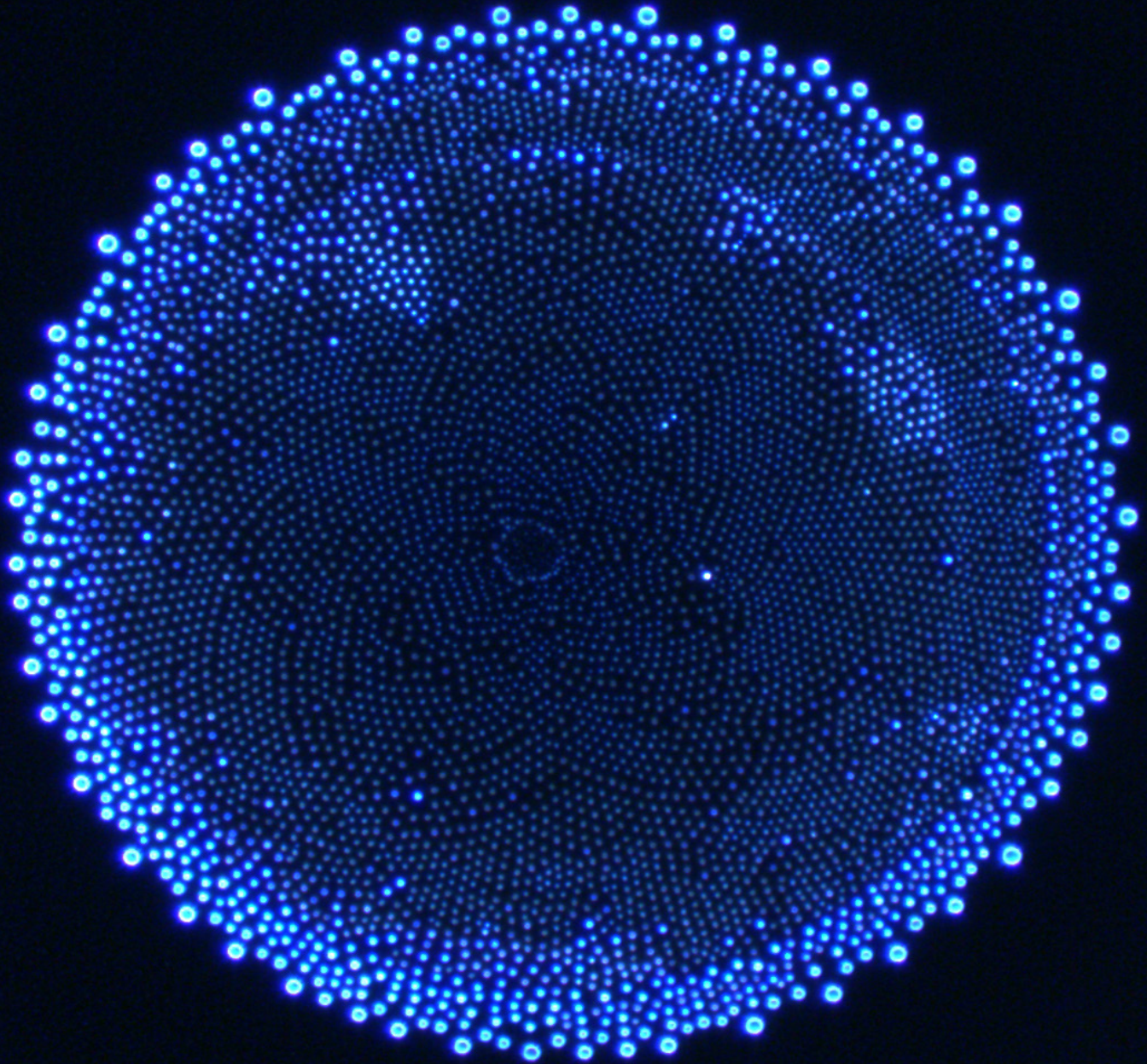National Science Board

National Science Foundation

Merit Review Process
Fiscal Year 2018 Digest

Cover Art:

Blue Sun Flower, an optical microscope image of liquid droplet residue from water-based chemicals, won grand prize in the 2013 Electron, Ion and Photon Beam Technology and Nanofabrication micrograph contest.

Credit: Devin K. Brown, Institute for Electronics and Nanotechnology, Georgia Institute of Technology

National Science Foundation's

Merit Review Process

Fiscal Year 2018 Digest

March 2020

NSB Overview of the NSF Merit Review Process
FY 2018

The National Science Board (NSB) is pleased to receive the FY 2018 Merit Review Digest from the National Science Foundation (NSF). NSF has substantially modernized its reporting on merit review, shortening the annual Digest and making it easier to navigate. The electronic version of the Digest now incorporates embedded links that allow readers to download and explore underlying data.

The Digest is one of several mechanisms NSF employs to ensure the excellence of its merit review process. Other tools for understanding, safeguarding, and improving NSF's key process include external Advisory Committees (ACs), Committee of Visitor (COV) reports, and biennial Surveys of proposers and reviewers. COV reports in particular are a key factor to maintain the quality and integrity of NSF's merit review process. They provide input on such critical elements as the qualifications of the reviewers, whether the reviews provide substantive explanatory comments and a documented rationale, and whether the resulting program portfolio is appropriately balanced. NSB relies on all of these to help assure that NSF implements the merit review process with integrity, and in a fair, competitive, and transparent manner.

Scientific Integrity and Fairness

Merit review is at the heart of NSF's enterprise. It is designed to ensure that, as far as possible, competitive peer review identifies the best portfolio of ideas for funding; that deliberations are open-minded and thoughtful, with biases and conflicts minimized; and that proposers receive constructive and useful feedback. The 2018 Digest, together with the most recent COV reports and the most recent (2017) Survey of proposers and reviewers lead the NSB to conclude the NSF's merit review process is working exceptionally well. Indeed, 72% percent of respondents in the biennial survey agreed their proposal was treated fairly in the review process.

In 2018 almost all proposals submitted were reviewed by external experts[1] in the appropriate field for Intellectual Merit and Broader Impacts—the two merit review criteria established by NSB—as well as for any additional requirements of particular solicitations. The COV reports covering FY 2015—2018 affirmed that reviewers consistently evaluate proposals based on these criteria. However, certain COV reports noted that some reviewers indicated the Broader Impacts criterion was less well defined and gave it less detailed attention. To enhance community awareness of the criterion, NSF has introduced a new description of it in the reviewer orientation video. NSB's Committee on Oversight plans to discuss the community's understanding of Broader Impacts in upcoming meetings and will work with NSF to explore additional ways to enhance public understanding of the criterion.

