



U N I T E D   S T A T E S  
National Science Foundation

**FY 2021**

**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) 2021, 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 guidance from the Office of Management and Budget 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 2022 management challenges, NSF management's report on the progress made on the challenges identified by the IG for FY 2021, 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 2023 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 2023 Budget Request to Congress* is published.

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

NSF by the Numbers	
<b>\$9.1 billion</b>	FY 2021 Appropriations (does not include mandatory accounts)
<b>1,900</b>	Colleges, universities, and other institutions receiving NSF funding in FY 2021
<b>43,600</b>	Proposals evaluated in FY 2021 through a competitive merit review process
<b>11,300</b>	Competitive awards funded in FY 2021
<b>211,900</b>	Proposal reviews conducted in FY 2021
<b>318,000</b>	Estimated number of people NSF supported directly in FY 2021 (researchers, postdoctoral fellows, trainees, teachers, and students)
<b>64,000</b>	Students supported by NSF Graduate Research Fellowships since 1952

<sup>1</sup> 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

I am pleased to present the National Science Foundation's *Fiscal Year (FY) 2021 Agency Financial Report (AFR)*. NSF's mission is to promote and advance the progress of science, to advance the national health, prosperity, and welfare; and to secure our Nation's defense. We achieve this mission through our strategic, long-term commitment to investing in research in all fields of science, technology, engineering, and mathematics (STEM) and all levels of STEM education.

In FY 2021, funding provided by Congress through the American Rescue Plan Act enabled NSF to invest in a dynamic research portfolio that focused on the people and institutions in the research community that have been most affected by the COVID-19 pandemic. In tandem with these critical investments, NSF continued its long-standing mission of expanding the frontiers of scientific knowledge and enhancing the well-being of millions of Americans through investments in basic research. These are strategic investments that span the whole spectrum of science and engineering disciplines, strengthen education at every level, and enhance industries from transportation and computing to manufacturing and agriculture. This AFR highlights just a sampling of the ground-breaking discoveries and innovations NSF helped foster this fiscal year.

People are the heart of the research enterprise, which is why NSF is focused on programs designed to promote STEM education and career opportunities. U.S. competitiveness is strengthened by unleashing STEM talent from all communities. Broadening participation has long been an agency-wide focus. The cornerstone of these efforts is NSF INCLUDES (Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science), which is a large-scale network of alliances built to find innovative ways for inclusivity to bring diverse talent into NSF-funded fields of science. In addition to strengthening the STEM workforce, NSF cultivates partnerships to accelerate discovery and the translation of research results into products and services. NSF programs flourish when the Foundation partners with other U.S. federal agencies, industry groups, private foundations, non-governmental organizations, and international organizations.

With the publication of the FY 2021 Agency Financial Report, I am pleased to report that for 24 consecutive years, NSF has received an unmodified "clean" opinion on its financial statements. The independent auditors did not identify any material weaknesses or significant deficiencies. In addition, NSF provided reasonable assurance that the agency complied with the Federal Managers' Financial Integrity Act and that internal controls were operating effectively to support accurate financial reporting. The AFR also includes summary performance information for FY 2021. For more information on NSF's performance management process and the complete results of our FY 2021 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 2023 Budget Request to Congress.

NSF has always aimed to uphold the highest standards of accountability and transparency, and the importance of science and engineering research during this pandemic has only strengthened our commitment. NSF's workforce has shown tremendous dedication to advancing the frontiers of research and innovation, to ensuring accessibility and inclusivity, and to sustaining the Nation's global leadership in science and engineering. Our Nation is on a path toward a brighter future, and NSF is proud to be part of that journey.

/s/

Sethuraman Panchanathan

November 12, 2021



## **Chapter 1**

# **Management's Discussion and Analysis**



## Agency Overview

### Mission and Vision

The National Science Foundation (NSF) was established in 1950 “to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense...”<sup>1</sup> As the only federal agency that invests in fundamental, basic research across all non-medical fields of science and engineering, NSF has played a leading role in helping the U.S. secure and maintain its competitive edge globally. NSF’s annual budget supports groundbreaking research, science, technology, engineering, and mathematics (STEM) education, and the development of the STEM workforce. This support is a critical source of federal funding for fields like biology, computer science, mathematics, the physical sciences, and the social sciences.



Scientists are expanding genome editing and engineering in plants to improve the efficiency of food production. Credit: National Institutes of Health

For more information: [https://www.nsf.gov/discoveries/disc\\_images.jsp?cntn\\_id=302453&org=NSF](https://www.nsf.gov/discoveries/disc_images.jsp?cntn_id=302453&org=NSF)

#### *New CRISPR technologies enable development of climate and disease resistant crops*

Over the past decade, huge leaps forward have been made in CRISPR—the gene editing technology that won the 2020 Nobel Prize in Chemistry. One of the most anticipated applications of CRISPR is the ability to strengthen the food supply by designing crops that are more robust, higher yield, and resistant to pests and climate change. NSF-funded researchers at the University of Maryland have made the next big step toward this goal. They’ve developed new techniques that not only expand the range of what CRISPR can do in plant genomes, but also allow these tools to operate on multiple parts of the genome simultaneously. By making it possible to imbue crops with multiple beneficial attributes at once, researchers are bringing us closer to a more resilient and sustainable food supply.

For over 70 years, NSF-funded research programs and initiatives have advanced knowledge to sustain global leadership and foster innovations that drive the economy, strengthen national security, and enhance the well-being of millions of Americans. NSF supports U.S. researchers as they probe the unknown and seek to understand nature’s great mysteries. These pioneers generate new knowledge and discoveries that transform the understanding of our world and galaxies, while also transforming modern society through technological innovations. NSF supported research essential to the creation of many advances such as the Internet, bar codes found on nearly all products, Magnetic Resonance Imaging, 3-D printing, and the game-changing technology on smart phones—from the liquid crystal display and multi-touch screen zoom to the lithium battery and the much relied on mapping software and GPS.

This report is focused on fiscal year (FY) 2021, a year in which NSF was engaged in the larger national effort to manage and begin to emerge from the COVID-19 pandemic. NSF’s principal role has been to continue funding the groundbreaking research that has long been its hallmark, and it has also fostered

<sup>1</sup> National Science Foundation Act of 1950 (Public Law [P.L.] 81–507).

and catalyzed efforts to help the U.S. science, engineering, and STEM education communities rebound from unprecedented disruptions brought by the pandemic. From equipment delays and reagent shortages to lost training time and missed field research, the pandemic has strained research projects in unique and indelible ways. NSF has deployed funds from the American Rescue Plan (ARP) Act to support groups and institutions most affected by the pandemic, with a special focus on transition points in an individual's educational and research trajectory that are most vulnerable to disruption.

***CyberCorps Scholarship for Service: Secure Embedded Systems***

From large scale and high-profile ransomware attacks to more pervasive vulnerabilities in consumer technology and online systems, the need to strengthen the nation's cybersecurity workforce only continues to grow. To help accomplish that, Morgan State University (MSU), a Historically Black College and University (HBCU) in Baltimore, Maryland, has launched the Secured Embedded Systems Scholarship Program (SES2). Supported by funding through NSF's CyberCorps® Scholarship for Service and the American Rescue Plan, this is an initiative to recruit, mentor, and financially support cybersecurity students at every level of higher education. The program focuses on connected embedded systems—products that have network technology built in, such as baby monitors, smart cars, and even critical infrastructure like power grids. By focusing on this specific area, and by supporting participants ranging from pre-freshmen through doctorate students, MSU is building the next generation of cybersecurity professionals.



In the SES2 program, MSU students follow an innovative curriculum in secure embedded systems, experience challenging research opportunities, and receive peer and professional mentoring. Credit: MSU

[https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2042700](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2042700)

NSF's FY 2021 research priorities were guided by a set of cutting-edge goals to enable rapid advances across such areas as artificial intelligence, quantum information science, advanced manufacturing, advanced wireless, biotechnology, and climate change and clean energy. In June, NSF announced the establishment of a geographically distributed Network for Advanced Nuclear Magnetic Resonance (NAN). NAN will advance biomolecular research to gain insights about how life has adapted to the world, allowing scientists to harness those adaptations to biotechnologies and spur a future U.S. bioeconomy. Also, in FY 2021, NSF supported research to better understand natural disasters and improve resilience in civic infrastructure, such as the power grid, that is vulnerable to natural hazards. Researchers have found that incorporating nanomaterials into traditional cement improves water and fracture resistance and can be used to build more durable roads and cities. NSF-funded researchers in the social, behavioral, and economic sciences gained insights into how to design systems and policies for meaningful impact on improving peoples' well-being and strengthening our communities. At the same time, NSF-funded engineers worked on developing the next generation of software for space weather modeling, while scientists using supercomputer-driven simulations discovered the mechanism that allows the coronavirus to enter and infect healthy human cells; this discovery holds the potential for opening avenues for new therapeutics to counter SARS-CoV-2 infection.

To sustain the Nation's scientific enterprise, NSF supports a wide array of research infrastructure throughout the country and around the world, including research stations in the Arctic and Antarctica. These investments provide the infrastructure needed to advance discovery, learning, and exploration, and include ships, aircraft and autonomous airborne platforms, ground-based telescopes, and other infrastructure and state-of-the-art tools. In 2021, astronomers gained insights into the existence of supermassive black hole pairs and galaxy mergers in the early universe by combining data from several space and ground-based telescopes, including the NSF-funded National Optical-Infrared Astronomy Research Laboratory (NOIRLab). Also in 2021, a high-resolution ocean model simulation at the NSF-supported National Center for Atmospheric Research has given scientists a look into the life cycle of endangered loggerhead turtles and could help inform conservation efforts. Each year, hundreds of U.S. scientist and engineers use NSF-funded Frontera, one of the most powerful supercomputers in the world, to tackle complex scientific and engineering challenges. The Foundation's long-term commitment to steady advancements and upgrades to research facilities enables this kind of ground-breaking research.



DES photographed the night sky using the Dark Energy Camera on the Victor

: Reidar Hahn, Fermilab

For more information: [https://nsf.gov/discoveries/disc\\_images.jsp?cntn\\_id=302871&org=MPS](https://nsf.gov/discoveries/disc_images.jsp?cntn_id=302871&org=MPS)

**Dark Energy Survey releases the most precise look at the universe's evolution**

Results from the Dark Energy Survey (DES) are giving researchers new insights into some of the universe's most mysterious phenomena. While we can't see dark energy or dark matter directly, we can watch as it shapes the structure and motion of galaxies through gravitational effects. The DES mapped more than 226 million galaxies over seven years—creating the largest and most precise map of the universe ever made—which is allowing astronomers to see the influence of dark energy and dark matter on a massive scale and with new precision. The DES is part of a new era of astronomy powered by massive surveys of the sky, and with the help of supercomputers (and even artificial intelligence), DES and similar projects are enabling huge leaps forward in our understanding of the structure of the universe.

The translation of NSF-funded science and engineering discoveries into innovative technologies and solutions in the market and society is also a long-standing priority for NSF, led by programs such as Partnerships for Innovation, NSF Innovation Corps (I-Corps™), and Small Business Innovation Research and Small Business Technology Transfer. These programs support researchers in prototyping, technology demonstration, and scaling-up their work, including the licensing of NSF-funded research outcomes and providing entrepreneurial education to help researchers with customer discovery. This has led to startups and new small businesses with impacts affecting entire market sectors.

The duality of NSF's investment strategy – the combination of basic and translational research that generates a steady flow of new knowledge with the support for STEM education and workforce development at all levels – is central to the U.S.'s standing in the global research enterprise. As mentioned earlier, as part of the national effort to recover from the COVID-19 pandemic, NSF received funding from the ARP Act to help individuals and institutions in the U.S. science, engineering, and STEM education communities most significantly affected by the pandemic recover. NSF's sustained funding supports innovative STEM education and keeps the Nation's workforce competitive and ready to take on future challenges. These

STEM education and training programs attract talented scientists and engineers from every corner of our Nation—from remote rural areas to the largest urban centers. NSF's Louis Stokes Alliances for Minority Participation program, for example, builds institutional alliances that assist universities and colleges in developing and retaining STEM talent from underrepresented communities so that students can more successfully transition from community colleges to four-year universities and on to graduate programs. These investments in people are a critical means by which NSF achieves its mission; transformational breakthroughs are shaped by a wide range of perspectives.

NSF's support for the Graduate Research Fellowship Program (GRFP) is an important component of its STEM workforce portfolio. Since 1952, NSF has funded approximately 64,000 Graduate Research Fellows, many of whom go on to become leaders in their chosen fields and make groundbreaking and important discoveries in STEM research. NSF also has funded the research of 253 individuals who have gone on to win the Nobel Prize, along with 43 individuals who have gone on to win the ACM<sup>2</sup> A.M. Turing Award, often referred to as the "Nobel Prize of Computing." NSF strives to provide every aspiring scientist and engineer access to the resources they need to prepare for a career in science or engineering.

***Sitting Bull College's Native American Prairie Ecosystems Research Center (PERC)***

NSF's Tribal Colleges and Universities Program (TCUP) is a critical STEM pathway for broadening participation, strengthening science and engineering capabilities, and increasing STEM opportunities in tribal communities. At Sitting Bull College (SBC) in Fort Yates, North Dakota, PERC is leveraging diverse research expertise and local indigenous ecological knowledge to study challenges in prairie ecosystems and help design new solutions and approaches in soil science, water quality, wildlife and plant ecology, microbiology, molecular ecology, and engineering. SBC and PERC are leading the way in North Dakota as the primary center for tribal knowledge about the Great Plains region.

For more information: [https://nsf.gov/awardsearch/showAward?AWD\\_ID=2055064&HistoricalAwards=false](https://nsf.gov/awardsearch/showAward?AWD_ID=2055064&HistoricalAwards=false)



PERC leverages the resources and faculty of SBC and local reservation communities to solve issues that arise in the community using practices that align with cultural traditions and have a direct impact on tribal communities in the Great Plains. Credit: U.S. Dept of the Interior

The partnerships that NSF undertakes represent another way that the agency adds value to the research enterprise. In addition to increasing access to research infrastructure and building broader communities of researchers, partnering can accelerate scientific discovery as well as the translation of research into products and services that benefit society. In July, the establishment of 11 new NSF National Artificial Intelligence (AI) Research Institutes was announced, building on the first round of seven institutes funded in 2020. Led by NSF, and in partnership with the U.S. Department of Agriculture, U.S. Department of Homeland Security, Google, Amazon, Intel, and Accenture, the National AI Research Institutes will act as connections in a broader nationwide network to pursue transformational advances in a range of economic sectors, and science and engineering fields — from food system security to the next-generation of cyber-infrastructure. Also, in partnership with 29 institutions, NSF has announced the launch of SpectrumX, an NSF Spectrum Innovation Center, that will address the growing demand for usage of the radio spectrum and catalyze innovation to solve radio spectrum challenges that are critical for the nation. The investment in SpectrumX is part of the Spectrum Innovation Initiative, a collaboration between NSF, the National

<sup>2</sup> ACM: Association for Computing Machinery

Telecommunications and Information Administration, and the Federal Communications Commission to promote dynamic and agile spectrum utilization while ensuring innovation and security for all users.

**Wireless research for universal and affordable rural broadband**

Iowa State University and the areas surrounding Ames, Iowa are the latest testbed for largescale wireless technology research that is extending the reach of broadband and other communications platforms. Known as the Wireless Living Lab for Smart and Connected Rural Communities, it is an \$8 million public-private partnership funded by NSF, the U.S. Department of Agriculture, and an industry consortium that is exploring how cutting-edge communications technology can be deployed to enable high-speed, universal, and affordable rural broadband connectivity. With a special emphasis on agricultural applications in crop and livestock farms, the wireless research platform will be an extensive collaboration between researchers, students, communities, industry partners, and state and local governments, working together to connect the unconnected.

More information [https://www.nsf.gov/news/special\\_reports/announcements/062221.jsp](https://www.nsf.gov/news/special_reports/announcements/062221.jsp)



Iowa State University researchers installed hardware to drive innovation in rural broadband connectivity.  
Credit: C Gannon.

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. These are embodied in the goals established in the NSF strategic plan for FY 2018 – 2022, *Building the Future: Investing in Discovery and Innovation*:<sup>3</sup> (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.

It can take many years for the new knowledge gained through basic research to realize its potential for benefitting society, but the benefits are undeniable, and the strategy of investing in high-risk, foundational research is a sound one that shapes and secures the future of our Nation. NSF supports 24 percent of all federally-sponsored basic scientific research conducted by America's colleges and universities; and the share of NSF's support increases to 57 percent when medical research supported by the National Institutes of Health is excluded.<sup>4</sup> NSF also has well-established programs that accelerate the translation of fundamental science and engineering discoveries into new technologies that have the potential to impact society. Advancing the frontiers of science and technology ensures the U.S. economy stays strong, that Americans remain safe and secure, and that the Nation continues to pursue knowledge and understanding on scales ranging from the subatomic to the cosmic.

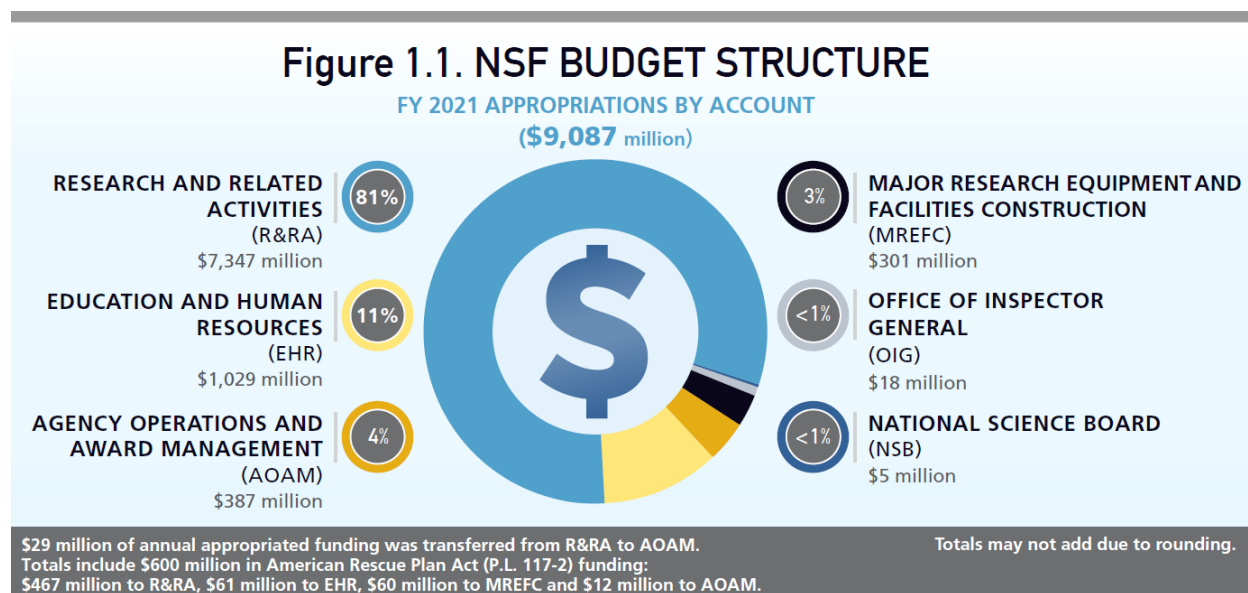
<sup>3</sup> NSF Strategic Plan FY 2018 – 2022: <https://www.nsf.gov/pubs/2018/nsf18045/nsf18045.pdf>

<sup>4</sup> National Center for Science and Engineering Statistics Survey of Federal Funds for Research and Development Fiscal Years 2019–2020: <https://nces.nsf.gov/pubs/nsf21329>

## 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 2021 totaled \$9,087 million,<sup>5</sup> an increase of approximately 9 percent over the FY 2020 appropriations level of \$8,354 million. R&RA, EHR, and MREFC appropriations fund the agency's programmatic activities and accounted for 95 percent of NSF's total appropriations in FY 2021.

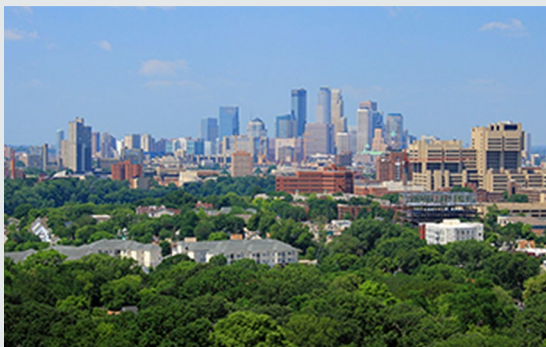
Figure 1.1 provides details on NSF's FY 2021 appropriations. As noted in the Figure 1.1 footnote, the amounts include \$600 million in supplemental funding received under the ARP Act and a transfer between R&RA and AOAM. The *COVID-19 Activities* section provides details on ARP Act funding by account.



- R&RA supports research and education activities in science and engineering, including high-risk and transformative research. This appropriation accounted for 81 percent of FY 2021 funding. The FY 2021 R&RA funding level of \$7,347 million was \$558 million higher than the FY 2020 appropriation of \$6,790 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 2021 funding level of \$1,029 million was \$86 million above the FY 2020 EHR appropriation of \$943 million.

<sup>5</sup> Amount shown is NSF's FY 2021 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)*.

- FY 2021 AOAM funding of \$387 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 2021 appropriations. AOAM increased by \$29 million from the FY 2020 level of \$358 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 over 3 percent of the agency's total appropriations in FY 2021. The FY 2021 MREFC funding level of \$301 million was \$58 million above the prior-year appropriation of \$243 million.
- Separate appropriations support the activities of the OIG and the NSB; each accounted for less than 1 percent of NSF's total FY 2021 appropriations. The FY 2021 OIG appropriation of \$17.9 million increased \$1 million over the FY 2020 appropriation. The NSB received an appropriation of \$4.5 million in FY 2021, equal to the previous year's funding level.



View of the Minneapolis skyline captured from Prospect Park Water Tower. Scientists affiliated with a new NSF-funded LTER site based in Minneapolis-St. Paul will examine how socioeconomic disparities, pollution, habitat loss and climate change interact to affect the environment in the Twin Cities. Credit: Michael Hicks

For more information: [https://www.nsf.gov/news/special\\_reports/announcements/031021.01.jsp](https://www.nsf.gov/news/special_reports/announcements/031021.01.jsp)

***New NSF Long-Term Ecological Research site will study dynamic and diverse relationships between urban nature and people***

Mayors and city councils spend a lot of time thinking about the systems that their towns and cities rely on. It can be an intricate network of infrastructure, from roads and the water supply to electric grids and sewers. But there are also ecological and environmental systems to consider—rivers and streams, parks, waterfronts, green space, and even individual gardens and yards are all part of the anatomy of cities and towns. With funding from NSF, researchers at the Minneapolis-St. Paul Urban Long-Term Ecological Research Program (LTER) are studying urban nature to better understand these environments and how they interact with the complex matrix of infrastructure and social systems that make up urban areas. This research will provide long-term environmental data collection, analysis, and interpretation to examine, among many issues, the interface between climate change and social disparities. Just as civil engineers help local governments improve infrastructure and services that residents depend on, this research is going to expand the understanding of urban ecology to help city planners strengthen the benefits of natural landscapes that are important to the Twin Cities and their residents. All data are publicly accessible across the LTER network and beyond.

More than 33,000 members of the science and engineering community participated in the merit review process as panelists and proposal reviewers.<sup>6</sup> Awards were made to over 1,900 institutions located in all 50 states, the District of Columbia, and four 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 2021, approximately 318,000 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

<sup>6</sup> For more information about NSF's merit review process, see [https://www.nsf.gov/bfa/dias/policy/merit\\_review/](https://www.nsf.gov/bfa/dias/policy/merit_review/) and *NSF's Merit Review Process, FY 2019 Digest* (NSB-2020-13) at [https://www.nsf.gov/nsb/publications/2020/merit\\_review/FY-2019/nsb202038.pdf](https://www.nsf.gov/nsb/publications/2020/merit_review/FY-2019/nsb202038.pdf)

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.

**New filtering method promises safer drinking water**

Most people know that adding fluoride to public water systems helps promote healthy teeth and prevent tooth decay. But in some places, the problem isn't too little fluoride in the water, it's too much. Where fluoride occurs naturally in water systems, communities have to be careful to limit the level of fluoride in drinking water in order to avoid health problems that can arise from prolonged exposure to excess fluoride. Until now, removing excess fluoride has required expensive high-pressure filtration systems or burdensome water treatment methods. But with funding from NSF's Small Business Innovation Research program—known as America's Seed Fund, researchers at Tufts University have developed a new, inexpensive filtering technology inspired by biology that can separate fluoride with twice the selectivity of other methods. Their novel and affordable polymer membranes can help protect community water systems and support public health throughout the nation and around the globe.



A new filtering method promises safer drinking water for tens of millions of people. Credit: Jenny Downing, CC by2.0

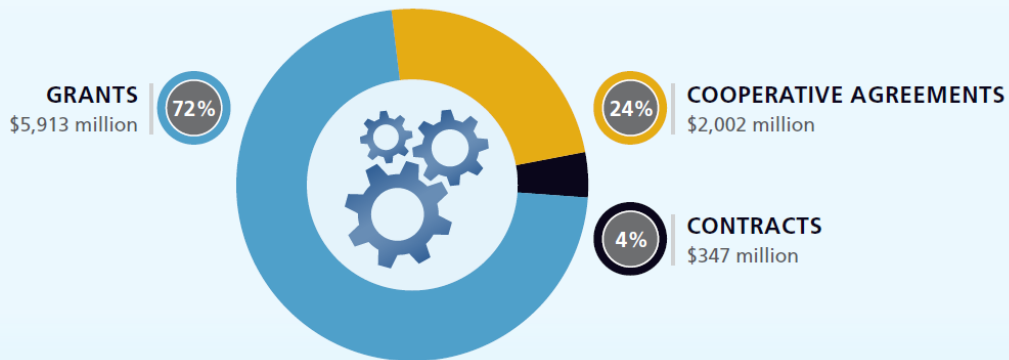
For more information: [https://www.nsf.gov/discover-ies/disc\\_summ.jsp?WT.mc\\_id=USNSF\\_1&cntn\\_id=303584&utm\\_medium=email&utm\\_source=govdelivery](https://www.nsf.gov/discover-ies/disc_summ.jsp?WT.mc_id=USNSF_1&cntn_id=303584&utm_medium=email&utm_source=govdelivery)

During FY 2021, NSF evaluated over 43,600 proposals through a competitive merit review process and made more than 11,300 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.

**Figure 1.2. NSF AWARD MECHANISMS**

FY 2021 OBLIGATIONS FOR RESEARCH AND EDUCATION PROGRAMS

(\$8,262 million)



NSF Research and Education programs include Research and Related Activities, Education and Human Resources, and Major Research Equipment and Facilities Construction appropriations. Totals may not add due to rounding.



As shown in Figure 1.3, the Institutions Funded chart, 80 percent of support for research and education programs (\$6,594 million) was provided to 822 different colleges, universities, and academic consortia. Private industry, including small businesses and non-profit organizations, accounted for 13 percent (\$1,047 million), and support to Federally Funded Research and Development Centers accounted for approximately 4 percent, or \$298 million. Other recipients (federal, state, and local governments; and international organizations) accounted for almost 4 percent (\$322 million) of support for research and education programs.

### Figure 1.3. INSTITUTIONS FUNDED BY NSF

FY 2021 OBLIGATIONS FOR RESEARCH AND EDUCATION PROGRAMS  
(\$8,262 million)



NSF Research and Education programs include Research and Related Activities, Education and Human Resources, and Major Research Equipment and Facilities Construction appropriations. Totals may not add due to rounding.

### COVID-19 Activities



Members of La Colaborativa, a Massachusetts non-profit that used science to help address vaccine hesitancy in their local community.

Credit: La Colaborativa/Darlene DeVita

#### Societal Experts Action Network helps community leaders save lives

How can state and local leaders and decision-makers draw on the vast research in social and behavioral sciences to help make better policy in their communities and effectively navigate an emergency like the COVID-19 pandemic? To respond to this need, the National Academies of Sciences, Engineering, and Medicine teamed up with NSF to assemble a network of scientists dedicated to helping local leaders translate decades of research into human behavior into clear and helpful guidance for public health and safety. Known as SEAN, the Social Experts Action Network, it's a compilation of accessible resources that local leaders and officials can use to keep their communities informed about COVID-19 and deploy evidence-based approaches for handling the public health emergency.

For more information:

<https://beta.nsf.gov/science-matters/camden-south-carolina-chelsea-massachusetts-behavioral-science-helps-community>

As part of the ARP Act, NSF received \$600 million to “fund or extend new and existing research grants, cooperative agreements, scholarships, fellowships, and apprenticeships, and related administrative expenses to prevent, prepare for, and respond to coronavirus.”<sup>7</sup> In addition, NSF drew from its FY 2021 base appropriations and other available funds to support research related to COVID-19. NSF’s FY 2021 COVID-19 activities funded nearly 8,000 awards to over 12,000 principal investigators in 50 states and the District of Columbia. Table 1.1 shows the FY 2021 obligations related to COVID-19 activities.<sup>8</sup> NSF’s coronavirus information webpages provide information on NSF’s response to the pandemic.<sup>9</sup>

**Table 1.1 FY 2021 COVID-19 Activity Awards and Obligations**

	ARP Act	All COVID-19
Number of Awards	756	7,996
FY 2021 Obligations (\$ in Millions)		
<i>Total</i>	\$240.5	\$1,775.9
<i>R&amp;RA</i>	\$195.5	\$1,411.5
<i>EHR</i>	\$24.0	\$291.4
<i>MREFC</i>	\$8.9	\$10.5
<i>AOAM</i>	\$12.0	\$12.0
<i>Other funding</i>	-	\$50.5

*Total may not add due to rounding.*

## 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.<sup>10</sup> As shown in Figure 1.4, NSF’s organizational structure aligns with the major fields of science and engineering.<sup>11</sup>

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.”<sup>12</sup> 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.<sup>13</sup> NSF’s Director is a member *ex officio* of the Board. The Director and the other NSB members serve 6-year terms.

The NSF Director leads a workforce that included 1,456 federal employees in FY 2021.<sup>14</sup>

<sup>7</sup> American Rescue Plan Act: <https://www.congress.gov/bill/117th-congress/house-bill/1319/text>

<sup>8</sup> Additional information on COVID-19 activities by appropriation is on page Financials-33 of this AFR.

