Chapter 3
Appendices (Other Information)

SUMMARY OF FY 2023 FINANCIAL STATEMENT AUDIT AND MANAGEMENT ASSURANCES

The following tables summarize NSF's FY 2023 Financial Statement Audit and Management Assurances.

Table 3.1 – Summary of Financial Statement Audit

Effectiveness of Internal Control over Financial Reporting (FMFIA § 2)	
Audit Opinion	*Unmodified*
Restatement	*No*

Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Ending Balance
Total Material Weaknesses	*0*	-	-	-	*0*

Table 3.2 – Summary of Management Assurances

Effectiveness of Internal Control over Financial Reporting (FMFIA § 2)						
Statement of Assurance	*Unmodified*					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Total Material Weaknesses	*0*	-	-	-	-	*0*

Effectiveness of Internal Control over Operations (FMFIA § 2)						
Statement of Assurance	*Unmodified*					
Material Weaknesses	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Total Material Weaknesses	*0*	-	-	-	-	*0*

Conformance with Federal Financial Management System Requirements (FMFIA § 4)						
Statement of Assurance	*Systems conform to financial management system requirements*					
Non-Conformances	Beginning Balance	New	Resolved	Consolidated	Reassessed	Ending Balance
Total non-conformances	*0*	-	-	-	-	*0*

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

Management Challenges for the National Science Foundation in Fiscal Year 2024

NATIONAL SCIENCE FOUNDATION
Office of Inspector General

October 13, 2023

NATIONAL SCIENCE FOUNDATION
Office of Inspector General

MEMORANDUM

DATE: October 13, 2023

TO: Dr. Dan Reed
Chair
National Science Board

Dr. Sethuraman Panchanathan
Director
National Science Foundation

FROM: Allison C. Lerner
Inspector General

SUBJECT: Management Challenges for the National Science Foundation in Fiscal Year 2024

Attached for your information is our report, *Management Challenges for the National Science Foundation in Fiscal Year 2024*. The *Reports Consolidation Act of 2000* (Pub. L. No. 106-531) requires us to annually update our assessment of the "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.

We appreciate the courtesies and assistance NSF staff provided during the completion of this report.

If you have questions, please contact me at 703-292-7100.

Attachment

2415 Eisenhower Avenue, Alexandria, Virginia 22314 | 703-292-7100 | oigpublicaffairs@nsf.gov | oig.nsf.gov

At a Glance

Management Challenges for the National Science Foundation in Fiscal Year 2024

October 13, 2023

WHY WE ISSUED THIS REPORT

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

WHAT WE FOUND

Each year, we identify NSF's most serious challenges based on our audit and investigative work, knowledge of NSF's operations, independent sources such as U.S. Government Accountability Office reports and NSF's advisory committees, and discussions with NSF senior staff and contractors. This year, we identified eight areas representing the most serious management and performance challenges facing NSF:

- Challenge 1: Overseeing and Managing Risks of Sexual Assault/Harassment in Antarctica
- Challenge 2: Addressing Sexual Harassment in the Scientific Enterprise
- Challenge 3: Increasing Diversity in Science & Engineering Education and Employment
- Challenge 4: Overseeing the United States Antarctic Program (USAP)
- Challenge 5: Overseeing NSF's Funding Portfolio in a Changing Environment
- Challenge 6: Managing Human Capital
- Challenge 7: Mitigating Threats to Research Security
- Challenge 8: Mitigating Threats Posed by the Risk of Cyberattacks

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 2023*

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 2023* in its Agency Financial Report.

Table of Contents

Introduction

The National Science Foundation is an independent federal agency that supports fundamental research and education in all the non-medical fields of science and engineering. With a budget of approximately $8.8 billion (FY 2022), NSF funds about 25 percent of all federally supported basic research at the Nation's colleges and universities, and supports about 200,000 scientists, engineers, educators, and students each year. NSF's goals include advancing the frontiers of knowledge, cultivating a broadly inclusive science and engineering workforce, expanding the scientific literacy of all citizens, building the nation's research capability through investments in advanced instrumentation and facilities, and supporting excellence in science and engineering research and education.

The *Reports Consolidation Act of 2000* (Pub. L. No. 106-531) requires us annually to update our assessment of NSF's "most serious management and performance challenges … and the agency's progress in addressing those challenges." Each year, we identify these challenges based on our audit and investigative work, knowledge of the Foundation's operations, independent sources such as U.S. Government Accountability Office reports and NSF's advisory committees, and discussions with NSF senior staff and contractors. We identify management challenges as those that meet at least one of the following criteria:

- The issue involves an operation that is critical to an NSF core mission.[1]
- The issue presents a risk of fraud, waste, or abuse to NSF or other government assets.
- The issue involves strategic alliances with other agencies, the Office of Management and Budget, the Administration, Congress, or the public.
- The issue is related to key initiatives of the President.

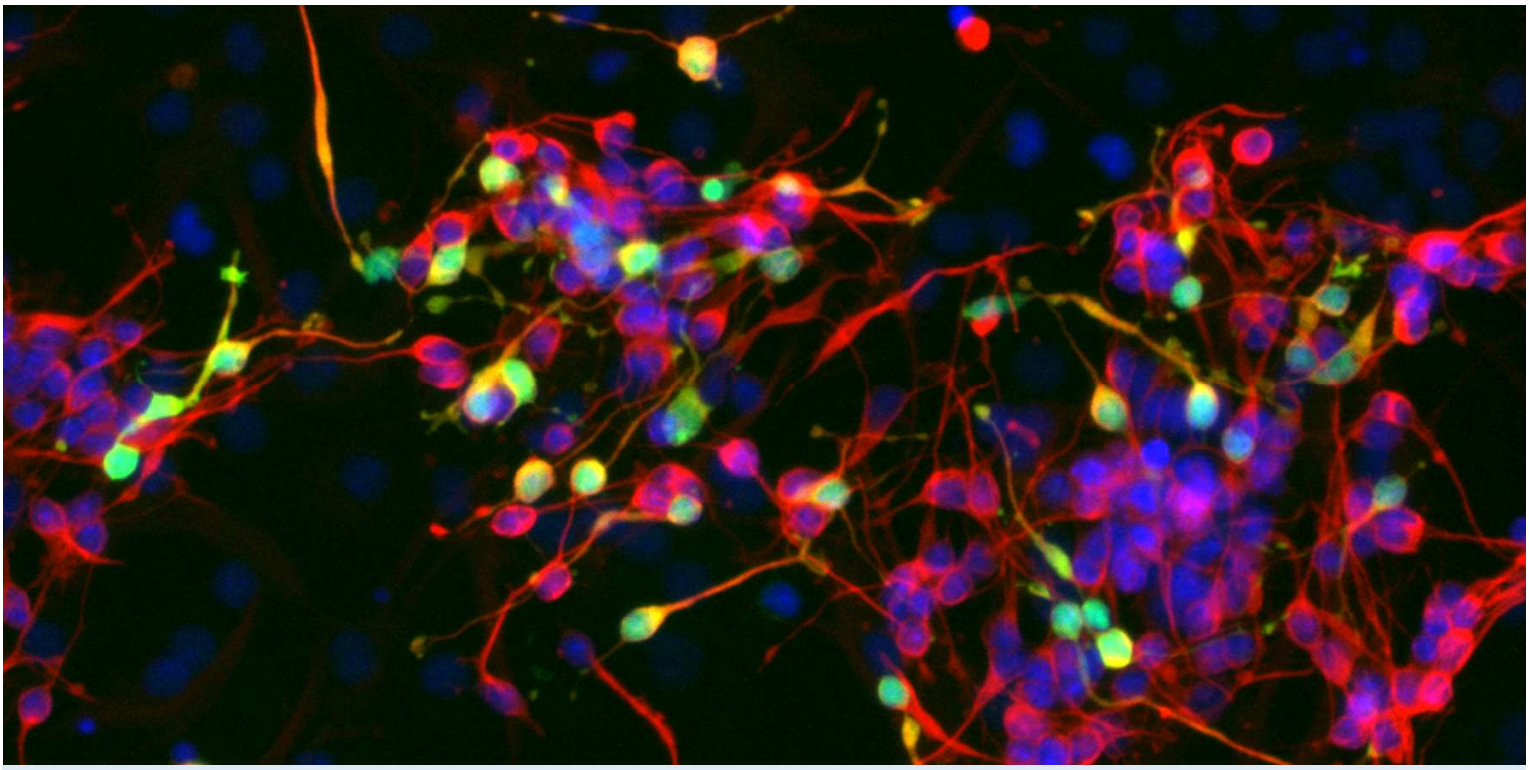
It is important to note that identifying an issue as a "management challenge" does not necessarily mean NSF is having difficulty addressing it; instead, it means we identify the issue as one of the top challenges facing NSF and report on NSF's progress in addressing it, as required by the Act.

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

- Overseeing and Managing Risks of Sexual Assault/Harassment in Antarctica
- Addressing Sexual Harassment in the Scientific Enterprise
- Increasing Diversity in Science & Engineering Education and Employment
- Overseeing the United States Antarctic Program (USAP)
- Overseeing NSF's Funding Portfolio in a Changing Environment
- Managing Human Capital
- Mitigating Threats to Research Security
- Mitigating Threats Posed by the Risk of Cyberattacks

This year, we are introducing two new challenge areas. We removed our prior challenge focused on managing the Intergovernmental Personnel Act Program; we instead discuss challenges NSF may face

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



Discovery of noncoding ribonucleic acid (RNA) molecule made in a lab, including, among others, an NSF Graduate Research Fellowship recipient. *Credit: Rebecca Andersen, Developmental and Stem Cell Biology Graduate Program, University of California, San Francisco*

with the program in a new challenge, "Managing Human Capital." We added a new challenge area, "Overseeing and Managing Risks of Sexual Assault/Harassment in Antarctica," to address issues previously described within other challenge areas and give NSF leadership a fuller picture of the challenges in this area.

In addition, we renamed two prior challenge areas to better reflect the challenges they describe: "Overseeing NSF's Funding Portfolio in a Changing Environment" expands upon the prior challenge "Overseeing Grants in a Changing Environment," and "Addressing Sexual Harassment in the Scientific Enterprise" expands upon the prior challenge "Addressing Sexual Harassment in the Academic Community."

Finally, we have removed the prior-year challenge of "Overseeing NSF-Funded Research Infrastructure." NSF is developing its capacity to oversee mid-scale research infrastructure projects, drawing upon its experience in the management of major multi-user research facility projects to develop appropriate approaches. However, major facilities and mid-scale projects are inherently risky because the infrastructure is one-of-a-kind and technically complex, and construction and operating costs are high. Accordingly, this area might again prove to be a management challenge for the agency in the future.

NSF has continued to demonstrate its ability to achieve its mission in an ever-changing environment. As the agency moves into FY 2024 and beyond, it is well positioned to address both familiar and new challenges it may face with acuity, agility, and adaptability.

Challenge 1: Overseeing and Managing Risks of Sexual Assault/Harassment in Antarctica

In August 2022, NSF publicly released the Sexual Assault/ Harassment Prevention and Response Final Report (SAHPR report), which it commissioned to examine sexual harassment and sexual assault in the United States Antarctic Program (USAP) community and identify corrective actions.[2] The review determined that "sexual harassment, stalking, and sexual assault are ongoing, continuing problems in the USAP community." The report highlights a concern that providing effective oversight of awardee compliance may be particularly difficult for NSF in Antarctica and its associated research vessels and field sites due to lack of trust and reporting mechanisms.

Following the release of the SAHPR report, we initiated our ongoing inspection of USAP's sexual harassment and assault prevention and response. Separately, in March 2023, our office provided NSF with a white paper detailing considerations for an effective reporting and response capability when presented with allegations of sexual assault and stalking.[3] Sexual assault cases present law enforcement challenges even under ordinary circumstances; those challenges are compounded by Antarctica's distant and sometimes inaccessible location.

KEY FACTS

- This issue involves an operation that is critical to an NSF core mission.
- NSF commissioned a report highlighting concerns about providing effective oversight of awardee compliance in the USAP due to lack of trust and reporting mechanisms.
- NSF has taken additional action, such as stationing an on-ice victim advocate, establishing a 24/7 NSF Antarctic Helpline, and making changes to the Antarctic Support Contract to require additional reporting.
- NSF has multiple actions planned for the 2023-2024 austral summer season.
- NSF is coordinating with our office, which will investigate criminal violations covered under the Special Maritime and Territorial Jurisdiction of the United States.

NSF has acted to address issues described in the SAHPR report and concerns we identified during our ongoing inspection, including during our joint audit/investigative site visit to McMurdo Station in February 2023. In the 2022-2023 austral summer season, NSF stationed an on-ice victim advocate to support sexual assault victims. In April 2023, NSF established a 24/7 helpline to provide support to members of the USAP community who experience sexual assault or sexual harassment. NSF established a Sexual Assault and Harassment Prevention and Response (SAHPR) Office to provide these resources and others, remove barriers, and provide an independent line of reporting for victims in the USAP. NSF made changes to the Antarctic Support Contract to require additional reporting on SAHPR complaints as well as imposing new requirements on prospective employees. NSF has also planned multiple actions for the 2023-2024 season.

Work remains, however, to ensure USAP participants have access to necessary reporting channels. NSF is coordinating with our Office of Investigations, which will investigate alleged criminal violations covered under the Special Maritime and Territorial Jurisdiction of the United States, including aggravated sexual abuse, sexual abuse, abusive sexual contact, and stalking. OIG special agents began responding, remotely, to concerns raised by individuals in Antarctica in July 2023, and our office is working toward having an on-site presence during future austral summer seasons.

[2] Department of the Interior's Federal Consulting Group, NSF/OPP/USAP Sexual Assault/Harassment Prevention and Response (SAHPR) Final Report, June 22, 2022

[3] NSF OIG, Law Enforcement Perspectives on Sexual Assault and Stalking Issues Pertaining to the United States Antarctic Program, March 7, 2023

Key Completed Actions

- Issued NSF Director Statement on USAP SAHPR Report and Follow-on Actions.
- Initiated NSF Action Plan in response to SAHPR report.
- Issued NSF OD-22-18, *Establishment of a Director's Task Force for Implementation of Measures to Combat Sexual Assault and Harassment in the United States Antarctic Program (USAP)* to implement the Action Plan.
- Hosted a series of listening sessions at McMurdo and virtually for current and former USAP participants to get community feedback on sexual assault/harassment prevention and reporting.
- Established SAHPR Office to provide access to resources and guidance to help prevent and address sexual assault and harassment.
- Stationed an on-ice victim advocate to support sexual assault victims in the 2022-2023 austral summer season.
- Established an NSF Antarctic Helpline to provide support to members of the USAP community who experience sexual assault or sexual harassment.
- Collaborated with NSF OIG on outreach materials for upcoming site visits to McMurdo Station.
- Met with U.S. Equal Employment Opportunity Commission and Office of Federal Contract Compliance Programs.
- Made changes to the Antarctic Support Contract to require more frequent and additional reporting on complaints, and to improve vetting procedures for potential employees.
- Formed joint NSF/NSF OIG working group to coordinate on law enforcement response.

