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The National Science Foundation: An Overview

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SUMMARY

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The National Science Foundation: An Overview

The National Science Foundation (NSF) supports basic research and education in the non-medical sciences and engineering. Congress established the foundation as an independent federal agency through the National Science Foundation Act of 1950 to "promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." The NSF is a major source of federal support for U.S. university research, especially in such areas as the social sciences, mathematics, and computer science. It is also responsible for substantial shares of the federal science, technology, engineering, and mathematics (STEM) education program portfolio and federal STEM student aid and support.

The NSF is an independent federal agency. Although governed by the congressional and administration budget and oversight processes, NSF's independent status has provided it with greater institutional autonomy than some other federal agencies. Some analysts assert that this autonomy protects NSF's scientific mission. It may also be perceived as existing in tension with other public values, such as accountability. The tension between independence and accountability is an enduring policy theme for the NSF. It is reflected in historical debates over the agency's authorization period and the role of Congress in topics such as grant-making and research prioritization.

NSF leadership and staff include highly trained scientists and engineers from a wide variety of scientific disciplines. In FY2020, NSF had a total workforce of over 2,000 at its headquarters in Alexandria, VA, including over 175 rotators—temporary staff from the research community who work at NSF for two to four years. NSF is governed jointly by the NSF director and the 24-person National Science Board (NSB). The director oversees the day-to-day activities of NSF, including staff and management, program creation and administration, grant-making and merit review, planning, budget, and operations. The NSB establishes agency policies, identifies issues critical to NSF's future, approves the agency's strategic budget direction, approves annual budget submissions to the Office of Management and Budget, and approves new major programs and awards. The board also serves as an independent body of advisors to Congress and the President.

NSF has seven directorates that support science and engineering research and education; directorates are organized mainly by academic discipline. NSF directorates are further divided into divisions—typically with between four and six divisions or offices per directorate—that manage programs. In addition to these seven directorates, two offices administer NSF-wide programs: the Office of International Science and Engineering (OISE) and the Office of Integrative Activities (OIA). Among various cross-directorate and agency-wide investments, two areas of particular focus at NSF and interest to Congress have been artificial intelligence (AI) and the agency's "Big Ideas," which the agency describes as bold inquiries into the frontiers of science and engineering that endeavor to break down the silos of conventional scientific research to embrace cross-disciplinary and dynamic research.

After the Department of Health and Human Services, NSF is the largest source of federal funding for basic research, and the top source of federal funding for basic research in the fields of computer sciences and mathematics, environmental sciences, and social sciences. NSF does not conduct research in-house; rather, the agency provides research funding to outside entities (i.e., extramural research). In FY2020, NSF distributed 74% of its obligations for research and education funding via grants, 21% via cooperative agreements, and 5% via contracts.

Approximately 80% of NSF research and education funds are typically awarded to colleges, universities, and academic consortia. The remainder goes to private industry (about 13%), federally funded research and development centers (FFRDCs, about 3%), and other recipients (about 4%). In addition to research grants, NSF provides funding for the construction, operations, and maintenance of research facilities and equipment. In FY2020, NSF issued approximately 12,200 new competitive awards to almost 1,900 colleges, universities, and other institutions in all 50 states, the District of Columbia, and 3 U.S. territories. In FY2021, NSF received $8.49 billion in appropriations. Of this amount, 81.4% supported the research and related activities account (RRA, $6.9 billion), 11.4% supported the education and human resources account (EHR, $968 million), and 2.8% supported major research equipment and facilities construction (MREFC, $241 million), with the remainder supporting administrative and related activities. After adjusting for inflation, NSF funding has seen slight increases in FY2020 and FY2021, after remaining relatively flat between FY2010 and FY2019.

The vast majority of NSF funding is awarded through a competitive, merit-based review process. This process involves three phases and at least five kinds of scrutiny for proposals, including an initial assessment for completeness, peer review by external subject matter experts who evaluate proposals according to two broad criteria (intellectual merit and broader impacts), program officer review, division director review, and a final assessment of the business, financial, and policy implications. Annually, NSF receives over 50,000 proposals for research, education, and training projects. In FY2020, NSF's funding of 12,200 awards represented an overall success rate of 28% for competitively reviewed proposals. About 29,000 individuals participated in the merit review process as panelists and proposal reviewers in FY2019.

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Introduction

The National Science Foundation (NSF) supports basic research and education in the non-medical sciences and engineering. Congress established the foundation as an independent federal agency through the National Science Foundation Act of 1950 to "promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."[1] The NSF is a major source of federal support for U.S. university research, especially in such areas as the social sciences, mathematics, and computer science. It is also responsible for substantial shares of the federal science, technology, engineering, and mathematics (STEM) education program portfolio and federal STEM student aid and support.

This report serves as an introduction to the NSF and provides background and institutional context for various policy debates surrounding the agency and its work. The **Appendix** contains information on NSF's legislative origins and selected reauthorization acts.

Structural Characteristics

Certain NSF structural characteristics set the foundation apart from other federal agencies and strongly influence its relationship with Congress. In particular, the NSF is generally classified as an "independent agency." Two of the characteristics that contribute to this classification include NSF's position within the executive branch—it is freestanding, not within an executive department—and its leadership arrangement.[2] The NSF (unlike many other federal agencies) is governed by a 24-member board and a director, each of whom are appointed by the President to six-year terms.[3] Further, the foundation's organic act specifically establishes it as an "independent agency."[4] However, the President and Congress retain authorities and powers over the agency. For example, NSF's authorizing statute expressly references the President's authority to remove the director. Further, both Congress and the President retain the power to govern the NSF through the budget, appropriations, and oversight processes.

Policymakers have expressed a variety of rationales for establishing independent agencies, including the belief that independence will facilitate better decisionmaking (particularly with respect to complex, ostensibly apolitical, or technical issues) or the desire to free agencies from the control and direction of the executive.[5] In NSF's case, one historian observed, "Although the director was subject to removal by the President, his six-year statutory term, like that of the board members, showed a desire to insulate the agency from politics."[6] Some analysts, though, find trade-offs to agency independence, noting that (in general) "autonomy can be a means of helping [agencies] accomplish democratic purposes[;] … however, [it] also shields them from direct

[1] P.L. 81-507.

[2] See David E. Lewis and Jennifer L. Selin, *Sourcebook of United States Executive Agencies*, 1st ed. (Washington, DC: Administrative Conference of the United States, March 2013), p. 54; J. Merton England, "National Science Foundation," in *Government Agencies*, ed. Donald R. Whitnah (Westport, CT: Greenwood Press, 1983), pp. 367-372; and Harold Seidman, "A Typology of Government," in *Federal Reorganization: What Have We Learned*, ed. Peter Szanton (Chatham, NJ: Chatham House Publishers, Inc. 1981), pp. 43-44.

[3] The NSF director is also subject to confirmation by the Senate.

[4] P.L. 81-507, Sec. 2; 42 U.S.C. 1861.

[5] For more information about independent agencies—including rationales for, historical origin of, and accountability in—see the section titled "Background and Context" in CRS Report R43391, *Independence of Federal Financial Regulators: Structure, Funding, and Other Issues*, by Henry B. Hogue, Marc Labonte, and Baird Webel.

[6] England, p. 367.

accountability."[7] (See text box.) As a practical matter, legislators seeking to apply various federal assets toward specific national goals may find both benefits and barriers in the foundation's status as an independent agency.

A Central Tension

In varying ways and to varying degrees, Congress has grappled with the tension between scientific independence and public accountability at the NSF since the foundation was established in 1950. (See **Appendix** for debates around the legislative origin of NSF.) This tension has remained a central policy theme for the NSF throughout its history. It is embedded in the very nature of the NSF as a federal entity, underpinning a wide variety of NSF policy debates. Some policymakers assert that the foundation can best accomplish its scientific purposes if free from undue political influence; others seek to ensure accountability in the expenditure of public funds. Each Congress has the opportunity to revisit this tension and to redefine the relationship between the NSF and Congress.

Leadership and Staff

Consistent with the foundation's purposes, NSF leadership and staff include highly trained scientists and engineers from a wide variety of disciplines. In FY2020, NSF had a total workforce of over 2,000 at its headquarters in Alexandria, VA, including 1,421 full-time equivalent (FTE) employees, 177 temporary rotator scientist appointments (discussed below), and 450 contract workers.[8] In addition to its headquarters, NSF maintains an office in Christchurch, New Zealand, to support the U.S. Antarctic Program (USAP) and an office for the Office of the Inspector General (OIG) in Denver, CO.[9]

Leadership. The National Science Foundation is governed jointly by the NSF director and the 24-person National Science Board (NSB).[10] The director oversees the day-to-day activities of NSF, including staff and management, program creation and administration, grant-making and merit review, planning, budget, and operations.[11] The NSB establishes agency policies, identifies issues critical to NSF's future, approves the agency's strategic budget direction, approves annual budget submissions to the Office of Management and Budget, and approves new major programs and awards.[12] The board also serves as an independent body of advisors to Congress and the

[7] Lewis and Selin, p. 59.

[8] FTEs include the federal employee workforce for NSF, the NSB, the OIG, and the U.S. Arctic Research Commission (NSF, *FY 2020 Agency Financial Report*, November 16, 2020, p. MD&A-10, https://www.nsf.gov/pubs/2021/nsf21002/pdf/nsf21002.pdf); and NSF, "About NSF: Who We Are," accessed April 1, 2020, http://www.nsf.gov/about/who.jsp.

[9] NSF, *FY 2020 Agency Financial Report*, November 16, 2020, p. MD&A-10, https://www.nsf.gov/pubs/2021/nsf21002/pdf/nsf21002.pdf. Prior to 2018, NSF had overseas offices in Beijing, China; Brussels, Belgium; and Tokyo, Japan. Those offices were closed reportedly because of "a desire for NSF to be more strategic and focused in its international affairs"; see Dennis Normile and Richard Stone, "National Science Foundation to Close Its Overseas Offices," *Science Magazine*, February 26, 2018, https://www.sciencemag.org/news/2018/02/national-science-foundation-close-its-overseas-offices.

[10] Also referred to in this report as "the board"; more information about NSF leadership and staff may be found in Stephen Horn (panel chair), et al., *National Science Foundation: Governance and Management for the Future*, National Academy of Public Administration, April 2004, p. xv, at http://www.napawash.org/2004/1539-national-science-foundation-governance-and-management-for-the-future.html.

[11] National Science Foundation, "About NSF: Who We Are," accessed April 1, 2021, http://www.nsf.gov/about/who.jsp.

