

SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY

HEARING CHARTER

“Oversight and Examination of the National Science Foundation’s Priorities for 2025 and Beyond”

**Thursday, May 16, 2024
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building**

Purpose

The purpose of the hearing is to review the Administration’s Fiscal Year 2025 budget request for the National Science Foundation (NSF) and its priorities for supporting science and engineering research and education, including the construction and operation of NSF’s research facilities and infrastructure; investments in STEM education and workforce development; and the activities of the Directorate for Technology, Innovation, and Partnerships. Additionally, the Committee will examine the progress of NSF’s National Artificial Intelligence Research Resource (NAIRR) Pilot Program, the development of research security guidance and policy implementation, and the future of the Quantum Leap Challenge Institutes. This hearing will also be an opportunity to discuss the steps the Foundation and the National Science Board have taken to address the unsafe culture and environment of the United States Antarctica Program (USAP).

Witnesses

- **Dr. Sethuraman Panchanathan**, Director, National Science Foundation
- **Dr. Dan Reed**, Former Chair, National Science Board

Key Questions

- How is NSF advancing U.S. competitiveness in critical technologies like artificial intelligence (AI) and quantum?
- How is NSF addressing increased international competition in S&T, as well as foreign espionage and theft of NSF funded research at U.S universities and research institutions?
- How is NSF coordinating its STEM education and workforce activities with STEM programs across the federal government, and meeting workforce needs of the private sector?
- What new initiatives are proposed in the FY25 budget request for NSF?
- How is the National Science Board working with NSF to address the Foundation’s priorities?

Background

The National Science Foundation (NSF) is an independent federal agency established by Congress in 1950 and is the primary source of federal funding for non-medical and non-defense basic research. NSF supports fundamental research that is not funded by the private sector. NSF is also responsible for a majority of the federal science, technology, engineering, and mathematics (STEM) education programs.

NSF supports approximately 353,000 scientists, engineers, educators, and students at universities, laboratories, and field sites through more than 11,000 competitive awards per year.¹ NSF is the funding source for over 23 percent of all federally supported basic research conducted at 1,900 American colleges, universities, and other research institutions.² These grants fund specific research proposals that have been judged the most promising by NSF's peer merit-review system. On average only one out of four proposals submitted to NSF is awarded funding.³

Governance

As an independent agency, NSF does not fall within a cabinet department. The agency's activities are governed jointly by the NSF Director and the National Science Board (NSB). The Director is appointed to a six-year term by the President and confirmed by the Senate. The current NSF Director, Dr. Sethuraman Panchanathan, was nominated by President Trump in 2019 and subsequently unanimously confirmed by the U.S. Senate on June 18, 2020.⁴

The NSB consists of 24 members appointed to six-year terms by the President.⁵ The NSB performs two primary functions: (1) to provide policy direction to NSF, including approval of the annual budget submission to the Office of Management and Budget (OMB) and new major programs and awards, and (2) to serve as an external advisory body to Congress and the President on policy issues pertaining to science and engineering and STEM education. The Board also publishes a biennial report on indicators of the state of science and engineering in the United States.⁶ The Board Chair and Vice Chair are elected to two-year terms by the Board membership. The Former Chair, Dr. Dan Reed, was elected in May 2022 and his term ended May 10, 2024.^{7,8}

Research and Education

NSF supports fundamental research and education across all fields of science and engineering. These activities are managed through seven research directorates under the Research and Related Activities (RRA) appropriations account – Biological Sciences (BIO); Computer and Information Science and Engineering (CISE); Engineering (ENG); Geosciences (GEO); Mathematical and Physical Sciences (MPS); Social, and Behavioral and Economic Sciences (SBE); Technology, Innovation and

¹ National Science Foundation. "FY 2025 Budget Request to Congress," March 11, 2024. https://nsf.gov/resources.nsf.gov/files/01_fy2025.pdf?VersionId=knPNtniWAYGCoAYZm.6L2GKK75_OJh1o.

² *Id.*

³ *Id.*

⁴ NSF, "New director takes helm at National Science Foundation", <https://beta.nsf.gov/news/new-director-takes-helm-national-science>.

⁵ NSB appointments are staggered so that every two years one-third of the Board is appointed.

⁶ The most recent Indicators report was released in March 2024 and can be found here: <https://nces.nsf.gov/pubs/nsb20243>.