Key Planned and Ongoing Actions

- Planning USAP Climate Survey to establish baseline data on sexual assault/sexual harassment incidence rate and culture/environment measures.
- Enacting USAP Accountability Framework, including meetings/coordination with federal and academic partners as well as contractors.
- Enhancing training including new training resources for supervisors and staff, prevention toolkit, safety planning resources, and training on how to receive and respond to a disclosure.
- Conducting on-ice, in-person outreach and education.
- Coordinating with NSF OIG on law enforcement response.

Challenge 2: Addressing Sexual Harassment in the Scientific Enterprise

A 2018 National Academies of Sciences, Engineering, and Medicine report identified that "… more rapid and sustained progress in closing the gender gap in science, engineering, and medicine is jeopardized by the persistence of sexual harassment and its adverse impact on women's careers in our nation's colleges and universities."[4] The report identified that more than 50 percent of women faculty and staff and 20–50 percent of women students encounter or experience sexual harassment in academia.[5] The *CHIPS and Science Act of 2022*, which includes findings from the 2018 National Academies report, requires NSF to examine "factors contributing to, and consequences of, sex-based and sexual harassment affecting individuals in the STEM workforce" and "approaches to reduce the incidence and negative consequences of such harassment."[6]

NSF has acted to combat harassment anywhere NSF-funded science or education is conducted, including in remote sites such as Antarctica, as previously described. NSF issued statements to the academic community that harassment will not be tolerated. It also implemented an award term and condition, effective in October 2018, requiring awardee organizations to notify NSF of findings or determinations of sexual harassment, other forms of harassment, or sexual assault by an NSF-funded Principal Investigator (PI) or any co-PI.[7]

According to its *Proposal & Awards Policies & Procedures Guide*, NSF expects all research organizations to establish and maintain clear and unambiguous standards of behavior to ensure harassment-free workplaces wherever science is conducted. Effective January 2023, for each proposal that includes research off-campus or off site, the proposing organization must complete a certification that the organization has a plan in place that describes how harassment and other abusive or unwelcome behavior at that site will be addressed. As previously

KEY FACTS

- This issue involves an operation that is critical to an NSF core mission.
- Recent reports and legislation indicate harassment is pervasive in institutions of higher education and jeopardizes more rapid and sustained progress in closing the gender gap in STEM.
- NSF has taken action, such as implementing an award term and condition about reporting harassment or sexual assault and setting expectations that research organizations establish and maintain clear and unambiguous standards of behavior.
- Harassment and sexual assault are still prevalent challenges facing the research community, and additional steps remain.
- An independent accounting firm, under a contract with our office, is evaluating whether recipient institutions' policies about harassment comply with relevant NSF policies.

[4] National Academies of Sciences, Engineering, and Medicine, Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine. Benya FF, Widnall SE, Johnson PA, editors. Washington, DC: National Academies Press (US), June 2018.
[5] Ibid.
[6] Pub. L. No. 117-167
[7] Specifically, the term and condition requires notification of (1) any findings/determinations regarding the PI or any co-PI that demonstrates a violation of organizational policies or codes of conduct, statutes, regulations, or executive orders relating to sexual harassment, other forms of harassment, or sexual assault, and/or (2) if the PI or any co-PI is placed on administrative leave or if any administrative action has been imposed on the PI or any co-PI by the organization relating to any finding/determination of an investigation of an alleged violation of grantee policies or codes of conduct, statutes, regulations, or executive orders relating to sexual harassment, other forms of harassment, or sexual assault.

discussed, NSF also established a SAHPR Office to provide access to resources and guidance to help prevent and address sexual assault and harassment.

However, harassment and sexual assault are still prevalent challenges facing the research community, and additional steps remain. In a 2023 report about NSF's vetting of individuals hired under the *Intergovernmental Personnel Act* (IPAs), we shared that only 6 of the 21 NSF-funded organizations we surveyed had policies or procedures for notifying NSF of employment status changes, such as administrative leave due to sexual harassment, as NSF requires.[8] We also reported NSF did not have a separate step in the IPA vetting process to address harassment-related issues. As a result of our audit, in October 2023, NSF will begin requiring IPAs' home organizations to notify NSF of any harassment-related findings or determinations. In September 2023, an independent public accounting firm, under a contract with us, began an engagement to evaluate whether recipient organizations' policies about harassment and/or sexual assault comply with relevant NSF terms, conditions, and policies.

As the primary source of federal academic support in many science and engineering fields, it is imperative that NSF continue working to address harassment and undertake prevention and response efforts. In addition, as outlined in its Equity Action Plan, NSF's commitment to creating a safe and inclusive environment will help advance its strategic goal of increasing participation in the STEM enterprise.[9]

Key Completed Actions

- Implemented a term and condition requiring the awardee organization to notify NSF of findings or determinations of sexual harassment, other harassment, or sexual assault.
- Established a SAHPR Office to coordinate communication, ensure matters are appropriately referred, and provide access to resources and guidance to help prevent and address sexual assault and harassment.
- Established saferscience@nsf.gov as the single point of communication on reports, complaints, or questions for the community.
- Updated the *Proposal & Awards Policies & Procedures Guide* (NSF 23-1) to require the proposing organization complete a certification that the organization has a plan for creating and maintaining safe and inclusive working environments for off-campus and off-site research for that project.
- Issued *Office of Equity and Civil Rights Bulletin No. 23-02: Sexual Harassment Reporting* to reiterate the responsibility of all NSF employees to swiftly report sexual harassment.
- Added a certification requirement that proposals that include off-campus or off-site research must also have a plan in place to address harassment and abusive behavior.
- Developed resources focused on preventing harassment, establishing effective means for reporting, and promising practices for the recipient community.
- Issued a Request for Information (RFI) to identify contract vendors for SAHPR prevention/reporting/consulting/education; conducting market research meetings with contract vendors in field of sexual misconduct prevention and response.
- Issued a "Dear Colleague Letter" (an announcement to the research community) that explicitly encourages proposals that address harassment.

[8] NSF OIG Report No. 23-2-003, Audit of NSF's Vetting Process for Individuals Assigned Under the Intergovernmental Personnel Act, January 9, 2023

[9] Ibid, and U.S. National Science Foundation, 2022-2026 Strategic Plan, Agency Equity Action Plan

Key Planned and Ongoing Actions

- Evaluating existing support services for the USAP, such as the Helpline and victim advocate, for broader use.
- Implementing a requirement for IPAs' home institutions to notify NSF of any harassment-related findings or determinations.
- Collaborating with awardees, federal agencies, and international organizations that support the research enterprise.
- Engaging with students, staff, and faculty at academic institutions on current gaps and promising practices in field research.

Challenge 3: Increasing Diversity in Science & Engineering Education and Employment

NSF, the National Science Board (NSB), the President, and Congress have prioritized increasing diversity in science, technology, engineering, and mathematics (STEM) education and employment.[10] NSF's January 2023 report, *Women, Minorities, and Persons with Disabilities 2023,* indicates that these groups remain underrepresented in STEM.[11]

The NSB issued a statement[12] on racism in science and engineering and approved an NSB-NSF commission on merit review to determine, among other things, if the existing criteria fully empowered diverse talent participation in STEM. A report from the commission is due in 2024. In June 2023, it issued a digest with trends in proposals, awards, and funding rates by self-reported information on gender, ethnicity, race, and disability.[13] Such statistics help track outcomes.

NSF posts its Broadening Participating Portfolio on its website to inform stakeholders of applicable research opportunities. It appointed a Chief Diversity and Inclusion Officer in January 2023. NSF also tracks progress in achieving its Agency Priority Goal to improve representation in the scientific enterprise.[14] In 2024, NSF is to provide to the NSB the results of two pilots to foster diversity.

KEY FACTS

- This challenge involves an operation that is critical to an NSF core mission.
- Increasing diversity in STEM is a top priority of NSF, the NSB, the President, and Congress.
- Greater participation in STEM by underrepresented groups is key to U.S. economic competitiveness worldwide and to national security.
- Women, minorities, and persons with disabilities remain underrepresented in STEM.
- The CHIPS and Science Act requires NSF to address underrepresentation in STEM.
- NSF has created an Equity Ecosystem framework to broaden participation in STEM, ensure equity in NSF program delivery, and promote diversity, equity, inclusion, and access in the NSF workforce.

In February 2023, the White House issued Executive Order (EO) 14091, which requires agencies to create an Agency Equity Team, submit an Equity Action Plan to the Office of Management and Budget, and update the plan annually.[15] NSF had already created its agency equity team and developed an Agency Equity Action Plan in response to 2021's EO 13985.[16] The Plan has five focus areas and includes methods to track progress, long-term success characteristics, and accountability procedures.

The CHIPS and Science Act also requires outreach to underserved populations and broadened participation in major research awards. The Act established targets for NSF funding to institutions in its

[10] *See* National Science Foundation, 2022-2026 Strategic Plan and NSF Diversity, Equity, Inclusion and Accessibility (DEIA) Strategic Plan 2022-2024; National Science Board, Vision 2030, May 2020; Biden-Harris, Management Agenda Vision; Relevant Executive Orders: 13985, 13988, 14020, 14035, 14091; Pub. L. No. 117-167

[11] National Center for Science and Engineering Statistics (NCSES), 2023. Diversity and STEM: Women, Minorities, and Persons with Disabilities 2023. Special Report NSF 23-315. Alexandria, VA: National Science Foundation.

[12] NSB 20-22

[13] NSB 2023-14

[14] *See* quarterly progress reports.

[15] Executive Order 14091, *Further Advancing Racial Equity and Support for Underserved Communities through the Federal Government*

[16] National Science Foundation, Agency Equity Action Plan

Established Program to Stimulate Competitive Research (EPSCoR) jurisdictions of 15.5 percent in FY 2023 increasing to 20 percent in FY 2029.

NSF has continued to prioritize its commitment to stakeholder engagement in its efforts to promote opportunities everywhere, by identifying and addressing individual, institutional, and geographic barriers to innovation, partnerships, and opportunities in STEM. NSF held listening sessions and roundtables with Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), and Tribal Colleges and Universities (TCUs). Such outreach has helped NSF engage the scientific community on equity issues at all academic levels, including students, senior scientists and engineers, educators, and administrators — all critical steps in its efforts to increase participation in the STEM enterprise.

Key Completed Actions

- Appointed a Chief Diversity and Inclusion Officer.
- Held listening sessions and roundtables with HBCUs, HSIs, and TCUs.
- Held listening sessions with Tribal Leaders.
- Included Indigenous community acknowledgments as part of its programmatic agreements for some facilities.
- Issued NSF Diversity, Equity, Inclusion and Accessibility (DEIA) Strategic Plan 2022-2024.
- Issued a Study of Anti-Harassment Policies, Guidelines, and Communications.
- Issued an EPSCoR Study.
- Initiated the Growing Research Areas for Nationally Transformative Equity and Diversity (GRANTED) program to support STEM at emerging and underserved research entities.
- Piloted Analytics for Equity Initiative.
- Submitted an Agency Equity Action Plan to the Domestic Policy Council and the Office of Management and Budget.

Key Planned and Ongoing Actions

- Implementing NSF's DEIA Strategic Plan.
- Implementing the Agency Equity Action Plan.
- Addressing recommendations in the staff-led Racial Equity Task Force Report.
- Addressing recommendations in EPSCoR reports.
- Tracking quarterly progress in achieving the Agency Priority Goal to improve representation in the scientific enterprise.
- Continuing to host listening sessions and roundtables, including on campuses of Minority Serving Institutions.
- Continuing to fund programs to increase diversity, such as the Louis Stokes Alliances for Minority Participation, Hispanic-Serving Institutions Program, Historically Black Colleges and Universities Excellence in Research, Tribal Colleges and Universities Program, and Organizational Change for Gender Equality in STEM Academic Professions (ADVANCE).
- Implementing CHIPS and Science Act requirements.
- Evaluating Merit Review as a factor in increasing diversity.

Challenge 4: Overseeing the United States Antarctic Program (USAP)

NSF, through the USAP, manages U.S. scientific research in Antarctica. 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 science operations.[17]

KEY FACTS

- This challenge involves an operation that is critical to an NSF core mission.
- Antarctica's environment presents unique operating and contract monitoring challenges.
- The ASC is NSF's largest and most visible contract, valued at $2.3 billion over 13 years. It expires in March 2025.
- NSF is undertaking a long-range infrastructure modernization project.
- Construction was delayed and science deferred due to the onset of the pandemic and other factors. NSF will prioritize already-funded science projects as much as possible to address the backlog.
- Ensuring seasonal employees are appropriately vetted prior to deployment remains a challenge.

Closeout and Recompetition of the Antarctic Support Contract

Leidos Innovations Corporation 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 conducting a long-range infrastructure investment program across the program, including the three U.S. Antarctic stations (McMurdo, Palmer, and South Pole). The Office of Polar Programs (OPP) monitors performance of the ASC, with several other NSF offices collaborating to manage the USAP more broadly. Managing the ASC is complex and requires a strong cost monitoring program, oversight of deliverables and deadline requirements, and appropriate consideration of risks.

The contract with Leidos Innovations Corporation as the prime contractor for logistical support expires in March 2025. Staffing changes, hiring challenges, and design errors related to the Antarctic Infrastructure Modernization for Science (AIMS) project have affected the timeline and will push some components of the project beyond March 2025. NSF has also discovered issues with Leidos' Earned Value Management System (EVMS),[18] and cannot accept its EVMS data for the AIMS project until Leidos makes necessary adjustments. These issues will need to be resolved prior to the contract closeout process. It is also imperative that NSF obtain timely audits of the ASC costs claimed to NSF by Leidos to ensure the costs claimed are allowable, allocable, and reasonable. These audits are an important part of the contract closeout process. When the contract is recompeted, NSF will need to ensure prospective audit contractors are qualified and their proposed costs are reasonable. Having sufficient, knowledgeable procurement staff to manage a procurement of this magnitude will also help NSF undertake this large procurement effort.

