UNITED STATES

National Science Foundation

FY 2020

Agency Financial Report

THE NSF STATUTORY MISSION

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

—from The National Science Foundation Act of 1950 (P.L. 81-507)

THE NSF VISION

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

—from "Building the Future: Investing in Discovery and Innovation"
NSF Strategic Plan for FY 2018-2022

ABOUT THIS REPORT

For fiscal year (FY) 2020, the National Science Foundation (NSF) issues three reports to provide financial management and program performance information to demonstrate accountability to our stakeholders and the American public. These reports are produced in accordance with the Office of Management and Budget (OMB) Circular A-136, *Financial Reporting Requirements,* and meet the requirements of the Chief Financial Officers (CFO) Act, as amended by the Government Management Reform Act of 1994, the Federal Managers' Financial Integrity Act of 1982, the Reports Consolidation Act of 2000, and the Government Performance and Results Modernization Act of 2010.

- The ***Agency Financial Report*** (AFR) focuses on financial management and accountability. Below is a high-level summary of the AFR's three chapters:
  - *Chapter 1: Management's Discussion & Analysis* provides a high-level overview of NSF's organizational structure, strategic framework, programmatic and financial performance, and management assurances related to NSF's internal controls.
  - *Chapter 2: Financials* includes the results of NSF's annual financial statement audit and financial statements and accompanying documents.
  - *Chapter 3: Appendices & Other Information* contains the memorandum from the NSF Inspector General (IG) on the agency's FY 2021 management challenges, NSF management's report on the progress made on the challenges identified by the IG for FY 2020, information on improper payments, patents and inventions resulting from NSF support, and other relevant information.
- The ***Annual Performance Report*** (APR) provides information on the progress NSF has made toward achieving its goals and objectives as described in the agency's strategic plan and Annual Performance Plan, including the strategic objectives, performance goals, and Agency Priority Goals. The ***APR*** will be included in NSF's *FY 2022 Budget Request to Congress.*
- NSF's ***Performance and Financial Highlights*** report summarizes key financial and performance information from the *AFR* and *APR*. This will be available on NSF's website when the *FY 2022 Budget Request to Congress* is published.

All three reports are available on NSF's website as they are completed.[1] We welcome your suggestions on how we can make these reports more informative. You can reach us at: accountability@nsf.gov or call (703) 292-8200.

NSF by the Numbers	
$8.4 billion	FY 2020 Appropriations (does not include mandatory accounts)
1,900	Colleges, universities, and other institutions receiving NSF funding in FY 2020
42,700	Proposals evaluated in FY 2020 through a competitive merit review process
12,200	Competitive awards funded in FY 2020
200,000	Proposal reviews conducted in FY 2020
313,000	Estimated number of people NSF supported directly in FY 2020 (researchers, postdoctoral fellows, trainees, teachers, and students)
61,700	Students supported by NSF Graduate Research Fellowships since 1952

[1] Online resource for NSF's accountability reports: https://www.nsf.gov/about/performance/

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A MESSAGE FROM THE DIRECTOR

Photo: NSF/Stephen Voss

It is my pleasure to present the National Science Foundation's *Fiscal Year (FY) 2020 Agency Financial Report*, my first as NSF's Director. In addition to providing the annual financial performance and accountability results, this report highlights NSF's accomplishments this fiscal year as we work with our partners in industry, government and academia to fulfill our mission, "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..." For seven decades, NSF has achieved this mission through critical investments advancing key national and scientific policy priorities, accomplished through broad-based support of science and engineering research and education.

NSF is an essential source of federal funding for basic research in computer science, engineering, biology, the social sciences, mathematics, geosciences, the physical sciences, and education. In FY 2020, NSF-supported scientists and engineers engaged nearly all aspects of coronavirus disease 2019 (COVID-19) research—from developing supercomputer-based models of the virus's structure and transmission to investigating anti-viral chemicals that can be safely embedded in self-sanitizing masks. A summary of the CARES Act funding NSF received is provided in this report. As we funded urgent, deployable research related to the pandemic, NSF continued to invest in ground-breaking basic research expanding the frontiers of scientific knowledge and leading to innovations supporting economic growth, societal well-being, and national security. NSF programs also are designed to promote STEM education and career opportunities for all Americans, including groups underrepresented in STEM. In FY 2020, NSF continued its funding of STEM education and education research from early childhood learning to doctoral work and beyond.

Essential to the fulfillment of its mission is NSF's work in partnership with universities, industry, and other federal agencies to advance research and bring it to bear on issues of national importance. In FY 2020, for instance, NSF took a leadership role in working with the White House, other science agencies, and the intelligence and law enforcement communities to examine risks to research and to outline actions to protect America's research enterprise.

Among federal agencies, NSF maintains its reputation for excellence in financial reporting and assurance. With the publication of the FY 2020 Agency Financial Report, I am pleased to report that NSF received its 23rd consecutive unmodified opinion from an independent audit of its financial statements. The Independent Auditors' Report identified no material weaknesses or significant deficiencies. In addition, NSF provides reasonable assurance that the agency complies with the Federal Managers' Financial Integrity Act, and that internal control over financial reporting is operating effectively to produce reliable financial reporting. The AFR also includes summary performance information for FY 2020. For more information on NSF's performance management process and the complete results of our FY 2020 annual goals under the Government Performance and Results Modernization Act of 2010, I invite you to read NSF's Annual Performance Report, which will be released with NSF's FY 2022 Budget Request to Congress.

NSF remains committed to efficient and effective management practices and sound financial oversight. Through this commitment, NSF is able focus on advancing the frontiers of research, ensuring accessibility and inclusivity, and sustaining the Nation's global leadership in science and engineering.

/s/
Sethuraman Panchanathan

November 13, 2020

Chapter 1

Management's Discussion and Analysis

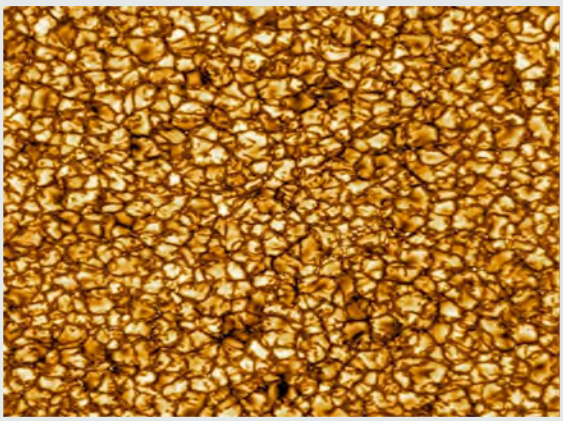
Agency Overview

Mission and Vision

This past year, 2020, marked 75 years since Vannevar Bush delivered the seminal report to the President, *Science—The Endless Frontier,* that called for the creation of a new government organization devoted to advancing fundamental research. In 1950, that vision led to the establishment of a new federal agency, the National Science Foundation (NSF), with a challenging and inspiring mission, "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense…"[1] This mission continues to guide the agency today, as NSF remains the only federal agency dedicated to advancing basic research and education across the spectrum of science, technology, engineering, and mathematics (STEM) fields and disciplines.

NSF's newest solar telescope produces first images

In January of 2020, NSF unveiled the first images from the Daniel K. Inouye Solar Telescope (DKIST), the largest solar telescope in the world and a state-of-the-art observatory that will generate more data on the sun in the next five years than scientists have collected so far in the history of solar observation. Positioned at the summit of Haleakala on the Hawaiian island of Maui, DKIST is designed to provide unprecedented insight into the sun's magnetic field. By better understanding the magnetic field, scientists will be able to predict more accurately "space weather" like solar wind and magnetically charged eruptions of plasma from sun that can interfere with satellites and ground-based communications systems. Combined with the space-based Parker Solar Probe and Solar Orbiter missions, DKIST is at the forefront of a new era of breakthroughs in understanding our sun.



DKIST has produced this image that shows a pattern of turbulent, "boiling" gas that covers the entire sun. *Credit: NSO/AURA/NSF.*

In no year has the wisdom of Dr. Bush's vision and the importance of NSF to the Nation been as evident as it has this past year. Not only did NSF fund over 500 projects under the CARES Act (Coronavirus Aid, Relief, and Economic Security Act, P.L. 116-136) that specifically focused on the coronavirus (COVID-19) pandemic, the larger response of the Nation's researchers to this unprecedented challenge was possible only because of the underlying strengths of the United States (U.S.) science and engineering enterprise. These strengths enabled researchers to reimagine their work, forge new collaborations, and capitalize on technological capabilities that were being advanced and often invented in real time. These strengths are the direct result of 70 years of investing in "the progress of science," an investment that has yielded transformative breakthroughs and led to the creation of critical industries, tools, and products that enhance and engage every aspect of our lives. Just as these advances have led to the Internet, smartphones, 3D printing, spectrum auctions, Magnetic Resonance Imaging, an algorithm for kidney exchanges, weather radar, and the first image of a black hole, so too have they led to discoveries and insights that are vital to addressing the scourge brought by COVID-19.

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

In fiscal year (FY) 2020, NSF's research priorities were guided by Big Ideas[2] and the Industries of the Future, the set of cutting-edge goals to enable rapid advances across such areas as artificial intelligence, quantum computing, and big data. NSF's Expeditions in Computing program is investing in research to combine artificial intelligence and machine learning with social sciences and other disciplines to simulate epidemics and how people and communities respond, ultimately giving public health officials, policymakers, and community leaders new insights on how to prepare for and respond to epidemics. Also, in FY 2020, NSF-funded nanotechnology researchers helped build better technologies and materials that touch nearly all aspects of daily life, from medical imaging to protective gear for first responders. Other research advanced improvements in agricultural production to boost long-term crop yields, environmental sustainability, and profitability for farmers; minimally invasive photodynamic treatments for cancer; and robust and resilient systems to protect critical infrastructure, such as power grids, from malicious actors or natural disasters. NSF also supported scientists unlocking mysteries in Earth's ocean environments using large research vessels and small autonomous submersibles.

Tiny optical cavities could advance quantum networks

Engineers have reached a new milestone for Quantum Information Science and the quest to create a quantum internet. The internet as we know it today is built on familiar technology like high-power microprocessors that power computation and networking infrastructure that is the backbone of connectivity, but scientists are still designing counterparts for the future of quantum computing. Funded by NSF under the Quantum Leap Big Idea, researchers have answered an important question about how quantum information can be sent and received through a quantum internet. Scientists can encode information in the quantum properties of individual atoms, which can be transmitted to other quantum computers. But how to "read" that information when it is received has been an open question until now. The researchers sculpted microscopic cavities in tiny pieces of crystal capable of holding atoms encoded with quantum information and sensing the atom's quantum properties. Just as technology like floppy disks kickstarted the digital age in 1960s, quantum breakthroughs like this are enabling leaps forward in the Industries of the Future.

NSF-funded researchers are working to create the building blocks of a quantum network. *Credit: The Opte Project/Wikimedia (CC BY 2.5).*

Many of FY 2020's accomplishments emphasize how important partnerships are to spurring innovation and discovery. In coordination with the White House, Congress, and three other agencies, NSF established seven National Artificial Intelligence (AI) Research Institutes, five fully funded by NSF and two fully funded by the U.S. Department of Agriculture National Institute of Food and Agriculture. The AI Institutes will catalyze transformational advances across many sectors of our Nation's economy, from extreme weather preparedness to Kindergarten to Grade 12 (K-12) education, all the while training the next generation of AI innovators and users.[3] Throughout FY 2020, NSF-funded researchers worked in collaboration with scientists from 20 countries on the Multidisciplinary Drifting Observatory for the Study of Arctic Climate

[2] NSF's Big Ideas: https://www.nsf.gov/news/special_reports/big_ideas

[3] AI Institutes: https://www.nsf.gov/news/special_reports/announcements/082620.jsp

(MOSAiC[4]) expedition, an ambitious international Arctic field mission. Their observations will improve our understanding of the current state and likely future trajectory of the Arctic. NSF also is partnering with the National Aeronautics and Space Administration (NASA) to look at new approaches to expand the understanding of space weather and its impact on the Earth, and to improve the ability to forecast future events.

NSF's sustained investments in research facilities foster collaboration and provide sophisticated platforms for research at the cutting-edge. These investments provide the infrastructure needed to advance discovery, learning, and exploration, including ships, aircraft and autonomous airborne platforms, ground-based telescopes, and other infrastructure and state-of-the-art tools to sustain the Nation's scientific enterprise. NSF also supports research stations in the Arctic and Antarctic. In January 2020, NSF unveiled the first images from the Daniel K. Inouye Solar Telescope (DKIST), the largest solar telescope in the world. In the midst of the COVID-19 pandemic, researchers across the country turned to NSF-funded high-performance computing (HPC) resources to better understand COVID-19. For example, the NSF-funded Frontera supercomputer, the most powerful machine deployed on an academic campus in the world, was used to study how the virus interacts with the human body on an atomic level, as well as how it spreads from person-to-person. Researchers are developing detailed models of the virus's structure and transmission that rely on complex simulations involving large amounts of data. Together with the White House, IBM, and U.S. Department of Energy, NSF co-established the COVID-19 HPC Consortium to allow researchers from around the world to access HPC resources. The Foundation's long-term commitment to steady advancements and upgrades to research facilities enables this kind of ground-breaking research.

Other programs, such as NSF's Innovation Corps™, help researchers extend their focus beyond the university laboratory and translate a promising idea from the laboratory to the marketplace. The Small Business Innovation Research (SBIR) program helps startups and small businesses transform their ideas into marketable products and services by focusing on high-risk, high-impact technologies.

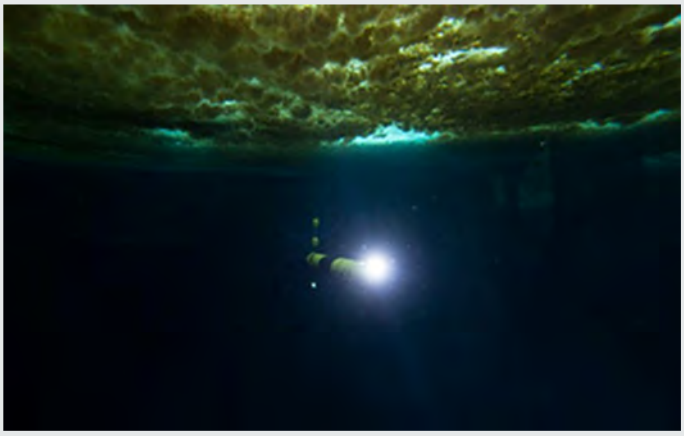
NSF's sustained investment in basic research generates a steady stream of new ideas and techniques that, together with a well-educated STEM workforce, foster a world-class research enterprise. NSF programs support STEM education and training that attract talented scientists and engineers from every corner of our Nation—from remote rural areas to the largest urban centers. The NSF Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES) Program, through its emphasis on broadening participation, exemplifies the high-priority NSF places on increasing the participation of underrepresented groups in the STEM workforce. NSF also supports a strong STEM workforce through the Graduate Research Fellowship Program (GRFP). Since 1952, NSF has funded approximately 62,000 Graduate Research Fellows, many of whom go on to become leaders in their chosen fields and make groundbreaking and important discoveries in STEM research. Over 450 Graduate Research Fellows have become members of the National Academies of Sciences, Engineering, and Mathematics; and 40 Fellows have been honored as Nobel laureates. NSF also has funded the research of 248 individuals who have gone on to win the Nobel Prize, along with 41 individuals who have gone on to win the ACM[5] A.M. Turing Award, often referred to as the "Nobel Prize of Computing." These investments in people are a critical means by which NSF achieves its mission; transformational breakthroughs are shaped by a wide range of perspectives.

[4] Multidisciplinary Drifting Observatory for the Study of Arctic Climate (MOSAiC) https://mosaic-expedition.org/

[5] ACM: Association for Computing Machinery

NSF's vision is to ensure that the U.S. remains the global leader in research and innovation. NSF's core values of excellence, public service, learning, inclusion, collaboration, integrity, and transparency articulate the essential qualities that staff are encouraged to embody in support of the agency's mission and vision. These core values guide staff in making decisions, setting priorities, addressing challenges, managing tradeoffs, recruiting and developing personnel, and working together with awardee recipients. NSF's strategic plan for FY 2018 – 2022, *Building the Future: Investing in Discovery and Innovation*,[6] identifies three interrelated goals for achieving the agency's mission: (1) expand knowledge in science, engineering, and learning; (2) advance the capability of the Nation to meet current and future challenges; and (3) enhance NSF's performance of its mission.

Public investment in high-risk, foundational research fulfills the strategic vision for scientific progress that will shape the future of our Nation. NSF supports 24 percent of all federally-sponsored basic scientific research conducted by America's colleges and universities; and NSF's support increases to 57 percent when medical research supported by the National Institutes of Health is excluded.[7]



Scientists conduct first study beneath Antarctica's Thwaites Glacier.
Credit: Georgia Tech University.

Robotic underwater vehicle snaps first images of seafloor beneath Antarctica's Thwaites Glacier

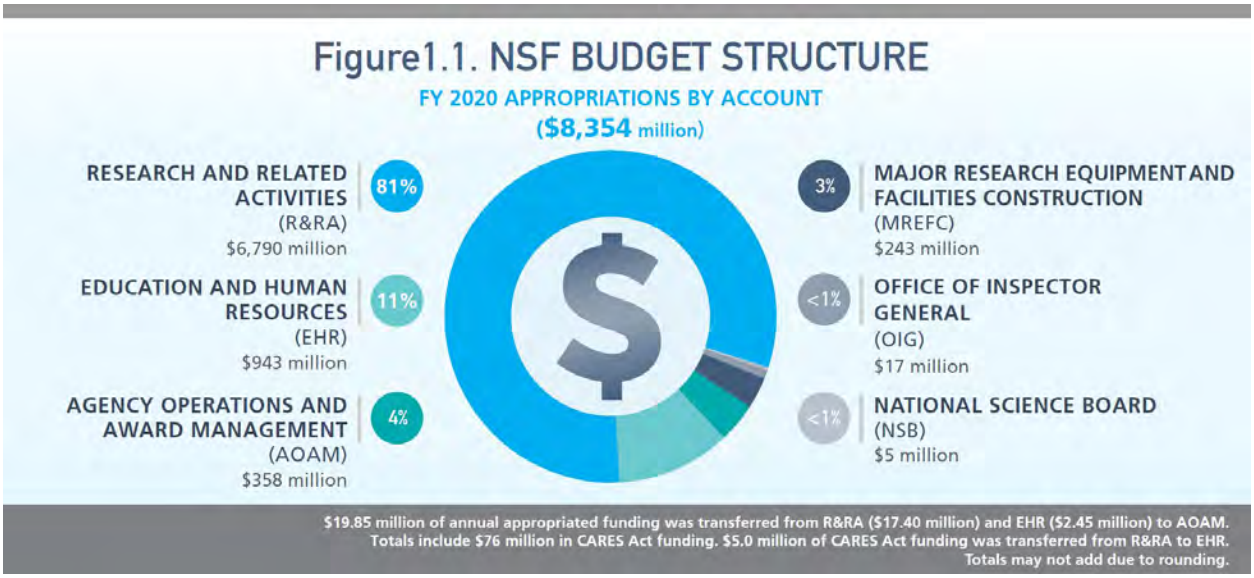
Antarctica is one of the most extreme environments on the planet. Despite the harsh environment and forbidding conditions, researchers funded by NSF are probing Antarctica's secrets above and below the ice. Using an underwater robot called Icefin, researchers with the International Thwaites Glacier Collaboration were able to study the ocean floor beneath the Thwaites Glacier—a fast-moving glacier about the size of Florida flowing into the Pine Island Bay off of West Antarctica. By diving beneath the waves, researchers are hoping to better understand the conditions in the area around the glacier and the changes taking place as it flows into the sea. The information is critical to our understanding of oceanography, sea-levels, and polar phenomena.

NSF by the Numbers

NSF is funded primarily through congressional appropriations that are provided to six accounts: Research and Related Activities (R&RA), Education and Human Resources (EHR), Major Research Equipment and Facilities Construction (MREFC), Agency Operations and Award Management (AOAM), the National Science Board (NSB), and the Office of Inspector General (OIG). Appropriations in these six accounts in FY 2020 totaled $8,354 million[8], an increase of approximately 3 percent over the FY 2019 appropriations level of $8,075 million. R&RA, EHR, and MREFC appropriations fund the agency's programmatic activities

[6] NSF Strategic Plan FY 2018 – 2022: https://www.nsf.gov/pubs/2018/nsf18045/nsf18045.pdf
[7] National Center for Science and Engineering Statistics Survey of Federal Funds for Research and Development Fiscal Years 2018–2019: https://ncsesdata.nsf.gov/fedfunds/2018/index.html
[8] Amount shown is NSF's FY 2020 discretionary appropriations. This amount does not include Donations and H-1B Nonimmigrant Petitioner Receipts. These amounts are included in NSF's appropriations shown in the Statement of Budgetary Resources (SBR). The SBR is on page Financials-17 of this *Agency Financial Report (AFR)*.

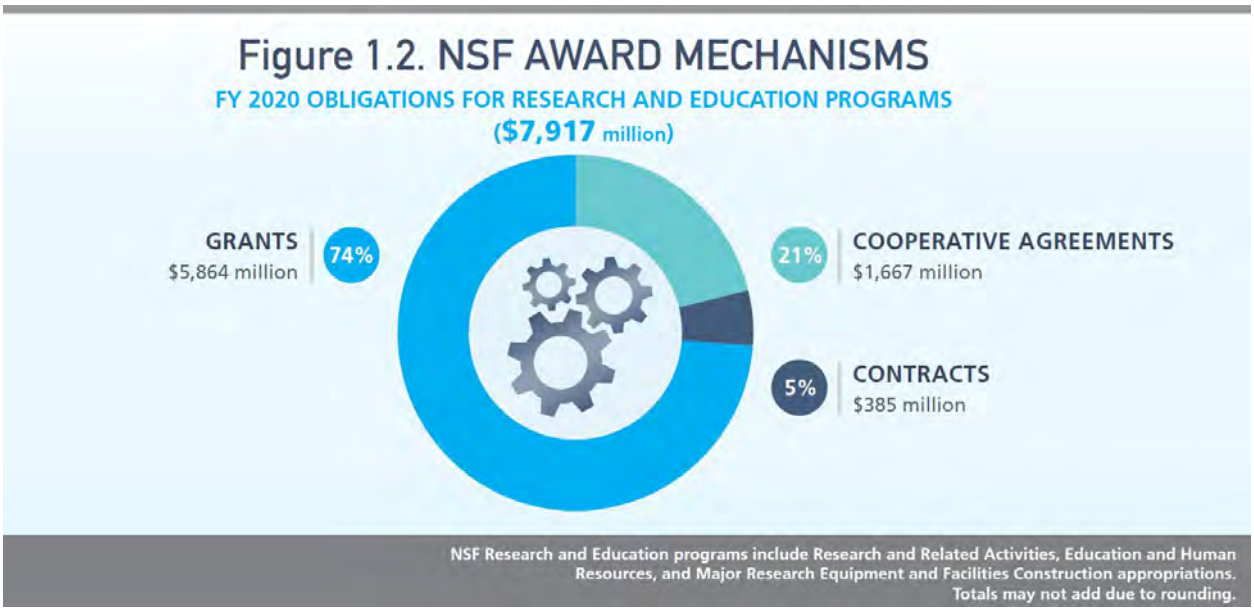
and accounted for 95 percent of NSF's total appropriations in FY 2020. Figure 1.1 provides details on NSF's FY 2020 appropriations. Of this total for FY 2020, $76 million was provided as a supplemental appropriation under the CARES Act. This additional funding is included in the appropriations totals described here, and a separate section (*COVID-19 Activities*) provides details on this supplemental funding by account.



- R&RA supports basic research and education activities in science and engineering, including high-risk and transformative research. This appropriation accounted for 81 percent of FY 2020 funding. The FY 2020 R&RA funding level of $6,790 million was $285 million higher than the FY 2019 appropriation of $6,505 million.
- EHR, which supports activities to develop a diverse and well-prepared U.S. STEM workforce and a scientifically literate citizenry, is NSF's second largest appropriation and is over 11 percent of the agency's budget. EHR's FY 2020 funding level of $943 million was $21 million above the FY 2019 EHR appropriation of $922 million.
- FY 2020 AOAM funding of $358 million supported NSF agency operations and award management activities through which NSF's science and engineering research and education programs are administered. AOAM was over 4 percent of NSF's total FY 2020 appropriations. AOAM increased by nearly $25 million from the FY 2019 level of $333 million.
- The MREFC appropriation supports the acquisition, construction, and commissioning of major and mid-scale infrastructure that provide unique capabilities at the frontiers of science and engineering. This account was about 3 percent of the agency's total appropriations in FY 2020. The FY 2020 MREFC funding level of $243 million was $53 million below the prior-year appropriation of $296 million.
- Separate appropriations support the activities of the OIG and the NSB; each accounted for less than 1 percent of NSF's total FY 2020 appropriations. The FY 2020 OIG appropriation of $16.5 million increased approximately $1 million over the FY 2019 appropriation. The NSB received an appropriation of $4.5 million in FY 2020, $130,000 higher than the previous year's funding level.

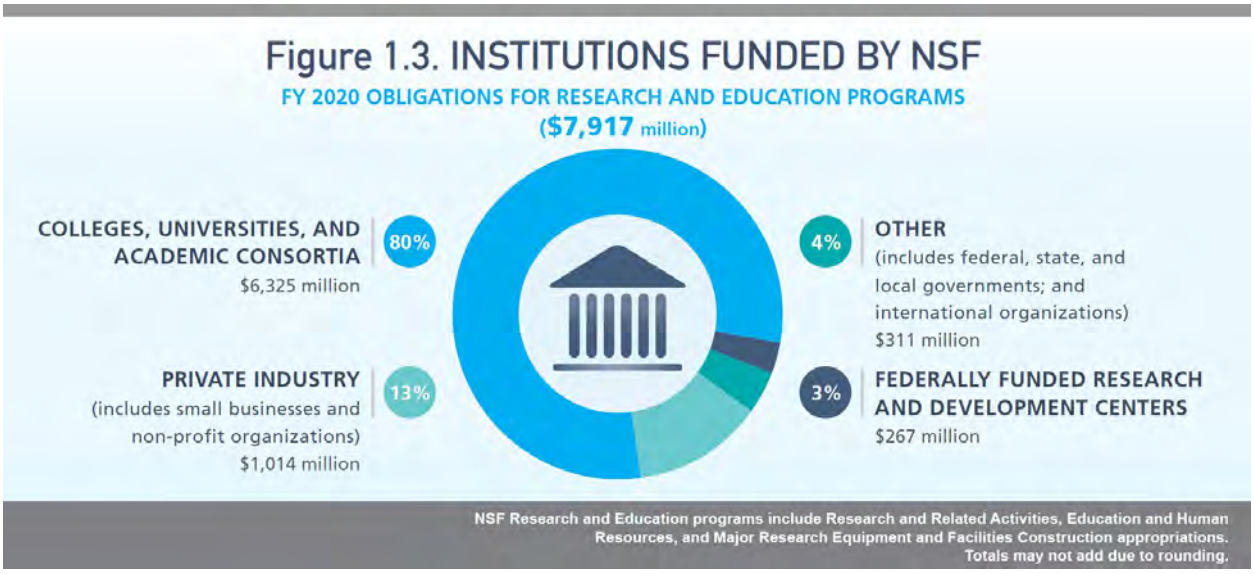
Approximately 30,000 members of the science and engineering community participated in the merit review process as panelists and proposal reviewers.[9] Awards were made to almost 1,900 institutions located in all 50 states, the District of Columbia, and three U.S. territories. These institutions employ many of America's leading scientists, engineers, and educators; and they train the leading innovators of tomorrow. In FY 2020, about 313,000 people were directly involved in NSF-funded programs and activities. Beyond these figures, NSF programs indirectly impact millions of people, reaching 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 dissemination of innovative instructional resources and teaching methods.

During FY 2020, NSF evaluated over 42,700 proposals through a competitive merit review process and made approximately 12,200 new competitive awards, mostly to academic institutions. In addition to these proposals, GRFP reviewed approximately 13,000 applications for fellowships. As shown in Figure 1.2, the Award Mechanisms chart, NSF's award funding was used primarily for financial assistance to carry out a public purpose through grants and cooperative agreements. Grants can be either standard awards, in which funding for the full duration of the project is awarded in a single fiscal year, or continuing awards, in which funding for a multi-year project is awarded in increments. Cooperative agreements are used when the project requires substantial agency involvement (such as research centers and multi-use facilities). Contracts are used to acquire products, services, and studies, such as program evaluations, required for NSF or other government use.



[9] For more information about NSF's merit review process, see https://www.nsf.gov/bfa/dias/policy/merit_review/ and *NSF's Merit Review Process, FY 2018 Digest* (NSB-2020-13) at https://www.nsf.gov/nsb/publications/2020/nsb202013.pdf

As shown in Figure 1.3, the Institutions Funded chart, 80 percent of support for research and education programs ($6,325 million) was provided to 822 different colleges, universities, and academic consortia. Private industry, including small businesses and non-profit organizations, accounted for 13 percent ($1,014 million), and support to Federally Funded Research and Development Centers accounted for 3 percent, or $267 million. Other recipients (federal, state, and local governments; and international organizations) received 4 percent ($311 million) of support for research and education programs.



COVID-19 Activities

NSF worked closely with the scientific research community to bolster the national response to the COVID-19 pandemic and employed several research funding mechanisms, notably Rapid Response Research (RAPID), a fast-tracked grant process designed to accelerate critical discovery. NSF-funded research related to the pandemic aligned with the following research areas:

- Improving our understanding of the coronavirus.
- Developing a predictive understanding of the spread of the virus.
- Enabling approaches that mitigate the negative impacts of COVID-19 on public health, society, and the economy.

As part of the CARES Act, NSF received $76 million in funding, of which $75 million supported a wide range of research to help the country "prevent, prepare for, and respond to coronavirus."[10] In addition, NSF drew from its FY 2020 base appropriations and other available funds to support research related to COVID-19. NSF's COVID-19 activities funded 1,172 awards to nearly 2,250 principal investigators in 48 states and the District of Columbia. Table 1.1 shows the FY 2020 obligations related to COVID-19 activities.

[10] Coronavirus Aid, Relief, and Economic Security Act, P.L. 116-136: https://www.congress.gov/116/plaws/publ136/PLAW-116publ136.pdf

Table 1.1: FY 2020 COVID-19 Activity Awards and Obligations
(Dollars in Millions)

	CARES Act	All COVID-19
Number of Awards	527	1,172
FY 2020 Obligations (Total)	$76.0	$197.5
R&RA	*$70.0*	*$178.5*
EHR[1]	*$5.0*	*$16.7*
AOAM	*$1.0*	*$1.0*
Other funding	-	*$1.3*

[1]NSF used transfer authority provided in P.L. 116-93, to transfer $5.0 million of R&RA CARES Act funding to the EHR budget account.

NSF's awardee institutions were impacted by the COVID-19 pandemic. Currently, the extent to which the pandemic impacted awards is being determined on an award-by-award basis. In the early months of the pandemic, NSF implemented time-limited administrative relief flexibilities applicable to NSF proposers and awardees affected by the loss of operational capacity and increased costs due to the COVID-19 pandemic in accordance with the Office of Management and Budget (OMB) guidance.[11] NSF Program and Grants Officers are responsible for determining how best to support research objectives for each award and are positioned to provide adjustments and flexibilities based on each situation. Flexibilities include adjustments to proposal deadlines, approval of progress reports, and modifications to project scope; the federal time-limited flexibilities mentioned above were applicable to areas such as salary support and deadlines for single audit submissions. While all NSF-funded major facilities construction projects have a contingency built in, the contingency budget is set based on known risks in control of a project. The situation with the pandemic extends beyond the realm of a foreseeable risk that a project could control.

To better understand COVID-19 and how to stop it, researchers are increasingly turning to some of the most powerful and uniquely capable computing facilities in the world like the NSF-funded Frontera supercomputer located at The University of Texas at Austin. *Credit: Texas Advanced Computing Center.*

Computing consortium takes on COVID-19

For more than four decades, NSF has been at the forefront of advanced computing capabilities that underpin U.S. leadership in research and innovation. Now, NSF-supported computing systems are an essential element of the COVID-19 High Performance Computing (HPC) Consortium, which is enhancing access to HPC resources to support global health efforts in the face of an ongoing pandemic. The HPC Consortium is a unique public-private partnership—spearheaded by the White House Office of Science and Technology Policy, IBM, U.S. Department of Energy and NSF—that gives researchers working to understand the COVID-19 virus access to powerful computational platforms that can enable major breakthroughs. Through data analytics, machine learning, artificial intelligence, and other advanced computing capabilities, researchers are modeling COVID-19 transmission, simulating the atomic structure of viruses, and forging new paths for fighting the disease.

[11] OMB M-20-17: https://www.whitehouse.gov/wp-content/uploads/2020/03/M-20-17.pdf; M-20-26: https://www.whitehouse.gov/wp-content/uploads/2020/06/M-20-26.pdf

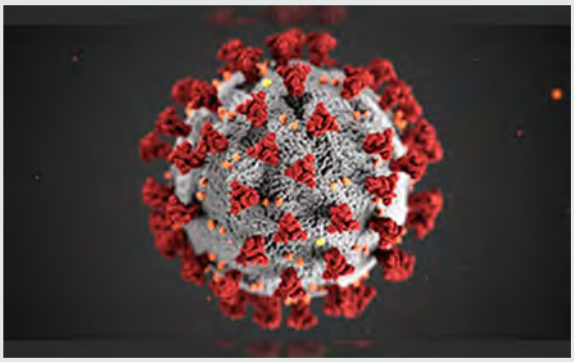
Costs and delays for construction project completion will not be known until the lengths of project suspensions and the additional costs and time required to restart construction are better known.

With 100 percent of NSF employees telework-eligible prior to the start of the pandemic, staff continued to fulfill NSF's mission after transitioning into full-time telework in the spring. AOAM funding ($1 million) secured ongoing continuity of operations during the COVID-19 response period, including costs stemming from changes to NSF agency operations in a virtual working environment.

In this *AFR*, NSF-funded research awards are highlighted, but this represents just a snapshot of the essential work NSF funded through the CARES Act and its regular FY 2020 appropriations. The COVID-19 research grants awarded through NSF are available on the NSF.gov website.[12]

RAPID award to study COVID-19 transmission through air and water

The COVID-19 pandemic has raised countless questions about the disease itself and how it spreads through the environment. To help answer those questions, provide the best information to public health officials, and find new ways to stop the spread of the disease, NSF activated its Rapid Response Research funding mechanism, known as RAPID. These awards streamline funding for scientists who need to act fast to gather information and develop new technology that can make a difference in a crisis. One of those RAPID awards went to study how the coronavirus that causes COVID-19 travels through the air, wastewater, and other environments. A key element of this work is designing sensor networks that can monitor wastewater for evidence of the virus that appears before symptoms and hospitalizations, giving communities and public health officials the information they need to help isolate occurrences of the virus and limit its spread.



This image shows SARS-CoV-2, the virus that causes COVID-19. ***Credit: Alissa Eckert, MS; Dan Higgins, MAMS, CDC.***

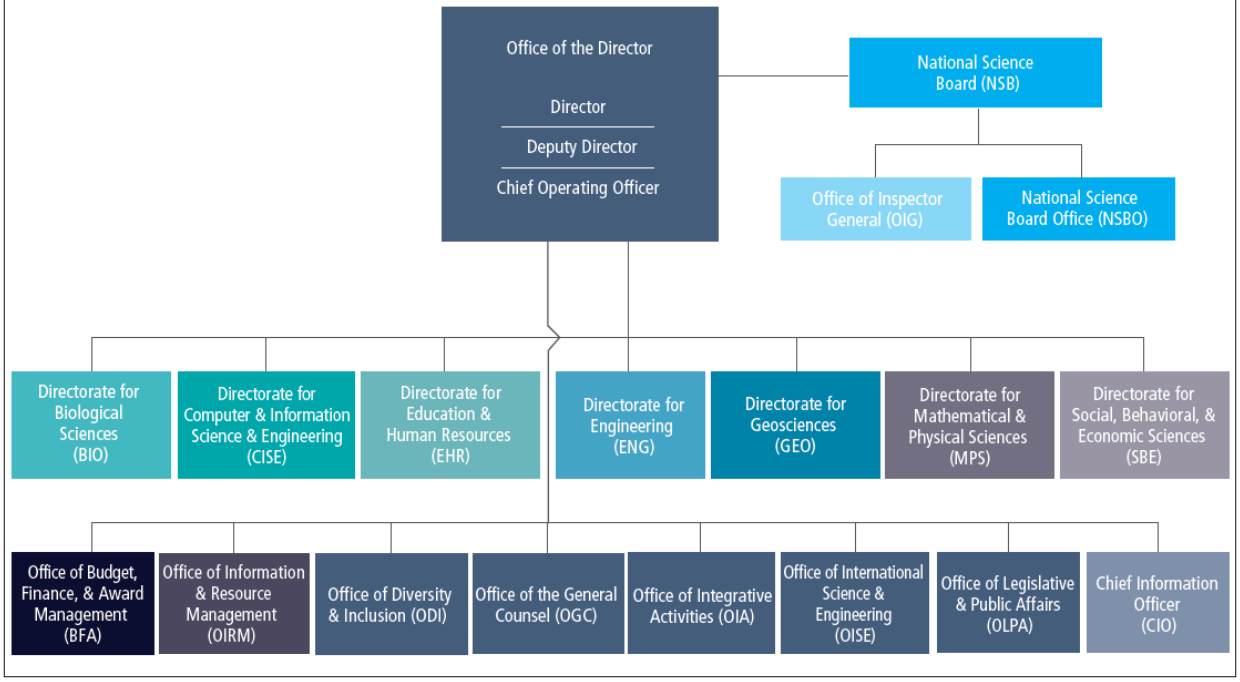
Organizational Structure

NSF is an independent federal agency headed by a Director who is appointed by the President and confirmed by the U.S. Senate.[13] As shown in Figure 1.4, NSF's organizational structure aligns with the major fields of science and engineering.[14]

The NSF Director and the 24-member NSB jointly pursue the goals and functions of NSF, including the duty to "recommend and encourage the pursuit of national policies for the promotion of research and education in science and engineering."[15] The NSB identifies issues critical to NSF's future and helps chart the strategic direction of NSF's budget and programs. NSB members are appointed by the President and are prominent contributors to the STEM research and education community.[16] NSF's Director is a member *ex officio* of the Board. The Director and the other NSB members serve 6-year terms.