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[1] Approximately 5% of proposals are in categories that only require review by internal experts.

NSF believes broad participation in the science and engineering enterprise is essential for both fairness and promoting the progress of science. To this end, new NSF Program Officers (POs) must complete training in a variety of relevant areas including unconscious bias, tools for portfolio balance, and productive communications with reviewers and Principal Investigators (PIs); POs are also required to seek diverse representation among reviewers. The 2018 Digest data illustrate that the funding rate for proposals by women and under-represented racial and ethnic groups is similar to that for proposers as a whole. Indeed, the funding rate for female PIs is slightly higher than average. The NSB notes that although the proportion of submissions from under-represented racial and ethnic groups is similar to their representation in the full-time faculty of academic institutions, it is smaller than their representation in the U.S. population as a whole and the pace of improvement lags behind the rate of demographic change in the country.[2]

Pilots and Process Improvements

In 2018, NSF continued to expand a long-term trial that institutes a no-deadline policy for some selected programs; PIs can now submit proposals to these programs at times they deem most appropriate for their research. NSF continues to survey proposers and reviewers for their reactions. NSB looks forward to a formal analysis of the results of the survey, and to conclusions regarding the effectiveness of the no-deadline pilot and its potential for further expansion. NSB also observes that there is a trend to rely increasingly on panel-only, rather than *ad hoc,* reviews. Panels comprised 67% of all reviews in 2018, increasing from about 57% in 2008 and 45% in 1998. NSB encourages the agency to analyze the panel-only trend, including virtual panels, to ensure that this form of proposal review does not have an unintended impact on reviewer recommendations or the level of S&E risk in the overall portfolio, such a lack of expertise in a panel leading it to not appropriately rank a good idea. In fact, some COV reports recommended more use of *ad hoc* reviews specially to fill undesirable gaps in a panel's expertise and background.

Since FY 2015, NSF has invested in continuous improvements to its proposal and review management systems and the supporting infrastructure. These include: simplifying proposal submission to reduce the burden on researchers and their Sponsored Research offices; more in-depth compliance checking; increasingly reliable data quality and capturing proposal content to support data-mining and content analysis; and using text analysis to suggest potential reviewers and identify potential conflicts of interest.

Increasing the quality of reviewers' written comments to proposers was identified by survey respondents as the most important improvement NSF could make to the merit review process. This sentiment was echoed by at least one COV report. Based on the 2015 and 2017 Survey results, NSF is continuing its development of a reviewer orientation video but, due to the recent roll-out of this tool, only a small number of reviewers had accessed it at the time of the 2017

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2 Women, Minorities, and Persons with Disabilities in Science and Engineering (2019).

Survey. NSB looks forward to the formal analysis of the 2019 Survey results to assess how well the orientation strategy is succeeding.

Transparency and Community Awareness

Because high-quality proposals are more likely to receive funding, NSB appreciates the many ways NSF engages with researchers to increase awareness of and success in NSF programs. In 2018, NSF outreach included a two-day grants conference in Detroit to discuss proposal preparation, the merit review process, and award administration, with faculty and administrators from around the nation. As usual, NSF hosted informational booths at several nationwide conferences. NSF also held four "NSF Days" around the country to meet with faculty about Directorate and cross-cutting programs and provide networking opportunities.

NSB notes that the merit review process itself provides opportunities for NSF to engage with the research community in mutually beneficial ways. In 2018, approximately 32,300 individuals from all 50 states served as reviewers. Based on 2017 Survey data, NSF benefited from more than 500 person-years of expert time volunteered to review proposals. Almost a fifth of these reviewers were reviewing proposals for the first time; their experience will undoubtedly help them prepare their own future proposals. Survey results may also provide insights into merit review topics that would benefit from more effective messaging. For example, a majority of respondents who had submitted proposals underestimated NSF funding rates. NSB looks forward to working with NSF to determine the causes of this misunderstanding and developing corrective strategies

Funding Rates Under Pressure

The 2018 Digest data show clearly that NSF receives many more high-quality proposals than it can fund. In 2018 NSF received 48,321 full proposals across all areas of research and was able to fund only 24%. For research proposals, only 22% could be funded. NSF's overall funding rate has changed little over the past several years, although historically it has been significantly higher. NSB members believe that a funding rate closer to the historical average of 30% or more would be beneficial to the long-term health of the research community and to the nation as a whole.

The Digest illustrates the large number of science and engineering research and education opportunities lost to NSF and the nation each year due to lack of resources. In 2018, 1835 proposals that received ratings higher than "Very Good" had to be declined. These requests amounted to about $1.5 billion. One COV report specifically expressed the view that the low success rate was "detrimental to the advancement of the national interests". NSB recognizes that the size and duration of awards critically impact NSF's funding rate but does not suggest increasing the number of awards by reducing their size or time-span. Rather, NSB affirms that the U.S. should continue its efforts to make the investments that are vital for the nation's science and engineering enterprise to advance and compete effectively in the 21st century global economy. The breakthroughs in fundamental research today pave the way for the industries of tomorrow. The NSB believes that a persistent inability to fund many outstanding

research ideas and programs also puts at risk our country's long-standing success in retaining and attracting the best STEM talent.

The NSB recommends the accompanying FY 2018 Merit Review Digest for further and in-depth information on the merit review process. The new format provides better access to the broad swath of data NSF collects on its merit review process and it demonstrates more transparently NSF's enduring commitment to integrity and quality in its mission to fund outstanding research.

TABLE OF CONTENTS

APPENDICES

The National Science Foundation's Merit Review Process: FY 2018 Digest

I.   Executive Summary

This report includes data and related information about the National Science Foundation (NSF or the Foundation) Merit Review Process for fiscal year (FY) 2018. NSF acted on 48,321 competitively reviewed full proposals in FY 2018, slightly less than the number acted on in FY 2017 (49,415). The Foundation made 11,702 awards in FY 2018, resulting in a funding rate of 24%, with 255 more awards made than in FY 2017. NSF's overall proposal funding rate for competitively reviewed full proposals has remained between 22% and 24% since 2010. Funding rates vary among directorates; in FY 2018, they ranged from 19% in Engineering to 37% in Geosciences.

In FY 2018, approximately 84% of NSF's competitively reviewed full proposals were research proposals. The funding rate for research proposals was 22% overall, with directorate rates ranging from 35% in Geosciences to 15% in Education and Human Resources. The funding rate for research proposals from early-career Principal Investigators (PIs) was 19%, compared to 24% for other PIs. The funding rates for research proposals from men and women were similar, 23% and 25%, respectively. Overall, the funding rate for research proposals from White PIs was 26%, while rates for proposals from Hispanic or Latino PIs, Black/African-American PIs, and Asian PIs were 23%, 19%, and 17%, respectively.