Construction Delays and Deferred Science

NSF paused on-site construction work for the AIMS project at McMurdo in March 2020 due to the COVID-19 pandemic, and construction personnel were not deployed to McMurdo for the 2020–2021 and 2021–

[17] Please see Management Challenge 1: Overseeing and Managing Risks of Sexual Assault/Harassment in Antarctica for more details on managing this challenge facing the USAP community.

[18] EVMS is a project management tool to measure the value of work accomplished in a given period and compare it with the planned value of work scheduled for that period and the actual cost of work accomplished. Its purpose is to integrate a project's cost, schedule, and technical efforts for management purposes and provide reliable data to decision makers.

An aurora australis over the IceCube Neutrino Observatory at the South Pole. IceCube is supported by NSF.
Credit: Yuya Makino, IceCube/NSF

2022 seasons. Construction of the Lodging Building, Vehicle Equipment and Operations Center (VEOC), and the Information Technology and Communications (IT&C) primary addition resumed in McMurdo this past 2022-2023 season. On-ice construction will continue in the 2023-2024 season with a focus on meeting near-term needs and improving critical infrastructure at McMurdo. Unfunded parts of AIMS will be considered for incorporation into the longer-term Antarctic Infrastructure Recapitalization (AIR) program portfolio of USAP infrastructure projects.

For the 2022-2023 season, delays in early-season cargo and passenger movements as well as COVID management protocols affected OPP's ability to support as much of the already-deferred projects as anticipated. For the next three field seasons (August 2023 through March 2026), NSF will prioritize already-funded science projects to the greatest extent possible to address the backlog of funded projects.

Information Security and Vetting of Contractors

NSF also continues to address recent USAP information security audit findings. These findings,[19] first identified in FY 2019, demonstrate the extended time needed to fully enact security measures for the USAP network[20] consistent with those of NSF. OPP is working to address audit recommendations related to incident logging and monitoring, as well as implementation of Personal Identity Verification (PIV) and multifactor authentication (MFA) for USAP contractors. However, due to the challenges of operating in

[19] NSF OIG Report No. 21-2-002, *Audit of NSF's Information Security Program for FY 2020*, November 20, 2020
[20] The USAP network is a government-owned, contractor-operated network that is independent and separate from the NSF headquarters network, merit review systems, and data.

this remote environment and the time necessary to implement improvements resulting from changes to USAP contracts, the USAP remains at an increased risk of negative impacts to USAP personnel, systems, and data.

In 2022, we reported that NSF did not ensure all ASC contractors were onboarded and vetted in accordance with NSF requirements; instead, NSF relied on the contractor's internal vetting processes, which are less rigorous than the minimum level of investigation.[21] Since this report, OPP has modified its process to follow federal requirements for vetting and credentialing contractors that require elevated access to USAP systems and data. NSF also issued ASC contract modifications to require the contractor's compliance with NSF vetting process. Though OPP is submitting seasonal contractors to NSF for vetting, ensuring seasonal employees are appropriately vetted prior to deployment remains a challenge.

Occupational Health and Safety

As we previously reported, Antarctica's extreme environment and relative isolation challenge human health and wellness.[22] In August 2023, we began an inspection of NSF's oversight of USAP occupational health and safety. As part of our inspection, we will assess Leidos' performance for ensuring the overall occupational health and safety for the USAP, and review policies and procedures related to food safety, fire safety, and waste management.

Key Completed Actions

- Determined the award type (contract) for the ASC replacement award.
- Corrected the VEOC design.
- Added additional resources to support the increased vetting workload.
- Implemented a Security Information and Event Monitoring capability for USAP.
- Implemented PIV credentials and enforcement for ASC contractors in the USAP Denver-based office.
- Established a more robust Acceptance of Risk program for the USAP.

Key Planned and Ongoing Actions

- Hiring a Program Manager to coordinate efforts related to entering into an agreement for Antarctic Science and Engineering Support as a follow-on arrangement to the ASC.
- Obtaining incurred cost audits of the Leidos ASC contract.
- Assessing the impacts of the VEOC construction delay.
- Monitoring AIMS via the NSF Office of the Director's Watch List.
- Prioritizing already-funded science projects to address the backlog of funded projects.
- Continuing prioritization of PIV card issuance and alternative MFA solution when PIV credentials cannot be issued.
- Ongoing monthly cybersecurity risk discussion with USAP leadership.
- Continuing efforts to meet NSF vetting requirements for contractors.

[21] NSF OIG Report No. 22-6-004, NSF Vetting of United States Antarctic Program Contractors, March 18, 2022
[22] NSF OIG Report No. 15-2-009, Audit of Health and Safety in the U.S. Antarctic Program, July 2, 2015

Challenge 5: Overseeing NSF's Funding Portfolio in a Changing Environment

The CHIPS and Science Act, enacted August 9, 2022, formally established the Technology, Innovation, and Partnerships (TIP) directorate — NSF's first new directorate in more than 3 decades — and created several new requirements for NSF related to research security, broadening participation in the research enterprise, and strengthening STEM education. It also provided NSF with the authority to use new types of award instruments.

NSF is managing these new requirements while facing an uncertain fiscal environment. The CHIPS and Science Act authorized NSF's budget to more than double within 5 years, to nearly $19 billion. The actual funding environment has been more constrained, with NSF receiving an overall budget of $9.9 billion in FY 2023 (20 percent less than what was authorized) and NSF requesting an overall budget of $11.4 billion in FY 2024 (37 percent less than what was authorized). As total appropriated funding may continue to fall short of authorized amounts, NSF will have to continue to overcome uncertainty and fiscal challenges to accomplish the various requirements of the CHIPS and Science Act.

In addition, TIP represents a transformational change to NSF's traditional mission by expanding its emphasis on applied and use-inspired research and establishing partnerships across a broad array of stakeholders, such as through its Regional Innovation Engines program (NSF Engines), which aims to grow and sustain regional innovation. Each NSF Engine can receive up to $160 million over a 10-year period to support the development of diverse regional coalitions of researchers, institutions, companies, and civil society to conduct research and development with economic and societal impacts. New award instruments, an expanded mission, and an increase — even if less than anticipated — in funding will bring inherent challenges in ensuring proper stewardship and accountability of award funds.

KEY FACTS

- This challenge involves an operation that is critical to an NSF core mission. It also presents a risk of fraud, waste, or abuse of NSF or other government assets.
- The CHIPS and Science Act formally established the TIP Directorate, created new requirements related increasing diversity in STEM, and authorized NSF to use new funding instruments.
- The Act authorized NSF's budget to more than double within 5 years, to nearly $19 billion, but to date the actual funding environment has been more constrained.
- TIP expands NSF's emphasis on applied and use-inspired research.
- NSF's Enterprise Risk Management gives NSF a way to monitor expanded risks associated with these changes.

NSF has long been successful in achieving its mission by funding promising scientific research through grants and cooperative agreements. However, with the newly granted authority to use other transaction agreements, NSF is reevaluating its processes for ensuring the consistent and proper selection of award instruments. Available award instruments include — as appropriate and consistent with law — not only grants, cooperative agreements, and other transaction agreements, but also contracts and other arrangements. The risks and challenges associated with expanding the use of alternative funding vehicles are further heightened by an increase in the expected number of award recipients without prior NSF funding history.

NSF has taken action to prepare for these challenges and position itself to manage the associated risks in an effective manner. For example, NSF's Enterprise Risk Management program provides NSF with a

Collection of a coral sample as part of a first-time study on the genetics of corals from the Northern Mariana Islands, supported in part by an NSF EPSCoR award.
Credit: Photo courtesy University of Guam

mechanism to monitor risks related to the increasing number of award recipients without prior NSF funding history and NSF's increased use of partnerships. Additionally, NSF has developed coalitions and partnerships both internally and externally to help ensure efficient and effective use of new award instruments. Managing these broad and wide-ranging risks will be critical for NSF to execute its mission effectively and continue to ensure proper stewardship and accountability of award funds.

Key Completed Actions

- NSF established the Strategy, Engagement, and Consultation Group to help meet increased funding targets for EPSCoR jurisdictions.
- NSF conducted pre-award accounting and financial capability reviews of potential Type-1 NSF Engines Development Awards recipients.
- NSF implemented new *Selection of Award Instrument* Standard Operating Guidance (SOG) to facilitate the proper selection of award instruments based on guiding authorities.
- NSF established a CHIPS and Science Executive Steering Group to focus the agency strategy and near-term implementation activities for CHIPS and Science, facilitate knowledge sharing, coordinate legislative requirements, and develop strategies for implementing CHIPS and Science Act requirements within appropriated resources.

Key Planned and Ongoing Actions

- NSF is evaluating current risk assessment and advanced monitoring site visit and desk review practices and assessing potential changes.
- NSF is using the Enterprise Risk Management process to evaluate current monitoring and oversight of award recipients, to include new awardee types.
- NSF is continuing to monitor portfolio composition and potential increases of small and mid-size award recipients, as well as emerging new partnerships.

Challenge 6: Managing Human Capital

One of the priorities of the President's Management Agenda is strengthening and empowering the federal workforce.[23] The Agenda Vision notes that to do so, federal agencies must have "high employee engagement, a commitment to respect workers' right to organize and bargain collectively, and strong systems to hire, retain, and develop the people needed to deliver agency missions."[24]

NSF has demonstrated its ability to engage its employees. Federal Employee Viewpoint Survey (FEVS) results indicate NSF continues to maintain progress in employee engagement and employee satisfaction, and according to the Partnership for Public Service, NSF is a top-five place to work in the federal government.[25]

NSF continues to evaluate how best to modernize how it works while strengthening relationships and personal interactions. In September 2023, the Office of the Director and AFGE Local 3403 jointly announced the launch of NSF's *Workspace Management Policy* and *Telework and Remote Work Policy* and expressed a joint commitment to learning and continuing dialogue as the work of implementing the new hybrid work model continues.

KEY FACTS

- This issue is related to key initiatives of the President.
- NSF continues to maintain progress in the areas of employee engagement and employee satisfaction.
- NSF, along with AFGE Local 3403, announced NSF's Workspace Management Policy and Telework and Remote Work Policy.
- NSF has strengthened its management of rotators, but risks remain given the IPA program's size and complexity.
- Significant growth in staffing levels, including in its IPA program, may challenge NSF's ability to hire, vet, and onboard staff efficiently and effectively.

Another defining characteristic of NSF's human capital management strategy continues to be its use of temporary staff, which includes both those brought on through authority provided by the *Intergovernmental Personnel Act*, known as IPAs, and those employed through NSF's own Visiting Scientist, Engineer, and Educator (VSEE) program. These individuals — referred to as IPAs or rotators — bring fresh perspectives from all fields of science and engineering to support NSF's mission.

NSF has taken action to respond to the findings and recommendations that we identified in our 2023 report titled *Audit of NSF's Vetting Process for Individuals Assigned Under the Intergovernmental Personnel Act.*[26] We reported that NSF did not always ensure IPA candidates met all program eligibility requirements or verify IPAs' salary and employment history prior to assignment, and did not update its personnel security and suitability review process to address risks associated with foreign influence. NSF has taken, and continues to take, corrective action to address the report's recommendations. Appropriately administering and monitoring its rotating workforce remains an ongoing risk within NSF's broader human capital management plan, given the program's size and complexity.

In addition, NSF updated its policy on administratively determined (AD) pay bands in September 2023 after confirming with the Office of Personnel Management and the U.S. Department of Justice that NSF's

[23] Workforce Priority | President's Management Agenda | Performance.gov
[24] *See* President's Management Agenda and Strengthening and Empowering the Federal Workforce
[25] National Science Foundation, Federal Employee Viewpoint Survey (FEVS) Results
[26] OIG Report No. 23-2-003, January 9, 2023

AD pay bands are subject to the pay limitations contained in 5 U.S.C. § 5373, and that NSF's pay levels exceeded the statutory cap on basic pay with locality. In January 2024, NSF will make adjustments for any position over the Executive Level III max, and no new hires as of September 2023 will be above the statutory cap.

Lastly, NSF has established systems for hiring, retaining, and developing people; however, it is experiencing growth in staffing levels, which may challenge its ability to hire, vet, and onboard staff in an effective, efficient manner. In NSF's FY 2024 Budget Request to Congress, the total number of federal employees was expected to increase from 1,516 in FY 2022 to 1,651 in FY 2023, a 9 percent increase.[27] NSF also estimated an increase in IPAs from 214 full-time equivalents to 267, a 25 percent increase, between FY 2022 and FY 2023. NSF will have to adeptly manage the operational and managerial challenges such growth can introduce.

NSF Headquarters in Alexandria, VA.
Credit: Maria B. Barnes/NSF

Key Completed Actions

- Issued Workspace Management Policy and Telework and Remote Work Policy.
- Held virtual office hours to inform and engage staff to discuss new hybrid model of work.
- Initiated corrective actions related to NSF OIG audit report on vetting of IPAs.
- Issued OD 23-17, *Update on Administratively Determined Pay Bands*.

Key Planned and Ongoing Actions

- Continuing to engage with AFGE Local 3403 and employees on the hybrid work environment and related policies.
- Continuing to complete corrective actions related to NSF OIG audit report on the vetting of IPAs.

[27] National Science Foundation, NSF FY 2024 Budget Request to Congress

Challenge 7: Mitigating Threats to Research Security

Safeguarding the U.S. research enterprise from threats of inappropriate foreign influence continues to be of critical importance. Although significant challenges remain, U.S. funding agencies and academia have made progress in combating malign 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. Nondisclosure of relationships with any such program adversely affects NSF decision-making on proposals. Although some of these programs are legitimate, many encourage or direct unethical and criminal behaviors, including the deliberate nondisclosure of the recruit's foreign position and associated foreign scientific funding. Agreements 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 program members; circumvent merit-based processes; and replicate or transfer U.S.-funded work to another country.

KEY FACTS

- The issue presents risk of fraud, waste, and abuse of NSF or other government assets.
- Federal agencies and academia have made progress in combating malign foreign influence on the U.S. research enterprise.
- NSF has worked to mitigate these threats, such as by releasing guidelines for strengthening research security and creating an Office of the Chief of Research Security Strategy and Policy.
- NSF also has expanded research security training and educated the research community.