[12] https://www.nsf.gov/awardsearch/simpleSearchResult?queryText=COVID+AND+RAPID
[13] The Director's biography: https://www.nsf.gov/staff/staff_bio.jsp?lan=spanchan&from_org=
[14] NSF's organization chart: https://www.nsf.gov/staff/organizational_chart.pdf
[15] 42 U.S. Code 1862(d): https://www.law.cornell.edu/uscode/text/42/1862
[16] NSB members during FY 2020 are shown in Appendix 9 of this *AFR*

Figure 1.4
NSF FY 2020 Organization Chart



The NSF workforce included 1,421 federal employees in FY 2020.[17] In FY 2020, NSF and the American Federation of Government Employees Local 3403 signed a new collective bargaining agreement for approximately 1,000 NSF bargaining-unit employees. The last agreement was signed in 1982.

NSF regularly recruits scientists, engineers, and educators through the Intergovernmental Personnel Act (IPA) who work at NSF for up to 4 years. These "rotators" bring fresh perspectives from across the country and across all fields of science supported by NSF, helping explore new directions for research in science, engineering, and education, including emerging interdisciplinary fields. On returning to their home institutions and across academia, rotators bring knowledge of NSF programming and leading research from a national perspective. As of September 30, 2020, there were 177 temporary appointments under the IPA program.

In addition to the Foundation's headquarters in Alexandria, Virginia, NSF maintains an office in Christchurch, New Zealand, to support the U.S. Antarctic Program (USAP); and the OIG has an office in Denver, Colorado.

Management Challenges

In October 2019, the OIG identified six areas representing challenges for the agency for FY 2020: (1) Managing Major Multi-User Research Facilities, (2) Meeting *Digital Accountability and Transparency*

[17] Full-time equivalents (FTEs) include the federal employee workforce for NSF, the NSB, the OIG, and U.S. Arctic Research Commission

Act of 2014 (DATA Act)[18] Reporting Requirements, (3) Managing the *Intergovernmental Personnel Act (IPA)* Program, (4) Managing the Antarctic Infrastructure Modernization for Science (AIMS) Project, (5) Encouraging the Responsible and Ethical Conduct of Research (RECR), and (6) Mitigating Threats Posed by Foreign Government Talent Recruitment Programs.[19] NSF activities relating to several of the Management Challenges were adjusted or reprioritized due to COVID-19 pandemic response actions. Nonetheless, progress on addressing the FY 2020 Management Challenges remained a priority for NSF and notable actions were taken in response to these challenges.

Management's report on the significant activities undertaken in FY 2020 to address the challenges is in *Appendix 2B: Management Challenges—NSF's Response* of this *AFR*. The report also discusses activities planned for FY 2021 and beyond. The following list summarizes some of the agency's significant actions and planned next steps to address the challenges.

The Institute for Student-AI Teaming aims to develop groundbreaking AI that helps both students and teachers work and learn together. *Credit: Phonlamai Photo/Shutterstock.*

AI in the classroom

Enhancing educational outcomes for all students is a critical part of building a STEM-enabled workforce and bolstering science and technology leadership for future generations. The Institute for Student-AI Teaming is designing new approaches to AI in the classroom to boost educational outcomes, foster deeper student engagement, and foster long-term interest in STEM subjects—especially for students from communities underrepresented in STEM fields. Working in close partnership with a diverse community of K-12 educators, students, parents, and stakeholders, researchers will deploy AI Partners that can interact naturally with students and teachers to augment classroom activities. This will give students the guidance they need to learn effectively while ensuring that educators can focus on what they do best: inspiring and teaching students. By supporting the development of AI-enabled tools that can be deployed in classrooms across the nation—including classrooms that are underrepresented in STEM—NSF is helping ensure that students from every community can develop their STEM talents.

Managing Major Multi-user Research Facilities

NSF understands the importance of its role in overseeing recipients' on-going management of major facilities and assuring successful performance. The agency also recognizes the importance of assessing prospective recipients' capabilities for managing major facilities prior to award. Over the past several years, NSF has greatly strengthened its oversight policies and procedures. This includes an annual Major Facilities Portfolio Risk Assessment to determine the necessary reviews and audits to be conducted by the Large Facilities Office (LFO) and Cooperative Support Branch (CSB) within the Office of Budget, Finance and Award Management (BFA). In close cooperation with NSF program offices, LFO and CSB conduct these reviews to safeguard NSF's significant, long-term investments in supporting the scientific endeavor. Importantly, in FY 2020, NSF continued to strengthen the established governance structure to help ensure consistent implementation of NSF's controls for major facilities oversight. Since 2017, NSF has been through three Government Accountability Office (GAO) reviews related to its oversight of projects funded

[18] DATA Act (P.L. 113-101): https://www.gpo.gov/fdsys/pkg/PLAW-113publ101/pdf/PLAW-113publ101.pdf

[19] The Inspector General's Memorandum on Management Challenges for NSF in FY 2020 is in NSF's *FY 2019 Agency Financial Report,* Appendix 2A: https://www.nsf.gov/pubs/2020/nsf20002/pdf/08-chap3-appendices.pdf

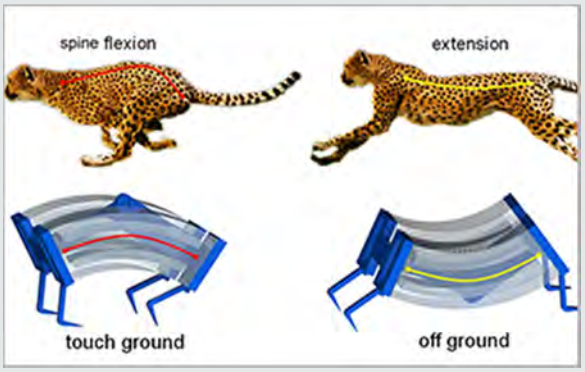
from the MREFC account. NSF has implemented corrective action plans and demonstrated progress towards addressing recommendations from these reports. The April GAO 2020 report had no new recommendations.

NSF has taken significant FY 2020 actions in response to the Office of Inspector General's (OIG's) identified challenge to continue to manage inherent risk associated with previously highlighted OIG concerns including the need for strengthened controls identifying subrecipients, completing subrecipient risk assessments, properly charging expenditures, and ensuring NSF and recipient project management expertise. Such actions include: (1) requiring recipients to develop Segregation of Funding Plans for several large NSF projects; (2) formalizing a process, under cognizance of the Chief Officer for Research Facilities in the Office of the Director (O/D), for tracing open action items periodically; (3) revising the *Business Systems Review (BSR) Guide* to better align with the Uniform Guidance and address implementation of Segregation of Funding Plans; and (4) implementing corrective actions in response to OIG Report 18-2-005, *Audit of NSF's Oversight of Subrecipient Monitoring*.

Going forward, NSF plans to continue strengthening its oversight by: (1) revising the *Obligation and Allocation of Management Reserve* Standard Operating Guidance (SOG); (2) finalizing and posting for public comment the *BSR Guide* and new/updated sections of the *Major Facilities Guide*; (3) finalizing the *Major Facilities Oversight Reviews* SOG; (4) completing the major facilities portfolio workforce gap analysis; and (5) ongoing monitoring of the allocation of funds between awards using Segregation of Funding plans.

Inspired by cheetahs, researchers build fastest soft robots yet

From navigating forbidding terrain in search-and-rescue missions to rapidly sorting fragile products in a warehouse environment, 'soft robots' have transformative potential in applications and environments that require machine assistants to have flexibility, agility, and a gentle touch. With a grant from NSF, engineers have developed a new type of soft robot that moves more than three times faster than previous designs. Inspired by the way that cheetahs derive their record speed by flexing their spine between two 'bistable' positions, researchers created soft robots that are faster and capable of running up steep inclines that are challenges for existing models. The engineers are already working on the next generation of their high-performing model, envisioning how their breakthrough could pave the way for multi-functional soft robots that may one day assist humans in a variety of environments.



Inspired by the biomechanics of cheetahs, researchers have developed a new type of soft robot. ***Credit: Jie Yin, North Carolina State University.***

Meeting Digital Accountability and Transparency Act of 2014 (DATA Act) Reporting Requirements

The purpose of the DATA Act is to improve the quality and transparency of the Federal Government's award data. Lawmakers have directed the Department of the Treasury (Treasury) and the OMB to create government-wide standards for reporting spending data associated with federal awards. The law also requires that this data be channeled to a central, public database so that it can be easily accessed and tracked throughout an award's full lifespan—from a vote in Congress to its final disbursement.

NSF submits all data required by the DATA Act to Treasury. NSF is confident in the quality of the quarterly and monthly data submissions, and NSF's internal controls support the reliability and validity of the agency account-level and award-level data. The data that the OIG identified under this challenge as errors are not designated as "errors" in Treasury's DATA Act Information Model Schema (DAIMS) technical requirements, but are actually broker "warnings," which are previously disclosed as explainable differences. Since February, NSF has been in regular communication with OMB to further address these explainable differences. Examples of actions taken by NSF in FY 2020, include: (1) implemented a SharePoint tool to assist in the quarterly DATA Act submission processes by tracking Division Director assurances and Senior Accountable Officer certification; (2) incorporated lessons learned from feedback on data submissions to improve accuracy and efficiency; (3) updated DATA Act and Financial Assistance Broker System policies and procedures to reflect new requirements; (4) continued to work closely with OMB, Treasury, and intra-governmental groups to provide input into DATA Act technical guidance and policy; and (5) continued to collaborate with NSF OIG and GAO to support their audit responsibilities as well as to resolve any recommendations through implementing a corrective action plan.

Going forward, NSF will: (1) continue to provide feedback to OMB and Treasury on recommended guidance changes that will help clarify the nature of NSF's differences; (2) continue to work with the OIG to achieve a common understanding and resolution of this issue; (3) incorporate recommendations from the GAO audit into NSF's reporting processes and controls.

Seismic network from unlikely source

How do you detect undersea earthquakes that can potentially cause devastating tsunamis? A team of NSF-funded geoscientists has found a way to use fiber optic communications cables at the bottom of the North Sea as a giant seismic network. While placing permanent seismic monitoring equipment on the seafloor would be prohibitively expensive, the fiber optic cables that already crisscross the ocean floor—carrying telecommunications signals between continents—are a ready-made solution. By sending a beam of light along the fiber optic cable, researchers detect tiny imperfections that reflect light back, which act as "waypoints" along the cable. When a seismic wave jostles the cable, the waypoints shift slightly, changing the way light in the cable is reflected and allowing researchers to take measurements of the seismic wave. By making creative use of existing infrastructure, researchers enhance disaster preparedness while opening up exciting new ways to study the Earth.

Researchers detected an earthquake by using fiber optic cable that connects a wind farm. ***Credit: Riekelt Hakvoort/Shutterstock.com.***

Managing the Intergovernmental Personnel Act (IPA) Program

Through the IPA program, scientists, engineers, and educators rotate into the Foundation as temporary Program Directors, advisors, and leaders. Due to the nature of this program, the OIG identifies the IPA program as an area of inherent risk that NSF must continue to monitor and mitigate. In response, NSF has taken a proactive approach in the management of the IPA program to appropriately consider and mitigate inherent risks associated with its execution. NSF established a senior-level IPA Steering Committee that reports to the NSF Director and Chief Operating Officer (COO). The Committee ensures that NSF is best utilizing the IPA hiring authority and regularly reports on its oversight and stewardship of the IPA program, including costs associated with the program, to the Director and COO, OMB, and Congress. NSF engages in continuous improvement of its management of the IPA Program, addressing the management challenges identified by the OIG as well as other agency-identified risks and challenges. Through these

actions, NSF is confident it has reduced the inherent risk substantially, such that the residual risk is acceptable to the agency. Selected examples of steps taken by NSF in FY 2020 include: (1) delivered the IPA Program Annual Report to the Director of NSF, including annual data and trend analyses on various aspects related to the use of IPAs at NSF; (2) through NSF's Enterprise Risk Management program, identified IPA program objectives and associated risks as they pertain to NSF's mission; (3) monitored time spent on Independent Research/Development (IR/D) and provided quarterly data to senior managers for appropriate oversight of IPA time and travel; (4) submitted annual responses on the Justifications for Rotator Pay Exceeding the Senior Executive Service Pay Max to Congress; and (5) submitted the FY 2019 IPA Program Annual Report to O/D, which demonstrated that the 10 percent cost-share pilot has reduced/eliminated the gap between IPA reimbursements and federal employee salaries, and thus is not a major risk to the agency.

Going forward, NSF will: (1) continue the various reporting listed above to the NSF Director, NSF senior managers, and Congress; (2) continue to use the robust onboarding, training, knowledge transfer, and performance management systems that are in place to ensure that turnover of all employees and IPAs have minimal impact on operations; and (3) continue monitoring established IPA IR/D travel caps.

Managing the Antarctic Infrastructure Modernization for Science (AIMS) Project

NSF funds and manages the USAP, which supports the U.S.'s research and national policy goals in the Antarctic. AIMS consists of six new structures being built to replace outdated buildings and consolidate key functions for more streamlined and efficient operations. The OIG identified the AIMS project as one that will require continued vigilance as it will stretch agency resources and may present additional challenges. While NSF agrees there are inherent risks associated with Antarctica's remote location, extreme environment, and the short period of time during which the continent is accessible, NSF has reduced risk levels to acceptable ranges through leadership commitments, dedication of staff and resources, corrective action planning, and monitoring implementation of plans. The global pandemic associated with COVID-19 has had impacts on USAP operations, resulting in significant changes to program and construction project plans. The global pandemic resulted in "excusable delays" for the contractor as well as additional government-directed delays in performance of work under the AIMS project, including placing the construction sites in a safe and stable configuration in March 2020 and bringing home deployed construction crews earlier than anticipated. In accordance with NSF policy, the magnitude of these impacts has required re-baselining the AIMS project, and the Office of Polar Programs is actively engaged with the contractor, BFA, and O/D for that purpose.

Among a number of milestones reached in FY 2020, NSF: (1) began on-site work on AIMS with approximately 16.5 percent of the project completed as of March 2020, when the pandemic began; (2) augmented the AIMS Integrated Project Team by adding a Project Controls Lead; (3) completed verification and acceptance of the AIMS Earned Value Management System (EVMS) in accordance with NSF policy; and (4) increased financial oversight of Construction in Progress reporting and construction invoicing.

Going forward NSF will: (1) continue monitoring and oversight of AIMS in accordance with established Internal Management and Project Execution Plans including external panel reviews and EVMS surveillance reviews for AIMS; (2) continue to assess COVID-19 impacts and evaluate options for minimizing negative impacts to AIMS cost and schedule; and (3) re-baseline AIMS and subject the revised cost, scope and schedule to external panel review, Facilities Readiness Panel Review, Director's Review Board Review, and NSB re-authorization of the Total Project Cost.

Love basmati rice? Scientists have now sequenced its genome

Rice is one of the most important staple crops worldwide, and now NSF-funded researchers have created the first complete, high-quality genome sequence for the iconic Basmati variety. By using nanopore sequencing technology, researchers assembled the complete genetic blueprint. The discovery sheds new light on how important crops adapt to different environments and how cultural preferences for certain qualities—like Basmati's fragrant aroma—can shape crop domestication. Breakthroughs like this are opening the door to new ways to enhance agricultural systems and food production around the world.

A new study offers clues to growing drought-tolerant and bacteria-resistant basmati rice. ***Credit: Ajay Suresh via Wikimedia (CC-BY-2.0).***

Encouraging the Responsible and Ethical Conduct of Research (RECR)

NSF views RECR holistically—not only as a responsibility to generate and disseminate knowledge with rigor and integrity, but also as a responsibility to conduct peer review with the highest ethical standards; diligently protect proprietary information and intellectual property from inappropriate disclosure; and treat students and colleagues fairly and with respect. This expectation is conveyed in the June 2020 update to the *Proposal and Awards Policies and Procedures Guide* (PAPPG) and on NSF's updated RECR web page.[20] NSF is working to understand and reduce the occurrence of irresponsible and unethical research conduct through three sets of actions: (1) characterizing the problem and identifying priorities through stakeholder engagement, complemented by data collection and analysis; (2) funding basic research into the underlying causes and potential solutions, including the effectiveness of different approaches to improve RECR; and (3) implementing change through policy and public engagement.

As stated in the Memorandum on Management Challenges for NSF in FY 2020, the OIG was encouraged by NSF's actions to strengthen training in the responsible conduct of research at NSF-funded institutions but also identified opportunities for improvement. Among the significant actions taken in FY 2020, NSF: (1) collected stakeholder input through participation in annual meetings of the Association for Practical and Professional Ethics; (2) continued to fund basic research to identify factors that are effective in the formation of ethical STEM researchers and approaches to developing those factors in the STEM fields supported by NSF; (3) provided intramural and extramural guidance, resources, and consultation for the inclusion of ethics considerations in citizen science, collaborative/team science, and international science; (4) in the 2020 PAPPG, provided a comprehensive definition of RECR and identified promising practices in RECR training; and (5) created a "Speak Up" campaign to raise awareness of resources available for personnel to address discrimination, bullying, harassment, stress and anxiety, physical safety, and violence in the workplace.

Going forward, NSF will: (1) continue to leverage NSF's leadership role as co-chair of the National Science and Technology Council (NSTC) Joint Committee on Research Environment (JCORE) Safe and Inclusive Research Environments subcommittee and the JCORE Rigor and Integrity in Research subcommittee to promote the coordination and development of RECR among federal agencies, including the National Institutes of Health; (2) establish a plan to assess the agency's harassment prevention efforts for university grantees, including methods to regularly monitor/evaluate policies and communication mechanisms;

[20] RECR webpage: https://www.nsf.gov/od/recr.jsp

(3) collaborate with other federal agencies and the ethics community to strengthen the understanding and effectiveness of RECR training and community guidance; and (4) collaborate with other federal agencies to address harassment in a coordinated manner through active participation in the JCORE Safe and Inclusive Research Environment subcommittee and its ad hoc working groups.

Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

NSF seeks to maintain a vibrant science and engineering community for the benefit of the Nation. Participation in this community relies on individuals to uphold core principles and values such as openness, transparency, collaboration, and integrity. Unfortunately, this commitment to open scientific exchange and research today faces a challenge from the talent recruitment programs established by some foreign governments that deliberately disregard these core principles and incentivize participants to acquire U.S.-funded scientific research. These programs target scientists, engineers, and educators of all nationalities working or educated in the U.S. Given the risk talent recruitment programs pose for NSF, the OIG noted that NSF should continue to assess and refine its controls in this area and should work to ensure that it has sufficient staff and resources to respond to this challenge.

Over the past two years, NSF has taken steps to mitigate threats posed by foreign government talent recruitment programs. Among several significant actions taken in FY 2020, NSF: (1) created and filled the position of Chief of Research Security Strategy and Policy and established a Research Security Strategy and Policy Group; (2) issued clarifications to its proposal preparation requirements specified in the PAPPG to ensure senior personnel on proposals provide information on all sources of current and pending research support, foreign and domestic, as well as requiring all titled positions be identified in the biographical sketch; (3) standardized the format and streamlined the processes for disclosure as part of the revision to the PAPPG, with the new formats released in April 2020 and use of an NSF-approved format required for these sections of proposals submitted or due on or after October 5, 2020; (4) finalized a revised term and condition on foreign collaboration considerations for major facilities, effective October 5, 2020, for new awards and funding amendments on existing awards; (5) released mandatory training for all NSF personnel on science and security that includes modules on risks from foreign governments, NSF's policies on disclosure, and NSF's policies on staff participation in foreign government talent recruitment programs; and (6) engaged Congress through briefings focused on NSF's efforts to implement reasonable and necessary steps to ensure integrity of federally-funded research and protect against threats from foreign government talent recruitment programs.

Going forward, NSF will: (1) continue to serve as co-chair of the two JCORE subcommittees noted above, working closely with the White House, other federal science funding agencies, and intelligence and law enforcement communities; (2) facilitate NSF's access to classified information and ability to engage in classified discussions with other U.S. government agencies, including through the addition of a Sensitive Compartmented Information Facility at NSF's headquarters; and (3) continue evaluation of recommendations to consider implementing additional policy steps and/or outreach activities related to research security at both the agency level and the JCORE level.

Performance

NSF's Strategic Plan for FY 2018 – 2022, *Building the Future: Investing in Discovery and Innovation,*[21] establishes two strategic goals that capture the dual nature of NSF's mission to advance the progress of science while benefitting the Nation: *Expand knowledge in science, engineering, and learning* and *Advance the capability of the Nation to meet current and future challenges*. A third goal, *Enhance NSF's performance of its mission*, directs NSF to hold itself accountable for achieving excellence in carrying out its mission. As shown in the following table, each goal has two strategic objectives which together encompass all areas of agency activity. This goal structure enables NSF to link its investments to longer-term outcomes.

Strategic Goals and Objectives

Strategic Goals	Strategic Objectives
Expand knowledge in science, engineering, and learning	*1.1 Knowledge* Advance knowledge through investments in ideas, people, and infrastructure.
	1.2 Practice Advance the practice of research.
Advance the capability of the Nation to meet current and future challenges	*2.1 Societal Impacts* Support research and promote partnerships to accelerate innovation and to provide new capabilities to meet pressing societal needs.
	2.2 STEM Workforce Foster the growth of a more capable and diverse research workforce and advance the scientific and innovation skills of the Nation.
Enhance NSF's performance of its mission	*3.1 Human Capital* Attract, retain, and empower a talented and diverse workforce.
	3.2 Processes and Operations Continually improve agency operations.

In FY 2020, NSF updated its Partnerships-focused Agency Priority Goal (APG): *Strategically engage in public and private partnerships to enhance the impact of NSF's investments and contribute to American economic competitiveness and security*.[22,23] The APG states that by September 30, 2021, NSF will develop and pursue an agency-wide partnerships strategy, components of which will include targeted outreach, implementation of process improvements, and improvement of internal and external communications. In FY 2020, NSF continued its practice of having agency leaders conduct quarterly data-driven performance reviews, including reporting on the APG.

NSF participates actively in the President's Management Agenda, most prominently in the implementation of Cross-Agency Priority (CAP) Goals relevant to its mission. For example, as a member of the Executive Steering Committee for CAP Goal 8, Results-Oriented Accountability for Grants,[24] NSF contributed to the revisions OMB released to Title 2 of the Code of Federal Regulations. This government-

[21] *NSF Strategic Plan FY 2018 – 2022*: https://www.nsf.gov/pubs/2018/nsf18045/nsf18045.pdf
[22] Agency Priority Goal – Expand Public and Private Partnerships: https://www.performance.gov/NSF/APG_nsf_1.html
[23] NSF has strategic public-private partnerships that do not meet the thresholds governing financial reporting, per the Statement of Federal Financial Accounting Standards (SFFAS) 49, "Private Public Partnership: Disclosure Requirements."
[24] CAP Goal 8: https://www.performance.gov/CAP/CAP_goal_8.html

wide policy revision marks the beginning of a foundational shift toward results-oriented accountability for federal grants.

App catches early signs of eye disease

Smart phones have been put to an astounding number of innovative uses. Now, with funding from NSF, researchers are making them important tools for the early detection of certain eye diseases. Signs of a rare form of eye cancer known as retinoblastoma can show up in smart phone photos in the form of a telltale white sheen that comes from light reflecting off tumors in the back of the eyes. The white reflections that can appear in photos might also indicate cataracts, infections, or other disorders. The researchers are using machine learning to power a smart phone app that can identify potential abnormalities. While the app can't take the place of a doctor's diagnosis, in places where cellphones are common but medical care is limited, the technology could make the difference in timely medical intervention for countless people.

Examples of what a smart phone app looks for: The white reflection from an otherwise dark pupil can indicate a tumor, a cataract or other eye problems. *Credit: Claire Eggers/NPR.*

Progress Toward Achievement of Performance Goals

Each year, NSF produces an *AFR, APR*, and a *Performance and Financial Highlights* summary report. NSF's *FY 2020 APR* will appear in the *FY 2022 Budget Request* as part of an integrated Performance Plan and Report. This report will provide a complete discussion of NSF's performance measures, including descriptions of the metrics, methodologies, results, and trends, along with a list of relevant external reviews. The topic areas of these goals are listed in the following table. Targets and annual results will be provided in the *FY 2020 APR*. Where appropriate, results will incorporate a discussion about the effects of the COVID-19 pandemic on performance. The *FY 2020 APR* will also provide information about NSF's verification and validation review of performance data, as required by the Government Performance and Results Modernization Act of 2010. NSF's *FY 2020 APR* (included in the *FY 2022 Budget Request to Congress)* and *FY 2020 Performance and Financial Highlights* summary report will be posted on the NSF website concurrent with NSF's *FY 2022 Budget Request to Congress* in 2021.[25]

FY 2020 Performance Goals

Goal Short Name	Goal Statement
APG: Public and Private Partnerships	*APG*: Strategically engage in public and private partnerships to enhance the impact of NSF's investments and contribute to American economic competitiveness and security.
Ensure that Key Program Investments are on Track	Ensure that key NSF-wide program investments are implemented and on track.
Ensure that Infrastructure Investments are on Track	Ensure program integrity and responsible stewardship of major research facilities and infrastructure.
Make Timely Proposal Decisions	Inform applicants whether their proposals have been declined or recommended for funding in a timely manner.

[25] *FY 2020 Agency Performance Report* (included in the Performance chapter of the FY 2022 Budget Request to Congress) and *FY 2020 Performance and Financial Highlights*: https://www.nsf.gov/about/performance/

Goal Short Name (continued)	Goal Statement
Improve Review Quality	Improve the quality of written reviews of NSF proposals.
Foster a Culture of Inclusion	Foster a culture of inclusion through change management efforts resulting in change leadership and accountability.
Align Job Requirements with Competencies	Ensure that employee job requirements are aligned with competencies and skills needed for the future.
Improve User Interactions with Information Technology (IT) Systems	Streamline and simplify user interactions with IT systems and functions that support the merit review process, reducing non-value-added steps and reducing the time spent managing the proposal and award lifecycle.

Renewing NSF

In FY 2020, NSF continued ongoing efforts focused on internal agency reform and process improvement, collectively called "Renewing NSF." Renewing NSF aims to enhance performance of NSF's mission and maintain U.S. leadership in research and education across all areas of STEM. This effort is aligned with NSF's history of continuous organizational improvement and the Administration's government-wide agency reform activities, and it will yield an even more agile organization better prepared for future challenges and opportunities. The four focus areas are: (1) making information technology work even better for all; (2) adapting the workforce and the work; (3) streamlining, standardizing, and simplifying processes and practices; and (4) expanding and deepening public and private partnerships. NSF has performance goals supporting all four areas.

NSF funds the design, development, and deployment of city-scale advanced wireless testing platforms that will enable experimentation and unleash new approaches and possibilities for next-generation wireless networks. Credit: PAWR Project Office.

Platforms for Advanced Wireless Research (PAWR)

Expanding the reach of high-speed Internet connectivity is critical to boosting economic productivity, educational opportunities, and other benefits to communities around the nation. Through PAWR, NSF is partnering with a consortium of more than 35 companies to stand up four city-scale testing platforms. These platforms are in turn enabling experimentation with novel wireless concepts, protocols, technologies, and applications and services. With platforms currently based in Salt Lake City, New York City, and North Carolina's Research Triangle, PAWR is moving forward with plans for a fourth testing platform to focus on rural broadband technology, with an eye toward reducing access costs for rural communities and integrating multiple wireless technologies in new ways to reach unserved and underserved areas.

Proposal Workload and Management Trends

NSF continuously monitors key portfolio, proposal 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 *National Science Foundation's Merit Review Process, Fiscal Year 2018 Digest*.[26]

Figure 1.5 identifies three key portfolio measures: competitive proposals acted upon, new awards, and funding rates. In FY 2020 there were increases in all three key measures.

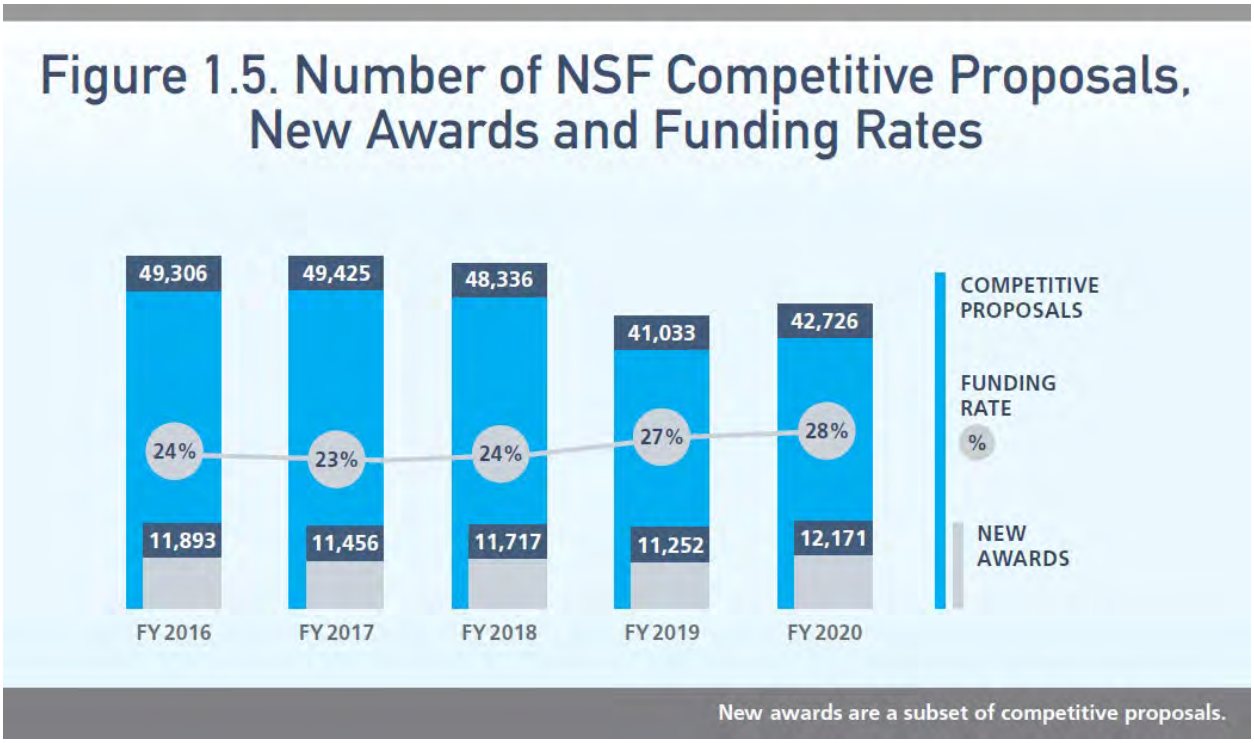


Table 1.2 provides proposal workload and management trends over 5 years. Highlights of these indicators are as follows:

- Between FY 2019 and FY 2020, the number of competitive proposal actions increased by 4 percent; from 41,033 to 42,726.
- The number of new awards in FY 2020 was 12,171, an 8 percent increase over FY 2019.
- The overall funding rate in FY 2020 was 28 percent, an increase of 1 percentage point. Funding rates differ by directorate and are presented in the agency's annual budget request to Congress.
- The average annual award size of competitive awards was $213,280, approximately $16,000 higher than in FY 2019. As shown in Table 1.2, award size varies by year. The average annual award size has been increasing over the past 3 years.
- The number of employees (FTEs) increased slightly between FY 2019 and FY 2020, 1,415 FTE and 1,421 FTE, respectively.

[26] *NSF's Merit Review Process, FY 2018 Digest* (NSB-2020-13): https://www.nsf.gov/nsb/publications/2020/nsb202013.pdf

- The number of active awards increased 2 percent in FY 2020, from 54,093 in FY 2019 to 55,239 in FY 2020. The 5-year average number of active awards is 54,593.

Table 1.2 Proposal Workload and Management Trends

Measure		FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	Percent Change (FY 2020-FY 2019)	Average (FY 2016-FY 2020)
Portfolio	Competitive proposal actions	49,306	49,425	48,336	41,033	42,726	4.1%	46,165
	Competitive award actions	11,893	11,456	11,717	11,252	12,171	8.2%	11,698
	Average annual award size (competitive awards)	$176,243	$174,533	$189,418	$197,530	$213,280	8.0%	$190,201
	Funding rate	24%	23%	24%	27%	28%	+1 percentage point	25%
Proposal Workload	Number of employees FTE, usage[1]	1,398	1,430	1,417	1,415	1,421	0.4%	1,416
	Number of active awards[2]	54,439	54,806	54,386	54,093	55,239	2.1%	54,593
	Proposal reviews conducted[3]	225,017	231,691	223,781	192,033	199,526	3.9%	214,410
Financial	Number of grant payments	22,926	22,615	21,727	20,935	22,169	5.9%	22,074
	Award expenses incurred but not reported at 9/30 ($ in millions)[4]	$366	$397	$393	$425	$437	2.8%	$402

Notes:

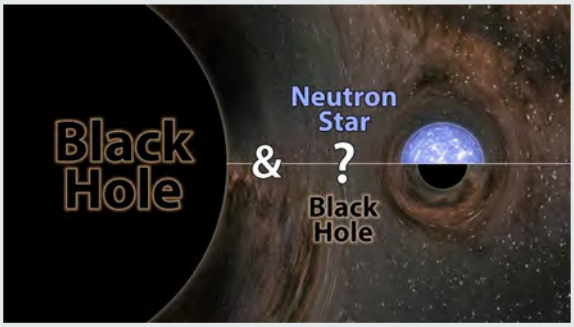
[1] FTEs shown include the federal employee workforce for NSF, NSB, OIG, and U.S. Arctic Research Commission.

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

[3] Includes written reviews, panel summaries, and site visit reports. In FY 2017, system changes implemented additional categories of panelist roles. Beginning in FY 2018, reviews conducted by these roles are included in the review counts, and FY 2017 was revised for historical consistency.

[4] FY 2020 number reflects an accrual, and all other years reflect actuals estimate.

- All NSF awardee institutions are required to submit payment requests at the award level to the NSF Award Cash Management Service (ACM$). Award expenses are posted to the NSF financial system at the time of the payment request. Reliance on ACM$ reduces the burden of manual invoicing and potential for errors or missed payments.
- Since its introduction in FY 2013, ACM$ has significantly improved the timeliness of grant financial data. Prior to ACM$, NSF awardee institutions using quarterly expense reporting processes had approximately $1.7 billion in award expenses that they had incurred but not-yet-reported to NSF on September 30. With the use of ACM$, the amount of incurred but not-yet-reported award expenses have averaged $402 million for each of the last 5 years.



The LIGO-Virgo gravitational-wave network witnessed the merger of a black hole and a mystery object. ***Credit: LIGO/Caltech/MIT/R. Hurt (IPAC).***

LIGO-Virgo finds mystery object in gap between neutron stars and black holes

When the Laser Interferometer Gravitational-Wave Observatory—known as LIGO—detected gravitational waves for the first time in 2016, it sent shockwaves through the scientific community, confirming predictions made by Albert Einstein a century before in a feat of research that some thought would be impossible to achieve. LIGO is continuing to make breakthroughs, detecting cosmic collisions between black holes and neutron stars, and answering key questions about our universe. One of those questions revolves around the "mass gap"—a blank space in astrophysicists' data between the largest neutron stars ever detected and the smallest black hole. At the end of their lifetimes, larger stars collapse into black holes, while smaller stars leave behind ultra-dense neutron stars. Since normal stars come in a spectrum of sizes, astrophysicists have been puzzled by the gap between neutron stars and black holes. A new LIGO discovery in 2020 provided evidence of an object firmly in the "mass gap" range. Whether it's record-breaking neutron star or a mini-black hole, the discovery is helping scientists get a clearer picture of some of the most exotic phenomena in the universe.