[12] National Science Board, "About the NSB," accessed April 1, 2021, http://www.nsf.gov/nsb/about/; see also the section titled "Grant-Making" in this report.

President. NSF's director is an *ex officio* member of the board. NSB members typically come from industry or academia and represent a variety of disciplines.[13] Historically, most NSF directors have come from the fields of physics, but this is not a requirement.[14]

Appointment and Terms of Office. The President appoints the NSF director with the advice and consent of the Senate. The President also appoints the members of the NSB. (In 2012, Congress enacted legislation removing Senate confirmation requirements for the members of the NSB.)[15] Both the NSF director and members of the board serve six-year terms. NSB terms are staggered such that one-third of the board is appointed every two years.

Deputy Director. 42 U.S.C. §1864a provides statutory authority for the position of NSF deputy director and provides the deputy director with the power to act as NSF director in the event of a vacancy, disability, or absence. The deputy director also performs other duties as determined by the director. The President appoints the NSF deputy director with the advice and consent of the Senate. Unlike the director and board members, the deputy director has no statutorily prescribed term of office.

Assistant Directors. The leaders of NSF's directorates carry the title "assistant director." The assistant director position is not currently statutorily authorized.[16] In FY2020, there were seven assistant directors in charge of directorates.[17] Assistant director duties vary by directorate and in some cases have changed over time. In general, assistant directors lead directorate programs and initiatives and are responsible for planning and implementing programs, priorities, and policies. Assistant directors are often nonpermanent staff. In previous years, this position required presidential appointment and Senate confirmation.

Division Directors. Division directors are responsible for long-range planning and budgetary stewardship within their research areas. They also oversee the grant-making process and, in many cases, make the final programmatic decisions to approve (or decline) awards to NSF grant-seekers.

Program Officers/Directors. Program officers are subject matter experts. They conduct scientific, technical, and programmatic review and evaluation of proposals, including peer reviewer recruitment and management of the proposal review process. They manage program budgets and provide award oversight. Program officers make proposal funding recommendations to division directors.

Rotators. The NSF workforce is made up of permanent FTEs and temporary staff, including those referred to as "rotators." Rotators may be hired under the authority of the Intergovernmental Personnel Act of 1970 (IPA, P.L. 91-648) or through NSF's own Visiting Scientist, Engineer, and Educator (VSEE) program. VSEE rotators are considered temporary federal employees, receiving their salary through NSF while on a leave of absence from their home institutions for up to two

[13] Board members must be "eminent in the fields of the basic, medical, or social sciences, engineering, agriculture, education, research management or public affairs…." (42 U.S.C. §1863(c)(1)).

[14] National Science Foundation, "List of NSF Directors, 1950-Present," accessed April 1, 2021, http://www.nsf.gov/od/nsf-director-list/nsf-directors.jsp.

[15] Presidential Appointment Efficiency and Streamlining Act of 2011 (P.L. 112-166, Section 2(s)).

[16] An Act to Amend the National Science Foundation Act of 1950 (P.L. 90-407, Section 6(b)), authorized four Assistant Directors at NSF to be appointed by the President with advice and consent of the Senate. The National Science Foundation Authorization Act for Fiscal Year 1987 (P.L. 99-383), subsequently struck the subsection providing that authorization.

[17] Assistant directors are listed on NSF's April 2021 organizational chart at https://www.nsf.gov/staff/organizational_chart.pdf.

years. In contrast, IPA rotators are not considered federal employees, though they are subject to provisions of law governing the ethics and conduct of federal employees.[18] IPA rotators must be U.S. citizens, and they typically come from institutions of higher education, but they may come from other organizations as well (e.g., state and local government, Indian tribal government, nonprofit entities). IPA rotators retain ties to their home institutions—including disbursements for pay and benefits—and may serve the NSF for up to four years. In FY2021, NSF requested funding for 205 IPAs.[19]

NSF Rotators: Pros and Cons

Policy analysts have debated NSF's use of rotators.[20] NSF asserts that rotators bring fresh, cutting-edge insight to foundation programs and that rotators increase knowledge transfer between the research community and the foundation. But the program has generated management challenges, including concerns that (1) IPAs can have heightened risks for conflict of interest because most come from institutions that receive NSF grants; (2) there is frequent staff turnover because they are limited to serving four years and are often in senior leadership positions; and (3) IPA salaries are not subject to federal pay and benefits limits, which makes them generally more expensive than federal employees.[21] The American Innovation and Competitiveness Act of 2017 (P.L. 114-329) directed NSF to report to certain congressional committees on its effort to control costs of the program, respond to NSF OIG management concerns from prior years, and provide annual justifications for each IPA rotator whose pay exceeds the maximum rate of pay for federal employees.[22] In 2018, the Government Accountability Office (GAO) reviewed NSF's use and management of IPA and VSEE rotator programs.[23] The GAO report recommended that NSF develop an agency-wide strategy for balancing NSF's use of rotators with permanent staff and evaluate the contributions of rotator programs towards NSF's human capital goals and programmatic results; NSF agreed with these recommendations and continues to work on implementing them.[24]

Directorates and Offices

NSF's dual mission is to support basic research and education in the non-medical sciences and engineering.[25] NSF is the second-largest source of federal funding for basic research after the

[18] Though NSF refers to both IPAs and VSEEs as rotators, the programs differ in some key ways. For example, VSEEs are on a non-paid leave of absence from their home institutions for a shorter period of time (up to one year with a possible one-year extension), and while they count as regular federal employees, their benefits are still provided through their home institutions as reimbursements from NSF. For more information, see NSF, "Rotator Programs," accessed April 1, 2021, https://beta.nsf.gov/careers/rotator-programs.

[19] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "R&RA and EHR-2," https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[20] For example, see Jeffrey Mervis, "Special Report: Can NSF Put the Right Spin on Rotators? Part 1," *Science Insider*, October 10, 2013, http://news.sciencemag.org/policy/2013/10/special-report-can-nsf-put-right-spin-rotators-part-1; and Jeffrey Mervis, "Special Report: Can NSF Put the Right Spin on Rotators? Part 2," *Science Insider*, October 24, 2013, at http://news.sciencemag.org/people-events/2013/10/special-report-can-nsf-put-right-spin-rotators-part-2.

[21] Managing the IPA program is one of the FY2021 management challenges identified by the NSF Office of the Inspector General (OIG) for FY2021. See NSF OIG, *Management Challenges for the National Science Foundation in Fiscal Year 2021*, October 15, 2020, p. 5, https://www.oversight.gov/sites/default/files/oig-reports/NSF_Management_Challenges_FY2021.pdf.

[22] Codified at 42 U.S.C. 1862s-3.

[23] Government Accountability Office, National Science Foundation: A Workforce Strategy and Evaluation of Results Could Improve Use of Rotating Scientists, Engineers, and Educators, September 2018, https://www.gao.gov/products/gao-18-533.

[24] See a discussion of NSF's management activities for the IPA rotator program in NSF, *FY 2020 Agency Financial Report*, November 16, 2020, pp. "MD&A-13"–"MD&A-14," https://www.nsf.gov/pubs/2021/nsf21002/pdf/nsf21002.pdf.

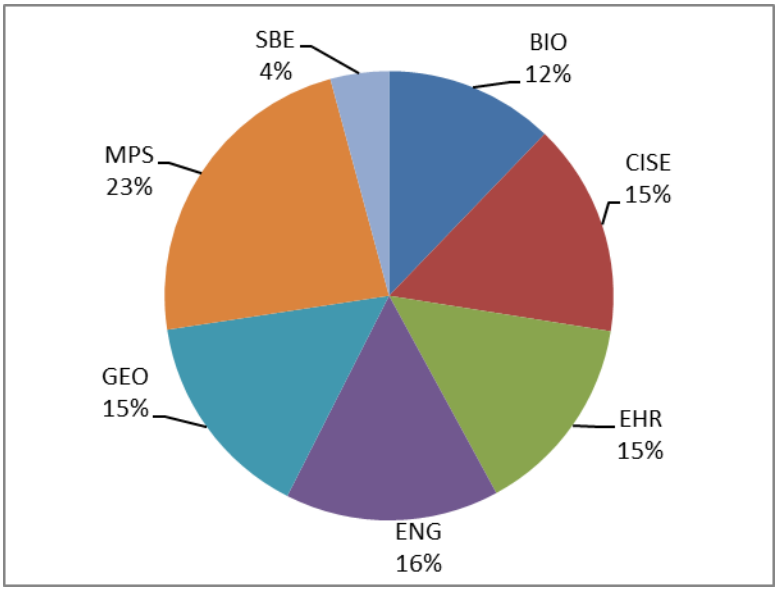
[25] OMB Circular A-11, Schedule C, defines basic research as "experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts. Basic research may include

Department of Health and Human Services, and the top source of federal funding for basic research in the fields of computer sciences and mathematics, environmental sciences, and social sciences.[26] Funding for STEM education activities at NSF constitute the largest shares (both by numbers of programs and total investment) of federal STEM education effort.[27]

NSF has seven directorates that support science and engineering research and education; directorates are organized mainly by academic discipline.[28] The largest directorate (measured by FY2019 actual funding) is Mathematical and Physical Sciences. The smallest directorate is Social, Behavioral, and Economic Sciences. **Figure 1** shows the distribution of total FY2019 actual funding by directorate. (Finalized data for FY2020 are not yet available.) **Figure 2** shows the agency's organization chart.

Figure 1. Distribution of Funding for NSF Directorates

FY2019 Actual, by Directorate



Source: Congressional Research Service, based on FY2019 actual funding levels reported in NSF's *FY2021 Budget Request to Congress*, https://www.nsf.gov/about/budget/fy2021/index.jsp.

Notes: The term "SBE" refers to the Directorate for Social, Behavioral, and Economic Sciences; "BIO" refers to the Directorate for Biological Sciences; "CISE" refers to the Directorate for Computer and Information Science and Engineering; "EHR" refers to the Directorate for Education and Human Resources; "ENG" refers to the

activities with broad or general applications in mind … but should exclude research directed towards a specific application or requirement." Basic research differs from applied research, which is "original investigation undertaken in order to acquire new knowledge … directed primarily towards a specific practical aim or objective" and from experimental development, which is "creative and systematic work, drawing on knowledge gained from research and practical experience, which is directed at producing new products or processes or improving existing products or processes." See Office of Management and Budget, "Section 84—Character Classification (Schedule C)," *OMB Circular A-11* (2020), p. 3, https://www.whitehouse.gov/wp-content/uploads/2018/06/s84.pdf.