<sup>9</sup> NSF Coronavirus Information page: [https://www.nsf.gov/news/special\\_reports/coronavirus/ARP & COVID-19 Response Update:](https://www.nsf.gov/news/special_reports/coronavirus/ARP%20&%20COVID-19%20Response%20Update)

[https://www.nsf.gov/about/congress/toolkit\\_images/NSF%20ARP%20Update%20Sept.%202021.pdf](https://www.nsf.gov/about/congress/toolkit_images/NSF%20ARP%20Update%20Sept.%202021.pdf)

<sup>10</sup> The Director’s biography: [https://www.nsf.gov/staff/staff\\_bio.jsp?lan=spanchan&from\\_org=](https://www.nsf.gov/staff/staff_bio.jsp?lan=spanchan&from_org=)

<sup>11</sup> NSF’s organization chart: [https://www.nsf.gov/staff/organizational\\_chart.pdf](https://www.nsf.gov/staff/organizational_chart.pdf)

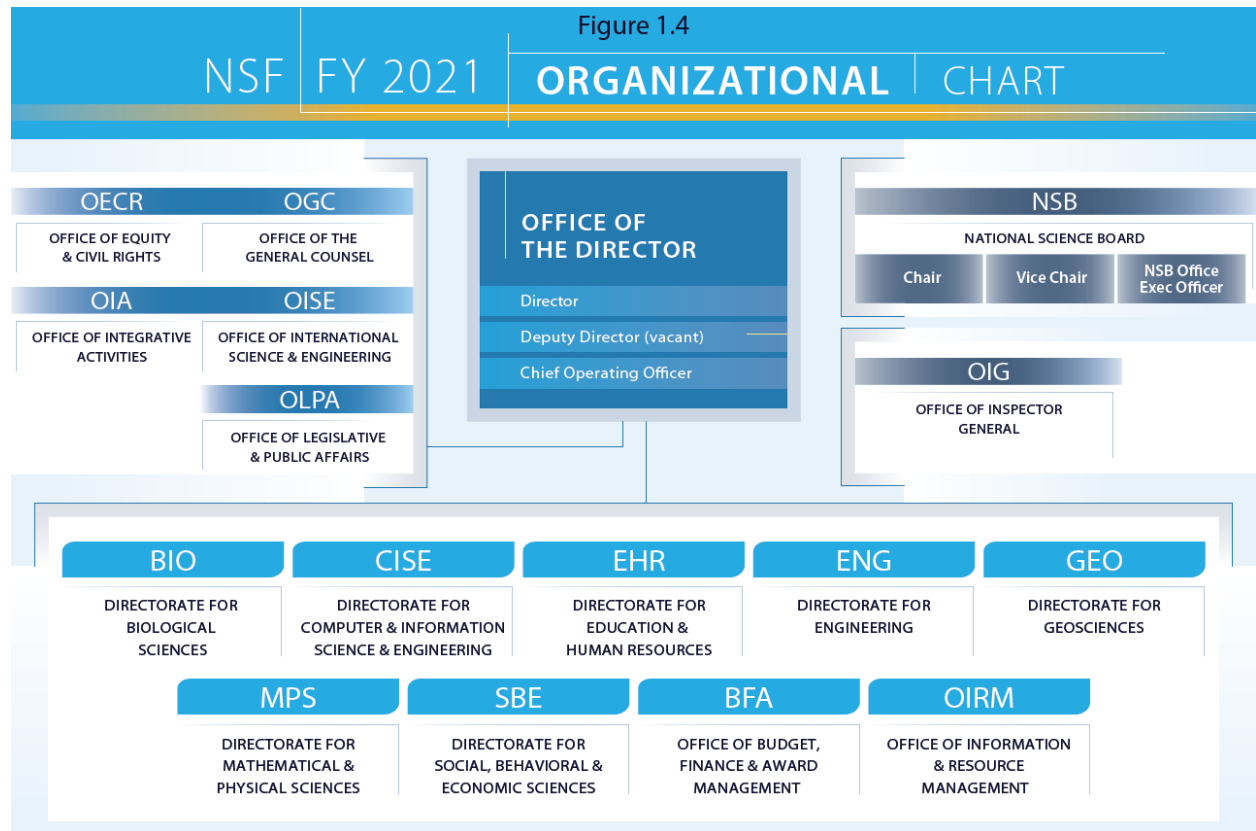
<sup>12</sup> 42 U.S. Code 1862(d): <https://www.law.cornell.edu/uscode/text/42/1862>

<sup>13</sup> NSB members during FY 2021 are shown in Appendix 10 of this AFR

<sup>14</sup> Full-time equivalents (FTEs) include the federal employee workforce for NSF, the NSB, the OIG, and U.S. Arctic Research Commission

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 from across academia, rotators bring knowledge of NSF programming and leading research from a national perspective. As of September 30, 2021, there were 195 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. During FY 2021, the OIG had an office in Denver, Colorado.



## Management Challenges

In October 2020, the OIG identified six areas representing challenges for the agency for FY 2021: (1) Providing Oversight of Major Multi-User Research Facilities, (2) Providing Oversight of Grants During a Pandemic, (3) Managing the Intergovernmental Personnel Act Program, (4) Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project, (5) Increasing Diversity in Science & Engineering Education and Employment, and (6) Mitigating Threats Posed by Foreign Government Talent Recruitment Programs.<sup>15</sup>

Management's report on the significant activities undertaken in FY 2021 to address these challenges is in the *Appendix 2B: Management Challenges – NSF's Response* of this Agency Financial Report (AFR). The report also discusses activities planned for FY 2022 and beyond. Some of the agency's significant actions and planned next steps to address the challenges are highlighted in the following text.

### ***Providing Oversight of Major Multi-User Research Facilities***

NSF understands the importance of its role in overseeing current grant recipients' on-going management of major facilities, and 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 in response to prior OIG audits and four GAO reviews related to its oversight of projects funded from the MREFC account.

NSF leadership continues to show its commitment to major facilities oversight through appointment of the Chief Officer for Research Facilities (CORF) and through the annual Major Facilities Portfolio Risk Assessment process. Further, NSF has taken significant actions in recent years to mitigate the risks inherent in the major facilities portfolio, including the unprecedented degree of complexity and uncertainty resulting from the COVID-19 pandemic. Such actions include, but are not limited to: (1) completing the major facilities portfolio workforce gap analysis and beginning development of a training plan tied specifically to the major facility oversight competency model, (2) producing a regular report on COVID-19 impacts on major facilities in both the operations and construction stages for review by NSF leadership, and (3) revising standard operating guidance for NSF grants and agreements officers on the pre-award review process, which includes business and financial reviews, in line with GAO guidance. In addition, NSF took action to address the unique risks presented by the COVID-19 pandemic, including potential improper use of budget contingency funds, by developing internal and external guidance for major facility programs and recipients. The controls developed for COVID-19 will be more widely applicable to other unforeseen events, such as when the shipyard constructing the Regional Class Research Vessels experienced a direct hit from Hurricane Ida in August 2021. 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.

Going forward, NSF will finalize the *Major Facilities Oversight Reviews* standard operating guidance and provide it to OIG and GAO for consideration in closing remaining recommendations. NSF will also complete development and implementation of the training plan for the major facilities oversight workforce and monitor progress through periodic self-assessment surveys or other means.

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<sup>15</sup> Inspector General's Management Challenges for NSF in FY 2021:  
[https://nsf.gov/oig/\\_pdf/NSF\\_Management\\_Challenges\\_FY2021.pdf](https://nsf.gov/oig/_pdf/NSF_Management_Challenges_FY2021.pdf)

### Providing Oversight of Grants During a Pandemic

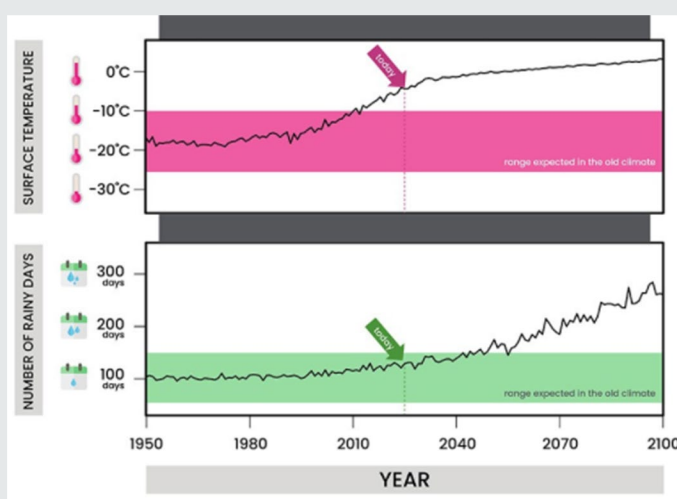
Throughout the COVID-19 pandemic, the research community has faced unprecedented challenges that have tested the people and infrastructure that make up the U.S. scientific research enterprise. Given these challenges, NSF recognized there may be heightened risk in grants programs compared to prior years, and that existing oversight processes may not align with challenges presented by the pandemic. In response to these risks, NSF demonstrated strong commitment to ensuring continued operations and maintenance of oversight functions, including ensuring sufficient people and resources to operate in a pandemic, and established processes to monitor spending of pandemic-related funding. NSF was able to maintain advanced monitoring and oversight activities through virtual site visits, desk reviews, targeted assessments, audit resolution, and new analytic approaches focused on the grant and cooperative agreement award portfolio.

In FY 2021, NSF demonstrated progress in addressing the challenges created by the COVID-19 pandemic in the following areas: (1) policy and outreach, including disseminating new guidance on the NSF Coronavirus webpage for the grants community to address emerging NSF and government-wide COVID-19 policies; (2) grants oversight, including implementation of internal NSF dashboards to monitor potential grant risk factors around expenditure patterns and post-award adjustments; and (3) risk management and internal controls, including conducting annual testing of grant award expenditures covering April 2020 through March 2021 to update the improper payment risk baseline, which indicated a similarly low risk level as in prior year testing results.

Going forward, NSF will continue to assess and minimize risk through activities such as issuing updated guidance as necessary, monitoring compliance through site visits and desk reviews, updating and enhancing financial reporting, and issuing a final improper payment risk assessment report.

#### Fast-warming Arctic transitioning to new climate state

The Arctic is experiencing climate change at a rapid and dramatic pace, leading to significant uncertainty about what regional weather patterns will look like in the future. With NSF funding, researchers from the National Center for Atmospheric Research—the Nation's premier research center for meteorology, climate science, and atmospheric research, headquartered in Boulder, CO—are working to understand how changes in sea ice cover will affect the future of the Arctic environment. Sea ice plays a critical role in climate and meteorology by reflecting heat and light, but when light-colored Arctic ice melts, it is replaced by darker ocean water, which absorbs more heat and accelerates the changes taking place. By improving our ability to measure sea ice, researchers are enabling better climate models that will help us navigate the enormous changes in the Arctic and better understand what they mean for the global climate.



The Arctic is transitioning to a new climate state because of rapid warming.  
Credit: Simmi Sinha/UCAR

For more information and a larger image:  
[https://www.nsf.gov/discoveries/disc\\_summ.jsp?cntn\\_id=301270](https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=301270)

### ***Managing the Intergovernmental Personnel Act (IPA) Program***

NSF provides the opportunity for scientists, engineers, and educators to rotate into the Foundation on a temporary basis, bringing fresh perspectives from across all fields of science and engineering (S&E) supported by the agency. OIG has noted risks related to these rotators remaining involved in their professional research and development activities while working at NSF; and the COVID-19 pandemic has brought new and unique challenges to this program, including recruiting, onboarding, and managing IPAs in a remote work environment. NSF takes a proactive approach to the management of the IPA Program to appropriately consider and mitigate inherent risks associated with its execution, including through an IPA Steering Committee that advises the Foundation's senior leadership on matters that directly concern policy on the use of the IPA Program. 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 recent years, NSF has completed numerous actions to address the management challenges identified by the OIG related to the IPA program. Through these actions, NSF is confident it has reduced the inherent risk substantially, such that the residual risk is acceptable to the agency. Specific accomplishments in FY 2021 include (1) migrating Program Director and Executive IPAs to the USA Performance system for managing performance plans; (2) facilitating a focus group of IPAs who onboarded during COVID, to help identify new and unique challenges associated with onboarding in a remote work environment; and (3) establishing a plan to collect and analyze FY 2021 data on IPA recruiting, onboarding, and costs attributed to the COVID-19 pandemic to be included in the FY 2021 IPA Annual Report.

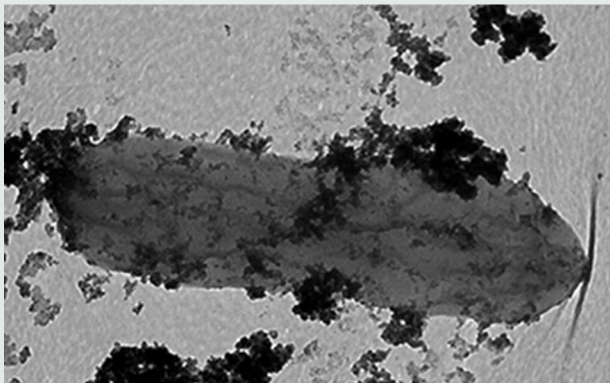
Going forward, NSF will continue to monitor risk and manage the IPA program through actions such as providing annual training for independent research/development (IR/D) experts; collecting quarterly data on IR/D time and travel by both permanent and rotating staff for oversight by NSF senior management; and using the Federal Employee Viewpoint Survey and other mechanisms to help identify challenges to the program, including recruiting, onboarding, and managing IPAs in a remote work environment.

### ***Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project***

NSF—through the Office of Polar Programs in the Directorate for Geosciences—funds and manages the USAP which supports the United States' research and national policy goals in the Antarctic. USAP has two major construction projects to replace multiple outdated structures and consolidate key functions for more streamlined and efficient operations, one of which is the AIMS project. 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 mitigated risk through actions such as extensive planning and coordination to meet equipment delivery dates.

The global pandemic associated with COVID-19 resulted in significant changes to program and construction project plans as deployed construction crews were brought home due to health and safety concerns. In accordance with NSF policy, the magnitude of these impacts will require re-baselining of the AIMS project and the Office of Polar Programs is actively engaged with the contractor; the Office of Budget, Finance, and Award Management; and the Office of the Director for that purpose. In FY 2021, NSF acquired no-cost access to long-term storage for materials, and convened NSF leadership to evaluate options for project re-baselining and to develop a new path forward that transitions AIMS to a long-term Antarctic Infrastructure Recapitalization program.

Going forward, NSF will continue to monitor and oversee AIMS, under established internal management and project execution plans, while working to re-baseline the project cost and schedule. NSF will also conduct quarterly NSF integrated project team meetings to ensure the status of AIMS developments is communicated and to solicit expert feedback.



This *Geobacter* cell is speckled with cobalt minerals that would be toxic to many organisms. Image Credit: Hunter Dulay

For more information: [https://www.nsf.gov/discoveries/disc\\_summ.jsp?cntn\\_id=302049](https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=302049)

#### 'Iron Man' bacteria could help protect the environment

Researchers at Michigan State University have shown that microbes found in soil and sediment, known as *Geobacter*, are capable of a feat that could help reclaim a valuable natural resource and soak up toxic pollutants. The researchers found that *Geobacter* microbes were resistant to the toxic effects of cobalt. Cobalt is a metal used in lithium-ion batteries—it is rare and valuable, and toxic to living things, including humans and microbes. When *Geobacter* microbes encountered rust containing cobalt, they were able to extract the cobalt without it penetrating their cells and causing harm. Cobalt nanoparticles instead formed a protective layer around the microbes. The research is an exciting proof-of-concept that *Geobacter* microbes could be an important tool for cleaning up a range of toxic metals and for efficiently reclaiming valuable resources like cobalt.

### **Increasing Diversity in Science & Engineering Education and Employment**

Efforts to increase diversity in S&E education and employment have been a hallmark of NSF since its founding, and throughout its history. The agency has pursued a variety of program and policy approaches to increasing diversity in S&E. Broadening participation is the focus or emphasis of a number of programs, and this emphasis is demonstrated within the entire NSF portfolio through the broader impacts criterion used in the merit review process. This challenge remains a priority for NSF: while there have been noteworthy areas of progress, such as increases in the shares of individuals in S&E occupations from racial and ethnic groups historically underrepresented in STEM,<sup>16</sup> the groups and communities that have been underrepresented and underserved in the STEM arena for decades remain so today.

NSF recognizes that its efforts to advance diversity and promote inclusion warrant unprecedented urgency, in keeping with the national imperative outlined by the Administration and its Racial Equity Executive Order<sup>17</sup> (Executive Order 13985) and the global trends in science as outlined by the NSB in the *Vision 2030* report.<sup>18</sup> Efforts to address this challenge span across every NSF Directorate and Office. Specific actions in FY 2021 to increase diversity in S&E education and employment included (1) the release of the 2021 Women, Minorities, and Persons with Disabilities in Science and Engineering report, providing data on participation of these groups in S&E education and employment; (2) organizational changes within NSF to streamline processes and procedures related to equity and civil rights issues; and (3) releasing new

<sup>16</sup> Underrepresented minorities in S&E occupations: <https://nces.nsf.gov/pubs/nsb20201/figure/8>

<sup>17</sup> Racial Equity Executive Order link: <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>

<sup>18</sup> The NSB's *Vision 2030* report is available at <https://www.nsf.gov/nsb/publications/2020/nsb202015.pdf>

funding opportunities related to broadening participation and to assessing the impacts of COVID-19 on students from groups historically underrepresented in STEM.<sup>19</sup>

Going forward, NSF will focus attention on milestones in line with its operational and strategic objectives in the area of increasing diversity, including: (1) continuing implementation work to strengthen the engagement of Historically Black Colleges and Universities (HBCUs) in NSF's programs, in line with a recent Executive Order, (2) continuing to examine the challenges of limited data on certain groups of individuals known to be underrepresented in STEM, and (3) in keeping with the agency's response to Executive Order 13985, finalizing the strategic framing of efforts to ensure accessibility and inclusivity in the NSF Strategic Plan for FY 2022-2026, and its associated performance activities, with public release scheduled for February 2022.

### ***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, reciprocity, 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 misappropriate U.S.-funded scientific research prior to its open publication. These programs target scientists, engineers, and educators of all nationalities working or educated in the United States.

In FY 2021, NSF took multiple actions to demonstrate progress on this issue. The agency (1) developed and released training for NSF staff on assessing disclosures required as part of the proposal process; (2) conducted outreach to the academic community to raise awareness of the risks to research security including those posed by foreign government talent recruitment programs; (3) co-chaired the subcommittee that developed the "Recommended Practices for Strengthening the Security and Integrity of America's Science and Technology Research Enterprise" released by the White House, and (4) collaborated with OIG to address threats posed by foreign government talent recruitment programs, including recouping or preventing the loss of millions of taxpayer dollars through actions to suspend or terminate awards.

Going forward, NSF will continue to work diligently to address the risks of foreign government interference in NSF-funded research. This work will include development of a comprehensive plan of additional actions to address threats from foreign government interference and ensure the integrity and security of NSF-funded research. More specifically, NSF will take steps to (1) enhance awareness of research security risks and protections; (2) implement NSF's enhanced pre-award and post-award disclosure requirements; (3) share information across U.S. government agencies, including OIG; and (4) identify and analyze risks.

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<sup>19</sup> The 2021 *Women, Minorities, and Persons with Disabilities in Science and Engineering* report is available at <https://nces.nsf.gov/pubs/nsf21321>



## Performance

NSF's Strategic Plan for FY 2018 – 2022, *Building the Future: Investing in Discovery and Innovation*,<sup>20</sup> 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	<i>1.1 Knowledge</i> Advance knowledge through investments in ideas, people, and infrastructure.
	<i>1.2 Practice</i> Advance the practice of research.
Advance the capability of the Nation to meet current and future challenges	<i>2.1 Societal Impacts</i> Support research and promote partnerships to accelerate innovation and to provide new capabilities to meet pressing societal needs.
	<i>2.2 STEM Workforce</i> 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	<i>3.1 Human Capital</i> Attract, retain, and empower a talented and diverse workforce.
	<i>3.2 Processes and Operations</i> Continually improve agency operations.

Although reporting on Agency Priority Goals (APGs) was suspended on performance.gov during FY 2021, a Presidential transition year, NSF continued to work towards its Partnerships-focused APG for FY 2020-2021: *Strategically engage in public and private partnerships to enhance the impact of NSF's investments and contribute to American economic competitiveness and security*.<sup>21,22</sup> The APG stated that by September 30, 2021, NSF would develop and pursue an agency-wide partnerships strategy, components of which would include targeted outreach, implementation of process improvements, and improvement of internal and external communications. NSF achieved this goal, making progress in all three areas. NSF's *FY 2021 Annual Performance Report (APR)* will contain a full accounting of what was implemented. In FY 2021, NSF continued its practice of having agency leaders conduct quarterly data-driven performance reviews, including reporting on the APG, and continued to participate actively in the President's Management Council.

<sup>20</sup> NSF Strategic Plan FY 2018 – 2022: <https://www.nsf.gov/pubs/2018/nsf18045/nsf18045.pdf>. The NSF Strategic Plan for FY 2022-2026 will be presented with the FY 2023 Budget in February 2022.

<sup>21</sup> Agency Priority Goal: [https://trumpadministration.archives.performance.gov/NSF/APG\\_nsf\\_1.html](https://trumpadministration.archives.performance.gov/NSF/APG_nsf_1.html)

<sup>22</sup> 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."

## Progress Toward Achievement of Performance Goals

Each year, NSF produces an *AFR*, *APR*, and a *Performance and Financial Highlights* summary report. NSF's *FY 2021 APR* will appear in the *FY 2023 Budget Request to Congress* 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 2021 APR*. Where appropriate, results will incorporate a discussion about the effects of the COVID-19 pandemic on performance. The *FY 2021 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 2021 APR* and *FY 2021 Performance and Financial Highlights* summary report will be posted on the NSF website concurrent with NSF's *FY 2023 Budget Request to Congress* in February 2022.<sup>23</sup>

### FY 2021 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	Divisions and Offices will make timely proposal decisions.
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 2021, 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 thereby 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 of Renewing NSF are: (1) making information technology work even better for all; (2) adapting the workforce and the work; (3) streamlining, standardizing, and

<sup>23</sup> *FY 2021 Agency Performance Report* (included in the Performance chapter of the *FY 2023 Budget Request to Congress*) and *FY 2021 Performance and Financial Highlights*: <https://www.nsf.gov/about/performance/>

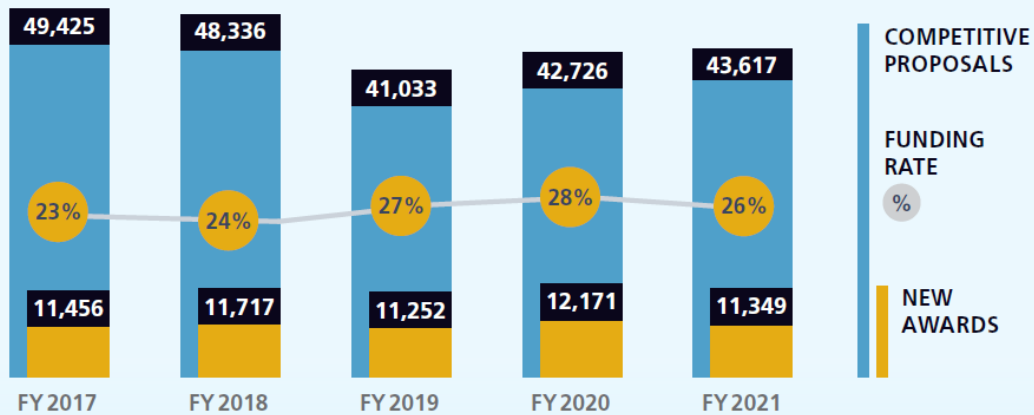
simplifying processes and practices; and (4) expanding and deepening public and private partnerships. NSF has performance goals supporting all four areas. For example, the Renewing NSF emphasis on expanding and deepening public and private partnerships has been directly aligned with the FY 2021 APG on Public and Private Partnerships.

### 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 2019 Digest*.<sup>24</sup> In FY 2021, NSF introduced a new, interactive dashboard, *NSF by the Numbers*,<sup>25</sup> that provides statistical and funding information with filters for viewing NSF funding, award, and proposal data by State, fiscal year, institution-type and other variables.

Figure 1.5 identifies three key portfolio measures: competitive proposals acted upon, new awards, and funding rates.

## Figure 1.5. Number of NSF Competitive Proposals, New Awards and Funding Rates



Note: New awards are a subset of competitive proposals.

<sup>24</sup> NSF's Merit Review Process, FY 2019 Digest (NSB-2020-38): [https://www.nsf.gov/nsb/publications/2020/merit\\_review/FY-2019/nsb202038.pdf](https://www.nsf.gov/nsb/publications/2020/merit_review/FY-2019/nsb202038.pdf)

<sup>25</sup> NSF by the Numbers dashboard: <https://beta.nsf.gov/about/about-nsf-by-the-numbers>

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

- Between FY 2020 and FY 2021, the number of competitive proposal actions increased by 2 percent; from 42,726 to 43,617.
- The number of new awards in FY 2021 was 11,349, a decrease of almost 7 percent from FY 2020.
- The overall funding rate in FY 2021 was 26 percent, a decrease of 2 percentage points. 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 \$231,202, approximately \$18,000 higher than in FY 2020. The average annual award size has been increasing each year.
- The number of employees (FTEs) increased between FY 2020 and FY 2021, 1,421 FTE and 1,456 FTE, respectively.
- The number of active awards increased 2 percent in FY 2021, from 55,239 in FY 2020 to 56,427 in FY 2021. The 5-year average number of active awards is almost 55,000.

**Table 1.2 Proposal Workload and Management Trends**

Measure		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Percent Change (FY 2021-FY 2020)	Average (FY 2017-FY 2021)
Portfolio	Competitive proposal actions	49,425	48,336	41,033	42,726	43,617	2.1%	45,027
	Competitive award actions	11,456	11,717	11,252	12,171	11,349	-6.8%	11,589
	Average annual award size (competitive awards)	\$174,533	\$189,418	\$197,530	\$213,280	\$231,202	8.4%	\$201,193
	Funding rate	23%	24%	27%	28%	26%	-2 percentage points	26%
Proposal Workload	Number of employees FTE, usage <sup>1</sup>	1,430	1,417	1,415	1,421	1,456	2.5%	1,428
	Number of active awards <sup>2</sup>	54,806	54,386	54,093	55,239	56,427	2.2%	54,990
	Proposal reviews conducted <sup>3</sup>	231,691	223,781	192,033	199,526	211,903	6.2%	211,787
Financial	Number of grant payments	22,615	21,727	20,935	22,169	23,794	7.3%	22,248
	Award expenses incurred but not reported at 9/30 (\$ in millions) <sup>4</sup>	\$397	\$393	\$425	\$390	\$444	13.8%	\$410

**Notes:**

<sup>1</sup> FTEs shown include the federal employee workforce for NSF, NSB, OIG, and U.S. Arctic Research Commission.

<sup>2</sup> Active awards include all active awards regardless of whether funds were received during the fiscal year.

<sup>3</sup> 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.

<sup>4</sup> FY 2021 number reflects an accrual, and all other years reflect the validated estimate for the fiscal year. This metric does not include accruals for SBIR awards.

- 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 \$410 million for the last 5 years.



The goal of new research is to develop room temperature superconducting materials. Currently, extreme cold is required to achieve superconductivity, as demonstrated in this photo in which a magnet floats over a superconductor cooled in liquid nitrogen. *Credit: University of Rochester/J. Adam Fenster*

For more information:  
[https://www.youtube.com/watch?v=onB0w3\\_Su9I](https://www.youtube.com/watch?v=onB0w3_Su9I)

#### *Room-Temperature Superconductor*

Researchers at the University of Rochester have set a new record in the quest to achieve superconductivity at room temperature. Superconducting materials have special properties—including zero electrical resistance—that could revolutionize technology at every level, from microscopic sensors to high-efficiency batteries to medical imaging and mag-lev trains. But until now, superconductivity has only been achieved at extremely low temperatures that are difficult and expensive to accomplish. Supported by NSF, the researchers squeezed a mixture of hydrogen, sulfur, and carbon to intense pressures to produce a tiny dot of superconducting material at 58 degrees Fahrenheit—the kind of temperatures seen in Rochester, NY in October and much easier to achieve than usual superconducting temperatures of hundreds of degrees below zero.

## Financial Discussion and Analysis

Financial accountability and effective business processes underpin NSF's programmatic activities and are critical to the achievement of NSF's mission. Following are several important FY 2021 financial management activities that highlight NSF's commitment to fiscal stewardship:

- *Flexibilities and Reporting Requirements related to the American Rescue Plan (ARP) Act of 2021<sup>26</sup> and Coronavirus Aid, Relief, and Economic Security (CARES) Act:<sup>27</sup>* In March 2021, NSF implemented the disaster relief flexibilities in Office of Management and Budget (OMB) Memorandum M-21-20, *Promoting Public Trust in the Federal Government through Effective Implementation of the American Rescue Plan Act and Stewardship of the Taxpayer Resources.*<sup>28</sup> The flexibilities applied to NSF recipients with COVID-19 related Federal financial assistance awards, as well as those with assistance awards not related to COVID-19. The flexibilities provided relief in specific administrative, financial management, and audit areas to limit the negative impacts of the pandemic on NSF-funded work without compromising accountability requirements.

To address requirements in the ARP Act, NSF is working to improve the award descriptions reported in USAspending.gov, project reporting, and sub-award reporting. NSF is undertaking these efforts while being mindful to minimize burden on the agency and the research community.

- *Reporting Innovations:* NSF published and utilized several dashboards in FY 2021 to track key indicators for analysis and decision-making related to the management of proposals, awards, and financial closeout.
  - The *ARP Proposal Lifecycle* dashboard provides summary and detailed information to assist NSF staff in reviewing ARP-funded proposals as the proposals move from 'pending' to 'committed' to 'awarded'. The dashboard provides award information by appropriation and division or directorate. Reporting takes advantage of Robotic Process Automation to distribute a daily e-mail with ARP proposal details and summary statistics to key staff involved in ARP proposal review.
  - NSF deployed the *COVID-19 Award Summary* dashboard to track the agency's total efforts related to COVID-19 research and recovery related activities. This dashboard allows NSF staff to explore and analyze COVID-19 grant information for awards funded through ARP, the CARES Act, and base NSF appropriations. The agency also uses the dashboard to support regular reporting to Congress and other external constituents.
  - The *BFA Burn Rate Explorer* dashboard, gives staff a snapshot of expenditures (burn rate) on awards in NSF's grant portfolio. For example, the dashboard helps users identify awards with burn rates that are a different rate from most of the portfolio, thereby identifying potential outliers. The information in this dashboard helps NSF staff monitor grants and provide appropriate and timely outreach.
  - NSF's *Small Business Innovation Research and Small Business Technology Transfer Award Close* dashboard is a valuable tool in managing the workload of awards for closure and aids financial closeout by the program offices.