Financial Discussion and Analysis

In FY 2020, NSF demonstrated its commitment to financial management excellence and support of the agency's mission through a set of activities spanning Enterprise Risk Management (ERM), internal control, data science, and financial system improvements. Financial highlights from the year include:

- *Enterprise Risk Management*: The Foundation continued to increase the maturity of its ERM community of practice through formalizing ERM governance structure and practices. This change allows the agency to identify threats and opportunities more effectively at both the operational and leadership levels. The agency also leveraged and expanded ERM in its day-to-day decision making to better respond to the risks presented by the COVID-19 pandemic. This experience has positioned NSF to be able to identify and address potential risk events in the future.
- *G-Invoicing*: NSF continued to participate in the government-wide long-term solution to improve the management and accounting of Interagency Agency Agreements (IAAs). This online, user-friendly platform will eliminate manual processes by tracking IAA information automatically and enhance the management and transparency of these agreements. G-Invoicing aligns with three of the Renewing NSF initiative's pillars: making information technology work for all; streamlining, standardizing, and simplifying processes and practices; and expanding and deepening public and private partnerships. The agency has established a project team to support the initiation, design, and deployment of G-Invoicing. In addition, NSF formed a G-Invoicing Stakeholders Working Group to engage program staff throughout the project.
- *DATA Act*: NSF continued its lead role working with the Department of Treasury (Treasury) to test financial system changes. In July 2020, the Foundation successfully implemented the legislative requirements of OMB M-20-21, *Implementation Guidance for Supplemental Funding Provided in Response to the Coronavirus Disease*, which required monthly reporting for all agencies receiving COVID-19 supplemental funding, and special designation of awards issued in response to COVID-19. To successfully implement these requirements, the Foundation changed its systems, processes, and controls, and provided coordination and communication among operational units. The agency also updated its Data Quality Plan to incorporate new enhancements required to implement OMB guidance. The plan provides an executive-level summary of the agency's controls across people, processes, and technology for DATA Act reporting to ensure the completeness, accuracy, and timeliness of monthly submissions.
- *NSF Financial Transparency Tool*: This year, BFA continued to enhance the timeliness and access to spending information by creating a module in its financial reporting system available to all NSF staff. Using the Transparency Tool, NSF published the executive dashboard, called "The Quad," to provide senior leaders with timely financial indicators for decision-making. Throughout the year, several enhancements were made based on agency-wide user feedback.
- *Monitoring COVID-19 Financial Resources*: To assist in expediting the award of CARES Act funding, NSF created a daily report that was provided to Program Offices and the Division of Grants and Agreements. The report helped ensure an accelerated flow of CARES Act funds. Further, NSF developed a COVID-19 funding dashboard that allowed the agency to monitor financial indicators associated with COVID-related research activities and assist with decision-making and oversight.

- *Blockchain*: NSF continued its partnership with Treasury's Office of Financial Innovation and Transformation on a proof-of-concept pilot using blockchain distributed ledger technology (DLT). The concept focuses on the grant payment process and providing enhanced transparency in multi-tiered grant payments. The current phase of this forward-looking pilot has been expanded to additional federal agencies and research universities to develop requirements on how DLT can best address current grant reporting concerns and increase the efficiency of the grant payment process.

In accordance with the Chief Financial Officers (CFO) Act and the Government Management Reform Act of 1994, NSF prepares financial statements in conformity with Generally Accepted Accounting Principles (GAAP) for federal entities. The financial statements present NSF's detailed financial information relative to its mission and the stewardship of resources entrusted to the agency. They also provide readers with an understanding of the resources that NSF has available, the cost of its programs, and the status of resources at the end of the fiscal year. NSF's financial statements have undergone 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 activities for the year ending September 30, 2020.

NSF received an unmodified audit opinion on its financial statements, and no material weaknesses or significant deficiencies were identified in the internal control program for financial reporting. The Independent Auditor's Report begins on the first page of Chapter 2, *Financials*. Management's response follows the audit report.

Understanding the Financial Statements

The following discussion of NSF's financial condition and results of operations should be read together with the FY 2020 financial statements and accompanying notes, found in Chapter 2, Financials, of this *AFR*.

In accordance with guidance in OMB Circular No. A-136, *Financial Reporting Requirements,* NSF's FY 2020 financial statements and notes are presented in a comparative format to facilitate analysis of FYs 2020 and 2019. Table 1.3 summarizes the changes in NSF's financial position in FY 2020 relative to FY 2019.

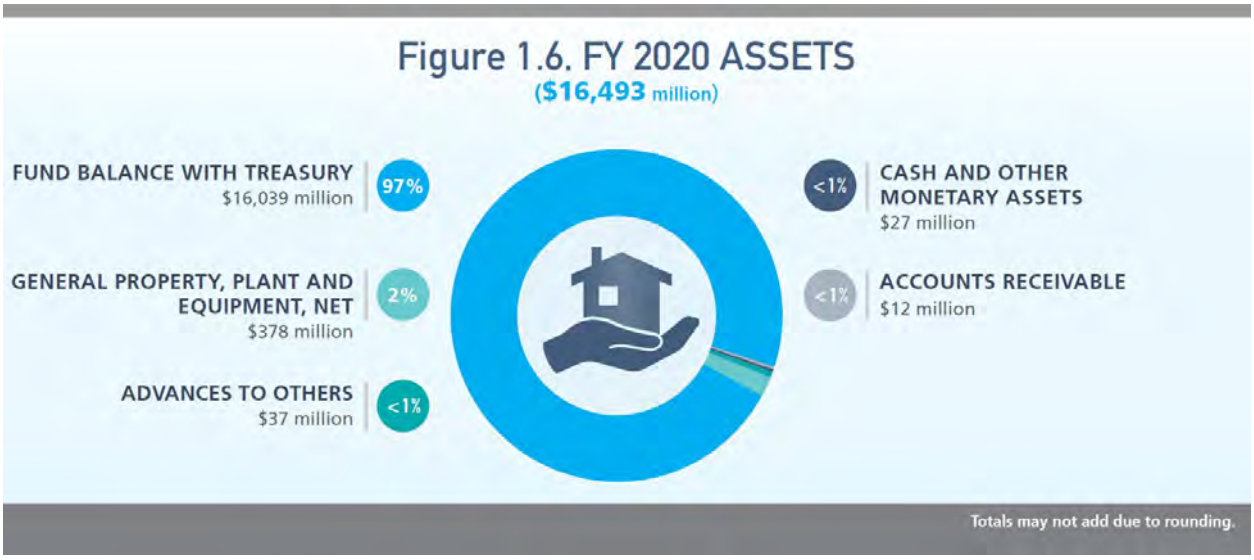
Table 1.3 – Changes in NSF's Financial Position in FY 2020
(Dollars in Millions)

Net Financial Condition	FY 2020	FY 2019	$ Change	% Change
Assets	$16,493	$15,295	$1,198	8%
Liabilities	$633	$541	$92	17%
Net Position	$15,860	$14,754	$1,106	7%
Net Cost	$7,355	$7,320	$35	<1%

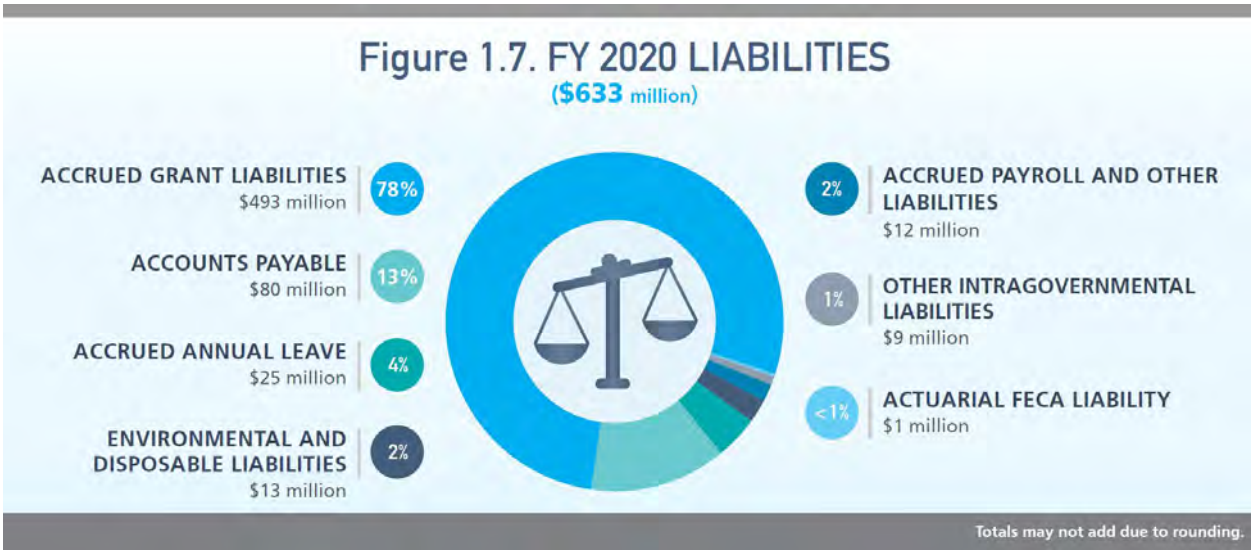
Balance Sheet

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*.

In FY 2020, Total Assets increased 8 percent from FY 2019 (see Figure 1.6). The majority of the change occurred in the *Fund Balance with Treasury* account, which increased by $1.141 million in FY 2020. NSF is authorized to use *Fund Balance with Treasury* to make expenditures and pay amounts due through the disbursement authority of Treasury. The *Fund Balance with Treasury* is increased through appropriations and collections and decreased by expenditures and rescissions.



In FY 2020, Total Liabilities increased 17 percent over FY 2019 (see Figure 1.7). Driving this change was an $80 million increase in *Accrued Grant Liabilities* in FY 2020. *Accrued Grant Liabilities* consist of estimated liabilities for grant expenses incurred but not reported for standard grants and cooperative agreements, and SBIR and Small Business Technology Transfer (STTR) grants.



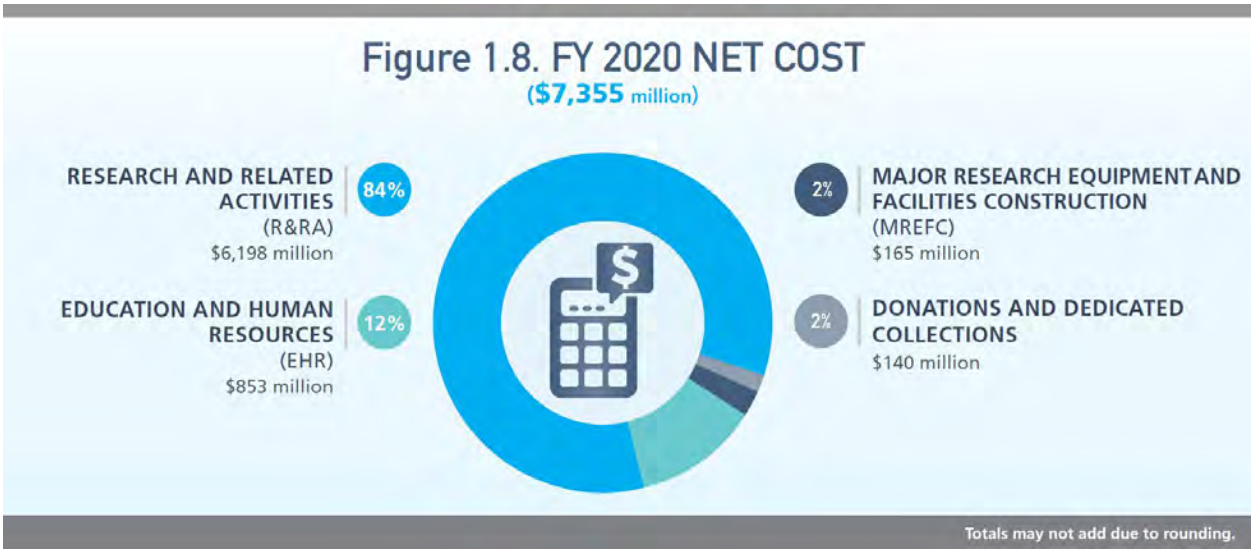
In FY 2020, NSF implemented a new accrual methodology for SBIR/STTR grants based on their unique terms and conditions. This new accrual methodology resulted in $56 million of the total increase to *Accrued Grant Liabilities*. The accrual for standard grants and cooperative agreements is estimated annually by utilizing a linear regression model based on the statistical correlation of NSF grantees' historical unliquidated obligations and expenses incurred but not reported. In FY 2020, the unliquidated obligations balance for grantees increased, resulting in $24 million of the total increase in *Accrued Grant Liabilities* as compared to FY 2019.

NSF's assets and liabilities were impacted by appropriated funds related to the CARES Act, primarily in support of R&RA activities related to COVID-19. As of September 30, 2020, NSF had $59 million in assets and $2 million in liabilities for COVID-19-related activities.

Statement of Net Cost

The Statement of Net Cost presents the annual cost of operating NSF programs. The net cost of operations of each NSF program 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 Operations*.

Approximately 95 percent of FY 2020 *Net Cost of Operations* was directly related to the support of R&RA, EHR, MREFC, 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 approximately 5 percent of FY 2020 *Net Cost of Operations* (see Figure 1.8). These administrative and management activities support the agency's program goals. Net Costs related to the CARES Act appropriations for R&RA, EHR, and AOAM were $18 million, $1 million, and $300,000, respectively.



Statement of Changes in Net Position

The Statement of Changes in Net Position presents the agency's cumulative results of operations and unexpended appropriations for the fiscal year. NSF's *Total Budgetary Financing Sources*, as part of *Unexpended Appropriations*, increased by $193 million; and *Total Financing Sources*, as part of *Cumulative*

Results of Operations, increased by $54 million in FY 2020 for a total increase of $247 million. *Cumulative Results of Operations* increased by $89 million.

Appropriations from the CARES Act resulted in Unexpended Appropriations of $57 million in FY 2020. As NSF continues to provide support for COVID-19 related research, costs will increase, which will lead to a decrease in net position.

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 2020, *Total Budgetary Resources* increased $295 million from the FY 2019 level. *Budgetary Resources—Appropriations* in FY 2020 for the R&RA, EHR, and MREFC accounts were $6,790 million, $943 million, and $243 million, respectively. The combined *Budgetary Resources—Appropriations* in FY 2020 for the NSB, the OIG, and AOAM accounts totaled $378 million. NSF also received funding via warrant from the H-1B Nonimmigrant Petitioner Account (H-1B) in the amount of $154 million and via funds from foreign governments, private companies, academic institutions, nonprofit foundations, and individuals in the amount of $27 million. In FY 2020, the *Budgetary Resources—Appropriations* line was also affected by H-1B sequestration in the amount of $9 million.

NSF received $76 million in CARES Act funding in support of the national response to COVID-19. NSF obligated $70 million for R&RA, $5 million for EHR, and $1 million for AOAM. Budget authority provided by the CARES Act is available to NSF for obligation through September 2021. As of September 30, 2020, all funds were obligated.

Limitations of the Financial Statements

In accordance with the guidance provided in OMB Circular No. A-136, NSF discloses the following limitations of the agency's FY 2020 financial statements. The principal financial statements are prepared to report the financial position and results of operations of NSF, pursuant to the requirements of 31 U.S.C. 3515(b). The statements are prepared from the books and records of NSF in accordance with federal GAAP and the formats prescribed by OMB. Reports used to monitor and control budgetary resources are prepared from the same books and records. Users of the statements are advised that the statements are for a component of the U.S. Government.

Other Financial Reporting Information

Debt Collection Improvement Act of 1996

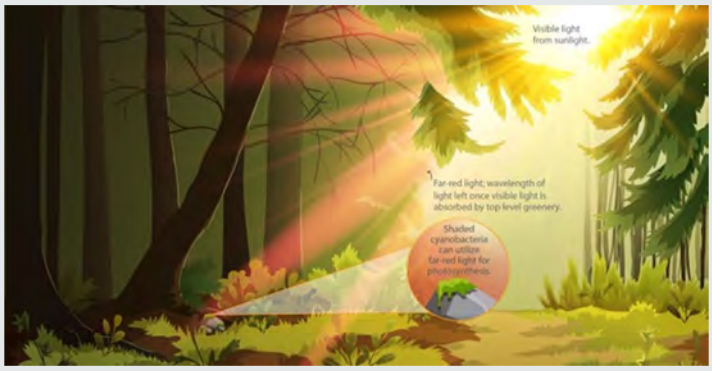
Net Accounts Receivable totaled $12.3 million at September 30, 2020. Of that amount, $11.4 million was due from other federal agencies. The remaining $900,000 was due from the public. In accordance with the Debt Collection Improvement Act, as amended by the DATA Act, NSF fully participates in Treasury's Cross-Servicing Program. This program requires NSF to refer debts due from the public that are delinquent more than 120 days to Treasury for appropriate collection action. In accordance with OMB Circular No. A-129, "Policies for Federal Credit Programs and Non-Tax Receivables," NSF writes off delinquent debt that is more than 2 years old. Additionally, NSF seeks Department of Justice concurrence for the write-off of debts greater than $100,000.

Cash Management Improvement Act of 1990

In FY 2020, 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 issue of timeliness of payment under the Act essentially not applicable to the agency. No interest payments were made in FY 2020.

Scientists discover how cyanobacteria thrive in low light

Cyanobacteria are tiny organisms that live virtually everywhere on Earth and use weak, filtered sunlight to generate energy through photosynthesis. They helped create an oxygen-rich atmosphere and continue to provide us with much of the oxygen we need to survive. Now, with funding from NSF, researchers have mapped the structure of the protein complex that allows cyanobacteria to live on such small amounts of light. The results could be used to engineer crops that thrive under low-light conditions, making the production of some crops less energy-intensive and more bountiful.



When cyanobacteria live in low-light conditions, some can switch to using far-red sunlight. ***Credit: Shireen Dooling, Graphic Designer, ASU Biodesign Institute.***

Systems, Controls, and Legal Compliance

Management Assurances

National Science Foundation

FY 2020 Statement of Assurance

The National Science Foundation (NSF) management is responsible for managing risks and maintaining effective internal control to meet the objectives of Sections 2 and 4 of the Federal Managers' Financial Integrity Act (FMFIA). The NSF conducted its assessment of risk and internal control processes in accordance with OMB Circular No. A-123, *Management's Responsibility for Enterprise Risk Management and Internal Control*. Based on the results of the assessment, NSF can provide reasonable assurance that internal control over operations, reporting, and compliance was operating effectively as of September 30, 2020.

/s/
Sethuraman Panchanathan
Director

November 13, 2020

The Federal Managers' Financial Integrity Act of 1982 (FMFIA)[27] and the OMB Circular A-123, *Management's Responsibility for Enterprise Risk Management and Internal Control*[28] require NSF to evaluate its systems of internal control and provide reasonable assurance to the President and the Congress on the adequacy of those systems, annually.

This year, NSF continued the work to transition its highly successful Internal Control and Quality Assurance Program to the Data Analytics & Assurance Program. NSF began to realize benefits associated with introducing analytics to internal control monitoring, in terms of increasing effectiveness and facilitating a shift to higher-value work. Specific areas of focus include: (1) dealing with the proliferation of data; (2) leveraging artificial intelligence and automation; (3) managing and reducing the cost of compliance efforts; and (4) building even stronger organizations.

The FY 2020 unmodified Statement of Assurance, with no material weaknesses, is reasonable assurance to the overall adequacy and effectiveness of internal controls based upon information that the system of internal control is operating as intended.

NSF's internal control assessment provides reasonable assurance that the objectives of FMFIA and the FFMIA were achieved and that the internal control process over reporting is effective.

[27] FMFIA: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/financial/fmfia1982.html
[28] *OMB Circular A-123*: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2016/m-16-17.pdf

Highlights from NSF's FY 2020 Data Analytics and Assurance Program

In FY 2020, the NSF Data Analytics and Assurance Program completed ERM, internal control, and data science initiatives to maintain and modernize the agency's strong control environment. The team also focused on change management and stakeholder engagement, working across the agency to engage personnel on risk management conversations and activities. This renewed focus on communications and engagement generated new insights and increased transparency into enterprise-level and internal control risks. The following list highlights the FY 2020 initiatives from the Data Analytics and Assurance Program:

- *Entity Level Control Checks:* As part of validating approach and identifying areas for continual improvement, NSF completed an entity-level design assessment to consider coverage and maturity in key ERM and internal control practices. NSF used the results of the entity level control checks to build consensus on areas of focus.
- *ERM Governance Improvement Initiative:* NSF focused on activating its ERM governance structure, including providing opportunities for senior-level functional leaders to discuss enterprise-level risks and coordinate management of these risks and reporting on ERM to NSF leadership.
- *Enhanced Risk and Control Checkpoints:* NSF assessed its risk and control landscape to identify areas of potential elevated risks associated with the COVID-19 pandemic, including the risk of fraudulent activities by internal and external parties. NSF reviewed the elevated risk areas with process owners and updated levels of risk and control activities to stay abreast of key monitoring activities and changes to fraud indicators.
- *Improper Payments Predictive Modeling:* Considering the changes to the improper payments risk landscape associated with the COVID-19 pandemic, NSF built a risk model to use Single Audit data to provide a quantitative view of which NSF awardees may present relatively higher risk of improper payments in the future. This will help the agency address improper payments risk, including fraud risk, with targeted monitoring and avoid undue compliance burden on NSF staff and grantees. NSF's improper payment risk assessment is described in the section, *Requirements for Effective Estimation and Remediation of Improper Payments*.
- *Travel Card Misuse Monitoring:* NSF increased the efficiency of its mature process for effectively identifying and monitoring potential travel card misuse by automating key data sources to create a dashboard. This new tool displays key indicators and increases transparency into potential misuse, including fraud, and associated follow-ups, while decreasing staff burden.

Management of ERM and Internal Control—OMB Circular A-123, Appendix A

NSF continued strengthening internal controls over financial reporting, conducted in support of program integrity and in alignment with OMB Circular A-123, the Green Book, and the Committee of Sponsoring Organizations of the Treadway Commission's (COSO's) Internal Control Integrated Framework and Internal Control Over Financial Reporting Compendium of Approaches and Examples. In addition, NSF continued to steadily increase the maturity of its ERM program in alignment with COSO's ERM Integrated Framework, as well as the risk-based assurance requirements of OMB and GAO. Some of the areas of focus for NSF in assessing its internal controls in FY 2020 included grants management, financial reporting, DATA Act, and IT general controls (ITGCs). In all cases, the team focused on confirming design and operating effectiveness of existing controls, with an eye to identifying new ways to leverage technology that further improves effectiveness and streamlines level-of-effort associated with monitoring.

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

NSF continues to maintain strong controls and effective monitoring over its government charge card programs. In FY 2020, this verification of the internal control environment included bi-annual reviews of the charge card risk landscape and NSF's key controls related to government charge card program management and oversight. Also, NSF completed process enhancements and developed a Travel Card Misuse Dashboard to streamline the completion of its monthly travel card misuse review process and provide additional transparency into the results of the reviews.

Requirements for Effective Estimation and Remediation of Improper Payments—OMB Circular A-123, Appendix C and the Payment Integrity Information Act of 2019 (PIIA):

Historically, NSF has had low risk and incidence of improper payments. In FY 2020, NSF moved its grants payments testing into the current year to identify and respond to improper payment risk in a timelier manner. Testing results indicated a similarly low risk of improper payments within NSF's grants program as the prior year qualitative risk assessment. In addition, NSF re-evaluated its improper payment risk assessment activities to focus on the most effective methodology to assess external risk of improper payments in the grants program, given the potential for heightened risk associated with the COVID-19 pandemic. NSF is designing an FY 2021 improper payments risk assessment, which will be aligned with requirements of OMB Circular A-123, Appendix C, and the PIIA. NSF will employ quantitative and qualitative methodologies to assess improper payment risk for its grants and mission support programs, including for the Small Business Innovation Research/Small Business Technology Transfer programs. NSF will monitor and address any risks it identifies in accordance with the agency's ERM governance structure.

Compliance with the FFMIA —OMB Circular A-123, Appendix D

OMB Circular A-123, Appendix D provides guidance in determining compliance with FFMIA for agencies subject to the Chief Financial Officers Act of 1990. NSF leveraged work previously described under Appendix A, including the ITGC assessment and active participation in the Statement of Standards for Attestation Engagements (SSAE 18) review process. In particular, the SSAE 18 process as it relates to the NSF financial management system (iTRAK) service provider includes verifying that NSF has the appropriate controls designed and in place to support responsible reliance on the financial system, including Complementary User Entity Controls. NSF's service provider received a clean opinion on the Service Auditor Type 2 System and Organization Controls Report, which is relevant to internal control over financial reporting. The auditors' opinion addressed the accuracy and completeness of the design of controls and services. No significant deficiencies or material weaknesses in internal control over FFMIA compliance were identified.

Federal Information Security Modernization Act (FISMA) of 2014: NSF has established a comprehensive IT Security and Privacy Program that is consistent with FISMA and industry best practices. NSF's IT controls are effective in maintaining a secure IT environment and align with the National Institute of Standards and Technology (NIST) Framework for Improving Critical Infrastructure. The agency's IT environment is supported by a suite of comprehensive policies and procedures that incorporate federal mandates and guidance. NSF has a strong Information Security Continuous Monitoring program that includes the Department of Homeland Security Continuous Diagnostic and Mitigation technologies. NSF includes cybersecurity as part of its ERM program; the cognizant ERM Risk Captain revisits the "Maintaining Cybersecurity" risk profile periodically to ensure that it accurately reflects the current enterprise-level risk and the risk responses are appropriate for NSF's risk appetite and tolerance.

Researchers prepare a test subject by dispensing conductive electrode gel into the electrodes in an EEG cap. *Credit: John Kounios, Drexel University*.

Understanding the Source of Creative Breakthroughs

Can you see a lightbulb go off over someone's head when they have a great idea? NSF-funded researchers saw the next closest thing. Using high-density electroencephalograms (EEGs), researchers took snapshots of the burst of brain activity that accompanies "aha!" moments. The increase in neural activity that accompanies creative insights is tied to the brain's reward center, and the study showed that the reward was triggered by the moment of insight before people even had a chance to make a conscious appraisal of the idea. The connection between creative insights and the brain's reward center can help scientists understand how the brain may have evolved to encourage creativity and thereby fostered the progress of science, art, industry, and culture for generations.

Other Federal Reporting and Disclosure

Antideficiency Act (ADA): NSF is not aware of any ADA violations that are required to be reported for the year ended September 30, 2020.

DATA Act: The DATA Act is a government-wide initiative led by OMB and Treasury to standardize and publish the federal government's wide variety of reports and data compilations related to spending. NSF developed its initial Data Quality Plan (DQP) to document the agency's approach to complying with the DATA Act and achieving reasonable assurance for internal control over DATA Act reporting. In FY 2020, NSF reevaluated this control baseline and updated the DQP. The DQP update incorporated DATA Act reporting requirements for federal agencies that received COVID-19 supplemental appropriations. The new reporting requirements were issued in OMB M-20-21, *Implementation of Guidance for Supplemental Funding Provided in Response to the Coronavirus Disease 2019 (COVID-19),* and the Treasury's DAIMS v2.0. In FY 2020, NSF successfully transitioned to the monthly reporting required under DAIMS 2.0 and implemented control enhancements in NSF systems to further mitigate data quality risks, improve reporting workflow, and minimize reliance on manual processes. NSF also conducted independent testing of its "higher risk" data elements and operational key controls over DATA Act reporting. This testing confirmed that NSF's controls were designed and are operating effectively to meet the reporting objectives of submitting complete, accurate, and timely data to USASpending.gov.

Pay and Allowance System for Civilian Employees, provided primarily in Chapters 31–50 of Title 5, U.S.C.: The Department of the Interior, Interior Business Center (IBC) Federal Personnel/Payroll System (FPPS) is a Shared Service Provider and performs many of NSF's payroll functions. IBC FPPS's internal control is reviewed annually by auditors under SSAE 18. IBC's FPPS controls were found to be suitably designed and operating effectively for FY 2020; this conclusion is based partly on transactional testing. In addition, NSF verified that its complementary user entity controls for FPPS provided adequate coverage for responsible reliance on IBC's payroll services.

Prompt Payment Act: The Prompt Payment Act mandates interest penalties on payments over 30 days. Under OMB M-17-27, *Reducing Burden for Federal Agencies by Rescinding and Modifying OMB Memoranda*, NSF encourages accelerating payments to all contractors within 15 days of a proper invoice being received. This acceleration allows small business contractors to be paid as quickly as possible.

Government Charge Card Abuse Prevention Act of 2012, Pub. L. 112 – 194: The act requires that agencies ensure that appropriate policies and controls are in place or that corrective actions have been taken to mitigate the risk of fraud and inappropriate charge card practices. NSF provides reasonable assurance that internal controls related to the government charge card programs are operating effectively, and no material weaknesses were identified. Additional information is provided above in subsection *Improving the Management of Government Charge Card Programs—OMB Circular A-123, Appendix B*, page MD&A-31.

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 is addressed on page MD&A-27.

Federal Information Security Modernization Act of 2014: This topic is addressed above in subsection *Compliance with the Federal Financial Management Improvement Act of 1996—OMB Circular A-123, Appendix D*, page MD&A-31.

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): In accordance with 2 CFR § 200.501, Subpart F, Audit Requirements, non-federal entities that expend $750,000 or more during the non-federal entity's fiscal year in federal awards must have a single or program specific audit conducted for that year. Federal agency internal control standards determine whether award expenditures comply with laws and regulations. NSF, like other federal agencies, is required to review the findings and recommendations of audit reports for funding recipients to determine whether corrective actions (if required) are adequate and implemented. NSF utilizes guidance from the OMB Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance) and Audit Follow-up as a basis for its audit resolution and follow-up activities. During FY 2020, NSF resolved 143 single audit reports.

Fraud Reduction and Data Analytics Act of 2015 (FRDAA), P.L. 114-186: In FY 2020, NSF incorporated fraud risk into its analytics and control monitoring activities to proactively identify and mitigate potential fraud scenarios. Areas where NSF implemented a fraud risk-based approach include the improper payments predictive model, travel card misuse dashboard, and enhanced risk and control checkpoints described in the preceding section.

Financial System Strategy and Framework

Financial System Strategy

iTRAK is NSF's Oracle-based commercial-off-the-shelf financial system, hosted in the 'cloud' by a commercial provider. iTRAK provides automated business processes, funds management, and reporting capabilities for NSF's external and internal customers, including grantees, financial and administrative staff, and program managers. NSF's financial system also performs system edit checks and provides an audit trail for financial transactions, thereby strengthening internal controls. iTRAK aligns with NSF's strategic objective to continually improve agency operations by enabling efficient, effective execution of financial activities and business operations; and it supports the agency in its stewardship role by providing managers and staff with financial data and reports, so they may make informed decisions about the programs they manage and support. For example, an iTRAK Open Obligations Reporting Tool was developed to assist NSF staff with prioritizing the review of open obligations and understanding the related funding impacts. The reporting tool supports NSF's efforts to continuously employ sound financial management and stewardship funding practices to fully utilize resources.

iTRAK complies with federal mandates and regulations by ensuring that transactions are posted in accordance with the U.S. Standard General Ledger (USSGL) at the transaction level; maintaining

accounting data to permit reporting in accordance with Generally Accepted Accounting Principles, as prescribed by the Federal Accounting Standards Advisory Board. iTRAK also complies with OMB Circular A-130, "Managing Federal Information as a Strategic Resource," OMB Circular A-123, Appendix D, "Compliance with the Federal Financial Management Improvement Act of 1996," and other federal regulations and guidance such as the CFO Act, FISMA, and the Rehabilitation Act, Section 508.

In April 2020, OMB issued Memorandum M-20-21, *Implementation Guidance for Supplemental Funding Provided in Response to the Coronavirus Disease 2019 (COVID-19)*. This memorandum significantly changed the reporting landscape for the DATA Act, through the issuance of new reporting requirements from the Department of Treasury in May 2020. After reaching a steady state of operations with DATA Act reporting, these new OMB and Treasury requirements shifted NSF back into an implementation phase. This required changes to NSF systems, processes, and controls, with many coordination points and moving parts across these three domains. NSF volunteered to be an early tester of Oracle's new DATA Act functionality for iTRAK, and in the process, identified several changes to the new functionality that would benefit NSF and the government-wide community. As one of the earliest agencies ready to report under the new requirements, NSF was also able to test early with the Department of Treasury, allowing them to test their processes and new visualizations for COVID-19. The entire initiative had an aggressive timeline, with a limited testing window for agencies to validate their data with Treasury, and three monthly submissions all due within the same 10-day reporting window. NSF successfully attested to and published its first DATA Act submissions for April, May, and June under the new requirements two days earlier than the legislative deadline of July 30, 2020.

In April 2019, OMB issued M-19-16, *Centralized Mission Support Capabilities for the Federal Government.* The objective of this guidance is to develop a new approach to shared services that will reduce duplication, improve accountability, and improve federal shared services. This initiative is one of the focus areas of the President's Management Agenda that centers on the Sharing Quality Services Cross Agency Priority Goal and improvements to government mission-support services. Under this initiative, Treasury was designated as the Financial Management Quality Service Management Office (FM QSMO) to establish a marketplace of systems and services that drive innovation, compliance with federal policies, standardization, and automation. In alignment with this goal, during FY 2020, NSF continued to work closely with Treasury's FM QSMO to identify services that may benefit NSF in meeting NSF's financial management and mission objectives.

In FY 2020, an independent accounting firm examined iTRAK's IT controls. The assessment was favorable with no significant findings. Details about the review are on page MD&A-28 in the subsection, *Compliance with the Federal Financial Management Improvement Act of 1996–OMB Circular A-123, Appendix D.*

As iTRAK continues to mature, NSF will continue to expand its analytical capabilities toward a more performance-driven system through reporting and data analytics tools and dashboards to better support NSF's mission. In keeping with this objective, NSF will continue to explore opportunities for iTRAK reporting and integration enhancements. Future initiatives on the horizon are summarized as follows with anticipated implementation dates:

- General Services Administration's (GSA's) System for Award Management (SAM) Unique Entity Identification (UEI) (FY 2021)——NSF will implement GSA's UEI requirements in place of the DUNS number as the primary key for institutions/vendors doing business with the federal government. This requires enhancements to iTRAK and certain NSF business applications.

- DATA Act DAIMS 2.0 (FY 2021 and FY 2022) – NSF will implement the requirement to report the Program Activity code in the appropriate file (File C) starting in FY 2021. Additionally, NSF will continue preparing for the DAIMS 2.0 requirement to report outlays for all transactions in File C starting in FY 2022.
- G-Invoicing (FY 2023)—NSF will integrate with Treasury's new G-invoicing system which will serve as the front-end application for users to originate and manage interagency agreements.

Financial Management System Framework

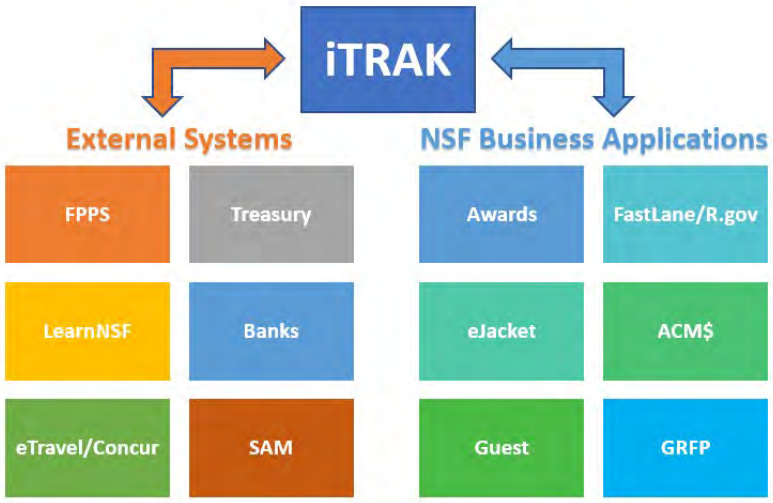
NSF's financial management system framework focuses on the Foundation's financial management systems, standard business processes, data, and information architecture to ensure reliable, timely, and consistent financial information that enables effective management of NSF resources and delivery of mission critical products and services (see Figure 1.9).

NSF's core financial system, iTRAK, interfaces with NSF's awards, grants management, and business process systems including:

- ACM$;
- Award Management and Award Letter System ("Awards");
- eJacket, NSF's internal awards processing system;
- Research.gov and FastLane, NSF's websites through which researchers, research administrators and their organizations, and reviewers interact with NSF;
- GRFP system; and
- Guest Travel and Reimbursement System.

iTRAK also interfaces with external systems operated by Treasury; Citibank and LearnNSF, the Foundation's training system; and with other federal systems such as FPPS, eTravel/Concur, and GSA's SAM.

Figure 1.9—NSF Financial Management System Framework



Chapter 2

Financials

National Science Foundation • Office of Inspector General
2415 Eisenhower Avenue, Alexandria, Virginia 22314

MEMORANDUM

DATE: November 13, 2020

TO: Dr. Ellen Ochoa
Chair
National Science Board

Dr. Sethuraman Panchanathan
Director
National Science Foundation

FROM: Allison C. Lerner
Inspector General
National Science Foundation

SUBJECT: Audit Report No. 21-2-001, Audit of the National Science Foundation's Fiscal Years 2020 and 2019 Financial Statements

This memorandum transmits the Kearney & Company, P.C.'s reports on its financial statement audit of the National Science Foundation (NSF) for FY 2020, which includes FY 2019 comparative information.