[26] Based on FY2018 data from Tables 27 and 30 of the National Science Foundation, National Center for Science and Engineering Statistics, *Federal Funds for Research and Development: Fiscal Years 2018-2019*, at https://ncsesdata.nsf.gov/fedfunds/2018/index.html.

[27] See CRS Report R45223, *Science, Technology, Engineering, and Mathematics (STEM) Education: An Overview*, by Boris Granovskiy.

[28] NSF, "Research Areas," accessed April 2, 2021, https://www.nsf.gov/about/research_areas.jsp.

Directorate for Engineering; "GEO" refers to the Directorate for Geosciences; and "MPS" refers to the Directorate for Mathematical and Physical Sciences. Actual funding includes annual appropriations, unobligated balances, transfers, and other adjustments.

NSF directorates are divided into divisions—typically with between four and six divisions or offices per directorate—that manage programs. The appropriations account for all but one directorate is NSF's Research and Related Activities (RRA) account. The Directorate for Education and Human Resources is the exception; its main source of appropriations is the Education and Human Resources (EHR) account. Within the RRA and EHR appropriations accounts, NSF generally has broad discretion to distribute funding among agency accounts. Many NSF programs and projects are cofunded (i.e., they receive funding from two or more agency accounts) or involve coordination and cooperation between programs and directorates.[29]

Directorate for Biological Sciences (BIO). BIO's mission "is to enable discoveries for understanding life. BIO-supported research advances the frontiers of biological knowledge, increases our understanding of complex systems, and provides a theoretical basis for original research in many other scientific disciplines."[30] BIO divisions include Biological Infrastructure, Environmental Biology, Integrative Organismal Systems, Molecular and Cellular Biosciences, and Emerging Frontiers. FY2019 actual funding for BIO was $784 million.[31]

Directorate for Computer and Information Science and Engineering (CISE). CISE "supports investigator-initiated research and education in all areas of computer and information science and engineering, fosters broad interdisciplinary collaboration, helps develop and maintain cutting-edge national computing and information infrastructure for research and education, and contributes to the development of a computer and information technology workforce with skills essential for success in the increasingly competitive global market."[32] CISE offices and divisions include Advanced Cyberinfrastructure, Computing and Communication Foundations, Computer and Network Systems, Information and Intelligent Systems, and Information Technology Research. FY2019 actual funding for CISE was $985 million.[33]

Directorate for Education and Human Resources (EHR). EHR seeks to "achieve excellence in U.S. science, technology, engineering, and mathematics (STEM) education at all levels and in all settings (both formal and informal) in order to support the development of a diverse and well-prepared workforce of scientists, technicians, engineers, mathematicians and educators and a well-informed citizenry that have access to the ideas and tools of science and engineering."[34] EHR divisions include Graduate Education, Human Resource Development, Undergraduate Education, and Research on Learning in Formal and Informal Settings. FY2019 actual funding for EHR was $935 million.[35]

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[29] Division lists and FY2019 actual funding levels in the following section are as per NSF, "Research Areas," accessed April 2, 2021, https://www.nsf.gov/about/research_areas; and NSF's *FY2021 Budget Request to Congress*.

[30] NSF, Directorate for Biological Sciences, "About Biological Sciences," accessed April 2, 2021, https://www.nsf.gov/bio/about.jsp.

[31] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. BIO-1, https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[32] NSF, Directorate for Computer and Information Science and Engineering, "CISE—About," accessed April 2, 2021, http://www.nsf.gov/cise/about.jsp.

[33] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. CISE-1, https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[34] NSF, Directorate for Education and Human Resources, "About Education and Human Resources," accessed April 2, 2021, http://www.nsf.gov/ehr/about.jsp.

[35] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. EHR-1, https://www.nsf.gov/about/budget/fy2021/

Directorate for Engineering (ENG). ENG "investments in engineering research and education are critical building blocks for the nation's future prosperity. Engineering breakthroughs address national challenges, such as smart manufacturing, resilient infrastructure and sustainable energy systems. Engineering also brings about new opportunities in areas ranging from advanced photonics to prosthetic devices."[36] ENG divisions include Chemical, Bioengineering, Environmental, and Transport Systems; Civil, Mechanical, and Manufacturing Innovation; Electrical, Communications, and Cyber Systems; Emerging Frontiers and Multidisciplinary Activities; Engineering Education and Centers; and Industrial Innovation and Partnerships. FY2019 actual funding for ENG was $991 million.[37]

Directorate for Geosciences (GEO). GEO supports "research spanning the Atmospheric, Earth, Ocean and Polar sciences" and "provides interagency leadership for U.S. polar activities."[38] GEO divisions include Atmospheric and Geospace Sciences, Earth Sciences, Integrative and Collaborative Education and Research, and Ocean Sciences. FY2019 actual funding for GEO was $970 billion.[39]

Directorate for Mathematical and Physical Sciences (MPS). Research funded through MPS "spans an enormous range: from the smallest objects and shortest timescales ever studied to distances and timescales that are the size and age of the universe."[40] MPS divisions include Astronomical Sciences, Chemistry, Materials Research, Mathematical Sciences, Physics, and the Office of Multidisciplinary Activities. FY2019 actual funding for MPS was $1.491 billion.[41]

Directorate for Social, Behavioral, and Economic Sciences (SBE). SBE supports basic research on people and society, and "SBE sciences focus on human behavior and social organizations and how social, economic, political, cultural, and environmental forces affect the lives of people from birth to old age and how people in turn shape those forces."[42] SBE divisions include Behavioral and Cognitive Sciences, Social and Economic Sciences, and the SBE Office of Multidisciplinary Sciences. Additionally, SBE houses the National Center for Science and Engineering Statistics (NCSES), which provides statistical information about the U.S. science and engineering (S&E) enterprise, often in the global context.[43] FY2019 actual funding for SBE was $271 million.[44]

In addition to these seven directorates, two offices administer NSF-wide programs: the Office of International Science and Engineering (OISE) and the Office of Integrative Activities (OIA).[45]

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pdf/fy2021budget.pdf.

[36] NSF, Directorate for Engineering, "General Information About ENG," accessed April 2, 2021, http://www.nsf.gov/eng/about.jsp.

[37] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. ENG-1, https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[38] NSF, Directorate for Geosciences, "About GEO," accessed April 5, 2021, http://www.nsf.gov/geo/about.jsp.

[39] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. GEO-1, https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[40] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "MPS-1, https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[41] Ibid.

[42] NSF, "About SBE," accessed April 5, 2021, https://www.nsf.gov/sbe/about.jsp.

[43] 42 U.S.C. 1862p.

[44] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "SBE-1, https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[45] See NSF, "Research Areas," accessed April 5, 2021, https://www.nsf.gov/about/research_areas.jsp; and **Figure 2**.

OISE is NSF's primary office for international science and engineering activities within and outside of the agency, promoting an agency-wide international engagement strategy and managing internationally focused programs.[46]

OIA "works across disciplinary boundaries to lead and coordinate strategic programs and opportunities that: advance research excellence and innovation; develop human and infrastructure capacity critical to the U.S. science and engineering enterprise; and promote engagement of scientists and engineers at all career stages."[47] OIA provides programmatic and policy support to the NSF director and deputy director and "working in partnership with NSF directorates and offices, plays a leadership role in shaping agency-wide policies and new strategic directions that promote cross-Foundational programmatic and operational unity and alignment."[48] OIA sections include

- the Integrative Activities Section, which administers NSF-wide programs such as the Science and Technology Centers, Major Research Instrumentation, Mid-scale Research Infrastructure-Track 1, Historically Black Colleges and Universities—Excellence in Research, Growing Convergence Research, and NSF 2026;
- the Convergence Accelerator Office, which "is designed to accelerate use-inspired convergence research in areas of national importance through partnerships between a variety of stakeholders—academia, industry, nonprofits, government, and other sectors";
- Established Program to Stimulate Competitive Research (EPSCoR) Section, which coordinates NSF's EPSCoR program "to strengthen research in STEM and education infrastructure";[49] and
- Evaluation and Assessment Capability Section, which "provides centralized support and resources for data collection, analytics, and the design of evaluation studies and surveys."[50]

[46] NSF, "About the Office of International Science & Engineering (OISE)," accessed on April 5, 2021, https://www.nsf.gov/od/oise/about.jsp.

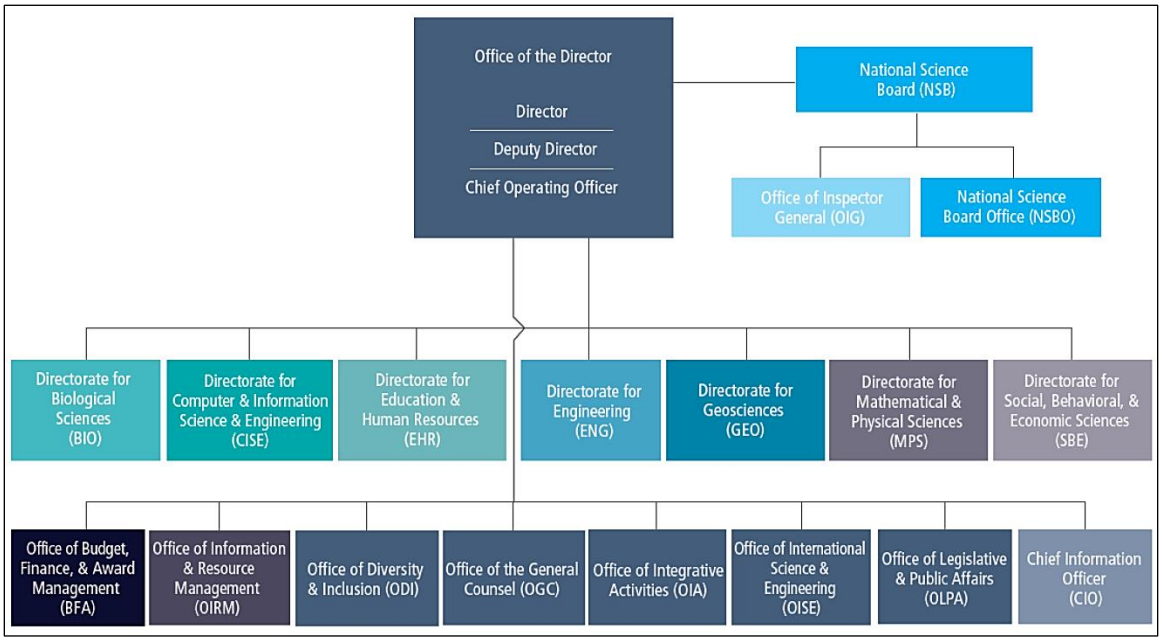
[47] NSF, "About OIA," accessed April 5, 2021, https://www.nsf.gov/od/oia/about.jsp.