⁷ National Science Board, "New Leadership of the National Science Board," https://www.nsf.gov/nsb/news/news_summ.jsp?cntn_id=305154.

⁸ The Ex Officio Vice-Chair of the NSB is Dr. Victor McCrary.

Partnerships (TIP) – and the STEM Education (EDU) directorate under a separate account. Each directorate is headed by an Assistant Director (AD) and further subdivided into divisions. In addition to these eight directorates, two offices administer agency-wide programs – the Office of International Science and Engineering (OISE) and the Office of Integrative Activities (OIA), both of which are housed in the Office of the Director.

NSF is the primary source of support for academic research in several scientific disciplines, accounting for more than 57% of federal funding in computer science, biology, environmental sciences, mathematics, and social sciences.⁹

Institutions and People

To support research and education activities, NSF typically enters into grant agreements with universities or other non-profit organizations. In FY 2023, NSF received 40,500 research grant proposals and made about 11,000 new awards to colleges, universities, and other institutions across all 50 states. Across the agency, 27 percent of proposals were selected for grant awards in FY 2023. The average award size that year was \$239,700 over 3.1 years. Activities funded by NSF in FY 2023 involved an estimated 55,400 senior researchers, 6,400 postdoctoral associates, 45,600 graduate students, 40,000 undergraduate students, and 190,000 K-12 teachers and students.¹⁰

Approximately 80% of NSF research and education funds are awarded to colleges, universities, and academic consortia. The remainder goes to private industry, including small businesses and non-profits (12%), Federally Funded Research and Development Centers (4%), and other recipients (5%).¹¹

Facilities

In addition to research grants, NSF funds the construction, operations, and maintenance of research facilities and equipment. NSF typically enters into cooperative agreements with universities or other non-profit organizations for the construction and management of major facilities. The construction phases of such projects usually span multiple years, with extensive planning and oversight. Large equipment and facility projects include multi-user facilities, such as astronomical observatories and ocean research vessels; networked instrumentation and equipment; and large-scale computational infrastructure.

Merit-Review

The NSF proposal review and award process is based on competition between proposals within a specific scientific discipline or under an interdisciplinary initiative. Award selection involves input from individuals outside and within NSF, starting with a review panel made up of scientists and engineers with expertise in the relevant research area. Every proposal is reviewed by multiple experts in the field and confidential feedback is made available to each proposer, allowing them to refine their proposal and increase their chance of success in the future. The panel evaluates proposals using two, NSB-approved criteria: (1) Intellectual Merit and (2) Broader Impacts. The NSF Merit Review Process is rigorous, highly competitive, and is regarded as the “gold standard” for reviewing proposals in a competitive environment by the NSB. In addition, the NSB-NSF Commission on Merit Review was

⁹ National Science Foundation, *supra* note 1.

¹⁰ *Id.*

¹¹ National Science Foundation, “FY 2023 Performance and Financial Highlights,” <https://www.nsf.gov/pubs/2024/nsf24003/nsf24003.pdf>.

established at the 2022 NSB meeting¹² to assess the efficacy of the current Merit Review policy and associated criteria and processes at supporting NSF’s mission to create new knowledge, fully empowering diverse talent to participate in STEM, and benefiting society by translating knowledge into solutions.

Strategic Planning

In March 2024, the NSB released its biennial Science and Engineering Indicators report which found that the global position of the U.S. science and engineering enterprise has shifted due to rapid growth in China’s research and development investments and science and technology capabilities. The report highlights the importance of building capacity through investing in research and development (R&D), enhancing education and training opportunities, and bringing in underrepresented groups into a STEM-educated labor force.¹³

On March 28, 2022, NSF released its 2022-2026 Strategic Plan. The Plan builds on 70 years of NSF driving critical research across all disciplines. The four strategic goals identified in the Plan are to (1) empower STEM talent to fully participate in science and engineering, (2) discover new information about our universe, the world and ourselves, (3) positively impact society by translating knowledge into solutions, and (4) excel at NSF operations and management. These goals will serve as a foundation for ensuring American leadership in science and technology innovation.¹⁴

Research Security

U.S. research agencies have worked for decades to foster openness, transparency, and reciprocal international collaboration on basic research. However, in recent years, several incidents have led to the concern that other countries are taking advantage of the openness of the academic research environment in the United States.¹⁵ This sense of unfair competition is entwined with concerns about U.S. economic and national security. Threats to research security primarily arise from the failure of researchers applying for federal funding to disclose foreign affiliations, commitments, and sources of funding that may present a conflict of interest. Foreign talent recruitment programs have been found to incentivize or coerce participants to acquire “through illicit as well as licit means, proprietary technology or software, unpublished data and methods, and intellectual property to further the military modernization goals and/or economic goals of a foreign government.”¹⁶