Audit Reports on Financial Statements; Internal Control over Financial Reporting; and Compliance with Laws, Regulations, Contracts, and Grant Agreements

The *Chief Financial Officers Act of 1990* (CFO Act, Pub. L. No. 101-576), as amended, requires that NSF's Inspector General or an independent external auditor, as determined by the Inspector General, audit NSF's financial statements in accordance with *Government Auditing Standards* (GAS) issued by the Comptroller General of the United States. We contracted with the independent certified public accounting firm Kearney & Company, P.C. (Kearney) to audit NSF's financial statements as of September 30, 2020, and for the fiscal year then ended. The contract requires that the audit be performed in accordance with GAS; Office of Management and Budget Bulletin 19-03, *Audit Requirements for Federal Financial Statements*; and the U.S. Government Accountability Office/Council of the Inspectors General on Integrity and Efficiency *Financial Audit Manual*.

For FY 2020, Kearney provided: (1) its opinion on the financial statements, (2) a report on internal control over financial reporting, and (3) a report on compliance with laws, regulations, contracts, and grant agreements. In its audit of NSF, Kearney:

- Found that the financial statements referred to above present fairly, in all material respects, the financial position of NSF as of September 30, 2020 and 2019, and its net cost of operations,

changes in net position, and budgetary resources for the years then ended, in accordance with accounting principles generally accepted in the United States of America.
- Identified no material weaknesses in internal control over financial reporting.[1]
- Identified no instances in which NSF's financial management systems did not substantially comply with the *Federal Financial Management Improvement Act of 1996* (FFMIA, Pub. L. No. 104-208).
- Identified no reportable instances of noncompliance with provisions of laws, regulations, contracts, and grant agreements tested or other matters.

NSF's response to the draft reports, dated November 13, 2020, follows Kearney's reports.

Kearney is responsible for the attached auditor's reports dated November 13, 2020, and the conclusions expressed therein. We do not express opinions on NSF's financial statements or internal control over financial reporting or on whether NSF's financial management systems substantially complied with the requirements of FFMIA, or conclusions on compliance and other matters.

Kearney's Independent Auditor's Report is meant only to be distributed and read as part of the Agency Financial Report (AFR). Also, Kearney's Independent Auditor's Report is not a stand-alone document because it refers to the AFR contents and should not be circulated to anyone other than those receiving this transmittal.

We thank your staff for the assistance that was extended to the auditors during this audit. If you have any questions regarding this report, please contact Mark Bell, Assistant Inspector General, Office of Audits, at 703.292.7100 or OIGpublicaffairs@nsf.gov.

[1] A material weakness is a deficiency, or combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented or detected and corrected on a timely basis.

KEARNEY& COMPANY

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INDEPENDENT AUDITOR'S REPORT

To the Director and Inspector General of the National Science Foundation

Report on the Financial Statements

We have audited the accompanying financial statements of the National Science Foundation (NSF), which comprise the balance sheets as of September 30, 2020 and 2019, the related statements of net cost and changes in net position, and the combined statements of budgetary resources (hereinafter referred to as the "financial statements") for the years then ended, and the related notes to the financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and Office of Management and Budget (OMB) Bulletin No. 19-03, *Audit Requirements for Federal Financial Statements*. Those standards and OMB Bulletin No. 19-03 require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of NSF as of September 30, 2020 and 2019, and its net cost of operations, changes in net position, and budgetary resources for the years then ended, in accordance with accounting principles generally accepted in the United States of America.

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that Management's Discussion and Analysis and Required Supplementary Information, as named in the Agency Financial Report (hereinafter referred to as the "required supplementary information"), be presented to supplement the financial statements. Such information, although not a part of the financial statements, is required by OMB and the Federal Accounting Standards Advisory Board (FASAB), who consider it to be an essential part of financial reporting for placing the financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management regarding the methods of preparing the information and comparing it for consistency with management's responses to our inquiries, the financial statements, and other knowledge we obtained during our audits of the financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

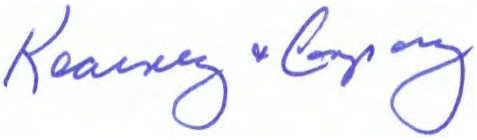
Other Information

Our audits were conducted for the purpose of forming an opinion on the financial statements taken as a whole. Other Information, as named in the Agency Financial Report, is presented for purposes of additional analysis and is not a required part of the financial statements. Such information has not been subjected to the auditing procedures applied in the audits of the financial statements; accordingly, we do not express an opinion or provide any assurance on it.

Other Reporting Required by *Government Auditing Standards*

In accordance with *Government Auditing Standards* and OMB Bulletin No. 19-03, we have also issued reports, dated November 13, 2020, on our consideration of NSF's internal control over financial reporting and on our tests of NSF's compliance with provisions of applicable laws, regulations, contracts, and grant agreements, as well as other matters for the year ended September 30, 2020. The purpose of those reports is to describe the scope of our testing of

internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance and other matters. Those reports are an integral part of an audit performed in accordance with *Government Auditing Standards* and OMB Bulletin No. 19-03 and should be considered in assessing the results of our audits.



Alexandria, Virginia
November 13, 2020

KEARNEY& COMPANY

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INDEPENDENT AUDITOR'S REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

To the Director and Inspector General of the National Science Foundation

We have audited, in accordance with auditing standards generally accepted in the United States of America; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and Office of Management and Budget (OMB) Bulletin No. 19-03, *Audit Requirements for Federal Financial Statements*, the financial statements of the National Science Foundation (NSF) as of and for the year ended September 30, 2020, and the related notes to the financial statements, which collectively comprise NSF's financial statements, and we have issued our report thereon dated November 13, 2020.

Internal Control over Financial Reporting

In planning and performing our audit of the financial statements, we considered NSF's internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinions on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of NSF's internal control. Accordingly, we do not express an opinion on the effectiveness of NSF's internal control. We limited our internal control testing to those controls necessary to achieve the objectives described in OMB Bulletin No. 19-03. We did not test all internal controls relevant to operating objectives as broadly defined by the Federal Managers' Financial Integrity Act of 1982 (FMFIA), such as those controls relevant to ensuring efficient operations.

A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A material weakness is a deficiency, or combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected, on a timely basis. A significant deficiency is a deficiency, or combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit, we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

We noted certain additional matters involving internal control over financial reporting that we will report to NSF's management in a separate letter.

KEARNEY& COMPANY

Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of internal control and the results of that testing, and not to provide an opinion on the effectiveness of NSF's internal control. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* and OMB Bulletin No. 19-03 in considering the entity's internal control. Accordingly, this communication is not suitable for any other purpose.

Alexandria, Virginia
November 13, 2020

KEARNEY& COMPANY

Attachment I – National Science Foundation's Management Response

KEARNEY& COMPANY

OFFICE OF BUDGET, FINANCE & AWARD MANAGEMENT

MEMORANDUM

Date: November 13, 2020

To: Allison Lerner, Inspector General

From: Teresa Grancorvitz, Chief Financial Officer

Subject: Management's Response to Independent Auditor's Report for Fiscal Year (FY) 2020

I am pleased that the National Science Foundation received an unmodified opinion in the Independent Public Auditor's Report on the FY 2020 financial statements. This accomplishment is the result of the hard work of many individuals across the Foundation. The timely completion of the audit is especially commendable because of the challenges we continue to face as a result of the pandemic and remote working environment. I also want to thank your staff and Kearney & Company (Kearney) for their professionalism and many constructive interactions during the audit.

We are committed to the continuous improvement of NSF's financial management. We look forward to working with the Office of Inspector General and Kearney to meet future challenges. If you have any questions or require additional information, please contact Mike Wetklow, Deputy Chief Financial Officer and Division Director for Financial Management at mwetklow@nsf.gov.

KEARNEY& COMPANY

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INDEPENDENT AUDITOR'S REPORT ON COMPLIANCE WITH LAWS, REGULATIONS, CONTRACTS, AND GRANT AGREEMENTS

To the Director and Inspector General of the National Science Foundation

We have audited, in accordance with auditing standards generally accepted in the United States of America; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and Office of Management and Budget (OMB) Bulletin No. 19-03, *Audit Requirements for Federal Financial Statements*, the financial statements of the National Science Foundation (NSF) as of and for the year ended September 30, 2020, and the related notes to the financial statements, which collectively comprise NSF's financial statements, and we have issued our report thereon dated November 13, 2020.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether NSF's financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of applicable laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts, and provisions referred to in Section 803(a) of the Federal Financial Management Improvement Act of 1996 (FFMIA). We limited our tests of compliance to these provisions and did not test compliance with all laws, regulations, contracts, and grant agreements applicable to NSF. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our test disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards* and OMB Bulletin No. 19-03.

The results of our tests of compliance with FFMIA disclosed no instances in which NSF's financial management systems did not comply substantially with the Federal financial management system's requirements, applicable Federal accounting standards, or application of the United States Standard General Ledger at the transaction level.

KEARNEY& COMPANY

Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* and OMB Bulletin No. 19-03 in considering the entity's compliance. Accordingly, this communication is not suitable for any other purpose.

Alexandria, Virginia
November 13, 2020

National Science Foundation

FINANCIAL STATEMENTS

As of and for the Fiscal Years ended
September 30, 2020 and 2019

National Science Foundation
Balance Sheet
As of September 30, 2020 and 2019
(Amounts in Thousands)

Assets	**2020**	**2019**
Intragovernmental Assets		
Fund Balance With Treasury (Note 2)	$ 16,039,090	$ 14,897,841
Accounts Receivable, Net	11,408	7,213
Advances to Others	36,824	38,613
Total Intragovernmental Assets	16,087,322	14,943,667
Cash and Other Monetary Assets (Note 2)	26,622	22,662
Accounts Receivable, Net	909	576
General Property, Plant and Equipment, Net (Note 3)	377,862	327,827
Total Assets	**$ 16,492,715**	**$ 15,294,732**
Liabilities		
Intragovernmental Liabilities		
Accounts Payable	$ 19,262	$ 9,951
Other Intragovernmental Liabilities	8,906	7,982
Total Intragovernmental Liabilities	28,168	17,933
Accounts Payable	60,519	65,184
Actuarial FECA Liability	1,219	1,389
Environmental and Disposal Liabilities (Note 6)	12,930	12,657
Accrued Grant Liabilities	493,090	413,128
Accrued Payroll and Other Liabilities	11,528	9,581
Accrued Annual Leave	25,088	21,433
Total Liabilities	**$ 632,542**	**$ 541,305**
Net Position		
Unexpended Appropriations - Other Funds	$ 14,830,495	$ 13,812,440
Cumulative Results of Operations - Other Funds	412,835	353,017
Cumulative Results of Operations - Dedicated Collections (Note 7)	616,843	587,970
Total Net Position	**$ 15,860,173**	**$ 14,753,427**
Total Liabilities and Net Position	**$ 16,492,715**	**$ 15,294,732**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Net Cost
For the Years Ended September 30, 2020 and 2019
(Amounts in Thousands)

Program Costs	**2020**	**2019**
Research and Related Activities		
Gross Costs	$ 6,321,811	$ 6,224,198
Less: Earned Revenue	(124,036)	(76,590)
Net Research and Related Activities	**6,197,775**	**6,147,608**
Education and Human Resources		
Gross Costs	$ 856,269	$ 886,650
Less: Earned Revenue	(3,706)	(7,041)
Net Education and Human Resources	**852,563**	**879,609**
Major Research Equipment and Facilities Construction		
Gross Costs	$ 164,583	$ 127,841
Less: Earned Revenue	-	-
Net Major Research Equipment and Facilities Construction	**164,583**	**127,841**
Donations and Dedicated Collections		
Gross Costs	$ 139,597	$ 165,090
Less: Earned Revenue	-	-
Net Donations and Dedicated Collections	**139,597**	**165,090**
Net Cost of Operations (Note 11)	**$ 7,354,518**	**$ 7,320,148**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Changes in Net Position
For the Year Ended September 30, 2020
(Amounts in Thousands)

	2020		
	Funds From Dedicated Collections (Note 7)	All Other Funds	Total
Unexpended Appropriations			
Beginning Balances	**$ -**	**$ 13,812,440**	**$ 13,812,440**
Budgetary Financing Sources			
Appropriations Received	-	8,354,330	8,354,330
Cancelled Authority Adjustments	-	(79,324)	(79,324)
Appropriations Used	-	(7,256,951)	(7,256,951)
Total Budgetary Financing Sources	**-**	**1,018,055**	**1,018,055**
Total Unexpended Appropriations	**$ -**	**$ 14,830,495**	**$ 14,830,495**
Cumulative Results of Operations			
Beginning Balances	**$ 587,970**	**$ 353,017**	**$ 940,987**
Budgetary Financing Sources			
Appropriations Used	-	7,256,951	7,256,951
Non-exchange Revenue	-	44	44
Donations	-	27,215	27,215
Funds from Dedicated Collections Transferred In / (Out)	153,719	-	153,719
Other Financing Sources			
Imputed Financing From Costs Absorbed By Others	-	11,310	11,310
Other	-	(6,030)	(6,030)
Total Financing Sources	**153,719**	**7,289,490**	**7,443,209**
Net Cost of Operations	**(124,846)**	**(7,229,672)**	**(7,354,518)**
Cumulative Results of Operations	**$ 616,843**	**$ 412,835**	**$ 1,029,678**
Net Position	**$ 616,843**	**$ 15,243,330**	**$ 15,860,173**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Changes in Net Position
For the Year Ended September 30, 2019
(Amounts in Thousands)

	2019		
	Funds From Dedicated Collections (Note 7)	All Other Funds	Total
Unexpended Appropriations			
Beginning Balances	**$ -**	**$ 12,987,425**	**$ 12,987,425**
Budgetary Financing Sources			
Appropriations Received	-	8,075,000	8,075,000
Cancelled Authority Adjustments	-	(60,156)	(60,156)
Appropriations Used	-	(7,189,829)	(7,189,829)
Total Budgetary Financing Sources	**-**	**825,015**	**- 825,015**
Total Unexpended Appropriations	**$ -**	**$ 13,812,440**	**$ 13,812,440**
Cumulative Results of Operations			
Beginning Balances	**$ 563,507**	**$ 308,487**	**$ 871,994**
Budgetary Financing Sources			
Appropriations Used	-	7,189,829	7,189,829
Non-exchange Revenue	-	131	131
Donations	-	32,227	32,227
Funds from Dedicated Collections Transferred In / (Out)	157,298	-	157,298
Other Financing Sources			
Imputed Financing From Costs Absorbed By Others	-	14,953	14,953
Other	-	(5,297)	(5,297)
Total Financing Sources	**157,298**	**7,231,843**	**7,389,141**
Net Cost of Operations	**(132,835)**	**(7,187,313)**	**(7,320,148)**
Cumulative Results of Operations	**$ 587,970**	**$ 353,017**	**- $ 940,987**
Net Position	**$ 587,970**	**$ 14,165,457**	**- $ 14,753,427**

The accompanying notes are an integral part of these statements.

National Science Foundation
Statement of Budgetary Resources
For the Years Ended September 30, 2020 and 2019
(Amounts in Thousands)

	2020	2019
Budgetary Resources		
Unobligated Balance from Prior Year Budget Authority, Net	$ 445,869	$ 417,890
Appropriations	8,535,304	8,264,651
Spending Authority from Offsetting Collections	101,120	105,117
Total Budgetary Resources (Note 9)	**$ 9,082,293**	**$ 8,787,658**
Status of Budgetary Resources		
New Obligations and Upward Adjustments (Note 9)	$ 8,596,034	$ 8,449,543
Unobligated Balance, End of Year		
Apportioned, Unexpired (Note 2)	298,562	145,862
Unapportioned, Unexpired (Note 2)	20,624	25,160
Unobligated Balance, Unexpired, End of Year	319,186	171,022
Unobligated Balance, Expired, End of Year (Note 2)	167,073	167,093
Total Unobligated Balance, End of Year	486,259	338,115
Total Status of Budgetary Resources	**$ 9,082,293**	**$ 8,787,658**
Net Outlays (Note 9 and 11)		
Net Outlays	$ 7,310,493	$ 7,292,246
Distributed Offsetting Receipts	(32,923)	(37,741)
Net Agency Outlays	**$ 7,277,570**	**$ 7,254,505**

The accompanying notes are an integral part of these statements.

NOTES TO THE PRINCIPAL FINANCIAL STATEMENTS

Note 1. Summary of Significant Accounting Policies

A. Reporting Entity

The National Science Foundation (NSF or "Foundation") is an independent federal agency created by the National Science Foundation Act of 1950, as amended (42 United States Code (U.S.C.) 1861-75). Its primary mission is to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense. NSF initiates and supports scientific research and research fundamental to the engineering process and programs to strengthen the Nation's science and engineering potential. NSF also supports critical education programs in science, technology, engineering, and mathematics (STEM) fields, which help prepare future generations of scientists and engineers. NSF funds research and education in science and engineering by awarding grants and contracts to educational and research institutions throughout the United States and its territories. NSF, by law, cannot operate research facilities except in the polar regions. NSF enters into relationships through awards, to fund the research operations conducted by grantees. Information on NSF funding by institution can be found on the website.[1]

NSF is led by a presidentially-appointed, Senate-confirmed Director, and a 24-member National Science Board (NSB). As of September 30, 2020, there were 22 members serving on the NSB. The NSB members represent a cross section of prominent leaders in science and engineering research and education, and are appointed by the President for 6-year terms. The NSF Director is an *ex officio* member of the Board. NSF has a total workforce of about 2,100 at its Alexandria, VA, headquarters, including the staff of the NSB Office and the Office of the Inspector General. The NSF workforce includes approximately 1,400 career employees, 200 rotator scientists from research institutions in temporary positions, and 450 contract workers. NSF provides the opportunity for scientists, engineers, and educators to join the Foundation as temporary program directors and advisors. These "rotators" provide input during the merit review process of proposals; provide insight for new directions in the fields of science, engineering, and education; and support cutting-edge interdisciplinary research. Rotators can come to NSF under multiple mechanisms. The largest numbers come on Intergovernmental Personnel Act assignments, or IPAs, and remain employees of their home institutions. NSF facilitates IPA assignments through grants to their institution as a reimbursement in whole or in part for salary and benefits, and that reimbursement is then paid by the institution to their employee. All rotators are subject to criminal conflict of interest statutes as well as the government-wide Standards of Ethical Conduct of Employees of the Executive Branch, which prohibit them from participating in NSF proposals and awards affecting themselves and their home organizations.

B. Basis of Presentation

These financial statements have been prepared to report the financial position and results of operations of NSF as required by the Chief Financial Officers Act of 1990, the Government Management Reform Act of 1994, the Reports Consolidation Act of 2000, and the Office of Management and Budget (OMB) Circular

[1] NSF Funding by Institution: https://www.fiscal.treasury.gov/reports-statements/

No. A-136, *Financial Reporting Requirements*, revised August 27, 2020. While the statements have been prepared from the books and records of NSF in accordance with United States Generally Accepted Accounting Principles (U.S. GAAP) for federal entities and the formats 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.

C. Basis of Accounting

The accompanying financial statements have been prepared in accordance with U.S. GAAP for federal entities using the accrual method of accounting. Under the accrual method, revenues are recognized when earned, and expenses are recognized when a liability is incurred, without regard to receipt or payment of cash. The accompanying financial statements also include budgetary accounting transactions that ensure compliance with legal constraints and controls over the use of federal funds.

D. Revenues and Other Financing Sources

NSF receives the majority of its funding through appropriations contained in the Commerce, Justice, Science, and Related Agencies Appropriations Act. NSF receives annual, multi-year, and no-year appropriations that may be expended within statutory limits. NSF also receives funding via warrant from a receipt account for dedicated collections that is reported as H-1B Nonimmigrant Petitioner Account (H-1B) funds. Additional amounts are obtained from reimbursements for services provided to other federal agencies as well as from receipts to the NSF Donations Account. NSF also receives interest earned on overdue receivables, which is subsequently returned to the Department of Treasury (Treasury) at the end of each fiscal year.

In FY 2020, the Science Appropriations Act, 2020 under Public Law (P.L.) 116-93, provided funding for NSF's appropriations. In addition, the Science Appropriations Act provided an administrative provision allowing NSF to transfer up to 5 percent of current year funding between appropriations, but no appropriation may be increased by more than 10 percent. In FY 2020, NSF also received supplemental funding through the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136). Appropriations are recognized as a financing source at the time the related "funded" program or administrative expenditures are incurred. Appropriations are also recognized when used to purchase Property, Plant and Equipment (PP&E). Donations are recognized as revenues when funds are received. Revenues from reimbursable agreements are recognized when the services are provided and the related expenditures are incurred. Reimbursable agreements are mainly for grant administrative services provided by NSF on behalf of other federal agencies.

Under the general authority of the Foundation, NSF is authorized to accept and use both U.S. and foreign funds in the NSF Donations Account. In accordance with 42 U.S.C. 1862 Section 3 (a)(3), NSF has authority "to foster the interchange of scientific and engineering information among scientists and engineers in the United States and foreign countries" and in 42 U.S.C. 1870 Section 11 (f), NSF is authorized to receive and use funds donated by others. Funds may be received from foreign governments, private companies, academic institutions, non-profit foundations, and individuals. Donations must be contributed without

restriction other than that they be used in furtherance of one or more of the general purposes of the Foundation. Funds are made available for obligations as necessary to support NSF programs.

E. Fund Balance with Treasury and Cash and Other Monetary Assets

Fund Balance with Treasury (FBWT) is composed of appropriated funds that are available to pay current liabilities and finance authorized purchase commitments. FBWT is an asset to NSF, but not to the Government as a whole (because it is a liability of the General Fund). FBWT is primarily increased by appropriations and decreased by disbursements. When disbursements are made, Treasury finances those disbursements in the same way it finances all other disbursements, using a combination of receipts, other inflows, and borrowing from the public (if there is a budget deficit). *Cash and Other Monetary Assets* include non-appropriated funding sources from donations and undeposited collections. *Undeposited Collections* are funds received by NSF, but not remitted to Treasury prior to September 30. Cash receipts and disbursements are processed by Treasury.

F. Accounts Receivable

Accounts Receivable consist of amounts due from governmental agencies, private organizations, and individuals. Additionally, NSF has the right to conduct audits of awardees to verify billed amounts. These audits may result in monies owed back to NSF. Upon resolution of the amount owed by the awardee to NSF, a receivable is recorded.

NSF establishes an allowance for loss on accounts receivable that are deemed uncollectible. NSF analyzes each account independently to assess collectability and the need for an offsetting allowance or write-off. NSF writes off delinquent debt from non-federal sources that is more than 2 years old. Account receivables from federal sources are not written off.

G. Advances to Others

Advances to Others consist of advances to federal agencies which are issued when agencies are operating under working capital funds or are unable to incur costs on a reimbursable basis. Advances are reduced when documentation supporting expenditures is received. Additionally, some NSF grantees receive advanced funds prior to incurring expenses. Payments are only made within the amount of the recorded obligation and are intended to cover immediate cash needs.

H. General Property, Plant and Equipment, Net

NSF capitalizes PP&E with costs exceeding $25.0 thousand and useful lives of 2 or more years; items not meeting these criteria are recorded as operating expenses. NSF currently reports capitalized PP&E at original acquisition cost; assets acquired from the General Services Administration (GSA) excess property schedules are recorded at the value assigned by the donating agency; and assets transferred in from other agencies are valued at the cost recorded by the transferring entity for the asset net of accumulated depreciation or amortization.

The PP&E balance consists of Equipment, Aircraft and Satellites, Buildings and Structures, Leasehold Improvements, Construction in Progress, Internal Use Software, and Software in Development. These

balances are comprised of PP&E maintained "in-house" by NSF to support operations and PP&E under the U.S. Antarctic Program (USAP). The majority of USAP property is under the custodial responsibility of the NSF prime contractor for the program. The USAP is undergoing a multi-year modernization project initiated in FY 2019.

Depreciation expense is calculated using the straight-line half-year convention. The economic useful life classifications for capitalized assets are as follows:

Equipment

5 years	Computers and peripheral equipment, fuel storage tanks, laboratory equipment, and vehicles
7 years	Communications equipment, office furniture and equipment, pumps and compressors
10 or 15 years	Generators, air traffic control, weather forecasting aids, and landing systems equipment
20 years	Movable buildings (e.g., trailers)

Aircraft and Satellites

7 years	Aircraft, aircraft standardizations, and satellites

Buildings and Structures

31.5 years	Buildings and structures placed in service prior to 1994
39 years	Buildings and structures placed in service after 1993

Leasehold Improvements

NSF's headquarters is leased through GSA under a non-cancelable occupancy agreement. Leasehold improvements performed by GSA are financed with NSF appropriated funds. Amortization is calculated using the straight-line half-year convention upon transfer from construction in progress.

Construction in Progress

Costs incurred for construction projects are accumulated and tracked as construction in progress until the asset is placed in service. Beneficial Occupancy is the point in time when the facility is ready for safe occupancy and use by NSF. Items that pertain to the safety and health of any future occupants of the facility must be corrected before a Beneficial Occupancy is granted and the facility occupied. All construction efforts at the construction site may not be completed (e.g., punch list items or other minor construction activities may still be required for construction to be considered complete), but the facility space can be used for its intended purpose. When Beneficial Occupancy is granted, the project is transferred from construction in progress to real property and depreciated over the respective useful life of the asset.

Internal Use Software and Software in Development

NSF controls, values, and reports purchased or developed software as tangible property assets, in accordance with the Statement of Federal Financial Accounting Standards (SFFAS) No. 10, *Accounting for Internal Use Software*. NSF identifies software investments as capital property for items that, in the aggregate, cost $500.0 thousand or more to purchase, develop, enhance, or modify a new or existing NSF system, or configure a government-wide system for NSF needs.

Software projects that are not completed at year end and are expected to exceed the capitalization threshold are recorded as software in development. All internal use software meeting the capitalization threshold is amortized over a 5-year period using the straight-line half-year convention.

Assets Owned by NSF in the Custody of Other Entities: NSF awards grants, cooperative agreements, and contracts to various organizations, including colleges and universities, non-profit organizations, state and local governments, Federally Funded Research and Development Centers (FFRDCs), and private entities. The funds provided may be used in certain cases to purchase or construct PP&E to be used for operations or research on projects or programs sponsored by NSF. In these instances, NSF funds the acquisition of property, but transfers control of the assets to these entities. NSF's authorizing legislation specifically prohibits the Foundation from operating such property directly.

In practice, NSF's ownership interest in such PP&E is similar to a reversionary interest. To address the accounting and reporting of these assets, specific guidance was sought by NSF and provided by the Federal Accounting Standards Advisory Board (FASAB). This guidance stipulates that NSF should disclose the value of such PP&E held by others in its financial statements based on information contained in the audited financial statements of these entities (if available). Very few entities disclose information on NSF-owned property in their audited financial statements. Entities that separately present the book value of NSF-owned property in their audited financial statements are listed in Note 4, *General Property, Plant and Equipment in the Custody of Other Entities*, along with the book value of the property held.

I. Other Intragovernmental Liabilities

Other Intragovernmental Liabilities consist primarily of a rental credit liability, unfunded employment-related and unfunded Federal Employees' Compensation Act (FECA) liabilities, liabilities for non-entity assets, and federal payroll payables. Federal payroll payables consist of the federal portion of payroll benefits and taxes. Liabilities for non-entity assets are recorded to offset accounts receivable balances associated with canceled appropriations.

J. Liabilities Not Covered by Budgetary Resources

Liabilities Not Covered by Budgetary Resources may include future environmental cleanup liabilities, legal claims, workers' compensation, rental credit liability, and unfunded annual leave.

NSF cannot pay for liabilities unless authorized by law and covered by budgetary resources. Liabilities covered by budgetary resources are those for which appropriated funds are available as of the Balance Sheet date and include: new budget authority, unobligated balances of budgetary resources, spending authority from offsetting collections, and recoveries of budget authority through downward adjustments of prior year obligations.

K. Accounts Payable

Accounts Payable consist of liabilities to commercial vendors, contractors, federal agencies, and disbursements in transit. *Accounts Payable* are expenses for goods and services received but not yet paid for by NSF. At year end, NSF accrues for the amount of estimated unpaid expenses to vendors, contractors, and federal agencies for which invoices have not been received, but goods and services have been delivered and performed.

L. Accrued Grant Liabilities

Accrued Grant Liabilities consist of estimated liabilities to grantees for expenses incurred but not reported (IBNR) by September 30. For standard grants and cooperative agreements, NSF's grant accrual methodology utilizes a linear regression model based on the statistical correlation between prior year unliquidated obligations and prior year expenses IBNR. NSF utilizes the Award Cash Management Service (ACM$), a grantee cash request and expenditure reporting system. ACM$ enables all grantee institutions to request funds at the award level to support project needs.

In FY 2020, NSF implemented an additional accrual methodology specifically for Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants. SBIR and STTR awards have unique terms and conditions compared to standard NSF grants and cooperative agreements. This methodology accrues for any SBIR and STTR funds approved for payment, but not yet disbursed to the grantee as of September 30.

M. Accrued Payroll and Other Liabilities

Accrued Payroll and Other Liabilities consist of accrued payroll and undeposited collections. *Accrued Payroll Liabilities* relate to services performed by NSF employees, for which they have not yet been paid. NSF's payroll services are provided by the Department of the Interior's Business Center. NSF accrues the amount of salaries and benefits earned, but not yet paid. At year end, NSF also records *Undeposited Collections* which are funds received by NSF, but not remitted to Treasury prior to September 30.

N. Employee Benefits

A liability is recorded for actual and estimated future payments to be made for workers' compensation pursuant to the FECA. The actual costs incurred are reflected as a liability because NSF will reimburse the U.S. Department of Labor (DOL) 2 years after the actual payment of expenses. The estimated actuarial FECA liability consists of the net present value of estimated future payments calculated by the DOL and is recorded as an unfunded liability. Future NSF Agency Operations and Award Management (AOAM) appropriations will be used for DOL's estimated reimbursement.

Annual leave is accrued as it is earned, and the accrual is reduced as leave is taken. Each quarter, the balance in the accrued annual leave account is adjusted to reflect changes. To the extent current and prior year appropriations are not available to fund annual leave earned but not taken, funding will be obtained from future AOAM appropriations. Sick leave and other types of non-vested leave are expensed as taken.

O. Net Position

Net Position is the residual difference between assets and liabilities and is composed of unexpended appropriations and cumulative results of operations. *Unexpended Appropriations* represent the amount of undelivered orders and unobligated balances of budget authority. Unobligated balances are the amount of appropriations or other authority remaining after deducting the cumulative obligations from the amount available for obligation. The *Cumulative Results of Operations* represent the net results of NSF's operations since the Foundation's inception.

P. Retirement Plan

In FY 2020, approximately 4 percent of NSF employees participated in the Civil Service Retirement System (CSRS), to which NSF matches contributions equal to 7 percent of pay. The majority of NSF employees are covered by the Federal Employees Retirement System (FERS) and Social Security. A primary feature of FERS is the thrift savings plan to which NSF automatically contributes 1 percent of pay. The maximum NSF matching contribution is 5 percent of employee pay, of which 3 percent is fully matched, and 2 percent is matched at 50 percent. NSF also contributes the employer's matching share for Social Security for FERS participants.

Although NSF funds a portion of the benefits under FERS and CSRS relating to its employees and withholds the necessary payroll deductions, the Foundation has no liability for future payments to employees under these plans, nor does NSF report CSRS, FERS, Social Security assets, or accumulated plan benefits on its financial statements. Reporting such amounts is the responsibility of the Office of Personnel Management (OPM) and the Federal Retirement Thrift Investment Board.

SFFAS No. 5, *Accounting for Liabilities of the Federal Government*, requires employing agencies to recognize the cost of pensions and other retirement benefits during their employees' active years of service. OPM actuaries determine pension cost factors by calculating the value of pension benefits expected to be paid in the future, and provide these factors to the agency for current period expense reporting. Information is also provided by OPM regarding the full cost of health and life insurance benefits on the OPM Benefit Administration website. [2]

[2] OPM Benefit Administration website:
https://www.opm.gov/retirement-services/publications-forms/benefits-administration-letters/2020/20-101.pdf

Q. Contingencies and Possible Future Costs

Contingencies – Claims and Lawsuits: NSF is a party to various legal actions and claims brought against it. In the opinion of NSF management and legal counsel, the ultimate resolution of these actions and claims will not materially affect the financial position or operations of the Foundation. NSF recognizes the contingency in the financial statements when claims are expected to result in a material loss (and the payment amounts can be reasonably estimated), whether from NSF's appropriations or the Judgment Fund, administered by the Department of Justice under Section 1304 of Title 31 of the U.S.C.

Claims and lawsuits can also be made and filed against awardees of the Foundation by third parties. NSF is not a party to these actions and NSF believes there is no possibility that NSF will be legally required to satisfy such claims. Judgments or settlements of the claims against awardees that impose financial obligation on them may be claimed as costs under the applicable contract, grant, or cooperative agreement and thus may affect the allocation of program funds in future fiscal years. In the event that the claim becomes probable and amounts can be reasonably estimated, the claim will be recognized.

Contingencies – Unasserted Claims: For claims and lawsuits that have not been made and filed against the Foundation, NSF management and legal counsel determine, in their opinion, whether resolution of the actions and claims they are aware of will materially affect the Foundation's financial position or operations. NSF recognizes a contingency in the financial statements if unasserted claims are probable of assertion, and if asserted, would be probable of an unfavorable outcome and expected to result in a measurable loss, whether from NSF's appropriations or the Judgment Fund. NSF discloses unasserted claims if the loss is more likely than not to occur, but the materiality of a potential loss cannot be determined.

Termination Claims: NSF engages organizations, including FFRDCs, in cooperative agreements and contracts to manage, operate, and maintain research facilities for the benefit of the scientific community. As part of these agreements and contracts, NSF funds on a pay-as-you-go basis certain employee benefit costs (accrued vacation and other employee related liabilities, severance pay and medical insurance), long-term leases, and vessel usage and drilling. In some instances, an award decision is made to continue operation of a facility with a different entity performing operation and management duties. In such an occurrence, NSF does not classify the facility as terminated. Claims submitted by the previous managing entity for expenditures not covered by the indirect cost rate included in the initial award are subject to audit and typically paid with existing program funds.

Agreements with FFRDCs include a clause that commits NSF to seek appropriations for termination expenses, if necessary, in the event a facility is terminated. NSF considers termination of these facilities only remotely possible. Should a facility be terminated, NSF is obligated to seek termination expenses for FFRDCs in excess of the limitation of funds set forth in the agreements, including any Post-Retirement Benefit liabilities, from Congress. Nothing in these agreements can be construed as implying that Congress will appropriate funds to meet the terms of any claims. Termination costs that may be payable to an FFRDC operator cannot be estimated until such time as the facility is terminated.

Environmental and Disposal Liabilities: NSF assesses the likelihood of required cleanup and establishes its environmental liability estimates in accordance with the requirements of the SFFAS No. 5, *Accounting for Liabilities of the Federal Government*, and as amended by SFFAS No. 12, *Recognition of Contingent Liabilities Arising from Litigation*, and the Federal Financial Accounting and Auditing Technical Release No.

2, *Determining Probable and Reasonably Estimable for Environmental Liabilities in the Federal Government*.

Special attention is paid to USAP to ensure compliance with the Antarctic Conservation Act requirements for environmental cleanup in Antarctica. NSF continually monitors USAP in regards to environmental issues. While NSF is not legally liable for environmental cleanup costs in the Antarctic, there are occasions when the NSF Office of Polar Programs chooses to accept responsibility and commit funds toward cleanup efforts of various sites as resources permit. Decisions to commit funds are in no way driven by concerns of probable legal liability for failure to engage in such efforts, but rather a commitment to environmental stewardship of Antarctic natural resources. Environmental cleanup projects started and completed during the year are reflected in NSF's financial statements as expenses for the current fiscal year. An estimated cost would be accrued for approved projects that are anticipated to be performed after the fiscal year end or will take more than one fiscal year to complete.

R. Use of Estimates

Management has made certain estimates and assumptions when reporting assets, liabilities, revenues, expenses, and note disclosures. Estimates underlying the accompanying financial statements can include accounting for grant liabilities, accounts payable, environmental liabilities, payroll, and PP&E, depending on availability of actual data. Actual results may differ from these estimates, and the difference will be adjusted for and included in the financial statements of the following fiscal year.

S. Permanent Indefinite Appropriations

NSF maintains permanent indefinite appropriations for Research and Related Activities (R&RA), Education and Human Resources (EHR), and Major Research Equipment and Facilities Construction (MREFC). The R&RA appropriation is used for polar research and operations support, reimbursements to other federal agencies for operational and science support, and logistical and other related activities for USAP. The EHR appropriation is used to support science and engineering education, and human resources programs and activities. The MREFC appropriation supports the procurement and construction of unique national research platforms, major research equipment, and USAP modernization projects.

T. Classified Activities

Accounting Standards require all reporting entities to disclose that accounting standards allow certain presentations and disclosures to be modified, if needed, to prevent the disclosure of classified information.