[48] Ibid.

[49] For more information on the NSF and other federal EPSCoR programs, see CRS Report R44689, *Established Program to Stimulate Competitive Research (EPSCoR): Background and Selected Issues*, by Laurie A. Harris.

[50] NSF, "About OIA," accessed April 5, 2021, https://www.nsf.gov/od/oia/about.jsp.

Figure 2. National Science Foundation Organization Chart, FY2020



Source: National Science Foundation, *FY 2020 Agency Financial Report*, November 16, 2020, Figure 1.4, p. MD&A-10, https://www.nsf.gov/pubs/2021/nsf21002/pdf/nsf21002.pdf.

Selected Integrative Activities

NSF's program structures support various cross-directorate and agency-wide investments, many led by OIA. Two focus areas for NSF, particularly since the late 2010s, have been artificial intelligence (AI) and the agency's "Big Ideas," for which the agency has generally requested increasing amounts of annual funding, even amidst constrained budget environments. This section provides information on these selected investment areas.

Artificial Intelligence

Artificial intelligence has been an area of increasing research and policy interest among stakeholders in the public and private sectors, including researchers, companies, federal agencies, and many Members of Congress. NSF has supported AI research for decades, and the agency's FY2020 investments included fundamental research in areas such as machine learning, computer vision, and natural language processing; safety, robustness, and explainability of AI systems; translational research at the intersection of AI and areas such as agriculture, manufacturing, and personalized medicine; and education and learning.[51] As codified in the National Artificial Intelligence Act of 2020 (Division E of P.L. 116-283), NSF announced the first round of funding for seven AI Research Institutes in FY2020, two supported jointly with the U.S. Department of Agriculture, providing $20 million per institute over five years.[52] The FY2021 funding opportunity for the next set of institutes will include partnerships with the private sector—Accenture, Amazon, Google, and Intel—to support AI research in eight areas, including human-

[51] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "Overview-3."

[52] For more information, see NSF's press release, "NSF Advances Artificial Intelligence Research with New Nationwide Institutes," August 26, 2020, https://www.nsf.gov/news/special_reports/announcements/082620.jsp.

AI interaction, cyberinfrastructure, learning, biology, and food systems, among others.[53] NSF's FY2021 budget request included $868 million in AI, nearly double the FY2019 actual funding of $465 million.[54]

NSF also has a leadership role in AI activities across the federal government; as the agency states, "NSF's ability to bring together numerous fields of scientific inquiry ... uniquely positions the agency to lead the Nation in expanding the frontiers of AI."[55] For example, during the Trump Administration, NSF cochaired the National Science and Technology Council's Select Committee on AI, which advised the White House on interagency AI research and development (R&D) priorities and established structures to improve government planning and coordination.[56] In June 2019, the Select Committee on AI also issued an update to the 2016 *National Artificial Intelligence Research and Development Strategic Plan*, which describes strategic priorities for coordinated federal AI R&D activities to support U.S. leadership in AI.[57] NSF's goals in addressing strategic priorities in AI include (1) investing in fundamental AI research; (2) developing AI systems to enhance learning and development of the U.S. AI R&D workforce; (3) providing access to high-quality data and advanced computing research infrastructure to advance AI research and education; and (4) continuing to pursue public-private partnerships in AI.[58] Further, in addition to the aforementioned provision on National AI Research Institutes, the National Artificial Intelligence Act of 2020 directs the agency to

- cochair (on a rotating basis) an Interagency Committee to advise the National AI Initiative Office established through the Office of Science and Technology Policy (OSTP) by the act (Sec. 5103);
- contract with the National Academies of Sciences, Engineering, and Medicine to conduct a study on impacts of AI on the U.S. workforce (Sec. 5105);
- with OSTP, establish a task force to investigate the potential establishment of a National Artificial Intelligence Research Resource (Sec. 5106).

Big Ideas

Since around 2016, NSF has developed and built on its "Big Ideas," which the agency describes as bold inquiries into the frontiers of science and engineering that endeavor to break down the silos of conventional scientific research to embrace cross-disciplinary and dynamic research.[59]

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[53] For more information, see NSF's program summary page, "National Artificial Intelligence (AI) Research Institutes," accessed April 5, 2021, https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505686.

[54] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "NSF-Wide Investments-27." The explanatory statement accompanying the Consolidated Appropriations Act, 2021 (P.L. 116-260) stated that the agreement "fully funds AI related grants and interdisciplinary research initiatives across NSF at up to the fiscal year 2021 request level." See Explanatory Statement, Consolidated Appropriations Act, 2021, Division B, *Congressional Record*, vol. 166, no. 218—Book III (December 21, 2020), p. H7947, https://www.govinfo.gov/content/pkg/CREC-2020-12-21/pdf/CREC-2020-12-21-house-bk3.pdf.

[55] Ibid.

[56] Ibid. For additional information on the Select Committee on AI, see the January 5, 2021, charter, at https://trumpwhitehouse.archives.gov/wp-content/uploads/2021/01/Charter-Select-Committee-on-AI-Jan-2021-posted.pdf.

[57] National Science and Technology Council, Select Committee on Artificial Intelligence, *The National Artificial Intelligence Research and Development Strategic Plan: 2019 Update*, June 2019, https://www.nitrd.gov/pubs/National-AI-RD-Strategy-2019.pdf.

[58] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "NSF-Wide Investments-28."

[59] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "Overview-9."

Six of the Big Ideas are research ideas, as described in NSF's FY2021 budget request, including the following, with FY2021 requested funding amounts in parentheses:

- **Harnessing the Data Revolution for 21st-Century Science and Engineering** ($45 million): "Engaging NSF's research community in the pursuit of fundamental research in data science and engineering, the development of a cohesive, federated, national-scale approach to research data infrastructure, and the development of a 21st-century data-capable workforce."
- **The Future of Work at the Human Technology Frontier** ($45 million): "Catalyzing interdisciplinary science and engineering research to understand and build the human-technology relationship; design new technologies to augment human performance; illuminate the emerging socio-technological landscape; and foster lifelong and pervasive learning with technology."
- **The Quantum Leap: Leading the Next Quantum Revolution** ($50 million): Exploiting quantum mechanics to observe, manipulate, and control the behavior of particles and energy at atomic and subatomic scales; and developing next-generation quantum-enabled science and technology for sensing, information processing, communicating, and computing.
- **Navigating the New Arctic** ($30 million): "Establishing an observing network of mobile and fixed platforms and tools, including cyber tools, across the Arctic to document and understand the Arctic's rapid biological, physical, chemical, and social changes, in partnership with other agencies, countries, and native populations."
- **Understanding the Rules of Life: Predicting Phenotype** ($30 million): "Elucidating the sets of rules that predict an organism's observable characteristics. Advances in understanding life at the fundamental level of the genome will enable re-engineering of cells, organisms, and ecosystems, and innovative biochemicals and biomaterials that sustain a vibrant bioeconomy and strengthen society."
- **Windows on the Universe: The Era of Multi-messenger Astrophysics** ($30 million): "Using powerful new syntheses of observational approaches to provide unique insights into the nature and behavior of matter and energy and to answer some of the most profound questions before humankind."[60]

Three of the Big Ideas are enabling ideas, supporting research to "improve the way science is done, from impacting the workforce to developing the infrastructure that will drive the discoveries and aid the discoverers of tomorrow's science."[61] These enabling ideas, as described in NSF's FY2021 budget request, include the following, with FY2021 requested funding amounts in parentheses:

- **NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES,** $18.9 million): "Transforming education and career pathways to help broaden participation in science and engineering and build a diverse, highly skilled American workforce."

[60] Ibid.

[61] Ibid., p. "Overview-10."

- **Growing Convergence Research** ($15.2 million): "Merging ideas, approaches, tools, and technologies from widely diverse fields of science and engineering to stimulate discovery and innovation."
- **Mid-scale Research Infrastructure** ($97.7 million): "Developing an agile process for funding experimental research capabilities in the mid-scale range, spanning the midscale gap in research infrastructure. This is a 'sweet spot' for science and engineering that has been challenging to fund through traditional NSF programs."[62]

Grant-Making

Because most NSF funding is distributed to researchers and institutions outside of the agency, grant-making is arguably the heart of what NSF does.[63] NSF uses a variety of mechanisms to communicate opportunities for research and education support; these include program descriptions, program announcements, program solicitations, and dear colleague letters.[64]

Grants can be either standard (i.e., full, up-front funding) or continuing (i.e., incremental funding on a multi-year basis, contingent upon project results and availability of agency funds). Annually, NSF receives over 50,000 proposals for research, education, and training projects.[65] Of these, between 23% and 27% have typically received funding; in FY2020, NSF funded over 12,000 awards, representing an overall success rate of 28% for competitively reviewed proposals.[66] About 29,000 individuals participated in the merit review process as panelists and proposal reviewers in FY2019.[67]

The vast majority of NSF research funding is awarded through a competitive, merit-based assessment process.[68] The peer review stage of this process—in which external "peer" reviewers with subject matter expertise assess the merits of each grant proposal—is both widely lauded and closely watched by policy analysts. Although peer review is perhaps the most well-known stage of NSF's grant-making process, peer review does not encompass the whole of the assessment process. Rather, the typical grant-making process for most NSF awards follows three phases.

- Phase 1: opportunity announced, proposals submitted, proposals received.

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[62] Ibid.

[63] In this report, "grant-making" refers broadly to NSF's range of funding support mechanisms, including grants, awards, and cooperative agreements. NSF's *Proposal and Award Policies and Procedures Guide* (PAPPG) describes the agency's grant-making process and provides guidance to potential applicants. NSF also has a short video on its grant-making process on its website, available at http://www.nsf.gov/news/mmg/mmg_disp.jsp?med_id=76467.

[64] National Science Foundation, "Introduction," *Proposal and Award Policies and Procedures Guide* (PAPPG, NSF 20-1), January 24, 2020, pp. I-2 – I-4, https://www.nsf.gov/pubs/policydocs/pappg20_1/nsf20_1.pdf.

[65] PAPPG, p. viii.

[66] NSF, *FY 2020 Agency Financial Report*, November 16, 2020, pp. "MD&A-20."