Research agencies, universities, law enforcement, and intelligence agencies are actively engaging to identify and mitigate threats to research security while preserving the U.S. system of scientific openness, transparency, and international collaboration. At NSF, a new Chief of Research Security Strategy and Policy position was created in March 2020 to lead the agency’s response to this challenge. NSF employees and Intergovernmental Personnel Act (IPA) Program staff are prohibited

¹² National Science Board, Merit Review Process, Fiscal Year 2021 Digest, June 2023. Available at https://nsf-gov-resources.nsf.gov/2023-06/FY_2021_Merit_Review_Digest.pdf

¹³ National Science Board, National Science Foundation. 2024. Science and Engineering Indicators 2024: The State of U.S. Science and Engineering. NSB-2024-1. Alexandria, VA. Available at <https://nces.nsf.gov/pubs/nsb20243>.

¹⁴ National Science Foundation, “2022-2026 Strategic Plan,” March 2024. <https://www.nsf.gov/pubs/2022/nsf22068/nsf22068.pdf>.

¹⁵ JASON, The MITRE Corporation. *Fundamental Research Security*. December 2019. McLean, VA. Available at https://www.nsf.gov/news/special_reports/jasonsecurity/JSR-19-2IFundamentalResearchSecurity_12062019FINAL.pdf.

¹⁶ National Science & Technology Council. Recommended Practices for Strengthening the Security and Integrity of America’s Science and Technology Research Enterprise. January 2021. Available at

<https://trumpwhitehouse.archives.gov/wp-content/uploads/2021/01/NSTC-Research-Security-Best-Practices-Jan2021.pdf>.

from participating in foreign talent recruitment programs. Disclosure requirements for researchers seeking a grant were clarified to include participation in foreign talent recruitment programs and an electronic form was created to facilitate and streamline such disclosures.

On January 14, 2021, President Trump issued National Security Presidential Memorandum 33 (NSPM-33), “*Presidential Memorandum on United States Government-Supported Research and Development National Security Policy*,” which tasked the Office of Science and Technology Policy (OSTP) and the Subcommittee on Research Security with coordinating the implementation of these provisions across federal agencies to secure federally funded R&D.¹⁷ NSPM-33 directs actions by funding agencies to secure intellectual capital while acknowledging the importance of openness and scientific collaboration. These include:

- prohibiting federal personnel from participating in foreign-government-sponsored talent recruitment programs;
- requiring institutions of higher education to develop research security programs;
- directing agencies and universities to share information about individuals whose behavior poses a risk to research integrity and security;
- directing the Department of State and the Department of Homeland Security to review vetting processes for foreign students and researchers;
- directing agencies to harmonize disclosure processes and definitions; and
- streamlining the grant application process through the use of digital persistent identifiers (DPI).

In response, OSTP and the Subcommittee on Research Security have issued several publications containing guidance for federal agencies to implement the research security requirements outlined in NSPM-33, including the following:

- NSTC JCORE Subcommittee on Research Security, *Recommended Practices for Strengthening the Security and Integrity of America’s Science and Technology Research Enterprise*, January 2021;¹⁸
- White House, OSTP, NSPM-33 Fact Sheet, “President Trump Takes Bold Action to Strengthen the Security and Integrity of America’s Research and Development Enterprise,” January 2021;¹⁹
- White House, OSTP Blog Post by Eric Lander, “Clear Rules for Research Security and Researcher Responsibility,” August 10, 2021;²⁰
- White House, OSTP Blog Post by Eric Lander, “Guidance for U.S. Scientific Research Security That Preserves International Collaboration,” January 4, 2022;²¹

¹⁷ The White House, “Presidential Memorandum on United States Government-Supported Research and Development National Security Policy,” January 14, 2021, <https://trumpwhitehouse.archives.gov/presidential-actions/presidential-memorandum-united-states-government-supported-research-development-national-security-policy/>.