In terms of individual investigators, the funding rate for PIs across the last three years – the average duration for a research grant – was 39%. That is, of PIs who submitted one or more research proposals between 2016 and 2018, 39% received an award in that period. Over that three-year period, the average number of research proposals submitted to obtain an award was 2.4.

The mean annual research award amount was $178,341, 3% larger than in FY 2017, and the mean duration of an award was 3.0 years. If graduate students were included in an award, the mean level of graduate student support was $31,182. NSF research awards supported 26,997 graduate students and 4,516 post-doctoral associates in 2018, as well as 35,870 senior research personnel. The average number of months of salary support for individual PIs or Co-PIs per research grant per year in FY 2018 was 0.75 months for single-PI and 0.6 months for multiple-PI awards, about half of the support for PIs provided in research grants in 2008.

Most proposals submitted to NSF are externally reviewed by one of three methods: a review panel only, ad hoc reviewers plus a panel, or ad hoc reviewers only. In FY 2018, 69% of proposals were reviewed by panel only, 22% by ad hoc plus panel, and 5% by ad hoc only. Following Foundation policy, about 5% of proposals were not reviewed externally. These included EArly-concept Grants for Exploratory Research (EAGER) proposals that enable program officers to support what they judge to be potentially transformative early-stage research

and Grants for Rapid Response Research (RAPID), as well as small grants for travel or workshops.

NSF's goal is to inform at least 75% of PIs of funding decisions within six months of receipt of their proposals.[1] In FY 2018, 72% of all proposals were processed within six months.

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[1] NSF FY 2016 Annual Performance Plan.

II.   Introduction

The National Science Foundation Act of 1950 directs the Foundation, "to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels."[2] NSF is the only federal agency whose mission includes support for all fields of fundamental science and engineering, except for medical sciences. NSF achieves its unique mission by making merit-based awards to around 1,800 colleges, universities, primary and secondary school systems, businesses, informal science organizations and other research organizations throughout the US.[3]

A National Science Board (NSB) policy, endorsed in 1977 and amended in 1984, 2017, and 2019, requests that the NSF Director submit an annual report on the NSF merit review process. The most recent report described the FY 2017 merit review process, in a shorter format that summarized a core set of data for that year. NSB and NSF have adopted this shorter format for the current and future reports, with a new name – the Merit Review Digest. This document is therefore entitled *The NSF Merit Review Process – FY 2018 Digest* and incorporates a new feature – embedded links that allow the reader to download electronic versions of all Tables and of the data, in tabular format, behind each Figure.

Section II of the digest describes the NSF Merit Review process. **Section III** provides summary data about proposals, awards, and funding rates. **Section IV** delivers information about the process by which proposals are reviewed and awarded.

The Merit Review Process

All proposals reviewed by NSF are evaluated using the two NSB-approved criteria: *Intellectual Merit* and *Broader Impacts*. These are stated in Part I of the NSF *Proposal and Award Policies and Procedures Guide*.[4] The Intellectual Merit criterion encompasses the potential to advance knowledge. The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes. Programs may have additional review criteria particular to the goals and objectives of the program. All relevant review criteria are described in the program announcement or solicitation.

About 95% of NSF's proposals are evaluated by external reviewers as well as by NSF staff. On average, NSF proposals are reviewed by 3-5 reviewers, depending on the type of review mechanism used and the nature of the proposals. Each reviewer is chosen for specific types of expertise and adds different points of view to the decision-making process. Reviewers provide written reviews that describe the strengths and weaknesses of proposals in the context of the NSB merit review criteria. NSF program officers make funding recommendations to award or decline proposals after scientific, technical and programmatic review and consideration of

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[2] 42 U.S.C. §1862, available at https://www.law.cornell.edu/uscode/text/42/1862.

[3] https://www.nsf.gov/pubs/2019/nsf19003/nsf19003.pdf

[4] Two versions of the NSF *Proposal and Award Policies and Procedures Guide* (PAPPG) were applicable in FY 2018: from October 1, 2017 to January 28, 2018, the applicable version may be found at: https://www.nsf.gov/pubs/policydocs/pappg17_1/nsf17_1.pdf; for January 29, 2018 on, the applicable version may be found at: https://www.nsf.gov/pubs/policydocs/pappg18_1/nsf18_1.pdf.

appropriate factors, such as portfolio balance and the amount of funding available. **Section IV** and **Appendix 8** of this report describe in detail the processes by which merit review is conducted as well as the principles and criteria that guide review and decision making. The integrity of the merit review process is assessed by external Committees of Visitors (**Appendix 11**) every 4 – 5 years.

Approximately 5% of proposals fall into special categories that are, by NSF policy, exempt from external review and may be internally reviewed only. These included proposals for conferences, EArly-concept Grants for Exploratory Research (EAGERs), Grants for Rapid Response Research (RAPIDs) (see **Section III.G** and **Appendix 7**), and proposals submitted through the Research Advanced by Interdisciplinary Science and Engineering (RAISE) mechanism.

Information about Proposals and Awards

NSF's annual portfolio of funding actions (award or decline) is associated with proposals, requests for supplements, and Intergovernmental Personnel Act agreements. Proposals are further divided into two types, full proposals and preliminary proposals. This report focuses on full proposals. In general, we will refer to these simply as proposals unless it is necessary to distinguish them from preliminary proposals. Information on preliminary proposals may be found in **Appendix 9**.

Section III.A discusses competitively reviewed proposals that are research proposals. This category includes proposals for typical research projects and consists of a large subset (84%) of the competitively reviewed proposals. **Sections III.B – F** summarize data on all competitively reviewed proposals.

Proposal funding rate refers to the proportion of proposals acted on in a fiscal year that resulted in awards. For example, if a directorate processed 8,000 proposals in the year, making 2,000 awards and declining the remaining 6,000, the "proposal funding rate" for that directorate in that year would be 25%.

Directorates are often referred to by their acronyms[5]: BIO (Biological Sciences), CISE (or CSE; Computer and Information Science and Engineering), EHR (Education and Human Resources), ENG (Engineering), GEO (Geosciences), MPS (Mathematical and Physical Sciences), and SBE (Social, Behavioral and Economic Sciences). Some tables and figures include data pertaining to the Office of International Science and Engineering and the Office of Integrative Activities,[6] abbreviated as OISE and OIA, respectively. In some tables, these two program offices are

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[5] A list of acronyms is provided in **Appendix 15**. In FY 2017, the Division of Advanced Cyberinfrastructure (ACI) and the Division of Polar Programs (PLR) were renamed the Office of Advanced Cyberinfrastructure (OAC) and Office of Polar Programs (OPP) but remain part of their parent directorates, CISE and GEO, respectively. Data for these units are not separately broken out in this report.