[67] NSF, *Merit Review Process: FY2019 Digest*, NSB-2020-38, December 2020, p. 32, https://www.nsf.gov/nsb/publications/2020/merit_review/FY-2019/nsb202038.pdf.

[68] Exceptions to the external merit review process include some categories of workshops and symposia, as well as certain types of proposals, such as those for the EAGER, RAISE, and RAPID (or Grants for Rapid Response Research) funding mechanisms (NSF, *Merit Review Process: FY2019 Digest*, p. 30). For example, RAPID grants may be used for "proposals having a severe urgency with regard to availability of, or access to, data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events." Only internal agency merit review is required for RAPID grants. PAPPG, p. II-23.

- Phase 2: reviewers selected, peer review, program officer recommendation, division director review.
- Phase 3: business review, award finalized.[69]

Put differently, most NSF proposals must survive at least five kinds of scrutiny. First, the initial assessment is for application completeness and conformance with NSF requirements. Second, if a proposal passes the initial assessment, it is sent to three or more external subject matter experts for peer review.[70] Peer reviewers evaluate the proposal according to two broad criteria: intellectual merit and broader impacts.[71] According to the NSF,

> *Intellectual Merit:* The Intellectual Merit criterion encompasses the potential to advance knowledge; and
>
> *Broader Impacts:* The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.[72]

Congress reaffirmed NSF's use of merit-based peer review in the American Innovation and Competitiveness Act in 2017 (P.L. 114-329), directing NSF to maintain the intellectual merit and broader impacts criteria, among other specific criteria as appropriate, as the basis for evaluating grant proposals in the merit review process. Congress further directed the agency to report to appropriate congressional committees within 30 days if any changes are made to the merit review process.[73]

Peer reviewers provide information about the merit of the proposal to the program officer (the third kind of scrutiny), who considers the proposal in the context of the broader program portfolio and direction. Program officers are not bound by the recommendations of peer reviewers. Rather, the program officer

> reviews the proposal and analyzes the input received from the external reviewers. In addition to the external reviews, Program Officers consider several factors in developing a portfolio of funded projects. For example, these factors might include different approaches to significant research and education questions; potential (with perhaps high risk) for transformational advances in a field; capacity building in a new and promising research area; or achievement of special program objectives. In addition, decisions on a given proposal are made considering both other current proposals and previously funded projects.[74]

Fourth, after the portfolio assessment, the program officer submits his or her award recommendation to the division director, who examines the recommendations and typically makes the final programmatic decision to fund or not.

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[69] More information on the merit review process and each of the three phases is available at https://www.nsf.gov/bfa/dias/policy/merit_review/.

[70] Peer review can happen in a number of ways. Reviewers may be sought out on an individual basis (also known as ad hoc review) or may participate in in-person or virtual panels. While a minimum of three reviewers is required, more may participate.

[71] In addition to these criteria, NSF solicitations may include additional criteria that meet the specific objectives of programs or activities.

[72] PAPPG, pp. III-1–III-2. More information about NSF's merit review process and criteria is available at the NSF Merit Review FAQ webpage, available at http://www.nsf.gov/bfa/dias/policy/merit_review/facts.jsp.

[73] 42 U.S.C. 1862s.

[74] NSF, "Phase II: Proposal Review and Processing," accessed April 5, 2021, http://www.nsf.gov/bfa/dias/policy/merit_review/phase2.jsp.

Fifth, if the proposal survives programmatic review (including initial, peer, program, and division), it is sent to the Division of Grants and Agreements (DGA). An officer within the DGA conducts an assessment of the business, financial, and policy implications, and, if called for, processes and issues the award.

In addition to the aforementioned stages of assessment, larger or "sensitive" awards may require further layers of review beyond those already described, including review by NSF senior management or the National Science Board.[75] This rule applies to all Major Research Equipment and Facilities Construction (MREFC) projects. NSB also requires NSF to obtain board approval for any award "involving an anticipated average annual amount of the greater of either 1 percent or more of the awarding Directorate's or Office's prior year current plan or 0.1 percent or more of the prior year total NSF budget."[76]

Besides grants, NSF also awards funding though other mechanisms, such as cooperative agreements and contracts. Cooperative agreements are used when a project requires substantial agency involvement (e.g., research centers and multi-use facilities). Contracts are used to acquire products, services, and studies (e.g., program evaluations). In FY2020, NSF distributed 74% of its obligations for research and education funding via grants, 21% via cooperative agreements, and 5% via contracts.[77]

Scientific Facilities, Instruments, and Equipment

Though NSF does not typically directly operate laboratories or scientific facilities, the agency does provide funding for the construction, operations, and maintenance of research facilities and equipment.

For construction of new facilities and equipment, NSF provides funding through the Major Research Equipment and Facilities Construction (MREFC) appropriations account. These projects have included international activities, such as the Atacama Large Millimeter Array completed in Chile in 2013, as well as domestic projects, including ground-based astronomical telescopes and ecological and ocean observatory networks, which connect geographically distributed scientific facilities and planning. The construction phases of such projects usually span multiple years, including extensive planning and oversight. Requested funding in FY2021 would support continued construction of the Vera C. Rubin Observatory (previously called the Large Synoptic Survey Telescope), the Antarctic Infrastructure Modernization for Science (AIMS) project, upgrades to the Large Hadron Collider in Switzerland, and funding for Mid-scale Research Infrastructure (projects with funding amounts in the $20 million to $70 million range).[78]

For ongoing operations and maintenance after the construction or acquisition phase, the agency provides support to outside awardees and contractors to manage a wide array of scientific facilities, instruments, and equipment. This funding comes primarily from the RRA account. For

[75] The NSB resolution "Delegation of Award-Approval Authority to the Director" (NSB-11-2), February 22, 2017, establishes the conditions under which the NSB delegates its authority to approve NSF awards to the NSF director. Section 5 states that the director shall consult with the NSB on programs "which represent a significant, long-term investment, particularly those which … involve substantive policy, interagency, or international issues." The resolution can be found at https://www.nsf.gov/pubs/2017/nsb17005/nsb17005.pdf.

[76] NSB, "Delegation of Award-Approval Authority to the Director" (NSB-11-2), February 22, 2017, https://www.nsf.gov/pubs/2017/nsb17005/nsb17005.pdf.

[77] NSF, *FY 2020 Agency Financial Report,* November 16, 2020, pp. "MD&A-6."

[78] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "Overview-7."

example, NSF funding supports polar facilities and logistics and a fleet of academic research ships, as well as ongoing support for telescopes and observatory networks.[79] NSF also supports a handful of federally funded research and development centers (FFRDCs), such as the National Center for Atmospheric Research.[80]

Major Constituencies

Approximately 80% of NSF research and education funds are typically awarded to colleges, universities, and academic consortia. The remainder goes to private industry (about 13%), FFRDCs (about 3%), and other recipients (about 4%).[81] In any given fiscal year, NSF funding provides 50% or more of federal funding for academic basic research in computer science, biology, environmental sciences, mathematics, and social sciences.[82] Further, about a third of all identified federal funding for STEM education comes from NSF in a typical budget year. The foundation is a primary source of support for graduate student fellowships in the non-biomedical sciences and engineering.[83]

In FY2020, NSF issued approximately 12,200 new competitive awards to almost 1,900 colleges, universities, and other institutions in all 50 states, the District of Columbia, and 3 U.S. territories.[84] The agency estimates that approximately 313,000 individuals were directly involved in NSF programs and activities in FY2020, including researchers, postdoctoral associates, and other professionals; undergraduate and graduate students; and elementary and secondary school teachers and students.[85] At least 248 Nobel laureates have received NSF support at some point in their careers.[86] Additionally, NSF support for informal science education and scientific literacy reaches many Americans each year in museums, libraries, and afterschool programs, and through the media.

Funding Profile

NSF received $8.49 billion in appropriations in FY2021.[87] Of this amount, 81.4% supported the main research account (RRA, $6.9 billion), 11.4% supported the main education account (EHR, $968 million), and 2.8% supported facilities and construction (MREFC, $241 million), with the

[79] More information on NSF's support for operations of scientific facilities, instruments, and equipment is typically found in the "Major Multi-Uses Research Facilities" section of NSF's annual budget request to Congress; for the most recent listing, see NSF, "Facilities," *FY2021 Budget Request to Congress*, February 10, 2020, pp. "Facilities-1" "Facilities-76," https://www.nsf.gov/about/budget/fy2021/pdf/fy2021budget.pdf.

[80] For more information on FFRDCs, see CRS Report R44629, *Federally Funded Research and Development Centers (FFRDCs): Background and Issues for Congress*, by Marcy E. Gallo.

[81] Based on FY2020 obligations for research and education programs as reported in NSF, *FY 2020 Agency Financial Report*, November 16, 2020, p. "MD&A-7."

[82] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, p. "Overview-14."

[83] For example, NSF's Graduate Research Fellowship program is one of the three largest federal investments in STEM education is (as measured by FY2016 budget authority in CRS Report R45223, *Science, Technology, Engineering, and Mathematics (STEM) Education: An Overview*, by Boris Granovskiy).

[84] NSF, *FY 2020 Agency Financial Report*, November 16, 2020, pp. "MD&A-6."

[85] Ibid.