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<sup>26</sup> *ARP Act:* <https://www.congress.gov/bill/117th-congress/house-bill/1319/text>

<sup>27</sup> *CARES Act:* <https://www.congress.gov/116/bills/hr748/BILLS-116hr748enr.pdf>

<sup>28</sup> *OMB M-21-20:* [https://www.whitehouse.gov/wp-content/uploads/2021/03/M\\_21\\_20.pdf](https://www.whitehouse.gov/wp-content/uploads/2021/03/M_21_20.pdf)

- **Financial System Upgrades and Innovations:** NSF continued to enhance and upgrade its financial system environment; work toward implementation of government-wide initiatives, such as G-invoicing and Unique Entity Identifiers; seek innovative solutions using robotics process automation; and expand its analytical capabilities to better support NSF's mission. More information on FY 2021 and future financial systems enhancements, initiatives, and innovations is on page MD&A-35.

#### **Synthetic biology startup helps fight COVID**

NSF investments sometimes pay off in more ways than one. Take Ginkgo Bioworks as an example. It's a synthetic biology company whose founders received early funding from NSF as Graduate Research Fellows in the early 2000s and then in 2009 through the Small Business Innovation Research (SBIR) program based on research conducted at an NSF Engineering Research Center. Today, Ginkgo Bioworks operates a cell programming platform intended to make biology "easier to engineer" and is valued at billions of dollars—hardly a small business anymore. But when the COVID-19 outbreak began in March of 2020, they knew that beating the pandemic would require scaling up efforts throughout the biotech community. They committed \$25 million of their resources for use by companies and laboratories developing diagnostic tools, drugs, vaccines, and therapeutics—at no cost to the users. They also stepped up to help coordinate matching resources to researchers, including private funding and R&D information. Ginkgo Bioworks shows how NSF investments keep paying off and can deliver returns to society when we need them most.



Image of a laboratory that designs and builds custom microbes and was supported through an SBIR grant. Credit: Ginkgo Bioworks

For more information: <https://seedfund.nsf.gov/awardees/history/details/?company=ginkgo-bioworks>

- **Government-wide Initiative on Unique Entity Identification (UEI):** In 2022, entities doing business with the federal government will use a UEI created in the System for Award Management (SAM.gov) and stop using DUNS numbers. This transition allows the government to streamline the entity identification and validation process, making it easier and less burdensome for entities to do business with the federal government. NSF is successfully moving forward with planned enhancements to iTRAK and certain NSF business applications. In addition, NSF is conducting data cleansing on institution data to ensure a one-to-one link between the institution identification and DUNS number and is also enhancing the consistent usage of SAM data across its externally facing systems. The agency plans to start using and reporting UEI information in February 2022, before the required April 2022 cutover date.
- **Blockchain proof-of-concept:** Blockchain is a type of database that has the potential to increase trust, security, transparency, and the traceability of data that NSF shares across its network. In FY 2021, NSF completed work on a second phase of a blockchain proof-of-concept project in collaboration with the U.S. Department of Treasury. The project team engaged with more than 100 stakeholders, across 15 government organizations and 57 universities to establish a Federal

Demonstration Partnership Exploration Working Group. Planning efforts are underway to begin the next phase of NSF's blockchain efforts.

- *Enterprise Risk Management (ERM)*: ERM supports NSF's mission by promoting and facilitating a risk-aware culture across NSF and enabling risk-informed decision making and resource prioritization. NSF continued to increase the maturity of its ERM capability consistent with the agency's goal to enhance performance of its mission. In FY 2021, NSF Risk Captains met regularly, updated prior year risk profiles, and supported NSF's directorates and offices in identifying emerging risk and opportunity areas. In the interest of ensuring efficient and effective operations, Risk Captains continued a risk dialogue around the threats and opportunities that a large increase to NSF's budget could present at the leadership and operational levels.

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, 2021.

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.

#### *Eco-friendlier plastic*

Plastic waste is a huge problem. Besides being made from petroleum, a non-renewable resource, most plastic products take a long time to break down, lingering for decades or even centuries in landfills and polluting water systems. Researchers at the FAMU-FSU College of Engineering—a joint engineering program between Florida A&M University and Florida State University—have made important progress on how industry could produce more sustainable plastics from renewable biomass. The researchers' breakthrough is in understanding how sustainable polymers behave when heated and cooled to their final shape. The team found that the polymers derived from biomass have properties very different from similar materials—rapid cooling and slow cooling each produce a different type of material, but mid-range cooling processes prevent the polymer from solidifying at all. Understanding the properties of these sustainable polymers could be a step toward revolutionizing how plastics are produced.



Principal Investigator Dr. Alamo with drawings of new polymer research that may revolutionize how plastics are processed. *Credit: FAMU-FSU*

For more information: <https://www.eng.famu.fsu.edu/index.php/news/alamo-temperature-sustainable-polymers>



## Understanding the Financial Statements

The following discussion of NSF's financial condition and results of operations should be read together with the FY 2021 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 2021 financial statements and notes are presented in a comparative format to facilitate analysis of FYs 2021 and 2020. Table 1.3 summarizes the changes in NSF's financial position in FY 2021 relative to FY 2020.

**Table 1.3 – Changes in NSF's Financial Position in FY 2021**  
(Dollars in Millions)

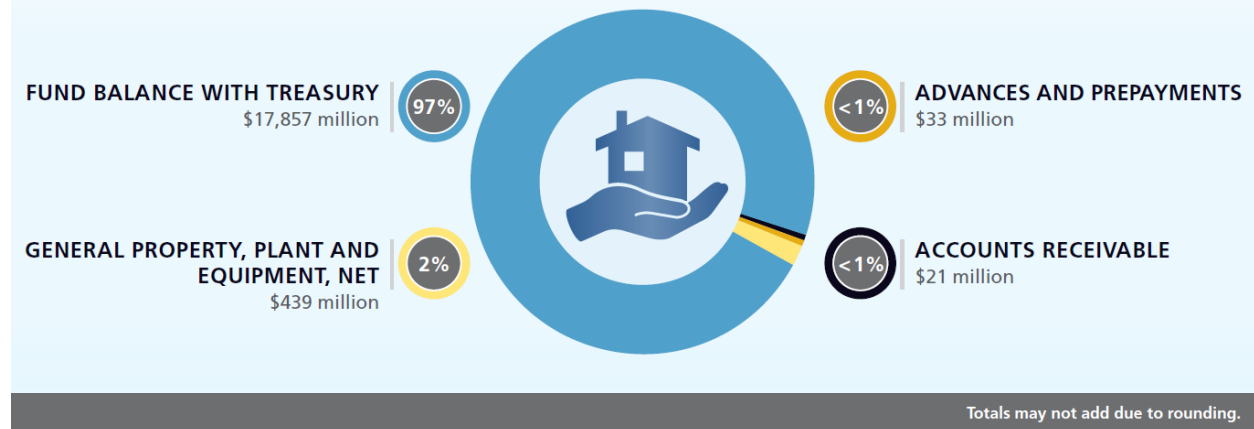
Net Financial Condition	FY 2021	FY 2020	\$ Change	% Change
Assets	\$18,349	\$16,493	\$1,856	11%
Liabilities	\$665	\$633	\$32	5%
Net Position	\$17,684	\$15,860	\$1,824	12%
Net Cost	\$7,376	\$7,355	\$21	<1%

### 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*.

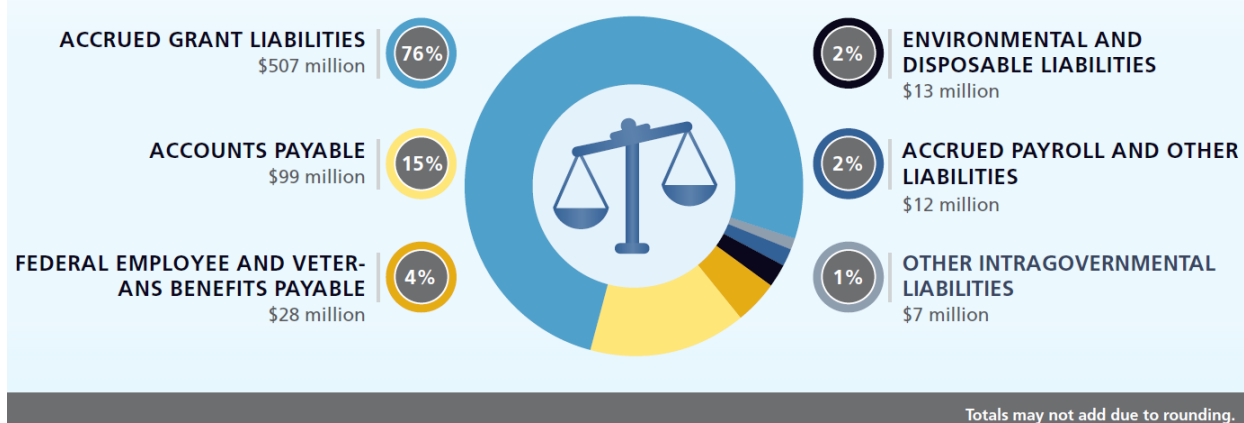
In FY 2021, Total Assets increased 11 percent from FY 2020. The majority of the change occurred in the *Fund Balance with Treasury* account, which increased by \$1,817 million in FY 2021. NSF is authorized to use *Fund Balance with Treasury* to make expenditures and pay amounts due through the disbursement authority of Treasury. The *Fund Balance with Treasury* is increased through appropriations and collections and decreased by expenditures and rescissions.

**Figure 1.6. FY 2021 ASSETS**



In FY 2021, Total Liabilities increased by 5 percent from FY 2020. Driving this change was a \$16 million increase in *Accounts Payable* in addition to an increase of \$13 million in *Accrued Grant Liabilities*. Non-Federal *Accounts Payable* is estimated annually by utilizing historical data based on the actual expenses incurred but not reported, as a percentage of current fiscal year expenses. In FY 2021, NSF modified the Federal portion of *Accounts Payable* by performing outreach to its trading partners and recording offsetting payable accruals for any reported trading partner *Accounts Receivable*. The accrual for standard grants and cooperative agreements is estimated annually by utilizing a linear regression model based on the correlation of NSF grantee's historical unliquidated obligations and expenses incurred but not reported. The accrual for Small Business Innovation Research and Small Business Technology Transfer grants uses a methodology that is based on their unique terms and conditions. In FY 2021, the unliquidated obligations balance for grantees increased, resulting in a higher *Accrued Grant Liabilities* as compared to FY 2020.

**Figure 1.7. FY 2021 LIABILITIES**



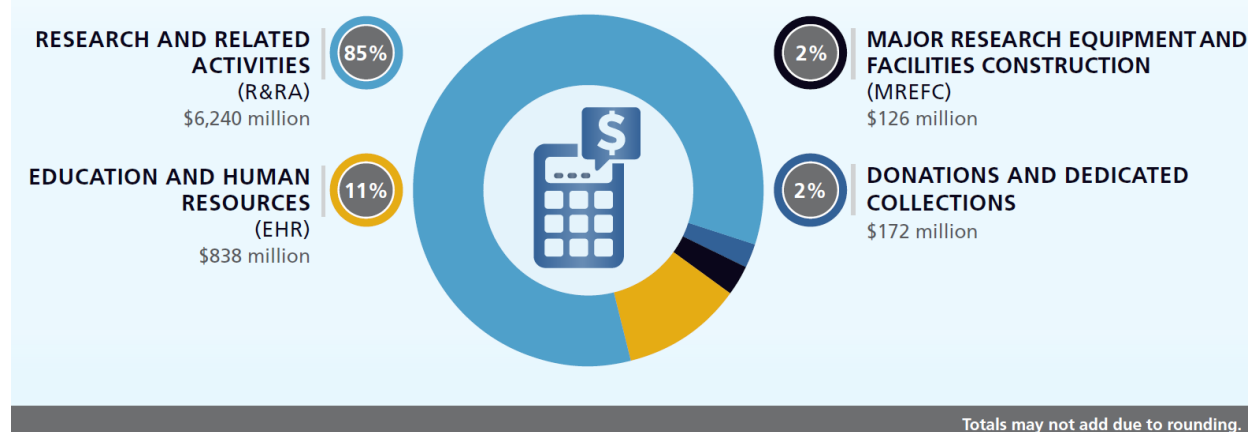
NSF's assets and liabilities were impacted by appropriated funds related to CARES and ARP Act funding primarily in support of R&RA for COVID-19. As of September 30, 2021, NSF had \$596 million in assets and \$10 million in liabilities for COVID-19 related activities.

### **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 2021 *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 2021 *Net Cost of Operations* (Figure 1.8). These administrative and management activities support the agency's program goals. Net costs related to the CARES and ARP Act appropriations for R&RA, EHR, MREFC and AOAM were \$50 million, \$4 million, \$8 million, and \$9 million, respectively.

Figure 1.8. FY 2021 NET COST



### 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 *Net Change in Unexpended Appropriations*, increased by \$713 million; and the *Net Change in Cumulative Results of Operations* increased by \$4 million in FY 2021 for a total increase of \$717 million.

Appropriations from the CARES and ARP Act resulted in Unexpended Appropriations of \$14 million and \$572 million in FY 2021, respectively. 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 2021, *Total Budgetary Resources* increased \$893 million from the FY 2020 level. *Budgetary Resources—Appropriations* in FY 2021 for the R&RA, EHR, and MREFC accounts were \$7,347 million, \$1,029 million, and \$301 million, respectively. The combined *Budgetary Resources—Appropriations* in FY 2021 for the NSB, the OIG, and AOAM accounts totaled \$409 million. NSF also received funding via warrant from the Nonimmigrant Petitioner Account (H-1B) in the amount of \$154 million and via donations from foreign governments, private companies, academic institutions, nonprofit foundations, and individuals in the amount of \$32 million. In FY 2021, the *Budgetary Resources—Appropriations* line also included an H-1B sequestration in the amount of \$9 million.

In FY 2021, NSF received \$600 million in ARP Act funding in support of the national response to COVID-19. The supplemental appropriations provided \$467 million for R&RA, \$61 million for EHR, \$60 million for MREFC, and \$12 million for AOAM. Budget authority provided by the ARP Act is available to NSF for obligation through September 2022.

## Limitations of the Financial Statements

The principal financial statements are prepared to report the financial position, financial condition, and results of operations, pursuant to the requirements of 31 U.S.C. § 3515(b). The statements are prepared from records of NSF in accordance with Federal generally accepted accounting principles (GAAP) and the formats prescribed by OMB. Reports used to monitor and control budgetary resources are prepared from the same 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 \$21 million at September 30, 2021. Of that amount, \$20 million was due from other federal agencies. The remaining \$1 million 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 2021, 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 2021.

### ***American lobster genome could aid development of new sensors, support research into aging and immunity***

American lobsters are fascinating creatures. They are important to the ecology, culture, and economy of the East Coast of the U.S. and Canada. But now, researchers have discovered there is even more under the surface of these spiny crustaceans! Researchers at the Gloucester Marine Genomics Institute have sequenced the American lobster genome for the first time. The lobster's genetic code is giving researchers new insights into the lobster's highly effective sensory nervous systems, unique immune system, and the biological mechanisms that keep them cancer-free. The lobster genome will be an important resource for ecological management and may contribute to new breakthroughs in how we think about cellular health.



NSF-funded researchers have published the first complete genome sequence of the American lobster. *Credit: NOAA*

For more information: <https://gmgi.org/news/gmgi-news-and-announcements/press-releases/press-release-cracking-the-american-lobster-genome/>

## Analysis of Systems, Controls, and Legal Compliance

### Management Assurances

The Federal Managers' Financial Integrity Act of 1982 (FMFIA)<sup>29</sup> and the OMB Circular A-123, *Management's Responsibility for Enterprise Risk Management and Internal Control*<sup>30</sup> require NSF to evaluate annually the effectiveness of agency internal controls and provide reasonable assurance to the President and the Congress on control system adequacy.

NSF assures that its internal control system supports a mature, agile, and sustainable control environment. The approach is proactive and supports effective governance and oversight informed by both internal and external risk. A strong risk-based framework ensures focus on the most consequential management issues and confidence that operations are functioning as intended. The risk-based approach also supports a maturing Enterprise Risk Management Program.

The FY 2021 unmodified Statement of Assurance, with no material weaknesses, provides reasonable assurance as to the overall adequacy and effectiveness of internal controls based upon information that the system of internal control is operating efficiently and effectively.

NSF's internal control assessment provides reasonable assurance that the objectives of FMFIA and the Federal Financial Management Improvement Act of 1996 (FFMIA) were achieved and that the internal control process over financial reporting is effective.

### Highlights from NSF's FY 2021 Data Analytics and Assurance Program

For FY 2021, NSF's Data Analytics & Assurance Program (DAAP) completed Enterprise Risk Management (ERM) and internal control activities in support of the agency's statement of assurance. The DAAP utilizes



#### National Science Foundation

#### FY 2021 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, 2021.

/s/

Sethuraman Panchanathan  
Director

November 12, 2021

<sup>29</sup> FMFIA: <https://www.congress.gov/bill/97th-congress/house-bill/1526/text>

<sup>30</sup> OMB Circular A-123: <https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2016/m-16-17.pdf>

declared enterprise-level and internal control risks leveraged by high-value data analytics and innovative technology to continuously improve the effectiveness of risk monitoring. The DAAP supports the NSF mission by:

- Dealing with the proliferation of data.
- Leveraging artificial intelligence and automation.
- Targeting and reducing the cost of compliance efforts.
- Strengthening management decision-making.

The DAAP's areas of focus for FY 2021 were as follows:

*Enterprise Risk Management* – NSF continued to mature its ERM program in alignment risk management standards issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) ERM Integrated Framework. Efforts included continued strengthening of ERM governance, increasing the maturity of analytic and risk management tools, supporting the OIG-identified FY 2021 management challenge on grants oversight, and aligning ERM entity level controls to validate internal control practices.

*Internal Control* – Oversight of NSF's internal controls over financial reporting was conducted to evaluate program integrity in accordance with OMB Circular A-123, the Green Book, and COSO's Internal Control Integrated Framework and Internal Control Over Financial Reporting Compendium of Approaches and Examples through the following key activities:

- Assessed internal control entity level controls (ELC).
- Conducted Biannual Risk and Control Checkpoints related to key risk areas.
- Conducted internal control over financial reporting risk assessment through testing and modernizing the control environment.
- Conducted the triennial improper payments risk assessment, including quantitative (grants payments testing) and qualitative assessments.
- Provided support for the validation of the grant accrual.
- Completed IT General Controls assessment.
- Supported the Statement of Standards for Attestation Engagements (SSAE 18) review cycle.

In FY 2021, DAAP also facilitated organizational change management efforts to productively engage key stakeholders in ERM and internal control strengthening activities. This included knowledge transfer and support in maintaining key control matrices and risk profiles and using data analytics tools to improve risk identification and monitoring.

***Management's Responsibility for ERM and Internal Control—OMB Circular A-123 and Management of Reporting and Data Integrity Risks, Appendix A***

The GAO "Standards for Internal Control in the Federal Government" and the OMB Circular A-123, "Management's Responsibility for Enterprise Risk Management and Internal Control (A-123)" provide the standards and guidance for a risk-based strategy-setting process to address risks, operations, and reporting objectives. In response to this guidance, NSF has established an effective control environment which provides the methods and tools to evaluate multiple controls, called ELCs. ELCs include both ERM controls and internal controls.

**Requirements for A Risk Management Framework for Government Charge Card Programs — OMB Circular A-123, Appendix B**

In FY 2021, the DAAP team completed a bi-annual risk and control checkpoint to validate the level of risk associated with NSF's government charge card program and the controls in place to mitigate that risk. Due to the pandemic and remote working, charge card activities were limited. Despite low transaction volume, the DAAP team monitored government charge card activity and evaluated and confirmed key controls were in place for charge cards.

**Requirements for Payment Integrity Improvement Act (PIIA)—OMB Circular A-123, Appendix C**

PIIA requires Federal agencies to complete an improper payments risk assessment for programs with annual outlays equal to or above \$10 million to determine whether the program is likely to have improper payments and unknown payments above the statutory threshold on a triennial basis. The statutory threshold is either (1) 1.5 percent of program outlays and above \$10 million of all program payments made during the FY or (2) \$100 million (regardless of the percentage of annual outlays). An improper payment is any payment that is made to the wrong recipient or in the incorrect amount or does not follow applicable statutes and regulations. In accordance with OMB Circular A-123, Appendix C, PIIA guidance, NSF conducted a FY 2021 quantitative assessment over its Grants and Cooperative Agreements program and qualitative assessment over all in-scope programs and mission support activities in FY 2021. The in-scope programs and mission support activities are Grants and Cooperative Agreements, Contracts and Individual Payments, and Payments to Employees. After conducting the quantitative and qualitative assessments, the results show that NSF is low risk of significant improper payment susceptibility for its program and mission support activities.

**Compliance with the Federal Financial Management Improvement Act (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 IT General Controls assessment and active participation in the SSAE 18 review process. Specifically, 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 an unqualified opinion on the Service Auditor Type 2 System and Organization Controls Reports for both Software as a Service and Infrastructure as a Service, and a qualified opinion for Platform as a Service. The service provider took immediate action to resolve the audit qualification and NSF's complementary controls mitigated any risks to NSF. The Independent auditors' opinion addressed the accuracy and completeness of the design of controls and services and is relevant to the internal control over financial reporting. No material non-conformances for FFMIA compliance were identified. Finally, in May 2021, NSF was amongst the first Federal agencies to transition its Financial System's (iTRAK) infrastructure to the cloud, significantly strengthening system security, reliability, and performance.

**Other Federal Reporting and Disclosure**

*Anti-Deficiency Act (ADA):* NSF is not aware of any ADA violations that are required to be reported for the year ended September 30, 2021.

*Digital Accountability and Transparency Act of 2014 (DATA Act):* The DATA Act is a government-wide effort led by OMB and Treasury to enhance and standardize the reporting of Federal contract and financial assistance spending information, enabling taxpayers and policy makers to track Federal spending more effectively. NSF implemented the initial DATA Act requirements in FY 2017. In FY 2020, NSF updated its

reporting processes and controls to meet the requirements of OMB M-20-21, *Implementation of Guidance for Supplemental Funding Provided in Response to the Coronavirus Disease 2019 (COVID-19)* and Treasury's DATA Act Information Model Schema (DAIMS) 2.0. NSF also updated its Data Quality Plan, as required by OMB M-18-16, *Appendix A to OMB Circular No. A-123, Management of Reporting and Data Integrity Risk*, to reflect this new reporting baseline and control environment. In FY 2021, NSF implemented additional process and control changes to meet the requirements of M-21-20, *Promoting Public Trust in the Federal Government through Effective Implementation of the American Rescue Plan Act and Stewardship of the Taxpayer Resources* to provide full transparency over NSF awards funded by the ARP Act. NSF is also finalizing process changes to fully implement Treasury's new DAIMS 2.1 requirements which will take effect in FY 2022, including outlay reporting for all awards.

*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 FPPS's controls are found to be suitably designed and operating effectively for FY 2021. This conclusion is based partly on transactional testing. In addition, NSF verified that its complimentary user entity controls for FPPS were designed and operating effectively and 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 Memorandum 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. Like FY 2020, the volume of charge card transactions in FY 2021 was significantly lower (less than \$4.5 million in FY 2021 outlays) than prior fiscal years due to travel restrictions in place under the COVID-19 pandemic response. Additional information is provided above in subsection *Requirements for A Risk Management Framework for 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-28.

*Federal Information Security Modernization Act Management 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 2021, NSF resolved 137 single audit reports.

NSF ensures that its policies and procedures fully align with federal requirements and continually assesses changes in policies and practices may have on NSF's stewardship over its activities. NSF continues to strengthen audit resolution and other oversight functions by deepening the subject matter expertise of its staff and maintaining a formal, ongoing dialogue with the OIG.

## Financial System Strategy and Framework

### ***Financial System Strategy***

iTRAK is NSF's Oracle-based, commercial-off-the-shelf financial system, hosted off-premise in the 'cloud'. The financial system 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. The financial system, iTRAK, also performs system edit checks and provides an audit trail for financial transactions, thereby strengthening internal controls. iTRAK aligns with NSF's strategic objective 3.2 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.

### ***Regulatory Compliance and Internal Control***

iTRAK complies with all applicable federal laws and regulations, and authoritative guidance 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 many other federal regulations and guidance, such as the CFO Act, FISMA, FMFIA, FFMIA, and the Rehabilitation Act, Section 508.

In FY 2021, 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-31 in the subsection, *Compliance with the Federal Financial Management Improvement Act of 1996—OMB Circular A-123, Appendix D*.

### ***Upgrades, Innovation, Data Analytics, and Future Initiatives***

#### **Upgrades**

NSF continues to enhance and upgrade its financial system environment, implement innovative solutions, and expand its analytical capabilities to better support NSF's mission. In keeping with this objective, NSF upgraded iTRAK and its infrastructure as follows:

- NSF upgraded iTRAK to Oracle EBS R 12.2.9 as a prerequisite for G-invoicing.
  - *Benefits:* (1) built-in integration with G-invoicing module; (2) functionality that enables the creation of business dashboards to assist users in prioritizing their work and to give visibility

- into actions they need to take; (3) icon-based navigation and new table viewing options on forms and new search functionality; and (4) reduced downtime to apply patches.
- NSF moved its financial system to the Oracle Cloud Infrastructure in May 2021.
    - *Benefits:* (1) enhanced security controls including incident identification and remediation; (2) more efficient iTRAK performance; and (3) improved reliability by ensuring nearly full-time availability to users.

#### Innovation

- NSF continues to expand its *Robotic Process Automation (RPA)* footprint utilizing financial data from the financial system (iTRAK) to streamline reconciliations, data processing into iTRAK, and financial reporting. Building on the successes of automation in invoice processing, intra-governmental transfers, and accounting system reconciliation, NSF will explore the use of RPA for vendor management and other financial functions.
- Planning efforts are underway to begin the next phase of NSF's blockchain efforts. In anticipation of moving beyond the proof-of-concept, NSF is exploring *Blockchain-as-a Service (BaaS)* technology and its integration with the financial system, iTRAK.

#### Reporting and Data Analytics

- iTRAK enables financial data to be extracted and loaded into business and visual analytic tools to provide stakeholders with the ability to analyze and present actionable information with metrics, dashboards, graphical displays, and ad hoc reporting.

#### Future Initiatives

Initiatives on the horizon are summarized as follows with anticipated implementation dates:

- UEI Transition (February 2022): Implementation requires enhancements to iTRAK and certain NSF business applications.
- G-Invoicing (October 2022): NSF is in the design phase of implementing Treasury's new G-Invoicing system which will serve as the front-end application for users to originate and manage interagency agreements. NSF is applying and evaluating required system updates to iTRAK. In addition, recognizing the success of the implementation relies on transparency and communication to stakeholders, NSF has fully engaged Directorate and Office staff across the Foundation in designing the G-Invoicing solution. NSF expects to begin testing during the 2<sup>nd</sup> quarter of FY 2022.
- Next Generation Financial System (Quarter 3 FY 2022): NSF will begin planning for the next generation of iTRAK, a cloud-based solution that offers a consumer-like user experience, provides financial analytics, utilizes artificial intelligence and machine learning.

#### **Financial Management System Framework**

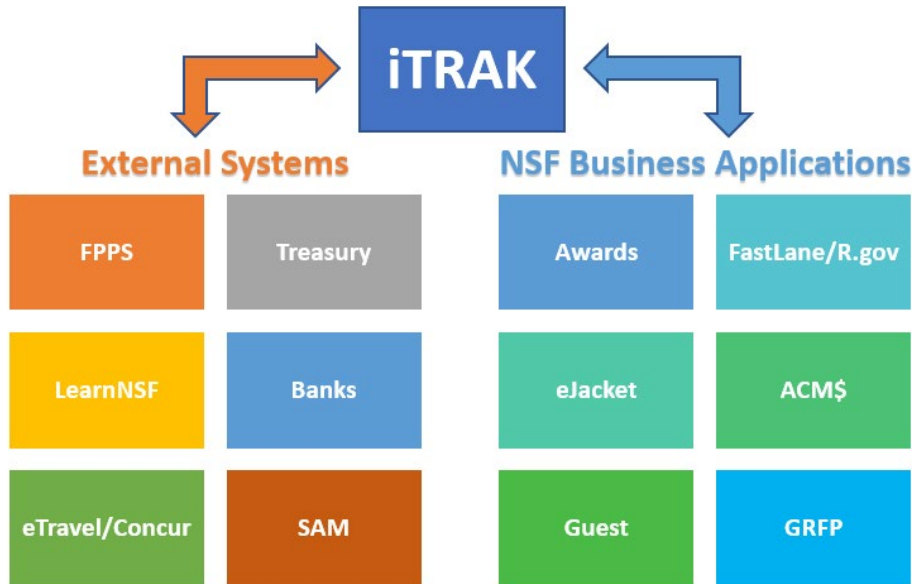
NSF's financial management system framework focuses on the Foundation's financial management systems, standard business processes, data, and information architecture to ensure reliable, timely, and consistent financial information that enables effective management of NSF resources and delivery of mission 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:

- Award Cash Management Service (ACM\$).
- MyNSF Awards (Awards) — NSF's award and award amendment processing, approval, and notification system.
- eJacket — NSF's internal proposal processing system, post-award request tracking and approval system, and document repository.
- Research.gov — Website for the research community that provides quick access to research information and grants management services. Research.gov will replace FastLane.
- Graduate Research Fellowship Program (GRFP) System.
- Guest Travel and Reimbursement System (Guest).

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 12, 2021

**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:** Audit Report No. 22-2-002, Audit of the National Science Foundation's Fiscal Years 2021 and 2020 Financial Statements including Audit Reports on Financial Statements; Internal Control over Financial Reporting; and Compliance with Laws, Regulations, Contracts, and Grant Agreements

This memorandum transmits the Kearney & Company, P.C.'s reports on its financial statement audit of the National Science Foundation (NSF) for FY 2021, which includes FY 2020 comparative information.

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 21-04, *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 2021, 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, 2021 and 2020, 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.<sup>1</sup>
- 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 12, 2021, follows Kearney's reports.

Kearney is responsible for the attached auditor's reports dated November 12, 2021, 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 for Audits, Office of Audits, at 703.292.7100 or [OIGpublicaffairs@nsf.gov](mailto:OIGpublicaffairs@nsf.gov).

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<sup>1</sup> 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.

## 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, 2021 and 2020, 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. 21-04, *Audit Requirements for Federal Financial Statements*. Those standards and OMB Bulletin No. 21-04 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, 2021 and 2020, 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 the 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. 21-04, we have also issued reports, dated November 12, 2021, 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, 2021. 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. 21-04 and should be considered in assessing the results of our audits.

A handwritten signature in blue ink that reads "Kearney &amp; Company". The signature is written in a cursive, flowing style.

Alexandria, Virginia  
November 12, 2021

## **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. 21-04, *Audit Requirements for Federal Financial Statements*, the financial statements of the National Science Foundation (NSF) as of and for the year ended September 30, 2021, and the related notes to the financial statements, which collectively comprise NSF's financial statements, and have issued our report thereon dated November 12, 2021.

### **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. 21-04. 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.



### **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. 21-04 in considering the entity's internal control. Accordingly, this communication is not suitable for any other purpose.