[6] Effective April 6, 2015, the Section for International Science and Engineering within the Office of International and Integrative Activities became a staff office, the Office of International Science and Engineering (OISE), within the Office of the Director (OD Memorandum 15-09). With this change, the name of what had been known as the Office of International and Integrative Activities (OIIA) reverted to the Office of Integrative Activities (OIA). Except where noted, the text, tables, and figures within this report reflect the nomenclature in effect at the end of FY 2018.

referred to collectively as OD since they reside within the Office of the Director (see **Appendix 14** for NSF's organizational chart).

III. Proposals and Awards

A. Data on Research Grants

"Research grant" is a term used by NSF to represent a typical research award, particularly with respect to the award size. Not included in this category are awards such as operations costs for centers and facilities, grants for equipment, instrumentation, conferences and symposia, grants in the Small Business Innovation Research program, and education and training grants.

A1. Research Proposal, Award, and Funding Rate Trends

Table 1 provides the research proposal, award, and funding rate[7] trends. The number of new awards made in FY 2018 (9,043) was 5.7% larger than in FY 2017 (8,553). The number of research proposals acted on decreased by 0.8%; the funding rate for research proposals increased by about 7 per cent, rising to 22%.[8,9] Note that a proposal is included in a given fiscal year based on whether the action (division director's recommendation to award or decline)[10] was taken that year, not whether the proposal was received in that year.

Table 1. Research Proposals, Awards, and Funding Rates

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Proposals	33,643	35,609	42,225	41,840	38,490	39,249	38,885	40,869	41,034	40,678	40,364
Awards	6,999	10,011	8,639	7,759	8,061	7,652	7,926	8,993	8,782	8,553	9,043
Funding Rate	21%	28%[11]	20%	19%	21%	19%	20%	22%	21%	21%	22%

Source: NSF Enterprise Information System, 10/01/18.

A2. Research Grant Size and Duration

In FY 2018, the annualized median award size was $140,000, a 5% increase from FY 2017 in nominal dollars, and the annualized mean award amount was $178,341, a 5.3% increase from FY 2017. The nominal and inflation-adjusted annual award sizes are shown in **Figure 1.**

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[7] This report uses the term "proposal funding rate" to refer to the fraction of submitted proposals that are funded.

[8] The ratio of funding rates between FY 2018 and FY 2017 is 1.066 [= (9,043/40,364) ÷ (8,553/40,678)].

[9] EAGER and RAPID proposals, which have a high funding rate, were approximately 2.3% of the research proposals. If these are removed, then the FY 2018 funding rate for research proposals is reduced from 22.4% to 21.1%.

[10] The merit review process is managed by NSF's program units (divisions and offices) and is completed when the division director or office head concurs with a program officer's recommendation to award or decline a proposal. For simplicity, this step will be referred to as completion of an award or decline action on a proposal. If that action is to recommend that an award be made, further processing takes place within the Office of Budget, Finance and Award Management (BFA) before an award is issued by NSF. More details may be found in **Section IV.B**.

[11]Results for FY 2009 and FY 2010 include funding actions made possible by the $3 billion additional appropriation that NSF received under the American Recovery and Reinvestment Act (ARRA). Approximately $2.5 billion of the ARRA appropriation was obligated in FY 2009. The remainder was obligated in FY 2010, primarily as facilities awards.

Figure 1. Annualized Award Amounts for Research Grants in Nominal and Real Dollars
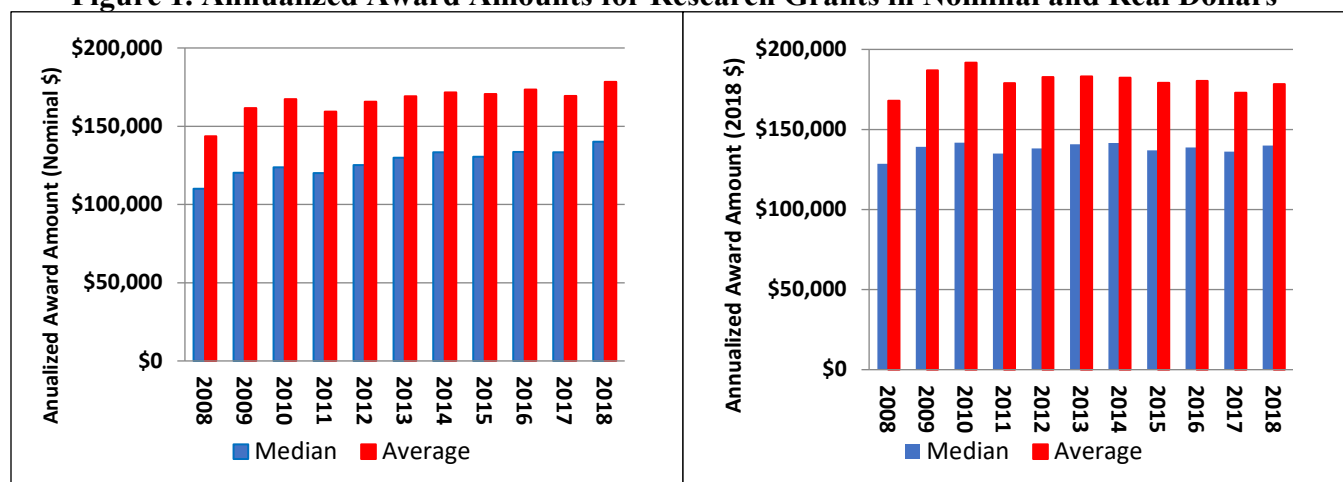
Source: NSF Enterprise Information System, 10/01/18 and Office of Management and Budget Historical Table 10.1 "*Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2024*", https://www.whitehouse.gov/wp-content/uploads/2019/03/hist10z1-fy2020.xlsx, accessed on 08/09/19. Real dollars use FY 2018 as a baseline. FY 2009 and FY 2010 include ARRA funding.

In real (i.e., inflation-adjusted) dollars, the FY 2018 annualized mean award amount ($178,341) was 3.1% larger than the FY 2017 amount ($172,994).[12] The mean annual award size in *nominal* dollars increased by 24.3% from FY 2008 to FY 2018. The mean annual award size in *real* dollars fluctuated over the same period and was 6.2% larger in FY 2018 than in FY 2008. The ARRA appropriation made possible an increase in average annual award size in FY 2009 and FY 2010, relative to FY 2008.