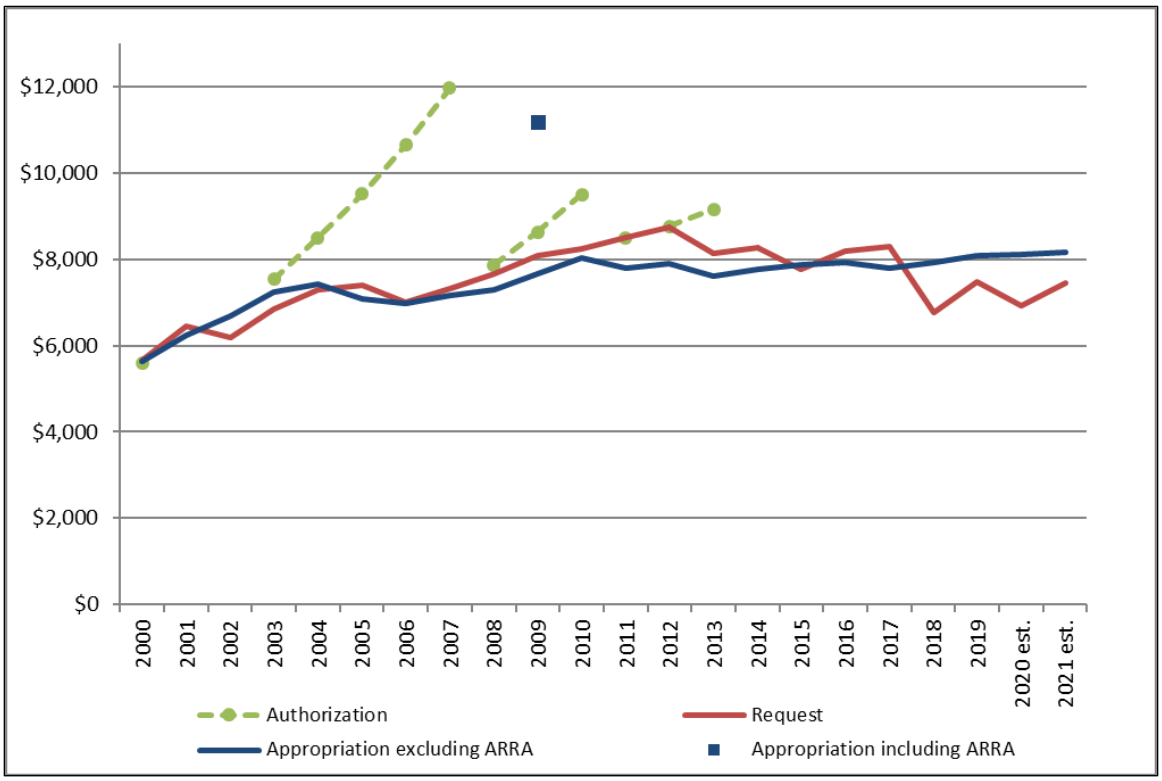
[86] NSF, "The Nobel Prizes: The NSF Connection," special report, https://www.nsf.gov/news/special_reports/nobelprizes; see also National Science Foundation, "NSF-Funded Nobel Prize Winners in Science Through 2018," fact sheet, October 9, 2018, https://www.nsf.gov/news/news_summ.jsp?cntn_id=100683.

[87] Consolidated Appropriations Act, 2021; P.L. 116-260.

remainder supporting administrative and related activities. After adjusting for inflation, NSF funding has seen slight increases in FY2020 and FY2021, after remaining relatively flat between FY2010 and FY2019 (see **Figure 3**).[88]

Figure 3. NSF Authorizations, Budget Requests, and Appropriations, FY2000-FY2021

Budget Authority in Millions of Constant FY2019 Dollars



Source: Funding data for the "Authorization" points are from selected NSF authorization acts. Funding data for the "Request" and "Appropriations" points are from NSF, Budget Internet Information System, "NSF Requests and Appropriations History," NSF.gov, accessed April 5, 2021, http://dellweb.bfa.nsf.gov/NSFRqstAppropHist/NSFRequestsandAppropriationsHistory.pdf, and P.L. 116-260. To calculate constant FY2019 dollars, CRS used the Gross Domestic Product (GDP) Chained Price Index found in Office of Management and Budget, Budget of the U.S. Government, Historical Tables, Table 10.1, accessed March 31, 2021, https://www.whitehouse.gov/wp-content/uploads/2020/02/hist10z1_fy21.xlsx.

Notes: GDP chained price indices for FY2020 and FY2021 are estimates. FY2009 appropriation amounts do not include American Recovery and Reinvestment Act (ARRA; P.L. 111-5) supplemental funding, which provided an additional $3,002 million to NSF. With ARRA included, total FY2009 appropriations to NSF were $9,496 million in current dollars and $11,194 million in constant (FY2019) dollars.

In addition to enacting overall NSF appropriations, the 116th and 117th Congresses have debated whether more funding should be focused on applied and development-oriented research. This long-standing question is discussed in more detail in the **Appendix**.

[88] For more information on NSF funding, including for research and development, see CRS Video WVB00272, *FY2020 Federal Research and Development Funding: National Science Foundation*, by Laurie A. Harris; and CRS Report R46341, *Federal Research and Development (R&D) Funding: FY2021*, coordinated by John F. Sargent Jr.

Appendix. Legislative Origins and Selected Reauthorization Acts

This appendix describes NSF's legislative origins and selected recently enacted reauthorization provisions in the America COMPETES Act (P.L. 110-69), America COMPETES Reauthorization Act of 2010 (P.L. 111-358), and American Innovation and Competitiveness Act (P.L. 114-329). **Table A-1** includes NSF appropriations by decade, in current and constant (FY2019) dollars. **Table A-2** lists selected additional NSF authorization acts going back to the 1950s. The most recent authorizations of appropriations for NSF expired in FY2013.

Many contemporary policy conversations about the NSF mirror the debate over the foundation's establishment. For example, the 116th and 117th Congresses have debated the question of funding for more applied and development-oriented research at the NSF.[89] This issue was also debated during the establishment of the agency. Retelling the historical conversation, therefore, contextualizes today's deliberations and provides legislators with additional insight into the enduring nature of some of these conflicts. It also provides insight into how previous generations of policymakers resolved similar questions.

Historical accounts of the NSF frequently peg the foundation's genesis to a dialogue between two men: Senator Harley M. Kilgore and Vannevar Bush.[90] Senator Kilgore chaired the Senate Subcommittee on War Mobilization during and immediately after World War II. Bush was director of the Office of Scientific Research and Development (OSRD) as well as a science advisor to President Franklin Delano Roosevelt.[91] Between 1942 and 1945, Senator Kilgore's subcommittee held a series of hearings on government support for scientific research. That effort resulted in the July 23, 1945, introduction of S. 1297 (National Science Foundation Act of 1945), which would have established a National Science Foundation. Bush authored an historic July 1945 report on post-war U.S. scientific research, *Science: An Endless Frontier*, which called for the creation of a National Research Foundation. On July 19, 1945, Senator Warren Magnuson introduced a bill, S. 1285 (National Research Foundation Act of 1945)—which was drafted in consultation with Bush and hewed closely to the proposal outlined in *Science*—to establish a National Research Foundation.[92]

Although Senator Kilgore and Senator Magnuson agreed on the goal of establishing a federal agency for the support of scientific research, and their bills shared certain similarities, they promoted different approaches.[93] There was agreement, for example, that the foundation should

[89] For example, regarding debates about the Endless Frontier Act (S. 3832 and H.R. 6978) in the 116th Congress. There is discussion of this bill again in the 117th Congress, though it has not been reintroduced as of April 6, 2021.

[90] While historical narratives about the founding of the NSF typically focus on Senator Kilgore and Bush, the 79th Congress considered several bills focused on the question of post-war scientific research. See U.S. Senate, Committee on Military Affairs, Subcommittee on War Mobilization, *Legislative Proposals for the Promotion of Science: The Texts of Five Bills and Excerpts from Reports*, subcommittee print, 79th Cong., 1st sess., August 1945.

[91] President Franklin Delano Roosevelt established the OSRD as an independent agency within the Office of Emergency Management (Executive Order 8807). More information about OSRD is available on the Library of Congress website at http://www.loc.gov/rr/scitech/trs/trsosrd.html.

[92] U.S. Congress, House Committee on Science and Technology, Task Force on Science Policy, "A History of Science Policy in the United States, 1940-1985," *Science Policy Study Background Report No. 1*, 99th Cong., 2nd sess., September 1986 (Washington, DC: GPO, 1986), pp. 21-27; and, George T. Mazuzan, *National Science Foundation: A Brief History*, NSF 88-16 (Washington, DC: National Science Foundation, 1988).

[93] At the time, most stakeholders agreed with the general concept of a publicly funded scientific research foundation. One exception was Frank B. Jewett, then president of the National Academy of Sciences. Jewett expressed concern

provide scholarships, that it should support basic research, that it should have both a board and a director, and that it should be independent from other executive branch agencies.[94] Differences focused on five broad themes that would be familiar to an NSF observer today. These include

- ownership of patents resulting from government research,
- inclusion of the social sciences,
- geographic distribution of funding,
- the extent to which the foundation should support applied research, and
- political and administrative control of the foundation.[95]

As drafted in August of 1945, S. 1297 and S. 1285 would have resolved these policy issues differently. Senator Kilgore's bill (S. 1297) envisioned a scientific foundation that was administered by a publicly appointed director and advised by a board, that distributed funding and research findings broadly, and that defined the term "research and development" to include both theoretical exploration as well as the extension of investigation

> into practical application, including the preparation of plans, specifications, and standards for various goods and services, the undertaking of related economic and industrial studies, the experimental production and testing of models, and the building and operation of pilot plants.[96]

Senator Magnuson's bill (S. 1285), on the other hand, would have created a research foundation led by a publicly appointed board that would select, direct, and supervise a director. The powers and duties of the foundation as described in S. 1285 include developing national science policies and support of basic research in the fields of mathematical, physical, and biological sciences. The bill does not include provisions for the broad distribution of funding, though it does authorize the publication and dissemination of research findings.

The differences between these approaches were not resolved in the 79th Congress. However, after two more years of debate Congress presented a bill to establish a National Science Foundation to President Harry S. Truman on July 25, 1947 (S. 526, National Science Foundation Act of 1947). Truman vetoed the legislation. In his veto message he expressed two concerns. First, Truman asserted that S. 526 violated his appointment powers and raised questions about accountability because it did not provide for a presidentially appointed director. (S. 526 gave authority to appoint a director to the foundation.) Second, the President expressed conflict-of-interest concerns. As defined in S. 526, the foundation included 24 eminent scientists appointed by the President with the advice and consent of the Senate. These 24 scientists would determine who

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about unwanted government control and interference in science and preferred private sources of funding. See J. Merton England, *A Patron for Pure Science: The National Science Foundation's Formative Years, 1945-57* (Washington, DC: NSF, 1982), pp. 35-36.

[94] S. 1297 and S. 1285 differed with respect to the roles and authorities assigned to the director and board. S. 1297 gave most of the power to the director (with the board in an advisory capacity); while S. 1285 put most of the authority in the hands of the board, who appointed the director.

[95] U.S. Congress, House Committee on Science and Technology, Task Force on Science Policy, "A History of Science Policy in the United States, 1940-1985," *Science Policy Study Background Report No. 1*, 99th Cong., 2nd sess., September 1986 (Washington, DC: GPO, 1986), pp. 21-27; and, J. Merton England, *A Patron for Pure Science: The National Science Foundation's Formative Years, 1945-57* (Washington, DC: NSF, 1982).