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Alexandria, Virginia  
November 12, 2021

**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. 21-04, *Audit Requirements for Federal Financial Statements*, the financial statements of the National Science Foundation (NSF) as of and for the year ended September 30, 2021, and the related notes to the financial statements, which collectively comprise NSF's financial statements and have issued our report thereon dated November 12, 2021.

**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 tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards* and OMB Bulletin No. 21-04.

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 systems requirements, applicable Federal accounting standards, or application of the United States Standard General Ledger at the transaction level.



### **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. 21-04 in considering the entity's compliance. Accordingly, this communication is not suitable for any other purpose.

A handwritten signature in blue ink that reads "Kearney &amp; Company". The signature is written in a cursive, flowing style.

Alexandria, Virginia  
November 12, 2021

**Attachment I –  
National Science Foundation’s  
Management Response**



**OFFICE OF BUDGET, FINANCE & AWARD MANAGEMENT**

**MEMORANDUM**

**Date:** November 12, 2021

**To:** Allison Lerner, Inspector General

**From:** *Teresa Grancorvitz*  
Teresa Grancorvitz, Chief Financial Officer

**Subject:** Management's Response to Independent Auditor's Report for Fiscal Year (FY) 2021

I am pleased the National Science Foundation received an unmodified opinion in the Independent Public Auditor's Report on the FY 2021 financial statements. Once again, staff across NSF rose to the challenges faced during the pandemic and demonstrated their commitment to financial management excellence. I also appreciate the professionalism and collaboration that your staff and Kearney & Company (Kearney) demonstrated during the audit.

We look forward to working with the Office of Inspector General and Kearney on future audits. 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](mailto:mwetklow@nsf.gov).



National Science Foundation

**FINANCIAL STATEMENTS**

As of and for the Fiscal Years ended  
September 30, 2021 and 2020



*Financial Statements*  
*September 30, 2021 and 2020*

**National Science Foundation**  
**Balance Sheet**  
**As of September 30, 2021 and 2020**  
**(Amounts in Thousands)**

<b>Assets</b>	<u><b>2021</b></u>	<u><b>2020</b></u>
Intragovernmental Assets		
Fund Balance With Treasury (Note 2)	\$ 17,856,554	\$ 16,039,090
Accounts Receivable, Net		
Assets for Custodial and Non-Entity Liabilities		
Other Than the General Fund of the US Government	8,747	-
Accounts Receivable, Net	<u>10,855</u>	<u>11,408</u>
Total Accounts Receivable, Net	19,602	11,408
Advances and Prepayments (Note 8)	<u>32,729</u>	<u>36,824</u>
Total Intragovernmental Assets	<u>17,908,885</u>	<u>16,087,322</u>
Assets With the Public		
Cash and Other Monetary Assets (Note 2)	16	26,622
Accounts Receivable, Net	900	909
General Property, Plant and Equipment, Net (Note 3)	<u>439,079</u>	<u>377,862</u>
Total Assets With the Public	439,995	405,393
<b>Total Assets</b>	<b><u>\$ 18,348,880</u></b>	<b><u>\$ 16,492,715</u></b>
<b>Liabilities</b>		
Intragovernmental Liabilities		
Accounts Payable		
Accounts Payable	<u>\$ 33,508</u>	<u>\$ 22,298</u>
Total Accounts Payable	33,508	22,298
Other Intragovernmental Liabilities		
Benefit Program Contributions Payable	2,881	2,387
Other Liabilities (Without Reciprocals)	2,810	2,599
Other Liabilities		
Liability to the General Fund of US Government - for Custodial and Other Non-Entity Assets	<u>837</u>	<u>884</u>
Total Other Intragovernmental Liabilities	6,528	5,870
Total Intragovernmental Liabilities	<u>40,036</u>	<u>28,168</u>
Liabilities With the Public		
Accounts Payable	65,588	60,519
Federal Employee and Veteran Benefits Payable	27,798	26,307
Environmental and Disposal Liabilities (Note 6)	13,006	12,930
Other Liabilities		
Accrued Grant Liabilities	506,525	493,090
Accrued Payroll and Other Liabilities	<u>12,280</u>	<u>11,528</u>
Total Other Liabilities	518,805	504,618
Total Liabilities With the Public	<u>625,197</u>	<u>604,374</u>
<b>Total Liabilities</b>	<b><u>\$ 665,233</u></b>	<b><u>\$ 632,542</u></b>
<b>Net Position</b>		
Unexpended Appropriations		
Unexpended Appropriations - Other Funds	<u>\$ 16,561,541</u>	<u>\$ 14,830,495</u>
Total Unexpended Appropriations	16,561,541	14,830,495
Cumulative Results of Operations		
Cumulative Results of Operations - Dedicated Collections (Note 7)	657,863	616,843
Cumulative Results of Operations - Other Funds	<u>464,243</u>	<u>412,835</u>
Total Cumulative Results of Operations	1,122,106	1,029,678
<b>Total Net Position</b>	<b><u>\$ 17,683,647</u></b>	<b><u>\$ 15,860,173</u></b>
<b>Total Liabilities and Net Position</b>	<b><u>\$ 18,348,880</u></b>	<b><u>\$ 16,492,715</u></b>

*The accompanying notes are an integral part of these statements.*

*Financial Statements*  
*September 30, 2021 and 2020*

National Science Foundation  
Statement of Net Cost  
For the Fiscal Years Ended September 30, 2021 and 2020  
(Amounts in Thousands)

Program Costs	<u>2021</u>	<u>2020</u>
Research and Related Activities		
Gross Costs	\$ 6,314,994	\$ 6,321,811
Less: Earned Revenue	<u>(74,971)</u>	<u>(124,036)</u>
<b>Net Research and Related Activities</b>	<b><u>\$ 6,240,023</u></b>	<b><u>\$ 6,197,775</u></b>
 Education and Human Resources		
Gross Costs	\$ 843,324	\$ 856,269
Less: Earned Revenue	<u>(5,545)</u>	<u>(3,706)</u>
<b>Net Education and Human Resources</b>	<b><u>\$ 837,779</u></b>	<b><u>\$ 852,563</u></b>
 Major Research Equipment and Facilities Construction		
Gross Costs	\$ 126,420	\$ 164,583
Less: Earned Revenue	<u>-</u>	<u>-</u>
<b>Net Major Research Equipment and Facilities Construction</b>	<b><u>\$ 126,420</u></b>	<b><u>\$ 164,583</u></b>
 Donations and Dedicated Collections		
Gross Costs	\$ 172,116	\$ 139,597
Less: Earned Revenue	<u>-</u>	<u>-</u>
<b>Net Donations and Dedicated Collections</b>	<b><u>\$ 172,116</u></b>	<b><u>\$ 139,597</u></b>
 <b>Net Cost of Operations (Note 11)</b>	<b><u>\$ 7,376,338</u></b>	<b><u>\$ 7,354,518</u></b>

*The accompanying notes are an integral part of these statements.*

*Financial Statements*  
*September 30, 2021 and 2020*

**National Science Foundation**  
**Statement of Changes in Net Position**  
**For the Fiscal Year Ended September 30, 2021**  
**(Amounts in Thousands)**

	<u>2021</u>		
	<u>Funds From Dedicated Collection (Note 7)</u>	<u>All Other Funds</u>	<u>Total</u>
<b>Unexpended Appropriations</b>			
<b>Beginning Balances</b>	\$ -	\$ 14,830,495	\$ 14,830,495
Appropriations Received	-	9,086,759	9,086,759
Other Adjustments (Canceled Authority)	-	(92,050)	(92,050)
Appropriations Used	-	<u>(7,263,663)</u>	<u>(7,263,663)</u>
<b>Net Change in Unexpended Appropriations</b>	-	<b>1,731,046</b>	<b>1,731,046</b>
<b>Unexpended Appropriations, Ending</b>	<u>\$ -</u>	<u>\$ 16,561,541</u>	<u>\$ 16,561,541</u>
 <b>Cumulative Results of Operations</b>			
<b>Beginning Balances</b>	\$ 616,843	\$ 412,835	\$ 1,029,678
Appropriations Used	-	7,263,663	7,263,663
Non-Exchange Revenue	-	6	6
Donations	-	32,243	32,243
Transfers In / (Out) Without Reimbursement	162,485	60,008	222,493
Imputed Financing	-	13,483	13,483
Other	-	(63,122)	(63,122)
Net Cost of Operations	<u>(121,465)</u>	<u>(7,254,873)</u>	<u>(7,376,338)</u>
<b>Net Change in Cumulative Results of Operations</b>	<b>41,020</b>	<b>51,408</b>	<b>92,428</b>
<b>Cumulative Results of Operations, Ending</b>	<u>\$ 657,863</u>	<u>\$ 464,243</u>	<u>\$ 1,122,106</u>
 <b>Net Position</b>	<u>\$ 657,863</u>	<u>\$ 17,025,784</u>	<u>\$ 17,683,647</u>

*The accompanying notes are an integral part of these statements.*

*Financial Statements*  
*September 30, 2021 and 2020*

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

		<u>2020</u>	
	Funds From Dedicated Collection (Note 7)	All Other Funds	Total
<b>Unexpended Appropriations</b>			
<b>Beginning Balances</b>	\$ -	\$ 13,812,440	\$ 13,812,440
Appropriations Received	-	8,354,330	8,354,330
Other Adjustments (Canceled Authority)	-	(79,324)	(79,324)
Appropriations Used	-	(7,256,951)	(7,256,951)
<b>Net Change in Unexpended Appropriations</b>	-	<b>1,018,055</b>	<b>1,018,055</b>
<b>Unexpended Appropriations, Ending</b>	\$ -	\$ 14,830,495	\$ 14,830,495
<b>Cumulative Results of Operations</b>			
<b>Beginning Balances</b>	\$ 587,970	\$ 353,017	\$ 940,987
Appropriations Used	-	7,256,951	7,256,951
Non-Exchange Revenue	-	44	44
Donations	-	27,215	27,215
Transfers In / (Out) Without Reimbursement	153,719	-	153,719
Imputed Financing	-	11,310	11,310
Other	-	(6,030)	(6,030)
Net Cost of Operations	(124,846)	(7,229,672)	(7,354,518)
<b>Net Change in Cumulative Results of Operations</b>	28,873	59,818	88,691
<b>Cumulative Results of Operations, Ending</b>	\$ 616,843	\$ 412,835	\$ 1,029,678
 <b>Net Position</b>	 \$ 616,843	 \$ 15,243,330	 \$ 15,860,173

*The accompanying notes are an integral part of these statements.*

**National Science Foundation**  
**Statement of Budgetary Resources**  
**For the Fiscal Years Ended September 30, 2021 and 2020**  
**(Amounts in Thousands)**

	<u>2021</u>	<u>2020</u>
<b>Budgetary Resources</b>		
Unobligated Balance from Prior Year Budget Authority, Net	\$ 589,136	\$ 445,869
Appropriations	9,272,739	8,535,304
Spending Authority from Offsetting Collections	113,864	101,120
<b>Total Budgetary Resources (Note 9)</b>	<b><u>\$ 9,975,739</u></b>	<b><u>\$ 9,082,293</u></b>
 <b>Status of Budgetary Resources</b>		
New Obligations and Upward Adjustments (Note 9)	\$ 9,018,208	\$ 8,596,034
Unobligated Balance, End of Year		
Apportioned, Unexpired (Note 2)	775,024	298,562
Unapportioned, Unexpired (Note 2)	15,121	20,624
Unobligated Balance, Unexpired, End of Year	790,145	319,186
Unobligated Balance, Expired, End of Year (Note 2)	167,386	167,073
Total Unobligated Balance, End of Year	957,531	486,259
<b>Total Status of Budgetary Resources</b>	<b><u>\$ 9,975,739</u></b>	<b><u>\$ 9,082,293</u></b>
 <b>Net Outlays (Note 9 and 11)</b>		
Net Outlays	\$ 7,389,780	\$ 7,310,493
Distributed Offsetting Receipts	(35,391)	(32,923)
<b>Net Agency Outlays</b>	<b><u>\$ 7,354,389</u></b>	<b><u>\$ 7,277,570</u></b>

*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.<sup>1</sup>

NSF is led by a presidentially-appointed, Senate-confirmed Director and a 24-member National Science Board (NSB). As of September 30, 2021, there were 24 members serving on the NSB, including the Director. 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 (OIG). 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

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<sup>1</sup> NSF Funding by Institution: <https://www.fiscal.treasury.gov/reports-statements/>

No. A-136, *Financial Reporting Requirements*, revised August 10, 2021. 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 reported as 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 2021, the Consolidated Appropriations Act, 2021 under Public Law (P.L. 116-260), 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 2021, NSF also received supplemental funding through the American Rescue Plan (ARP) Act (P.L. 117-2) to provide grants, scholarships, cooperative agreements, and other activities to respond to COVID-19. Appropriations are recognized as a financing source at the time the related "funded" program or administrative expenditures are incurred. 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.

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. These funds must be donated without restriction other than that they be used in furtherance of one or more of the general purposes of the Foundation and are made available for obligations as necessary to support NSF programs. Donations may be received from foreign governments, private companies, academic institutions, non-profit foundations, and individuals.

**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 and 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* includes non-appropriated funding sources from donations and undeposited collections. *Undeposited Collections* are funds received by NSF, but not remitted to Treasury by September 30. Cash receipts and disbursements are processed by Treasury.

**F. Accounts Receivable, Net**

*Accounts Receivable, Net* consists of amounts due from governmental agencies, private organizations, and individuals. NSF's *Accounts Receivable, Net* also includes debts related to criminal restitutions adjudicated by the Department of Justice, where NSF is identified as the payee. 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 in accordance with SFFAS 1, *Accounting for Selected Assets and Liabilities* and Technical Bulletin 2020-1, *Loss for Intragovernmental Receivables*. 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. NSF's intragovernmental receivables are not written off, but rather the allowance is used to present the net realizable value.

*Assets for Custodial and Non-Entity Liabilities – Other Than the General Fund of the US Government* consists of an accrual of a receivable of sequestered H-1B funds due from the Department of Homeland Security at the end of the subsequent fiscal year.

**G. Advances and Prepayments**

*Advances and Prepayments* consists 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. Payments are only made within the amount of the recorded obligation.

**H. General Property, Plant and Equipment (PP&E), Net**

NSF capitalizes PP&E with costs exceeding \$25 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
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**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 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 custody 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 Federally Owned Property (FOP) held by others in its financial statements based on information contained in the audited financial statements of these entities (if available). 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. Entities which hold FOP but do not separately present the book value of NSF-owned property in their audited financial statements are also listed in Note 4, *General Property, Plant and Equipment in the Custody of Other Entities*, with an unavailable note.

### ***I. Accounts Payable***

*Accounts Payable* consists of liabilities to commercial vendors, contractors, federal agencies, and a rental credit liability. *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 and contractors for which invoices have not been received, but goods and services have been delivered and performed.

### ***J. Other Intragovernmental Liabilities***

*Other Intragovernmental Liabilities* consist primarily of the employer portion of payroll taxes and benefits, payroll taxes associated with unfunded leave, unfunded Federal Employees' Compensation Act (FECA), and liabilities for non-entity assets. A liability is recorded for payments made for workers' compensation pursuant to the FECA because NSF will reimburse the U.S. Department of Labor (DOL) 2 years after the payment of expenses. Liabilities for non-entity assets are recorded to offset accounts receivable balances associated with canceled appropriations.

**K. Other Liabilities**

*Accrued Grant Liabilities* consists 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.

*Accrued Grant Liabilities* also consists of an accrual 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 calculates any SBIR and STTR funds approved for payment, but not yet disbursed to the grantee as of September 30.

*Accrued Payroll and Other Liabilities* consists of accrued payroll and undeposited collections. Accrued Payroll relates to services performed by NSF employees and the Department of Interior's Business Center is NSF's payroll service provider. NSF accrues the amount of salaries earned but not paid as of the end of the reporting period. At year end, NSF also records Undeposited Collections which are funds received by NSF, but not remitted to Treasury by September 30.

**L. Federal Employee and Veteran Benefits Payable**

*Federal Employee and Veterans Benefits Payable* consists of liabilities for actuarial FECA and unfunded employee leave. An actuarial liability is recorded for estimated future payments for workers' compensation pursuant to the FECA. The actuarial FECA liability is the present value of estimated future payments calculated by DOL and is recorded as an unfunded liability. Future appropriations will be used for DOL's estimated reimbursement. *Veterans Benefits Payable* is not applicable to NSF.

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 appropriations. Sick leave and other types of non-vested leave are expensed as taken.

**M. Liabilities Not Covered by Budgetary Resources**

*Liabilities Not Covered by Budgetary Resources* may include liabilities associated with future environmental cleanup, legal claims, FECA, unfunded leave, and a rental credit liability.

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.

### **N. Net Position**

*Net Position* is the residual difference between assets and liabilities and is composed of unexpended appropriations and cumulative results of operations, presented separately by dedicated collections and all other funds. *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.

### **O. Retirement Plan**

In FY 2021, approximately 3 percent of NSF employees participated in the Civil Service Retirement System (CSRS), to which NSF matches contributions up 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 to 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<sup>2</sup>.

### **P. 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.

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<sup>2</sup> OPM Benefit Administration website:

<https://www.opm.gov/retirement-services/publications-forms/benefits-administration-letters/2021/21-103.pdf>

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 SFFAS No. 6, *Accounting for Property, Plant, and Equipment*, 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.

***Q. 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. Actual results may differ from these estimates, and the difference will be adjusted for and included in the financial statements of the following quarter.

***R. 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.

***S. 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, 2021 and 2020:

(Amounts in Thousands)	2021
Obligated, Not Yet Disbursed	\$ 16,899,010
Unobligated Available, Unexpired	775,024
Unobligated Unavailable, Unexpired	15,121
Unobligated Unavailable, Expired	167,386
Less: Cash and Other Monetary Assets	(16)
Add: Undeposited Collections and Donations Sequestration	29
<b>Total FBWT</b>	<b>\$ 17,856,554</b>

(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
<b>Total FBWT</b>	<b>\$ 16,039,090</b>

*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. In FY 2021, NSF closed the commercial bank accounts and transferred all balances to Treasury. *Undeposited Collections* are funds received by NSF, but not remitted to Treasury by September 30.

*Notes to the Financial Statements*  
*September 30, 2021 and 2020*

**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 2021 reporting. The reconciliation as of September 30, 2021 and 2020 is shown below.

(Amounts in Thousands)	2021	2020
	Net PP&E	Net PP&E
Balance Beginning of Fiscal Year	\$ 377,862	\$ 327,827
Capitalized Acquisitions	77,640	100,827
Dispositions/Revaluations	735	(30,480)
Depreciation Expense	(17,158)	(20,312)
Balance as of September 30, 2021 and 2020	\$ 439,079	\$ 377,862

The components of *General Property, Plant and Equipment, Net* as of September 30, 2021 and 2020 are shown below. As of September 30, 2021, NSF had not identified any asset impairments.

(Amounts in Thousands)	2021		
	Acquisition Value	Accumulated Depreciation/Amortization	Net PP&E
Equipment	\$ 177,053	\$ (150,569)	\$ 26,484
Aircraft and Satellites	115,806	(115,806)	-
Buildings and Structures	319,629	(177,767)	141,862
Leasehold Improvements	29,729	(8,816)	20,913
Construction in Progress	143,445	-	143,445
Internal Use Software	87,642	(87,531)	111
Software in Development	106,264	-	106,264
Total PP&E	\$ 979,568	\$ (540,489)	\$ 439,079

(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



#### 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 NSF Federally Owned Property 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.

Major facilities with significant Federally Owned Property are required to disclose in their audited financial statements the value of Federally Owned Property in their custody. With the exception of these Major facilities, other entities which received NSF funding are not required to report Federally Owned Property separately in their audited financial statements. For entities which hold Federally Owned Property but do not disclose the book value in their audited financial statements, the value of Federally Owned Property will be listed as unavailable below.

(Amounts in Thousands)

<u>Entities with Audited and Separately Reported NSF Federally Owned Property</u>	<u>Amount</u>	<u>Fiscal Year Ending</u>
National Radio Astronomy Observatory - AUI	\$ 310,892	9/30/2020
Association of Universities for Research in Astronomy, Inc - AURA	\$ 1,120,866	9/30/2020
California Institute of Technology	Unavailable	9/30/2020
Dartmouth College	Unavailable	6/30/2020
Incorporated Research Institutions for Seismology - IRIS	Unavailable	6/30/2020
Oregon State Univeristy	Unavailable	6/30/2020
Raytheon BBN Technologies Corp.	Unavailable	12/31/2020
SRI International	Unavailable	12/26/2020
UNAVCO, Inc.	Unavailable	12/31/2019
University Corporation for Atmospheric Research	Unavailable	9/30/2020
University of Alaska	\$ 144,700	6/30/2020
University of California	Unavailable	6/30/2020
University of Central Florida	Unavailable	6/30/2020
University of Rhode Island	Unavailable	6/30/2020
University of Wisconsin	Unavailable	6/30/2020
Woods Hole Oceanographic Institution	Unavailable	12/31/2020

#### Note 5. Leases

NSF currently has an occupancy agreement with GSA for its 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:

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(Amounts in Thousands)

Fiscal Year	Building Operating Lease Amount (Federal)
2022	\$ 24,879
2023	25,001
2024	25,125
2025	25,254
2026	25,386
2027 through 2032	152,747
Total Minimum Non-Cancelable Lease Payments	\$ 278,392

NSF also has an occupancy agreement with GSA for warehouse space in Springfield, Virginia that will expire in 2029. The occupancy agreement for office space in Denver, Colorado was terminated as of September 30, 2021. The cancellation clauses with the agreements allow NSF to terminate use with 120-day notice. These agreements contain escalation clauses tied to operating expenses. In addition, the Springfield agreement contains a contingent rental based on re-appraised rental rates.

## **Note 6. Environmental and Disposal Liabilities**

### Restoration Projects

After an extensive evaluation process, NSF decided to cease scientific observations from the Sondrestrom Research Facility, a geophysical observatory in Kangerlussuaq, Greenland and to proceed with actions to restore the location. In FY 2019, NSF recorded an initial total estimated liability for the restoration project costs of \$2 million to decommission and decontaminate the site. The estimated liability remained at \$2 million as of September 30, 2021

### 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 cost re-estimates since FY 2020. Although NSF recorded a minor adjustment to the liability, the estimated liability remained \$11 million as of September 30, 2021 and 2020.

## 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:

- Scholarships in Science, Technology, Engineering, and Mathematics
- Grants for Mathematics, Engineering, or Science Enrichment Courses
- Systemic Reform Activities

The H-1B Nonimmigrant Petitioner 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, 2021 and 2020, NSF was subject to H-1B sequestrations of \$9 million for each year. In addition, the Consolidated Appropriations Act, 2021 (P.L. 116-260) permanently rescinded \$60 million of H-1B receipts in FY 2021.

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(Amounts in Thousands)	2021	2020
<u>Balance Sheet as of September 30, 2021 and 2020</u>		
<b>Assets</b>		
Intragovernmental Assets		
Fund Balance With Treasury	\$ 663,976	\$ 632,023
Accounts Receivable, Net		
Asset for Custodial and Non-Entity Liabilities -		
Other Than the General Fund of the US Government	8,747	-
Total Accounts Receivable, Net	<u>8,747</u>	<u>-</u>
Total Intragovernmental Assets	<u>672,723</u>	<u>632,023</u>
<b>Total Assets</b>	<b><u>\$ 672,723</u></b>	<b><u>\$ 632,023</u></b>
<b>Liabilities</b>		
Liabilities With the Public		
Accounts Payable	\$ 171	\$ 125
Other Liabilities		
Accrued Grant Liabilities	14,689	15,055
Total Other Liabilities	<u>14,689</u>	<u>15,055</u>
Total Liabilities With the Public	<u>14,860</u>	<u>15,180</u>
<b>Total Liabilities</b>	<b><u>\$ 14,860</u></b>	<b><u>\$ 15,180</u></b>
<b>Net Position</b>		
Cumulative Results of Operations	\$ 657,863	\$ 616,843
<b>Total Net Position</b>	<b><u>\$ 657,863</u></b>	<b><u>\$ 616,843</u></b>
<b>Total Liabilities and Net Position</b>	<b><u>\$ 672,723</u></b>	<b><u>\$ 632,023</u></b>

(Amounts in Thousands)	2021	2020
<u>Statement of Net Cost For the Fiscal Years Ended September 30, 2021 and 2020</u>		
Gross Costs	\$ 121,465	\$ 124,846
Less: Earned Revenues	-	-
<b>Net Cost of Operations</b>	<b><u>\$ 121,465</u></b>	<b><u>\$ 124,846</u></b>

<u>Statement of Changes in Net Position For the Fiscal Years Ended September 30, 2021 and 2020</u>		
<b>Net Position, Beginning</b>	<b>\$ 616,843</b>	<b>\$ 587,970</b>
Transfers In / (Out) Without Reimbursement	162,485	153,719
Net Cost of Operation	<u>(121,465)</u>	<u>(124,846)</u>
Net Change in Cumulative Results of Operations	41,020	28,873
<b>Net Position, Ending</b>	<b><u>\$ 657,863</u></b>	<b><u>\$ 616,843</u></b>

**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, 2021 and 2020 amounted to \$16 billion and \$15 billion, respectively.

(Amounts in Thousands)	2021	2020
<b>Undelivered Orders as of September 30, 2021 and 2020</b>		
Undelivered Orders, Unpaid - Non-Federal	\$ 16,229,160	\$ 14,960,079
Undelivered Orders, Paid - Federal	32,729	36,824
Undelivered Orders, Unpaid - Federal	175,273	124,585
Total Undelivered Orders - Federal	208,002	161,409
<b>Total Undelivered Orders</b>	<b>\$ 16,437,162</b>	<b>\$ 15,121,488</b>

**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 2023 President's Budget will include FY 2021 budget execution information and is scheduled for publication in the spring of 2022 and can be found upon publication on the OMB website<sup>3</sup>.

Balances reported in the FY 2020 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)				
<b>Fiscal Year 2020</b>	Budgetary Resources	New Obligations and Upward Adjustments	Distributed Offsetting Receipts	Net Outlays
Combined Statement of Budgetary Resources	\$ 9,082,293	\$ 8,596,034	\$ 32,923	\$ 7,310,493
Expired Accounts	\$ (240,764)	\$ (73,691)	\$ -	\$ -
Other	\$ -	\$ -	\$ (27,923)	\$ -
<b>Budget of the U.S. Government</b>	<b>\$ 8,841,529</b>	<b>\$ 8,522,343</b>	<b>\$ 5,000</b>	<b>\$ 7,310,493</b>

<sup>3</sup> OPM Benefit Administration website: <https://www.whitehouse.gov/omb>

## 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 \$754 million to Board member affiliated institutions as of September 30, 2021. 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 million dollars or 20 percent of the amount specified in the Board resolution; and
- In the case of procurements when no amount was specified in the Board resolution, if the amended amount exceeds the lesser of \$10 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 2021, the NSB authorized the Director to increase management reserve for an award in which a Board member affiliated institution was a sub-contractor.

**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 validates 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)	2021		
	Federal	Public	Total
<b>Net Cost</b>	<b>\$ 147,514</b>	<b>7,228,824</b>	<b>7,376,338</b>
<b>Components of Net Cost Not Part of Net Agency Outlays</b>			
Property, Plant, and Equipment Depreciation Expense	-	(17,158)	(17,158)
Applied Overhead / Cost Capitalization Offset	-	78,389	78,389
Increase / (Decrease) in Assets:			
Accounts Receivable, Net	(553)	(9)	(562)
Other Assets	(4,095)	(50)	(4,145)
(Increase) / Decrease in Liabilities:			
Accounts Payable	(11,705)	(18,504)	(30,209)
Environmental and Disposal Liabilities	-	(76)	(76)
Federal Employee and Veteran Benefits Payable	-	(1,491)	(1,491)
Other Liabilities	(211)	(752)	(963)
Financing Sources:			
Imputed Costs	(13,483)	-	(13,483)
<b>Total Components of Net Cost Not Part of Net Agency Outlays</b>	<b>(30,047)</b>	<b>40,349</b>	<b>10,302</b>
<b>Components of Net Agency Outlays Not Part of Net Cost</b>			
Donated Revenue	-	(32,243)	(32,243)
Transfers Out (In) Without Reimbursement	(8)	-	(8)
<b>Total Components of Net Agency Outlays Not Part of Net Cost</b>	<b>(8)</b>	<b>(32,243)</b>	<b>(32,251)</b>
<b>Net Agency Outlays</b>	<b>\$ 117,459</b>	<b>7,236,930</b>	<b>7,354,389</b>
<b>Related Amounts on the Statement of Budgetary Resources</b>			
Net Outlays			\$ 7,389,780
Distributed Offsetting Receipts			(35,391)
<b>Net Agency Outlays</b>			<b>\$ 7,354,389</b>

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	<b>2020</b>		
	<b>Federal</b>	<b>Public</b>	<b>Total</b>
<b>Net Cost</b>	<b>\$ 174,339</b>	<b>7,180,179</b>	<b>7,354,518</b>
<b>Components of Net Cost Not Part of Net Outlays</b>			
Property, Plant, and Equipment Depreciation	-	(20,294)	(20,294)
Applied Overhead / 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)
Transfers Out (In) Without Reimbursement	-	-	-
<b>Total Components of Net Cost Not Part of the Net Outlays</b>	<b>(19,138)</b>	<b>(30,884)</b>	<b>(50,022)</b>
<b>Components of Net Outlays Not Part of Net Cost</b>			
Other (Revenue)	333	(27,259)	(26,926)
<b>Total Components of Net Outlays Not Part of Net Cost</b>	<b>333</b>	<b>(27,259)</b>	<b>(26,926)</b>
<b>Net Outlays</b>	<b>\$ 155,534</b>	<b>7,122,036</b>	<b>7,277,570</b>

**Related Amounts on the Statement of Budgetary Resources**

Net Outlays	\$ 7,310,493
Distributed Offsetting Receipts	(32,923)
<b>Net Agency Outlays</b>	<b>\$ 7,277,570</b>



## **Note 12. COVID-19 Activity**

As part of the American Rescue Plan (ARP) Act of 2021 (P.L. 117-2), the National Science Foundation (NSF) received \$600 million "to fund or extend new and existing research grants, cooperative agreements, scholarships, fellowships, and apprenticeships, and related administrative expenses to prevent, prepare for, and respond to coronavirus." In addition, NSF used funding from its base appropriation, the Consolidated Appropriations Act, 2021 (P.L. 116-260), H-1B Nonimmigrant Petitioner Fees, and Reimbursable Authority to support COVID-19-related research and other activity.

In FY 2020, in addition to base appropriation, NSF received \$76 million from the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136) "to prevent, prepare for, and respond to coronavirus."

The table below provides a summary of budget authority established by the ARP Act of 2021 and CARES Act of 2020.