Data on award size organized by NSF directorate for the past decade are presented in **Appendix 1**. There is considerable variation among directorates; for example, BIO, CISE and GEO award larger research grants on average, while ENG, MPS and SBE award smaller grants.

As **Table 2** shows, the average award duration has remained relatively constant over the past decade at 3 years.[13]

Table 2. Mean Award Duration for Research Grants

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Duration (Years)	3.0	3.0	2.9	2.9	2.9	3.0	3.0	2.9	2.9	2.9	3.0

Source: NSF Enterprise Information System, 10/01/18.

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[12] Inflation-adjusted dollars were calculated using the Office of Management and Budget's Gross Domestic Product (GDP) (chained) Price Index. This deflator is updated by the Office of Management and Budget and is based on the U.S. Government fiscal year, October 1 to September 30. For this section and **Figure 1**, FY 2018 is the reference year (one FY 2018 dollar equals one real dollar).

[13] The number of years is rounded to one decimal place. This is the initial duration for new awards in each year and does not take into account no-cost extensions.

A3. Diversity of Participation

To advance the goals described in NSF's Strategic Plan[14], an important strategy is broadening the participation in NSF's activities by members of groups that are currently under-represented in Science, Technology, Engineering, and Mathematics (STEM). This includes encouraging the participation of researchers, educators, and students from such groups in NSF's programs as well as preparing and engaging a diverse STEM workforce to participate at the frontiers of research and education. Demographic information about proposers is based on self-reported data; not all proposers choose to disclose this information. PIs of research proposals submitted in FY 2018 provided information about their gender, race, ethnicity or disability status 83%, 82%, 81% or 69% of the time, respectively.

Proposals from Various Racial and Ethnic Groups
Tables 3 and **4** show the numbers of proposals and awards for various racial and ethnic groups.

Table 3. Research Proposals, by Racial and Ethnic Group

	Hispanic	Non-Hispanic	Unknown	Total
American Indian or Native Alaskan	32	48	†	††
Asian	43	9,451	659	**10,153**
Black/African American	31	800	28	**859**
Native Hawaiian or Pacific Islander	†	21	†	††
White	1,108	19,252	1,239	**21,599**
Multi-racial	66	363	23	**452**
Unknown	474	1,219	5,494	**7,187**
TOTAL	**1,754**	**31,154**	**7,456**	**40,364**

† = number less than 10; †† = row sum not available because a cell includes a number less than 10.

Table 4. Research Awards, by Racial and Ethnic Group

	Hispanic	Non-Hispanic	Unknown	Funding Rate
American Indian or Native Alaskan	†	12	†	**22%**
Asian	†	1,642	97	**17%**
Black/African American	†	149	†	**19%**
Native Hawaiian or Pacific Islander	†	†	†	**††**
White	256	4,995	290	**26%**
Multi-racial	18	94	†	**26%**
Unknown	116	246	1,095	**20%**
Funding Rate	**23%**	**23%**	**22%**	

† = number less than 10; †† = too few proposals and awards to compute a funding rate.

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[14]NSF Strategic Plan for Fiscal Years (FY) 2018-2022 https://www.nsf.gov/pubs/2018/nsf18045/nsf18045.pdf.

A4.   Number of Investigators per Research Project

Figure 2 shows the number of new research projects with single PIs (SPI) compared to the number of new research projects with multiple PIs (MPI). Some of the MPI projects are associated with multiple awards, each to a different collaborating institution.

Figure 2. Number of New Research Projects with Single PIs (SPI) & Multiple PIs (MPI)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
# SPI	3,252	4,627	3,822	3,478	3,545	3,295	3,253	3,606	3,549	3,401	3,644
# MPI	2,625	3,745	3,284	2,945	3,091	2,975	3,127	3,659	3,524	3,464	3,627
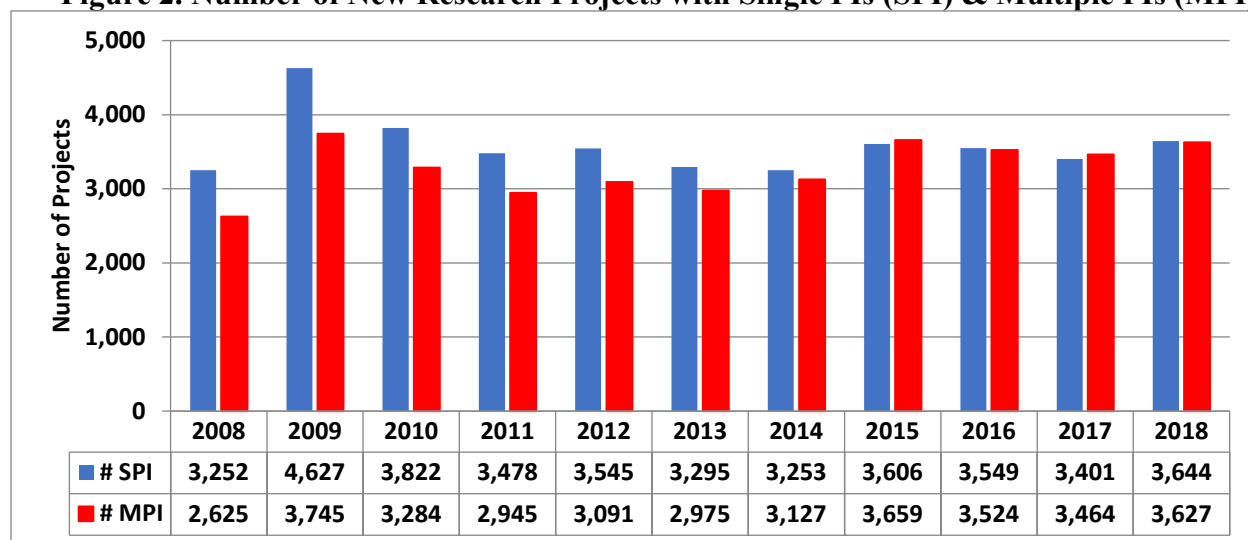
Source: NSF Enterprise Information System, 10/01/18.

As with prior years since FY 2014, the numbers of MPI projects and SPI projects funded were approximately the same. **Figure 3** shows the total amount of funds awarded to SPI and MPI research projects.