Note 2. Fund Balance with Treasury

Fund Balance with Treasury (FBWT) consisted of the following components as of September 30, 2020 and 2019:

(Amounts in Thousands)		2020
Obligated, Not Yet Disbursed	$	15,579,373
Unobligated Available, Unexpired		298,562
Unobligated Unavailable, Unexpired		20,624
Unobligated Unavailable, Expired		167,073
Less: Cash and Other Monetary Assets		(26,622)
Add: Undeposited Collections and Donations Sequestration		80
Total FBWT	$	16,039,090

(Amounts in Thousands)		2019
Obligated, Not Yet Disbursed	$	14,582,018
Unobligated Available, Unexpired		145,862
Unobligated Unavailable, Unexpired		25,160
Unobligated Unavailable, Expired		167,093
Less: Cash and Other Monetary Assets		(22,662)
Add: Undeposited Collections and Donations Sequestration		370
Total FBWT	$	14,897,841

Obligated, Not Yet Disbursed balances include obligations for which outlays have not been made. *Unobligated Available* balances include current period amounts available for obligation or commitment. *Unobligated Unavailable* balances include recoveries of prior year obligations and other unobligated expired funds that are unavailable for new obligations. Donations are reported as *Cash and Other Monetary Assets* and represent cash held outside of Treasury at a commercial bank in interest bearing accounts and may be subject to sequestration. *Undeposited Collections* are funds received by NSF, but not remitted to Treasury prior to September 30.

Note 3. General Property, Plant and Equipment, Net

To support the *Financial Report of the United States Government (FR)* compilation process, OMB Circular No. A-136 prescribed a new reconciliation for *General Property, Plant and Equipment, Net*, effective for FY 2020 reporting. The reconciliation as of September 30, 2020 and 2019 is shown below.

(Amounts in Thousands)	2020	2019
	Net PP&E	Net PP&E
Balance Beginning of Fiscal Year	$ 327,827	$ 281,211
Capitalized Acquisitions	100,827	73,403
Dispositions	(30,480)	(2,513)
Depreciation Expense	(20,312)	(24,274)
Balance as of September 30, 2020 and 2019	$ 377,862	$ 327,827

The components of *General Property, Plant and Equipment, Net* as of September 30, 2020 and 2019 are shown below. As of September 30, 2020, NSF had not identified any asset impairments.

(Amounts in Thousands)	2020		
	Acquisition Value	Accumulated Depreciation/ Amortization	Net PP&E
Equipment	$ 172,703	$ (148,733)	$ 23,970
Aircraft and Satellites	115,806	(115,806)	-
Buildings and Structures	315,161	(170,240)	144,921
Leasehold Improvements	29,729	(6,825)	22,904
Construction in Progress	91,677	-	91,677
Internal Use Software	87,642	(86,792)	850
Software in Development	93,540	-	93,540
Total PP&E	$ 906,258	$ (528,396)	$ 377,862

(Amounts in Thousands)	2019		
	Acquisition Value	Accumulated Depreciation/ Amortization	Net PP&E
Equipment	$ 159,298	$ (146,869)	$ 12,429
Aircraft and Satellites	115,806	(115,806)	-
Buildings and Structures	315,080	(163,244)	151,836
Leasehold Improvements	29,569	(4,841)	24,728
Construction in Progress	57,391	-	57,391
Internal Use Software	88,295	(82,676)	5,619
Software in Development	75,824	-	75,824
Total PP&E	$ 841,263	$ (513,436)	$ 327,827

Note 4. General Property, Plant and Equipment in the Custody of Other Entities

NSF received a ruling from FASAB on accounting for non-USAP PP&E owned by NSF but in the custody of and used by others (see Note 1H. *General Property, Plant and Equipment, Net*). The FASAB guidance requires PP&E in the custody of others be excluded from NSF PP&E as defined in the SFFAS No. 6, *Accounting for Property, Plant and Equipment*. NSF is required to disclose the dollar amount of PP&E held by others for any entity which separately discloses NSF property in the most recently issued audited financial statements of the organization holding the assets.

Large facilities with significant NSF property are required to disclose in their audited financial statements the value of NSF-owned property in their custody. With the exception of these large facilities, other entities which received NSF funding are not required to report NSF-owned property separately in their audited financial statements. The amount of PP&E owned by NSF but in the custody of an NSF awardee which is separately disclosed in the awardee's audited financial statements is identified in the table below.

(Amounts in Thousands)

Entities with Audited and Separately Reported NSF-Owned Equipment	Amount	Fiscal Year Ending
Association of Universities for Research in Astronomy, Inc. - AURA	$ 1,053,899	9/30/19
Incorporated Research Institutions for Seismology - IRIS	Unavailable	6/30/19
National Radio Astronomy Observatory - AUI	$ 341,292	9/30/19
University of Alaska	$ 152,400	6/30/19

Note 5. Leases

NSF currently has occupancy agreements with GSA for office space in Denver, Colorado and warehouse space in Springfield, Virginia. These agreements are cancelable and expire in 2028 and 2029, respectively. The cancellation clauses within the agreements allow NSF to terminate use with 120-day notice. These agreements contain escalation clauses tied to operating expenses. In addition, both the Denver and Springfield agreements contain a contingent rental based on re-appraised rental rates.

NSF also has an occupancy agreement with GSA for its current headquarters in Alexandria, VA. This agreement is non-cancelable and active through 2032. In addition, this agreement contains escalation clauses tied to operating expenses and taxes. The following is a schedule of future minimum rental payments for the NSF headquarters:

(Amounts in Thousands)

Fiscal Year	Building Operating Lease Amount (Federal)
2021	$ 24,762
2022	24,879
2023	25,001
2024	25,125
2025	25,254
2026 through 2032	178,133
Total Minimum Non-Cancelable Lease Payments	$ 303,154

Note 6. Environmental and Disposal Liabilities

Restoration Projects

NSF recorded a total estimated liability for a known restoration project of $2.2 million in FY 2019, resulting from the cleanup estimate for the decontamination and decommissioning of the Sondrestrom Research Facility, a geophysical observatory in Kangerlussuaq, Greenland. After an extensive evaluation process, NSF decided to no longer conduct scientific observations from that site and will proceed with actions to restore the location. There was no change to the estimated liability for the restoration project as of September 30, 2020.

Asbestos

Pursuant to FASAB Technical Bulletin 2006-1, *Recognition and Measurement of Asbestos-Related Cleanup Costs*, federal entities are required to recognize a liability for federal property asbestos cleanup costs. Some NSF owned buildings and structures used to support USAP have been identified as having, or expecting to have, friable and non-friable asbestos containing material.

As required by SFFAS No. 6, *Accounting for Property, Plant and Equipment*, NSF works with the current USAP contractor through the Antarctic Support Contract (ASC) to determine the need for asbestos liability adjustments based on actual asbestos costs incurred on an annual basis. Actual asbestos remediation costs are submitted by the ASC and the asbestos liability is adjusted for the impact. Changes to NSF's estimated asbestos liability consisted of the impact of asbestos remediation and cost re-estimates since FY 2019. The asbestos liability was $10.7 million and $10.5 million as of September 30, 2020 and 2019.

Note 7. Funds from Dedicated Collections

In FY 1999, Title IV of the American Competitiveness and Workforce Improvement Act of 1998 (P.L. 105-277) established the H-1B Nonimmigrant Petitioner Account in the General Fund of the U.S. Treasury. Funding is established from fees collected for alien, nonimmigrant status petitions. This law requires that a prescribed percentage of the funds in the account be made available to NSF for the following activities:

- Computer Science, Engineering, and Mathematics Scholarship
- Grants for Mathematics, Engineering, or Science Enrichment Courses
- Systemic Reform Activities

The H-1B fees are available to the Director of NSF until expended. The funds may be used for scholarships to low income students, or to carry out a direct or matching grant program to support private and/or public partnerships in K-12 education. The H-1B fund is set up as a permanent indefinite appropriation by NSF. These funds are described in the Budget of the United States Government (President's Budget). Funds from Dedicated Collections are accounted for in a separate Treasury Account Symbol (TAS), and the budgetary resources are recorded as *Funds from Dedicated Collections Transferred In / (Out)*. *Funds from Dedicated Collections* are reported in accordance with SFFAS No. 43, *Funds from Dedicated Collections: Amending Statement of Federal Financial Accounting Standards 27, Identifying and Reporting Earmarked Funds*. As of September 30, 2020 and 2019, NSF was subject to H-1B sequestrations of $9.0 million and $9.7 million, respectively.

(Amounts in Thousands)	2020	2019
Balance Sheet as of September 30, 2020 and 2019		
Intragovernmental:		
Fund Balance With Treasury	$ 632,023	$ 603,934
Total Assets	$ 632,023	$ 603,934
Accounts Payable	$ 125	$ 121
Accrued Grant Liabilities	15,055	15,843
Total Liabilities	$ 15,180	$ 15,964
Cumulative Results of Operations	$ 616,843	$ 587,970
Total Liabilities and Net Position	$ 632,023	$ 603,934
Statement of Net Cost for the Years Ended September 30, 2020 and 2019		
Program Costs	$ 124,846	$ 132,835
Net Cost of Operations	$ 124,846	$ 132,835
Statement of Changes in Net Position for the Years Ended September 30, 2020 and 2019		
Net Position Beginning of Period	$ 587,970	$ 563,507
Funds from Dedicated Collections Transferred In / (Out)	153,719	157,298
Net Cost of Operation	(124,846)	(132,835)
Change in Net Position	28,873	24,463
Net Position End of Period	$ 616,843	$ 587,970

Note 8. Undelivered Orders at the End of the Year

In accordance with SFFAS No. 7, *Accounting for Revenue and Other Financing Sources*, the amount of budgetary resources obligated for undelivered orders for the years ended September 30, 2020 and 2019 amounted to $15.1 billion and $14.2 billion, respectively.

(Amounts in Thousands)	2020	2019
Undelivered Orders as of September 30, 2020 and 2019		
Undelivered Orders, Unpaid - Non-Federal	$ 14,960,079	$ 14,035,172
Undelivered Orders, Paid - Federal	36,824	39,010
Undelivered Orders, Unpaid - Federal	124,585	151,488
Total Undelivered Orders - Federal	161,409	190,498
Total Undelivered Orders	$ 15,121,488	$ 14,225,670

Note 9. Explanation of Differences between the Statement of Budgetary Resources and the Budget of the United States Government

SFFAS No. 7, *Accounting for Revenue and Other Financing Sources and Concepts for Reconciling Budgetary and Financial Accounting*, requires explanations of material differences between amounts reported in the Statement of Budgetary Resources (SBR) and the actual balances published in the President's Budget. The FY 2022 President's Budget will include FY 2020 budget execution information and is scheduled for publication in the spring of 2021 and can be found upon publication on the OMB website.[3]

Balances reported in the FY 2019 SBR and the related President's Budget are shown in a table below for Budgetary Resources, New Obligations and Upward Adjustments, Distributed Offsetting Receipt, and Net Outlays, and any related differences. The differences reported are due to differing reporting requirements for expired and unexpired appropriations between the Treasury guidance used to prepare the SBR and the OMB guidance used to prepare the President's Budget. The SBR includes both unexpired and expired appropriations, while the President's Budget presents only unexpired budgetary resources that are available for new obligations. Additionally, the Distributed Offsetting Receipts amount on the SBR includes donations, while the President's Budget does not.

(Amounts in Thousands)

Fiscal Year 2019	Budgetary Resources	New Obligations and Upward Adjustments	Distributed Offsetting Receipts	Net Outlays
Combined Statement of Budgetary Resources	$ 8,787,658	$ 8,449,543	$ 37,741	$ 7,292,246
Expired Accounts	$ (170,547)	$ -	$ -	$ -
Other	$ -	$ -	$ (34,741)	$ -
Budget of the U.S. Government	$ 8,617,111	$ 8,449,543	$ 3,000	$ 7,292,246

Note 10. Awards to Affiliated Institutions

NSB members may be affiliated with institutions that are eligible to receive grants and awards from NSF. NSF made awards totaling $793.7 million to Board member affiliated institutions as of September 30, 2020. The Board does not review all NSF award actions; however the following require NSB approval for the NSF Director to take action under delegated authority:

- Proposed awards where the average annual award amount is the greater of 1 percent of the prior year current plan of the awarding directorate/office, or 0.1 percent of the prior year enacted NSF budget level;
- Major Research Equipment and Facilities Construction (MREFC) awards;
- Amendments to awards and procurement actions specifying a dollar amount in the Board resolution, if the amended award exceeds the lesser of $10.0 million dollars or 20 percent of the amount specified in the Board resolution; and

[3] OMB website: https://www.whitehouse.gov/omb

- In the case of procurements when no amount was specified in the Board resolution, if the amended amount exceeds the lesser of $10.0 million dollars or 20 percent of the contract ceiling award amount.

The Director will continue to consult with the NSB on programs which represent a significant, long-term investment, particularly those which will be funded as an ongoing NSF-wide activity or which involve substantive policy, interagency, or international issues.

The Director's Review Board (DRB) reviews proposed actions for evaluation adequacy and documentation, and compliance with Foundation policies, procedures and strategies. Items requiring DRB action include large awards and Requests for Proposal that meet or exceed a threshold of 2.5 percent of the prior year Division or Subactivity Plan. In addition, the DRB reviews all items requiring NSB action as well as NSB information items prior to submission.

NSF may fund awards meeting the above requirements to institutions affiliated with Board members. Federal conflict-of-interest rules prohibit NSB members from participating in matters where they have a conflict of interest or there is an impartiality concern without prior authorization from the Designated Agency Ethics Official (DAEO) or delegee. Prior to Board meetings, all NSB action items are screened for conflict-of-interest/impartiality concerns by the NSB Counsel (Deputy Ethics Official/Ethics Counselor) and a Legal Administrative Specialist (Deputy Ethics/Reviewing Official) in the National Science Board Office. Members who have conflicts are either recused from the matter or receive a waiver from the Deputy Ethics Official to participate. Following NSF and NSB conflict of interest procedures, in FY 2020, the NSB did not authorize the Director to make any awards to Board member affiliated institution.

Note 11. Reconciliation of Net Cost to Net Outlays

The Reconciliation of Net Cost to Net Outlays reconciles the net costs for a federal entity's programs and operations to the net outlays for that entity. The reconciliation clarifies the relationship between budgetary and proprietary accounting information. Examples of the reconciling items identified are: (1) Transactions which resulted in an outlay but did not result in a cost; (2) Unpaid expenses included in the net cost in this reporting period but not yet included in outlays; and (3) Other temporary timing differences such as special adjustments including prior period adjustments due to correction of errors.

(Amounts in Thousands)	2020		
	Federal	**Public**	**Total**
Net Cost	**$ 174,339**	**$ 7,180,179**	**$ 7,354,518**
Components of Net Cost Not Part of Net Outlays			
Property, Plant, and Equipment Depreciation	-	(20,294)	(20,294)
Other (Cost Capitalization Offset)	-	70,373	70,373
Increase/(Decrease) in Assets:			
Accounts Receivable	4,196	334	4,530
Other Assets	(1,790)	(295)	(2,085)
(Increase)/Decrease in Liabilities Not Affecting Net Outlays:			
Accounts Payable	(9,311)	4,666	(4,645)
Salaries and Benefits	(688)	(2,242)	(2,930)
Environmental and Disposal Liabilities	-	(273)	(273)
Other Liabilities	(235)	(83,153)	(83,388)
Other Financing Sources:			
Imputed Financing	(11,310)	-	(11,310)
Total Components of Net Cost Not Part of the Net Outlays	**$ (19,138)**	**$ (30,884)**	**$ (50,022)**
Components of Net Outlays Not Part of Net Cost			
Other (Revenue)	$ 333	$ (27,259)	$ (26,926)
Total Components of Net Outlays Not Part of Net Cost	**$ 333**	**$ (27,259)**	**$ (26,926)**
Net Outlays	**$ 155,534**	**$ 7,122,036**	**$ 7,277,570**

Related Amounts on the Statement of Budgetary Resources	
Net Outlays	$ 7,310,493
Distributed Offsetting Receipts	(32,923)
Net Agency Outlays	**$ 7,277,570**

(Amounts in Thousands)	2019		
	Federal	**Public**	**Total**
Net Cost	**$ 196,633**	**$ 7,123,515**	**$ 7,320,148**
Components of Net Cost Not Part of Net Outlays			
Property, Plant, and Equipment Depreciation	-	(23,757)	(23,757)
Other (Cost Capitalization Offset)	-	70,398	70,398
Increase/(Decrease) in Assets:			
Accounts Receivable	(6,982)	(370)	(7,352)
Other Assets	(9,061)	285	(8,776)
(Increase)/Decrease in Liabilities Not Affecting Net Outlays:			
Accounts Payable	(1,438)	(17,386)	(18,824)
Salaries and Benefits	(384)	(1,462)	(1,846)
Environmental and Disposal Liabilities	-	(2,389)	(2,389)
Other Liabilities (Grants, Rental Credit, Unfunded Leave, FECA, and Other Misc)	(3,306)	(22,370)	(25,676)
Other Financing Sources:			
Imputed Financing (OPM and DHS)	(14,953)	-	(14,953)
Total Components of Net Cost Not Part of the Net Outlays	**$ (36,124)**	**$ 2,949**	**$ (33,175)**
Components of Net Outlays Not Part of Net Cost			
Other (Revenue)	$ (110)	$ (32,358)	$ (32,468)
Total Components of Net Outlays Not Part of Net Cost	**$ (110)**	**$ (32,358)**	**$ (32,468)**
Net Outlays	**$ 160,399**	**$ 7,094,106**	**$ 7,254,505**

Related Amounts on the Statement of Budgetary Resources	
Net Outlays	$ 7,292,246
Distributed Offsetting Receipts	(37,741)
Net Agency Outlays	**$ 7,254,505**

Note 12. COVID-19 Activity

NSF has worked closely with the scientific research community to bolster the national response to coronavirus disease 2019 (COVID-19). As part of the third emergency supplemental appropriation bill to support the CARES Act (P.L. 116-136), NSF received $76.0 million "to prevent, prepare for, and respond to coronavirus." In addition, NSF used funding from its base appropriation, the Consolidated Appropriations Act, 2020 (P.L. 116-93), and H-1B Nonimmigrant Petitioner Fees Funding to support COVID-19 related research and other activity.

NSF COVID-19 resources support fast-track, fundamental, and transformational research activity associated with (1) improving our understanding of SARS-CoV-2, the coronavirus causing COVID-19; (2) developing a predictive understanding of the spread of the virus; and (3) enabling approaches that mitigate the negative impacts of COVID-19 on public health, society, and the economy.

Given the impacts of the coronavirus, STEM education and workforce are experiencing unique challenges that warrant study. Therefore, NSF used the transfer authority provided in P.L. 116-93, the FY 2020 appropriations bill, to transfer $5.0 million of R&RA CARES Act funding to the EHR budget account. Similar to R&RA, the EHR funds support fast-track, fundamental and transformational research activities that

align with the three identified research areas. A summary of budget authority provided by the CARES Act is shown below:

(Amounts in Thousands)

NSF by Account	Amount
Research and Related Activities	$ 70,000
Education and Human Resources	5,000
Agency Operations and Award Management	1,000
Total	$ 76,000

AOAM funding secures ongoing continuity of operations during the COVID-19 response period, including costs stemming from changes to NSF agency operations in a virtual working environment.

FY 2020 obligations for COVID-19 activities, by funding source, is summarized as follows:

(Amounts in Thousands)

NSF by Account	CARES Act	Base Appropriation	Mandatory H-1B Fees + Reimbursable	Amount
Research and Related Activities	$ 70,000	$ 108,485	$ 398	$ 178,883
Education and Human Resources	5,000	11,709	882	17,591
Agency Operations and Award Management	1,000	-	-	1,000
Total	$ 76,000	$ 120,194	$ 1,280	$ 197,474

Budget authority provided by the CARES Act is available to NSF for obligation through September 2021. As of September 30, 2020, all funds were obligated.

NSF's assets, liabilities, costs, revenues, and net position are impacted by appropriated funds and disbursements related to COVID-19 activity. Appropriations from the CARES Act resulted in an increase to NSF's assets and net position as of September 30, 2020. As NSF continues to provide support for COVID-19 related research, costs will increase, which will lead to a decrease in net position.

Note 13. Reclassification Adjustments of Balance Sheet, Statement of Net Cost, and Statement of Changes in Net Position Due to FR Compilation

To prepare the Financial Report of the U.S. Government (FR), the Treasury requires agencies to submit an adjusted trial balance, which is a listing of amounts by U.S. Standard General Ledger account that appear in the financial statements. Treasury uses the trial balance information reported in the Governmentwide Treasury Account Symbol Adjusted Trial Balance System (GTAS) to develop a Reclassified Balance Sheet, Reclassified Statement of Net Cost, and a Reclassified Statement of Changes in Net Position for each agency, which are accessed using GTAS. Treasury eliminates all intragovernmental balances from the reclassified statements and aggregates lines with the same title to develop the FR statements. This note shows the NSF's financial statements and the NSF's reclassified statements prior to elimination of intragovernmental balances and prior to aggregation of repeated FR line items. A copy of the 2019 FR can be found on the FR website[4] and a copy of the 2020 FR will be posted to this site as soon as it is released.

The term "Non-Federal" is used to refer to transactions with non-federal entities. These include transactions with individuals, businesses, non-profit entities, and State, local, and foreign governments.

[4] 2019 FR website: https://www.fiscal.treasury.gov/reports-statements/

Reclassification of Balance Sheet to Line Items Used for the Government-wide Balance Sheet as of September 30, 2020
(Amounts in Thousands)

FY 2020 National Science Foundation Balance Sheet		Line Items Used to Prepare FY 2020 Government- wide Balance Sheet			
Financial Statement Line	**Amounts**	**Dedicated Collections**	**All Other**	**Total**	**Reclassified Financial Statement Line**
ASSETS					**ASSETS**
Intra-Governmental Assets					**Intra-Governmental Assets**
Fund Balance With Treasury	$16,039,090	$ 632,023	15,407,067	$16,039,090	Fund Balance With Treasury
Accounts Receivable, Net	11,408	-	11,408	11,408	Accounts Receivable, Net
Advances to Others	36,824	-	36,824	36,824	Advances to Others and Prepayments
Total Intra-Governmental Assets	16,087,322	632,023	15,455,299	16,087,322	Total Intra-Governmental Assets
Cash and Other Monetary Assets	26,622	-	26,622	26,622	Cash and Other Monetary Assets
Accounts Receivable, Net	909	-	909	909	Accounts Receivable, Net
General Property, Plant, and Equipment, Net	377,862	-	377,862	377,862	General Property, Plant, and Equipment, Net
		-	405,393	405,393	Total With the Public
TOTAL ASSETS	**$16,492,715**	**$ 632,023**	**15,860,692**	**$16,492,715**	**TOTAL ASSETS**
LIABILITIES					**LIABILITIES**
Intra-Governmental Liabilities					**Intra-Governmental Liabilities**
Accounts Payable	$ 19,262	$ -	22,298	$ 22,298	Accounts Payable
Other Intragovernmental Liabilities	8,906	-	884	884	Liability to the General Fund for Custodial and Other Non-Entity Assets
		-	2,387	2,387	Benefit Program Contributions Payable
		-	2,599	2,599	Other Liabilities (Without Reciprocals)
Total Intra-Governmental Liabilities	28,168	-	28,168	28,168	Total Intra-Governmental Liabilities
Accounts Payable	60,519	125	60,394	60,519	Accounts Payable
Acturial FECA Liability	1,219	-	26,307	26,307	Federal Employee and Veteran Benefits Payable
Accrued Annual Leave	25,088				
Environmental and Disposal Liabilities	12,930	-	12,930	12,930	Environmental and Disposal Liabilities
Accrued Grant Liabilities	493,090	15,055	489,563	504,618	Other Liabilities
Accrued Payroll and Other Liabilities	11,528				
		15,180	589,194	604,374	Total With the Public
TOTAL LIABILITIES	**$ 632,542**	**$ 15,180**	**617,362**	**$ 632,542**	**TOTAL LIABILITIES**
NET POSITION					**NET POSITION**
Unexpended Appropriations – Other Funds	$14,830,495	$ -	14,830,495	$14,830,495	Unexpended Appropriations - Funds Other Than Those From Dedicated Collections
Cumulative Results of Operations – Other Funds	412,835	-	412,835	412,835	Cumulative Results of Operations – Funds Other Than Those From Dedicated Collections
Cumulative Results of Operations – Dedicated Collections	616,843	616,843	-	616,843	Cumulative Results of Operations – Funds from Dedicated Collections
TOTAL NET POSITION	**$15,860,173**	**$ 616,843**	**15,243,330**	**$15,860,173**	**TOTAL NET POSITION**
TOTAL LIABILITIES & NET POSITION	**$16,492,715**	**$ 632,023**	**15,860,692**	**$16,492,715**	**TOTAL LIABILITIES & NET POSITION**

Reclassification of Statement of Net Cost (SNC) to Line Items Used for the Government-wide SNC for the Year Ending September 30, 2020
(Amounts in Thousands)

FY 2020 National Science Foundation SNC		Line Items Used to Prepare FY 2020 Government-wide SNC			
Financial Statement Line	**Amounts**	**Dedicated Collections**	**All Other**	**Total**	**Reclassified Financial Statement Line**
GROSS COSTS					**GROSS COSTS**
Research and Related Activities	$ 6,321,811	$ 124,846	7,061,330	$ 7,186,176	Non-Federal Gross Cost
		124,846	7,061,330	7,186,176	Total Non-Federal Gross Cost
Education and Human Resources	856,269	-	41,081	41,081	Benefit Program Costs
Major Research Equipment and Facilities Construction	164,583	-	11,310	11,310	Imputed Costs
Donations and Dedicated Collections	139,597	-	230,142	230,142	Buy/Sell Costs
		-	13,551	13,551	Other Expenses (Without Reciprocals)
		-	296,084	296,084	Total Federal Gross Cost
TOTAL GROSS COSTS	**$ 7,482,260**	**$ 124,846**	**7,357,414**	**$ 7,482,260**	**TOTAL GROSS COSTS**
EARNED REVENUE					**EARNED REVENUE**
Research and Related Activities	$ (124,036)	$ -	(5,997)	$ (5,997)	Non-Federal Earned Revenue
		-	(5,997)	(5,997)	Total Non-Federal Earned Revenue
Education and Human Resources	(3,706)	-	(121,745)	(121,745)	Buy/Sell Revenue (Exchange)
		-	(121,745)	(121,745)	Total Federal Earned Revenue
TOTAL EARNED REVENUE	**$ (127,742)**	**$ -**	**(127,742)**	**$ (127,742)**	**TOTAL EARNED REVENUE**
NET COST OF OPERATIONS	**$ 7,354,518**	**$ 124,846**	**7,229,672**	**$ 7,354,518**	**NET COST OF OPERATIONS**

Reclassification of Statement of Changes in Net Position (SCNP) to Line Items Used for the Government-wide Statement of Operations and Changes in Net Position for the Year Ending September 30, 2020
(Amounts in Thousands)

FY 2020 National Science Foundation SCNP		Line Items Used to Prepare FY 2020 Government-wide SCNP			
Financial Statement Line	**Amounts**	**Dedicated Collections**	**All Other**	**Total**	**Reclassified Financial Statement Line**
UNEXPENDED APPROPRIATIONS					
Beginning Balance	**$13,812,440**	**$ -**	**13,812,440**	**$14,753,427**	Net Position, Beginning of Period (Includes Cumulative Results of Operations, Beginning Balance)
Appropriations Received	8,354,330	-	8,275,006	8,275,006	Appropriations Received as Adjusted
Cancelled Authority Adjustments	(79,324)				
Appropriations Used	(7,256,951)	-	(7,256,951)	(7,256,951)	Appropriations Used
TOTAL UNEXPENDED APPROPRIATIONS	**$14,830,495**				
CUMULATIVE RESULTS OF OPERATIONS					
Beginning Balance	$ 940,987	$ 587,970	353,017	Included Above	Net Position, Beginning of Period (Included in Net Position, Unexpended Appropriations)
Appropriations Used	7,256,951	-	7,256,951	7,256,951	Appropriations Expended
Non-Exchange Revenue	44	-	27,226	27,226	Other Taxes and Receipts
Donations	27,215				
Other (1 of 2)	(33)				
Total Non-Federal Non-Exchange Revenue	27,226	-	27,226	27,226	Total Non-Federal Non-Exchange Revenues
		162,748	-	162,748	Appropriation of Unavailable Special/Trust Fund Receipts Transfers-In
		(9,029)	-	(9,029)	Appropriation of Unavailable Special/Trust Fund Receipts Transfers-Out
Funds from Dedicated Collections Transferred In / (Out)	153,719	153,719	-	153,719	Total Appropriation of Unavailable Special or Trust Fund Receipts Transfers, Net
Imputed Financing	11,310	-	11,310	11,310	Imputed Financing Sources
		-	(5,665)	(5,665)	Non-Entity Collections Transferred to the General Fund
		-	(332)	(332)	Accrual for Non-Entity Amounts to be Collected and Transferred to the General Fund
Other (2 of 2)	(5,997)	-	(5,997)	(5,997)	Total Non-Entity Collections and Accrual for Non-Entity Amounts to be Collected
Total Financing Sources	7,443,209				
Net Cost of Operations	(7,354,518)	(124,846)	(7,229,672)	$(7,354,518)	Net Cost of Operations
CUMULATIVE RESULTS OF OPERATIONS, ENDING BALANCE	**$ 1,029,678**				
TOTAL NET POSITION	**$15,860,173**	**$ 616,843**	**15,243,330**	**$15,860,173**	**TOTAL NET POSITION**

REQUIRED SUPPLEMENTARY INFORMATION

Deferred Maintenance and Repairs

For the Fiscal Years ended September 30, 2020 and 2019

Deferred Maintenance and Repairs

NSF performs condition assessment surveys in accordance with SFFAS No. 42, *Deferred Maintenance and Repairs*, for capitalized general PP&E, including fully depreciated general personal property to determine if any maintenance and repairs are needed to keep an asset in an acceptable condition or restore an asset to a specific level of performance. NSF considers deferred maintenance and repairs to be any maintenance and repairs that are not performed on schedule, unless it is determined from the condition of the asset that scheduled maintenance does not have to be performed. Deferred maintenance and repairs also include any other type of maintenance or repair that, if not performed, would render the PP&E non-operational. Circumstances such as non-availability of parts or funding are considered reasons for deferring maintenance and repairs.

NSF considered whether any scheduled maintenance or repair necessary to keep fixed assets of the agency in an acceptable condition was deferred at fiscal years ended September 30, 2020 and 2019. Assets deemed to be in excellent, good, or fair condition are considered to be in acceptable condition. Assets in poor or very poor condition are in unacceptable condition and the deferred maintenance and repairs required to get them to an acceptable condition are reported. NSF determines the condition of an asset in accordance with standards comparable to those used in the private industry. Due to the environment and remote location of Antarctica, all deferred maintenance and repairs on assets in poor or very poor condition are considered critical in order to maintain operational status.

In accordance with SFFAS No. 42, NSF discloses the beginning and ending balances for the fiscal year ending September 30, 2020. At September 30, 2020, NSF determined that scheduled maintenance or repairs on one item of Antarctic capital equipment in poor condition was not completed and was deferred or delayed for a future period. The dollar amount of deferred maintenance for this item was $50.0 thousand. The item is heavy mobile equipment and is considered non-critical to NSF operations.

At September 30, 2019, NSF determined that there was no scheduled maintenance or repairs on Antarctic capital equipment in poor or very poor condition that was deferred or delayed for a future period.

REQUIRED SUPPLEMENTARY INFORMATION

Combining Statement of Budgetary Resources by Major Budget Accounts

In the following tables, NSF budgetary information for the fiscal years ended September 30, 2020 and 2019, as presented in the Statement of Budgetary Resources, is disaggregated for each of NSF's major budget accounts.

The Science Appropriations Act, 2020
2020
(Amounts in Thousands)

	Research and Related Activities	Education and Human Resources	Major Research Equipment	OIG, AOAM, and NSB	Special and Donated	Total
Budgetary Resources						
Unobligated Balance from Prior Year Budget Authority, Net	$ 235,916	49,437	40,953	8,534	111,029	$ 445,869
Appropriations	6,789,800	942,550	243,230	378,750	180,974	8,535,304
Spending Authority from Offsetting Collections	89,536	5,174	-	6,410	-	101,120
Total Budgetary Resources	**$ 7,115,252**	**997,161**	**284,183**	**393,694**	**292,003**	**$ 9,082,293**
Status of Budgetary Resources						
New Obligations and Upward Adjustments	$ 6,969,171	959,602	154,836	376,592	135,833	$ 8,596,034
Unobligated Balance, End of Year:						
Apportioned, Unexpired	14,786	2,087	127,346	9,983	144,360	298,562
Unapportioned, Unexpired	3,935	2,878	2,001	-	11,810	20,624
Unobligated Balance, Unexpired, End of Year	18,721	4,965	129,347	9,983	156,170	319,186
Unobligated Balance, Expired, End of Year	127,360	32,594	-	7,119	-	167,073
Total Unobligated Balance, End of Year	146,081	37,559	129,347	17,102	156,170	486,259
Total Status of Budgetary Resources	**$ 7,115,252**	**997,161**	**284,183**	**393,694**	**292,003**	**$ 9,082,293**
Net Outlays						
Net Outlays	$ 5,811,244	813,091	178,567	372,379	135,212	$ 7,310,493
Distributed Offsetting Receipts	-	-	-	-	(32,923)	(32,923)
Net Agency Outlays	**$ 5,811,244**	**813,091**	**178,567**	**372,379**	**102,289**	**$ 7,277,570**

The Science Appropriations Act, 2019
2019
(Amounts in Thousands)

	Research and Related Activities	Education and Human Resources	Major Research Equipment	OIG, AOAM, and NSB	Special and Donated	Total
Budgetary Resources						
Unobligated Balance from Prior Year Budget Authority, Net	$ 224,099	55,516	28,486	8,815	100,974	$ 417,890
Appropriations	6,504,510	922,000	295,740	352,750	189,651	8,264,651
Spending Authority from Offsetting Collections	92,992	5,344	-	6,781	-	105,117
Total Budgetary Resources	**$ 6,821,601**	**982,860**	**324,226**	**368,346**	**290,625**	**$ 8,787,658**
Status of Budgetary Resources						
New Obligations and Upward Adjustments	$ 6,675,953	940,342	285,273	359,932	188,043	$ 8,449,543
Unobligated Balance, End of Year:						
Apportioned, Unexpired	20,505	5,537	38,897	1,050	79,873	145,862
Unapportioned, Unexpired	1,310	1,081	56	4	22,709	25,160
Unobligated Balance, Unexpired, End of Year	21,815	6,618	38,953	1,054	102,582	171,022
Unobligated Balance, Expired, End of Year	123,833	35,900	-	7,360	-	167,093
Total Unobligated Balance, End of Year	145,648	42,518	38,953	8,414	102,582	338,115
Total Status of Budgetary Resources	**$ 6,821,601**	**982,860**	**324,226**	**368,346**	**290,625**	**$ 8,787,658**
Net Outlays						
Net Outlays	$ 5,808,697	837,740	139,085	348,520	158,204	$ 7,292,246
Distributed Offsetting Receipts	-	-	-	-	(37,741)	(37,741)
Net Agency Outlays	**$ 5,808,697**	**837,740**	**139,085**	**348,520**	**120,463**	**$ 7,254,505**

Chapter 3

Appendices (Other Information)

SUMMARY OF FY 2020 FINANCIAL STATEMENT AUDIT AND MANAGEMENT ASSURANCES

Table 3.1 – Summary of Financial Statement Audit

Effectiveness of Internal Control over Financial Reporting (FMFIA § 2)					
Audit Opinion	*Unmodified*				
Restatement	*No*				
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Ending Balance
Total Material Weaknesses	*0*	-	-	-	*0*

Table 3.2 – Summary of Management Assurances

Effectiveness of Internal Control over Financial Reporting (FMFIA § 2)						
Statement of Assurance	*Unmodified*					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Total Material Weaknesses	*0*	-	-	-	-	*0*
Effectiveness of Internal Control over Operations (FMFIA § 2)						
Statement of Assurance	*Unmodified*					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Total Material Weaknesses	*0*	-	-	-	-	*0*
Conformance with Federal Financial Management System Requirements (FMFIA § 4)						
Statement of Assurance	*Systems conform to financial management system requirements*					
Non-Conformances	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Total non-conformances	*0*	-	-	-	-	*0*

Compliance with Section 803(a) of the Federal Financial Management Improvement Act (FFMIA)		
	Agency	Auditor
Federal Financial Management System Requirements	*No lack of compliance noted*	
Applicable Federal Accounting Standards	*No lack of compliance noted*	
USSGL at Transaction Level	*No lack of compliance noted*	

Management Challenges for the National Science Foundation in Fiscal Year 2021

October 15, 2020

AT A GLANCE

Management Challenges for the National Science Foundation in Fiscal Year 2021

October 15, 2020

WHY WE DID THIS REPORT

The *Reports Consolidation Act of 2000* (Pub. L. No. 106-531) requires us to annually update our assessment of NSF's "most serious management and performance challenges facing the agency … and the agency's progress in addressing those challenges."

WHAT WE FOUND

NSF leads the world as an innovative agency dedicated to advancing science. Its support of basic research has led to many discoveries that have contributed to the progress of science, as well as the national health, prosperity, and welfare. Beyond its scientific mission, NSF must be a responsible steward of taxpayer dollars.

