the iTRAK command center to provide hands on assistance to users as they processed their work in the new

[27] For more information on single audits, see *OMB Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*, Subpart F, December 26, 2014, www.ecfr.gov/cgi-bin/text-idx?SID=a1865f427fe12905196bcd34b074f672&mc=true&node=sp2.1.200.f&rgn=div6 and *Audit Follow-up* (OMB Circular A-50), www.whitehouse.gov/omb/circulars_a050/.

system; and developed a cadre of skilled users from each directorate to become change champions and subject matter experts to help grow the iTRAK capability throughout NSF. We continue to build upon iTRAK's strong foundation by standardizing and increasing the automation of business processes; improving system performance; further streamlining transaction processing; and improving access to more detailed financial information.

iTRAK was developed to align with the NSF's strategic goals to further scientific and organizational excellence and accountability for the public benefit and to comply with federal mandates. Specifically, iTRAK complies with OMB Memorandum M-10-26, *Immediate Review of Financial Systems IT Projects,* OMB Memorandum M-13-08, *Improving Financial Systems through Shared Services,* and OMB Circular A-123, Appendix D. iTRAK ensures that transactions are posted in accordance with the U.S. Standard General Ledger (USSGL) at the transaction level; maintains accounting data to permit reporting in accordance with Generally Accepted Accounting Principles (GAAP) as prescribed by the Federal Accounting Standards Advisory Board (FASAB) for federal reporting entities; enforces strict funds control to prevent anti-deficiencies across the budgeting and spending functions; and enables strong access control and definition of "responsibilities" to support segregation of duties control. As iTRAK continues to mature, NSF will expand its analytical capabilities towards a more mature and performance driven system to better support NSF's mission.

Financial Management System Framework

NSF's Financial Management System Framework focuses on the agency's financial management systems, standard business processes, data, and information architecture to ensure reliable, timely, and consistent financial information that enables effective management of NSF resources and delivery of mission critical products and services. NSF's new core financial system, iTRAK, interfaces with NSF's existing awards and grants management systems including eJacket, NSF's internal awards processing system; FastLane, NSF's online website through which the agency conducts its relationship with the proposal community, reviewers, and research administrators and their organizations; the Award Management and Award Letter System ("Awards"); the Award Cash Management Service (ACM$); the Graduate Research Fellowship Program (GRFP); and the Guest Travel and Reimbursement System. As shown in Figure 12 below, iTRAK also interfaces with LearnNSF, the agency's staff training module; other federal systems such as the Federal Personnel Payroll System (FPPS), eTravel/Concur, and GSA's System for Award Management (SAM); and the U.S. Treasury as well as with J.P. Morgan Chase Bank. Future iTRAK phases include electronic invoicing, compliance with the Digital Accountability and Transparency Act (DATA Act) and IRS Audit; and integration of an Acquisition Module, a Fixed Asset Module, and a Budget Formulation Module.

Figure 11

The iTRAK Framework