¹⁸ *supra* note 5

¹⁹ The White House, *President Trump Takes Bold Action to Strengthen the Security and Integrity of America’s Research and Development Enterprise*. January 2021. Fact Sheet. Available at <https://trumpwhitehouse.archives.gov/wp-content/uploads/2021/01/NSC-OSTP-NSPM33-Fact-Sheet-Jan2021.pdf>.

²⁰ Lander, E. (2021, August 10). Clear rules for research security and researcher responsibility. The White House.

<https://www.whitehouse.gov/ostp/news-updates/2021/08/10/clear-rules-for-research-security-and-researcher-responsibility/>

²¹ Lander, E. (2022, January 4). Guidance for U.S. Scientific Research Security that preserves international collaboration. The White House.

<https://www.whitehouse.gov/ostp/news-updates/2022/01/04/guidance-for-u-s-scientific-research-security-that-preserves-international-collaboration/>

- NSTC JCORE Subcommittee on Research Security, Guidance for Implementing National Security Presidential Memorandum 33 (NSPM-33) on National Security Strategy for United States-Government-Supported Research and Development, January 2022;²²
- Memorandum from Alondra R. Nelson, Deputy Director for Science and Society, OSTP, to Heads of Member Agencies of the National Science and Technology Council, “Re: Next Steps on NSPM-33 Implementation,” March 1, 2022;²³
- White House, OSTP, Updates on Research Security Policies and Practices in the U.S. Government, October 2022;²⁴ and
- On February 14, 2024, OSTP released two new guidance documents: 1) policy for the use of standardized disclosure forms, and 2) guidance prohibiting federal employee participation in foreign talent recruitment plans as well as award applicants’ participation in malign foreign talent recruitment programs.²⁵

In February 2023, the NSTC Subcommittee on Research Security released a “Draft Research Security Programs Standard Requirement” to facilitate implementation of Section 4(g) of NSPM-33.²⁶ The draft guidance provided additional details on covered organizations, foreign travel security, research security training, cybersecurity, and export control training. It also specified that federal agencies should communicate the required training components and standards to research organizations as part of their funding agreement processes. A revised version of the draft guidance was posted in the Federal Register for public comment on March 7, 2023.²⁷

Research Security Training Modules

As first directed by NSPM-33 and codified by the CHIPS and Science Act of 2022, NSF, in partnership with the National Institutes of Health (NIH), Department of Energy (DOE), and Department of Defense (DoD), released the first iteration of the Research Security Training Modules resource earlier this year.²⁸ The goal of these modules is to provide recipients of federal research funding the training and information necessary to identify and avoid security risks. These training courses were developed with support from NSF cooperative agreements with the University of Alabama in Huntsville, the Texas A&M University System, the University of Pennsylvania, and Associated Universities, Inc. and AUI Labs.

²² *supra* note 4.

²³ Office of Science and Technology Policy, & Nelson, A., White House. Retrieved from https://www.whitehouse.gov/wp-content/uploads/2022/03/03-2022-Coordination_RS_Letter.pdf.

²⁴ Executive Office of the President of the United States, Updates on Research Security Policies and Practices in the U.S. Government. Office of Science and Technology Policy . Retrieved from https://www.whitehouse.gov/wp-content/uploads/2022/10/WHOSTP_ResearchSecurity_CommunityBriefingSlides.pdf.

²⁵ Executive Office of the President of the United States, Memorandum for the Heads of Federal Research Agencies, retrieved from <https://www.whitehouse.gov/wp-content/uploads/2024/02/OSTP-Common-Disclosure-Form-Policy.pdf>

²⁶ NSTC Subcommittee on Research Security, “Draft Research Security Programs Standard Requirement,” February 2023, https://www.whitehouse.gov/wp-content/uploads/2023/02/RS_Programs_Guidance_public_comment.pdf

²⁷ OSTP, Request for Information; NSPM 33 Research Security Programs Standard Requirement, 88 Federal Register 14187, April 7, 2023, <https://www.federalregister.gov/documents/2023/03/07/2023-04660/request-for-information-nspm-33-research-security-programs-standard-requirement>.

²⁸ <https://new.nsf.gov/research-security/training#take-the-research-security-training-66a>

AI Institutes

As part of the National AI Initiative Act of 2020, Congress directed the creation of a network of AI Institutes, coordinated through NSF, that any Federal department or agency can fund to create partnerships between academia and the public and private sectors to accelerate AI research. Since enactment, twenty-five Institutes have been established, nearly \$500M in total investments, with focuses ranging from agriculture to cybersecurity to education.²⁹ The FY 2025 requests states NSF plans to award up to two additional AI Institutes in FY 2024, and up to three more in FY 2025.