This year, we have identified six areas representing challenges NSF must continue to address to enhance mission performance:

- Providing Oversight of Major Multi-User Research Facilities
- Providing Oversight of Grants During a Pandemic
- Managing the Intergovernmental Personnel Act Program
- Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project
- Increasing Diversity in Science & Engineering Education and Employment
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

We have included information about challenges NSF faces in addressing the public health and economic crises resulting from the Coronavirus Disease 2019 (COVID-19) pandemic within each challenge section. We have also removed two challenges identified in our FY 2020 Management Challenges report — Meeting Digital Accountability and Transparency Act of 2014 (DATA Act) Reporting Requirements and Encouraging the Responsible and Ethical Conduct of Research — based on NSF's significant progress in these areas.

We are encouraged by NSF's progress in its efforts to address critical management and performance challenges. Effective responses to these challenges will continue to promote the integrity of NSF-funded projects, help ensure research funds are spent effectively and efficiently, and help maintain the highest level of accountability over taxpayer dollars.

AGENCY RESPONSE TO *MANAGEMENT CHALLENGES FOR FISCAL YEAR 2020*

Following the issuance of this report, NSF will include its Management Challenges Progress Report and its response to *Management Challenges for the National Science Foundation in Fiscal Year 2020* in its Agency Financial Report.

FOR FURTHER INFORMATION, CONTACT US AT OIGPUBLICAFFAIRS@NSF.GOV.

National Science Foundation • Office of Inspector General
2415 Eisenhower Avenue, Alexandria, Virginia 22314

MEMORANDUM

DATE: October 15, 2020

TO: Dr. Ellen Ochoa
Chair
National Science Board

Dr. Sethuraman Panchanathan
Director
National Science Foundation

FROM: Allison C. Lerner Allison C. Lerner
Inspector General
National Science Foundation

SUBJECT: Management Challenges for the National Science Foundation in Fiscal Year 2021

Attached for your information is our report, *Management Challenges for the National Science Foundation in Fiscal Year 2021*. The *Reports Consolidation Act of 2000* (Pub. L. No. 106-531) requires us to annually update our assessment of NSF's "most serious management and performance challenges facing the agency … and the agency's progress in addressing those challenges." A summary of the report will be included in the National Science Foundation Agency Financial Report.

If you have questions, please contact me at 703.292.7100.

Attachment

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Introduction

NSF leads the world as an innovative agency dedicated to advancing science. Its support of basic research has led to many discoveries that have contributed to the progress of science, as well as the national health, prosperity, and welfare. Beyond its scientific mission, NSF must be a responsible steward of taxpayer dollars.

The *Reports Consolidation Act of 2000* requires us to annually update our assessment of NSF's "most serious management and performance challenges facing the agency … and the agency's progress in addressing those challenges" (Pub. L. No. 106-531). Accordingly, we identify the challenges we consider most critical based on our audit and investigative work; general knowledge of the agency's operations; and evaluative reports of others, including the U.S. Government Accountability Office (GAO) and NSF's various advisory committees, contractors, and staff. We identify management challenges as those that meet at least one of the following criteria:

- The issue involves an operation that is critical to an NSF core mission.[1]
- There is a risk of fraud, waste, or abuse of NSF or other Government assets.
- The issue involves strategic alliances with other agencies, the Office of Management and Budget (OMB), the Administration, Congress, or the public.
- The issue is related to key initiatives of the President.
- The issue involves a legal or regulatory requirement not being met.

FY 2021 Challenges

This year, we have identified six areas representing the most serious management and performance challenges for NSF:

- Providing Oversight of Major Multi-User Research Facilities
- Providing Oversight of Grants During a Pandemic
- Managing the Intergovernmental Personnel Act Program
- Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project
- Increasing Diversity in Science & Engineering Education and Employment
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

We describe our work and NSF's progress in addressing these six critical challenges areas in more detail in the following pages.

We have added a new challenge, Providing Oversight of Grants During a Pandemic, as well as included information within each section, to discuss challenges NSF faces in addressing the public health and economic crises resulting from the Coronavirus Disease 2019 (COVID-19) pandemic. NSF has procedures and plans in place to effectively manage the programs funded by the *Coronavirus Aid, Relief, and Economic Security Act* (CARES Act) and other related legislation. Its greater risks may be from the pandemic's impacts on institutions of higher education and other recipient organizations, which may extend to non-pandemic funding.

[1] The *National Science Foundation Act of 1950* (Pub. L. No. 81-507) sets forth the mission: "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."

Introduction

In addition, we have included another new challenge, Increasing Diversity in Science & Engineering Education and Employment, also impacted by COVID-19. NSF's ongoing efforts to address this challenge may help mitigate the pandemic's impact on Science, Technology, Engineering, and Mathematics (STEM) research and education, including reported adverse impacts for Hispanic and Black STEM undergraduates and women STEM faculty and students.

The Foundation has already begun to identify risk areas, develop mitigation strategies, and determine financial impacts of the pandemic. We are monitoring NSF's efforts to ensure that its strategies for mitigating impacts are fully developed and address the areas of greatest concern.

Progress in Addressing FY 2020 Challenges

We have removed two challenge areas identified in our FY 2020 Management Challenges report — Meeting Digital Accountability and Transparency Act of 2014 (DATA Act) Reporting Requirements and Encouraging the Responsible and Ethical Conduct of Research. NSF continues to improve its DATA Act reporting and work closely with OMB, the U.S. Department of the Treasury, and intra-Governmental groups. In addition, we are encouraged by NSF's actions to strengthen training in the responsible conduct of research at NSF-funded institutions and its commitment to ensuring the research enterprise it supports is free of harassment. NSF has also continued to emphasize its culture of zero tolerance for harassment of any kind by NSF staff.

In last year's report, we identified a new area — managing the enterprise-wide internal control environment — that we considered an emerging challenge for NSF. NSF continues to make progress in this area, refining and strengthening its overall internal control environment and integrating Enterprise Risk Management into its planning and operations. NSF's quick response to the pandemic and handling of additional CARES Act funding demonstrate an ability to adapt quickly and implement enterprise-wide solutions. We will continue to monitor NSF's progress in this area.

NSF's effective responses to its serious management and performance challenges will continue to promote the integrity of NSF-funded projects, help ensure research funds are spent effectively and efficiently, and help maintain the highest level of accountability over taxpayer dollars.

CHALLENGE 1 Providing Oversight of Major Multi-User Research Facilities

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission.

As part of its mission, NSF funds the scientific community to manage the development, design, construction, and operation of major multi-user research facilities (major facilities), which are state-of-the art infrastructure for research and education that include telescopes, ships, distributed networks, and observatories. NSF's major facility portfolio is inherently risky because the facilities are technically complex, and their construction and operating costs are high. In FY 2019, NSF spent approximately $285 million constructing major facilities and more than $1 billion operating them.

Major facilities have always faced unknown risks — for example, a snapped cable recently damaged a radio telescope's antennae at one facility — but the advent of COVID-19 has added an unprecedented degree of complexity and uncertainty for their operations. Facility closures and safety precautions taken due to COVID-19 have delayed construction and research, as well as increased costs. This has resulted in NSF authorizing total project costs increases and the reprogramming of funds to cover these increases. In response to COVID-19, many existing facilities have been closed or required to operate with minimal staff. This has led to disruptions in data gathering and routine maintenance, as well as the postponement or cancellation of some planned scientific activities. The pandemic response has also halted or delayed the construction of new facilities.

NSF continues to work diligently to address recommendations from recent audits. For example, to improve its oversight of federally owned property, including vehicles, NSF has developed standard operating guidance via an agency-wide equipment working group. NSF also has revised its standard solicitation language to ensure facility operation proposals include risks and inflation factors.

NSF's major facilities program has continued to evolve and improve each year, cementing its place as a model program. Its work to identify risk areas, develop mitigation strategies, and assess financial impacts of COVID-19 will help position it to best address this challenge.

Completed Actions

- ☑ Required recipients to develop segregation of funding plans for projects, including the Daniel K. Inouye Solar Telescope, Vera C. Rubin Observatory, and AIMS.
- ☑ Revised standard solicitation language to ensure facility operation proposals include risks and inflation factors.
- ☑ Implemented policies and procedures to improve pass-through entities' oversight of subrecipients.
- ☑ Developed standard operating guidance for oversight of federally owned property.
- ☑ Issued *Obligation and Allocation of Management Reserve* standard operating guidance, which eliminates the $10 million applicability limit for use on construction projects impacted by the pandemic.

Ongoing Actions

- ➢ Issuing the revised *Business System Review Guide*, which now aligns with *Uniform Guidance*.
- ➢ Finalizing the *Major Facilities Oversight Reviews* standard operating guidance.
- ➢ Completing major facilities portfolio workforce gap analysis.

CHALLENGE 2 Providing Oversight of Grants During a Pandemic

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission. There is also risk of fraud, waste, or abuse of NSF or other Government assets.

Making grants in support of promising scientific research is NSF's primary business and a key element of its mission. COVID-19 has added complexity to the grant management process due to the need to expend additional Federal funds to address its impacts, as well as the health, economic, and societal impacts on NSF's recipient environment.

The CARES Act, enacted on March 27, 2020, provided NSF with a total of $76 million, including $75 million to support its ongoing grant response to COVID-19 and $1 million to assist in the administration of those grants. These funds include Rapid Response Research (RAPID) awards and are in addition to NSF's existing active grant portfolio, which totaled more than $33 billion in FY 2019. As we reported in May 2020, we found NSF's CARES Act Spending Plan to be reasonable, prudent, and consistent with the intent of the Act's funding objectives. NSF is using existing funding mechanisms with established policies, procedures, and controls to disperse the funds provided by the CARES Act, which reduces the risk of misuse and helps ensure accountability.

However, COVID-19 has introduced new and unique factors to which NSF must adapt to maintain effective grant accountability. For example, OMB issued multiple guidance documents authorizing temporary spending flexibilities that greatly expanded the allowable uses of grant funds. Accordingly, while some scientific activity moved to a virtual environment, other activities slowed due to facility closures and stay-at-home orders. This has created uncertainty about achieving grant objectives, especially those reliant upon field research, continuous use of cell lines, animal colonies, or human subject participation. In some cases, restarting research may be costly and original grant objectives may be unattainable. Some institutions may no longer be viable due to pandemic-driven fiscal constraints, including the need to refund portions of tuition; lower than anticipated tuition revenue; and declining support from state governments, endowments, or other sources of funding. If those factors lead to staff cuts in sponsored research offices or offices responsible for identifying and managing scientists' conflicts of interest and commitment, recipients' ability to ensure compliance with NSF award terms and conditions could be undermined.

NSF has begun planning how to address some of these risks, but uncertainty remains, especially as the pandemic continues. NSF may need to make difficult decisions about which grants to terminate, which to continue supporting at established funding levels, and which to support with supplemental funding — and it must consider how these decisions will impact the funding levels of future awards.

Completed Actions

- ☑ Fully obligated funding authorized by CARES Act.
- ☑ Issued CARES Act Spending Plan.
- ☑ Established the Recovery Planning Task Force to look at pandemic's impact on grantees and NSF.
- ☑ Developed NSF Coronavirus Information webpage to share COVID-19 guidance with the award recipient community.

Ongoing NSF Actions

- ➢ Finalizing high level strategy for identifying and responding to risks and impacts of COVID 19 on both the agency and its recipients.
- ➢ Reviewing individual requests for grant extensions and supplemental funding.
- ➢ Continuing to update and share COVID 19 guidance with the award recipient community.

CHALLENGE 3 Managing the Intergovernmental Personnel Act Program

Why is this a serious management challenge? This challenge involves an operation that is critical to an NSF core mission.

NSF gives scientists, engineers, and educators the opportunity to temporarily serve as NSF program directors, advisors, and senior leaders. Most non-permanent staff members are individuals assigned under the *Intergovernmental Personnel Act* (IPA, Pub. L. No. 91-648), who are not Federal employees but are paid through grants and remain employees of their home institutions. These individuals — hereafter referred to as IPAs or rotators — bring in fresh perspectives from across all fields of science and engineering to support NSF's mission. However, IPAs can have a heightened risk of conflicts of interest while working at NSF because most come from institutions receiving NSF grants. Also, because they only serve up to 4 years, there is frequent staff turnover at NSF, especially in senior leadership positions filled by IPAs. In addition, IPAs can spend up to 50 days each year on Independent Research/Development (IR/D) and their salaries are not subject to Federal pay and benefits limits.

NSF continues to strengthen its management of the program. For example, for all new IPA agreements initiated in FY 2017 and beyond, NSF requires every IPA's home institution, unless it requests a waiver, to pay 10 percent of the IPA's base salary and fringe benefits. An assessment indicated the cost-share percentage (based on the IPA's base salary and fringe benefits) gradually increased from 7.2 percent in FY 2016 to 10.4 percent in FY 2019. At the conclusion of FY 2019, NSF had realized significant cost avoidance with increased cost share dollars and participation rates each year.

COVID-19 has brought new and unique challenges to this program, including recruiting, onboarding, and managing IPAs in a remote work environment. It is unclear if institutions will be reluctant to allow staff to participate in the IPA program — and, if the number of IPAs decreases, whether NSF will be able to recruit qualified staff to fill any resulting openings. Fiscal concerns at institutions could also undermine the progress NSF has made in increasing cost-sharing for IPAs.

Completed Actions

- ☑ Submitted the IPA Program Annual Report.
- ☑ Approved IPA Cost Share Policy.
- ☑ Migrated executive-level IPAs along with NSF senior executive employees into USA Performance Management System.
- ☑ Submitted to Congress the FY 2019 annual response to the *American Innovation and Competitiveness Act* justifying rotator pay exceeding the maximum senior executive service pay.
- ☑ Integrated corrective actions in response to GAO report on renewing NSF goal of Adapting the Workforce to the Work.
- ☑ Engaged in IPA Program Enterprise Risk Management to clearly identify IPA Program objectives and associated risks.

Ongoing Actions

- ➢ Continuing to submit the IR/D Annual Report, covering program participation statistics, average days and dollars requested and used, and status of IR/D training and outreach.
- ➢ Continuing to provide annual training for IR/D experts, including updates to the IR/D Guide and the online electronic IR/D plan.
- ➢ Continuing to monitor turnover risk for IPAs.
- ➢ Continuing to use onboarding, training, knowledge transfer, and performance management systems in place to ensure that staff turnover has minimal impact on operations.

CHALLENGE 4 Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS)

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission.

NSF, through the United States Antarctic Program (USAP), manages U.S. scientific research in Antarctica. Leidos Innovations Corporation (Leidos) currently holds the Antarctic Support Contract (ASC) for USAP logistical support. It is NSF's largest contract, valued at $2.3 billion over 13 years. NSF recently initiated a $410 million project to update and consolidate the footprint of McMurdo Station. The Office of Polar Programs (OPP), in coordination with the Division of Acquisition and Cooperative Support and the Large Facilities Office, is providing oversight of the Antarctic Infrastructure Modernization for Science (AIMS) project as a series of modifications to the existing ASC with Leidos and by following procedures in the *Major Facilities Guide*. This anticipated 10-year project, to be completed in phases, will stretch agency resources and may present additional challenges for NSF to overcome. OPP is also currently providing oversight of a separate ASC contract modification with Leidos to build an Information Technology & Communications (IT&C) primary facility — a key precursor to AIMS' success.

The advent of COVID-19 has added an unprecedented degree of complexity and uncertainty to the AIMS project. For example, while design and domestic fabrication of materials are continuing, AIMS construction on-ice at McMurdo has been put on hold and will require a complete rebaseline in FY 2021; the IT&C primary facility construction was also halted and will need rebaselining. Additionally, actions taken to keep Antarctica free of COVID-19, particularly those associated with rotating staff and contractors to and from the Antarctic continent, will have significant impacts on program operations and construction progress.

NSF has committed to completing the AIMS project with minimal impact on the scientific research that will continue to take place at McMurdo station. This commitment, the inherent risk of the ASC, the remote and isolated environment coupled with the harsh climate of Antarctica, the challenges presented by COVID-19, and the capacity of the prime contractor to effectively manage this complex project will require continued vigilance.

Completed Actions

- ☑ Partnered within NSF to identify areas the contractor needed to strengthen, which resulted in the contractor hiring additional staff, restructuring the office supporting the contract, and obtaining interagency support for cost analysis from the U.S. Army Corps of Engineers.
- ☑ Restructured the U.S. Army Corps of Engineers support being provided to the AIMS project by moving from cost reasonableness reviews to full independent cost estimates for proposal packages.
- ☑ Completed verification and acceptance of the AIMS Earned Value Management System in accordance with NSF policy.

Ongoing Actions

- ➢ Continuing oversight of the AIMS and IT&C Primary Addition Projects in accordance with established Internal Management and Project Execution Plans. Both projects require rebaselining due to COVID 19.
- ➢ Assessing COVID 19 impacts and evaluate options for minimizing negative impacts to AIMS cost and schedule.
- ➢ Working with the Office of Budget, Finance and Award Management to rebaseline AIMS, and subject the revised cost, scope, and schedule to external panel review, Facilities Readiness Panel Review, Director's Review Board Review, and National Science Board (NSB) re authorization of the Total Project Cost.

CHALLENGE 5 Increasing Diversity in Science & Engineering Education and Employment

Why is this a serious management challenge?

This challenge involves an operation that is critical to an NSF core mission.

In the Federal Government's 5-year strategic plan for STEM education, issued in December 2018, the Executive Office of the President's National Science and Technology Council reported:

> Women, persons with disabilities, and three racial and ethnic groups — Blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives — are significantly underrepresented in S&E [science and engineering] education and employment.

In August 2020, OMB directed 16 departments and agencies to prioritize investments that increase diversity, equity, and inclusion in STEM. Further, in its *Vision 2030*, the NSB estimated that to lead globally in S&E and to remain competitive, by 2030 the number of women in the S&E workforce must nearly double, the number of Black or African Americans must more than double, and the number of Hispanics or Latinos must triple compared to the respective numbers in the 2020 S&E workforce.

NSF maintains a comprehensive portfolio to increase diversity in S&E. The Broadening Participation portfolio focuses on awards with specific goals to increase participation of underrepresented groups. In addition, the NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES) program, one of NSF's Big Ideas, focuses on scaling up proven approaches to broadening participation. NSF has issued two progress reports on NSF INCLUDES. They document the work of grantees, lessons learned on building connections, and corporate and Federal partnerships designed to broaden participation in STEM nationwide. Further, at its July 29, 2020 meeting, the NSB discussed working with NSF on the broader impacts criterion of merit review to foster a more inclusive S&E workforce. Members noted the *American Innovation and Competitiveness Act of 2017* (Pub. L. 114-329) lists increasing diversity in STEM as a broader impacts goal for NSF.

Actions taken by NSF and the NSB help alleviate the impact of COVID-19 on efforts to increase diversity in STEM research and education. A recent NSF-funded study[2] — an early snapshot of an evolving situation — found that Hispanic (12.7 percent) and Black (10.3 percent) STEM undergraduates were more likely than those identifying as Asian (6.3 percent) and White (6.0 percent) to delay graduation, and women faculty and students reported being more adversely affected by remote learning than did their male counterparts. In FY 2021, we will monitor NSF's continued efforts to develop strategies and programs to increase diversity in S&E education and employment and to measure their effectiveness.

Completed Actions

- ☑ Issued biannual *Women, Minorities, and Persons with Disabilities in Science and Engineering* reports.
- ☑ With NSB, issued *2019 Science & Engineering Labor Force* report and *The State of U.S. Science and Engineering 2020*.
- ☑ Contributed to NSB's Vision 2030.
- ☑ Created and twice evaluated the NSF INCLUDES portfolio.

Ongoing Actions

- ➢ Clarifying Broader Impacts criterion of Merit Review.
- ➢ Continuing NSF INCLUDES' activities and evaluations.
- ➢ Continuing to share *Indicators*, a quantitative summary of the scope, quality, and vitality of the S&E enterprise over time and within a global context.

[2] Saw, G. K., Chang, C.-N., Lomelí, U., & Zhi, M. Fall Enrollment and Delayed Graduation Among STEM Students during the COVID-19 Pandemic ([Network for Research and Evaluation in Education] Data Brief No. 1), July 15, 2020

CHALLENGE 6 Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

Why is this a serious management challenge?

There is a risk of fraud, waste, or abuse of NSF or other Government assets.

NSF, and other agencies that fund basic and advanced research, are facing increasing challenges from programs sponsored by some foreign governments or affiliates, referred to as "foreign government talent recruitment programs." These programs — designed to benefit the foreign state's economic development, industry, and national security by obtaining information and technology from abroad — have the potential to exploit the openness of American universities and threaten the integrity of U.S. research initiatives.

Talent recruitment programs target individuals with access to, influence over, or expertise in cutting-edge science, including NSF-funded researchers, merit review panelists, and career Federal employees or rotators who manage NSF's scientific programs. Some plans have required members to affirmatively demonstrate their involvement in research or technology development, sometimes by providing information that is proprietary. These plans often use contracts to establish the relationship between the plan and the researcher. The contracts can contain provisions related to the researcher's intellectual activities and outputs, which may raise significant questions about ownership of intellectual property developed with NSF funding and create conflicts of interests, time, and commitments. Failure to properly disclose membership in such programs can also have criminal or civil ramifications. In addition, many institutions funded by NSF could be affected by financial constraints driven by the pandemic, which could undermine their ability to identify and manage conflicts of interests, commitment, and affiliation created by researchers' involvement with such programs.

NSF has begun to take action to confront the challenges presented by foreign talent recruitment programs. NSF should continue to assess and refine its controls in this area and should work to ensure that it has sufficient staff and resources to respond to this challenge.

Required NSF IPA Program staff to be U.S. citizens or have applied for U.S. citizenship.

- ☑ Issued a personnel policy prohibiting NSF employees and IPA Program staff from participating in foreign government talent recruitment programs.
- ☑ Commissioned an independent study.
- ☑ Appointed an NSF Chief of Research Security Strategy and Policy to lead NSF's response.
- ☑ Published final 2020 *Proposal and Award Policies and Procedures Guide*, including clarifications regarding reporting requirements for current and pending support and professional appointments, to include participation in talent recruitment programs.
- ☑ Developed electronic formats for submission of biographies, appointment disclosures, and current and pending support information.
- ☑ Created science and security training for NSF staff.
- ☑ Issued new award terms and conditions regarding previously undisclosed information.

- ➢ Strengthening and improving certifications relating to representations and disclosures made in proposals and other ongoing communications with NSF during the lifecycle of the award.
- ➢ Continuing coordination with other Federal agencies on science and security policies.

Appendix A: References

Please visit http://www.nsf.gov/oig for additional reports and publications.

Introduction

- NSF OIG Report No. 2-2-003, *Fiscal Year 2019 Implementation of the Digital Accountability and Transparency Act of 2014 Performance Audit*, Nov. 8, 2019
- NSF OIG Report, *Management Challenges for the National Science Foundation in FY 2020*, Oct. 15, 2019
- NSF Office of the Director Staff Memorandum, O/D 18-18, NSF is Committed to Stopping Harassment in Research and Learning Environments, Sept. 19, 2018
- NSF Office of the Director Important Notice No. 144, *Harassment*, Feb. 8, 2018

Providing Oversight of Major Multi-User Research Facilities

- NSF OIG 20-2-007, *Audit of NSF's Monitoring of Government-Owned Equipment Purchased on NSF Awards*, August 26, 2020
- NSF OIG 20-2-006, *NSF Could Improve Accountability for Its Vehicle Fleet and Recipient-titled Vehicles at Major Facilities*, May 21, 2020
- NSF OIG 20-2-004, *Audit of NSF's Process for Evaluating the Operations and Maintenance Proposal for the Ocean Observatories Initiative*, April 14, 2020
- NSF OIG Report No. 19-2-006, *Audit of NSF's Controls to Prevent Misallocation of Major Facility Expenses*, June 21, 2019
- NSF OIG Report No. 18-2-005, *Audit of NSF's Oversight of Subrecipient Monitoring*, June 21, 2018

Providing Oversight of Grants During a Pandemic

- Pandemic Response Accountability Committee, *Top Challenges Facing Federal Agencies: COVID-19 Emergency Relief and Response Efforts*, June 2020
- NSF OIG Report No. 20-6-001, *Review of the National Science Foundation CARES Act Spending Plan*, May 21, 2020
- NSF Coronavirus Information Website

Managing the Intergovernmental Personnel Act Program

- NSF OIG Report No. 17-2-008, *NSF Controls to Mitigate IPA Conflicts of Interest*, June 8, 2017

Increasing Diversity in Science & Engineering Education and Employment

- Office of Science and Technology Policy of the Executive Office of the President, *Charting a Course for Success: America's Strategy for STEM Education*, December 2018
- OMB M-20-20, *Fiscal Year 2022 Administration Research and Development Budget Priorities and Cross-Cutting Actions*, August 14, 2020
- NSB Report No. NSB-2020-15, *Vision 2030*, May 2020
- Saw, G. K., Chang, C.-N., Lomelí, U., & Zhi, M. *Fall Enrollment and Delayed Graduation Among STEM Students during the COVID-19 Pandemic* ([Network for Research and Evaluation in Education] Data Brief No. 1), July 15, 2020
- National Science Board, National Science Foundation, NSB-2019-8: *Science and Engineering Indicators 2020: Science and Engineering Labor Force*, September 2019
- National Science Board, National Science Foundation, NSB-2020-1: *Science and Engineering Indicators 2020: The State of U.S. Science and Engineering*, January 2020

Additional Information

About NSF OIG

We promote effectiveness, efficiency, and economy in administering the Foundation's programs; detect and prevent fraud, waste, and abuse within NSF or by individuals who receive NSF funding; and identify and help to resolve cases of research misconduct. NSF OIG was established in 1989, in compliance with the *Inspector General Act of 1978*, as amended. Because the Inspector General reports directly to the National Science Board and Congress, the Office is organizationally independent from the National Science Foundation.

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National Science Foundation
Office of the Director

October 22, 2020

MEMORANDUM

TO: Ms. Allison Lerner
Inspector General, National Science Foundation

FROM: Dr. Sethuraman Panchanathan
Director, National Science Foundation

SUBJECT: Acknowledgement of the Inspector General's FY 2021 Management Challenges Report and Transmittal of NSF's Progress Report for the FY 2020 Management Challenges

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As Director of the National Science Foundation (NSF), I recognize the importance of acknowledging, understanding, and mitigating risk to the execution of our mission and proper stewardship of taxpayer dollars. The Office of Inspector General's (OIG) yearly Management Challenges, which are required by statute, are an important part of NSF's risk management processes. The pandemic this year demonstrated that, while there may be unforeseeable risks, established risk management processes well-position NSF to address emerging challenges. To that end, this memorandum provides you with NSF's Progress Report for the OIG Management Challenges for FY 2020 and acknowledges my receipt of the OIG's Management Challenges for NSF for FY 2021, dated October 15, 2020. As you review our Progress Report and the new challenges, here are three considerations:

First, we are pleased that the OIG has removed two challenges identified in the FY 2020 Management Challenges report — Meeting Digital Accountability and Transparency Act of 2014 (DATA Act) Reporting Requirements and Encouraging the Responsible and Ethical Conduct of Research.

Second, we appreciate the OIG's acknowledgement of the progress NSF is making in managing the enterprise-wide internal control environment, an area identified by the OIG last year as a potential challenge. More generally, we recognize the benefit of the OIG's identification of potential or emerging challenges, as it provides NSF the opportunity to investigate and address concerns before they could amplify.

Third, I am engaging the Chief Operating Officer, Assistant Directors, and the Chief Financial Officer to identify owners and paths forward, for each of the six management challenges identified for FY 2021, as noted below:

- Providing Oversight of Major Multi-User Research Facilities
- Providing Oversight of Grants During a Pandemic
- Managing the Intergovernmental Personnel Act Program

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- Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project
- Increasing Diversity in Science & Engineering Education and Employment
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

As always, NSF remains committed to serving the research community effectively, to continually improving stewardship across the agency, and to safeguard Federal funds awarded by NSF in support of the agency's mission. We look forward to continuing to work with your office to achieve those goals.

Sethuraman Panchanathan

Attachments

cc: Chair, National Science Board
Chair, National Science Board, Committee on Oversight
Chief Financial Officer

National Science Foundation (NSF)
FY 2020 Progress Report on OIG Management Challenges

MANAGEMENT CHALLENGE 1: Managing Major Multi-User Research Facilities

NSF Lead: Teresa Grancorvitz, Chief Financial Officer and Jim Ulvestad, Chief Officer for Research Facilities

Summary of OIG Identified Challenge

a) *Manage inherent risk associated with previously highlighted OIG concerns, including the need for strengthened controls to ensure major facilities clearly identify subrecipients, complete subrecipient risk assessments, and properly charge project expenditures to construction or operations.*
b) *Ensure that NSF and recipients constructing and operating major facilities maintain project management expertise.*

NSF Management's Overview of the Challenge and Action Plan to Address and Monitor the Challenge

NSF understands the importance of its role in overseeing recipients' on-going management of major facilities. The agency also recognizes the importance of assessing prospective recipients' capabilities for managing major facilities prior to award. Over the past several years, NSF has greatly strengthened its oversight policies and procedures. This includes an annual Major Facilities Portfolio Risk Assessment to determine the necessary reviews and audits to be conducted by the Large Facilities Office (LFO) and Cooperative Support Branch (CSB) within the Office of Budget, Finance and Award Management (BFA). In close cooperation with NSF program offices, LFO and CSB conduct these reviews to safeguard NSF's significant, long-term investments in supporting the scientific endeavor.

NSF leadership continues to show its commitment to major facilities oversight through the active engagement of the Chief Officer for Research Facilities (CORF) and leadership's periodic review of the Office of the Director's Watch List. The governance structure currently in place, which includes the Accountable Directorate Representatives, Facilities Governance Board, Facilities Readiness Panel, and the Director's Review Board, continues to help ensure consistent implementation of NSF's expanded controls for major facilities oversight. Furthermore, NSF is ensuring adequate human capacity through implementation of the Program Management Improvement Accountability Act (PMIAA) on the major facility/acquisition portfolio for NSF staff overseeing major facility awards, and by establishing guidance on the necessary core competencies for recipient staff managing major facilities.

Since 2017, NSF has been through three Government Accountability Office (GAO) reviews related to its oversight of projects funded from the Major Research Equipment and Facilities Construction (MREFC) account. The June 2018 report entitled *National Science Foundation: Revised Policies on Developing Costs and Schedules Could Improve Estimates for Large Facilities* (GAO-18-370) recommended that NSF revise its policies for estimating and reviewing the costs and schedules of major facility projects to better incorporate the best practices in GAO's

guides. The March 2019 report entitled *National Science Foundation: Cost and Schedule Performance of Large Facilities Construction Projects and Opportunities to Improve Project Management* (GAO-19-227) recommended that NSF conduct a workforce gap analysis for project management competencies, ensure recipients provide lessons learned and best practices to NSF, and establish criteria for recipient project management competencies to be incorporated into NSF's review process. The April 2020 report entitled *National Science Foundation: Cost and Schedule Performance of Major Facilities Construction Projects and Progress on Prior GAO Recommendations* had no new recommendations. NSF has Corrective Action Plans (CAPs) in place as described below.

The COVID-19 pandemic presents unique challenges for major facilities, including protecting the safety of personnel and property, construction delays, and unanticipated additional costs given that it is considered an "unforeseen event." The greatest risk is the inadvertent misuse of funds when re-budgeting (Operations Stage awards) and the proper use of budget contingency funds (Construction Stage awards). Following the flexibilities granted through OMB guidance under the pandemic, NSF is taking action to address these risks by developing internal and external guidance for major facility programs and recipients. These efforts have included the following: (1) developing and updating a set of frequently asked questions (FAQs) specific to major facility recipients as a complement to NSF's implementation of Office of Management and Budget (OMB) Guidance; (2) issuing guidance jointly from the Office of the Director (OD) and the Large Facilities Office (LFO) to NSF Program Offices in response to the COVID-19 pandemic to ensure recipients segregate and track related cost increases; and (3) providing guidance for addressing re-baselining of construction projects and the application of management reserve for this unforeseen event. NSF will be following its current policies and controls with only minor clarifications. No additional controls are deemed necessary.

Based on NSF's evaluation of this Management Challenge under Enterprise Risk Management (ERM), coupled with activities already completed and those planned for FY 2020, NSF has determined that the residual risk impact for fraud, waste and abuse (Risk 1) is "low" and the likelihood is "very low" and that the residual risk impact for scientific performance (Risk 2) is "moderate" and the likelihood is "very low." Risk 2 impact and likelihood assume sufficient additional funding is made available. NSF is confident that its current and planned controls related to major facility oversight adequately consider and balance risk, resources, benefit to the science community, and stewardship of federal funds.

The planned corrective actions, demonstrated progress, and monitoring activities are described below.

NSF's Corrective Actions to Address the Challenge

Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years (FY 2016 - 2019)

Since 2015, NSF has implemented enhanced controls and strengthened agency governance to fully address the recommendations of the 2015 National Academy of Public Administration report; the requirements of the American Innovation and Competitiveness Act of 2017 (AICA); the FY 2018 and FY 2019 GAO Review Reports; and numerous OIG report recommendations. Examples of recent (FY 2019) agency actions include the following:

- Addition of the Chief Officer for Research Facilities (CORF) in the Office of the Director and Accountable Directorate Representatives; formation of the Major Facilities Working Group, Facilities Readiness Panel, and Facilities Governance Board; and implementation of Integrated Project Teams.
- Revised the *Major Facilities Guide* (MFG; NSF 19-68, September 2019) to include:
  - Created new Section 4.3 - *Schedule Development, Estimating, and Analysis.*

  - Requirement for Segregation of Funding Plan (as part of the Project Execution Plan) which requires recipients to describe how they allocate expenses between Construction and Operation Stage awards, particularly when awards overlap in duration.
  - Language describing the intent of the final Construction Stage review in determining whether the required project scope to meet science requirements was delivered in accordance with the Project Execution Plan and the impact on operations for any deferred work packages.
- Initiated major facilities portfolio workforce gap analysis as part of PMIAA implementation and the CAP for GAO-19-227.
- Revised Major Facilities Cooperative Agreement Supplemental Terms and Conditions (and any major facility contract terms and conditions) to require recipients to participate in NSF's Knowledge Management Program as part of the CAP for GAO-19-227.
- Drafted the new *Major Facilities Oversight Reviews* Standard Operating Guidance (SOG) to utilize external review panels more fully in addressing elements of cost and schedule and to evaluate the competencies of Recipient Key Personnel (GAO-18-370 and GAO-19-227).
- Drafted new MFG Section on *Key Personnel* as part of CAP for GAO-19-227.

Demonstrated Progress Through Agency Actions Taken in FY 2020

- Required recipients to develop Segregation of Funding Plans for the following NSF projects: Daniel K. Inouye Solar Telescope (DKIST), Vera C. Rubin Observatory (formerly Large Synoptic Survey Telescope, or LSST), Antarctic Infrastructure Modernization for Science (AIMS), Regional Class Research Vessel (RCRV), and Large Hadron Collider Hi-Luminosity Upgrade (HL-LHC) Program (the CMS and ATLAS projects).
- Converted Director's Watch List to Office of the Director's Watch List under cognizance of the Chief Officer for Research Facilities, formalizing the process of tracking open action items on a monthly to bi-monthly interval.
- Ensured that the AIMS project has Federal Acquisition Regulations (FAR)-compliant procedures in place, including requirements for expending funds for established purposes, tracking and billing of costs incurred, and record-keeping for audit comparable to Segregation of Funding Plans under cooperative agreements.
- Revised the *Business Systems Review (BSR) Guide* to better align with the Uniform Guidance and address implementation of Segregation of Funding Plans and the allocation of expenses during the Construction and Operations Stages (if identified as a risk).
- Implemented corrective actions in response to all OIG recommendations under OIG Report 18-2-005 *Audit of NSF's Oversight of Subrecipient Monitoring,* which included updating various NSF policies and procedures to: (1) align with the Uniform Guidance; (2) provide a specific mechanism to verify that Pass-through entities (PTEs) of large and complex awards complete subrecipient risk assessments; and (3) to require that PTEs clearly identify entities that will receive a subaward.

NSF's Anticipated Action Plan Milestones

NSF management developed the following anticipated milestones in consideration of NSF's strategic and operational objectives and the previous actions NSF has already taken as described above:

- Revise *Obligation and Allocation of Management Reserve* SOG (NSF-LFO-FY19-02-00) to clarify the relation to the NSB delegation order and eliminate the $10 million applicability limit for use on construction projects impacted by the COVID-19 pandemic [FY 2020, Q3].

- Finalize the *BSR Guide* and post for public comment [FY 2020, Q4].
- Finalize the *Major Facilities Oversight Reviews* SOG and provide to the OIG for consideration in closing the resolved recommendation in OIG Report 19-2-006, *Audit of NSF's Controls to Prevent Misallocation of Major Facility Expenses* [FY 2020, Q4].
- Complete the major facilities portfolio workforce gap analysis as part of Program Management Improvement Accountability Act (PMIAA) implementation and the CAP for GAO-19-227 [FY 2020, Q4].
- Finalize and post interim update to the MFG for public comment [FY 2021, Q1], including:
  - Content in the new MFG Section 4.3, *Schedule Development, Estimating, and Analysis.*
  - More detailed guidance on Segregation of Funding Plans and provide to the OIG for consideration in closing resolved recommendations in OIG Report 19-2-006, *Audit of NSF's Controls to Prevent Misallocation of Major Facility Expenses.*
  - New section(s) on *Key Personnel* and *Recipient Core Competencies.*
- Monitor allocation of funds between awards as part of required cost incurred audits using Segregation of Funding Plans as reference [on-going].