[96] S. 1297, Title IV, Section 402 (a) as published in U.S. Senate, Committee on Military Affairs, Subcommittee on War Mobilization, *Legislative Proposals for the Promotion of Science: The Texts of Five Bills and Excerpts from Reports*, subcommittee print, 79th Cong., 1st sess., August 1945.

would receive foundation grants, which Truman perceived as a conflict of interest that "would inevitably give rise to suspicions of favoritism."[97]

In April 1950, Congress sent the President a new bill, S. 247 (National Science Foundation Act of 1950). President Truman signed S. 247, which became P.L. 81-507 (referred to as NSF's "organic act") on May 10, 1950.[98] NSF's organic act provided for an independent federal agency administered by a presidentially appointed board *and* director. As established in its organic act, NSF was empowered to develop and encourage a national policy for the promotion of basic research and science education, to support basic research in the mathematical, physical, medical, biological, engineering, and "other" (e.g., social) sciences. Section 3(b) addressed the geographic distribution issue by stating that it

> shall be one of the objectives of the Foundation to strengthen basic research and education in the sciences, including independent research by individuals, throughout the United States, including its Territories and possessions, and to avoid undue concentration of such research and education.[99]

As with prior versions of the bill, NSF's organic act specifically authorized the foundation to provide for scholarships and fellowships, to foster information exchange among scientists in the United States and abroad, to establish commissions, to act as a central clearinghouse for information about scientific and technological personnel, and to establish research divisions. With respect to patent issues, P.L. 81-507 left these questions to the NSF to decide through the contract process.[100] With one notable exception, Congress did not pass another NSF authorization act for the next 15 years.[101]

1968 Reauthorization

The next major reauthorization of the NSF organic act came in 1968.[102] In 1965, the House Committee on Science and Astronautics, Subcommittee on Science, Research, and Development (chaired by Representative Emilio Daddario) undertook an extensive, three-year examination of the foundation's activities and legal authority. Some historians assert that renewed interest in the NSF organic act stemmed from concern about U.S. science policy post-*Sputnik*.[103] The result of the Daddario committee's work was P.L. 90-407 (An Act to Amend the National Science

[97] Harry S. Truman Library and Museum, Public Papers of the Presidents, Harry S. Truman 1945-1953, "169. Memorandum of Disapproval of the National Science Foundation Bill," August 6, 1947, at http://www.trumanlibrary.org/publicpapers/index.php?pid=1918.

[98] Harry S. Truman Library and Museum, Public Papers of the Presidents, Harry S. Truman 1945-1953, "120. Statement by the President Upon Signing Bill Creating the National Science Foundation," May 10, 1950, at http://trumanlibrary.org/publicpapers/index.php?pid=743.

[99] P.L. 81-507, Section 3(b).

[100] For a broader treatment of federal patent issues, see CRS Report R46525, *Patent Law: A Handbook for Congress*, by Kevin T. Richards.

[101] NSF's organic act authorized $500,000 in FY1951 and $15,000,000 annually thereafter. Congress amended the act in 1953 to authorize "such sums as may be necessary" (P.L. 83-223).

[102] Although not a reauthorization act per se, in 1962 President John F. Kennedy signed "Reorganization Plan No. 2 of 1962," which established the Office of Science and Technology (OST) within the Executive Office of the President. The plan transferred authority for national science policy making from NSF to OST and made other changes within NSF. Congress had the power to disapprove of this plan, but did not do so and thereby facilitated its implementation. For more information about executive branch reorganization processes, see CRS Report R44909, *Executive Branch Reorganization*, by Henry B. Hogue.

[103] Many analysts and historians consider the Soviet Union's launch of *Sputnik*, the world's first artificial satellite, a watershed moment in U.S. science (and science education) policy history.

Foundation Act of 1950). P.L. 90-407 made several critical changes to the NSF organic act that harkened back to the establishment debates of the 1940s. In particular, the act expressly authorized NSF activities in the social sciences and specifically authorized support for applied research.

P.L. 90-407 also changed NSF's authorization cycle. The 1968 act repealed the indefinite authorization established by P.L. 83-223 in 1953 and replaced it with an annual authorization. The one-year authorization cycle established by P.L. 90-407 was in place (generally) from FY1969 until FY1989. It was not unchallenged, however. During the late 1970s and early 1980s, Congress debated whether to maintain the one-year authorization cycle for NSF. Some Members of Congress preferred tighter oversight and control over the foundation and therefore argued for the one-year authorization.[104] Other Members asserted that longer authorization cycles would assist in long-range planning, ensure stable funding, and facilitate "sound national science policy and programs."[105] These legislators typically argued for at least two-year authorizations.

Since FY1989, NSF authorization cycles have generally extended beyond a single year. Enacted authorizations for the NSF over the past two decades typically fluctuated between three and five years, though there have not been broad authorizations of appropriations for the agency since FY2013. (See **Table A-2**.)

America COMPETES Acts[106]

Between 2007 and 2013, Congress included language to reauthorize the NSF in broader, multi-agency bills that, among other things, also authorized scientific research at the Department of Energy's Office of Science and the National Institute of Standards and Technology. Known colloquially as the COMPETES Acts,[107] these measures authorized FY2008 through FY2013 funding levels for selected federal research accounts, authorized certain federal STEM education programs, and addressed various other policy issues associated with innovation and national competitiveness. NSF provisions in the 2007 and 2010 COMPETES Acts included funding authorizations for most major NSF accounts as well as policy provisions authorizing or amending specified policies and programs related to research, STEM education, and broadening participation. Most COMPETES Acts-related funding authorizations expired in FY2013.

Congress and two successive Administrations sought to double—over several years—combined funding for certain federal accounts (including at NSF) that fund substantial levels of physical sciences and engineering (PS&E) research,[108] referred to as a "doubling path" policy.[109] PS&E

[104] Ken Hechler, *Toward the Endless Frontier: History of the Committee on Science and Technology, 1959-79* (Washington, DC: U.S. House of Representatives/GPO, 1980), pp. 537-538.

[105] S.Rept. 95-851, pp. 22-23.

[106] More information about the COMPETES Acts is available in CRS Report R43880, *The America COMPETES Acts: An Overview*, by Heather B. Gonzalez, and in CRS Report R44345, *Efforts to Reauthorize the America COMPETES Act: In Brief*, by John F. Sargent Jr.

[107] America COMPETES Act (P.L. 110-69) and America COMPETES Reauthorization Act of 2010 (P.L. 111-358).

[108] The targeted accounts included the NSF, the Department of Energy's Office of Science, and the Scientific and Technical Research and Services (STRS) and Construction of Research Facilities (CRF) accounts at the National Institute of Standards and Technology (NIST). Other federal agencies also fund PS&E research. For example, the largest federal funder of research in engineering is the Department of Defense. The National Aeronautics and Space Administration (NASA) also emphasizes engineering and physical sciences research. See National Science Board, *Science and Engineering Indicators 2014*, NSB-14-01 (Arlington, VA: National Science Foundation, 2014), p. 4-38.

[109] For more information about the PS&E doubling effort, see CRS Report R41951, *An Analysis of Efforts to Double Federal Funding for Physical Sciences and Engineering Research*, by John F. Sargent Jr.

research is widely believed to contribute to U.S. economic growth and national security by creating the underlying knowledge that supports technological innovation. The COMPETES-authorized PS&E doubling effort followed a successful effort to double funding for medical research at the National Institutes of Health.[110]

As enacted in the 2007 America COMPETES Act, combined funding for the targeted accounts was authorized to increase at a compound annual growth rate of 10.4% (between the FY2006 baseline and FY2010, the final year under P.L. 110-69). If actual and authorized appropriations had grown at the 10.4% pace, funding for the targeted accounts would have doubled in seven years. That is, combined funding for the targeted accounts would have increased to approximately twice the FY2006 level in FY2013. However, actual appropriations to the targeted accounts over the America COMPETES Act's authorization period increased at a compound annual growth rate of 6.3%. At this pace, funding for the targeted accounts would have doubled in about 11 years.

Following the trend in actual appropriations during the first authorization period, the America COMPETES Reauthorization Act of 2010 authorized funding increases at a compound annual growth rate of 6.4% (between the FY2006 baseline and FY2013, the final year addressed by the act). If actual appropriations had grown at this pace, funding for the targeted accounts would have doubled over about an 11-year period. In other words, combined funding for the targeted accounts would have increased to approximately twice the FY2006 level in FY2017. However, actual appropriations over the reauthorization act's authorization period increased at a compound annual growth rate of 3.1%. At this pace, it would take about 22 years for the targeted accounts to double.

The idea of an NSF budget doubling did not originate with the COMPETES Acts. President Ronald Reagan proposed a five-year doubling of the NSF budget in 1987.[111] His FY1988, FY1989, and FY1990 budget requests sought increases that were consistent with this approach. At around the same time, Congress enacted funding authorizations that sought to double NSF's budget in approximately five years as part of P.L. 100-570 (National Science Foundation Authorization Act of 1988), which President Reagan signed. Actual appropriations to the NSF increased by about 59% during this period.[112] In 2002, Congress passed and President George W. Bush signed P.L. 107-368 (National Science Foundation Authorization Act of 2002). P.L. 107-368 authorized increases in the NSF budget that were consistent with a five-year doubling. However, the Bush Administration reportedly objected to the notion of doubling as an arbitrary goal for the NSF, and language referring to doubling was removed from the final bill, though the authorization increases remained.[113] Actual appropriations to the NSF increased by about 22% during the P.L. 107-368 authorization period.[114] President Bush later proposed a doubling similar

[110] For more information about the NIH doubling, see CRS Report R43341, *National Institutes of Health (NIH) Funding: FY1995-FY2021*, by Kavya Sekar.

[111] President Ronald Reagan, "Radio Address to the Nation on Administration Goals," radio address, January 31, 1987, at http://www.presidency.ucsb.edu/ws/index.php?pid=34674.

[112] NSF received $1.717 billion in appropriations in FY1988. P.L. 100-570 authorized NSF funding increases from FY1989 ($2.050 billion) through FY1993 ($3.505 billion). Actual appropriations to NSF in FY1993 were $2.734 billion, or $1.017 billion (59%) more than the FY1988 funding level.

[113] Jeffrey Mervis, "Bush Signs NSF 'Doubling' Bill," *Science*, December 20, 2002, at http://news.sciencemag.org/2002/12/bush-signs-nsf-doubling-bill.