Figure 3. Award Amounts of Research Projects with Single PIs (SPI) & Multiple PIs (MPI)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SPI in $M	1,131	1,659	1,352	1,209	1,307	1,225	1,250	1,330	1,331	1,200	1,413
MPI in $M	1,489	2,490	2,247	1,947	2,061	2,102	2,143	2,523	2,457	2,353	2,672
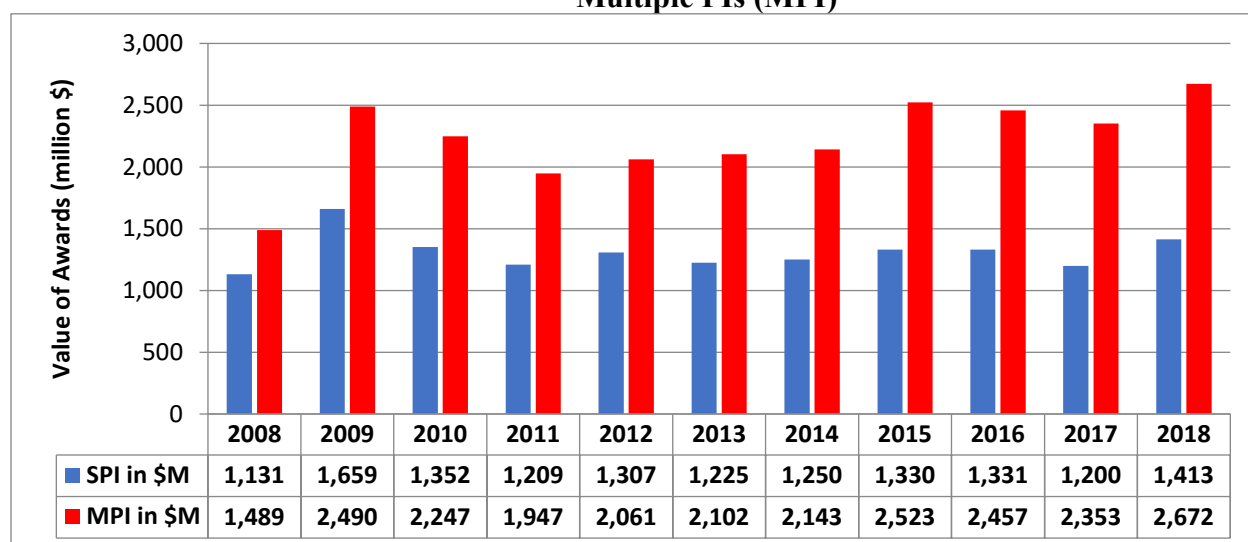
Source: NSF Enterprise Information System, 10/01/18.

Figure 4 shows the funding rates for SPI and MPI research proposals (as distinct from projects). The difference between the SPI and MPI funding rates has varied over the last ten years, but the SPI funding rate has been, and remains, consistently higher.

Figure 4. Funding Rates for Single-PI & Multi-PI Research Proposals

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
■ **Single PI Funding Rate**	22%	30%	22%	21%	22%	21%	22%	23%	23%	23%	24%
■ **Multi PI Funding Rate**	19%	25%	18%	16%	19%	17%	18%	20%	19%	19%	20%
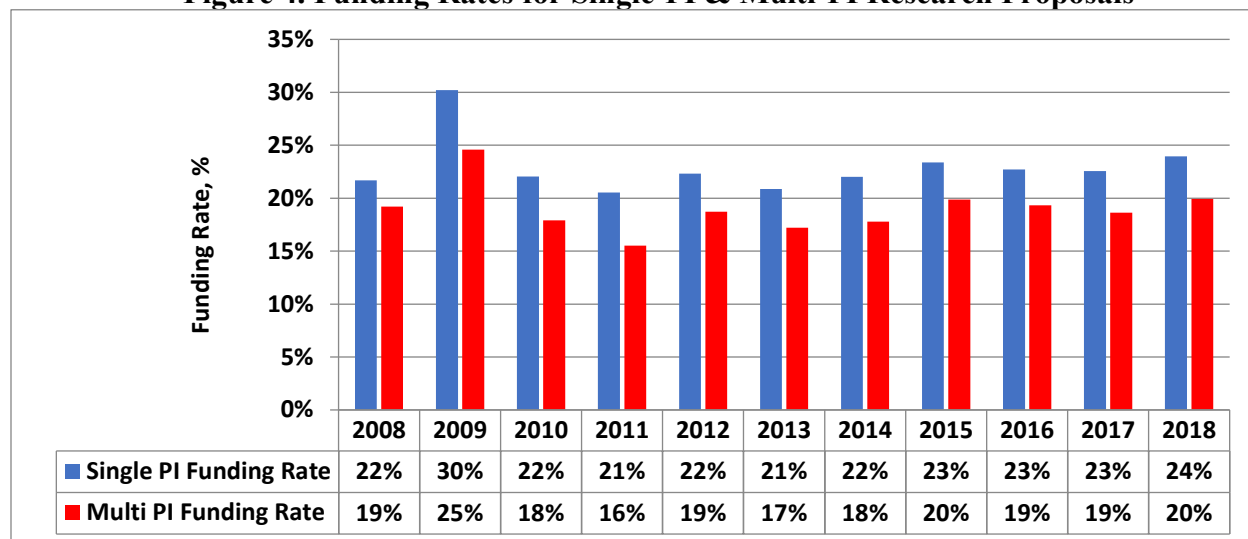
Source: NSF Enterprise Information System, 10/01/18.

A5. Number of Research Grants per PI

Table 5 shows that most PIs (81%) have one research grant, with only 4% of PIs having three or more grants. The data are averaged over the three-year period FY 2016 – 2018.

Table 5. Number of Grants per PI, by percentage of PIs

	One	Two	Three	Four or more
Fiscal Years 2016-2018	81%	15%	3%	1%

Source: NSF Enterprise Information System, 10/01/18.

A6. Number of People Supported on Research Grants

Table 6 shows the number of graduate students, post-doctoral associates and senior personnel supported on NSF research grants.[15] These data were extracted from the budget details of research grants active in the year indicated.

The absolute numbers of post-doctoral associates and graduate students supported peaked in FY 2009, as a result of NSF policy on the use of ARRA funding, and has been lower since then. From FY 2017 to FY 2018, the number of graduate students and post-doctoral associates supported by research grants increased by 1.1% and 1.6%, respectively.

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[15] The research grant category does not include most individual post-doctoral fellowships, NSF Graduate Research Fellowship awards (2,000 per year; FY 2010-2018), and other individual awards to graduate students. However, most NSF-supported post-doctoral associates and graduate students are supported as part of research grants.