MANAGEMENT CHALLENGE 2: Meeting DATA Act Reporting Requirements

NSF Lead: Teresa Grancorvitz, Chief Financial Officer and Wonzie Gardner, Office Head, Office of Information and Resource Management (OIRM)

Summary of OIG Identified Challenge

In OIG Fiscal Year (FY) 2019 performance audit of NSF's implementation of the Digital Accountability and Transparency Act (DATA Act), the audit report (OIG 20-2-003) noted that "[data reviewed] did not meet OMB quality requirements [and several] data elements were inaccurate, incomplete, or untimely". Most of these OIG-identified errors were related to specific award actions, notable award closeout transactions, and post-closeout upward and downward modifications, that are not captured in NSF's Awards System. The report also acknowledged that although NSF has improved its DATA Act reporting, "challenges remain in implementing a process to ensure all award actions are transparent to the public".

NSF Management's Overview of the Challenge and Action Plan to Address and Monitor the Challenge

NSF is confident in the quality of our quarterly and monthly data submissions. The data submitted includes the required linkages between the submission files, the differences are legitimate and documented, and NSF's internal controls support the reliability and validity of the agency account-level and award-level data. NSF does not agree with the OIG's finding that the NSF award and financial systems must reconcile exactly. The data that the OIG pulled and identified as errors are not designated as "errors" in the Department of Treasury's (Treasury) DATA Act Information Model Schema (DAIMS) technical requirements, but are actually broker "warnings", which are previously disclosed as explainable differences between File C and D2.

NSF stores the original award amount and the true award actions (amendments) for additional funding, no-cost extensions and other administrative amendments in its award management system (Awards). NSF maintains

information regarding all financial award actions interfaced from Awards, outlays/expenditures, and accounting adjustments (resulting from award close and post-award close actions) in its financial management system (iTRAK). The policy of maintaining award close-out and post-award actions in iTRAK is in compliance with the Office of Management and Budget's (OMB) Uniform Grant Guidance (2 CFR 200). A unique Federal Award ID link exists between the two systems, providing full traceability for transactions that are interfaced from Awards to iTRAK, as required by the DATA Act guidance from OMB and Treasury (OMB M-15-12 and DAIMS specifications). The specific difference in interpretation between NSF and the OIG is whether the non-financial system should be used as an accounting ledger or sub-ledger.

NSF has communicated with OMB and Treasury requesting further guidance on this issue, and we have received several responses that support our position.

- On October 3, 2019, NSF received an email from Treasury that noted that DAIMS Policy and Procedures Guide does not provide detailed policy requirements for what should be in the award system and recommended agencies defer to FAR and 2 CFR 200 as well as OMB.
- On October 16, 2019, NSF received an email from OMB that confirmed our interpretation of 2 CFR 200, validating our approach of managing award activity between the award system and the financial management system.
- On October 24, 2019, NSF received an email from Treasury that validated NSF's opinion that the DAIMS Practices and Procedures contains no absolute requirement to have a one-to-one match between Files C and D2.
- On February 24, 2020, NSF provided OIG a walkthrough of various interactions with OMB and Treasury as well as additional clarifications on NSF data and its representation on USASpending.gov which also included a confirmation from Treasury that the "Obligation Amount" on USAspending.gov is pulled from File D2.

Since February, NSF has been in constant communication with OMB and Treasury through Leveraging Data As a Strategic Asset (LDASA) and Chief Financial Officers Council (CFOC) meetings on revising documentation to further address these explainable differences. Although we are working to resolve this issue before the next audit, Treasury has deferred documentation updates to future DAIMS releases. NSF is also currently undergoing a Government Accountability Office (GAO) audit in which we have explained the nature of the abovementioned recommendation and how it relates to our standard business processes. Since this regular business process comprises the majority of our submission warnings, we look forward to GAO's interpretation of the issue and related feedback at the conclusion of the audit.

The NSF business process that is used for recording and reporting these transactions to USASpending.gov is fully aligned with the DATA Act and applicable guidance (e.g., OMB M-17-04, and Treasury DAIMS technical guidance). Our monthly Financial Assistance Broker System (FABS) submission process ensures that reportable award actions from the Awards system are validated and reviewed by the stakeholders before publishing on USASpending.gov. NSF has also updated its Data Quality Plan (DQP) to note that the agency considers these adjustments as non-addressable, acceptable differences between Files C and D2. NSF accounts for these differences as part of its quantitative and qualitative materiality considerations, and monitors adjustments for significant increases to the risk of misstatement via its newly implemented Award Reconciliation Report. Further, NSF implemented a Quarterly Retrospective to review outstanding discrepancies and final dispositions of warnings, consider dollar materiality of issues, and document lessons learned for subsequent quarters.

Through this process, NSF validates that all addressable warnings identified within monthly reporting cycles were addressed at the time of certification to provide full transparency to the public over its award actions.

NSF's Corrective Measures to Address the Challenge

Demonstrated Progress Through Actions Taken in Prior Fiscal Years (FY 2019)

- Actively participated in the Chief Financial Officer Council (CFOC) DAIMS workgroup on data quality improvements, which is a cross-agency group led by Treasury for introducing potential improvements to the DAIMS specifications for improving data quality on USASpending.gov.
- Continued ongoing work, through the NSF Deputy Chief Financial Officer (DCFO) and staff, with the joint working group of the CFOC and the Council of the Inspectors General on Integrity and Efficiency (CIGIE) to provide input and recommendations around the next iteration of DATA Act policies, internal control, and audit guidance to OMB, Treasury, and CIGIE.
- Committed the NSF DCFO to leading a subgroup on internal controls, serving as primary author of a government-wide DATA Act Playbook, and actively participating in developing best practices for financial assistance data quality.
- Instituted processes to monitor and independently validate the effectiveness and sustainability of data quality measures. The NSF DATA Act Working Group worked with appropriate stakeholders from the Internal Controls and Enterprise Risk Management groups in developing and executing a data quality plan that would define NSF's FY 2019 approach to achieve reasonable assurance for internal control over quarterly DATA Act reporting. The plan was prepared in accordance with OMB M-18-16, *Appendix A to OMB Circular No. A-123*.
- Conducted a risk assessment of the 57 essential reporting elements related to procurement, financial management, and financial assistance data and submission processes and reviewed related system controls and Standard Operating Procedures (SOPs).
- Performed analysis of NSF's submission warnings to provide warning rationales, counts, and frequency of each identified warning during the execution phase of the data quality plan. This practice will continue with each quarterly submission and be reported in the annual assurance document.
- Updated documentation of DATA Act processes including, the DATA Act SOPs, Financial Assistance Broker System (FABS) Standard Operating Guidance, and NSF Acquisition Manual.
- Created a desk guide for the NSF Contracts Branch that includes step-by-step instructions intended to reduce recurring data errors.
- Implemented a SharePoint tool to assist in quarterly DATA Act submission processes by tracking Division Director assurances and the Senior Accountable Officer (SAO) certification.

Demonstrated Progress Through Actions Taken in FY 2020

- Corresponded with Treasury and OMB to get further clarity on the linkage requirements between Files C and D2 and to inform updates to Treasury DAIMS specifications that will provide more specific guidance on NSF's legitimate differences.
- Migrated reporting functionality from NSF's custom solution into iTRAK so that all reporting is now conducted directly out of NSF's financial system of record, with reconciliation reports also implemented into iTRAK directly.
- Implemented a SharePoint tool to assist in quarterly DATA Act submission process by tracking Division Director assurances and the SAO certification.

- Implemented an NSF Award Reconciliation Report to identify potential data issues across financial and award files and assign dollar impact and preliminary root causes to these issues to help report all addressable warnings.
- Incorporated lessons learned from feedback on data submissions to improve accuracy and efficiencies.
- Continued to work closely with OMB, Treasury, and intra-governmental groups to provide input into DATA Act technical guidance and policy
- Updated NSF's DQP for FY 2020 to provide an executive level summary of key and supplemental controls to ensure the completeness, accuracy, and timeliness of DATA Act submissions. This update includes new procedures developed and implemented to meet DAIMS 2.0 and OMB M-20-21 requirements.
- Updated DATA Act and FABS policies and procedures to reflect DAIMS 2.0 and OMB M-20-21 enhancements.
- Continued collaboration with NSF OIG and GAO to cooperate with and support their audit responsibilities as well as to resolve any recommendations through implementing a corrective action plan.

NSF's Anticipated Action Plan Milestones

NSF management developed the anticipated milestones below in consideration of NSF's strategic and operational objectives, the risks inherent to achieving these objectives, and the key actions NSF has already taken to address those risks.

- Incorporate recommendations from the GAO audit into NSF's reporting processes and controls.
- Continue to provide feedback to OMB and Treasury on recommended guidance changes that will help clarify the nature of NSF's legitimate differences, and reference to-be-published guidance in NSF policies and procedures.
- Continue to work with the OIG to achieve a common understanding and resolution of this issue.

MANAGEMENT CHALLENGE 3:
Managing the Intergovernmental Personnel Act (IPA) Program

NSF Leads: Wonzie Gardner, Office Head, OIRM and Joanne Tornow, Assistant Director, BIO

Summary of OIG Identified Challenge

IPAs can have a heightened risk of conflicts of interest while working at NSF because most IPAs come from institutions receiving NSF grants. The IPA program remains an area with inherent risk that NSF must continue to monitor and mitigate, because:

a) IPAs serve in a temporary capacity for up to 4 years, there is frequent turnover in staff at NSF, especially in senior leadership positions filled by IPAs.
b) IPAs can spend up to 50 days each year on Independent Research/Development (IR/D).
c) IPAs are not subject to Federal pay and benefits limits.

NSF Management's Overview of the Challenge and Action Plan to Address and Monitor the Challenge

NSF provides the opportunity for scientists, engineers, and educators to rotate into the Foundation as temporary Program Directors, advisors, and leaders. Rotators bring fresh perspectives from across the country and across all fields of science and engineering supported by the Foundation, helping influence new directions for research in science, engineering, and education, including emerging interdisciplinary areas. Many of these rotators remain involved in their professional research and development activities while working at NSF through participation in the IR/D program, which is overseen by the NSF IR/D Council.

NSF takes a proactive approach in the management of the IPA Program to appropriately consider and mitigate inherent risks associated with its execution.

Demonstrated Top Leadership Commitment:
The IPA Steering Committee reports directly to the NSF Director and Chief Operating Officer (COO) and has been in place since April 2016. The IPA Steering Committee is comprised of senior-level leadership across the agency, namely a Chair and Vice-Chair who are part of the agency's Senior Executive Service (SES), the Chairs of the NSF Executive Resources Board (ERB) and IR/D Council, Head of the Office of Diversity and Inclusion, and four at-large members, including two SES and two executive-level IPAs.

The IPA Steering Committee is charged with ensuring NSF is best utilizing the IPA hiring authority. It advises the Foundation's senior leadership on matters that directly concern policy on the use of the IPA Program, and on common approaches to budgeting and implementation of the program. It also regularly reports on its oversight and stewardship of the IPA Program, including costs associated with the program, to the Director and COO, the Office of Management and Budget (OMB), and Congress, pursuant to the American Innovation and Competitiveness Act (AICA).

Capacity:
The IPA Steering Committee is supported in the execution of its responsibilities by various NSF units with key expertise for risk management, reporting, and accountability, including BFA, the OIRM's Division of Human Resource Management, the Office of General Counsel (OGC), the Office of Legislative and Public Affairs, and the Office of Integrative Activities.

Demonstrated Progress:
NSF engages in continuous improvement of its management of the IPA Program, addressing the management challenges identified by the OIG as well as other agency-identified risks and challenges. In this way, NSF is ensuring the program fully supports the mission of the agency and the Nation's interests. Indeed, NSF believes that the steps taken to date as described above have reduced the inherent risk substantially, such that the residual risk is acceptable to the agency. One example is NSF's work to resolve and close the recommendations from OIG report 17-2-008, *NSF Controls to Mitigate IPA Conflicts of Interest*. The last of the four recommendations from this report was closed by the OIG in October 2018. This result demonstrates that NSF has effectively minimized the inherent risk of IPA conflicts of interest while working at NSF (since most IPAs come from institutions receiving NSF grants). NSF is confident that these actions taken in response to prior OIG recommendations and ongoing monitoring and controls have mitigated the potential risks associated with managing IPAs' COIs.

NSF's Corrective Measures to Address the Challenge

Demonstrated Progress Through Actions Taken in Prior Fiscal Years

a) *Because individuals serve in a temporary capacity for up to 4 years, there is frequent turnover in staff at NSF, especially in senior leadership positions filled by IPAs.*

- Ensured there is a "bench" of staff ready to fill developmental detail assignments to vacant executive positions who have been trained at the Federal Executive Institute (FEI), American University Executive Leadership Program, Harvard Business School Leadership Training, Individual Development Plans, and NSF Academy Leadership Development Program.
- Implemented the New Executive Transition Program (NeXT) in 2009 to onboard employees and IPAs transitioning into executive-level positions to help new executives reach full performance as quickly as possible by developing executive knowledge about NSF mission, culture, organization, people, and business processes.
- Instituted mandatory training for Program Officers, including IPAs, on NSF's Merit Review process which teaches how research proposals are evaluated and how to execute the Program Officer role.
- Created a parallel performance management system in 2014 for IPAs to ensure clarity in setting expectations and providing feedback on performance.
- Established a knowledge transfer process in 2015 that exiting IPA executives can use to transfer knowledge and information to incoming executives.
- Implemented a required three-day supervisory training and development course in 2015 called Federal Supervision at NSF designed to assist new federal supervisors (including IPAs) in understanding their roles and all the requirements pertaining to federal human capital management.
- Established a Steering Committee for Policy and Oversight of the IPA Program (IPA Steering Committee) in April 2016 to serve as the primary body for considering policy on NSF's use of IPAs, and to oversee common approaches to budgeting and implementation of the IPA program.

- Produced IPA Program Annual Reports for the Director of NSF, beginning in 2018. This report provides annual data and trend analyses on various aspects related to the use of IPAs at NSF for use by the Director and NSF senior managers in assessing and overseeing the program.
- Developed the Corrective Action Plan (CAP) response to the GAO report, *A Workforce Strategy and Evaluation of Results Could Improve Use of Rotating Scientists, Engineers, and Educators* (GAO-18-533).

b) *IPAs can spend up to 50 days each year on Independent Research/Development (IR/D).*

- Established the IR/D Council in October 2011 to develop and monitor internal controls related to the IR/D Program, including tracking the time spent on IR/D activities. Data from these internal controls are disseminated to NSF senior management quarterly for use in managing the IR/D Program within each organization.
- Developed an IR/D Guide in 2012 to clearly communicate NSF policies on the use of IR/D, including the possibility that participation in the IR/D Program could be curtailed if it compromised the completion of NSF duties.
- Designated IR/D experts in each Directorate/Office who receive annual training to ensure that NSF IR/D policies are implemented appropriately.
- Instituted a requirement that all IR/D plans provide an explanation of how the IR/D activities enhance the requestor's ability to perform NSF duties.
- Published a revised IR/D Guide in January 2017 that includes guidance limiting NSF payment of IPAs' IR/D travel to their home institutions to 12 trips per year. The guidance encourages IPAs to combine other NSF official business and/or telework with these trips to more efficiently use travel dollars.
- Delivered a "Benefits of the NSF IR/D Program" report to the NSF Deputy Assistant Directors (DADs) in March 2018 highlighting the value of IR/D in recruitment, research currency, and ethics protection.
- Monitored time spent on IR/D by both permanent and rotating staff, and provided quarterly data to NSF senior managers to ensure appropriate oversight of IR/D.
- Performed yearly data checks to assure that no IPA IR/D participant travel was paid by NSF in excess of 12 trips per year.

c) *IPAs are not subject to Federal pay and benefits limits.*

- NSF initiated a pilot requiring 10% cost sharing by IPAs' home institutions of their academic-year salaries and fringe benefits (per NSF Bulletin 16-11). This pilot applies to all new IPA agreements initiated in FY 2017 and beyond, including those for executive and program level staff. Additionally, NSF eliminated reimbursement for lost consulting. An assessment of the pilot indicated that the cost-share percentage increased from 7.2% in FY 2016 to 7.9% in FY 2017 to 9.2% in FY 2018 and to 10.4% in FY 2019. At the conclusion of FY 2019, NSF had realized significant cost avoidance with increased cost share dollars and participation rates each year.
- Engaged with the GAO on the salary reimbursements associated with IPAs. As noted in the GAO report, IPAs remain employees of their home institutions, with NSF reimbursing the institutions for most of their salaries and benefits. NSF does not set the salaries for rotators who are detailed to NSF using the IPA authority because their salaries are set by their home institutions.
- Submitted to Congress annual responses to the AICA (P.L. 114-329 Section 111 on Personnel Oversight) on the Justifications for Rotator Pay Exceeding the SES Pay Max.

Demonstrated Progress Through Actions Taken in FY 2020

a) *Because individuals serve in a temporary capacity for up to 4 years, there is frequent turnover in staff at NSF, especially in senior leadership positions filled by IPAs.*

- Submitted the IPA Program Annual Report covering the prior fiscal year to the Director of NSF.
- Integrated activities associated with the CAP in response to GAO-18-533 into Renewing NSF goal 1 Adapting the Workforce to the Work.
- Engaged in IPA Program Enterprise Risk Management to clearly identify IPA Program objectives and associated risks as they pertain to the mission of NSF.
- Established implementation plan to Integrate Program level and Executive level IPAs into the USA Performance Management System in FY21.

b) *IPAs can spend up to 50 days each year on Independent Research/Development (IR/D).*

- Continued the IR/D Program, which permits employees and individuals performing temporary service with NSF to maintain their involvement with their professional research and research-related activities. Prior to creating an IR/D plan, participants must receive approval from their supervisor for the time and expense related to the submitted activities. Additionally, the plan needs to be approved by the Division Director and designated IR/D Expert from the organization. IR/D activities may not interfere with other assigned NSF duties and may be curtailed at management's or the participant's discretion.
- NSF continued to maintain robust oversight, training, and internal controls to monitor use of the IR/D program as demonstrated by these actions taken in FY 2020.
- Submitted the IR/D Annual Report to the DADs, covering program participation statistics, average days and dollars requested and used and status of IR/D training and outreach.
- Provided annual training for IR/D experts, including updates to the IR/D Guide and the online electronic IR/D plan.
- Provided quarterly data to NSF senior managers to ensure appropriate oversight of IR/D time and travel by both permanent and rotating staff.
- Continued to perform yearly data check to assure that there are no IPA IR/D participants where NSF payment of travel to their home institutions exceeds 12 trips per year.

c) *IPAs are not subject to Federal pay and benefits limits.*

- Submitted the FY 2019 IPA Program Annual Report to OD, which demonstrated that the 10% cost-share pilot has reduced/eliminated the gap between IPA reimbursements and Fed salaries, and thus this is not a major risk to the agency.
- Effective January 16, 2020, informed by the data in the IPA Program Annual Report, NSF implemented the 10% Cost Share Policy for Personnel on Intergovernmental Personnel Act (IPA) Assignment to NSF. Submitted to Congress the FY2019 annual response to the AICA on the Justifications for Rotator Pay Exceeding the SES Pay Max.
- NSF is preparing a brief report to GAO that will highlight the efforts of the agency surrounding the IPA Cost Share Policy and address concerns surrounding IPA costs at the Foundation.

NSF's Anticipated Milestones

NSF management developed the anticipated milestones and responses to the findings in the OIG Management Challenge FY 2020 Report below in consideration of NSF's strategic and operational objectives, the risks inherent to achieving these objectives, and the key actions NSF has already taken in response to those risks.

a) *Because individuals serve in a temporary capacity for up to 4 years, there is frequent turnover in staff at NSF, especially in senior leadership positions filled by IPAs.*

- NSF conducted an analysis (January 2018) on IPA years of service and found that, on average, IPA executives serve 3.1 years at NSF and are 3 times more likely to stay for 3-4 years compared to staff-level IPAs. Non-executives serve, on average, 2.3 years at NSF. Per OPM, the average time a career SES spends in a position is 3.4 years and non-career SES is 1.7 years.[1]
- Thus, the turnover risk for IPAs is not any greater than for other employees. NSF will continue to use the robust onboarding, training, knowledge transfer, and performance management systems that are in place, to ensure that turnover of all employees and IPAs have minimal impact on operations.
- Migrate Program Director and Executive IPAs to the USA Performance system for managing performance plans.

b) *IPAs can spend up to 50 days each year on Independent Research/Development (IR/D).*

- Continue to submit the IR/D Annual Report to the DADs, covering program participation statistics, average days and dollars requested and used and status of IR/D training and outreach.
- Continue to provide annual training for IR/D experts, including updates to the IR/D Guide and the online electronic IR/D plan.
- Continue to provide quarterly data to NSF senior managers to ensure appropriate oversight of IR/D time and travel by both permanent and rotating staff.
- Continue to perform yearly data checks to assure that there are no IPA IR/D participants where NSF payment of travel to their home institutions exceeds 12 trips per year.

c) *IPAs are not subject to Federal pay and benefits limits.*

- As of FY 2020, the gap in pay between IPAs and Federal employees has been reduced/eliminated by implementing the required 10% cost-share as policy. Thus, this does not constitute a significant risk to the agency. NSF will continue to monitor costs of the program, and provide annual reports to the Director, COO and NSF senior management.

[1] *https://www.opm.gov/policy-data-oversight/senior-executive-service/facts-figures/#url=Demographics*

MANAGEMENT CHALLENGE 4: Managing the Antarctic Infrastructure Modernization for Science (AIMS) Project

NSF Lead: William Easterling, Assistant Director, Directorate for Geosciences and Kelly Falkner, Director, Office of Polar Programs

Summary of OIG Identified Challenge

a) *The Antarctic Infrastructure Modernization for Science (AIMS) Project will stretch Agency resources and may present additional challenges for NSF to overcome.*
b) *In addition, OPP is also managing construction of the Information Technology & Communications (IT&C) primary facility – a key precursor to the success of AIMS.*

NSF Management's Overview of the Challenge and Action Plan to Address and Monitor the Challenge

NSF—through the Office of Polar Programs (OPP) in the Directorate for Geosciences (GEO)—funds and manages the U.S. Antarctic Program (USAP). The USAP supports United States' research and national policy goals in the Antarctic. USAP has two major construction projects ongoing at McMurdo Station – the IT&C Primary Addition, which entails building onto an existing facility for the consolidation of IT&C functions, and the AIMS Project, for which 6 new facilities are being built to replace multiple outdated structures and consolidate key functions for more streamlined and efficient operations. Both projects are being implemented through NSF's Antarctic Support Contractor (ASC) under a FAR-based contract with NSF. Antarctica's remote location, extreme environment, and the short period of time during which the continent is accessible present challenges above and beyond those typically encountered for domestic construction projects.

The ASC (Leidos, Inc.) has a well-developed risk identification and mitigation process overseen by NSF as captured in the Project Execution Plan. The initial risk register for AIMS contained 120 entries to develop the project's budget contingency – key among them were delays in long-lead procurement items, inadequate quantities of fill material on-site, and work stoppages due to weather. Leidos mitigates the likelihood and impacts of these key risks through extensive pre-authorization planning and coordination to identify the key long-lead material and equipment purchases to support delivery dates meeting the logistics supply chain requirements. These procurements are captured and tracked in the project integrated master schedule and reviewed regularly by project and program leadership.

A significant challenge that remains is the risk of increased costs due to unpredictable and fluctuating market conditions. To minimize the impact of these uncertainties, each major construction package is awarded only after designs are complete, subcontractor bids are received, and costs are understood. This risk of rising costs has materialized in the first few construction packages, and mitigation steps have included evaluation of design-to-cost measures and seeking revised bids. Another significant challenge remaining is the need to align logistics

chain/cargo capacities with the planned pace of construction. To mitigate this risk, NSF and Leidos held a series of workshops to clearly define execution and oversight processes for each step in the logistics pathway.

The global pandemic associated with COVID-19, which is considered an unforeseen event not addressed by budget contingency for AIMS construction, has had impacts on the entirety of USAP operations. As a result of the significant health risk to the deployed population as well as global travel restrictions, it was necessary to make significant changes to program and construction project plans. The global pandemic resulted in "excusable delays" for the contractor as well as additional government-directed delays in performance of work under the AIMS project. This included placing the construction sites in a safe and stable configuration in March 2020 and bringing home deployed construction crews earlier than anticipated. In accordance with NSF policy, the magnitude of these impacts will require re-baselining of the AIMS project and OPP is actively engaged with Leidos, BFA, and the Office of the Director for that purpose.

NSF's Corrective Measures to Address the Challenge

Demonstrated Progress Through Actions Taken in Prior Fiscal Years

- Completed design and began construction on the IT&C Primary Addition Project. As of March 2020, the facility construction was 74% complete and is poised to be continued as conditions warrant. Significant delays to schedule due to the COVID-19 pandemic will now require a re-baselining effort.
- AIMS received authorization for the total project cost and duration from the National Science Board in February 2019 following extensive internal reviews and Independent Cost Estimate (ICE), with the first two construction packages awarded for the Vehicle Equipment and Operations Center and the Lodging Building exterior in April 2019.
- OPP augmented internal staffing for program/project management and oversight by assigning the management of capital projects to a dedicated staff resource.
- Shortly following AIMS authorization, weekly meetings of the core Integrated Project Team – including OPP, DACS, and LFO – were initiated.

Demonstrated Progress Through Actions Taken in FY 2020

- On-site work began on AIMS with aggregate production, and demolition of facilities in the footprint of VEOC and Lodging. As of March 2020, the project was approximately 16.5% complete. Significant delays to schedule due to the COVID-19 pandemic will now require a re-baselining effort.
- Continued to engage the research community to ensure they remained aware of potential disruptions that construction might have on Antarctic science.
- Partnered with BFA/DACS and LFO to identify areas the contractor needed to strengthen, which resulted in the contractor hiring additional staff, restructuring the office supporting the contract, and obtaining interagency support for cost analysis from the U.S. Army Corps of Engineers (USACE).
- Augmented the AIMS Integrated Project Team by adding a Project Controls Lead, providing support to the Program Officer.
- Restructured USACE support being provided to the AIMS project by moving from cost reasonableness reviews to full independent cost estimates for proposal packages.
- Completed verification and acceptance of the AIMS Earned Value Management System (EVMS) in accordance with NSF policy.
- Enlisted formal Value Engineering sessions with NSF participation.

- Increased financial oversight of Construction in Progress reporting and construction invoicing by requiring Program Officer review of every invoice, and augmenting the accounting support to OPP.

NSF's Anticipated Milestones in FY 2021

- Continue monitoring and oversight of the AIMS and IT&C Primary Addition Projects in accordance with established Internal Management and Project Execution Plans including external panel reviews and EVMS surveillance reviews for AIMS. Significant delays to schedule due to the COVID-19 pandemic will now require a re-baselining effort for both projects.
- Assess COVID-19 impacts and evaluate options for minimizing negative impacts to AIMS cost and schedule.
- Working closely with BFA, re-baseline AIMS, subject the revised cost, scope and schedule to external panel review, Facilities Readiness Panel Review, Director's Review Board Review and NSB re-authorization of the Total Project Cost.

MANAGEMENT CHALLENGE 5: Encouraging the Responsible and Ethical Conduct of Research

NSF Lead: Fleming Crim, Chief Operating Officer

Summary of OIG Identified Challenge

a) *Develop written guidelines or templates for universities to follow so that NSF can ensure the training is of sufficient quality and complies with Responsible Conduct of Research (RCR) training requirements. Strengthen the impact of RCR training by working with the National Institutes of Health to harmonize RCR expectations as much as possible.*

b) *Ensure that reports of sexual and other forms of harassment made pursuant to NSF's award term and condition are properly made to the NSF Office of Diversity and Inclusion and that NSF has enough staff and resources to respond to this new body of work.*

NSF Management's Overview of the Challenge and Action Plan to Address and Monitor the Challenge

Research supported by NSF must be conducted responsibly and ethically to ensure that it is credible to the science and engineering community, trusted by the public, and maximizes the Nation's return on investment. NSF views the Responsible and Ethical Conduct of Research (RECR) holistically—not only as a responsibility to generate and disseminate knowledge with rigor and integrity, but also as a responsibility to conduct peer review with the highest ethical standards; diligently protect proprietary information and intellectual property from inappropriate disclosure; and treat students and colleagues fairly and with respect. This expectation is fully articulated in the June 2020 update to the Proposal and Awards Policies and Procedures Guide (PAPPG) and on NSF's updated RECR web page.

NSF does not tolerate research misconduct (falsification, fabrication, and plagiarism) in proposing or performing research funded by NSF, in reviewing research proposals submitted to NSF, or in reporting research results

funded by NSF. Allegations of research misconduct (RM) are taken seriously and are investigated by NSF's OIG. The OIG refers completed investigations of RM to NSF for action. Upon determination of RM, NSF promptly takes appropriate action against individuals or organizations.

NSF is working to understand and reduce the occurrence of irresponsible and unethical research conduct through three sets of actions: 1) characterizing the problem and identifying priorities through stakeholder engagement, complemented by data collection and analysis; 2) funding basic research into the underlying causes and potential solutions, including the effectiveness of different approaches to improve RECR; and 3) implementing change through policy and public engagement. As reported by the OIG in its Fall 2019 Semiannual Report, the number of RM referrals to NSF from FY 2010 to FY 2019 has remained relatively low and has not trended upward. For example, from FY 2016 to FY 2019 NSF reviewed over 187,000 proposals, resulting in approximately 46,000 awards; *during that same four-year period, the OIG issued nearly four dozen referrals to NSF for RM (excluding other types of investigative referrals). Nearly half were allegations of research misconduct in proposals that NSF had not funded. Note that the referrals of potential RM account for just 0.02% of the proposals received.*

NSF is supporting research into the underlying causes, effective training practices, and how to best disseminate knowledge and best practice through community-led approaches. This approach will enhance understanding of the scope, causes, and best mitigation strategies to reduce detrimental conduct. NSF welcomes any further insight from the OIG into the scope and nature of RECR problems (including RM) brought to their attention. NSF is also involved in efforts to harmonize RECR expectations with other agencies, including the National Institutes of Health (NIH), being led by the Office of Science and Technology Policy (OSTP) through the National Science and Technology Council (NSTC) Joint Committee on Research Environment (JCORE). JCORE is co-chaired by the NSF Director, and NSF staff co-chair all four of the subcommittees: Coordinating Administrative Requirements for Research; Rigor and Integrity in Research; Research Security; and Safe and Inclusive Research Environments. Furthermore, NSF leadership has committed to ensuring that the award term and condition (T&C) associated with sexual and other forms of harassment reporting is managed effectively, dedicating professional staff and senior executives in the Office of the Director to respond to and assess the reporting processes and outcomes.

NSF's Corrective Measures to Address the Challenge

NSF has consistently addressed RECR by working to characterize the problem and identify priority actions; funding basic research into the underlying causes and potential solutions; and implementing change through policy and public engagement.

Demonstrated Progress Through Actions Taken in Prior Fiscal Years (FY 2019)

Characterizing the problem and identifying priority actions:

- Funded the Online Ethics Center to hold a national workshop on identifying promising practices and innovative programs in RECR education and practice.
- Issued a Dear Colleague Letter welcoming proposals in Education and Human Resources (EHR) on equity, inclusion, and ethics in Science, Technology, Engineering and Mathematics (STEM).
- Issued a Dear Colleague Letter encouraging researchers in computer and information science and engineering to include fairness, ethics, accountability, and transparency in their proposals.
- Renewed and refreshed the mission of the Online Ethics Center to develop communities of practices in RECR education (continuing into FY 2020).

Implementing change through policy and public engagement:

- Provided intramural and extramural guidance, resources, and consultation for the inclusion of ethics considerations in citizen science, collaborative/team science, and international science by NSF program officers overseeing the Ethics and Responsible Research Program (continuing into FY 2020).
- Conducted outreach to the Principal Investigator and awardee community on promising practices in RECR training; continued to encourage STEM faculty to incorporate RECR into their mentoring, teaching, and curriculum development (continuing into FY 2020).
- Presented guidance and NSF perspectives to university research integrity officers and other research administrators at a workshop on RECR tools and methods for university leaders.
- Expanded efforts to create a harassment-free environment internally at NSF, including requiring mandatory training in harassment prevention for all personnel, which includes Federal employees; Intergovernmental Personnel Act (IPA) assignees; Visiting Scientists, Engineers and Educators; in-house fellows; experts; and others who regularly conduct business at NSF. (See Staff Memorandum OD 19-09, Required Harassment Prevention Training.
- Clarified the PAPPG requirements for anti-harassment mitigation in conference/workshop proposals.
- Funded an Online Ethics Center workshop on training STEM faculty new to teaching ethics using a "train the trainer" approach for capacity building across diverse STEM communities (continuing into FY 2020).
- Published, communicated, and implemented NSF's new harassment policy.
- Added staff in the Office of Diversity and Inclusion to manage the harassment T&C process.
- Added additional questions and answers to further explain the new harassment policy in the updated T&C FAQs.
- Drafted language on the applicability of the new T&C for awards made directly to individuals (vs. institutions); e.g., for NSF Postdoctoral Fellowships.

Demonstrated Progress Through Actions Taken in FY 2020

Characterizing the problem and identifying priority actions:

- Collected stakeholder input through regular participation in the annual meetings of the Association for Practical and Professional Ethics.
- The Social, Behavioral & Economic Sciences (SBE) Directorate asked leading members from the Association for Practical and Professional Ethics to join SBE's Professional Societies Advisory Board and SBE's Committee of Visitors to provide direct stakeholder input into the Ethical and Responsible Research Program.
- OD and SBE staff members regularly discussed policy and best practices with colleagues in the HHS Office of Research Integrity.

Funding basic research into the underlying causes and potential solutions:

- Repositioned the former Cultivating Cultures for Ethical STEM program to SBE's Office for Multidisciplinary Activities and renamed to Ethical and Responsible Research to fund research projects that identify factors that are effective in the formation of ethical STEM researchers and approaches to developing those factors in all STEM fields that NSF supports. Increased the budget of this program from $3.55 million to $5.55 million.
- Renewed and refreshed the mission of the Online Ethics Center to develop communities of practices in RECR education.

Implementing change through policy and public engagement:

- Provided intramural and extramural guidance, resources, and consultation for the inclusion of ethics considerations in citizen science, collaborative/team science, and international science by NSF program officers overseeing the Ethics and Responsible Research Program.
- Conducted outreach to the principal investigator and awardee community on promising practices in RECR training; continued to encourage STEM faculty to incorporate RECR into their mentoring, teaching, and curriculum development.
- Funded an Online Ethics Center workshop on training STEM faculty new to teaching ethics using a "train the trainer" approach for capacity building across diverse STEM communities.
- Provided a comprehensive definition of RECR in the 2020 PAPPG: "The responsible and ethical conduct of research involves not only a responsibility to generate and disseminate knowledge with rigor and integrity, but also a responsibility to (a) conduct peer review with the highest ethical standards, (b) diligently protect proprietary information and intellectual property from inappropriate disclosure, and (c) treat students and colleagues fairly and with respect."
- Published revisions to the PAPPG to point to promising practices in RECR training, including the encouragement of faculty training and reference material to use in designing RECR training (National Academy of Sciences, Engineering, and Medicine (NASEM) Reports: Fostering Integrity in Research; Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine; and Reproducibility and Replicability in Science).
- Issued in the 2020 PAPPG clarification of requirements for disclosure of institutional/professional appointments to achieve full transparency.
- Created a "Speak Up" campaign to raise awareness of materials and resources available for personnel to address discrimination, bullying, harassment, stress and anxiety, physical safety, and violence in the workplace.
- ODI, in collaboration with OIA's evaluation and assessment team, developed a phased evaluation plan for the new T&C on reporting incidents of harassment, with the first stage starting in FY 2021.

NSF's Anticipated Action Plan Milestones

As NSF continues to characterize the problem and identify priority actions, fund basic research, and implement change through policy and public engagement, specific actions are planned for the coming year.

Strengthen the understanding and effectiveness of RECR training and community guidance through coordination with Federal agencies and the ethics community:

- Leverage NSF's leadership role as co-chair of the JCORE Safe and Inclusive Research Environment subcommittee and the JCORE Rigor and Integrity in Research subcommittee to promote the coordination and development of RECR among Federal agencies, including with NIH.
- Fund through the Ethical and Responsible Research program a prospective workshop that will curate relevant ethics and educational resources for NSF's RECR training requirements.
- Update NSF's RECR page periodically to ensure the newest resources and current information are available; build a more user-friendly portal for the new web site (see https://beta.nsf.gov/) that makes it easier to find available resources and makes NSF's commitment to RECR more prominent.