A visible laser used to study semiconductor properties close-up.
Credit: Georgia Tech/Rob Felt

Over the past 5 years, NSF has taken meaningful action to mitigate threats posed by these programs. It strengthened disclosure requirements and provided compliance recommendations to U.S. academic institutions to ensure accurate disclosures to U.S. funding agencies. Further, NSF created an Office of the Chief of Research Security Strategy and Policy, which has taken a leading role in federal government efforts to combat this threat. It has expanded research security training and educated the research community through domestic and international outreach. NSF should continue to assess and refine its controls in this area and ensure that it has sufficient staff and resources to address this challenge.

Key Completed Actions

- Created a Chief of Research Security Strategy and Policy position, later codified in the CHIPS and Science Act.
- Created a Chief Data Officer position.
- Launched the Research Security Strategy and Policy Group; developed and implemented research security data analytics capability that captures nondisclosure of foreign affiliations, sources of funding, and collaborations that present conflicts of commitment or capacity.
- Communicated an express prohibition of Foreign Talent Plan membership for all NSF staff, including rotators, and contributed to the process of vetting incoming rotators.
- Developed and implemented mandatory research security training for staff and rotators in direct communication with recipient organizations and principal investigators.
- Educated the 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.
- Developed and implemented an award term and condition for previously undisclosed information.
- Served as steward of the development of harmonized disclosure requirements for proposers and grantees that have been adopted by the U.S. government interagency community.
- Increased collaboration with NSF OIG, U.S. government agencies, and other relevant stakeholders.
- Solicited input on the Research Security and Integrity Information Sharing Analysis Organization (RSI-ISAO), as required by the CHIPS and Science Act.
- Developed internal guidance and public-facing guidelines on research security data-related practices.

Key Planned and Ongoing Actions

- Stand up the Research Security Liaison group, which will oversee many of the issues previously assigned to the Research Security Strategy and Policy Group.
- Establishing the statutorily mandated SECURE Center (also known as RSI-ISAO) as a clearinghouse for information to empower the research community to identify and mitigate foreign risks to the U.S.-funded research enterprise.
- Capturing nondisclosure of foreign affiliations, sources of funding, and collaborations that present conflicts of commitment or capacity.
- Continuing to conduct and monitor mandatory research security training for staff and rotators in direct communication with recipient organizations and principal investigators.
- Continuing education of the research community about risks presented by foreign talent recruitment programs and the importance of compliance with NSF policies and procedures.
- Implementing harmonized disclosure requirements for proposers and grantees that have been adopted by the U.S. government interagency community.
- Maintaining collaborative relationships with NSF OIG, U.S. government agencies, and other relevant stakeholders.
- Developing guidelines for strengthening research security, including those required by the CHIPS and Science Act and National Security Presidential Memorandum 33.
- Developing online research security training modules that will be made publicly available through awards made in partnership with National Institutes of Health, the Department of Energy, and the Department of Defense.
- Developing the Research-on-Research Security Program with international partners.

Challenge 8: Mitigating Threats Posed by the Risk of Cyberattacks

Federal agencies need information technology (IT) systems and electronic data to carry out operations and to process, maintain, and report essential information. The security of these systems and data is vital to public confidence and national security, prosperity, and well-being.

KEY FACTS

- This issue involves an operation that is critical to an NSF core mission.
- The security of IT systems and data is vital to NSF's mission and continued funding of scientific research.
- NSF continues to make progress on improving IT security and implementing ZTA, but new cybersecurity risks remain.
- Growing use of personal devices that connect to the NSF network may increase security risks.

NSF continues to make progress on improving the security of its data and systems and implementing a Zero Trust Architecture (ZTA) in response to EO 14028.[28] ZTA is an approach to cyber security which seeks the vigorous use of modern technology and security practices to defend against the current threat environment. Malicious actors target federal technology infrastructure, threatening public safety and privacy, damaging the American economy, and weakening trust in government.

In July 2023, two federal agencies were the target of an attack against their Microsoft 365 email cloud environments. Microsoft found approximately 25 organizations, including multiple government agencies, were affected by this targeted attack against cloud-based email accounts. In response, the U.S. Department of Homeland Security's Cybersecurity & Infrastructure Security Agency (CISA) and the Federal Bureau of Investigation strongly urged agencies to implement the logging recommendations in a July 2023 CISA alert to enhance their cybersecurity posture and position themselves to detect similar malicious activity.

Our *Federal Information System Modernization Act of 2014* (FISMA) audits have found that NSF has an effective information security program under current standards.[29] NSF could enhance its cybersecurity defenses by fully implementing the use of PIV or alternative MFA cards; implementing security controls related to untrusted removable media devices; ensuring all contractors adhere to the NSF screening process; and completing the annual recertification process for its service accounts. Finally, the Microsoft attack highlights the importance of NSF's audit logging, log retention, and log management as part of its Security Information and Event Management capabilities.[30]

In addition, new cybersecurity risks remain on the horizon. For example, recent developments in quantum computing have created threats to long-trusted public key cryptography. Decryption that used to take traditional supercomputers more than 2 days can now be accomplished by quantum computers in about 3 minutes. The U.S. Department of Homeland Security has provided guidance to agencies to begin preparing for a transition to post-quantum cryptography, and federal guidance from the National Institute of Standards and Technology is forthcoming.[31] The quantum transition will take place over the

[28] Improving the Nation's Cybersecurity, May 12, 2021
[29] Pub. L. No. 113-283
[30] OMB M-21-31, Improving the Federal Government's Investigative and Remediation Capabilities Related to Cybersecurity Incidents, August 27, 2021
[31] See Policy Directive 140-15, September 17, 2021, and National Institute of Standards and Technology, Preliminary Draft NIST SP 1800-38A, Migration to Post-Quantum Cryptography, April 24, 2023

next 10 to 15 years, and the federal government is working towards the future of post-quantum cryptography. NSF could further prepare for this transition by identifying critical data and cryptographic technologies, and prioritizing systems for replacement based on mission requirements.

With the large-scale increase in NSF's resources and staffing authorized by the CHIPS and Science Act, as well as more personal devices are accessing NSF resources due to the post-pandemic shift to hybrid workspaces, NSF will need increasingly effective measures to protect its data. As its workforce grows and workplace environments change, NSF should determine if changes or enhancements are needed to its VPN and Virtual Desktop Infrastructure capabilities to improve the availability, integrity, and confidentiality of NSF data. In anticipation of significant growth, NSF is creating a new office led by a new executive who will serve as NSF's Chief Information Officer and Chief Technology Officer. NSF seeks to position its IT functions to work even more effectively and efficiently throughout the agency. However, the structure of the new office is not yet finalized, and future challenges may be associated with staffing changes, reorganization, and growth.

Key Completed Actions

- Worked with the U.S. Department of Justice's Cybersecurity Shared Services Program to obtain Security Information and Event Management capability for the USAP network.
- Updated password policy to align with ZTA; continues to use the principles of ZTA in cloud planning efforts to strengthen data protection, access controls, and application boundaries.
- Made significant strides in moving IT systems and services to the cloud to modernize legacy technology, improve capacity and uptime, enable standardization of services, and leverage the security benefits of cloud-based infrastructure.
- Automated the annual recertification process for its Active Directory service accounts to help mitigate the risk that unnecessary service accounts remain within IT environments.
- Completed an inventory of high value assets and systems critical to its mission that use cryptographic algorithms; NSF will transition to post-quantum cryptography for standardization, implementation, and testing of replacement products where vulnerable cryptographic algorithms are identified.
- Implemented a solution to block all removable media and only allow authorized removable media after security review and confirmation for the USAP network.

Key Planned and Ongoing Actions

- Updating password enforcement to align with ZTA to implement enterprise tools to check passwords against known-breached data and dictionary words.
- Implementing an endpoint management platform to only allow authorized removeable media to be used on NSF managed devices and will update the rules of behavior to inform staff to use only authorized NSF storage devices.
- Prioritizing PIV card implementation for USAP users and deploy necessary resources to fully implement PIV authentication for privileged or administrator level access to the USAP network.
- Implementing an MFA smart card solution for USAP contractors who do not receive a PIV card.
- Continuing to implement procedures and a formal monitoring program to screen USAP's full-time and seasonal staff before access is granted to the USAP network.
- Enhancing its monitoring and alerting tools as part of its incident response capabilities for the USAP network.

Staff Acknowledgments

Key contributors to this report include Theresa Hull (Assistant Inspector General for Audits), Elizabeth Argeris Lewis (Executive Coordinator and Communications Analyst), Ken Chason, Jessica Elkins, Heather Gallagher, Javier Inclán, Elizabeth Kearns, Ken Lish, Melissa Woolson Prunchak, Laura Rainey, Jennifer Springmann, Kelly Stefanko, Megan Wallace, Emily Woodruff, and Vashti Young.

About NSF OIG

We promote effectiveness, efficiency, and economy in administering the Foundation's programs; detect and prevent fraud, waste, and abuse within NSF or by individuals who receive NSF funding; and identify and help to resolve cases of research misconduct. NSF OIG was established in 1989, in compliance with the *Inspector General Act of 1978* (5 USC 401-24). Because the Inspector General reports directly to the National Science Board and Congress, the Office is organizationally independent from the Foundation.

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- For general inquiries about reporting fraud, waste, and abuse: Email oig@nsf.gov

Contact the NSF Antarctic Helpline

The NSF Antarctic Helpline provides 24/7 crisis intervention and emotional support as well as information about support resources for members of the USAP community who experience sexual assault and/or sexual harassment.

- Confidential Helpline: 1-833-673-1733
- Learn more: https://www.nsfantarctichelpline.org/

National Defense Authorization Act (NDAA) General Notification

Pursuant to Pub. L. No. 117-263 § 5274, business entities and non-governmental organizations specifically identified in this report have 30 days from the date of report publication to review this report and submit a written response to NSF OIG that clarifies or provides additional context for each instance within the report in which the business entity or non-governmental organizations is specifically identified. Responses that conform to the requirements set forth in the statute will be attached to the final, published report.

If you find your business entity or non-governmental organization was specifically identified in this report and wish to submit comments under the above-referenced statute, please send your response within 30 days of the publication date of this report to OIGPL117-263@nsf.gov, no later than December 15, 2023. We request that comments be in .pdf format, be free from any proprietary or otherwise sensitive information, and not exceed two pages. Please note, a response that does not satisfy the purpose set forth by the statute will not be attached to the final report.

National Science Foundation
Office of the Director

MEMORANDUM

DATE: October 20, 2023

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

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

SUBJECT: Acknowledgment of the Inspector General's Fiscal Year (FY) 2024 Management Challenges Report and Transmittal of NSF's Progress Report for the FY 2023 Management Challenges

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In FY 2023, Congress appropriated $9.9 billion to NSF, reflecting the largest dollar increase in funding in NSF's history and the largest percentage increase in more than two decades. This historic investment reflects the value of our work to accelerate technology, safeguard U.S. investments through enhanced research security, strengthen the discovery ecosystem, and invest in the U.S. STEM research and development and workforce enterprise to unleash opportunities for everyone and innovation everywhere. I am honored to lead the agency in delivering on these challenging goals while elevating the importance of risk management and sound financial management to properly steward our resources.

The statutorily required report on Management Challenges that Office of Inspector General (OIG) issues annually illustrates both the obstacles NSF faces in achieving its mission and vision, such as threats to research security and cyberattacks, as well as the strong processes the agency has in place to appropriately manage risk. The attached Progress Report for OIG Management Challenges for Fiscal Year (FY) 2023 outlines many of these processes and expresses our continued commitment to address challenges going forward, including in response to the FY 2024 OIG Management Challenges that your office shared October 13, 2023:

- Overseeing and Managing Risks of Sexual Assault/Harassment in Antarctica
- Addressing Sexual Harassment in the Scientific Enterprise
- Increasing Diversity in Science & Engineering Education and Employment

- Overseeing the United States Antarctic Program (USAP)
- Overseeing NSF's Funding Portfolio in a Changing Environment
- Managing Human Capital
- Mitigating Threats to Research Security
- Mitigating Threats Posed by the Risk of Cyberattacks

In FY 2024, NSF will continue its strong performance in oversight and management of awards, extending this experience to the oversight and management of new award instrument types. We will continue our strong track record of effective cybersecurity through implementation of measures to protect sensitive data from the threat of cyberattacks and build upon the solid foundation of actions to promote research security. In addition, NSF will devote focus to continued improvement in areas such as increasing diverse representation in science and preventing sexual assault and harassment. Among my highest priorities for NSF are creating opportunities everywhere, and ensuring a safe, harassment-free workspace and collegial culture in which research can thrive.

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.

/s/
Sethuraman Panchanathan

Attachments

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

National Science Foundation (NSF)
FY 2023 Progress Report on OIG Management Challenges

Summary of OIG's Management Challenge 1: Increasing Diversity in Science and Engineering Education and Employment

- There is synergy and alignment among NSF, the National Science Board (NSB) and broadly across the federal government in identifying Challenge #1 as a high priority goal.
- Challenge #1 is a focus area and is closely aligned with NSF's mission.
- In FY 2023, NSF plans to increase investments in underfunded Established Program to Stimulate Competitive Research (EPSCoR) jurisdictions.
- NSF is implementing strategies to bolster the research capacity of emerging research institutions.

NSF Management's Overview and Action Plan

NSF Leads: Alicia Knoedler, Office Head, Office of Integrative Activities; James Moore, Assistant Director, Directorate for STEM Education

Innovations in science and engineering education and the broader STEM enterprise are informed by the lived experiences, cultural differences, and varying perspectives of the people represented in the STEM workforce. In efforts to improve the representation of women, racial and ethnic minorities, and persons with disabilities in STEM learning, career development, and advancement, NSF has implemented a multi-level, systemic approach to realize an inclusive STEM workforce. The visionary leadership of the NSF Director serves as the primary driver for addressing this Management Challenge and resulted in the NSF Equity Ecosystem framework. The framework organizes equity-related activities, along three lines of effort: broadening participation in STEM, ensuring equity in NSF program delivery, and promoting DEIA within the NSF workforce. Additionally, it enables the agency to leverage shared knowledge and decades of broadening participation research and practice to impact equity and achieve demonstrable outcomes.