National Artificial Intelligence Research Resource (NAIRR) Pilot Program

On January 24, 2024, NSF launched a two-year pilot program for NAIRR, in partnership with 10 other Federal agencies and more than 25 private sector, nonprofit, and philanthropic organizations.³⁰ The goals of the pilot program are to serve as a proof-of-concept model for connecting researchers and educators to resources and to demonstrate NAIRR's ability to advance novel and transformative AI research. The first round of funding will prioritize proposals that address 1) safe, secure, and trustworthy AI, 2) healthcare, 3) environment and infrastructure, and 4) AI education.

On May 6, 2024, NSF announced the first 35 projects to be supported with computational time and access to federal high-performance computing resources provided by NSF and the DOE.³¹ Projects granted computing time will be able to practice investigations into language model safety and security, privacy and federated models, and privacy-preserving synthetic data generation. Other projects also focus on domain-specific research, such as using AI and satellite imagery to map permafrost disturbances, developing a foundation model for aquatic sciences, securing medical imaging data, and using AI for agricultural pest identification.

Quantum Leap Challenge Institutes (QLCI)

Congress directed NSF to establish multidisciplinary centers for quantum research and education in the National Quantum Initiative Act (NQIA) of 2018³². In response, NSF created the Quantum Leap Challenge Institutes, a large-scale interdisciplinary research project program. On November 29, 2023, the Science, Space, and Technology Committee favorably reported the National Quantum Initiative Reauthorization Act³³ out of committee, which authorizes the creation of additional quantum centers and institutes. Since their creation in 2018, QLCI's have done the following: 1) fostered collaboration between academic researchers, industry partners, and national laboratories to accelerate the development and application of quantum technologies; 2) addressed critical challenges and driving breakthroughs in areas such as quantum computing, quantum sensing, and quantum communications; 3) supported the education and training of the next generation of quantum scientists, engineers, and technicians, helping to build a robust quantum workforce.

²⁹ NSF Announces 7 New National Artificial Intelligence Research Institutes. (n.d.). [NSF - National Science Foundation](#)

³⁰ National Science Foundation, "Democratizing the future of AI R&D: NSF to launch National AI Research Resource pilot", press release, January 24, 2024, available at <https://new.nsf.gov/news/democratizing-future-ai-rd-nsf-launchnational-ai>.

³¹ National Science Foundation, "NSF-led National AI Research Resource Pilot awards first round access to 35 projects in partnership with DOE", press release, May 6, 2024, available at https://new.nsf.gov/news/nsf-led-national-ai-research-resource-pilot-awards?utm_source=miragenews&utm_medium=miragenews&utm_campaign=news

³² [P.L. 115-368](#)

³³ [H.R. 6213](#)

United States Antarctica Program (USAP) Investigation

The Committee has been conducting oversight of sexual assault and harassment in academic settings since 2018. However, since the release of the Sexual Assault/Harassment Prevention and Response Report (SAPHR)³⁴ in 2022, the Committee has been extensively investigating the prevalence, prevention, and response to sexual assault and harassment within the United States Antarctic Program (USAP). In December 2022, the Committee held a hearing with NSF and Leidos regarding issues raised in the SAPHR report.³⁵ Following this hearing, the Committee launched a bipartisan investigation into the USAP beginning with a letter of clarification to Leidos regarding their responses to questions for the record from the hearing.³⁶ The Committee then began conversations with various former and current USAP contract employees. As a result of those conversations, the Committee sent two letters in November of 2023, one to NSF³⁷ and one to Leidos³⁸ requesting substantial document productions.³⁹ The Committee has been receiving and reviewing documents from both entities since early December 2023. Over the last five months, the Committee has also conducted interviews with the various subcontractors to the USAP in Antarctica to better understand the reporting processes and communications dynamics on the ground in Antarctica. As staff continues document review, the Committee will move forward with understanding the issues related to the sexual assault and harassment reporting structure in the USAP.