Table 6. Number of People Supported on NSF Research Grants

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	% Change, 2008 - 2018
Senior Personnel	26,494	33,536	33,650	35,523	39,862	32,829	31,650	33,831	35,326	33,296	35,870	35%
Postdocs	3,909	5,580	4,653	4,751	4,596	4,447	4,286	4,586	4,460	4,442	4,516	16%
Graduate Students	22,936	33,371	24,554	24,855	25,550	25,161	26,317	26,882	27,099	26,693	26,997	18%

Source: NSF Enterprise Information System, 10/01/18.

Appendix 2 provides data on the levels of support in research grants for graduate students and post-doctoral associates.

A7. Average Number of Months of Budgeted Salary Support for Single-PI & Multi-PI Research Grants

Figure 5 shows the mean number of months of salary support per individual for PIs and co-PIs in the award budgets of single-PI and multiple-PI research grants. From FY 2008 through FY 2012, PIs on multiple-PI awards consistently averaged fewer months of support than those on single-PIs grants. Since then, the levels of support have typically been approximately equal for both types of grant. Exceptions were FY 2015, when the average number of months of support per PI or Co-PI on multiple-PI awards was more than 5% greater than the support for PIs on single-PI awards and FY 2017 and FY 2018, when it was 10% and 20% lower, respectively. (See **Appendix 2** for directorate or office level data on months of support.) The number of per-individual PI/co-PI months of support per grant has dropped considerably since the period prior to 2003. In FY 2018, support was approximately 60% of the levels a decade earlier. The data by directorate in **Appendix 2** show that, in comparison to NSF as a whole, ENG awards tend to provide fewer months of salary support for PIs and Co-PIs, approximately half the NSF average.

Figure 5. Average Number of Months of Salary for Single-PI & Multi-PI Research Grants

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single PIs	1.32	1.23	1.11	1.03	0.93	0.81	0.82	0.74	0.72	0.70	0.75
Multiple PIs	1.12	1.10	1.01	0.93	0.85	0.84	0.78	0.79	0.71	0.63	0.60

Source: NSF Report Server, 07/17/19.
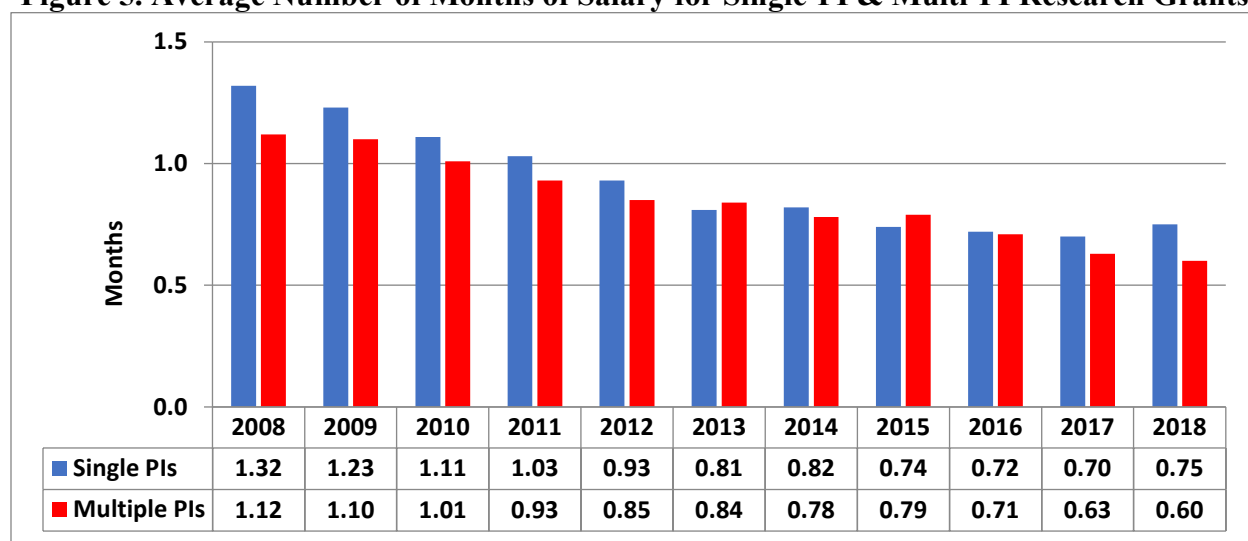
NSF's Merit Review Process: FY 2018 Digest — October 2019

A8. Principal Investigator Funding Rates

Figure 6 shows the funding rate (the green curve) for PIs in a three-year period, defined as the number of investigators receiving a research grant divided by the number of investigators submitting proposals in the same three-year window. The number of PIs submitting proposals grew over the first part of the past decade. The PI funding rate was temporarily increased by the funds appropriated under ARRA but then declined, reaching a low in FY 2011 – FY 2013. Since then, the rate has recovered and is approaching the level seen in FY 2008 – FY 2010.

Figure 6. PI Funding Rates for Research Grants

	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018
PIs Applied	47.0	48.5	51.7	54.7	55.6	55.1	53.4	53.9	54.2	54.6	54.6
PIs Awarded	17.4	19.6	20.5	21.0	19.7	19.0	19.1	19.9	20.6	21.1	21.2
PIs Funded %	37%	40%	40%	38%	35%	35%	36%	37%	38%	39%	39%
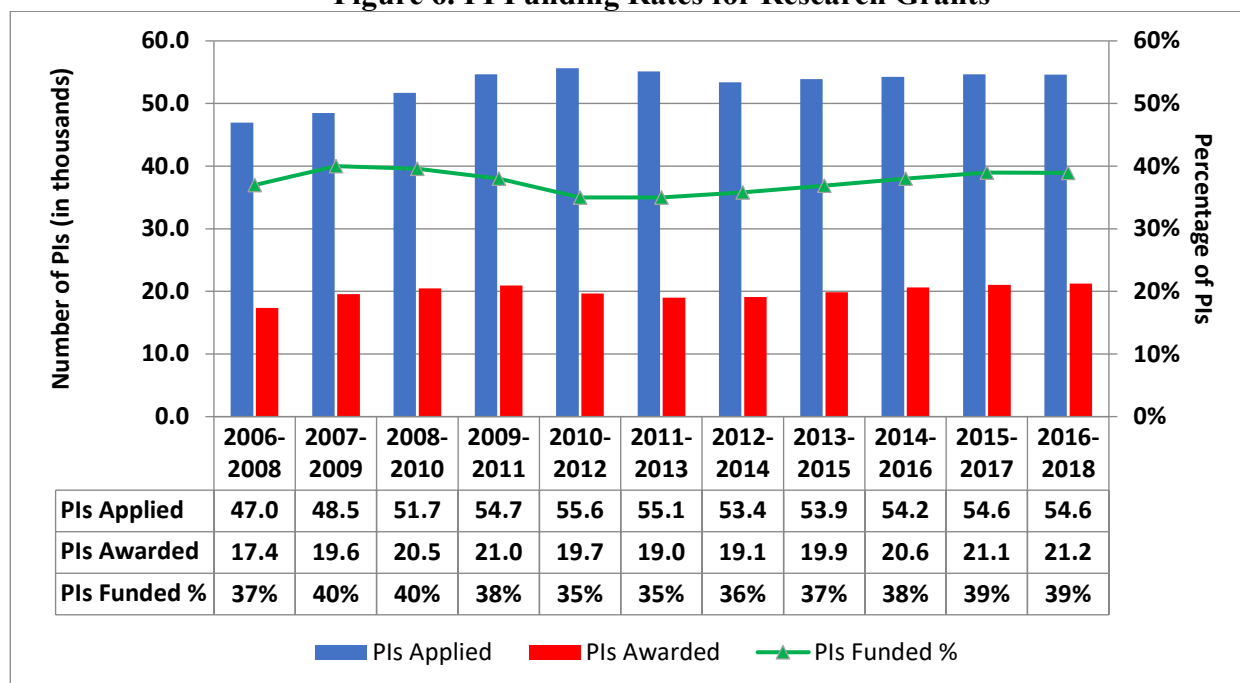
Source: NSF Enterprise Information System, 10/01/18.