(Amounts in Thousands)	ARP Act FY 2021	CARES Act FY 2020
<u>NSF by Account</u>	<u>Amount</u>	<u>Amount</u>
Research and Related Activities	\$ 467,000	\$ 70,000
Education and Human Resources	61,000	5,000
Major Research Equipment and Facilities Construction	60,000	-
Agency Operations and Award Management	12,000	1,000
<b>Total</b>	<b>\$ 600,000</b>	<b>\$ 76,000</b>

NSF will use Research and Related Activities (R&RA) resources to support new grant and fellowship awards as well as issue supplements to existing awards to support individuals and institutions disproportionately impacted by the coronavirus pandemic. In particular, NSF is structuring the investments to: (1) reach the most strongly affected groups; (2) support individuals at vulnerable career transition points; and (3) ensure broad distribution.

Like the intent of the R&RA funds, EHR will support new and existing research grants, fellowships, and education activities that align with the three identified emphasis areas. These investments will be awarded across both FY 2021 and FY 2022.

NSF currently has several major multi-user research facility projects under construction with funding appropriated under the Major Research Equipment and Facilities Construction (MREFC) account. Some of these projects, all funded through cooperative agreements, have seen significant delays and concomitant cost increases caused by the COVID-19 pandemic. The primary impacts have been the inability to conduct construction work at remote sites and the impacts of social distancing on the efficiency of construction.

NSF will use ARP resources in accordance with NSF policy and practice to cover impacts that are out of the control of the Project. NSF will also use MREFC funds to cover similar impacts to Midscale-Research Infrastructure, Track 2 projects.

NSF continues to face increased costs across all aspects of agency operations and award management due to coronavirus. The \$12 million provided to Agency Operations and Award Management (AOAM) supports additional program officers and grant specialists and expands the agency's use of virtual technologies and

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collaboration tools that provide the ability to sustain remote operations. NSF relies on the use of these technologies to enable virtual merit review panels to make timely ARP funded awards which go beyond the current needs for obligation of base appropriations. Remaining increased administration costs are to support financial management for the increased number of fellows expected from ARP funding, system configurations, and attendant technical support inside NSF and for awardees.

FY 2021 obligations for COVID-19 activities, by funding source, are summarized as follows:  
(Amounts in Thousands)

NSF by Account	ARP Act	Base Appropriation	H-1B Fees Mandatory + Reimbursable	Amount
Research and Related Activities	\$ 195,542	\$ 1,215,995	4,464	\$ 1,416,001
Education and Human Resources	23,995	267,428	45,995	337,418
Major Research Equipment and Facilities Construction	8,947	1,534	-	10,481
Agency Operations and Award Management	12,000	23	-	12,023
<b>Total</b>	<b>\$ 240,484</b>	<b>\$ 1,484,980</b>	<b>\$ 50,459</b>	<b>\$ 1,775,923</b>

FY 2020 obligations for COVID-19 activities, by funding source, are summarized as follows:  
(Amounts in Thousands)

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

All the available funds provided by the CARES Act of 2020 were obligated as of September 30, 2020.

Budget authority provided by the ARP Act of 2021 is available to NSF for obligation through September 2022. The amount of funding remaining available for obligation is as follows:

(Amounts in Thousands)

NSF by Account	ARP Act Amount
Research and Related Activities	\$ 271,458
Education and Human Resources	37,005
Major Research Equipment and Facilities Construction	51,053
Agency Operations and Award Management	-
<b>Total</b>	<b>\$ 359,516</b>

### 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 2020 FR can be found on the FR website<sup>4</sup> and a copy of the 2021 FR will be posted to this site as soon as it is released.

In FY 2021, NSF implemented the standardized Balance Sheet format as required by the Treasury and has excluded the Balance Sheet in the Reclassification footnote.

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.

**Reclassification of Statement of Net Cost (SNC) to Line Items Used for the  
Government-wide SNC for the Period Ending September 30, 2021  
(Amounts in Thousands)**

FY 2021 National Science Foundation SNC		Line Items Used to Prepare FY 2021 Government-wide SNC			
Financial Statement Line	Amounts	Dedicated Collections	All Other	Total	Reclassified Financial Statement Line
<b>GROSS COSTS</b>					<b>GROSS COSTS</b>
Research and Related Activities	\$ 6,314,994	\$ 121,465	7,110,469	\$ 7,231,934	Non-Federal Gross Cost
		121,465	7,110,469	7,231,934	Total Non-Federal Gross Cost
Education and Human Resources	843,324	-	45,621	45,621	Benefit Program Costs
Major Research Equipment and Facilities	126,420	-	13,483	13,483	Imputed Costs
Donations and Dedicated Collections	172,116	-	151,591	151,591	Buy/Sell Costs
		-	14,225	224,920	Other Expenses (Without Reciprocals)
		-	224,920	224,920	Total Federal Gross Cost
<b>TOTAL GROSS COSTS</b>	<b>\$ 7,456,854</b>	<b>\$ 121,465</b>	<b>7,335,389</b>	<b>\$ 7,456,854</b>	<b>TOTAL GROSS COSTS</b>
<b>EARNED REVENUE</b>					<b>EARNED REVENUE</b>
Research and Related Activities	\$ (74,971)	\$ -	(3,102)	\$ (3,102)	Non-Federal Earned Revenue
		-	(3,102)	(3,102)	Total Non-Federal Earned Revenue
Education and Human Resources	(5,545)	-	(77,414)	(77,414)	Buy/Sell Revenue (Exchange)
		-	(77,414)	(77,414)	Total Federal Earned Revenue
<b>TOTAL EARNED REVENUE</b>	<b>\$ (80,516)</b>	<b>\$ -</b>	<b>(80,516)</b>	<b>\$ (80,516)</b>	<b>TOTAL EARNED REVENUE</b>
<b>NET COST OF OPERATIONS</b>	<b>\$ 7,376,338</b>	<b>\$ 121,465</b>	<b>7,254,873</b>	<b>\$ 7,376,338</b>	<b>NET COST OF OPERATIONS</b>

<sup>4</sup> 2020 FR website: <https://www.fiscal.treasury.gov/reports-statements/>

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**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 Period Ending September 30, 2021  
(Amounts in Thousands)**

FY 2021 National Science Foundation SCNP		Line Items Used to Prepare FY 2021 Government-wide SCNP			
Financial Statement Line	Amounts	Dedicated Collections	All Other	Total	Reclassified Financial Statement Line
<b>UNEXPENDED APPROPRIATIONS</b>					
Beginning Balance	\$ 14,830,495	\$ -	14,830,495	\$ 15,860,173	Net Position, Beginning of Period (Includes Cumulative Results of Operations, Beginning Balance)
Appropriations Received	9,086,759	-	8,994,709	8,994,709	Appropriations Received as Adjusted
Other Adjustments (Canceled Authority)	(92,050)	-	-	-	
Appropriations Used	(7,263,663)	-	(7,263,663)	(7,263,663)	Appropriations Used
Net Change in Unexpended Appropriations	1,731,046	-	-	-	
<b>TOTAL UNEXPENDED APPROPRIATIONS</b>	<b>16,561,541</b>	-	-	-	
<b>CUMULATIVE RESULTS OF OPERATIONS</b>					
Beginning Balance	\$ 1,029,678	\$ 616,843	412,835	Included Above	Net Position, Beginning of Period (Included in Net Position, Unexpended Appropriations)
Appropriations Used	7,263,663	-	7,263,663	7,263,663	<b>Appropriations Expended</b>
Non-Exchange Revenue	6	-	32,229	32,229	<b>Other Taxes and Receipts</b>
Donations	32,243	-	-	-	
Other (1 of 2)	(20)	-	-	-	
Total Non-Exchange Revenues	32,229	-	32,229	32,229	Total Non-Federal Non-Exchange Revenues
		-	-	-	Accruals for Entity Amounts to be Collected in a TAS Other Than the General Fund of the U.S. Government - Non-Exchange
		8,747	-	8,747	Expenditure Transfers-In of Financing Sources
		222,485	-	222,485	Appropriation of Unavailable Special/Trust Fund Receipts Transfers-In
		(8,747)	-	(8,747)	Appropriation of Unavailable Special/Trust Fund Receipts Transfers-Out
Transfers In / (Out) Without Reimbursement	222,493	222,485	8	222,493	Total Appropriation of Unavailable Special/Trust Fund Receipts Transfers-In
Imputed Financing	13,483	-	13,483	13,483	Imputed Financing Sources
		(60,000)	(3,150)	(63,150)	Non-Entity Collections Transferred to the General Fund of the U.S. Government Accrual for Non-Entity Amounts to be Collected and Transferred to the General Fund
Other (2 of 2)	(63,102)	(60,000)	(3,102)	(63,102)	Total Non-Entity Collections and Accrual for Non-Entity Amounts to be Collected
Net Cost of Operations	(7,376,338)	(121,465)	(7,254,873)	(7,376,338)	Net Cost of Operations
Net Change in Cumulative Results of Operations	92,428	-	-	-	
<b>CUMULATIVE RESULTS OF OPERATIONS, ENDING</b>	<b>\$ 1,122,106</b>	-	-	-	
<b>TOTAL NET POSITION</b>	<b>\$ 17,683,647</b>	<b>\$ 657,863</b>	<b>17,025,784</b>	<b>\$ 17,683,647</b>	<b>TOTAL NET POSITION</b>

REQUIRED SUPPLEMENTARY INFORMATION

**Deferred Maintenance and Repairs**

For the Fiscal Years ended September 30, 2021 and 2020

## **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, 2021 and 2020. 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, 2021. At September 30, 2021, NSF determined that there was no scheduled maintenance or repairs on Antarctic capital equipment in poor or very poor condition that were not completed and were deferred or delayed for a future period.

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 thousand. The item was heavy mobile equipment and was considered non-critical to NSF operations.

## 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, 2021 and 2020, as presented in the Statement of Budgetary Resources, is disaggregated for each of NSF's major budget accounts.

*Required Supplementary Information  
September 30, 2021 and 2020*

**The Consolidated Appropriations Act, 2021**

**2021**

(Amounts in Thousands)

	<u>Research and Related Activities</u>	<u>Education and Human Resources</u>	<u>Major Research Equipment</u>	<u>OIG, AOAM, and NSB</u>	<u>Special and Donated</u>	<u>Total</u>
<b>Budgetary Resources</b>						
Unobligated Balance from Prior Year Budget Authority, Net Appropriations	\$ 237,391	43,461	129,426	17,269	161,589	\$ 589,136
Spending Authority from Offsetting Collections	7,347,479	1,029,000	301,000	409,280	185,980	9,272,739
	103,815	4,416	-	5,633	-	113,864
<b>Total Budgetary Resources</b>	<b>\$ 7,688,685</b>	<b>1,076,877</b>	<b>430,426</b>	<b>432,182</b>	<b>347,569</b>	<b>\$ 9,975,739</b>
<b>Status of Budgetary Resources</b>						
New Obligations and Upward Adjustments	\$ 7,246,601	1,003,479	170,216	425,462	172,450	\$ 9,018,208
Unobligated Balance, End of Year:						
Apportioned, Unexpired	306,304	40,590	260,190	1,022	166,918	775,024
Unapportioned, Unexpired	4,278	2,622	20	-	8,201	15,121
Unobligated Balance, Unexpired, End of Year	310,582	43,212	260,210	1,022	175,119	790,145
Unobligated Balance, Expired, End of Year	131,502	30,186	-	5,698	-	167,386
Total Unobligated Balance, End of Year	442,084	73,398	260,210	6,720	175,119	957,531
<b>Total Status of Budgetary Resources</b>	<b>\$ 7,688,685</b>	<b>1,076,877</b>	<b>430,426</b>	<b>432,182</b>	<b>347,569</b>	<b>\$ 9,975,739</b>
<b>Net Outlays</b>						
Net Outlays	\$ 5,885,636	800,746	152,601	384,538	166,259	\$ 7,389,780
Distributed Offsetting Receipts	-	-	-	-	(35,391)	(35,391)
<b>Net Agency Outlays</b>	<b>\$ 5,885,636</b>	<b>800,746</b>	<b>152,601</b>	<b>384,538</b>	<b>130,868</b>	<b>\$ 7,354,389</b>



**The Consolidated Appropriations Act, 2020**

**2020**

(Amounts in Thousands)

	<u>Research and Related Activities</u>	<u>Education and Human Resources</u>	<u>Major Research Equipment</u>	<u>OIG, AOAM, and NSB</u>	<u>Special and Donated</u>	<u>Total</u>
<b>Budgetary Resources</b>						
Unobligated Balance from Prior Year Budget Authority, Net Appropriations	\$ 235,916	49,437	40,953	8,534	111,029	\$ 445,869
Spending Authority from Offsetting Collections	6,789,800	942,550	243,230	378,750	180,974	8,535,304
	89,536	5,174	-	6,410	-	101,120
<b>Total Budgetary Resources</b>	<b>\$ 7,115,252</b>	<b>997,161</b>	<b>284,183</b>	<b>393,694</b>	<b>292,003</b>	<b>\$ 9,082,293</b>
<b>Status of Budgetary Resources</b>						
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
<b>Total Status of Budgetary Resources</b>	<b>\$ 7,115,252</b>	<b>997,161</b>	<b>284,183</b>	<b>393,694</b>	<b>292,003</b>	<b>\$ 9,082,293</b>
<b>Net Outlays</b>						
Net Outlays	\$ 5,811,244	813,091	178,567	372,379	135,212	\$ 7,310,493
Distributed Offsetting Receipts	-	-	-	-	(32,923)	(32,923)
<b>Net Agency Outlays</b>	<b>\$ 5,811,244</b>	<b>813,091</b>	<b>178,567</b>	<b>372,379</b>	<b>102,289</b>	<b>\$ 7,277,570</b>



## **Chapter 3**

# **Appendices (Other Information)**

## SUMMARY OF FY 2021 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	<i>Unmodified</i>				
Restatement	<i>No</i>				
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Ending Balance
<i>Total Material Weaknesses</i>	<i>0</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>0</i>

**Table 3.2 – Summary of Management Assurances**

Effectiveness of Internal Control over Financial Reporting (FMFIA § 2)						
Statement of Assurance	<i>Unmodified</i>					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
<i>Total Material Weaknesses</i>	<i>0</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>0</i>
Effectiveness of Internal Control over Operations (FMFIA § 2)						
Statement of Assurance	<i>Unmodified</i>					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
<i>Total Material Weaknesses</i>	<i>0</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>0</i>
Conformance with Federal Financial Management System Requirements (FMFIA § 4)						
Statement of Assurance	<i>Systems conform to financial management system requirements</i>					
Non-Conformances	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
<i>Total non-conformances</i>	<i>0</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>0</i>
Compliance with Section 803(a) of the Federal Financial Management Improvement Act (FFMIA)						
	Agency			Auditor		
Federal Financial Management System Requirements	<i>No lack of compliance noted</i>					
Applicable Federal Accounting Standards	<i>No lack of compliance noted</i>					
USSGL at Transaction Level	<i>No lack of compliance noted</i>					

# Management Challenges for the National Science Foundation in Fiscal Year 2022

NATIONAL SCIENCE FOUNDATION  
OFFICE OF INSPECTOR GENERAL

October 13, 2021



## AT A GLANCE

### Management Challenges for the National Science Foundation in Fiscal Year 2022

October 13, 2021

#### 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 eight areas representing challenges NSF must continue to address to enhance mission performance:

- Increasing Diversity in Science & Engineering Education and Employment
- Overseeing the United States Antarctic Program (USAP)
- Overseeing Grants in a Changing Environment
- Managing the Intergovernmental Personnel Act Program
- Overseeing Major Multi-User Research Facilities
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs
- Mitigating Threats Posed by the Risk of Cyberattacks
- Managing Transformational Change

When appropriate, 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 are encouraged by NSF's progress in its efforts to address critical management and performance challenges. Effective responses to these challenges will 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 2021

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 2021* in its Agency Financial Report.

FOR FURTHER INFORMATION, CONTACT US AT [OIGPUBLICAFFAIRS@NSF.GOV](mailto:OIGPUBLICAFFAIRS@NSF.GOV).



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

**MEMORANDUM**

**DATE:** October 13, 2021

**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 2022

Attached for your information is our report, *Management Challenges for the National Science Foundation in Fiscal Year 2022*. 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 Foundation's operations; and 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.<sup>1</sup>
- 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.

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

- Increasing Diversity in Science & Engineering Education and Employment
- Overseeing the United States Antarctic Program (USAP)
- Overseeing Grants in a Changing Environment
- Managing the Intergovernmental Personnel Act Program
- Overseeing Major Multi-User Research Facilities
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs
- Mitigating Threats Posed by the Risk of Cyberattacks
- Managing Transformational Change

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

This year, we have recast some prior challenges and added two new challenge areas. First, we broadened our previous challenge focused on overseeing the Antarctic Infrastructure Modernization for Science (AIMS) Project to include other areas of potential concern within USAP. In our continuing oversight, we have found that NSF has a robust plan to address AIMS construction delays. Although we will continue to be vigilant in our oversight of AIMS, broadening the challenge allows us to highlight other areas that could impact overall USAP operation; in addition, the expansion of this challenge will give new Office of Polar Programs leadership a fuller picture of the challenges the program may face. Second, we also expanded last year's challenge focused on overseeing grants during a pandemic to reflect the continuing changes to the research environment, including the potential for increased funding for traditionally smaller and mid-size institutions that may need to strengthen their grant management controls.

<sup>1</sup> 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

Finally, we are introducing two new challenge areas: Mitigating Threats Posed by the Risk of Cyberattacks and Managing Transformational Change. We added the first challenge because, although recent audits have found NSF has an effective information security program under current standards, there is significant risk to federal systems and data, demonstrated by recent attacks on commercial software programs used by federal agencies in 2021. We introduced the second challenge because NSF would grow significantly if pending legislation were to become law, which would demand NSF effectively manage substantial changes in staffing, grant management approaches, and internal processes.

NSF has demonstrated its ability to achieve its mission in an ever-changing environment. As the agency moves into FY 2022 and beyond, it is well positioned to address both familiar and new challenges it may face with acuity, agility, and adaptability.

**CHALLENGE 1****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.

NSF's April 2021 *Women, Minorities, and Persons with Disabilities* report stated:

Women, persons with disabilities, and some minority groups—Blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives—are underrepresented in science and engineering (S&E). That is, their representation in S&E education and S&E employment is smaller than their representation in the U.S. population.

These conclusions echoed those in the NSB's *Vision 2030*, which stated 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. To address this challenge, NSF created the Racial Equity Task Force in September 2020 to focus on the missing millions in STEM. Subsequently, the President issued multiple EOs on diversity, equity, inclusion, and accessibility (DEIA). The EOs' requirements, summarized in Appendix A, include actions to advance these goals both internally — such as providing agency-specific plans to advance DEIA — and more broadly — such as advancing racial equity and support for underserved communities, and preventing and combatting discrimination.

In some instances, NSF had already addressed the EOs' requirements. In other instances, the EOs were broader, requiring NSF to take additional steps. In response to EO 13985, NSF created an Equity Team of 14 leaders from across the agency, has submitted three progress reports, and is required to submit i

Further, NSF maintains a comprehensive portfolio to increase diversity in S&E, including the NSF INCLUDES program, which focuses on scaling up proven approaches to broadening participation, and NSF's Build and Broaden 2.0 program, which encourages research collaborations between scholars at minority-serving institutions and scholars in other institutions. In addition, broadening participation is part of the Broader Impacts criteria in merit review. NSF leadership recognizes the importance of this challenge and recently identified this issue as an "exceedingly important priority." In FY 2022, we will continue to monitor NSF's efforts to develop strategies and programs to increase diversity in S&E education and employment and to measure their effectiveness. We will also monitor its actions to alleviate the disproportionate impact of the COVID-19 pandemic on the careers of scientists and trainees from underrepresented groups.

**Completed Actions**

- ☑ Prepared *Women, Minorities, and Persons with Disabilities* report.
- ☑ Prepared *The STEM Labor Force of Today: Scientists, Engineers, and Skilled Technical Workers*.
- ☑ Responded to multiple requirements in 2021 EOs.
- ☑ Funded rapid response grants on the effects of COVID-19 on underrepresented groups.
- ☑ Created four Employee Resource Groups to advise NSF on achieving equity.

**Ongoing Actions**

- Including accessibility and inclusivity in Strategic Plan.
- Continuing to respond to requirements in 2021 EOs.
- Continuing to strengthen the broadening participation element of the Broader Impacts merit review criteria.
- Continuing NSF INCLUDES, Build and Broaden 2.0, and comparable activities impacting S&E education and employment in the broadening participation portfolio.
- Continuing to share *Indicators*, a quantitative summary of the S&E enterprise's scope, quality, and vitality over time and within a global context.

**CHALLENGE 2****Overseeing the United States Antarctic Program (USAP)****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.

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 and most visible contract, valued at \$2.3 billion over 13 years. Through this and other contracting vehicles, NSF is also implementing a long-range infrastructure investment program across the three U.S. Antarctic stations (McMurdo, Palmer, and South Pole). The Office of Polar Programs (OPP) monitors the contract, with several other NSF offices and divisions collaborating to manage the USAP, including the Division of Acquisition and Cooperative Support (DACS), the Large Facilities Office, the Office of Budget, Finance and Award Management, the Division of Information Systems, the Division of Administrative Services, and the Division of Human Resources Management (HRM).

The advent of COVID-19 in 2020 added unprecedented complexity and uncertainty to USAP operations. For example, deployments in the 2020–2021 and 2021–2022 seasons have been limited to only those necessary for health and safety or to preserve long-term data sets. In addition, construction at McMurdo under the Antarctic Infrastructure Modernization for Science (AIMS) project and the Information Technology and Communications (IT&C) primary addition was put on hold, and both projects will need rebaselining. OPP is working closely with DACS to implement a new approach that will use NSF's Antarctic Infrastructure Recapitalization program to address the unfunded phases of AIMS.

Additionally, recent information security audit findings<sup>2</sup> have identified challenges in USAP's implementation of authentication and incident response requirements. These findings, first identified in FY 2019, demonstrate the extended time needed to fully enact security measures for the USAP network consistent with those of NSF. This audit work also revealed concerns relating to the onboarding and vetting process for ASC contractors. Namely, NSF relies on the contractor's internal pre-employment screening procedures for most ASC employees; thus, NSF does not directly adjudicate most ASC personnel who conduct work for or on behalf of USAP for suitability. OPP is working with various NSF offices to identify and implement the appropriate approach for personnel screening and to issue contract modifications and procure solutions as necessary. However, because of these ongoing issues, USAP remains at an increased risk of negative impacts to personnel, systems, and data.

**Completed Actions**

- ☑ Collaborated with DACS to restructure AIMS' latter phases into stand-alone projects that will be evaluated in accordance with other infrastructure priorities.
- ☑ Developed a Project Execution Plan (PEP) to implement Personal Identification Verification (PIV) for access to USAP applications.
- ☑ Initiated acquisition for Managed Security Service Provider.
- ☑ Identified all positions on the ASC contract with elevated access to data or systems and began implementing NSF personnel security screenings on those individuals.

**Ongoing Actions**

- Assessing COVID-19 impacts and evaluating options to minimize any negative impacts to USAP operations and construction.
- Implementing PIV for access to USAP applications.
- Implementing Security Information and Event Monitoring tools for the USAP network to automatically detect malicious network events.
- Implementing Trusted Internet Connection for the USAP network.

<sup>2</sup> [FISMA Audit of NSF's Information Security Program for FY 2020](#), November 20, 2020

**CHALLENGE 3****Overseeing Grants in a Changing Environment****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 to support promising scientific research is NSF's primary business and a key element of its mission. The COVID-19 pandemic continues to add complexity to grant management and oversight due to the need to expend additional federal funds to address its impacts and because of the health, economic, and societal impacts on NSF's recipient population. Despite these challenges, NSF and the research community continued conducting the work that creates opportunities, spurs innovation, and improves quality of life for individuals, families, and communities across the nation. In 2020, NSF developed a Coronavirus Aid, Relief, and Economic Security (CARES) Act Spending Plan, which used existing funding mechanisms with established policies, procedures, and controls to disperse the supplemental funds, reduce the risk of misuse, and help ensure accountability. In 2021, NSF developed a similar approach for the supplemental funds provided under the *American Rescue Plan Act (ARP)*.

Even with NSF's efforts to address the impacts of the pandemic, institutions continue to confront mounting fiscal constraints, related in part to lower-than-anticipated tuition revenue and declining support from state governments, endowments, or other funding sources. 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 and proper stewardship over NSF funds could be undermined. Additionally, NSF is devoting significantly more resources to growing the STEM workforce and increasing the proportion of underrepresented groups within STEM fields. This effort will create new risks by increasing the number of awards to both smaller institutions, which traditionally have less robust grant management environments, and mid-sized institutions, which will have to strengthen their grant management controls to account for more funding. Further, the risk of inappropriate foreign influence, which we further address later in this report, continues to be a challenge.

NSF has begun planning how to address some of these risks. However, the ever-changing grant management environment increases the risk that recipients will misuse funds, and, as a result, increases the need for NSF to develop an even stronger control environment. The combination of these risks will require a concerted outreach effort from NSF to broaden the recipient community's understanding of grant management guidance and expectations and to monitor the varying ways in which the community responds to those risks.

**Completed Actions**

- ☑ Conducted targeted Enterprise Risk Management Science Directorate workshops.
- ☑ Conducted risk and control checkpoints, walkthroughs, and tests of design and operating effectiveness to validate existing grants monitoring/oversight controls.
- ☑ Conducted baseline monitoring; used data analytics to better identify potential risk areas/improve monitoring.
- ☑ Established controls for CARES Act and ARP funds.
- ☑ Created task force to evaluate the pandemic's impact.
- ☑ Developed [NSF Coronavirus Information](#) webpage to share guidance with recipient community.

**Ongoing NSF Actions**

- Continuing development of the Awardee Internal Control/Financial Solvency Dashboard.
- Continuing advanced monitoring site visits and desk reviews.
- Continuing development of an Enterprise Project Report Scorecard.

**CHALLENGE 4****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.

As part of its workforce strategy, NSF provides 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 — referred to as IPAs or rotators — bring in fresh perspectives from 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. 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.

Over the past several years, NSF has taken steps to address these risks. After a successful pilot period, NSF implemented a cost share policy, effective January 31, 2020, requiring that institutions provide a minimum of 10 percent cost share for every full-time IPA agreement. Total cost share increased by more than \$1 million between FY 2019 and FY 2020, with the percent of assignments that cost share near 90 percent.<sup>3</sup> Additionally, NSF facilitated a focus group for IPAs who onboarded during the pandemic to help identify unique challenges associated with onboarding in a remote-work environment. NSF has also continued to strengthen its policies around the IR/D program, potential conflicts of interest, and managing turnover.

However, ongoing audit work indicates that challenges remain with overseeing the IPA program. Increased coordination across the varying offices involved in the vetting and hiring process would further reduce the risks inherent to the IPA program and strengthen the control environment. This includes reducing the risk of hiring individuals who are ineligible to serve as IPAs, verifying IPA salary and employment history prior to appointment, complying with financial disclosure requirements, and adjudicating suitability and fitness determinations in a timely manner.

**Completed Actions**

- ☑ Migrated Program Director and Executive IPAs to the USA Performance system for managing performance plans.
- ☑ Submitted the IPA Program Annual Report covering the prior fiscal year to NSF Director.
- ☑ 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.
- ☑ Engaged in IPA Program Enterprise Risk Management to clearly identify IPA Program objectives and associated risks.

**Ongoing Actions**

- Continuing to submit IR/D Annual Report, including data on program participation, average days and dollars requested and used, and training.
- Continuing to train IR/D experts annually, including on updates to the IR/D Guide and online IR/D plan.
- Continuing to monitor turnover risk for IPAs.
- Continuing to use existing onboarding, training, knowledge transfer, and performance management systems to minimize impact of staff turnover.
- Continuing to integrate activities in response to GAO-18-533 into NSF’s human capital goal of “Adapting the Workforce to the Work.”

<sup>3</sup> Strongly justified requests to waive cost share requirements may be considered.

**CHALLENGE 5****Overseeing 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. There is also risk of fraud, waste, or abuse of NSF or other government assets.

As part of its mission, NSF funds the scientific community to manage the development, design, construction, operation, and divestment 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 2020, NSF spent almost \$154 million constructing major facilities and more than \$900 million operating them.

Major facilities have always faced risks including protecting the safety of personnel and property, construction delays, and unanticipated additional costs. We previously reported about the risk of inadvertent misuse of funds when re-budgeting and improper use of contingency funds. The COVID-19 pandemic presented additional, unique challenges for major facilities. Following the flexibilities granted by OMB in response to the pandemic, NSF took action to address these risks by developing internal and external guidance for major facility programs and recipients. NSF will need to continue its work to identify current risk areas, implement mitigation strategies, and assess any remaining financial impacts as the pandemic continues in the United States and abroad.

Since 2015, NSF has implemented enhanced controls and strengthened agency governance to fully address our recommendations, the recommendations of the 2015 National Academy of Public Administration report; the requirements of the *American Innovation and Competitiveness Act of 2017* (AICA); and FY 2018 and FY 2019 GAO reports. 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**

- ☑ Revised Major Facilities Cooperative Agreement Modified & Supplemental Terms and Conditions to require participation in NSF's Knowledge Management Program.
- ☑ Re-programmed funds appropriated in FY 2020 to the Major Research Equipment and Facilities Construction account, from AIMS to Rubin Observatory and the Daniel K. Inouye Solar Telescope, for use as management reserve to cover documented, COVID-19- related costs.
- ☑ Completed major facilities portfolio workforce gap analysis per *Program Management Improvement Accountability Act* (PMIAA) requirements.
- ☑ Conducted a vehicle allocation methodology and updated optimal fleet profile.

**Ongoing Actions**

- Finalizing the Major Facilities Oversight Reviews standard operating guidance.
- Continuing to develop and implement training plan for the major facilities oversight workforce as part of PMIAA implementation.
- Evaluating all active major facility awards to identify federally owned property and develop property transition plans as necessary.

**CHALLENGE 6****Mitigating Threats Posed by Foreign Government Talent Recruitment Programs****Why is this a serious management challenge?**

The issue is related to key initiatives of the President. There is also risk of fraud, waste, or abuse of NSF or other government assets.

Safeguarding the U.S. research enterprise from threats of inappropriate foreign influence is of critical importance. Recent reports by GAO and others have noted challenges faced by the research community to combat undue foreign influence, while maintaining an open research environment that fosters collaboration, transparency, and the free exchange of ideas.

NSF, and other agencies that fund research, continue to face challenges from foreign talent recruitment programs. According to the Office of Science and Technology Policy, a foreign government sponsored talent program is an effort directly or indirectly organized, managed, or funded by a foreign government to recruit science and technology professionals in targeted fields. Some countries sponsor such programs for legitimate purposes. However, some programs encourage or direct unethical and criminal behaviors. Contracts for participation in some programs include language that creates conflicts of commitment and/or conflicts of interest for researchers, such as requirements to attribute U.S.-funded work to a foreign institution; recruit or train other talent recruitment plan members, circumventing merit-based processes; and replicate or transfer U.S.-funded work in another country.