NSF's Completed Actions to Address the Challenge

NSF's ongoing efforts for making positive impacts in increasing diversity in science and engineering education and employment have included: (1) maintaining and updating the NSF portfolio of broadening participation (BP) programs; (2) increasing the diversity of scientists and other STEM experts who review NSF proposals; (3) providing training for staff and the larger community on NSF BP/diversity, equity, inclusion, and accessibility (DEIA) priorities and relevant policies; (4) identifying and communicating BP promising practices; and (5) strengthening the accountability and tracking of NSF-supported BP/DEIA efforts.

The NSF OIG recently highlighted several key completed actions: (1) issuance of the agency strategic plan for 2022-2026 with its first goal, "to promote inclusion in the research community and STEM workforce, access to STEM learning and training and widespread STEM literacy; (2) release of the report of the staff-convened Racial Equity Task Force, including recommendations to increase racial equity among NSF staff and across the external research community; (3) issuance of the NSF's Diversity, Equity, Inclusion and Accessibility (DEIA) Strategic Plan 2022-2024; and (4) the expansion of NSF Eddie Bernice Johnson INLCUDES Initiative.

Demonstrated Progress Through Agency Actions Taken in FY 2023

- In line with requirements of the CHIPS and Science Act, NSF created the Chief Diversity and Inclusion Officer position to improve the coordination and oversight of the agency's efforts to broaden participation in STEM and lead the agency in the implementation of the 2022-2024 DEIA Strategic

Plan[1], DEIA Implementation Plan, and Measures of Effectiveness and Analytical Tools (Maturity Model and Under-representation Framework).

- NSF developed a new research capacity initiative called GRANTED (Growing Research Access for Nationally Transformative Equity and Diversity) and issued funding opportunities (NSF 23-037 Dear Colleague Letter[2] and NSF 23-221Y Program Description[3]).
- NSF Directorates developed new funding opportunities to diversify the STEM workforce (e.g., Cultural Transformation in the Geoscience Community – NSF 23-539; Translation, Innovation and Partnerships (TIP) Enabling Partnerships to Increase Innovation Capacity – NSF 23-528; Mathematical and Physical Sciences Ascending Postdoctoral Research Fellowships – NSF 23-501).
- NSF provides regular updates to the NSB about the Agency Priority Goal, "Improve representation in the scientific enterprise," which focuses on increasing the diversity of investigators and institutions submitting proposals to NSF.
- NSF has piloted including broader impacts experts on the Committees of Visitors panels.
- In response to the OIG's Report No. 22-6-003, "Remote Versus In-Person Merit Review Panels," NSF identified and implemented solutions to improve merit review panelist demographic data.
- In response to Executive Order 14091, Further Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, NSF submitted the 2023 Equity Action Plan to the White House Steering Committee on September 11, 2023.

NSF's Planned and Ongoing Actions

NSF will continue to leverage the internal communities of practice to discuss new endeavors, such as the Equity Ecosystem, as well as to develop strategies for responding to recommendations in the various BP/DEIA reports (e.g., reports from the Committee on Equal Opportunities in Science and Engineering (CEOSE) and NSB; reports of the National Academies of Science, Engineering, and Medicine). Specific ongoing actions:

- Implementing the DEIA strategic plan and identifying actionable metrics for assessing progress. The Chief Diversity and Inclusion Officer (CDIO) will develop strategies to improve outreach to and engagement with minority serving institutions, promote diversity and inclusion in PreK-12 STEM education and increase recruitment from untapped locations and underrepresented populations.
- Assessing the recommendations identified in the staff-led Racial Equity Task Force's report.
- Increasing and diversifying external engagements with underrepresented communities and emerging research institutions, particularly minority-serving institutions and those institutions located within EPSCoR jurisdictions.
- Promoting the NSF theme of *creating opportunities everywhere.* Analyzing and reporting status updates on the Agency Priority Goal.[4]
- Responding to the CEOSE theme of *making visible the invisible* by highlighting new BP programs and activities, such as the Directorate for Social, Behavioral, and Economic Sciences' emphasis on "Diversifying Diversity," and the Directorate for Geosciences' support for developing Belonging, Access, Justice, Equity, Diversity, Inclusion – Be A JEDI – leaders, as well as the new conceptual frameworks for the NSF's Equity Ecosystem and GRANTED.
- Facilitate cross agency discussions to leverage the depth of NSF experience on BP.

[1] The DEIA Strategic Plan is available at https://www.nsf.gov/od/oecr/reports/DEIA_Strategic_Plan_2022.pdf
[2] The Dear Colleague Letter for GRANTED may be accessed at https://nsf.gov/pubs/2023/nsf23037/nsf23037.jsp.
[3] The Program Description for GRANTED may be accessed at https://new.nsf.gov/funding/opportunities/growing-research-access-nationally-transformative-0
[4] NSF reports quarterly on the Agency Priority Goal at https://www.performance.gov/agencies/NSF/apg/goal-1/

Summary of OIG's Management Challenge 2: Overseeing the United States Antarctic Program (USAP)

- The Antarctic Support Contract (ASC) is NSF's largest and most visible contract, valued at $2.3 billion over 13 years.
- Due to COVID-19, 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.
- Recent information security audit findings have identified challenges.
- NSF commissioned a sexual assault and sexual harassment risk assessment in the USAP environment.

NSF Management's Overview and Action Plan

NSF Lead: James Ulvestad, Acting Director, Office of Polar Programs

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 and science operations. COVID-19 dramatically increased these challenges. USAP's recovery from two seasons of drastic curtailment of activity during the pandemic is now underway. Science teams are returning to the field, delayed construction work has resumed, and our approach to managing COVID-19 has shifted with the end of the public health emergency declaration. To provide effective government oversight of these activities, the Antarctic Infrastructure and Logistics Section continues to mature financial management, performance monitoring, and planning processes.

Regarding information security, USAP has been working towards modernizing its processes, resources, and tools following a period of less-than-adequate investment. Some of these efforts have included a monthly cybersecurity risk discussion with USAP leadership that is based on formal metrics with trend analysis, a more robust Acceptance of Risk program, addition of technical resources to support government oversight of contractor performance, implementation of personal identity verification (PIV) credentialing, and increased rigor in vetting of elevated risk contractors.

In addition, the Office of Polar Programs (OPP) and the Office of Equity and Civil Rights (OECR) have joined forces to make a major push towards a robust Sexual Assault and Harassment Prevention and Response (SAHPR) program. Guided by leadership commitment and action from the highest levels, OPP and OECR have made combating these challenges a priority; the Office of the Director has made this issue a priority not only in USAP but across NSF.

NSF's Completed Actions to Address the Challenge

Management of COVID-19 in the FY 2023 season shifted to one of managing the illness rather than preventing all cases of the virus. That shift was challenging, and several changes to the USAP approach were made to accommodate emerging information as deployers moved onto the continent.

OPP accepted a new AIMS project baseline following an external panel review and an independent cost assessment by the US Army Corps of Engineers. Construction on that project and the IT&C primary addition resumed in the FY 2023 season. While significant progress was made, workforce shortages impacted the schedule on both activities.

OPP has been implementing multiple information security improvements, including improved audit logging capability to support Security Information and Event Monitoring tools; documented an Acceptance of Risk and Corrective Action Plan for contractor vetting concerns identified by the OIG, and cleared the backlog of over one hundred contractors in elevated risk positions requiring NSF adjudication; and achieved Initial and

Final Operating Capability for enforcing PIV credentials in the Denver-based offices of the Antarctic Support Contractor and at NSF's interagency partner, NIWC.

Demonstrated Progress Through Agency Actions Taken in FY 2023

Actions noted above on construction, COVID-19 management, and information security are continuing; however, a major focus this year has been improving the SAHPR program not only for USAP but also across the Foundation. See further discussion of SAHPR progress under OIG Management Challenge 8: Addressing Harassment in the Academic Community. Specifically, for USAP:

- This year NSF implemented more than 60 bystander intervention training sessions that reached over 1,200 deployers. Those sessions focused on scenarios tailored to the USAP environment. NSF also provided season-long reminders of that information through message boards and emails.
- NSF held both in-person listening sessions at McMurdo and a series of virtual listening sessions open to all current and former USAP community members. Special sessions were reserved for Palmer and ships, South Pole, individuals who experienced sexual assault in the USAP program, and early career individuals.
- NSF deployed a confidential, on-ice victim advocate (also available for off-ice deployers via telephone and email) and extended that service virtually through the winter season. The victim advocate is available to provide confidential support, safety planning, and advocacy to the USAP community on issues related to sexual harassment and assault.
- To increase NSF's oversight of incidents of sexual misconduct, the agency made changes to the Antarctic Support Contract to require additional reporting on contractor investigations of sexual misconduct.
- NSF established enhanced screening requirements for NSF contractors.
- NSF added SAHPR intranet pages at the stations which provide easy access to key documents and contact information in one place, including the victim advocate contact information to the "emergency contacts" page on the intranet and on postings around station.
- NSF deployed a 24/7 Antarctic Helpline to provide support to members of the USAP community who experience sexual assault or sexual harassment.[5]
- NSF increased the number of satellite communication devices for all field teams to improve access to the counselor, advocate, and other support systems for individuals working in the field camps.
- NSF provided the tools necessary to ensure lodging room doors can be locked from the inside and the outside at every station.

NSF's Planned and Ongoing Actions

- A comprehensive USAP climate survey will be disseminated in the coming months.
- OPP is finishing the addition of door viewers in all lodging rooms.
- OPP and the Personnel Security and Suitability Team in the Division of Administrative Services continue efforts to transition to enhanced screening procedures for contractors.
- Additional training is being developed for next season to expand SAHPR prevention efforts.

[5] The website for the helpline is available at https://nsfantarctichelpline.org/

Summary of OIG's Management Challenge 3: Overseeing Grants in a Changing Environment

The CHIPS and Science Act formally codifies into law the Technology, Innovation and Partnerships Directorate, requires significant expansion of programs aimed at increasing diversity in STEM, and authorizes NSF's budget to more than double within five years, to nearly $19 billion.

NSF Management's Overview and Action Plan

NSF Lead: Janis Coughlin-Piester, Office Head and CFO, Office of Budget, Finance, and Award Management

The CHIPS and Science Act of 2022 (CHIPS) authorizes NSF's budget to more than double over 5 years to nearly $19 billion to support and further enable NSF's three pillars of inspiring the missing millions, strengthening the established NSF, and accelerating technology and innovation. CHIPS formally codifies into law the Directorate for Technology, Innovation and Partnerships (TIP) to advance research and development, technology development, and related solutions to address national societal, national, and geostrategic challenges. CHIPS also encourages NSF to continue ongoing efforts to increase the level and diversity of participation in STEM education and increase the diversity of NSF grant recipients, including increased targets for the EPSCoR program. To support the vision outlined in CHIPS, significant investments are required. In FY 2023, NSF received $9.9 billion, which included approximately $1 billion in additional funding for TIP and other programs. Of this additional funding, $335 million was specifically appropriated to support CHIPS implementation. However, future appropriated funds might not match authorized amounts, creating fiscal uncertainty and challenges in meeting some of the Act's goals. NSF must continue to adapt to effectively manage this complex and changing environment over the next several years.

This dynamic and evolving environment requires a strategic and methodical assessment of the current award oversight and control environment. NSF is committed to continuing to provide exceptional stewardship over its federal grant funds while keeping pace with anticipated growth. In FY 2023, NSF established a CHIPS and Science Executive Steering Group to focus the agency strategy and near-term implementation activities for CHIPS, facilitate knowledge sharing, coordinate legislative requirements, and develop strategies for implementing CHIPS requirements within appropriated resources.

In addition, NSF's Enterprise Risk Management (ERM) and award monitoring programs provide a strong foundation for the agency to address emerging risks. NSF anticipates potential changes to its award portfolio composition, for example, through inclusion of awardees without prior NSF funding history. The Foundation's strong ERM foundation enables NSF to agilely monitor potential changes to its portfolio composition to mitigate the risk of fraud or mismanagement of federal funds. NSF's ERM activities and other concurrent efforts throughout the Foundation are currently assessing the risk and control environment related to emerging partnerships and new recipient communities to either confirm controls are operating effectively or recommend appropriate controls for new processes or award instruments. For example, in FY 2023, NSF issued a TIP Broad Agency Announcement for the NSF Regional Innovation Engines (NSF Engines) program. The intent of this program is to support the development of diverse regional coalitions of researchers, institutions, companies, and civil society that in turn accelerate advances in key technologies; solutions to pressing national, societal, and geostrategic challenges; regional workforce development; and economic growth and job creation. To manage potential risks associated with new awardees in this program, NSF issued special terms and conditions that established additional monitoring and controls, including grantee reporting requirements prior to NSF release of funds. NSF's planned FY 2023 ERM activities include creating an inventory of existing fraud risk prevention and detection activities, assessing key fraud risks, and identifying opportunities to improve fraud risk mitigation efforts. NSF is also developing coalitions with other federal entities to exchange information, lessons learned, and best practices about the

use of new award instruments. To inform these interagency discussions, NSF first conducted internal roundtable discussions to better understand the nuances and challenges in implementing and using these new award instruments.

NSF continues to monitor its investments in EPSCoR states, emerging research institutions, minority-serving institutions, and STEM education to optimize the use of its existing resources for meeting participation goals. One way NSF is tracking progress is through its Agency Priority Goal, "Improve representation in the scientific enterprise." To provide full transparency into these enhanced participation targets, NSF deployed an enterprise dashboard[6] to measure a set of key metrics around increasing proposals received with principal investigators from groups underrepresented in STEM, and from underserved institutions by 10 percent over FY 2020 baselines. NSF will continue to monitor these metrics and others related to leveraging CHIPS and its associated resources to expand access and inclusion in STEM along individual, institutional, and geographic lines.

NSF's Completed Actions to Address the Challenge

Demonstrated Progress Through Agency Actions Taken in FY 2023

- Established the Strategy, Engagement, and Consultation Group to help meet increased funding targets for EPSCoR jurisdictions.
- Provided pre-award business assistance, reviewed accounting and financial capability, and held Office Hours to outline the payment process for new Type-1 NSF Engines Development Awards recipients.
- Implemented new *Selection of Award Instrument* Standard Operating Guidance (SOG) to facilitate the proper selection of award instruments based on NSF authorities and guiding statute. NSF briefed the SOG to the OIG in April 2023.
- Issued draft 2024 Proposal & Award Policies & Procedures Guide (PAPPG) guidance which outlined specific research security requirements and other provisions required in CHIPS.