Budget Request Overview

The President's FY25 budget request for NSF is \$10.1 billion, a 14% increase of \$1.1 billion above the FY24 total enacted level of \$9.06 billion.⁴⁰

³⁴ NAT'L SCIENCE FOUND., OFF. OF POLAR PROGRAMS, AND US ANTARCTICA PROGRAM, SEXUAL ASSAULT/HARASSMENT PREVENTION AND RESPONSE (SAPHR), FINAL REPORT, (2022),

<https://www.nsf.gov/geo/opp/documents/USAP%20SAHPR%20Report.pdf>

³⁵ *Building a Safer Antarctica Research Environment Full Comm. Hearing Before the H. Comm. On Science, Space, and Tech.*, 117th Cong. 2 (2022) <https://science.house.gov/2022/12/full-committee-hearing-building-a-safer-antarctic-research-environment>

³⁶ See Leidos Response to U.S. House Science, Space, and Technology Committee letter from Chairman Lucas and Ranking Member Lofgren, May 12, 2023; compared to Building a Safer Antarctic Research Environment Full Comm. Hearing Before the H. Comm. on Science, Space, and Tech., 117th Cong. 2 (2022) (Leidos Response to Questions for the Record), <https://republicans-science.house.gov/cache/files/9/8/98be50e4-386a-4bfc-b8c4-ed9bffabf86f/F55169C206211288C386C63C7DC0430B.12-may-2023-leidos-response-redacted.pdf>

³⁷ U.S. House Science, Space, and Technology Committee, press release from Chairman Lucas and Ranking Member, November 16, 2023, <https://republicans-science.house.gov/cache/files/b/9/b9691eb1-cb10-4881-a88a-0b5003c8795f/FB55969D94154371D9E1681E2A92FAEB.11.16.2023-usap-questions-letter-to-nsf.pdf>

³⁸ U.S. House Science, Space, and Technology Committee, Letter from Chairman Lucas and Ranking Member, to Sethuraman Panchanathan, November 16, 2023, <https://republicans-science.house.gov/cache/files/6/6/66d373e8-bb67-459b-8c74-b5784ffb7d88/63F57F8E085B85E9C23166A6F712C325.11.16.2023-usap-questions-letter-to-leidos.pdf>

³⁹ U.S. House Science, Space, and Technology Committee, Letter from Chairman Lucas and Ranking Member, to Thomas Bell, November 16, 2023, <https://science.house.gov/2023/11/lucas-and-lofgren-expand-committee-s-investigation-into-handling-of-sexual-assault-in-the-u-s-antarctic-program>

⁴⁰ National Science Foundation, *supra* note 1.

*National Science Foundation (NSF) FY25 Budget Request
(Dollars in millions)*

Account	FY22 Enacted	FY23 Enacted	FY24 Enacted	FY25 Request	FY25 Request Over FY24 Enacted	
					\$	%
Research and Related Activities (RRA)	6964.66	7826.80	7176.50	8045.32	868.82	12.10
STEM Education	1146.72	1371.00	1172.00	1300.00	128.00	10.92
Major Research Equipment & Facilities Construction (MREFC)	120.60	187.23	234.00	300.00	66.00	28.20
Agency Operations & Award Management (AOAM)	420.21	463.00	448	504.00	56.00	12.50
Office of Inspector General (OIG)	18.89	23.39	24.41	28.46	4.05	16.59
National Science Board (NSB)	4.52	5.09	5.09	5.22	0.13	2.55
Totals:	8675.61	9876.51	9060.00	10183.00	1123.00	13.81

Budget Request Highlights

The NSF Director’s vision for the future can be summarized in three pillars that point to opportunities to continue building on recent investments, such as the CHIPS and Science Act⁴¹ and the FY 2023 Omnibus and the Disaster Relief Supplemental Appropriations.⁴² These pillars⁴³ include:

1. ***Strengthening Established NSF*** – For more than seven decades, NSF has been making investments to expand the frontiers of science and technology. This mission to accelerate discovery and enhance U.S. research capabilities will continue to be a central focus.
2. ***Inspiring Missing Millions*** – In its *Vision 2030* report, the NSB identified a significant talent gap in the science and engineering workforce which they name the “Missing Millions.”⁴⁴ Every geographic region of the country has talented people who can contribute to the innovation of our national scientific enterprise. To address this talent gap, NSF plans to increase investments in existing programs and create new pathways into STEM fields to expand opportunities leading to a well-paid workforce and vibrant economy.
3. ***Accelerating Technology and Innovation*** – Global competition for leadership and talent in science, engineering, and technology is escalating. To maintain global leadership, the U.S. must continue to invest in advancing breakthrough technologies, translating research results to the market and society, and nurturing diverse talent by creating opportunities for everyone everywhere. To enable these types of investments, NSF plans to accelerate partnerships with other agencies, private industry, nonprofits, and foreign allies to foster innovation through the leveraging of resources.