Over the past 3 years, NSF has taken action to mitigate threats posed by such programs. In particular, it strengthened disclosure requirements and processes and released guidelines for strengthening research security. It also created research security strategy positions, expanded research security training, and educated the research community. 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 address this challenge.

**Completed Actions**

- ☑ Released guidelines for strengthening research security.
- ☑ Implemented independent report's recommendations.
- ☑ Created and filled Chief of Research Security Strategy and Policy and Chief Data Officer positions.
- ☑ Launched Research Security Strategy and Policy Group.
- ☑ Expanded research security training for staff in direct communication with recipient organizations.
- ☑ Educated research community about risks and compliance with NSF's policies and procedures.
- ☑ Strengthened disclosure requirements and processes, including implementing two new vehicles for submitting post-award information.
- ☑ Revised term and condition for foreign collaboration considerations in major facilities.
- ☑ Increased collaboration with our office and the FBI.
- ☑ Used Enterprise Risk Management framework.

**Ongoing Actions**

- Developing policy across the enterprise.
- Pursuing a Systems of Record Notice to use data analytics tool.
- Revising terms and conditions to require Principal Investigator certifications
- Coordinating with the FBI to prepare a compendium of anonymized research security actions available to inform stakeholders.
- Continuing outreach and education.

**CHALLENGE 7****Mitigating Threats Posed by the Risk of Cyberattacks****Why is this a serious management challenge?**

The issue is related to key initiatives of the President.

The prevention, detection, assessment, and remediation of cybersecurity incidents is a top priority of the Administration and essential to national and economic security. The recent SolarWinds and Microsoft Exchange incidents demonstrate the significant risk to federal information. In both incidents, foreign governments exploited vulnerabilities in commercial software programs that are used by federal agencies, and gained privileged access to federal systems, allowing them to extract data and personally identifiable information (PII). Additionally, the recent Colonial Pipeline ransomware attack is one example of an issue on the GAO high-risk list that illustrates the pressing need to strengthen federal cybersecurity and IT management. Although these incidents did not directly affect NSF or USAP networks, they highlight the need for increasingly effective measures to ensure the availability, integrity, and confidentiality of data used to achieve NSF's mission.

EO 14028<sup>4</sup> directs agencies to focus on meeting key baseline security measures, including universal logging, multi-factor authentication, reliable asset inventories, and ubiquitous use of encryption, and to adopt a zero-trust architecture. Zero-trust assumes there is no implicit trust granted to assets or user accounts based solely on their physical or network location (i.e., local area networks versus the internet) or based on asset ownership (enterprise or personally owned). It assumes that networks and other components will be compromised and requires authentication and authorization as separate functions before a connection to an enterprise resource is established. Zero-trust protects against both external and internal threat factors. The Department of Homeland Security Cybersecurity Infrastructure Security Agency has established a zero-trust maturity model that focuses on five pillars: Identity, Device, Network/Environment, Application Workload, and Data. The maturity of all five pillars must be optimized to fully protect federal systems and data.

Our FISMA<sup>5</sup> audits have found that NSF has an effective information security program under current standards. NSF, however, could enhance its cybersecurity by implementing zero-trust measures such as: multi-factor authentication for access to all networks; a phishing-resistant authentication option for NSF's public-facing website and systems; encryption and authentication of all traffic within the NSF.gov and USAP.gov environments; regular third-party identification and evaluation of vulnerabilities; automated patch management and software update tools; advanced tools that address zero-day threats; and segmenting networks around their applications.

**Completed Actions**

- ☑ Requires multi-factor authentication for access to NSF internal network and applications.
- ☑ Encrypted all NSF data at rest and in-transit.
- ☑ Regularly conducts internal vulnerability assessments of the NSF and USAP networks.
- ☑ Strengthened controls over access to sensitive PII, including Social Security Numbers.
- ☑ Improved Endpoint Detection and Response capabilities.

**Ongoing Actions**

- Identifying critical software used by NSF.
- Ensuring storage and retention of logging data complies with requirements.
- Conducting additional supply chain risk management authenticity/anti-counterfeit training.

<sup>4</sup> *Improving the Nation's Cybersecurity*, May 12, 2021

<sup>5</sup> *Federal Information System Modernization Act of 2014*, Pub. L. No. 113-283



**CHALLENGE 8****Managing Transformational Change****Why is this a serious management challenge?**

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

NSF may be facing rapid and transformational change. The *U.S. Innovation and Competition Act*, passed by the Senate on June 8, 2021, and the *NSF for the Future Act*, passed by the House of Representatives on June 28, 2021, both support significant growth for the agency. If pending legislation — which is also consistent with the Administration’s outlined vision — were to become law, it would demand NSF manage increased funding, the establishment of a new directorate, and several other significant programmatic changes.

Effectively managing growth is critical to both NSF’s near and long-term success. NSF will need to sustain existing programs while developing and implementing new programs. This growth is likely to happen in an environment where existing staff are working at maximum capacity; the nation is facing a labor shortage; and a key onboarding mechanism, the *Intergovernmental Personnel Act*, has a need for more robust controls.

In addition, NSF plans to transition to a hybrid work model upon reopening its physical office environment. In response to the COVID-19 pandemic, NSF shifted its workforce to a fully virtual environment in March 2020. After more than a year, NSF has shown it can achieve its mission while staff work remotely. Staff have also expressed interest in teleworking more permanently, with 89 percent of respondents to NSF’s November 2020 Remote Work Survey supporting a hybrid workforce model. Although remote work and flexible hours are proven tools for retaining and recruiting staff, increased telework comes with challenges. NSF staff have also reported experiencing virtual meeting and email fatigue, feelings of isolation due to the physical separation, and the need for help in ensuring work-life balance. As NSF develops and implements its new remote work policy, it will need to address challenges with adapting its cyberinfrastructure, managing a remote workforce, and maintaining its current culture long term.

Finally, as previously discussed, as NSF takes further steps to increase diversity and inclusivity in S&E, it must continue to strengthen its own commitment to those values. Ensuring NSF continues to provide resources and opportunities to strengthen and advance diversity, equity, inclusion, and accessibility is paramount as NSF faces possible large-scale growth and the transition to a hybrid workforce model.

**Completed Actions**

- ☑ Implemented robust telework capabilities.
- ☑ Provided virtual access to the Employee Assistance Program.
- ☑ Obtained employee feedback related to remote work via an organization-wide survey.
- ☑ Established the NSF Racial Equity Task Force.
- ☑ Established a Remote Work Tiger Team to inform policy creation and implementation.
- ☑ Established the Agency Equity Team to lead NSF’s Equity Assessment and to address the goals of EO 13985.

**Ongoing Actions**

- Developing a draft remote work policy.
- Conducting a Diversity, Equity, Inclusion, and Accessibility Assessment.

## Appendix A

2021 Executive Orders on Diversity,  
Equity, Inclusion, and Accessibility

EO	Date	Title	Requirements
<a href="#">13985</a>	Jan. 2021	Advancing Racial Equity and Support for Underserved Communities Through the Federal Government	Identify methods to assess equity and to further opportunities for underrepresented groups.
<a href="#">13988</a>	Jan. 2021	Preventing and Combating Discrimination on the Basis of Gender Identity or Sexual Orientation	Ensure equal treatment under the law irrespective of gender identity or sexual orientation.
<a href="#">14020</a>	March 2021	Establishment of the White House Gender Policy Council	Submit input to the Government-wide Gender Strategy; when final, will be sent to the President.
<a href="#">14035</a>	June 2021	Diversity, Equity, Inclusion, and Accessibility in the Federal Workforce	

Source: NSF OIG-generated from whitehouse.gov

## Appendix B

## Additional Resources

Please visit <https://www.oig.nsf.gov> for additional reports and publications.

### Introduction/All Challenges

- NSF OIG, [Management Challenges for the National Science Foundation in FY 2021](#), October 2020
- NSF, [FY 2020 Agency Financial Report](#), November 2020

### Increasing Diversity in Science & Engineering Education and Employment

- Bates, Jason, [Researchers apply COVID-19 lessons to prevent future pandemics](#), Science Matters, May 2021
- Special Report NSF 21-321, National Center for Science and Engineering Statistics, [Women, Minorities, and Persons with Disabilities: 2021](#), April 2021
- NSB, NSF, [The STEM Labor Force of Today: Scientists, Engineers, and Skilled Technical Workers](#), August 2021
- NSF, [An Update on Diversity, Equity, Inclusion, and Accessibility Progress at NSF](#), August 2021
- NSF 20-099, [NSF Includes: Special Report to the Nation II](#), July 2020
- NSB-2020-15, [Vision 2030](#), May 2020

### Overseeing the United States Antarctic Program (USAP)

- NSF OIG Report No. 21-2-002, [Performance Audit of the National Science Foundation's Information Security Program for FY 2020](#), November 2020

### Overseeing Grants in a Changing Environment

- NSF OIG Report No. 21-6-003, [Capstone Report: Observations on the OMB COVID-19 Flexibilities](#), August 2021
- NSF OIG Report No. 20-6-001, [Review of the National Science Foundation CARES Act Spending Plan](#), May 2020

### Overseeing Major Multi-User Research Facilities

- NSF, [FY 2022 Budget Request to Congress](#), May 2021
- NSF OIG Report No. 20-2-007, [Audit of NSF's Monitoring of Government-Owned Equipment Purchased on NSF Awards](#), August 2020
- NSF OIG Report No. 20-2-006, [NSF Could Improve Accountability for Its Vehicle Fleet and Recipient-titled Vehicles at Major Facilities](#), May 2020
- NSF OIG Report No. 19-2-006, [Audit of NSF's Controls to Prevent Misallocation of Major Facility Expenses](#), June 2019

### Mitigating Threats Posed by Foreign Government Talent Recruitment Programs

- GAO, [Protecting Federal Research from Foreign Influence](#), January 2021
- GAO-21-130, [Federal Research: Agencies Need to Enhance Policies to Address Foreign Influence](#), December 2020
- The White House Office of Science and Technology Policy, [Enhancing the Security and Integrity of America's Research Enterprise](#), June 2020

### Mitigating Threats Posed by the Risk of Cyberattacks

- GAO, [Colonial Pipeline Cyberattack Highlights Need for Better Federal and Private-Sector Preparedness](#), May 2021
- Executive Order 14028, [Improving the Nation's Cybersecurity](#), May 2021
- GAO, [SolarWinds Cyberattack Demands Significant Federal and Private-Sector Response](#), April 2021

### Managing Transformational Change

- S.1260 - [United States Innovation and Competition Act of 2021](#)
- H.R. 2225 - [National Science Foundation for the Future Act](#)

## 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 investigate allegations 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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- Anonymous Hotline: 1.800.428.2189
- Mail: 2415 Eisenhower Avenue, Alexandria, VA 22314 ATTN: OIG HOTLINE



National Science Foundation  
Office of the Director

October 18, 2021

MEMORANDUM

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

**FROM:** Dr. Sethuraman Panchanathan  
Director, National Science Foundation

**SUBJECT:** Acknowledgment of the Inspector General's Fiscal Year (FY) 2022 Management Challenges Report and Transmittal of NSF's Progress Report for the FY 2021 Management Challenges

As Director of the National Science Foundation (NSF), I recognize the importance of acknowledging, understanding, and mitigating risk to the execution of our mission, while ensuring 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. To that end, this memorandum provides you with NSF's Progress Report for the OIG Management Challenges for FY 2021 and acknowledges my receipt of the OIG's Management Challenges for NSF for FY 2022, dated October 13, 2021. Below are several considerations as you review our Progress Report and the new challenges.

Over the past year and a half, NSF has demonstrated that our established risk management processes well-position the agency to address both ongoing and unforeseeable risks. Throughout the COVID-19 pandemic, NSF has steadfastly maintained its advanced monitoring and oversight of awards through virtual site visits, desk reviews, targeted assessments, audit resolution, and new analytic approaches. Our annual testing of grant award expenditures for the April 2020 through March 2021 period found a low risk level for improper payments, similar to prior year test results.

We appreciate OIG's recognition of our progress addressing challenges identified with managing the Intergovernmental Personnel Act (IPA) Program and our major multi-user research facilities, and agree with the characterization of the latter as a "model program." We will continue our strong performance in oversight and management of these areas as we expand to focus on the two new challenges identified for FY 2022 related to cybersecurity and change management. Although OIG has previously found NSF's information security program to be effective, we recognize that we operate within a broader environment of increased cyber threats to federal agencies. NSF is committed to protecting the data and systems critical to the agency's mission. Similarly, we stand ready to lead the organization through anticipated

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changes in the coming years by leveraging and expanding our existing controls and enterprise risk management framework to new programs and new ways of conducting our work.

Going forward, I will engage the Chief Operating Officer, Assistant Directors and Office Heads, and the Chief Financial Officer to identify owners and paths forward for each of the eight management challenges identified for FY 2022, as noted below:

- Increasing Diversity in Science & Engineering Education and Employment
- Overseeing the United States Antarctic Program (USAP)
- Overseeing Grants in a Changing Environment
- Managing the Intergovernmental Personnel Act Program
- Overseeing Major Multi-User Research Facilities
- Mitigating Threats Posed by Foreign Government Talent Recruitment Programs
- Mitigating Threats Posed by the Risk of Cyberattacks
- Managing Transformational Change

As always, NSF remains committed to serving the research community effectively, to continually improving stewardship across the agency, and to safeguarding 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 2021 Progress Report on OIG Management Challenges

### **MANAGEMENT CHALLENGE 1: Providing Oversight of Major Multi-User Research Facilities**

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

#### Summary of OIG Identified Challenge

- a) *Manage the inherent risk associated with the major facility portfolio and continue to address recommendations from recent audits.*
- b) *The advent of COVID-19 added an unprecedented degree of complexity and uncertainty for NSF's major facilities. Facility closures and safety precautions taken due to COVID-19 delayed construction and research, as well as increased costs. This 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 were closed or required to operate with minimal staff. This led to disruptions in data gathering and routine maintenance, as well as the postponement or cancellation of some planned scientific activities. The pandemic response also halted or delayed the construction of new facilities. NSF will need to continue its work to identify current risk areas, implement mitigation strategies, and assess any remaining financial impacts as the pandemic comes under control in the United States, but continues abroad.*

#### 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 business-related reviews and audits to be conducted by the Large Facilities Office (LFO) and the 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 appointment of the Chief Officer for Research Facilities (CORF) and periodic use of the Office of the Director's Watch List. The governance structure currently in place, which includes the Accountable Directorate Representatives (ADRs), 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 and the associated 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 four 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, *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.<sup>1</sup> The March 2019 report, *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.<sup>2</sup> The April 2020 report, *National Science Foundation: Cost and Schedule Performance of Major Facilities Construction Projects and Progress on Prior GAO Recommendations* (GAO-20-268), and the June 2021 report *National Science Foundation: COVID-19 Affected Ongoing Construction of Major Facilities Projects* (GAO-21-417), had no new recommendations.<sup>3</sup> NSF has Corrective Action Plans (CAPs) in place as described below, and four of the six previous GAO recommendations are now considered fully implemented.

The COVID-19 pandemic presented 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 the Office of Management and Budget (OMB) guidance under the pandemic, NSF took action to address these risks by developing internal and external guidance for major facility programs and recipients. These efforts 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 OMB Guidance; (2) issuing guidance jointly from the CORF and LFO to NSF Program Offices in response to the COVID-19 pandemic to ensure recipients segregate and track related cost increases; (3) issuing guidance from the Division Director for the Division of Acquisition and Cooperative Support (DACs) directly to recipients on the OMB and NSF flexibilities, the documentation required for tracking cost impacts, and the submission of prior approvals for COVID-19 related requests; and (4) providing guidance for addressing re-baselining of construction projects, incorporation of impacts into Earned Value Management, and the application of management reserve. NSF followed its current policies and controls with only minor clarifications. No additional controls were deemed necessary.

The Regional Class Research Vessel (RCRV) project also experienced a different unforeseen event when the shipyard constructing the vessels experienced a direct hit from Hurricane Ida on August 29, 2021. Although hurricanes are a known phenomenon in the Gulf of Mexico and reasonable preparations can be made, a direct hit from a major hurricane is not manageable by the project. NSF’s current controls that are in use for COVID-19 are considered sufficient to deal effectively with this event and any other future unforeseen event.

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<sup>1</sup> GAO-18-370 is available at: <https://www.gao.gov/products/gao-18-370>.

<sup>2</sup> GAO-19-227 is available at: <https://www.gao.gov/products/gao-19-227>.

<sup>3</sup> GAO-20-268 is available at: <https://www.gao.gov/products/gao-20-268> and GAO-21-417 is available at <https://www.gao.gov/products/gao-21-417>.



Based on NSF’s evaluation of this Management Challenge under Enterprise Risk Management (ERM), coupled with activities already completed and those planned for FY 2022, NSF has determined that the residual risk impact for fraud, waste and abuse (Risk 1) is “low”, 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 when needed to sustain ongoing activities. As of September 2021, sufficient additional funding has been available. Additional funding needs for both Operations Stage and Construction Stage awards were addressed by reprogramming of funds, modifications of budget requests to Congress, and application of American Rescue Plan (ARP) funds as described below. 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.

Regarding removal criteria described in OIG Bulletin 18-02, Attachment 2, NSF believes it has demonstrated senior-level leadership commitment through the appointment of the CORF, has CAPs in place that implement solutions that are tied to root causes, and has established appropriate performance measures to monitor construction progress. Capacity is demonstrated through rigorous reporting and accountability, and workforce capacity will continue to be enhanced as NSF completes implementation of PMIAA for the major facilities portfolio. In addition, NSF has implemented planned corrective actions, demonstrated progress, and monitored on-going activities as described below.

### **NSF’s Completed Actions to Address the Challenge**

#### ***Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years***

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 2020) agency actions include the following:

- Revised Major Facilities Cooperative Agreement Modified & 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.
- 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), RCRV, and Large Hadron Collider Hi-Luminosity Upgrade (HL-LHC) Program (the Compact Muon Solenoid, or CMS, and A Toroidal LHC Apparatus, or ATLAS, projects).
- Converted the “Director’s Watch List” to the “Office of the Director’s Watch List” under cognizance of the CORF, formalizing the process of tracking open action items on a monthly to bimonthly interval.
- Ensured that the AIMS project has Federal Acquisition Regulations-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.
- Re-programmed funds appropriated in FY 2020 in the MREFC account, from AIMS to Rubin Observatory and DKIST, for use as management reserve to cover documented costs incurred due to COVID-19 (approved by NSF Acting Director under authority delegated by the National Science Board).

- 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, procedures and terms to: (1) align with the Uniform Guidance, (2) provide a specific mechanism to verify that passthrough 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.

***Demonstrated Progress Through Agency Actions Taken in FY 2021***

- Continued to monitor allocation of funds between awards as part of required cost incurred audits using Segregation of Funding Plans as reference.
- Completed the major facilities portfolio workforce gap analysis and began development of a Training Plan tied specifically to the major facility oversight competency model as part of PMIAA implementation and the CAP for GAO-19-227.
- Finalized revisions to the 2021 *Major Facilities Guide* (MFG), including:
  - a. Content in the new MFG Section 4.3, Schedule Development, Estimating, and Analysis.
  - b. More detailed guidance on Segregation of Funding Plans. Provided 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*.<sup>4</sup>
  - c. New sections on Key Personnel and Recipient Core Competencies.
- Revised and published the *Business Systems Review 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).
- Revised Standard Operating Guidance for DACS/CSB Grants and Agreements Officers on the Pre-Award Review Process, which includes business and financial review, incorporates requirements on reviewing the costs and schedules of major facility projects to align with GAO’s guides.
- Revised and published *Obligation and Allocation of Management Reserve* Standard Operating Guidance (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.
- Authorized management reserve for RCRV (December 2020) through the Director’s delegated authority and additional management reserve for DKIST (February 2021) and Rubin Observatory (August 2021), with National Science Board approval, to account for continuing impacts of the COVID-19 pandemic.
- Allocated FY 2021 funds from the ARP to cover realized and potential COVID-caused cost increases for DKIST, Rubin Observatory, and RCRV construction projects, as well as for operations of the Academic Research Fleet.
- Produced a regular report on COVID-19 impacts on major facilities in both Operations and Construction Stages,<sup>5</sup> which was used to keep leadership aware of the current state of COVID-19 impacts and to retain awareness of impacts for which NSF action or enhanced oversight might be necessary.

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<sup>4</sup> OIG Report 19-2-006 is available at <https://oig.nsf.gov/reports/audit/audit-nsfs-controls-prevent-misallocation-major-facility-expenses>.

<sup>5</sup> The regular COVID-19 impacts report was produced weekly by the CORF, working closely with the ADRs, from early March 2020 through mid-June 2020, then biweekly through the beginning of March 2021, and now is produced once per month.

### NSF's Ongoing and Planned Actions

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

- Finalize the *Major Facilities Oversight Reviews* SOG and provide to the OIG and GAO for consideration in closing remaining recommendations in OIG Report 19-2-006 on NSF's controls to prevent misallocation of expenses, OIG report 20-2-004 related to Ocean Observatories Initiative operations and maintenance, and a recommendation on recipient project management expertise from GAO-19-227 [FY 2022, Q1].
- Complete development and implementation of the Training Plan for the major facilities oversight workforce as part of PMIAA implementation and the CAP for GAO-19-227. Monitor progress through periodic self-assessment surveys or other means [FY 2022, Q4].

## MANAGEMENT CHALLENGE 2: Providing Oversight of Grants During a Pandemic

NSF Lead: Teresa Grancorvitz, Chief Financial Officer

### Summary of OIG Identified Challenge

*The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) provided \$76 million to NSF, including \$75 million to support NSF's grant response to COVID-19 and \$1 million to assist in the administration of those grants. NSF used funding mechanisms with established policies, procedures, and controls to disperse the funds provided by the CARES Act.*

*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.*

*Similarly, COVID-19 has introduced new and unique factors to which NSF must adapt to maintain effective grant accountability. 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.*

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

Throughout the COVID-19 pandemic, the research community faced unprecedented challenges that have tested the people and infrastructure that make up the U.S. scientific research enterprise. Throughout these difficulties, NSF and the research community continued doing the work that creates opportunities, spurs innovation, and improves quality of life for individuals, families, and communities across the U.S. NSF plays a unique role in supporting the future of science, technology, engineering, and math (STEM) education in the U.S. This support has remained a top priority for NSF throughout the pandemic and recovery. NSF's response to the pandemic was based on its ERM process, which generated robust dialogue, informed decisions, and coordinated actions for providing oversight during the pandemic. NSF recognized that a destabilizing event in the operating environment (e.g., COVID-19 pandemic) required continuous diligence to minimize the risk of negative outcomes to NSF's monitoring and oversight activities. NSF also recognized that its existing oversight mechanisms and activities may not align with challenges presented by the pandemic. In response, NSF approached its oversight activities with the understanding that there may be heightened risk in the grants program compared to prior years.

NSF's monitoring and oversight efforts spanned the award lifecycle (proposal submission, merit review, pre-award financial review, post-award monitoring, award closeout, and audit follow-up) to ensure financial capability, non-financial administrative and programmatic compliance, and research performance. The foundation of NSF's monitoring and oversight efforts is its suite of policy and procedural documents that incorporate federal regulations, legislative mandates, and agency-specific requirements; the translation of policies and procedures into business rules that are enforced through NSF's business systems; and a risk-based approach to financial and administrative monitoring. Baseline

monitoring activities, which are conducted on most awards through standard, recurring, and automated processes, focused on post-award administration and financial transactions to identify exceptions and potential issues that may require additional scrutiny through advanced monitoring. NSF steadfastly maintained its advanced monitoring and oversight activities through virtual site visits, desk reviews, targeted assessments, audit resolution, and new analytic approaches focused on the grant and cooperative agreement award portfolio.

Over the past year, in addition to monitoring and oversight activities, NSF has taken significant steps to mitigate risks. NSF has:

- Demonstrated strong commitment and top leadership support to ensure continued operations and maintenance of standard business processes and management functions;
- Ensured that NSF has the people and resources to effectively operate in the pandemic environment;
- Executed an action plan that included numerous working groups and committees, such as the Recovery Planning Task Force, the Major Facilities Working Group, and several facility-specific working groups;
- Established processes to monitor the spending of pandemic related funding; and
- Incorporated pandemic relief flexibilities into policy and process documentation.

In 2020, NSF developed a CARES Act Spending Plan, which used existing funding mechanisms with established policies, procedures, and controls to disperse the supplemental funds, to reduce the risk of misuse, and help ensure accountability. NSF also established a process to ensure appropriate financial controls over CARES Act funds by using unique fund codes. The OIG conducted a review of NSF's *CARES Act Spending Plan and Review Team* documents, related policies and procedures, and additional information provided directly by NSF's senior leadership. In its final report ([OIG 20-6-001](#)), the OIG concluded that NSF's plan for expending CARES Act funds was "reasonable, prudent, and met the intent of the funding objectives."<sup>6</sup>

In FY 2021, NSF developed a similar approach for the supplemental funds provided under the American Rescue Plan Act (ARP). NSF established unique fund codes for ARP to facilitate quick and transparent tracking of proposal and award actions. NSF developed its ARP spending plan in keeping with the same expectations for reasonableness, prudence, and consistency with the intent of the funds that the OIG noted in its review of NSF's CARES Act spending plan.

To facilitate tracking and reporting on COVID-19 related awards funded from NSF's base appropriation, NSF established new financial coding mechanisms. Specifically, NSF tracks awards issued for COVID-19 research, awards impacted by COVID-19, and institutional or individual recipients disproportionately affected by COVID-19.

Finally, as of September 13, 2021, NSF noted in its review and analysis of grantee single audit reporting packages published in the Federal Audit Clearinghouse that independent public accountants had reported low risks for NSF grant recipients in areas including going concern, financial statement or major

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<sup>6</sup> OIG 20-6-001, *Review of the National Science Foundation CARES Act Spending Plan* <https://oig.nsf.gov/reports/other/review-national-science-foundation-cares-act-spending-plan>.

program audits, and questioned costs. NSF continues to monitor this data for potential changes in its grantee external risk landscape.

### **NSF's Completed Actions to Address the Challenge**

#### ***Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years***

##### **Policy and Outreach**

- Developed and distributed several rounds of policy updates to codify NSF's implementation of OMB Memoranda (M-20-17, M-20-20, and M-20-26) related to COVID-19 grant flexibilities and temporary policies.
- Distributed reminders of monitoring responsibilities across NSF (e.g., Program Officers, Grants Officers, and Operations staff) through targeted outreach (BFA Update).
- Conducted targeted grants management outreach to the awardee community most impacted by the pandemic.
- Conducted a June 2020 Webinar and Question & Answer session with over 1,000 NSF grantees to remind them of important financial management responsibilities under the pandemic environment.

##### **Grants Oversight**

- Established the Recovery Planning Task Force to evaluate the pandemic's impact on grantees and NSF.
- Implemented OMB Memorandum M-20-21 to address mandated improvements to NSF's Digital Accountability and Transparency Act (DATA Act) reporting, including monthly reporting of grant awards obligated using CARES Act funding, and employed enhanced monthly reconciliations over CARES Act awards reported to USASpending.gov.
- Developed an enterprise dashboard to assist with oversight and reporting around award obligations and outlays for COVID-19 research funded under the CARES Act and NSF base appropriations.
- Monitored use of program reference code 102Z "COVID Disproportionate Impacts to Institutions/Individuals" to track assistance for vulnerable populations.
- Initiated development of data products using grantee single audits, NSF financial data, and historical monitoring results to monitor risks in NSF's external enterprise.

##### **Risk Management and Internal Controls**

- Conducted current fiscal year testing of grant award expenditures for potential unallowable costs to develop a pre-pandemic baseline of NSF grant improper payment risk.
- Briefed OIG on proposed FY 2021 approach to align its implementation of OMB A-123 Appendix A, ERM, and Appendix C to holistically assess whether there is an increased risk of improper payments under the pandemic environment.
- Continued development of the Awardee Internal Control / Financial Solvency Dashboard.
- Conducted targeted ERM Science Directorate workshops.
- Continued development of an Enterprise Project Report Scorecard.

#### ***Demonstrated Progress Through Agency Actions Taken in FY 2021***

##### **Policy and Outreach**

- Published new guidance on the NSF Coronavirus webpage for awardees, programs, and panelists to address emerging government-wide and NSF-specific policies surrounding COVID-19.
- Closely monitored the COVID-19 status and recovery for Major Facilities.

- Distributed enhanced financial coding guidance through BFA Updates to track awards with disproportionate impact to individuals and institutions.
- Published NSF implementation guidance for OMB M-21-20, Promoting Public Trust in the Federal Government through Effective Implementation of the American Rescue Plan Act and Stewardship of the Taxpayer Resources.
- Developed and put into action the NSF ARP spending plan and implementation guidance.

#### **Grants Oversight**

- Conducted FY 2021 advanced monitoring site visits and desk reviews, which involved adapting protocols where required to maintain effectiveness.
- Conducted baseline monitoring activities and implemented incremental monitoring enhancements using data and analytics to better identify potential risk areas.
- Identified opportunities to use data analytics to improve oversight and monitoring, including re-evaluation of the approach to improper payments risk assessment, development of an Awardee Internal Control / Financial Solvency Dashboard, and development of an Enterprise Project Report Scorecard.
- Implemented internal NSF dashboards to monitor potential grant risk factors around grant award expenditure patterns and post-award adjustments.
- Updated DATA Act reporting to encompass M-21-20 requirements for tracking financial assistance awards obligated with supplemental ARP funding.

#### **Risk Management and Internal Controls**

- Conducted risk and control checkpoints, walkthroughs, and tests of design and operating effectiveness to validate existing grants monitoring and oversight controls.
- Conducted qualitative and quantitative risk assessment for compliance with the Payment Integrity Information Act of 2019 (PIIA) and completed and planned interviews across the Foundation, including BFA, Office of Information and Resource Management (OIRM), OPP, and other Program Office Directorate representatives.
- Conducted annual testing of grant award expenditures covering April 2020 through March 2021 to update baseline of improper payment risk under the peak pandemic period. Results indicated a similarly low risk level as prior year testing results.
- Engaged regularly with NSF ERM Risk Captains to monitor this enterprise-level risk and identify ways to support increased effectiveness across Offices and Programs.
- Facilitated breakout sessions with NSF Directorates and other key stakeholders to further integrate oversight activities across the agency and maximize the value of targeted outreach opportunities.
- Conducted interactive listening sessions with Program Offices on potential risk areas and oversight responsibilities, and engaged with other NSF key stakeholders (e.g., Program Officers and Grants Officers) on monitoring and oversight responsibilities via BFA Pulse and other targeted communications.