NSF's Planned and Ongoing Actions

- Evaluate current risk assessment and advanced monitoring site visit and desk review practices and assess potential changes.
- Use ERM process to evaluate current monitoring and oversight of award recipients, to include new awardee types.
- Conduct triennial FY 2024 Payment Integrity and Information Act (PIIA) risk assessment.
- Continue progress on the Project Reporting Improvement Team (PRIT) initiative to develop solutions for improving compliance on the timely submission of grant project reports across the agency.
- Continue to monitor portfolio composition and potential increases of small and mid-size award recipients, as well as emerging new partnerships.

[6] Agency Priority Goal dashboard https://tableau.external.nsf.gov/views/AgencyPriorityGoal/APGInvestigatorsGoal?%3Aembed=y&%3B%3AisGuestRedirectFromVizportal=y

Summary of OIG Management Challenge 4: Managing the Intergovernmental Personnel Act (IPA) Program

- IPAs or rotators are non-federal employees who temporarily serve as NSF staff on detail.
- IPAs bring fresh perspectives but may have a higher risk of conflicts of interest because most come from institutions receiving NSF-funded awards.
- Our ongoing audit work has found challenges with the IPA vetting and hiring process. In response, NSF established a working group to improve the vetting of IPAs.

NSF Management's Overview and Action Plan

NSF Leads: Sylvia Butterfield, Acting Assistant Director, Directorate for Social, Behavioral and Economic Sciences; Wonzie Gardner, Office Head and Chief Human Capital Officer, Office of Information and Resource Management

NSF's scientific community and the American public benefit from the regular influx of science and engineering expertise available through the IPA program. NSF takes a proactive approach in the management of the IPA program to appropriately consider and mitigate inherent risks associated with its execution. The IPA Steering Committee is charged with ensuring NSF is best utilizing the IPA hiring authority. It advises the agency'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, the Office of Management and Budget (OMB), and Congress.

NSF monitors the use of IPA assignments via an annual review of metrics related to participation, demographic characteristics, annual costs, and cost share value, which is provided to NSF leadership. Analyses of these data have demonstrated positive trends in increasing demographic diversity and reductions in annual costs. In FY 2022, NSF saved $3.3 million in costs by using the IPA program to fill key scientific positions when compared to the average Federal rate for salary and fringe benefits.

NSF has taken steps to ensure the IPA program fully supports the mission of the agency and the nation's interests. NSF has addressed the management challenges identified by the OIG as well as other agency-identified risks and challenges by actively engaging with stakeholders to implement the agency's action plan on re-entry of the IPA workforce, cost controls, turnover lifecycles, security concerns related to Malign Foreign Talent Programs, and overall vetting process improvements for IPAs. NSF is continuously improving its management of the IPA program and participation in the Independent Research and Development (IR/D) program. 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's Completed Actions to Address the Challenge

Demonstrated Progress Through Agency Actions Taken in Prior Fiscal Years

NSF has instituted many policies and practices over several years to successfully manage the risks related to the IPA program. Some of the major actions NSF has taken in prior years to address this challenge include:

- Fully addressed recommendations from the OIG report, "NSF Controls to Mitigate IPA Conflicts of Interest," by minimizing risk of conflict of interest when IPA home institutions receiving NSF grants.
- Established the IPA Steering Committee to serve as the primary body for considering policy on NSF's use of IPAs, and to oversee approaches to budgeting and implementation of the IPA program.
- Established a requirement that institutions provide a minimum of 10 percent cost share for every full-time IPA agreement, unless a waiver is granted based on financial hardship. The total amount of

cost share by institutions increased by over $2.1 million due to the implementation of this policy. The cost share mechanism continues to maximize taxpayer value.
- Successfully migrated Program Director and Executive IPAs to the USA Performance system to manage performance consistently throughout the agency.

NSF will continue to maintain the excellent management practices that have been acknowledged by the OIG.

Demonstrated Progress Through Agency Actions Taken in FY 2023

NSF recognizes the need to better vet incoming IPAs via the recent OIG audit on the agency's internal processes. To address concerns and risks identified, NSF established an IPA Candidate Vetting Working Group. The group has made recommendations to the NSF Chief Operating Officer regarding the NSF approach to vetting candidates for IPA positions at NSF.

- The IPA Candidate Vetting Working Group partnered with NSF stakeholders to address issues such as (1) potential threats to national or economic security by IPA candidates with foreign affiliations or sources of funding; (2) potential risks due to other conflicts of interest and commitments; (3) confirmation of eligibility, salary, and employment history; (4) timeliness of vetting relative to employment offers and start of assignment; and (5) responsibility and overall timeline for various aspects of vetting and assessment.
- NSF's Office of Information and Resource Management proactively streamlined the IPA cost formula process for uniformity and implemented a mandatory submission of supporting financial documentation from home institutions when certifying IPA costs in FY 2023.

NSF's Planned and Ongoing Actions

NSF management developed the following anticipated milestones and responses to the findings in the FY 2023 OIG Management Challenge Report in consideration of NSF's strategic and operational objectives, the risks inherent to achieving these objectives, and key actions NSF has already taken.

- The IPA Steering Committee will continue to use enterprise risk management concepts, applying them to the committee's risk environment to monitor metrics related to participation, demographic characteristics, annual costs, and cost share value. The IR/D Council will continue to develop and monitor internal controls related to the IR/D Program, to include clear communication on participation and NSF policies on the use of IR/D.
- The NSF Office of the Director will continue to partner with NSF stakeholders to address (1) potential threats to national or economic security by IPA candidates with foreign affiliations or sources of funding, (2) potential risks due to other conflicts of interest and commitment, and (3) timeliness of vetting relative to employment offers and start of assignment, to include identifying the responsibilities and authorities of different organizations within NSF and how and when they interact during the process.

Additionally, NSF released a Corrective Action Plan (CAP) related to OIG's audit on the agency's IPA vetting process in FY 2023 which consisted of five recommendations. All five recommendations were resolved by March 2023. As agreed, NSF provided updated implementation milestones by October 2, 2023 (FY 2024). Recommendations 2, 4 and 5 of the CAP have been closed. Recommendations 1 and 3 will have new milestone implementation dates in FY 2024 with collaborative efforts across the Office of the Chief of Research Security Strategy and Policy, the Office of General Counsel, and Office of Information and Resource Management.

Summary of OIG's Management Challenge 5: Overseeing NSF-Funded Research Infrastructure

- Major facilities and mid-scale research infrastructure projects are inherently risky because of their uniqueness, complexity, and high costs.
- With a decade of corrective actions implemented, NSF's research infrastructure program is a model program.
- NSF is applying some of its major facility controls to its mid-scale research infrastructure projects.

NSF Management's Overview and Action Plan

NSF Leads: Linnea Avallone, Chief Officer for Research Facilities; Janis Coughlin-Piester, Office Head and CFO, Office of Budget, Finance, and Award Management

NSF funds award recipients to manage the development, design, construction, operation, and disposition of research infrastructure (RI), which are state-of-the art facilities that support research and education and include telescopes, ships, detectors, and distributed observatories. The RI portfolio is complex and has certain inherent risks including meeting emergent scientific objectives, protecting the safety of life and property, potential implementation delays, and unanticipated additional costs. The OIG previously reported on the risk of inadvertent misuse of federal funds and improper use of budget contingency, but the COVID-19 pandemic presented additional, unique challenges across the portfolio. Following the flexibilities granted by the OMB in response to the pandemic, NSF took action to address the associated cost impacts by developing internal and external guidance for RI programs and award recipients. NSF continues to implement mitigation strategies for this unforeseen event and assess any remaining financial impacts as research infrastructure projects and programs return to normal operations.

NSF leadership continues to show its commitment to RI oversight through appointment of the Chief Officer for Research Facilities (CORF), a deputy CORF (with responsibility for strategic oversight of mid-scale RI investments), and periodic use of the Office of the Director's Watch List. The governance structure currently in place, which includes Directorate and Office Representatives (on the Major and Mid-scale Facilities Working Group), Facilities Governance Board, Facilities Readiness Panel, and the Director's Review Board, continues to help ensure consistent implementation of NSF's enhanced controls related to RI oversight. Furthermore, NSF is ensuring adequate human capacity among the RI oversight staff through implementation of the Program Management Improvement Accountability Act (PMIAA) on the RI acquisition portfolio, and by establishing guidance on the necessary core competencies for recipient staff managing RIs.

NSF believes it has demonstrated senior-level leadership commitment through the appointment of the CORF and deputy CORF, has corrective action plans in place that implement solutions that are tied to root causes, and has established appropriate performance measures to monitor construction progress, in response to criteria for removal of this challenge from OIG's list of Management Challenges, as described in OIG Bulletin 18-02, Attachment 2.[7] Capacity is demonstrated through rigorous reporting and accountability, and workforce capacity will continue to be enhanced as NSF completes implementation of PMIAA for the RI portfolio. In addition, NSF has implemented planned corrective actions, demonstrated progress, and monitored on-going activities as described below. Finally, NSF continues to routinely evaluate this management challenge under the agency's Enterprise Risk Management program which considers the activities completed and those planned when assessing remaining risks related to potential waste and poor Awardee performance.

[7] OIG Bulletin 18-02, "Management Challenges," dated August 15, 2018, describes OIG's process for identifying and reporting the most significant management challenges facing NSF and the National Science Board (NSB). This document also describes OIG's criteria for removing prior reported management challenges.

NSF's Completed Actions to Address the Challenge

Since 2015, NSF has implemented enhanced controls and strengthened agency governance to fully address OIG recommendations and those of other external organizations. As a result, oversight of NSF's RI portfolio has continued to evolve and improve each year, making it a model within NSF.

Demonstrated Progress Through Agency Actions Taken in FY 2023

- Continued to use the Office of the Director's Watch List under cognizance of the CORF with inclusion based on credible threats of cost or schedule overruns, performance issues, or constituting a new, high-risk, large-scale endeavor for the agency.
- Revised and published the *Business Systems Review (BSR) Guide* to better align with the Uniform Guidance and address implementation of segregation of funding plans and the allocation of expenses.
- Authorized additional management reserve for projects in the Construction Stage to account for the impacts of the COVID-19 pandemic and other unforeseen events and enhanced federal requirements for data security.
- Developed standard award terms and conditions for Mid-scale RI projects, finalized BFA's *Mid-scale RI Pre-award Review Guidance* SOG and completed three Mid-scale RI webinars for the research community to improve proficiencies in Project Execution Plan development.
- Evaluated NSF's use of the Federally Funded Research and Development Center (FFRDC) designation.

NSF's Planned and Ongoing 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 to enhance the PMIAA Course Curriculum Tool for the RI oversight workforce as part of PMIAA implementation and the corrective action plan related to GAO-19-227[8]. Monitor progress of professional development, for staff overseeing either Major Facilities or Mid-scale RI, through periodic self-assessments.
- Continue to work across NSF Directorates and Offices to "right-size" Mid-scale RI oversight to ensure appropriate implementation of requirements and stewardship of federal funds.
- Implement corrective actions related to the OIG audit of divestment of major facilities.

[8] GAO-19-227 "Cost and Schedule Performance of Large Facilities Construction Projects and Opportunities to Improve Project Management" is available at https://www.gao.gov/products/gao-19-227.

Summary of OIG Management Challenge 6: Mitigating Threats to Research Security

- Federal agencies and academia have made progress in combating undue foreign influence on the U.S. research enterprise.
- NSF has worked to mitigate these threats by creating an Office of the Chief of Research Security Strategy and Policy, developing guidelines for strengthening research security, and continuing to expand research security training for the research community.

NSF Management's Overview and Action Plan

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

To maintain a vibrant science and engineering community for the benefit of the Nation and maintain the integrity of international scientific collaborations, NSF seeks to safeguard the U.S. research enterprise from threats of inappropriate foreign influence. Participation in this community relies on individuals to uphold core principles 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.

NSF focuses on risks to its funded research from foreign government interference related to: (1) required disclosure of biographical data and professional affiliations to U.S. employers of the research community and NSF; (2) undisclosed research duplication and researcher commitments to research entities outside their U.S.-funded scientific research; (3) compromises to the merit review system; and (4) unauthorized use of pre-publication data and information.

Over the past five years, NSF has taken action by strengthening disclosure requirements, collaborating with the research community to develop research security training modules, conducting domestic and international outreach, and publishing a solicitation to establish the SECURE Center.[9] NSF also works closely with the rest of the U.S. government to develop policy that enhances the security and integrity of the science and technology research enterprise.

NSF's Completed Actions to Address the Challenge

In prior fiscal years, NSF completed various actions to safeguard the integrity of federally funded research, including revising disclosure requirements to align with National Security Presidential Memorandum 33 Implementation Guidance,[10] regularly revising the Proposal & Award Policies & Procedures Guide,[11] and engaging with the U.S.-funded research community to identify research security-related training needs.

Demonstrated Progress Through Agency Actions Taken in FY 2023

- Co-chaired the National Science and Technology Council Subcommittee on Research Security, working closely with the White House, other federal science agencies, and the intelligence and law enforcement community to create, publish, and implement common disclosure formats and draft standardized research security program standards.
- In partnership with the National Institutes of Health, the Department of Energy, and the Department of Defense, NSF funded four awards to develop online research security training modules that will

[9] The SECURE Center stands for Safeguarding the Entire Community in the U.S. Research Ecosystem and will provide research security-related support to the U.S.-funded research community.
[10] Guidance for Implementing National Security Presidential Memorandum 33 may be accessed at https://www.whitehouse.gov/wp-content/uploads/2022/01/010422-NSPM-33-Implementation-Guidance.pdf
[11] NSF's Proposal & Award Policies & Procedures Guide may be accessed at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf23001&org=NSF

be made publicly available and cover the importance of research security and best practices; the importance of disclosure and disclosure policies; actions federally funded research recipients can take to manage and mitigate risk; and principled international collaboration.[12]

- Developed and published Program Solicitation (NSF 23-613)[13] on the SECURE Center, referred to as the Research Security and Integrity Information Sharing Analysis Organization (RSI-ISAO), under the CHIPS and Science Act.
- Developed internal guidance and public-facing guidelines[14] on research security data-related practices to clearly define how NSF is assessing research security-related risks.
- Initiated a pilot for the forthcoming malign foreign talent program prohibition under Section 10632 of the CHIPS and Science Act for peer reviewers in the NSF Engines program.
- Solicited a report from the JASON to inform the development of a "Research on Research Security" program, and published a Dear Colleague Letter requesting input from the research community on topics to cover in a workshop that will inform development of this program.[15]
- Scaled data analytics capabilities to identify potential foreign interference and determine the extent of interactions between NSF-funded researchers and researchers located abroad.
- Created a process to support the vetting of incoming Intergovernmental Personnel Act assignments at NSF to mitigate research security-related risks.
- Began concept development and published data elements for the foreign financial support requirement under Section 10339B of the CHIPS and Science Act. Began development of a system to collect this information.