[114] NSF received $4.823 billion in appropriations in FY2002. P.L. 107-368 authorized NSF funding increases from FY2003 ($5.536 billion) to FY2007 ($9.839 billion). Actual appropriations to NSF in FY2007 were $5.890 billion, or $1.067 billion (22%) more than the FY2002 funding level.

to that authorized by the COMPETES Acts—focused on the targeted accounts, not just NSF—in the 2006 American Competitiveness Initiative.[115]

If NSF appropriations are viewed by decade (e.g., FY1951 to FY1960, FY1961 to FY1970, etc.), the NSF budget doubled (in current dollars) over the course of each of the five decades between the foundation's first budget in FY1951 and FY1990.[116] (See **Table A-1**.) Growth slowed from this pace around the turn of the 21st century. Between FY1990 and FY2000, the NSF budget grew by about 88% in current dollars; between FY2000 and FY2010, it grew by about 76% in current dollars.[117] Between FY2010 and FY2020, the NSF budget grew by about 20% in current dollars.

In inflation-adjusted (constant) dollars, NSF's budget much more than doubled between FY1951 and FY1960, and again between FY1960 and FY1970. The NSF budget has not doubled by decade (in constant dollars) since then. Between FY1970 and FY1980, NSF's budget grew at 16%. Between FY1980 and FY2010, NSF constant-dollar funding increased by 38% or more each decade. Between FY2010 and FY2020, NSF's budget grew at its lowest constant-dollar rate (1.1%). (See **Figure A-1**.)

Table A-1. NSF Appropriations by Decade: FY1951 to FY2020

In Millions of Current and Constant (FY2019) Dollars, Rounded

Year	Current ($ millions)	Constant (FY2019 $ millions)
FY1951	0	2
FY1960	153	1,035
FY1970	440	2,327
FY1980	992	2,687
FY1990	2,082	3,693
FY2000	3,912	5,640
FY2010	6,873	8,032
FY2020	8,278	8,118

Sources: CRS analysis of data National Science Foundation, Budget Internet Information System, "NSF Requests and Appropriations History," http://dellweb.bfa.nsf.gov/NSFRqstAppropHist/NSFRequestsandAppropriationsHistory.pdf. To calculate constant FY2019 dollars, CRS used the Gross Domestic Product (GDP) Chained Price Index found in Office of Management and Budget, Budget of the U.S. Government, Historical Tables, Table 10.1, accessed March 31, 2021, at https://www.whitehouse.gov/wp-content/uploads/2020/02/hist10z1_fy21.xlsx.

Note: GDP chained price index for FY2020 is an estimate.

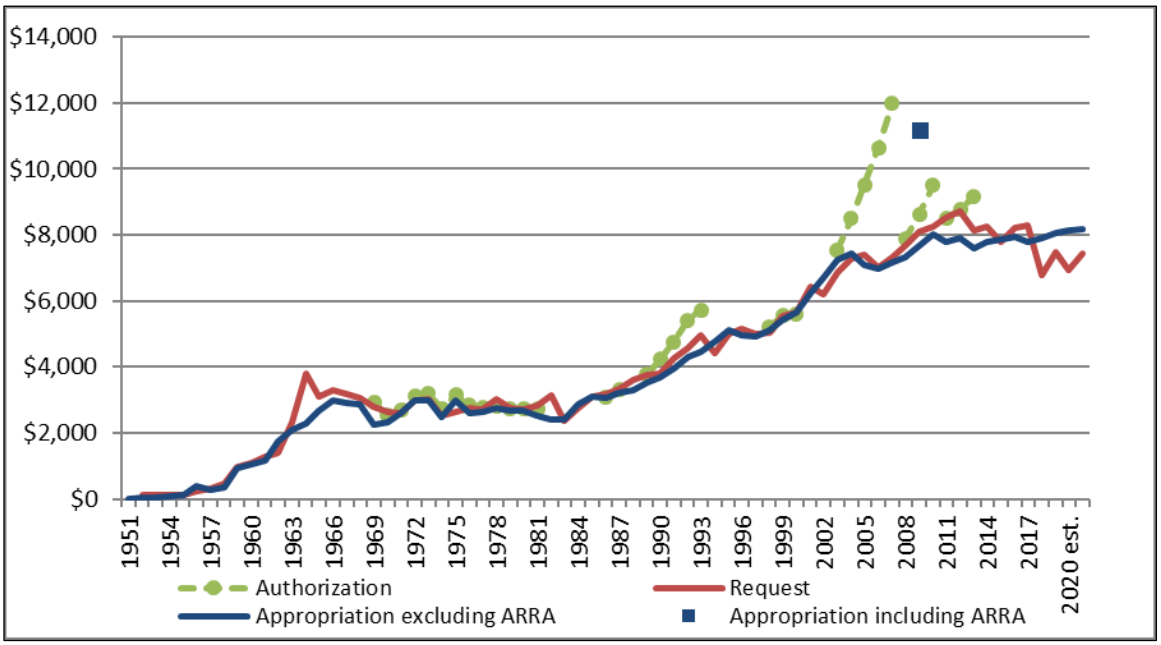
[115] Executive Office of the President, Domestic Policy Council, Office of Science and Technology Policy, *American Competitiveness Initiative: Leading the World in Innovation*, February 2006, at http://georgewbush-whitehouse.archives.gov/stateoftheunion/2006/aci/aci06-booklet.pdf.

[116] Other periods of time or funding units might produce different results. However, the decade-long perspective is largely consistent with the 11-year doubling period implicit in the America COMPETES Reauthorization Act of 2010 (P.L. 111-358).

[117] This growth estimate excludes American Recovery and Reinvestment Act (ARRA, P.L. 111-5) funding.

Figure A-1. NSF Authorizations, Budget Requests, and Appropriations: FY1951-FY2021

Budget Authority in Millions of Constant FY2019 Dollars



Source: Funding data for the "Authorization" points are from selected NSF authorization acts. Funding data for the "Request" and "Appropriations" points are from NSF, Budget Internet Information System, "NSF Requests and Appropriations History," NSF.gov, accessed April 5, 2021, http://dellweb.bfa.nsf.gov/NSFRqstAppropHist/NSFRequestsandAppropriationsHistory.pdf, and P.L. 116-260. To calculate constant FY2019 dollars, CRS used the Gross Domestic Product (GDP) Chained Price Index found in Office of Management and Budget, Budget of the U.S. Government, Historical Tables, Table 10.1, accessed March 31, 2021, https://www.whitehouse.gov/wp-content/uploads/2020/02/hist10z1_fy21.xlsx.

Notes: GDP chained price indices for FY2020 and FY2021 are estimates. FY2009 appropriation amounts do not include American Recovery and Reinvestment Act (ARRA; P.L. 111-5) supplemental funding, which provided an additional $3,002 million to NSF. With ARRA included, total FY2009 appropriations to NSF were $9,496 million in current dollars and $11,194 million in constant (FY2019) dollars.

In addition to funding authorizations, the COMPETES Acts authorized and amended some NSF STEM education programs.[118] Among the amended programs were the Graduate Research Fellowship (GRF) program and the Integrative Graduate Research and Education Traineeship (IGERT). The GRF program was established in 1951 and is one of the oldest and most prestigious federal graduate research fellowships. GRF fellows receive a three-year, portable stipend of $34,000 annually and a $12,000 cost-of-education allowance for tuition and fees (paid to their institutions).[119] NSF typically offers around 2,000 new fellowships a year. The IGERT program, which began in 1997, was NSF's flagship interdisciplinary training program. IGERT funding was awarded to institutions of higher education, which could use IGERT funding for student support or education research. In FY2014, NSF absorbed the IGERT program into the (then new) NSF Research Traineeship (NRT) program.[120]

[118] Most NSF STEM education programs are operated under general authority.

[119] NSF, *Graduate Research Fellowship Program (GRFP) Program Solicitation*, NSF 20-587, July 23, 2020, https://www.nsf.gov/pubs/2020/nsf20587/nsf20587.htm.

[120] More information about the NRT program is available at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505015.

American Innovation and Competitiveness Act

Following previous reauthorization efforts of the COMPETES Acts that inspired debate about such topics as the scientific peer review process, certain provisions of the acts were reauthorized and modified as part of the American Innovation and Competitiveness Act (AICA, P.L. 114-329). As did the COMPETES Acts, the AICA reauthorized certain previous activities and authorized new activities at NSF, as part of a multi-agency reauthorization measure. The enacted version of the AICA did not address expired authorizations of appropriations for NSF.

Table A-2. Selected NSF Authorization Acts

Public Law	Bill Number	From	To
P.L. 81-507	S. 247	FY1951	FY1952
P.L. 83-223	S. 977	FY1953	indefinite
indefinite authorization under P.L. 81-507 and P.L. 83-223		FY1954	FY1968
P.L. 90-407	H.R. 5404	FY1969	FY1969
P.L. 91-120	S. 1857	FY1970	FY1970
P.L. 91-356	H.R. 16595	FY1971	FY1971
P.L. 92-86	H.R. 7960	FY1972	FY1972
P.L. 92-372	H.R. 14108	FY1973	FY1973
P.L. 93-96	H.R. 8510	FY1974	FY1974
P.L. 93-413	H.R. 13999	FY1975	FY1975
P.L. 94-86	H.R. 4723	FY1976	FY1976
P.L. 94-471	H.R. 12566	FY1977	FY1977
P.L. 95-99	H.R. 4991	FY1978	FY1978
P.L. 95-434	H.R. 11400	FY1979	FY1979
P.L. 96-44	H.R. 2729	FY1980	FY1980
P.L. 96-516	S. 568	FY1981	FY1981
authorization bills are introduced, none become law		FY1982	FY1985
P.L. 99-159	H.R. 1210	FY1986	FY1986
P.L. 99-383	H.R. 4184	FY1987	FY1987
authorization bills are introduced, none become law		FY1988	FY1988
P.L. 100-570	H.R. 4418	FY1989	FY1993
authorization bills are introduced, none become law		FY1994	FY1997
P.L. 105-207	H.R. 1273	FY1998	FY2000
authorization bills are introduced, none become law		FY2001	FY2002
P.L. 107-368	H.R. 4664	FY2003	FY2007
P.L. 110-69	H.R. 2272	FY2008	FY2010
P.L. 111-358	H.R. 5116	FY2011	FY2013
authorization bills are introduced, none become law		FY2014	—

authorization bills are introduced, none become law		FY2015	—
P.L. 114-329[a]	S. 3084	FY2016	—

Source: Congressional Research Service, based on information from Congress.gov and Proquest Congressional.

Notes: This table includes a list of major NSF authorization acts as per a CRS search of legislative databases. In addition to the above-listed authorization acts, other laws have also amended various parts of the NSF code.

a. Authorizations of appropriations were included in early versions of the bill but excluded from the final enacted version.

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