⁴¹ [P.L. 117-167](#)

⁴² [P.L. 117-164](#)

⁴³ National Science Board, *supra* note 1.

⁴⁴ National Science Board. “*Vision 2030*,” May 2020. <https://www.nsf.gov/nsb/publications/2020/nsb202015.pdf>.

NSF Investments in Emerging Technologies

NSF has supported research to advance emerging technologies for decades. As the U.S. faces intensifying global competition in science and technology, NSF’s investments in emerging technology research are imperative for scaling innovation and commercializing basic research. Created in 2022, the Technology, Innovation and Partnership (TIP) Directorate builds on NSF’s longstanding leadership in science and engineering research and education. It serves as a crosscutting platform that leverages, energizes, and rapidly advances use-inspired research and innovation. Further, TIP opens new possibilities for research and education by catalyzing strategic partnerships that link academia; industry, including startups and small businesses; federal, state, local, and tribal governments; nonprofits and philanthropic organizations; civil society; and communities of practice to cultivate 21st-century innovation ecosystems that give rise to future jobs and enhance the Nation’s long-term competitiveness. The FY 2025 budget request for TIP is \$900 million.⁴⁵ NSF investments in key technology focus areas, remain crucial to securing American leadership in the future. NSF has identified six focus areas for proposed funding increases including advanced manufacturing, advanced wireless, artificial intelligence, biotechnology, microelectronics and semiconductors, and quantum information science.

*NSF Emerging Industries Funding⁴⁶
(Dollars in Millions)*

Emerging Industry	FY22 Actual	FY23 Enacted	FY24 Request	FY25 Request
Advanced Manufacturing	\$364.89	\$367.43	\$453.86	\$386.67
Advanced Wireless	\$131.76	\$161.31	\$179.17	\$167.90
Artificial Intelligence	\$679.23	\$687.70	\$796.48	\$729.16
Biotechnology	\$315.22	\$401.28	\$470	\$421.18
Microelectronics & Semiconductors	\$106.46	\$164.24	\$209.68	\$174.97
Quantum Information Science	\$252.48	\$275.91	\$332.67	\$294.37

*Investments may overlap and should not be summed.

Research Infrastructure

Research infrastructure is foundational to science and innovation and enables advances in all scientific disciplines. The FY 2025 request includes funds for ongoing Major Research Equipment and Facilities Construction (MREFC) (\$304.67 million) which supports construction projects that require an investment of more than \$100 million. This funding would support three ongoing projects – the Antarctic Infrastructure Recapitalization program,⁴⁷ the two detector upgrades to operate the High Luminosity-Large Hadron Collider, and the Vera C. Rubin Observatory – and one new project – the Leadership-Class Computing Facility. The MREFC account also supports the Mid-scale Research Infrastructure Track 2 program which funds projects in the \$20 million to \$100 million range.

⁴⁵ National Science Foundation, *supra* note 1.

⁴⁶ National Science Foundation, *supra* note 1.

⁴⁷ United States Antarctic Program, “Background of AIMS,” <https://future.usap.gov/foundation-of-aims/>.

MREFC Account Funding, by Project⁴⁸
(Dollars in Millions)

Project	FY23 Estimate	FY24 Request	FY25 Request
Antarctic Infrastructure Recapitalization	\$60.00	\$60.00	\$60.00
HL-Large Hadron Collider Upgrade	\$33.00	\$38.0	-
Leadership-Class Computing Facility	-	\$93.0	\$154.00
Mid-scale Research Infrastructure, Track 2	\$76.25	\$105.06	\$85.00
Regional Class Research Vessel	\$1.98	-	-
Vera C. Rubin Observatory	\$15.00	\$7.61	-
Dedicated Construction Oversight	\$1.00	\$1.0	\$1.00
Totals	\$187.23	\$304.67	\$300.00

The FY 2025 budget request also includes increases for Major Facilities operations and maintenance. In addition to regular upkeep, support for upgrades and periodic maintenance must be addressed within the budget for facilities operations and management, which accounts for 10 percent of NSF's total request in FY 2025.⁴⁹

⁴⁸ National Science Foundation, *supra* note 1.

⁴⁹ National Science Foundation, *supra* note 1.