NSF's Planned and Ongoing Actions

- Continue to work with Federal partners to meet CHIPS and Science Act requirements, including identifying a certification process for research security programs and developing an implementation strategy that prohibits involvement in malign foreign talent programs for covered individuals.
- Deliver the completed research security training modules to the research community and implement monitoring and evaluation of the modules.
- Host a research community-wide workshop to support the development of the "Research on Research Security" program.
- Conduct merit review process and review proposals from potential awardees to establish the SECURE Center, as required under Section 10338 of the CHIPS and Science Act.
- Continue to refine and scale-up research security-related analytics capabilities, including the expansion of a pilot sharing research security-related information with the research community.
- Develop a process through the Proposal & Award Policies & Procedures Guide to review the foreign financial disclosure reporting filings submitted to NSF by NSF awardees in the research community, as required under Section 10339B of the CHIPS and Science Act.

[12] The press release for the research security training modules may be accessed at https://new.nsf.gov/news/nsf-2022-research-security-training-united-states

[13] NSF Program Solicitation (NSF 23-613), Research Security and Integrity Information Sharing Analysis Organization (RSI-ISAO), https://www.nsf.gov/pubs/2023/nsf23613/nsf23613.htm

[14] NSF Guidelines for Research Security Analytics may be accessed at https://new.nsf.gov/research-security/guidelines

[15] The Dear Colleague Letter may be accessed at https://www.nsf.gov/pubs/2023/nsf23126/nsf23126.jsp

Management Challenge 7: Mitigating Threats Posed by the Risk of Cyberattacks

- The security of IT systems and data is vital to national security.
- NSF continues to make progress on improving IT security and implementing a zero-trust architecture, but new cybersecurity risks remain.
- Growing use of personal devices that connect to the NSF network may increase security risks.

NSF Management's Overview and Action Plan

NSF Lead: Dorothy Aronson, Chief Information Officer

NSF recognizes the cybersecurity challenges of a digital federal government. Federal agencies are transforming the way information technology and mission critical data is managed. NSF's cybersecurity risk strategy is adaptive, incorporates best practices and provides resilience to emerging cybersecurity threats.

NSF continues to implement a Zero Trust Architecture (ZTA) focusing on priority tasks to address the five pillars of the Zero Trust Maturity Model. NSF maintains strong access controls and a robust capability to quickly detect and respond to incidents, including state-of-the-art network and security protections. Advanced threat and breach protections provide industry-leading threat visibility and detection against attacks.

NSF has made progress in the implementation of enterprise identity management and multifactor authentication (MFA). NSF is employing a multi-pronged approach to MFA for employee and contractor access to agency systems and has continued prioritization of PIV card issuance and use. NSF is focused on ensuring all eligible staff members have a PIV card issued and use PIV to log in to agency systems, as well as providing an alternative phishing-resistant MFA approach where PIV is not viable. NSF is evaluating high-level plans to move internally accessible FISMA Moderate systems to be phishing resistant MFA only. To support this effort, NSF is piloting a strong phishing resistant authorization to establish the groundwork for other internet-accessible applications that require authentication.

NSF is evaluating improvements to its remote access capabilities (e.g., Virtual Private Network (VPN) and Virtual Desktop Infrastructure (VDI)) to improve security and access controls. In addition to rolling out a phishing-resistant MFA solution as an alternative to PIV, NSF is evaluating secure access service edge (SASE) solutions to maximize security across users, devices and applications. Enhancements to remote access methods will improve the confidentiality, integrity, and availability of NSF data.

As NSF moves to a zero-trust architecture the paradigm shift relies in part on the ubiquitous use of strong encryption. The threat posed by the prospect of a cryptanalytically relevant quantum computer (CRQC) requires that NSF prepare to implement post-quantum cryptography (PQC) to prevent exposure of sensitive data. NSF plans to monitor the Federal government's strategy and transitional guidance as PQC standards are finalized. NSF will implement post-quantum cryptography guidance when it is issued.

NSF continues to mature and implement its security information and event management (SIEM). NSF has comprehensive logging and information-sharing capabilities and is expanding log elements and retention periods to further enhance event correlation and incident management.

NSF recertifies user and service accounts including accounts related to its Merit Review system. NSF confirms the completeness of the data used in the annual recertification process for database service accounts to include new sources and completeness in the datasets.

NSF's Completed Actions to Address the Challenge

- NSF enhanced onboarded threat feed information into the SIEM. This allows NSF to enhance vulnerability information and provide additional context to current logging capabilities. NSF plans to ingest other threat feeds into the SIEM moving forward.
- NSF updated its password policy to align with ZTA to remove the requirement for special characters and regular password rotation from internal facing and customer facing systems for accounts assigned to individuals and then implemented the policy.
- NSF made significant strides in moving IT systems and services to the cloud to modernize legacy technology, improve capacity and uptime, enable standardization of services, and leverage the security benefits of cloud-based infrastructure. Over 80 percent of NSF business applications and services are in the cloud. NSF continues to use the principles of zero trust architecture in cloud planning efforts to strengthen data protection, access controls, and application boundaries.
- NSF automated the annual recertification process for its Active Directory service accounts to help mitigate the risk that unnecessary service accounts remain within IT environments.
- NSF completed an inventory of high value assets and systems critical to its mission that use cryptographic algorithms. NSF will transition to post-quantum cryptography for standardization, implementation, and testing of replacement products where vulnerable cryptographic algorithms are identified.

NSF's Planned and Ongoing Actions

NSF's cybersecurity efforts are focused on establishing new capabilities to reduce risk and protect sensitive agency data from compromise. NSF management identified the following priority initiatives in support of federal cybersecurity requirements to mitigate threat posed by the risk of cyberattacks:

- NSF is updating its password enforcement to align with ZTA to implement enterprise tools to check passwords against known-breached data and dictionary words. For customer facing systems, NSF will continue work with Login.gov to determine whether phishing-resistant authentication was used.
- To protect NSF sensitive data on removable storage devices, NSF will use an endpoint management platform to only allow authorized removeable media to be used on NSF managed devices. NSF will update the rules of behavior to inform staff to use only authorized NSF storage devices. USAP has implemented a removable media solution and is actively blocking all removable media and only allows authorized removable media after security review and confirmation of USAP mission need.
- USAP has taken steps to prioritize the PIV implementation for USAP users and deploy necessary resources to fully implement PIV authentication for privileged or administrator level access to the USAP network and for the distribution of PIV cards to privileged employees. USAP has developed a plan through its PIV and MFA Project Plan to distribute PIV and MFA smart cards to unprivileged/ non-sensitive positions in FY 2024.
- USAP continues to implement procedures and a formal monitoring program to screen USAP's fulltime and seasonal staff before access is granted to the USAP network. NSF established additional support to continue prioritizing and screening privileged and non-privileged/non-sensitive positions in FY 2024. USAP has implemented an incident response monitoring and alerting tool through the Department of Justice's Cybersecurity Shared Services Program (CSSP). USAP is completing assessments to identify gaps associated with completing the event logging maturity requirements and ensure the USAP achieves the required maturity levels.

Summary of OIG Management Challenge 8: Addressing Harassment in the Academic Community

- Recent reports[16] and legislation[17] indicate harassment is pervasive in institutions of higher education and a deterrent to participation in STEM.
- NSF has taken actions to address harassment, including implementing an award term and condition that requires institutions to report findings of harassment or assault by NSF-funded principal investigators or co-principal investigators; developing a Polar Code of Conduct; and reaffirmed expectations that research organizations establish and maintain clear and unambiguous standards of behavior.
- NSF also commissioned a needs assessment to better understand the state of sexual harassment in the United States Antarctic Program (USAP). The resulting report highlighted concerns about oversight of sexual harassment response activities by USAP partners, lack of trust in the reporting process, and the need for additional reporting mechanisms.
- It is imperative that NSF continue working to address harassment in the academic community and undertake prevention and response efforts.

NSF Management's Overview and Action Plan

NSF Leads: Linnea Avallone, Chief Officer for Research Facilities; Rhonda Davis, Head, Office of Equity and Civil Rights

The U.S. National Science Foundation is committed to combatting harassment and sexual assault anywhere science or education is conducted, including research stations, vessels, field sites, and NSF-funded programs.

NSF has taken, and continues to take, steps to help ensure all NSF-funded research and learning environments are free from sexual harassment and other forms of harassment. Additionally, NSF continually bolsters our policies, guidelines and communications so that organizations clearly understand expectations and individuals understand their rights. The agency's approach to combatting harassment and sexual assault is guided by the following:

- First, NSF recognizes that to enable scientists, engineers, and students to work at the outermost frontiers of knowledge, the agency must be a role model for teamwork, fairness, and equity.
- Second, investing in science, technology, engineering, and education for the Nation's future necessitates a safe environment, free of any form of harassment, that fosters equal opportunities.
- And finally, NSF is committed to creating safe and inclusive research environments for all.

NSF's Completed Actions to Address the Challenge

Prior to FY 2023, NSF implemented an award term and condition that requires award recipients to notify NSF of any findings or determinations of sexual harassment, other forms of harassment, or sexual assault by an NSF-funded principal investigator or co-principal investigator. Additionally, NSF issued statements to the academic community and states within its Proposal & Awards Policies & Procedures Guide (PAPPG) that

[16] 2018 National Academies of Sciences, Engineering, and Medicine (NASEM) study: Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine on the prevalence and impact of sexual harassment in science, engineering, and medical departments and programs. The report is available at https://www.nationalacademies.org/our-work/sexual-harassment-in-academia

[17] The recently enacted CHIPS and Science Act requires NSF to undertake a follow-on study to examine the influence of sexual harassment in institutions of higher education on the career advancement of individuals in the STEM workforce and assess progress in implementing recommendations from the 2018 report. Efforts to do so are already underway.

NSF expects all research organizations to establish and maintain clear and unambiguous standards of behavior to ensure harassment-free workplaces.

Demonstrated Progress Through Agency Actions Taken in FY 2023

During FY2023, NSF took the following actions to address harassment:

- NSF Grant and Cooperative Agreement Term and Condition Monitoring, Updating and Education: NSF continued to receive, review, and monitor notifications filed under the harassment notification term and condition, as well as conducted standard Title IX compliance reviews of NSF awardee organizations.[18] In addition, NSF gathered input to support modifications to the awardee complaint portal for sexual and gender-based harassment complaints, and commissioned an independent evaluation of the harassment notification term and condition and conference requirement.
- Policy and Procedure Guidance: NSF revised the PAPPG[19] to require that proposals with off-campus or off-site work include a certification that proposers have a plan for creating and maintaining Safe and Inclusive Working Environments for Off-Campus and Off-Site Research for that project. NSF also reiterated the responsibility of all NSF employees to swiftly report sexual harassment by issuing OECR Bulletin No. 23-02: Sexual Harassment Reporting.[20]
- Supporting Safer Research Environments: NSF established a new Sexual Assault and Harassment Prevention and Response (SAHPR) Office to serve as NSF's centralized communication point for sexual assault and sexual harassment matters, ensuring matters are appropriately referred and providing access to resources and guidance to help prevent and address sexual assault and harassment. NSF developed and implemented an 8-point action plan[21] to ensure a safe and productive environment for scientists, support personnel, and visitors who participate in USAP activities. Key completed actions include:
    - Established the Director's SAHPR Task Force to facilitate cross-agency coordination on the action plan for USAP.
    - Established the saferscience@nsf.gov contact line as the single point of contact for all comments, inquiries or reports for the community.
    - Established formal lines of communication with federal partners to coordinate response and follow-up on sexual assault and harassment issues. Began the process of building an accountability framework among the partners.
- NSF released a Dear Colleague Letter, which explicitly encourages applicants to submit research proposals that address:
    - Anti-Harassment in STEM education and research settings and workplaces, and,
    - Culture change and organizational policy structure projects to create harassment-free STEM education and research settings and workplaces.

Please see the discussion of Management Challenge 2: Managing the US Antarctic Program (USAP) for more details on the implementation of this plan.

[18] Includes academic institutions or other organizations with NSF grants, cooperative agreements or contracts.
[19] The PPAPG section on Safe and Inclusive Working Environments is available at https://new.nsf.gov/policies/pappg/23-1/ch-2-proposal-preparation#2E9
[20] OECR Bulletin No. 23-02 is available at https://www.nsf.gov/od/oecr/docs/oecr2302.pdf
[21] Available at https://www.nsf.gov/od/oecr/docs/nsf-actions-to-prevent-sexual-assault-and-harassment.pdf

NSF's Planned and Ongoing Actions

Moving into FY 2024, NSF remains committed to continuing the work to combat sexual misconduct and to ensure all NSF environments are safe, harassment and assault-free spaces with a positive and inclusive culture. Some of NSF's planned and ongoing actions include:

- Conduct an independent evaluation to examine community understanding, experiences with, and implementation of NSF's harassment notification term and condition and conference requirement.
- Conduct pilots to test and evaluate an off-campus and off-site research proposal requirement that extends beyond self-certification and requires that grant applicants submit a plan for creating and maintaining a safe and inclusive working environment as a part of the merit review process.
- Evaluate how NSF award terms and conditions could be modified to further promote safe and inclusive research environments.
- Conduct outreach and benchmarking with federal partners and international entities on promising policies, practices, and procedures for creating and maintaining safe and inclusive environments.
- Develop a secure system to document activity and data on sexual assault and harassment reports.

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. NSF does not have any high-priority programs as defined by A-123 Appendix C (programs with estimates of improper payments resulting in monetary loss that exceeds $100 million annually). 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 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 2022 inflation adjustments to civil monetary penalties.