#### **NSF's Ongoing and Planned Actions**

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

- Continue advanced monitoring site visits and desk reviews. [On-going]
- Continue to update ongoing supplemental fund government-wide policy and subsequent ARP spending requirements and guidance as needed. [On-going]

- Continue to update and enhance internal financial reporting over ARP obligations and outlays. [On-going]
- Issue final PIIA risk assessment report. [FY 2022, Q1]
- Continue to evaluate extended enterprise risks in the post-pandemic environment through advanced monitoring, baseline monitoring, and routine grantee communications. [On-going]



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

NSF Leads: Wonzie Gardner, Office Head, Office of Information & Resource Management and Joanne Tornow, Assistant Director, Directorate for Biological Sciences

### Summary of OIG Identified Challenge

- 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.*
- 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.*
- d) *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.*

### 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 leaders 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 Equity and Civil Rights, and four at large members, including two Senior Executive Service (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 NSF Director and Chief Operating Officer, OMB, and Congress, pursuant to the 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, OIRM's Division of Human Resource Management (HRM), the Office of General Counsel (OGC), the Office of Legislative and Public Affairs (OLPA), and the Office of Integrative Activities (OIA).

**Monitoring:**

NSF continues to monitor the use of IPA assignments on an ongoing basis, providing a data-driven summary to NSF senior leadership via an annual review of metrics related to participation, demographic characteristics, annual costs, and cost share value. Analyses of these data have demonstrated positive trends in increasing demographic diversity and reductions in annual costs. NSF has recently integrated program and executive level IPAs into the USA Performance Management System to enhance its ability to monitor supervisory oversight of IPA performance.

**Demonstrated Progress:**

NSF engages in continuous improvement of its management of the IPA Program, addressing the management challenges identified by 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 have reduced the inherent risk substantially, such that the residual risk is acceptable to the agency.

NSF worked to resolve, and close, the recommendations from OIG report 17-2-008, *NSF Controls to Mitigate IPA Conflicts of Interest*.<sup>7</sup> 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 the actions taken in response to prior OIG recommendations and ongoing monitoring and controls have mitigated the potential risks associated with the IPA program.

In FY 2017, NSF initiated a pilot to require a cost share of 10 percent from the IPA's home institution. Historically, NSF requested institutions provide up to 15 percent cost share of IPAs' salaries and fringe benefits, with mixed success. After a successful pilot period, in FY 2020, NSF implemented required cost share as policy, requiring that institutions provide a minimum of 10 percent cost share for every full-time IPA agreement. Exceptions to the mandatory cost share policy are limited and include federally funded research centers or extremely resource-constrained institutions. NSF's reimbursement of the IPAs' base salary is now reduced by 10 percent in a standardized manner. Total cost share increased by over \$1 million between FY 2019 and FY 2020, with the percent of assignments that cost share near 90 percent. Since IPAs continue to be full-time employees of their home institutions, those institutions continue to provide coverage for fringe benefits upon their return and into retirement. NSF does not take on the long-term responsibility for health/life insurance, retirement, or other benefits typically conferred upon federal employees. The cost share mechanism continues to maximize taxpayer value and eliminate the differential in the average cost of an IPA vs. a Federal employee.

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<sup>7</sup> OIG Report 17-2-008 can be accessed at: <https://oig.nsf.gov/reports/audit/nsf-controls-mitigate-ipa-conflicts-interest>.

In FY 2012, the OIG issued an audit of NSF's IR/D Program (OIG Report 12-2-008).<sup>8</sup> The report suggested several recommendations including tracking planned and actual IR/D time and expenses for each IR/D participant, clarifying the scope of the program and providing clear guidance to IR/D participants and supervisors, automation of the IR/D plan and creation of an IR/D Council and IR/D experts across NSF to review IR/D requests in each directorate. Actions taken by NSF included implementation of electronic plans and workflow approval in SharePoint, an IPA time tracker, a comprehensive IR/D Guide, an automated quarterly tracking report showing planned versus actual IR/D time and expenses by participant and annual training for IR/D experts. All recommendations from the report were closed by the OIG in March 2013.

### NSF's Completed Actions to Address the Challenge

#### ***Demonstrated Progress Through Agency 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).

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<sup>8</sup> OIG Report 12-2-008 may be accessed at: <https://oig.nsf.gov/reports/audit/nsfs-independent-research-and-development-program>.

- 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 FY 2021.
- 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.
  - 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.
  - 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.
  - 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 home 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 percent cost sharing by IPAs’ home institutions of their academic-year salaries and fringe benefits (per NSF Bulletin 16-11). This pilot applied 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 33.3 percent between FY 2017 – FY 2020.
  - After a successful pilot period, NSF implemented the required cost share as policy, effective January 31, 2020, requiring that institutions provide a minimum of 10 percent cost share for every full-time IPA agreement. Total cost share increased by over \$1 million between FY 2019 and FY 2020, with the percent of assignments that cost share near 90 percent (note that strongly justified waiver requests may be considered). The cost share mechanism continues to maximize taxpayer value.
  - Engaged with the GAO on the salary reimbursements associated with IPAs. As noted in the 2018 GAO report (GAO-18-533), 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 Agency Actions Taken in FY 2021***

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.*

- Migrated Program Director and Executive IPAs to the USA Performance system for managing performance plans.
- Submitted the IPA Program Annual Report covering the prior fiscal year to the Director of NSF.
- Continued to provide ongoing training/onboarding activities and mandatory supervisor training for new IPAs.
- Continued to engage in IPA Program Enterprise Risk Management to clearly identify IPA Program objectives and associated risks as they pertain to the mission of NSF.
- Continued to integrate activities associated with the CAP in response to GAO-18-533 into Renewing NSF goal 1 Adapting the Workforce to the Work.

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.
- Submitted the IR/D Annual Report to the NSF Deputy Assistant Directors, 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.*

- 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 NSF.
- Submitted the FY 2020 IPA Program Annual Report to the Office of the Director, which demonstrated that the 10 percent cost-share policy continued to reduce or eliminate the gap between IPA reimbursements and federal salaries, and thus this is not a major risk to the agency.
- Submitted to Congress the FY 2020 annual response to the AICA on the Justifications for Rotator Pay Exceeding the SES Pay Maximum. With the implementation of the cost-sharing policy, the overall cost of IPAs to the agency, and to the taxpayer, is comparable to federal staff.

d) *COVID-19 Challenges.*

- Actively engaged with the NSF Remote Workforce Working Group to discuss the Agency's action plan for remote IPA positions, post the pandemic.

- Facilitated a focus group of IPAs who onboarded during COVID, to help identify new and unique challenges associated with onboarding in a remote work environment. The results of that study determined that the onboarding experience for the IPA was different depending on the individual. Many felt completely assimilated to the NSF culture and mission. There were opportunities identified to enhance the onboarding experience as NSF develops personnel policies based on our experience with the pandemic.
- Established implementation plan to collect and analyze FY 2021 data on IPA recruiting, onboarding, and costs attributed to the COVID-19 pandemic. Findings will be included in the FY 2021 IPA Annual Report.

### NSF's Ongoing and Planned Actions

NSF management developed the anticipated milestones and responses to the findings in the OIG Management Challenge FY 2021 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 the Office of Personnel Management, the average time a career SES spends in a position is 3.4 years and non-career SES is 1.7 years.<sup>9</sup> Thus, the turnover risk for IPAs is not any greater than for 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.
  - Migrated Program Director and Executive IPAs to the USA Performance system for managing performance plans and will continue using this platform.
- b) *IPAs can spend up to 50 days each year on Independent Research/Development (IR/D).*
- Determine how the IR/D program will operate in a long-term remote work environment and adjust policies in the IR/D Guide, if necessary, in FY 2022.
  - 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 or eliminated by implementing the required 10 percent cost-share as policy. Thus, this does not

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<sup>9</sup> Office of Personnel Management data on SES demographics <https://www.opm.gov/policy-data-oversight/senior-executive-service/facts-figures/#url=Demographics>.

constitute a significant risk to the agency. NSF will continue to monitor costs of the program, and provide annual reports to the Director, Chief Operating Officer, and NSF senior management.

d) *COVID-19 Challenges.*

- Continue IPA engagement activities using the Federal Employee Viewpoint Survey and other surveys or mechanisms to help identify new and unique challenges to the program, including recruiting, onboarding, and managing IPAs in a remote work environment.
- Continue to engage with the NSF Remote Workforce Working Group to discuss the agency's action plan for remote IPA positions, post the pandemic.
- The IPA Steering Committee will continue to collect and analyze data on recruiting, onboarding, and IPA costs to identify if there are changes or challenges that may be attributed to the pandemic.

## MANAGEMENT CHALLENGE 4: Providing Oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project

NSF Lead: Alexandra Isern, Assistant Director, Directorate for Geosciences

### Summary of OIG Identified Challenge

- Providing oversight of the Antarctic Infrastructure Modernization for Science (AIMS) Project, which will stretch agency resources and may present additional challenges for NSF to overcome, and doing so with minimal impact on scientific research.*
- Providing oversight of the separate Antarctic Support Contractor (ASC) contract modification with Leidos to build an Information Technology & Communications (IT&C) Primary Addition — 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 rebaselining in FY 2021; the IT&C Primary Addition 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 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) which supports the 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 involves building onto an existing facility for the consolidation of IT&C functions, and the AIMS Project, the scope of which currently includes six new facilities as well as utilities to support them. All 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 ASC under a Federal Acquisition Regulation-based contract with NSF. This management challenge

addresses AIMS only, but IT&C Primary Addition is identified here since its completion is on the critical path for construction for AIMS.

Antarctica’s remote location, extreme environment, and the short period of time each year 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 which were used 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 continues to mitigate the likelihood and impacts of these key risks through extensive planning and coordination and has already identified the key long-lead material and equipment purchases to support delivery dates, meeting the logistics supply chain requirements. These procurements for equipment and construction material are captured and tracked in the project’s integrated master schedule and reviewed regularly by project and program leadership.

The global pandemic associated with COVID-19, which is considered an unforeseen event not addressed by the budget contingency for AIMS construction, impacted all 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 Completed Actions to Address the Challenge**

#### ***Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years***

- Completed design and began construction on the IT&C Primary Addition Project. The IT&C Primary Addition Project is a prerequisite to the AIMS project but is not part of the funded AIMS project. As of March 2020, the facility construction was 74 percent complete and is poised to be continued as conditions allow. 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 an independent cost estimate, with the first two construction packages awarded for the Vehicle Equipment and Operations Center (VEOC) 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 newly created staff position.
- Shortly following AIMS authorization, weekly meetings of the core integrated project team – including OPP, DACS, and LFO – were initiated.
- On-site work began on AIMS with aggregate production and demolition of facilities in the footprint of VEOC and Lodging. 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 and the pandemic might have on Antarctic science.



- Partnered with BFA/DACS and LFO to: (1) identify areas that the contractor needed to strengthen, which resulted in the contractor hiring additional staff, (2) restructure the office supporting the contract, and (3) obtain interagency support for engineering and cost analysis from the U.S. Army Corps of Engineers (USACE).
- 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.
- Completed AIMS EVMS surveillance and identified corrective action requirements to ensure that an appropriate EVMS is developed.
- Completed the first annual construction review carried out by an independent external review team in accordance with NSF policy to evaluate contractor performance.
- Required the contractor to clearly distinguish COVID-19-driven impacts to cost and schedule from non-COVID-driven impacts to facilitate reconciliation of funding responsibilities.
- Conducted a “Logistics Summit” to ensure adequate and timely throughput of material into and out of the domestic departure point to McMurdo Station.

***Demonstrated Progress Through Agency Actions Taken in FY 2021***

- Acquired no-cost access to a long-term storage area to accommodate increased backlog of material resulting from COVID-19 resupply impacts.
- Provided ASC with planning parameters for re-baselining.
- The Chief Officer for Research Facilities convened an AIMS "Tiger Team," consisting of representatives from GEO Office of the Assistant Director, OPP, and BFA, in order to evaluate options for the future re-baselining of AIMS and develop a new path forward that transitions AIMS to a long-term Antarctic Infrastructure Recapitalization program.

**NSF's Ongoing and Planned Actions**

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

- 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.
- Working closely with BFA, re-baseline AIMS, subject the revised cost and schedule to external panel review, Facilities Readiness Panel Review, Director's Review Board Review and if required, notification to National Science Board.
- Leverage the expertise within the USACE to provide quality assurance through design and constructability technical reviews, on-ice construction observation, cost estimating services, and schedule and cost review.
- Conduct quarterly NSF Integrated Project Team Meetings to ensure status of AIMS developments is known and to solicit expert feedback/advice.

## MANAGEMENT CHALLENGE 5: Increasing Diversity in Science & Engineering (S&E) Education and Employment

NSF Leads: Karen Marrongelle, NSF Chief Operating Officer and Rhonda Davis, Office Head, Office of Equity and Civil Rights (OECR)

### Summary of OIG Identified Challenge

- a) *Continue efforts to develop strategies and programs to increase diversity in S&E education and employment and to measure their effectiveness.*
- b) *Take action to help alleviate the impact of COVID-19 on efforts to increase diversity in STEM research and education.*

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

The importance of this challenge was imprinted on the Foundation at the earliest points of its origins. Chapter 4 of the NSF blueprint, *Science: The Endless Frontier*, identifies “The Renewal of Our Scientific Talent” as a priority for the then-nascent Foundation, with a specific focus on removing the barriers that prevent major segments of society from participating in the scientific enterprise. This aspect of NSF’s mission and purpose was established more formally in 1980 with the enactment of the Science and Engineering Equal Opportunities Act. This Act specifically authorized NSF to undertake a comprehensive program to increase the participation of women and minorities in science and engineering and established what would become the Committee on Equal Opportunities in Science and Engineering<sup>10</sup> (CEOSE) to advise the Foundation. For decades NSF has maintained a robust portfolio of programs that aim to broaden participation in science and engineering, with \$1.4 billion requested for FY 2022.

As is noted in the OIG’s framing of this challenge, NSF and 16 other agencies were directed by OMB in August 2020 to prioritize investments that increase diversity, equity, and inclusion in STEM. More recently, Executive Order 13985 has directed that all agencies “pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality.” NSF will continue to strengthen its investments and policies but addressing this challenge will require a more holistic approach, which involves institutional partners to also make changes in addressing systemic barriers to inclusion in STEM.

NSF leadership recognizes both the importance of this issue and also the fact that barriers in STEM in many ways reflect and are perhaps rooted in the systemic, stubborn, and destructive barriers to participation more generally that have existed throughout our nation’s history. In fact, top NSF leadership recently identified this issue as an “exceedingly important priority.” At the 2021 Annual Meeting of the American Association for the Advancement of Science, NSF Director Dr. Sethuraman Panchanathan defined ensuring accessibility and inclusivity in STEM as the second of three major pillars of the NSF vision, saying “There is so much untapped talent across the nation that can strengthen the science and engineering community. Every demographic and socioeconomic group and geographical area in the nation has diverse people who are capable of succeeding in STEM and contributing to the

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<sup>10</sup> CEOSE was originally named the Committee on Equal Opportunities in Science and Technology.

research enterprise. We need to scale up existing pathways into STEM fields for them and create new ways into science and engineering. And we need to do it quickly. This is critical to making progress and being competitive.”

It is also undeniable that despite NSF’s efforts, data confirm the persistence of this challenge. There have been noteworthy areas of progress, such as increases in the shares of individuals in S&E occupations from racial and ethnic groups historically underrepresented in STEM.<sup>11</sup> But the overall picture is summed up in the opening sentences of the recently issued report on Women, Minorities, and Persons with Disabilities in Science and Engineering:<sup>12</sup>

Women, persons with disabilities, and some minority groups—Blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives—are underrepresented in science and engineering (S&E). That is, their representation in S&E education and S&E employment is smaller than their representation in the U.S. population.

The risk of inadequate action is significant, as the opportunity costs of this exclusion are substantial. Recent economic literature on the cost of lack of diversity finds that if key racial gaps had been closed 20 years ago, the result would be an additional \$16 trillion in gross domestic product (Peterson & Mann, 2020). Similarly, gender equality in earnings would increase total global wealth by 14 percent (Wodon & Briere, 2018). The size and scale of this issue and the NSF mission require the agency to elevate its action to address this challenge within the S&E enterprise.

Indeed, the need for NSF to escalate its efforts was captured in the 2011-2012 report to Congress by CEOSE, which noted both the progress to date and the insufficiency of that progress in redressing historic patterns of underrepresentation. That report called for a “bold new initiative focused on broadening participation of underrepresented groups in STEM, similar in concept and scale to NSF’s centers.” This motivated the establishment of the NSF INCLUDES (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science) national network.

In the context of this management challenge, NSF INCLUDES is of special significance because of its emphasis on building on the best practices and lessons learned from previous investments by NSF and other organizations. Even though its budget of \$46 million (proposed for FY 2022) is only 3 percent of NSF’s Broadening Participation Portfolio,<sup>13</sup> it is providing a unifying framework and a set of expectations for the larger portfolio grounded in research and implementation. Through NSF INCLUDES, the agency is building a national network to connect individuals, institutions, alliances, and other entities to catalyze the STEM enterprise to work collaboratively toward building a STEM workforce that reflects the population of the Nation. NSF INCLUDES is building the infrastructure for sustained broadening participation efforts across the Nation.

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<sup>11</sup> Figure of underrepresented minorities in S&E occupations, by broad occupational category: 2003 and 2017  
<https://nces.nsf.gov/pubs/nsb20201/figure/8>.

<sup>12</sup> Women, Minorities, and Persons with Disabilities in Science and Engineering report issued in April 2021  
<https://nces.nsf.gov/pubs/nsf21321/>

<sup>13</sup> NSF’s Broadening Participation Portfolio is set forth in its annual budget request to Congress and can be divided into three categories: (1) Focused Programs have broadening participation as an explicit goal of the program, (2) Emphases Programs have broadening participation as one of several emphases, but broadening participation is not an explicit goal of the program, and (3) NSF’s Geographic Diversity program, EPSCoR, has geographic diversity as an explicit goal.

Also of special note in this context is the Science of Broadening Participation program. This program draws upon the theories, methods, and analytic techniques of the social, behavioral, economic, and learning sciences to better understand the factors that enhance as well as the barriers that hinder our ability to expand participation in education, the workforce, and major social institutions in society. This is intended to enable educators, employers, and policy makers to make evidence-based decisions, design effective interventions, and create programs that successfully engage diverse groups.

The agency has taken a variety of program and policy approaches to increasing diversity in S&E. While broadening participation is the focus or emphasis of some programs, it is included through the broader impacts criteria, in the review criteria of all NSF proposals for funding. Additionally, some program announcements and solicitations go beyond the standard criteria. They range from encouraging language to specific requirements. Investments range from capacity building, research centers, institutional transformation, partnerships, and alliances to the use of co-funding or supplements to existing awards in the core research programs.

Efforts to increase diversity in science and engineering education and employment have been a hallmark of NSF since its founding. NSF fully recognizes that today these efforts warrant unprecedented urgency given the national and economic security concerns and the global S&E trends set forth by the NSB in the Vision 2030 report. Today's efforts to address this challenge span across every NSF Directorate and Office. NSF also recognizes that the COVID-19 pandemic exacerbated this situation in 2020, having a disproportionate impact on the careers of scientists and trainees from underrepresented groups. NSF appreciates the grand scale of these issues and the pressing need to define all pieces of the challenge within the agency's broad sphere of influence and to address them with speed using all available strategies and programs. To achieve this, NSF's commitment to ensuring accessibility and inclusivity has been embedded as a pillar in the agency's strategic planning process, which will facilitate determining the appropriate focus, scope, and monitoring for NSF's next steps in addressing this challenge.

### **NSF's Completed Measures to Address the Challenge**

#### ***Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years***

- Embedded Broadening Participation in the NSF Strategic Plan, FY 2018 – 2022, through a variety of investment priorities related to the Learning and Stewardship strategic outcome goals.
- Provided robust funding for Programs to Broaden Participation, with over \$1.0 billion provided annually since FY 2018.
- Emphasized the importance of efforts to broaden participation in the guidance and FAQs issued in response to the impact of COVID-19.<sup>14</sup>
- Developed and provided annually to Congress the Report on Funding to Minority-Serving Institutions, as required by the NSF Authorization Act of 2002 (P.L. 107-368).<sup>15</sup>
- Included information on the participation of women, individuals from racial and ethnic groups historically underrepresented in STEM, and persons with disabilities in the annual Report to the National Science Board on the NSF's Merit Review Process.<sup>16</sup>

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<sup>14</sup> NSF's Coronavirus Information website can be found at [https://www.nsf.gov/news/special\\_reports/coronavirus/](https://www.nsf.gov/news/special_reports/coronavirus/)

<sup>15</sup> Annual reports to Congress on Funding to Minority-Serving Institutions may be accessed at [https://www.nsf.gov/od/broadeningparticipation/bp\\_investments.jsp](https://www.nsf.gov/od/broadeningparticipation/bp_investments.jsp).

<sup>16</sup> Reports on NSF's merit review process may be accessed at <https://www.nsf.gov/nsb/publications/pubmeritreview.jsp>.

- Established NSF INCLUDES as one of the NSF Big Ideas, with the goal of developing a talented, innovative, and capable STEM workforce that reflects the diversity of the Nation.
- Conducted competitions for NSF INCLUDES funding, which led to:
  - a. 70 awards for Design and Development Launch Pilots in FY 2016 and FY 2017
  - b. 8 awards for Alliances in FY 2018 and FY 2019
  - c. 1 award for the NSF INCLUDES Coordination Hub in FY 2018
  - d. 29 awards for Planning Grants in FY 2020
  - e. Published two Reports to the Nation on the INCLUDES program and its accomplishments:
    - i. The 2018 Report to the Nation: NSF INCLUDES which explored the initial program statistics for the NSF INCLUDES design (NSF 18-040).<sup>17</sup>
    - ii. The 2020 Special Report to the Nation II: Building Connections, which highlights the progress of this collective effort to achieve greater diversity in STEM (NSF 20-099).<sup>18</sup>
  - f. Issued call for new NSF INCLUDES Alliances (NSF 20-629).
- Convened CEOSE meetings three times per year; receipt of key biennial reports and recommendations.
- Implemented a new award term and condition in October 2018 entitled, “Notification Requirements Regarding Sexual Harassment, Other Forms of Harassment, or Sexual Assault.” This term and condition applies to NSF awardee organizations.

***Demonstrated Progress Through Agency Actions Taken in FY 2021***

- Initiated the agency’s response to EO 13985 with the establishment by the NSF Director of the Agency Equity Team (AET), which is leading the agency’s Equity Assessment and engaging internal and external stakeholders to address the goals of the EO.
- Released the NCSES 2021 Women, Minorities, and Persons with Disabilities in Science and Engineering report (NSF 21-321).
- Initiated a comprehensive outreach strategy for the 2021 Women, Minorities, and Persons with Disability in Science and Engineering report that is engaging major stakeholders and building awareness within the university and employer communities of the underrepresentation reflected by the data in the report.
- Renamed the Office of Diversity and Inclusion to the Office of Equity and Civil Rights (OECR), which supports the agency’s goal to advance diversity, equity, inclusion, and accessibility and is responsible for the Diversity and Inclusion (D&I) Program, Equal Employment Opportunity (EEO) Program, Reasonable Accommodations (RA) Program, Alternative Dispute Resolution (ADR) Program, Awardee Civil Rights Compliance Program, and Harassment Notification Term and Condition.
- Reorganized OECR and established three branches: the Equity and Operations Branch (EOB) which is responsible for the D&I Program, ADR Program, civil rights policy and OECR administrative functions; the Awardee Compliance Branch (ACB) which is responsible for the Equal Opportunity (EO) Program, including awardee compliance; and Equal Employment and Accessibility Branch (EEAB) which is responsible for the EEO Program and RA Program. The

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<sup>17</sup> The 2018 Report to the Nation: NSF Includes may be accessed at [https://www.nsf.gov/news/special\\_reports/nsfincludes/pdfs/INCLUDES\\_report\\_to\\_the\\_Nation.pdf](https://www.nsf.gov/news/special_reports/nsfincludes/pdfs/INCLUDES_report_to_the_Nation.pdf).

<sup>18</sup> The 2020 Report to the Nation II: Building Connections may be accessed at <https://www.nsf.gov/pubs/2020/nsf20099/nsf20099.pdf>.

changes will provide greater focus and separation of functions and responsibilities enabling more effective, efficient, and streamlined processes and procedures.

- Established the NSF Racial Equity Task Force (RETF) to review employment and program delivery policies and practices, determine if there are potential barriers that may hinder racial equity, and identify ways to incorporate recommended initiatives and practices into NSF policies and procedures. The efforts of the task force also serve to operationalize Dr. Panchanathan’s vision that discrimination and bias have no place at NSF, in the research community, or any corner of science and engineering. Task force leadership is primarily comprised of NSF executives at the Leadership Team level. The working groups were comprised of a diverse cross-section of 28 NSF employees, representing the full spectrum of employees, to include: permanent, temporary and IPA Staff; all GS levels; supervisory and non-supervisory staff; SES staff and staff from each scientific directorate.
- Expanded the Broadening Participation Portfolio with new funding opportunities: Dear Colleague Letter: Broadening Participation in STEM Entrepreneurship and Innovation (BPINNOVATE – DCL 21-023), Build and Broaden 2.0 (21-542); Launching Early-Career Academic Pathways in the Mathematical and Physical Sciences (LEAP-MPS – 21-570); and NSF Boosting Research Ideas for Transformative and Equitable Advances in Engineering (21-568); DCL (21-110) Persons with Disabilities – STEM Engagement and Access (PWD-SEA); and others.
- Funded several rapid response research grants related to impacts of COVID-19, some of which were directed to Historically Black Colleges and Universities (HBCUs) and Hispanic Serving Institutions (HSIs), or that focused on COVID-19 impacts on students from groups historically underrepresented in STEM.
- Issued new funding opportunities targeted toward populations and institutions disproportionately impacted by the global pandemic, including Racial Equity in STEM Education (EHR Racial Equity) Program Description, Advancing Innovation and Impact in Undergraduate STEM Education at Two-year Institutions of Higher Education Program Description, Dear Colleague Letter: Supplemental Funding for Postdoctoral Researchers to Mitigate COVID-19 Impacts on Research Career Progression, and Dear Colleague: Tribal Colleges and Universities Program STEM Innovative Faculty Support (DCL – 21-096).<sup>19,20,21,22</sup>

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<sup>19</sup> More information on the Racial Equity in STEM Education (EHR Racial Equity) Program may be accessed at <https://beta.nsf.gov/funding/opportunities/racial-equity-stem-education-ehr-racial-equity>.

<sup>20</sup> More information on the Advancing Innovation and Impact in Undergraduate STEM at Two-year Institutions of Higher Education may be accessed at <https://beta.nsf.gov/funding/opportunities/advancing-innovation-and-impact-undergraduate-stem-education-two-year>.

<sup>21</sup> The Dear Colleague Letter: Supplemental Funding for Postdoctoral Researchers to Mitigate COVID-19 Impacts on Research Career Progression may be accessed at <https://www.nsf.gov/pubs/2021/nsf21066/nsf21066.jsp?org=NSF>.

<sup>22</sup> The Dear Colleague Letter: Tribal Colleges and Universities Program STEM Innovative Faculty Support may be accessed at <https://www.nsf.gov/pubs/2021/nsf21066/nsf21066.jsp?org=NSF>.

- Continued long-term strategic investment in NSF broadening participation-focused programs as these programs have broadening participation as an explicit goal. This includes not only our longer-standing programs,<sup>23</sup> but also several new programs such as the Social, Behavioral, and Economic Science Directorate’s Build and Broaden program, the Computer and Information Science and Engineering-MSI Research Expansion Program, and Mathematical and Physical Sciences Ascending Post-Doctoral Research Fellowships.
- Convened the Fall 2020 and Spring 2021 meetings of the STEM Education Advisory Panel to assess the progress of the Committee on Science, Technology, Engineering, and Mathematics Education (CoSTEM) in carrying out responsibilities related to the America COMPETES Reauthorization Act and help identify the need or opportunity to update the Federal STEM Education 5-Year Strategic Plan.
- Convened FY 2021 CEOSE meetings (October 2020, February 2021, and June 2021), and received the summer 2021 report, *Making Visible the Invisible*, recommending that NSF demonstrate, support, and reward bold leadership actions to create, integrate, and make visible efforts, promising practices, and impacts within and across its programs to broaden participation of underrepresented groups in STEM.
- Continued strengthening NSF’s sexual harassment policies by convening the NSF Sexual Harassment Working Group (SHWG), comprised of OECR, OGC, and Policy Office staff.
- Assessed selected NSF programs to determine the necessity for harassment policies and expanded the harassment notification term and condition to postdoctoral fellowship awards and Small Business Innovation Research (or SBIR) awards.
- Initiated the first phase of an evaluation of the sexual harassment term and condition and conference proposal policy to determine the extent to which these policies are creating positive and lasting change.
- Developed a harassment term and condition FAQ page on the website of OECR, clarifying that the term & condition also applies to other forms of unlawful harassment.
- Initiated action to revise all postdoctoral fellowship solicitations that make awards directly to the individual to stipulate that the fellow must agree to abide by the affiliated institution’s policies or codes of conduct and to notify NSF if the fellow is subjected to any “administrative leave/administrative action,” or is the subject of any “finding/determination” relating to sexual harassment, other forms of harassment or sexual assault.
- Modified the Small Business Innovation Research and Small Business Technology Transfer solicitation to include language to stipulate that all personnel supported by an NSF award must remain in full compliance with policies and/or codes of conduct, statutes, regulations, or executive orders relating to sexual harassment, other forms of harassment, or sexual assault.
- Completed the review of proposals for additional NSF INCLUDES planning grants and Alliances. Eighteen new planning grants and five new Alliances were funded in FY 2021. The biennial NSF INCLUDES National Network Convening took place, engaging individuals from NSF-funded projects, other federal agencies and allied efforts in interactive presentations and discussions. In addition, the agency is awarding a contract for NSF INCLUDES program-level evaluation services. Conducted an analysis, led by BFA and the OIRM, into participation in NSF programs by HBCUs, which entailed hosting listening sessions with HBCU Office of Sponsored Program staff and

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<sup>23</sup> For example, the Historically Black Colleges and Universities – Undergraduate Program (HBCU-UP), including the Excellence in Research Track; the Improving Undergraduate STEM Education – HSI program; the Louis Stokes Alliances for Minority Participation (LSAMP) program; Tribal Colleges and Universities Program (TCUP); Alliances for Graduate Education and the Professoriate; Centers of Research Excellence in Science and Technology (CREST); and the ADVANCE program.

professors. Leveraged available data sources to do quantitative analysis of NSF award data about the state of NSF investment in HBCUs to supplement the qualitative data gathered. Shared findings and recommendations broadly across NSF with senior leadership in program, performance, and agency operations. Evaluated cross-agency input on next steps.