Assess and strengthen through action and policy efforts to reduce sexual and other forms of harassment:

- Implement Recommendation 15 from the GAO report, Sexual Harassment in STEM Research, that the "Director of NSF should establish goals and an overall plan to assess all of the agency's sexual harassment prevention efforts for their university grantees, including methods to regularly monitor and evaluate Its sexual harassment prevention policies and communications mechanisms."
- Collaborate with other Federal agencies to address harassment in a coordinated manner through active participation in the JCORE Safe and Inclusive Research Environment subcommittee and its ad hoc working groups.

MANAGEMENT CHALLENGE 6: Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

NSF Lead: Rebecca Keiser, Chief of Research Security Strategy and Policy

Summary of OIG Identified Challenge

Foreign government talent recruitment programs – designed to benefit the foreign state by obtaining information and technology from abroad – have the potential to exploit the openness of American universities and threaten the integrity of U.S. research initiatives. Talent recruitment programs target individuals with expertise in cutting-edge science, including NSF-funded researchers, merit review panelists, and career Federal employees or rotators who manage NSF's scientific programs. These programs may require members to provide proprietary or export-controlled information and create conflicts of interests. Failure to disclose membership in such programs can have criminal or civil ramifications.

NSF should continue to assess and refine its controls in this area and should work to ensure that it has sufficient staff and resources to respond to this challenge.

NSF Management's Overview of the Challenge and Action Plan to Address and Monitor the Challenge

The National Science Foundation seeks to maintain a vibrant science and engineering community for the benefit of the Nation. Participation in this community relies on individuals to uphold core principles and values such as openness, transparency, collaboration, and integrity. However, open scientific exchange and research face a challenge from some foreign governments through the use of talent recruitment programs. Some of these programs deliberately disregard these core principles and incentivize participants to acquire U.S. funded scientific research. These programs target scientists, engineers, and educators of all nationalities working or educated in the United States.

Over the past two years, NSF has taken steps to mitigate threats posed by foreign government talent recruitment programs. To ensure that NSF has sufficient staff and resources to continue to respond to this challenge, NSF created and filled the position of Chief of Research Security Strategy and Policy in March 2020 and is developing a new team to support the Chief. In addition, NSF coordinated with other agencies via the Joint Committee on the Research Environment (JCORE), an activity launched by the White House Office of Science and Technology Policy (OSTP) under the National Science and Technology Council in mid-2019.

Under the leadership of OSTP and through the JCORE subcommittee on research security which NSF co-chairs, U.S. science funding agencies are taking a risk-based approach to strike an appropriate balance between fostering the open and internationally collaborative environment that has contributed to the success of the U.S. research enterprise and mitigating emerging threats to the integrity of that enterprise. NSF also co-chairs a JCORE subcommittee on coordinating administrative requirements for research across the science funding agencies, including those associated with research security. We work closely with other U.S. government science agencies to share policies and practices, and regularly engage with the academic research community to educate them about the risks, hear their concerns about this emerging challenge, and clarify our positions, policies, and procedures. With an increased awareness of the risk, the U.S. research community now is better positioned to understand, evaluate, and do their part to address it.

NSF's Corrective Measures to Address the Challenge

Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years

In July 2019, NSF released a Dear Colleague Letter (DCL) on Research Protection to the research community from former Director Córdova. The DCL alerted the community to existing and emerging risks to the global research ecosystem, inspired conversations about balancing science and security, and warned of the risks of participation in foreign government talent recruitment programs. Further, it described NSF's commitment to vigilantly addressing emerging risks to the Nation's science and engineering enterprise, including concrete steps the agency is taking. To amplify the message from Director Córdova, NSF conducted outreach to multiple research community groups and sought best practices from the JASON advisory group, the National Science Board, and NSF Advisory Committees.

At the same time, NSF issued a policy prohibiting NSF personnel and rotators such as Intergovernmental Personnel Act personnel (IPAs) detailed to NSF from participating in foreign government talent recruitment programs. This policy helps prevent inappropriate foreign influence on NSF personnel. This change built on earlier steps to protect NSF's policies, programs, and priorities, including the merit review process. For example, in 2018, NSF issued a requirement that all staff employed by NSF or detailed to NSF must be U.S. citizens or have applied for U.S. citizenship. In addition, earlier in 2019, NSF issued a note to NSF staff reminding everyone that government ethics regulations require accurate and timely financial disclosure reports and that federal ethics rules apply to both our career and rotator personnel.

NSF's actions were taken in coordination with other U.S. agencies that fund basic research, including through the White House National Science and Technology Committee's JCORE subcommittees on research security and coordinating administrative requirements for research.

Demonstrated Progress Through Agency Actions Taken in FY 2020

- **Improved transparency / clarification for disclosure:** In January 2020, following a public comment process that began in May 2019, NSF issued clarifications to its proposal preparation requirements specified in the PAPPG to ensure senior personnel on proposals provide information on all sources of current and pending research support, foreign and domestic. NSF has also clarified its biographical sketch preparation requirements to ensure that any titled position is identified whether or not remuneration is received. Effective June 1, 2020, all senior personnel identified on an NSF proposal are required to comply with these requirements.

- **Standardized format and streamlined processes for disclosure:** As part of its revision to the PAPPG, NSF announced that use of an NSF-approved format will be required to be used by senior personnel in preparation of both the biographical sketch and current and pending support sections of the proposal. To streamline the process, NSF worked with the National Institutes of Health (NIH) to use SciENcv: Science Experts Network Curriculum Vitae as an NSF-approved format for both sections of the proposal. The formats were released in April 2020, and the community will be required to use an NSF-approved format to prepare these sections of any proposal submitted or due on or after October 5, 2020.
- **Issuance of a new award term and condition regarding previously undisclosed information:** NSF's longstanding policy is that senior personnel must disclose, in any submitted proposal, all current and pending support. In July 2020, NSF released a revised set of general terms and conditions that incorporated a new term that addresses the process and content requirements to be used if an organization discovers that a Principal Investigator or co-Principal Investigator on an active NSF award failed to disclose current support or in-kind contribution information as part of the proposal submission process. This new term and condition is effective for all new awards and funding amendments on existing awards effective October 5, 2020.
- **Term and condition for foreign collaboration considerations in major facilities:** In July 2020, NSF finalized a revised term and condition on foreign collaboration considerations for major facilities. The new term and condition is effective October 5, 2020, for new awards and funding amendments on existing awards. As of October 5, 2020, awards that contain the revised term and condition must provide NSF with advance notification of potential collaboration with non-U.S. organizations or governments in connection with its NSF-funded award and must await guidance from NSF prior to negotiating terms of any potential agreement.
- **Training for NSF staff:** In March 2020, NSF released mandatory training for all NSF personnel on science and security. It includes modules on risks from foreign governments, NSF's policies on disclosure, and NSF's policies on staff participation in foreign government talent recruitment programs.
- **Independent report on research security:** In December 2019, NSF accepted the final commissioned report from the independent JASON advisory group assessing risks to fundamental research. The study included recommendations for NSF and grantee institutions to maintain balance between openness and security of science. In March 2020, NSF published its response, agreeing with the report's recommendations and noting where the agency has already taken action or plans to do so. More details on NSF's actions are included elsewhere in this document, and briefly, they can be summarized in relation to the nine JASON recommendations:
    1. **Scope of disclosure:** NSF clarified its disclosure requirements in the revision to the PAPPG. NSF's new internal training reinforces these requirements. (see above)
    2. **Failures to disclose:** NSF developed a new term and condition for previously undisclosed information. (see above)
    3. **Responsibilities of all stakeholders and harmonization:**
        - NSF has conducted significant outreach with other federal agencies, Congress, the research community, and the OIG (as detailed in subsequent sections).
        - NSF has been in discussions with the NIH to examine the existing content disclosure requirements for both the biographical sketch and current and pending support by both agencies. The goal of this exercise is to harmonize, to the extent possible, the requirements imposed by both agencies.

- Through JCORE, NSF has worked to harmonize definitions of terms such as conflicts of commitment.

4. **Tools to evaluate risk:** Through JCORE, the U.S. government collected best practices in risk assessment and mitigation from the research community, from other agencies, and from the intelligence community. Internally, NSF has used an Enterprise Risk Management framework to identify and mitigate risks.
5. **Expand ethics training:** NSF has reviewed its internal training modules to adapt them for potential external use.
6. **Reaffirm the principles of NSDD-189:** NSF continues to support openness and transparency in fundamental research. In 2018, in its Statement on Security and Science (NSB-2018-42), the National Science Board "strongly reaffirm(ed) the principle behind President Reagan's National Security Decision Directive 189 (NSDD-189)."
7. **Communicate the problem and the importance of foreign researchers and collaborations:** NSF agreed with the JASON Advisory Group on the need for an evidence-based description of the scale and scope of the problems, though as many potential conflicts are not disclosed, understanding the full scale and scope is a great challenge. NSF has and will continue to communicate to other government agencies that international collaboration and participation are essential to our continued scientific advancement.
8. **Engage with foreign researchers in the United States:** NSF has engaged with the full community of researchers, both foreign and domestic, in the United States (see "Engagement with the Research Community" below).
9. **Plan for maintaining competitiveness for top talent globally:** NSF's specialized focus on STEM education, with a more than $900 million budget, has programs that concentrate on maintaining the excellence of the U.S. STEM educational system.

- **Leadership in the U.S. government:** As co-chair of the JCORE subcommittee on research protection, NSF coordinated policy, practices, and guidance on science and security with the White House, other science agencies, and the intelligence and law enforcement communities. JCORE developed education and outreach materials – including a slide deck released in June 2020 called Enhancing the Security and Integrity of America's Research Enterprise – that highlight examples of risks to research and outline actions the Federal government is taking to protect America's research enterprise.
- **Engagement with Congress:** In November 2019, the Head of NSF's Office of International Science and Engineering, testified before the Permanent Subcommittee on Investigations of the Senate Committee on Homeland Security and Governmental Affairs. The briefing focused on NSF's efforts to implement all reasonable and necessary steps to ensure the integrity of federally-funded research and protect against threats from foreign government talent recruitment programs. In March 2020, a similar briefing was provided to the House Committee on Science, Space, and Technology.
- **Engagement with the research community:** To increase awareness of the risks and compliance with NSF's policies and procedures, NSF met with or presented to the research community, including to the National Science Board, Association of American Universities, Association of Public and Land-grant Universities, American Association of the Advancement of Science Board of Directors, Council on Government Relations, NSF Advisory Committees, American Physics Society, International Union of Pure and Applied Physics, American Society for Engineering Education, Federal Demonstration Partnership, and National Academies of Science, Engineering, and Medicine's Committee on Science, Engineering, Medicine, and Public Policy. NSF's outreach included an articulation of the clarified requirements for

both the biographical sketch and current and pending support sections of the proposal. This outreach helped NSF to develop, issue, and update a set of Frequently Asked Questions to help ensure a consistent understanding on NSF expectations.

- **Engagement with the Office of Inspector General:** In 2020, NSF worked collaboratively with the OIG, where appropriate, to address threats posed by foreign government talent recruitment programs. In 2020, consistent with our OIG Cooperation Directive, NSF continued to support the OIG's investigations, including those involving allegations related to foreign talent programs. Our support includes taking appropriate actions such as suspending or terminating awards, based on OIG recommendations arising from, for example, investigations for failures to disclose foreign talent program affiliations.
- **Risk-benefit assessments:** Consistent with OSTP's guidance to utilize a risk-based approach to balance the need to foster an open and internationally collaborative environment while mitigating threats to the integrity of that enterprise, NSF worked with experts in Enterprise Risk Management to conduct risk assessments and analyses to guide decision-making. This includes assessing and refining NSF's controls to mitigate threats posed by foreign government talent recruitment programs. NSF also developed and implemented a formal process to assess requests for collaborative agreements with foreign entities that may involve items of value provided to or from NSF-funded major research facilities.
- **Creation of the position of Chief of Research Security Strategy and Policy:** In March 2020, NSF created and filled the position of Chief of Research Security Strategy and Policy (CRSSP) and established a Research Security Strategy and Policy Group. The CRSSP is the NSF focal point for providing science and security strategy and policy recommendations to NSF leadership and for ensuring that NSF has the information that it needs to act vigilantly to address existing and emerging risks to the Nation's science and engineering enterprise posed by foreign government talent recruitment programs.

NSF's Anticipated Action Plan Milestones

NSF management developed the anticipated milestones below in consideration of NSF's strategic and operational objectives, the risks inherent to achieving these objectives, and the key actions NSF has already taken in response to those risks.

- Continue to serve as co-chair of the JCORE subcommittees on research security and reducing administrative workload and work closely with the White House, other federal science funding agencies, and intelligence and law enforcement communities to share information, promote outreach, coordinate policy and practices, and develop guidance for federal departments and agencies, as well as for universities and other research institutions.
- Facilitate NSF's access to classified information and ability to engage in classified discussions with other U.S. government agencies more easily, including through the addition of a Sensitive Compartmented Information Facility (SCIF) in NSF's headquarters.
- Evaluate recommendations and consider implementing additional policy steps or outreach related to research security at both the agency level and the JCORE level. Additional activities could include, but are not limited to:
    1. **Scope of disclosure:** Require the use of an NSF-approved format for biographical sketches and current and pending support in proposals submitted or due on or after October 5, 2020.
    2. **Failures to disclose:** Continue to coordinate with the NSF OIG and take the appropriate action needed to address violations.

3. **Responsibilities of all stakeholders and harmonization:** Harmonize requirements and systems with other U.S. science funding agencies, when practical; co-chair the JCORE subcommittee on coordinating administrative requirements for research.
4. **Tools to evaluate risk:** Continue to use the Enterprise Risk Management framework to describe science and security risks and implement risk mitigation strategies; initiate the development of risk assessment tools; and carry out regular risk assessments regarding the impacts of NSF's response to the threats posed by foreign government talent recruitment programs. Develop an approach to promulgate best practices in the research community.
5. **Expand ethics training:** Prepare and distribute communication and briefing material for the external scientific research community on science and security and research integrity.
6. **Reaffirm the principles of NSDD-189:** Work with other U.S. government agencies to further reaffirm the National Policy on the Transfer of Scientific, Technical and Engineering Information (aka NSDD-189) and maintain the distinction between research that should continue to be made open to the scientific community and research that should be protected due to security concerns.
7. **Communicate the problem and the importance of foreign researchers and collaborations:** Support efforts of JCORE, the intelligence community, and/or law enforcement to understand the scale and scope of the risk of inappropriate foreign influence on the U.S. science and engineering research ecosystem, recognizing that this is a great challenge.
8. **Engage with foreign researchers in the United States:** Further engage with the full community of researchers, both foreign and domestic.
9. **Plan for maintaining competitiveness for top talent globally:** Continue to support programs that will increase the pool of top science and engineering talent available in the United States.

PAYMENT INTEGRITY INFORMATION ACT REPORTING

The Improper Payments Information Act of 2002 (IPIA; Pub. L. 107-300), as amended by the Improper Payments Elimination and Recovery Act of 2010 (IPERA; Pub. L. 111-204), the Improper Payments Elimination and Recovery Improvement Act of 2012 (IPERIA; Pub. L. 112-248), and the Payment Integrity Information Act of 2019 (PIIA; Pub. L. 116-117) require agencies to annually report information on improper payments to the President and Congress. More detailed information on improper payments and all of the information previously reported in the AFR that is not included in this FY 2020 AFR can be found at https://paymentaccuracy.gov/.

Actions Taken to Address Auditor Recovery Recommendations

Using OMB Circular A-123, Appendix C, Part III.C.6 guidance, NSF determined, that it would not be cost effective to conduct recapture audits of its single grants program and other activities (contracts, charge cards, and payments to employees). OMB agreed with NSF's analysis. As such, NSF did not conduct payment recapture audits during FY 2020.

NSF has leveraged the results of the work performed under IPERA, audits, grant monitoring programs, and internal control reviews. All consistently demonstrated that there is not a significant risk of unallowable costs or improper payments within NSF's single grant program and other mission support activities. No circumstances have changed within NSF's grant program or its mission support activities requiring NSF to reassess its payment recapture cost-effectiveness analysis.

Fraud Reduction Report

The Fraud Reduction and Data Analytics Act (FRDAA) of 2015, Pub. L. 114-186, requires agencies to improve federal agency financial and administrative controls and procedures to assess and mitigate fraud risks, and to improve federal agencies' development and use of data analytics for the purpose of identifying, preventing, and responding to fraud, including improper payments.

In FY 2020, NSF incorporated fraud risk into its analytics and control activities to proactively mitigate and monitor potential fraud scenarios. NSF implemented a fraud risk-based approach in the following areas:

- *Improper Payments Predictive Modeling*: NSF developed a prototype risk model that uses Single Audit data to provide a quantitative view of which NSF awardees may present relatively higher risk of improper payments on a go-forward basis and in light of the evolving risk in the COVID-19 environment. This will help the agency address improper payments risk, including fraud risk, with targeted monitoring.
- *Travel Card Misuse Monitoring*: NSF increased the efficiency of its travel card monitoring process by automating key portions of the monthly travel card misuse review. The team also developed a Travel Card Misuse Dashboard to increase transparency into potential misuse, including fraud, and associated follow-up activities. The dashboard also provides a stronger overarching perspective of travel activity across NSF, enabling users to derive new insights into financial trends or potential areas of interest with the travel card program.
- *Enhanced Risk and Control Checkpoints*: As part of an enhanced risk and control checkpoint in September 2020, NSF assessed its risk and control landscape to identify areas of potential elevated risks associated with COVID-19, including the risk of fraudulent activities by internal and external parties. NSF reviewed the elevated risk areas with process owners and updated levels of

risk and control activities to stay abreast of key monitoring activities and changes to fraud indicators.

In FY 2021, NSF will continue to identify and monitor fraud risks, as well as key data and information that can be leveraged to improve controls and monitoring activities. As the agency's data analytics program continues to mature, NSF will look for additional opportunities to introduce advanced tools and techniques to support fraud risk identification and monitoring.

REAL PROPERTY

NSF's headquarters, in Alexandria, Virginia, is leased by the General Services Administration (GSA). The move to the new headquarters was completed in FY 2018, and NSF's occupancy agreement is through FY 2032.

Real property metrics for NSF and other federal agencies are available at the FY 2019 Reduce the Footprint results link: https://www.performance.gov/real-property-metrics/.

CIVIL MONETARY PENALTY ADJUSTMENT FOR INFLATION

The Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015 (the 2015 Act; Sec. 701 of Public Law [P.L.] 114–74) further amended the Federal Civil Penalties Inflation Adjustment Act of 1990 (P.L. 104–410) to improve the effectiveness of civil monetary penalties and to maintain their deterrent effect. The 2015 Act requires agencies to (1) adjust the level of civil monetary penalties with an initial "catch-up" adjustment through an interim final rulemaking and (2) make subsequent annual adjustments for inflation. Inflation adjustments are to be based on the percent change in the Consumer Price Index for all Urban Consumers (CPI-U) for the month of October preceding the date of the adjustment, relative to the October CPI-U in the year of the previous adjustment.

The only civil monetary penalties within NSF's jurisdiction are those authorized by the Antarctic Conservation Act of 1978, 16 U.S.C. 2401, et seq., and the Program Fraud Civil Remedies Act of 1986, 31 U.S.C. 3801, et seq.

The following table identifies NSF's FY 2020 inflation adjustments to civil monetary penalties.

Table 3.3 – FY 2020 Civil Monetary Penalty Adjustment for Inflation

Statutory Authority	Penalty (Name and Description)	Year Enacted	Latest Year of Adjustment (via Statute or Regulation)	Current Penalty Level ($ Amount or Range)	Location for Penalty Update Details
Antarctic Conservation Act of 1978, 16 U.S.C., 2401 *et seq.,* as amended	Antarctic Conservation Act, Knowing violations	1978	2020	$29,755	85 FR 1825 Friday, January 10, 2020
Antarctic Conservation Act of 1978, 16 U.S.C., 2401 *et seq.,* as amended	Antarctic Conservation Act, Not knowing violations	1978	2020	$17,583	85 FR 1825 Friday, January 10, 2020
Program Fraud Civil Remedies Act of 1986, 31 U.S.C., 3801, *et seq.*	Program Fraud violations	1986	2020	$11,665	85 FR 1825 Friday, January 10, 2020

GRANTS PROGRAM REPORTING

Expired Awards Not Closed

OMB's Circular A-136, Financial Reporting Requirements requires agencies with Federal grants programs to submit a high-level summary of expired, but not closed, Federal grants and cooperative agreements (awards). Table 3.4, below, shows the total number of awards and balances for which closeout has not yet occurred, but for which the period of performance has elapsed by two years or more prior to September 30, 2020.

Table 3.4 – Age and Balances for Expired Awards not Closed

CATEGORY	2 – 3 Years	>3-5 years	>5 years
Number of Grants/ Cooperative Agreements With Zero Dollar Balances	224	288	279
Number of Grants/ Cooperative Agreements With Undisbursed Balances	30	31	-
Total Amount of Undisbursed Balances	$1.6 million	$1.7 million	-

Information shown above is as of 9/30/2020.

Of the 852 financial assistance awards (grants, cooperative agreements, and fellowships) that are expired but not closed, 61 have undisbursed balances; these balances total $3.3 million. Most of these 61 awards are to SBIR/STTR awardees or individual fellowship recipients. NSF plans to address the closeout of these awards in planned updates to our operating policies and procedures for automatic financial closeout of awards.

NSF works to close out all awards as quickly as possible. Typically, awards are financially closed 120-days after the end-date of the award and are administratively closed automatically once the awards are financially closed. The majority of the awards that are still not fully closed on this report have overdue final project reports and/or project outcome reports. While NSF has already incorporated many policies and procedures to track and enforce the submission of required project reports, NSF plans to review our current process and tighten our controls. These changes include reporting overdue report information to the Federal Awardee Performance and Integrity Information System, as prescribed in the revised 2 CFR § 200 published in the Federal Register on August 13, 2020,[1] among other possible changes.

[1] https://www.federalregister.gov/documents/2020/08/13/2020-17468/guidance-for-grants-and-agreements

UNDISBURSED BALANCES IN EXPIRED GRANT ACCOUNTS

In FY 2020, NSF funded research and education in science and engineering through grants and cooperative agreements to 1,900 colleges, universities, and other institutions. NSF grants are funded in one of two ways: (1) the grant may be funded fully at the time of award, called a standard grant, or (2) the grant may be funded incrementally (one year at a time), called a continuing grant. In both cases, all costs on the grant must be incurred by the grantee during the term of the grant period. At NSF, grantees typically have 120 days after the grant expires to complete final drawdowns and expenditures.

The information provided here pertains to the agency's two grant making appropriation accounts: Research and Related Activities and Education and Human Resources. The data reported are based on the following definitions:

- An **expired grant** is a grant award that has reached the grant end date and is eligible for closeout. For NSF, this means grants with an expired period of performance.
- **Undisbursed balances** on expired grants are amounts that remain available for expenditure before it is closed out.

Once a grant has expired, NSF takes actions to close out the grant both administratively and financially. The financial closeout action takes place 120 days after the award expiration date when the undisbursed balances are de-obligated from the award. Administrative closeout is initiated after financial closeout is completed.

The methodology used to develop undisbursed balances on expired grant awards is consistent with the U.S. Government Accountability Office (GAO) conclusions documented in their April 2012 report, GAO-12-360, *Grants Management: Action Needed to Improve the Timeliness of Grant Closeouts by Federal Agencies,* along with discussion and clarifying information from GAO. The data reported here reflects the amount of undisbursed balances in grant accounts that have reached their end date and are eligible for closeout and is provided in accordance with OMB M-16-18, *Financial and Performance Reporting on Undisbursed Balances in Expired Grant Accounts*.

1. **In the preceding three fiscal years, the total number of expired grant accounts with undisbursed balances (on the first day for each fiscal year) and the total amount that has not been obligated to specific grant or project remaining in the accounts**
   The number of expired grants with undisbursed balances for the preceding three fiscal years is provided in Table 3.5. The numbers and balances reflect a point in time before expired awards are closed out during normal processes described above. For FY 2020, there were 4,478 expired grants with undisbursed balances of $84,615,563.

Table 3.5 – Status of Undisbursed Balances in Expired Grants

	FY 2020 (as of 9/30/20)	FY 2019 (as of 9/30/19)	FY 2018 (as of 9/30/18)
Number of expired grants	4,478	5,204	5,225
Undisbursed balances prior to closeout	$84,615,563	$97,666,016	$107,860,158

2. Details on future action NSF will take to resolve undisbursed balances in expired grant accounts

NSF continually monitors its grant awards throughout their lifecycle following a comprehensive post-award monitoring process. NSF grants are closed based on their period of performance end date. All unliquidated (or undisbursed) award balances are de-obligated 120 days after the grant period has expired. Having small undisbursed balances at the end of the grant period is a routine occurrence, as not all grantees fully spend the funds obligated during the course of their research.

3. The method that NSF uses to track undisbursed balances in expired grant accounts

NSF completes financial closeout of expired grant awards on a daily basis using a set of automated and manual activities. Eligibility for closeout for all NSF awards begins 120 days after the award expiration date. The NSF closeout process automatically de-obligates any unliquidated award balance, produces an award closeout transaction to flag the award as financially closed, and sends the financial closeout date to NSF's award management system. This initiates final administrative closeout procedures in the award management system.

The expected award closeout date is made available to awardees and staff through the Award Cash Management Service (ACM$). ACM$ requires the submission of award level payment amounts and expenditures each time funds are requested by awardees and allows NSF to complete post-award monitoring at the individual award level throughout the lifecycle of the award.

4. Process for identification of undisbursed balances in expired grant accounts that may be returned to the Treasury of the United States

When a grant is closed out, the unliquidated balances are de-obligated. The de-obligated grant balances are treated one of three ways:

- If the source appropriation is still active, the balances are recovered by NSF and remain available for valid new obligations until the source appropriation's expiration date.
- If the source appropriation has expired but funds have not yet been canceled, the grant balances are recovered by NSF and remain available for upward adjustments on other existing obligations within the source appropriation.
- If the source appropriation has been canceled, the grant balances are returned to the Treasury.

Prior to September 30 of each year, all undisbursed grant balances in canceling appropriations are de-obligated and subsequently returned to Treasury.

AWARDS TO AFFILIATED INSTITUTIONS

The following table lists institutions affiliated with members of the National Science Board (NSB) in FY 2020.[2]

Affiliated Institution	Awards Obligated in FY 2020 (Dollars in thousands)
Arizona State University	$65,312
California Institute of Technology	81,297
Catholic University of America	1,262
Massachusetts Institute of Technology	95,471
Michigan State University	83,720
Southwest Research Institute	374
Stanford University	93,747
University of Colorado	119,235
University of Florida	49,691
University of Massachusetts	58,878
University of Oregon	20,524
University of Tennessee	28,255
University of Texas at El Paso	17,331
University of the District of Columbia	1,760
University of Utah	43,480
University of Vermont	12,944
Washington University	20,447
TOTAL	***$ 793,728***

[2] This information is provided solely in the interest of openness and transparency. The table lists the dollar value of the awards made to institutions affiliated with NSB members during their time on the NSB in fiscal year ended September 30, 2020. NSB establishes the policies of NSF within the framework of applicable national policies set forth by the President and Congress. Federal conflict of interest rules prohibit NSB members from participating in matters where they have a conflict of interest or there is an impartiality concern without prior authorization from the designated agency Ethics Official. Individual NSF grant awards are made pursuant to a peer-review based process and most are not reviewed by the NSB. With regard to matters that are brought to the Board, NSB members are not involved in the review or approval of grant awards to their affiliated institutions. The table displaying Awards to Affiliated Institutions applicable to the previous fiscal year is available in the Appendices at https://nsf.gov/pubs/2020/nsf20002/pdf/nsf20002.pdf. Because of the regular turnover among NSB membership, the information in these tables is not directly comparable across years.

AWARDS TO ASSISTANT DIRECTOR IPAS' HOME INSTITUTIONS BY NSF DIRECTORATES

The following tables identify the awards made by directorates to the home institutions of Assistant Directors serving under the Intergovernmental Personnel Act (AD IPAs) during their time at NSF for the fiscal years ended September 30, 2020 and 2019. AD IPAs led five of the seven directorates during the fiscal year ended on September 30, 2020 and led six of the seven directorates during the fiscal year ended on September 30, 2019. NSF executive staff formulate directorate or office scientific goals, objectives, and priorities. Federal conflict of interest rules prohibit executives, including IPA detailees who serve in AD positions, from participating in matters where they have a conflict of interest or an impartiality concern. NSF grant awards are made pursuant to a merit-review based process and are not routinely reviewed by IPAs serving in executive positions. If matters are brought to such IPAs, they do not participate in the review or approval of awards to their home institutions. The following tables are provided in the interest of openness and transparency.

Table 3.6 – FY 2020 Awards to AD IPAs' Home Institutions
(Dollars in Thousands)

Directorate	Total Dollars and Awards Made by Directorate in FY 2020[3]	Home Institution of IPA Assistant Director	Total Dollars and Awards to Home Institution by Directorate in FY 2020	Total Dollars and Awards to Home Institution by NSF in FY 2020
Computer & Information Science & Engineering	$1,018,016 (3,666 awards)	Princeton University	$7,539 (36 awards)	$64,010 (149 awards)
Engineering	$1,022,730 (3,751 awards)	University of Michigan	$20,961 (69 awards)	$120,997 (329 awards)
Geosciences	$1,524,571 (2,569 awards)	Pennsylvania State University	$8,552 (33 awards)	$81,686 (267 awards)
Social, Behavioral, & Economic Sciences	$260,831 (1,387 awards)	University of Michigan	$10,468 (31 awards)	$120,997 (329 awards)
Education & Human Resources	$1,036,508 (1,993 awards)	Portland State University	$497 (2 awards)	$5,779 (28 awards)
Total	$4,862,656 (13,366 awards)		$48,017 (171 awards)	$272,472[4] (773 awards)

[3] Some NSF awards are split funded, meaning an award is funded by two or more directorates. For a split-funded award in this column: the award is counted for each directorate; the award funding is only the split-funded amount.
[4] Two IPAs from the University of Michigan served as Ads during the entire FY 2020. Award dollars and count have been reduced by $120,997 thousand and 329 awards, respectively, in this total box to avoid double counting.

Table 3.7 – FY 2019 Awards to AD IPAs' Home Institutions
(Dollars in Thousands)

Directorate	Total Dollars and Awards Made by Directorate in FY 2019[5]	Home Institution of IPA Assistant Director	Total Dollars and Awards to Home Institution by Directorate in FY 2019	Total Dollars and Awards to Home Institution by NSF in FY 2019
Computer & Information Science & Engineering	$982,907 (3,411 awards)	University of Massachusetts – Amherst	$11,749 (54 awards)	$47,655 (197 awards)
Education & Human Resources	$1,072,584 (1,772 awards)	Portland State University	$8,503 (8 awards)	$16,397 (37 awards)
Engineering	$970,592 (3,701 awards)	University of Michigan	$14,068 (52 awards)	$107,482 (299 awards)
Geosciences	$1,666,931 (2,549 awards)	The Pennsylvania State University	$13,147 (31 awards)	$77,300 (239 awards)
Mathematics & Physical Sciences	$1,556,611 (4,496 awards)	George Washington University	$634 (6 awards)	$11,373 (55 awards)
Social, Behavioral, & Economic Sciences	$239,443 (1,212 awards)	University of Michigan	$15,679 (32 awards)	$107,482 (299 awards)
Total	$6,489,068 (17,141 awards)		$63,780 (183 awards)	$260,207[6] (827 awards)

[5] Some NSF awards are split funded, meaning an award is funded by two or more directorates. For a split-funded award in this column: the award is counted for each directorate; the award funding is only the split-funded amount.
[6] Two IPAs from the University of Michigan served as ADs during the entire FY 2019. Award dollars and count have been reduced by $107,482,000 and 299 awards, respectively, in this total box to avoid double counting.

NSF SENIOR MANAGEMENT AND NATIONAL SCIENCE BOARD

NSF Senior Management

(as of September 30, 2020)

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Vacant, *Deputy Director*
F. Fleming Crim, *Chief Operating Officer*
Brian Stone, *Chief of Staff*

O/D Offices

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Rhonda Davis, *Head*
Affirmative Action Officer

Office of the General Counsel
Lawrence Rudolph, *General Counsel*

Office of Integrative Activities
Suzanne Iacono, *Head*

Office of International Science & Engineering
Rebecca S. Keiser, *Head (Acting)*

Office of Legislative & Public Affairs
Amanda Greenwell, *Head*

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Joanne S. Tornow, *Assistant Director*

Directorate for Computer & Information Science & Engineering
Margaret Martonosi, *Assistant Director*

Directorate for Education & Human Resources
Karen A. Marrongelle, *Assistant Director*

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Directorate for Social, Behavioral, & Economic Sciences
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Office of Information & Resource Management
Wonzie L. Gardner, *Head*
Chief Human Capital Officer

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Dorothy Aronson (O/D)

Chief Officer for Research Facilities
James S. Ulvestad (O/D)

Chief of Research Security Strategy and Policy
Rebecca S. Keiser (O/D)

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Terms expired May 10, 2020

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National Academy of Engineering

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Maria T. Zuber

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Terms expire May 10, 2026

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Oak Ridge National Laboratory/University of Tennessee, Knoxville

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Aaron Dominguez
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University of Massachusetts, Dartmouth

Heather A. Wilson
University of Texas, El Paso

*Member of the National Science Board whose term has recently expired, temporarily serving as a consultant to the Board

Member ex officio

Sethuraman Panchanathan, *NSF Director*

National Science Board Office

John J. Veysey, II, *Executive Officer*

Office of Inspector General

Allison C. Lerner, *Inspector General*

PATENTS AND INVENTIONS RESULTING FROM NSF SUPPORT

The following information about inventions is being reported in compliance with Section 3(f) of the National Science Foundation Act of 1950, as amended [42 U.S.C. 1862(f)]. There were 1,134 NSF invention disclosures reported to NSF either directly or through the National Institutes of Health's iEdison database during FY 2020. Rights to these inventions were allocated in accordance with Chapter 18 of Title 35 of the United States Code, commonly called the "Bayh-Dole Act."

ACRONYMS

ACM$	NSF Award Cash Management Service
AFR	Agency Financial Report
AI	Artificial Intelligence
AICA	American Innovation and Competitiveness Act of 2017
AIMS	Antarctic Infrastructure Modernization for Science
AOAM	Agency Operations and Award Management
APG	Agency Priority Goal
APR	Annual Performance Report
ASC	Antarctic Support Contractor
BFA	Office of Budget, Finance and Award Management
BSR	Business Systems Review
CA	Convergence Accelerator
CARES Act	Coronavirus Aid, Relief, and Economic Security Act
CAP	Cross-Agency Priority or Corrective Action Plan
CFO	Chief Financial Officers
CFOC	Chief Financial Officers Council
COO	Chief Operating Officer
COVID	Coronavirus
DATA Act	Digital Accountability and Transparency Act of 2014
DAIMS	DATA Act Information Model Schema
DQP	Data Quality Plan
EHR	Directorate for Education and Human Resources
ERM	Enterprise Risk Management
EVMS	Earned Value Management System
FASAB	Federal Accounting Standards Advisory Board
FBWT	Fund Balance with Treasury
FECA	Federal Employees' Compensation Act
FFMIA	Federal Financial Management Improvement Act of 1996
FFRDC	Federally Funded Research and Development Center
FISMA	Federal Information Security Modernization Act
FMFIA	Federal Managers' Financial Integrity Act of 1982
FPPS	Federal Personnel/Payroll System
FTE	Full-time Equivalents
FY	Fiscal Year
GAAP	Generally Accepted Accounting Principles
GAO	Government Accountability Office
GEO	Directorate for Geosciences
GPRA	Government Performance and Results Modernization Act of 2010
GRFP	Graduate Research Fellowship Program
GSA	General Services Administration
H-1B	H-1B Nonimmigrant Petitioner Account
HPC	high performance computing
IBC	Interior Business Center
IG	Inspector General

INCLUDES	Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
IPA	Intergovernmental Personnel Act
IPERA	Improper Payment Elimination and Recovery Act
IR/D	Independent Research/Development
IT	Information Technology
iTRAK	NSF's financial management system
JCORE	Joint Committee on Research Environment
K-12	Kindergarten to Grade 12
LFO	Large Facilities Office
MFG	Major Facilities Guide
MOSAiC	Multidisciplinary Drifting Observatory for the Study of Arctic Climate
MREFC	Major Research Equipment and Facilities Construction
NSB	National Science Board
NSF	National Science Foundation
O/D	Office of the Director
OIG	Office of Inspector General
OMB	Office of Management and Budget
OPM	Office of Personnel Management
OPP	Office of Polar Programs
PAPPG	Proposal and Award Policies and Procedures Guide
PL	Public Law
PP&E	General Property, Plant, and Equipment
R&D	Research and Development
R&RA	Research and Related Activities
RECR	Responsible and Ethical Conduct of Research
RCRV	Regional Class Research Vessels
SAM	System for Award Management
SBIR	Small Business Innovation Research
SBR	Statement of Budgetary Resources
SES	Senior Executive Service
SFFAS	Statement of Federal Financial Accounting Standards
SOG	Standard Operating Guidance
SSAE	Statement of Standards for Attestation Engagements
STEM	Science, Technology, Engineering, and Mathematics
STTR	Small Business Technology Transfer
USAP	U.S. Antarctic Program
USSGL	United States Standard General Ledger