Table 3.3 – FY 2023 Civil Monetary Penalty Adjustment for Inflation

Statutory Authority	Penalty (Name and Description)	Year Enacted	Latest Year of Adjustment (via Statute or Regulation)	Current Penalty Level ($ Amount or Range)	Location for Penalty Update Details
Antarctic Conservation Act of 1978, 16 U.S.C., 2401 *et seq.,* as amended	Antarctic Conservation Act, Knowing violations	1978	2023	$34,457	87 FR 79910 Wednesday, December 28, 2022
Antarctic Conservation Act of 1978, 16 U.S.C., 2401 *et seq.,* as amended	Antarctic Conservation Act, Not knowing violations	1978	2023	$20,362	87 FR 79910 Wednesday, December 28, 2022
Program Fraud Civil Remedies Act of 1986, 31 U.S.C., 3801, *et seq.*	Program Fraud violations	1986	2023	$13,508	87 FR 79910 Wednesday, December 28, 2022

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, 2023.

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	331	236	101
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 9/30/2023.

As indicated in the table above, NSF's 668 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 (98 percent) that are still not fully closed have overdue final project reports and/or project outcome reports and cannot be completely closed. In FY 2022, NSF reported 683 awards still open and no awards with undisbursed funds. NSF reviews operating policies and accounting practices to close all awards on the same schedule, thereby, ensuring the number is zero.

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 administratively closes awards nightly and runs the automated closeout routines daily to close out awards as quickly as possible.

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. NSF reviews overdue report information for awards that may be eligible for reporting in the Federal Awardee Performance and Integrity Information System (FAPIIS), as prescribed in the revised 2 CFR § 200 published in the Federal Register on August 13, 2020.[1] NSF has not yet reported any awards/ Awardees. A working group is addressing internal policy and procedures related to FAPIIS. Further, in FY 2023, NSF introduced a pilot program wherein an awardee organization's ability to draw down expenses may be suspended for awards with overdue project reports. NSF expects report compliance to increase for organizations in the pilot.

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

UNDISBURSED BALANCES IN EXPIRED GRANT ACCOUNTS

In FY 2023, NSF funded research and education in science and engineering through grants, cooperative agreements, and other financial assistance award instruments to 1,850 colleges, universities, and other institutions. For all NSF financial assistance award instruments, awardees must include all costs during the period of performance of the award. Per NSF policy in the Proposal and Award Policies and Procedures Guide (PAPPG), awardees typically have 120 days after the grant expires to complete final drawdowns and expenditures.

The information provided here pertains to the agency's two main grant making appropriation accounts: Research and Related Activities and STEM Education. 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 expired periods of performance.
- **Undisbursed balances on expired grants** refers to amounts that remain available for expenditures before financial closeout.
- **Undisbursed balances for expired grant awards that may be returned to the Treasury** refers to funding that was previously obligated on a grant award and was subsequently de-obligated, and never re-obligated prior to the cancellation of the source appropriation.
- **Amounts that have not been obligated to a specific grant or project** refers to unobligated amounts for grant related funding in expired appropriation accounts.

NSF has developed leading practices for monitoring and de-obligating balances on expired grant awards through automated processes. Once a grant has expired, NSF executes actions to close out the grant both administratively and financially. The financial closeout action occurs 120 days after the award expiration date, and de-obligates the remaining undisbursed balances from the award. Administrative closeout is initiated after financial closeout is completed. 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 Circular A-136, Section II.4.9.2 *Reporting Related to Commerce, Justice, Science, and Related Agencies Appropriation Act*.

1. **Information about future action NSF will take to resolve undisbursed balances for grant awards for which the period of performance has expired**
   NSF continually monitors its grant awards throughout their lifecycle following a comprehensive post-award monitoring process. NSF utilizes automated, system-based processes to close grants based on their period of performance end date. This process de-obligates all undisbursed award balances 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 awardees fully spend the funds obligated throughout the course of their research.

2. **The method that NSF uses to track undisbursed balances in expired grant awards**
   NSF completes timely financial closeout of expired grant awards daily through an automated process. Eligibility for NSF grant award closeout begins 120 days after the award expiration date. The NSF closeout process automatically de-obligates any undisbursed award balance, generates an award closeout transaction to flag the award as financially closed, and records the financial closeout date to NSF's award management system to initiate final administrative closeout procedures.

Awardees and NSF personnel can view the expected award closeout date through the Award Cash Management Service (ACM$). ACM$ requires awardees to submit payment amounts and expenditures at the individual award level each time funds are requested by awardees, allowing NSF to conduct post-award monitoring activities on individual awards.

3. **The identification of undisbursed balances for expired grant awards that may be returned to the Department of Treasury (Treasury)**
   When NSF closes out a grant award, it de-obligates the undisbursed balances. The de-obligated grant balances are treated one of three ways:
   - If the source appropriation is unexpired, 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 is canceling in the current fiscal year, NSF de-obligates all undisbursed grant balances prior to September 30 as part of its year-end close process, and subsequently returns the funding to Treasury.

   For FY 2023, the amount of undisbursed funding previously obligated on grant awards that NSF returned to Treasury was $81.5 million.

4. **The number of expired grant awards, the undisbursed balances on these expired grants, and the amounts that have not been obligated to a specific grant or project remaining in the appropriations accounts as of September 30, 2023; September 30, 2022; and September 30, 2021.**
   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 on September 30 before NSF executes its regular closeout processes described above. For FY 2023, there were 4,988 expired grants with undisbursed balances of $129,860,154. Table 3.5 also presents amounts that have not been obligated to a specific grant or project as of September 30.

Table 3.5 – Status of Undisbursed Balances in Expired Grants

	FY 2023 (as of 9/30/2023)	FY 2022 (as of 9/30/2022)	FY 2021 (as of 9/30/2021)
Number of expired grants with undisbursed balances	4,988	5,127	4,616
Undisbursed balances prior to closeout	$129,860,154	$123,876,877	$99,486,778
Amounts that have not been obligated to a grant or project remaining in the appropriations accounts[1]	$257,151,673	$226,104,413	$209,615,739

[1] NSF updated this table for FY 2023 to align with updates to OMB Circular A-136, Section II.4.9.2 *Reporting Related to Commerce, Justice, Science, and Related Agencies Appropriation Act*. This figure includes data from NSF's Research and Related Activities and STEM Education appropriation accounts.

AWARDS TO AFFILIATED INSTITUTIONS

The following table lists institutions affiliated with members of the National Science Board (NSB) in FY 2023.[1]

Affiliated Institution	Awards Obligated in FY 2023 (Dollars in thousands)
Arizona State University	$112,252
Auburn University	22,449
Catholic University of America	2,591
Iowa State University	47,828
Ohio State University	83,292
Southwest Research Institute	1,141
University of California, Los Angeles	55,516
University of Illinois	167,666
University of Massachusetts	67,820
University of Michigan	135,405
University of Tennessee	27,549
University of Texas, El Paso	18,857
University of the District of Columbia	1,734
University of Utah	47,946
University of Vermont	13,736
Vanderbilt University	29,888
Virginia Tech University	60,875
Washington University	31,594
TOTAL	**$928,139**

[1] 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, 2023. 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 prohibits 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/2023/nsf23002/pdf/nsf23002.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, 2023 and 2022. AD IPAs led four directorates during the fiscal year ended September 30, 2023 and four directorates during the fiscal year ended September 30, 2022. 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 2023 Awards to AD IPAs' Home Institutions

(Dollars in Thousands)

Directorate	Total Dollars and Awards Made by Directorate in FY 2023	Home Institution of IPA Assistant Director	Total Dollars and Awards to Home Institution by Directorate in FY 2023	Total Dollars and Awards to Home Institution by NSF in FY 2023
Biological Sciences	$852,468 (1,868 awards)	University of California	$7,063 (17 awards)	$74,676 (166 awards)
Computer & Information Science & Engineering	$1,070,614 (3,352 awards)	Princeton University	$12,333 (38 awards)	$66,293 (154 awards)
Engineering	$777,047 (2,629 awards)	Emory University	$1,189 (4 awards)	$27,057 (47 awards)
STEM Education	$1,362,115 (2,164 awards)	Ohio State University	$6,734 (9 awards)	$83,503 (161 awards)
Total	$4,062,244 (10,013 awards)		$27,319 (68 awards)	$251,529 (528 awards)

Table 3.7 – FY 2022 Awards to AD IPAs' Home Institutions

(Dollars in Thousands)

Directorate	Total Dollars and Awards Made by Directorate in FY 2022	Home Institution of IPA Assistant Director	Total Dollars and Awards to Home Institution by Directorate in FY 2022	Total Dollars and Awards to Home Institution by NSF in FY 2022
Computer & Information Science & Engineering	$1,039,029 (2,117 awards)	Princeton University	$10,099 (37 awards)	$57,590 (129 awards)
Engineering	$970,237 (3,260 awards)	Emory University	$424 (3 awards)	$8,387 (41 awards)
Social, Behavioral, & Economic Sciences	$253,555 (1,150 awards)	University of Michigan	$55 (2 awards)	$4,101 (23 awards)
Education & Human Resources	$1,432,621 (3,126 awards)	Ohio State University	$2,726 (5 awards)	$13,115 (26 awards)
Total	$3,695,442 (9,653 awards)		$13,304 (47 awards)	$83,193 (219 awards)

NSF SENIOR MANAGEMENT AND NATIONAL SCIENCE BOARD

NSF Senior Management
(as of September 30, 2023)

Office of the Director (O/D)
Sethuraman Panchanathan, *Director*
Vacant, *Deputy Director*
Karen A. Marrongelle, *Chief Operating Officer*
Brian W. Stone, *Chief of Staff*

O/D Offices

Office of Equity and Civil Rights
Rhonda Davis, *Head*
Affirmative Action Officer

Office of the General Counsel
Angel Williams, *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*

Directorate for Biological Sciences
Susan Marqusee, *Assistant Director*

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

Directorate for STEM Education
James L. Moore III, *Assistant Director*

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
Sylvia Butterfield, *Assistant Director (Acting)*

Directorate for Technology, Innovation and Partnerships
Erwin Gianchandani, *Assistant Director*

Office of Budget, Finance, & Award Management
Janis Coughlin-Piester, *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 Diversity and Inclusion Officer
Charles Barber (O/D)

Chief Information Officer
Dorothy Aronson (O/D)

Chief Officer for Research Facilities
Linnea Avallone (O/D)

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

National Science Board Members
(during FY 2023)

Terms expire May 10, 2024

Deborah Loewenberg Ball
University of Michigan

Vicki Chandler
Minerva University

Maureen L. Condic
University of Utah

Suresh V. Garimella
University of Vermont

Stephen Leath
Auburn University (retired)

Dan Reed, *NSB Chair*
University of Utah

Alan Stern
Southwest Research Institute

Stephen H. Willard
NRx Pharmaceuticals

Terms expire May 10, 2026

Sudarsanam Suresh Babu
Oak Ridge National Laboratory/University of Tennessee, Knoxville

Roger N. Beachy
Washington University, St. Louis (retired)

Aaron Dominguez
Catholic University of America

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

Terms expire May 10, 2028

Dorota Grejner-Brzezinska
The Ohio State University

Victor R. McCrary, *NSB Vice Chair*
University of the District of Columbia

Julia M. Phillips
Sandia National Laboratories (retired)

Marvi Matos Rodriguez
Boeing Company

Keivan Stassun
Vanderbilt University

Merlin Theodore
Oak Ridge National Laboratory

Wanda E. Ward
University of Illinois Urbana-Champaign

Bevlee Watford
Virginia Polytechnic Institute and State University

Terms expired, but temporarily served as consultants to the Board in FY 2023

Arthur Bienenstock
Stanford University

W. Kent Fuchs
University of Florida

W. Carl Lineberger
University of Colorado

Emilio F. Moran
Michigan State University

Anneila I. Sargent
California Institute of Technology

Member ex officio
Sethuraman Panchanathan, *NSF Director*

National Science Board Office
John J. Veysey, II, *Executive Officer*

Office of Inspector General
Allison C. Lerner, *Inspector General*

PATENTS AND INVENTIONS RESULTING FROM NSF SUPPORT

The following information about inventions is being reported in compliance with Section 3(f) of the National Science Foundation Act of 1950, as amended [42 U.S.C. 1862(f)]. There were 1,783 NSF invention disclosures reported to NSF either directly or through the National Institutes of Health's iEdison database during FY 2023. Rights to these inventions were allocated in accordance with Chapter 18 of Title 35 of the United States Code, commonly called the "Bayh-Dole Act."

ACRONYMS

ACM$	NSF Award Cash Management Service
AFR	Agency Financial Report
AOAM	Agency Operations and Award Management
APR	Annual Performance Report
BFA	Office of Budget, Finance and Award Management
CAP	Corrective Action Plan
CFO	Chief Financial Officer
COVID	Coronavirus Disease
DAAP	Data Analytics and Assurance Program
DEIA	diversity, equity, inclusion, and accessibility
ERM	Enterprise Risk Management
EDU	STEM Education
EPSCoR	Established Program to Stimulate Competitive Research
FBWT	Fund Balance with Treasury
FECA	Federal Employees' Compensation Act
FFMIA	Federal Financial Management Improvement Act of 1996
FFRDC	Federally Funded Research and Development Center
FISMA	Federal Information Security Modernization Act
FMFIA	Federal Managers' Financial Integrity Act of 1982
FTE	full-time equivalent
FY	fiscal year
GAAP	generally accepted accounting principles
GAO	Government Accountability Office
GPRA	Government Performance and Results Modernization Act of 2010
GRANTED	Growing Research Access for Nationally Transformative Equity and Diversity
GRFP	Graduate Research Fellowship Program
H-1B	H-1B Nonimmigrant Petitioner Account
IAA	Interagency Agreement
IG	Inspector General
IPA	Intergovernmental Personnel Act
IT	Information Technology
iTRAK	NSF's financial management system
MREFC	Major Research Equipment and Facilities Construction
MSI	minority-serving institution
NSB	National Science Board
NSF	National Science Foundation
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
PIV	personal identity verification
PMIA	Program Management Improvement Accountability Act

PP&E	General Property, Plant, and Equipment
R&D	Research and Development
R&RA	Research and Related Activities
SAM	System for Award Management
SBIR	Small Business Innovation Research
SBR	Statement of Budgetary Resources
SFFAS	Statement of Federal Financial Accounting Standards
SSAE	Statement of Standards for Attestation Engagements
STEM	science, technology, engineering, and mathematics
STTR	Small Business Technology Transfer
TIP	Directorate for Technology, Innovation and Partnerships
USAP	U.S. Antarctic Program
USSGL	United States Standard General Ledger
ZTA	Zero-trust Architecture