### **NSF's Ongoing and Planned Actions**

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:

- Finalize the strategic framing of efforts to ensure accessibility and inclusivity, in keeping with the agency's response to Executive Order 13985, in the NSF Strategic Plan for FY 2022-2026 and its associated performance activities, with public release scheduled for February 2022.
- Continue action to strengthen the Broadening Participation component of the Broader Impacts criterion, for example, by working externally with the NSF INCLUDES Network and the ARIS (Advancing Research Impact in Society) Center to identify new incentives to encourage current and prospective PIs to visit their websites and utilize available broadening participation resources to strengthen proposals and enhance inclusive implementation/communication strategies.
- Continue the work of the NSF RETF, including planning implementation of the recommendations made. Efforts will also include further barrier analysis to include data challenges.
- Identify, in collaboration with the National Science Board and CEOSE, potential approaches for more consistent reporting of Broadening Participation outcomes by NSF awardees.
- Proceed with the multi-year framework for investments through NSF INCLUDES, as presented in the FY 2022 budget request, with emphasis on supporting research on broadening participation in STEM, developing shared goals and objectives, and continuing to build the NSF INCLUDES National Network.
- Continue comprehensive outreach strategy for the 2021 Women, Minorities, and Persons with Disability in Science and Engineering report that is engaging major stakeholders and building awareness within the university and employer communities of the underrepresentation reflected by the data in the report.
- Continue to examine the challenges of limited data in terms of studying small groups of people who we know are underrepresented in STEM, as well as less studied groups, e.g., sexual orientation/gender identification, who may be underrepresented and would enhance diversity in the S&E workforce.
- Continue to implement post-COVID-19 initiatives, policies, and programs designed to address the lasting and unequal impact of the pandemic on groups and institutions such as minority-serving institutions, two-year institutions and community colleges, and people from groups historically underrepresented in the S&E enterprise.
- Continue implementation work, in alignment with Executive Order 14041 of September 3, 2021, of the BFA/OIRM initiative to strengthen the engagement of HBCUs in NSF's programs, including potentially enabling new research avenues/program offerings for HBCUs, setting aggressive HBCU-focused goals for equity and inclusion, and systematically investing in outreach, training, and post-award compliance support for HBCUs.
- Continue to expand the harassment notification term and condition by updating the upcoming PPAPG to include a term and condition for travel funding proposals.



## 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

*NSF, and other agencies that fund basic and advanced research, are facing challenges from foreign government-sponsored 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 provide information that is proprietary. Failure to properly disclose membership in such programs can also have criminal or civil ramifications. In addition, 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.*

### 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, reciprocity, 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 misappropriate U.S.-funded scientific research prior to its open publication. These programs target scientists, engineers, and educators of all nationalities working or educated in the United States.

Over the past three years, NSF has taken steps to mitigate threats posed by foreign government talent recruitment programs. NSF focuses on the following risks to its funded research from foreign government interference:

- Conflicts of interest that need to be recognized and mitigated by the U.S. employers of the research community;
- Undisclosed research duplication and researcher commitments to research entities outside their U.S. employer;
- Compromises to the merit review system; and
- Unauthorized use of pre-publication data and information.

In recognition of the importance of working closely with the rest of the U.S. government, NSF serves as co-chair of the National Science and Technology Council Subcommittee on Research Security. The

Subcommittee on Research Security brought together science agencies and law enforcement to develop the recommendations that served as the foundation for National Security Presidential Memorandum 33 (NSPM-33).<sup>24</sup> NSPM-33, the Recommended Practices for Strengthening the Security and Integrity of America’s Science and Technology Research Enterprise, and the associated fact sheet were released by the White House in January 2021 to direct a national response to safeguard the security and integrity of federally funded research and development (R&D) in the United States.<sup>25</sup> The Subcommittee on Research Security also convened a new Interagency Working Group (IWG) on Disclosure Policies (DP). The objective of the IWG-DP is to provide clarity regarding disclosure requirements (e.g., who discloses what, relevant limitations and exclusions), disclosure process (e.g., updates, corrections, certification, and provision of supporting documentation), and expected degree of uniformity across agencies. NSF also co-chairs this IWG.

On August 10, 2021, Dr. Eric Lander announced that the Biden Administration “is working on how to implement NSPM-33 effectively, rigorously, and uniformly across the federal government in a way that protects the nation’s interests in both security and openness.”<sup>26</sup>

### **NSF’s Completed Actions to Address the Challenge**

#### ***Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years***

In July 2019, NSF released a Dear Colleague Letter on Research Protection to the research community from then-Director Córdova. The letter 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. At the same time, NSF issued a policy prohibiting NSF personnel and rotators such as IPAs detailed to NSF from participating in foreign government talent recruitment programs.<sup>27</sup> This policy helps prevent inappropriate foreign influence on NSF personnel.

In 2019, NSF commissioned a report from the independent JASON advisory group to assess risks to fundamental research. NSF also asked what good practices could be put into place by academic researchers and funding agencies such as NSF to balance the open environment of fundamental research with the needs for national and economic security. In the report – which was made public in December 2019 – JASON provided NSF and awardees with many helpful findings and recommendations to maintain balance between openness and security of science. NSF responded to the report in early

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<sup>24</sup> The National Security Presidential Memorandum 33 may be accessed at <https://trumpwhitehouse.archives.gov/presidential-actions/presidential-memorandum-united-states-government-supported-research-development-national-security-policy/>

<sup>25</sup> Recommended Practices for Strengthening the Security and Integrity of America’s Science and Technology Research Enterprise may be accessed at <https://trumpwhitehouse.archives.gov/wp-content/uploads/2021/01/NSTC-Research-Security-Best-Practices-Jan2021.pdf>. The associated fact sheet is available at <https://trumpwhitehouse.archives.gov/wp-content/uploads/2021/01/NSC-OSTP-NSPM33-Fact-Sheet-Jan2021.pdf>.

<sup>26</sup> Dr. Eric Lander, President’s Science Advisor and Director of the Office of Science and Technology Policy: Clear Rules for Research Security and Researcher Responsibility <https://www.whitehouse.gov/ostp/news-updates/2021/08/10/clear-rules-for-research-security-and-researcher-responsibility/>.

<sup>27</sup> NSF’s Personnel Policy on Foreign Government Talent Recruitment Programs may be accessed at [https://www.nsf.gov/bfa/dias/policy/researchprotection/PersonnelPolicyForeignGovTalentRecruitment%20Programs07\\_11\\_2019.pdf](https://www.nsf.gov/bfa/dias/policy/researchprotection/PersonnelPolicyForeignGovTalentRecruitment%20Programs07_11_2019.pdf).

2020, taking actions to mitigate risks, noting where the agency has already taken action, and agreeing with the report's recommendations.<sup>28</sup>

The additional actions that NSF took to ensure the integrity of federally-funded research included demonstrating organizational leadership and oversight. NSF has reprogrammed existing resources to mitigate risks to research security. Specifically, NSF created and filled the first-in-government position of Chief of Research Security Strategy and Policy (CRSSP) in March 2020 – a leadership position which reports to the NSF Director – and the position of CRSSP Chief Data Officer in September 2020. In June 2020, CRSSP launched the Research Security Strategy and Policy Group (RSSPG) which comprises the Chief Officer for Research Facilities, the Director's Chief of Staff, the Head of the Office of Legislative and Public Affairs, the General Counsel, and the Executive Secretary. The RSSPG meets quarterly and as situations arise to advise the Director and the CRSSP on all aspects of research security strategy and policy. In May 2020, CRSSP created the International Collaboration in Large Facilities (ICLF) Team which comprises the Chief Officer for Research Facilities and representatives from the OGC, BFA, and the Office of International Science and Engineering, and reviews potential international collaboration information from major facility managing organizations. CRSSP also meets regularly with the Assistant General Counsel (Ethics) and the Head of the Policy Office in the Division of Institution and Award Support, within BFA to develop policy and training and resolve other issues related to science and security.

NSF coordinated with U.S. government interagency partners, including through the National Science and Technology Council (NSTC) Subcommittee on Research Security, on the development of NSPM-33 which established national security policy for U.S. government-supported R&D, including by outlining specific actions the federal government – including NSF – will take to enhance research security and integrity in the following areas:

- Enhance awareness of research security risks and protections,
- Strengthen disclosure requirements and processes,
- Information sharing,
- Research security training,
- Risk identification and analysis, and
- Promote and protect international R&D cooperation.

#### ***Demonstrated Progress Through Agency Actions Taken in FY 2021***

Pursuant to NSPM-33 and the recommendations of JASON, NSF took multiple actions in FY 2021, which are summarized here:

- **Chief of Research Security Strategy and Policy (CRSSP):** Teams of experts were assembled in 2020 and 2021 to ensure that NSF has the necessary staff and resources to continue to respond to this challenge. CRSSP has taken on new roles and developed new capabilities to mitigate risks associated with foreign government talent recruitment programs. Importantly, CRSSP also regularly coordinates science and security-related actions with relevant offices across NSF, especially the Office of the Director, the Policy Office in the Division of Institution and Award Support, within BFA, OGC, the Office of International Science and Engineering, and OIG, including through the RSSPG and ICLF Team. CRSSP and relevant offices have set up an “NSF

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<sup>28</sup> The report on Fundamental Research Security may be accessed at [https://www.nsf.gov/news/special\\_reports/jasonsecurity/JSR-19-21FundamentalResearchSecurity\\_12062019FINAL.pdf](https://www.nsf.gov/news/special_reports/jasonsecurity/JSR-19-21FundamentalResearchSecurity_12062019FINAL.pdf). NSF's Response is available at [https://nsf.gov/news/special\\_reports/jasonsecurity/NSF\\_response\\_JASON.pdf](https://nsf.gov/news/special_reports/jasonsecurity/NSF_response_JASON.pdf).

Research Protection Group” email alias to receive and respond to questions from within NSF on issues such as post-award information disclosure and other issues such as how to respond to a PI’s request for extended leave to work for a foreign company submitted.

- Enhance awareness of research security risks and protections:
  - a. Research security training for NSF staff: In March 2020, NSF released mandatory training for all NSF personnel on science and security. It includes modules on the importance of international collaborations, undue foreign government interference, NSF’s policies on disclosure, and NSF’s policies on staff participation in foreign government talent recruitment programs. In August 2021, NSF released a second phase of training aimed at staff in positions such as program directors and relevant staff in BFA, that directly communicate with proposer and awardee organizations and principal investigators. This training focuses on new requirements in the proposal process related to submission of “Current and Pending Support” and “Biographical Sketch” by senior personnel. More specifically, the training covers:
    - i. The information that is required to be disclosed in the Biographical sketch and Current and Pending Support sections of the proposal;
    - ii. How NSF uses the information disclosed in these sections in the merit review process; and
    - iii. Assessing information disclosed in the Biographical Sketch and Current and Pending Support sections of the proposal and Post Award Information disclosures.
  - b. Research security training for the external community: Beginning in 2020, NSF and the National Institutes of Health (NIH) co-chaired the Research Security Education and Training working under the National Counter-Intelligence Task Force. Together with interagency partners, the co-chairs are coordinating research security training for the external community.
  - c. Outreach to the academic community: To increase awareness of the risks and compliance with NSF’s policies and procedures, NSF participated in numerous meetings and conferences for the research community, including to the National Academies of Sciences, Engineering, and Medicine (NAEM), National Council of University Research Administrators (NCURA), Council on Governmental Relations, Society of Research Administrators International, National Association of College and University Attorneys (NACUA), Federal Demonstration Partnership, Global Research Council Conference on Responsible Research Assessment, American Association for the Advancement of Science (AAAS) Science Diplomacy Affinity Group, U.S.-China Business Council, as well as to institutions of higher education and Statewide Systems Offices such as the University of Texas, University of California, and University of Virginia systems. NSF also utilizes the NSF Grants Conference to relay this important information to the proposer and awardee community.
  - d. Recommended Practices for research organizations: The NSTC released Recommended Practices for Strengthening the Security and Integrity of America’s Science and Technology Research Enterprise in January 2021. The 21 recommended practices for enhancing research and security and integrity span five broad categories:
    - i. Demonstrate organizational leadership and oversight.
    - ii. Establish an expectation of openness and transparency.
    - iii. Provide and share training, support, and information.
    - iv. Ensure effective mechanisms for compliance with organizational policies.
    - v. Manage potential risks associated with collaborations and data.
- Strengthen disclosure requirements and processes:

- a. Standardized format and streamlined processes for disclosure: As part of its revision to the Proposal & Award Policies & Procedures Guide (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.<sup>29</sup> To streamline the process, NSF worked with the NIH to use SciENCv:Science Experts Network Curriculum Vitae as an NSF-approved format for both sections of the proposal.<sup>30</sup> A separate fillable format also is available for use. A set of Frequently Asked Questions regarding the NSF-approved formats also has been developed to assist users in completion of these electronic formats. The community was required to use an NSF-approved format to prepare these sections of any proposal submitted or due on or after October 5, 2020. In addition, a new table entitled, *NSF Pre-award and Post-award Disclosures Relating to the Biographical Sketch and Current and Pending Support*, has been developed and disseminated to assist users in completion of these sections of the proposal.<sup>31</sup>
- b. Submission of Post-award Information: Effective October 2020, NSF has implemented the two new electronic vehicles for submission of post-award updates to current and pending support information:
  - i. Issuance of a new award term and condition regarding previously undisclosed information. If an organization discovers that a Principal Investigator (PI) or co-PI on an active NSF award failed to disclose current support or in-kind contribution information as part of the proposal submission process, the Authorized Organizational Representative of the awardee organization must submit the requisite information outlined in the article within 30 calendar days of the identification of the undisclosed current support or in-kind contribution.
  - ii. Update of NSF’s Annual Project Reporting Format. Effective October 5, 2020, PIs and co-PIs on NSF awards must notify NSF when active other support has changed since the award was made or since the last reporting period. They must include a revised current and pending support document as part of this notification.
- Information sharing:
  - a. NSF partners with OIG on incidents.
    - i. In FY 2021, NSF greatly increased its collaboration with OIG and Federal Bureau of Investigation to exchange information and take action to address offenses, where appropriate. NSF worked collaboratively with the OIG, where appropriate, to address threats posed by foreign government talent recruitment programs. In 2021, consistent with our OIG Cooperation Directive, NSF continued to support the OIG’s investigations, including those involving allegations related to foreign talent programs.
    - ii. Following referrals by the OIG, NSF has recouped, or prevented the loss of, millions of taxpayer dollars through actions on awards given to institutions of higher education, and small businesses through NSF award suspension, government-wide suspension, and NSF award termination.

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<sup>29</sup> NSF’s Proposal & Award Policies & Procedures Guide (PAPPG) may be accessed at [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf22001&org=NSF](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf22001&org=NSF). Additional information on the biographical sketch is available at <https://www.nsf.gov/bfa/dias/policy/biosketch.jsp> and on the current and pending support is available at <https://www.nsf.gov/bfa/dias/policy/cps.jsp>.

<sup>30</sup> The SciENCv: Science Experts Network Curriculum Vitae is available at <https://www.ncbi.nlm.nih.gov/sciencv/>

<sup>31</sup> The NSF Pre-award and Post-award Disclosures table may be accessed at [https://www.nsf.gov/bfa/dias/policy/disclosures\\_table/august2021.pdf](https://www.nsf.gov/bfa/dias/policy/disclosures_table/august2021.pdf).

- iii. Following referrals by the OIG, NSF has taken additional actions such as removal of PI from NSF award and NSF debarment from serving as reviewer, panelist, or consultant.
- b. Pursuant to Section 115 of the AICA and implementing regulations, NSF reports findings of research misconduct made under its research misconduct regulation (45 C.F.R Part 689) to other “Federal science agencies” as defined in the AICA and consistent with privacy laws and other legal restrictions.
- Risk identification and analysis:
  - a. NSF has used an Enterprise Risk Management framework to identify and mitigate risks.
  - b. Revised term and condition for foreign collaboration considerations in major facilities: As of October 5, 2020, NSF-funded major facilities 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.
  - c. NSF International Collaboration in Large Facilities (ICLF) Team: This team, which was created in May 2020, is chaired by the CRSSP and includes the Chief Officer for Research Facilities and representatives from OGC, the Office of International Science and Engineering, and BFA. The team reviews the potential international collaboration information from major facility managing organizations in compliance with the new award term and condition and provides the necessary guidance back to the NSF Program Officer based on strategic agency considerations.

NSF has taken a range of actions against individuals and entities associated with foreign talent programs or organizations receiving foreign funding, based on recommendations by the OIG. In many cases, actions were taken based on grant fraud or other wrongful conduct (or allegations thereof) before any foreign affiliation was surfaced to NSF. The types of actions taken include award suspension, award termination, cancellation of final payment, government-wide suspension, debarment, and a ban on serving as a proposal reviewer.

### NSF’s Ongoing and Planned Actions

NSF will continue to work diligently to address the risks of foreign government interference in NSF-funded research so that our research community can continue to contribute to the U.S. economy and to U.S. security. Ongoing and future actions include:

- Develop a comprehensive action plan to outline next steps the agency will take to further action to address the threats from foreign government interference.
- Continue to serve as co-chair with the NIH of the NSTC Subcommittee on Research Security and work closely with the White House, other federal science funding agencies, and intelligence and law enforcement communities to share information, promote outreach to institutions of higher education and other research organizations, coordinate policy and practices, and implement the NSPM-33 guidance for federal departments and agencies. This includes serving as co-chair of the interagency working group established in May 2021 on disclosure policy under the Subcommittee on Research Security.
- Evaluate recommendations and consider implementing additional policy steps or outreach related to research security at both the agency level and the Subcommittee on Research Security level. Additional activities could include, but are not limited to, those listed below.
- Enhance awareness of research security risks and protections:
  - a. Issue a notice from Director Panchanathan to the U.S. research community communicating the continuing threat from foreign government interference and the need for researchers to

- disclose all sources of funding and all affiliations to their home organizations and to U.S. federal science agencies. The notice will also communicate the risks of foreign government talent recruitment plans that present the great potential for conflicts of interest and commitment and the research community’s responsibility to manage these.
- b. Develop a Cooperative Agreement between agencies to support the development of online training (curriculum and technical solutions) to increase the security and integrity of federally funded research by providing a wider knowledge base on the application of new research security measures in the proposal and award process. The goal of the training is to better protect U.S. research interests from both domestic and foreign threats.
  - c. Continue to provide up-to-date research security training for all staff.
  - d. Continue to enforce NSF’s policy prohibiting NSF personnel and rotators from participating in foreign government talent recruitment programs.
- Strengthen disclosure requirements and processes:
    - a. Implement NSF’s enhanced pre-award and post-award disclosure requirements regarding preparation of the biographical sketch, and current and pending support information in the FY 2022 PAPPG. NSF’s disclosure requirements have been summarized in a new table entitled, *Pre-award and Post-award Disclosures Relating to Biographical Sketch and Current and Pending Support*, originally issued on June 16, and as modified on August 24, 2021.
    - b. Evaluate NIH’s requirement that key personnel individually certify that the information in current and pending support is accurate and complete; consider whether this model is consistent with NSF’s existing authorities and an effective way to comply with the National Defense Authorization Act Section 223: Disclosure of Funding Sources in Applications for Federal Research and Development Awards.
  - Information sharing:
    - a. 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 in NSF’s headquarters.
    - b. Continue to partner with OIG on incidents.
  - Risk identification and analysis:
    - a. Continue to ensure adherence to the term and condition for foreign collaboration considerations in major facilities.
    - b. Continue with ongoing efforts to enhance threat awareness in the research community, which includes outreach and dialogue with researchers and grants management staff—sharing information and providing resources necessary to protect federally funded research, and referring incidents that cause concern of potential waste, fraud, and abuse to the NSF OIG.

## 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 NSF's payment integrity program can be found at <https://paymentaccuracy.gov/>.

### **Actions Taken to Address Auditor Recovery Recommendations**

Using OMB Circular A-123, Appendix C, Part V.B.2 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 does not conduct payment recapture audits.

NSF has leveraged the results of the work performed under PIIA, audits, grant monitoring programs, and internal control reviews. All activities 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.



## 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 2021 inflation adjustments to civil monetary penalties.

**Table 3.3 – FY 2021 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 <i>et seq.</i> , as amended	Antarctic Conservation Act, Knowing violations	1978	2021	\$30,107	<a href="#">85 FR 86968</a> Thursday, December 31, 2020
Antarctic Conservation Act of 1978, 16 U.S.C., 2401 <i>et seq.</i> , as amended	Antarctic Conservation Act, Not knowing violations	1978	2021	\$17,791	<a href="#">85 FR 86968</a> Thursday, December 31, 2020
Program Fraud Civil Remedies Act of 1986, 31 U.S.C., 3801, <i>et seq.</i>	Program Fraud violations	1986	2021	\$11,803	<a href="#">85 FR 86968</a> Thursday, December 31, 2020

## GRANTS PROGRAM REPORTING

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, 2021.

**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	424	239	130
Number of Grants/ Cooperative Agreements With Undisbursed Balances	0	0	0
Total Amount of Undisbursed Balances	\$0	\$0	\$0

Information shown above is as of 9/30/2021.

As indicated in the table above, NSF's 793 financial assistance awards (grants, cooperative agreements, and fellowships) that are expired but not closed have zero-dollar balances in NSF's financial accounting system. The majority of these awards that are still not fully closed have overdue final project reports and/or project outcome reports.

In the FY 2020 AFR appendix '*Grants Program Reporting*', NSF reported 61 awards with undisbursed funds. To address this, NSF reviewed operating policies and implemented accounting practices to close all awards on the same schedule, thereby, reducing this number to zero in the above reporting for FY 2021.

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. NSF has made progress in decreasing the number of overdue final project reports and/or project outcome reports by implementing policies and procedures to track and enforce the submission of required project reports. Further, in FY 2021, NSF convened a working group to review our current process and make recommendations to tighten our controls. Changes are still being reviewed and assessed.

Overdue report information will be provided by NSF 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,<sup>1</sup> among other possible changes.

<sup>1</sup> <https://www.federalregister.gov/documents/2020/08/13/2020-17468/guidance-for-grants-and-agreements>

## UNDISBURSED BALANCES IN EXPIRED GRANT ACCOUNTS

In FY 2021, 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 2021, there were 4,616 expired grants with undisbursed balances of \$99,486,778.

**Table 3.5 – Status of Undisbursed Balances in Expired Grants**

	FY 2021 (as of 9/30/21)	FY 2020 (as of 9/30/20)	FY 2019 (as of 9/30/19)
Number of expired grants	4,616	4,478	5,204
Undisbursed balances prior to closeout	\$99,486,778	\$84,615,563	\$97,666,016

**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 2021.<sup>1</sup>

Affiliated Institution	Awards Obligated in FY 2021 (Dollars in thousands)
Arizona State University	\$74,735
Auburn University	21,487
California Institute of Technology	79,924
Catholic University of America	2,772
Michigan State University	67,294
Southwest Research Institute	418
Stanford University	68,871
University of California, Los Angeles	65,937
University of Colorado	125,345
University of Florida	50,191
University of Massachusetts	51,853
University of Oregon	23,940
University of Tennessee	26,816
University of Texas at El Paso	16,193
University of the District of Columbia	2,357
University of Utah	47,715
University of Vermont	8,164
Washington University	19,837
<b>TOTAL</b>	<b>\$ 753,849</b>

<sup>1</sup> 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, 2021. 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://www.nsf.gov/pubs/2021/nsf21002/pdf/08-chap3-appendices.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, 2021 and 2020. AD IPAs led five of the seven directorates during the fiscal year ended on September 30, 2021 and September 30, 2020. 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 2021 Awards to AD IPAs' Home Institutions**  
(Dollars in Thousands)

Directorate	Total Dollars and Awards Made by Directorate in FY 2021 <sup>1</sup>	Home Institution of IPA Assistant Director	Total Dollars and Awards to Home Institution by Directorate in FY 2021	Total Dollars and Awards to Home Institution by NSF in FY 2021
Computer & Information Science & Engineering	\$1,064,516 (3,188 awards)	Princeton University	\$12,689 (33 awards)	\$70,187 (149 awards)
Engineering	\$1,068,240 (3,670 awards)	University of Michigan	\$4,761 (30 awards)	\$93,971 (285 awards)
		Emory University	\$715 (4 awards)	\$13,681 (38 awards)
Geosciences	\$1,573,387 (2,861 awards)	Pennsylvania State University	\$2,083 (17 awards)	\$28,858 (95 awards)
Social, Behavioral, & Economic Sciences	\$259,359 (1,240 awards)	University of Michigan	\$14,122 (26 awards)	\$93,971 (285 awards)
Education & Human Resources	\$1,115,229 (1,906 awards)	Portland State University	\$1,546 (5 awards)	\$4,268 (20 awards)
<b>Total</b>	<b>\$5,080,731 (12,865 awards)</b>		<b>\$35,916 (115 awards)</b>	<b>\$210,965<sup>2</sup> (587 awards)</b>

<sup>1</sup> 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.

<sup>2</sup> Two IPAs from the University of Michigan served as ADs during FY 2021. Award dollars and count have been reduced by \$93,971 thousand and 285 awards, respectively, in this total box to avoid double counting.

Appendix 8: Awards to Assistant Director IPAs' Home Institutions by NSF Directorates

**Table 3.7 – FY 2020 Awards to AD IPAs' Home Institutions**  
(Dollars in Thousands)

Directorate	Total Dollars and Awards Made by Directorate in FY 2020 <sup>3</sup>	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 <sup>4</sup> (773 awards)

<sup>3</sup> 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.

<sup>4</sup> 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.

## NSF SENIOR MANAGEMENT AND NATIONAL SCIENCE BOARD

### **NSF Senior Management**

*(as of September 30, 2021)*

#### **Office of the Director (O/D)**

Sethuraman Panchanathan, *Director*

Vacant, *Deputy Director*

Karen Marrongelle, *Chief Operating Officer*

Brian Stone, *Chief of Staff*

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Rhonda Davis, *Head*

*Affirmative Action Officer*

##### **Office of the General Counsel**

Peggy Hoyle, *General Counsel*

##### **Office of Integrative Activities**

Alicia Knoedler, *Head*

##### **Office of International Science & Engineering**

Kendra Sharp, *Head*

##### **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**

Sylvia Butterfield, *Assistant Director (Acting)*

#### **Directorate for Engineering**

Susan Margulies, *Assistant Director*

#### **Directorate for Geosciences**

Alexandra R. Isern, *Assistant Director*

#### **Directorate for Mathematical & Physical Sciences**

Sean L. Jones, *Assistant Director*

#### **Directorate for Social, Behavioral, & Economic Sciences**

Arthur W. Lupia, *Assistant Director*

#### **Office of Budget, Finance, & Award Management**

Teresa Grancorvitz, *Head*

*Chief Financial Officer*

*Performance Improvement Officer*

#### **Office of Information & Resource Management**

Wonzie L. Gardner, Jr., *Head*

*Chief Human Capital Officer*

#### **Other Designated Senior Officials**

##### **Chief Information Officer**

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)



**National Science Board  
Members in FY 2021**

*Terms expire May 10, 2022*

**Arthur Bienenstock**

Stanford University

**W. Kent Fuchs**

University of Florida

**W. Carl Lineberger**

University of Colorado

**Victor R. McCrary, NSB Vice Chair**

University of the District of Columbia

**Emilio F. Moran**

Michigan State University

**Ellen Ochoa, NSB Chair**

Lyndon B. Johnson Space Center (retired)

**Julia M. Phillips**

Sandia National Laboratories

**Anneila I. Sargent**

California Institute of Technology

*Terms expire May 10, 2024*

**Maureen L. Condit**

University of Utah

**Suresh V. Garimella**

University of Vermont

**Stephen Leath**

Iowa State University and Auburn University  
(retired)

**Dan Reed**

University of Utah

**Geraldine L. Richmond**

University of Oregon

**Alan Stern**

Southwest Research Institute

**Stephen H. Willard**

Cellphire, Inc.

**Maria T. Zuber<sup>1</sup>**

Massachusetts Institute of Technology

*Terms expire May 10, 2026*

**Sudarsanam Suresh Babu**

Oak Ridge National Laboratory/University of  
Tennessee, Knoxville

**Roger N. Beachy**

Washington University, St. Louis

**Aaron Dominguez**

Catholic University of America, Washington, D.C.

**Dario Gil**

IBM

**Melvyn E. Huff**

University of Massachusetts, Dartmouth

**Matthew Malkan**

University of California, Los Angeles

**Scott Stanley**

Techno Planet

**Heather A. Wilson**

University of Texas, El Paso

**Vicki L. Chandler<sup>2</sup>**

Minerva Schools at KGI

**Robert Groves<sup>2</sup>**

Georgetown University

**Member ex officio**

**Sethuraman Panchanathan, NSB Director**

**National Science Board Office**

**John J. Veysey, II, Executive Officer**

**Office of Inspector General**

**Allison C. Lerner, Inspector General**

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<sup>1</sup> Resigned February 2021

<sup>2</sup> NSB Member whose term expired, but temporarily served as a consultant to the Board until November 2020.

## 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 1,366 NSF invention disclosures reported to NSF either directly or through the National Institutes of Health's iEdison database during FY 2021. 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	FISMA	Federal Information Security Modernization Act
AFR	Agency Financial Report	FMFIA	Federal Managers' Financial Integrity Act of 1982
AI	Artificial Intelligence	FPPS	Federal Personnel/Payroll System
AICA	American Innovation and Competitiveness Act of 2017	FTE	Full-time Equivalents
AIMS	Antarctic Infrastructure Modernization for Science	FY	Fiscal Year
AOAM	Agency Operations and Award Management	GAAP	Generally Accepted Accounting Principles
APG	Agency Priority Goal	GAO	Government Accountability Office
APR	Annual Performance Report	GEO	Directorate for Geosciences
ARP Act	American Rescue Plan Act	GPRA	Government Performance and Results Modernization Act of 2010
ASC	Antarctic Support Contractor	GRFP	Graduate Research Fellowship Program
BFA	Office of Budget, Finance and Award Management	GSA	General Services Administration
CAP	Cross-Agency Priority or Corrective Action Plan	H-1B	H-1B Nonimmigrant Petitioner Account
CARES Act	Coronavirus Aid, Relief, and Economic Security Act	HBCU	Historically Black Colleges and Universities
CFO	Chief Financial Officers	IBC	Interior Business Center
COVID	Coronavirus	IG	Inspector General
DATA Act	Digital Accountability and Transparency Act of 2014	INCLUDES	Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
EHR	Directorate for Education and Human Resources	IPA	Intergovernmental Personnel Act
ERM	Enterprise Risk Management	IR/D	Independent Research/Development
FBWT	Fund Balance with Treasury	IT	Information Technology
FECA	Federal Employees' Compensation Act	iTRAK	NSF's financial management system
FFMIA	Federal Financial Management Improvement Act of 1996	K-12	Kindergarten to Grade 12
FFRDC	Federally Funded Research and Development Center	LFO	Large Facilities Office
		MFG	Major Facilities Guide

MREFC	Major Research Equipment and Facilities Construction
NCSES	National Center for Science and Engineering Statistics
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