In FY 2016 – 2018, PIs who received an award submitted, on average, 2.4 proposals per award received. 61% of PIs who submitted proposals during the three-year period did not receive any research award. A decade earlier, in FY 2006 – 2008, the corresponding numbers were 2.2 proposals per award and 63% of PIs not receiving an award. Note that the number of PIs who submitted proposals in FY 2016 – 2018 was 16% larger than the number in FY 2006 – 2008.

A9. Early and Later Career PIs

Figure 7 and **Figure 8** show the number and percentage, respectively, of NSF PIs of research awards that are in the early or later stages of their careers. An early career PI is defined as someone within seven years of receiving his or her last degree at the time of the award. In this document, PIs who received their last degree more than seven years before the time of their first NSF award are considered later career PIs. The funding rate for later career PIs, 24%, was slightly larger than in FY 2017 (22%), while the funding rate for early career PIs, 19%, increased by 1% in FY 2018. (**Figure 7**). The percentage of research awards to early career PIs remained approximately steady at 22% in FY 2018 (**Figure 8**).

Figure 7. Research Grants Awarded to PIs in Early and Later Stages of Career and Research Proposal Funding Rates
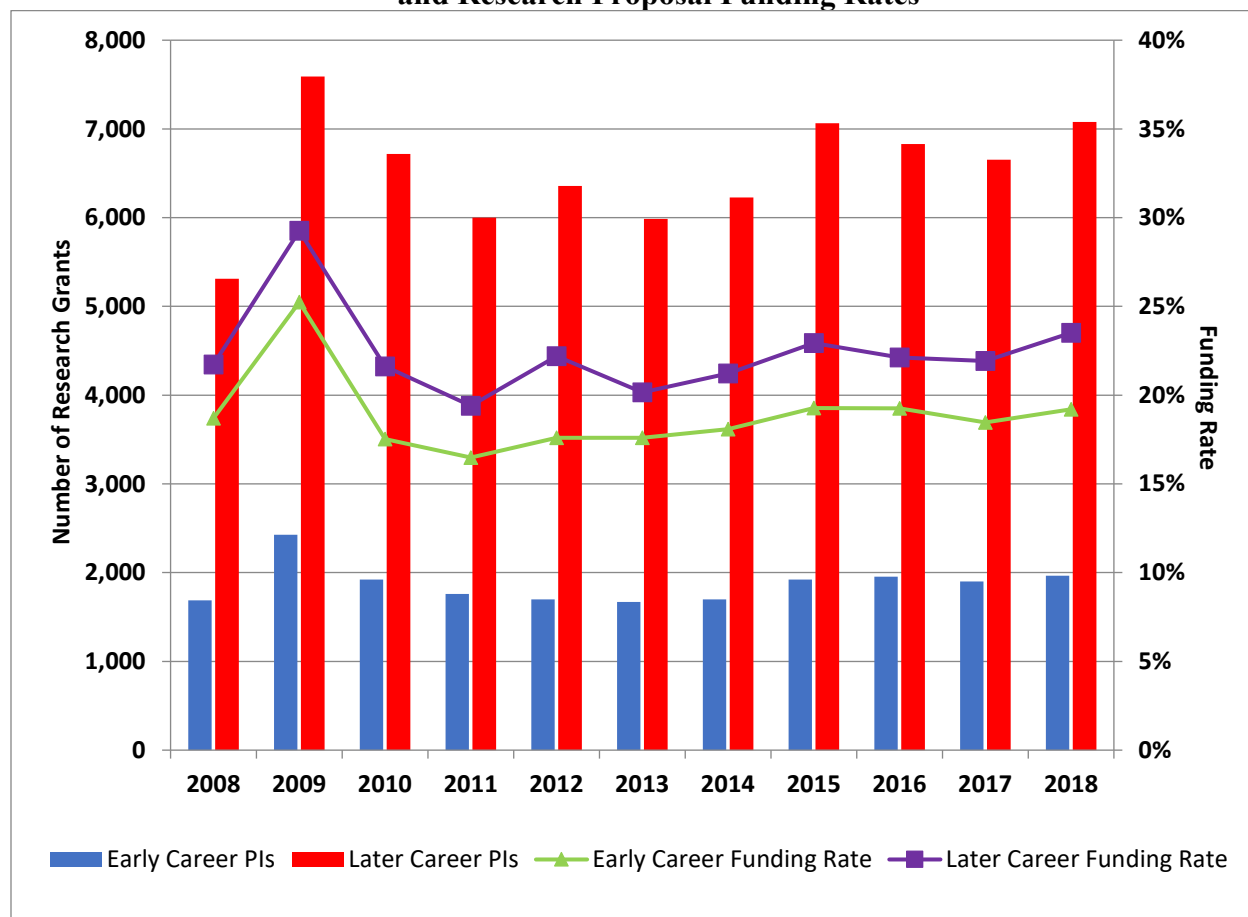
Source: NSF Enterprise Information System, 10/01/18.

Figure 8. Proportion of Awards to PIs in Early Stage of Careers

Source: NSF Enterprise Information System, 10/01/18.

NSF's Merit Review Process: FY 2018 Digest — October 2019
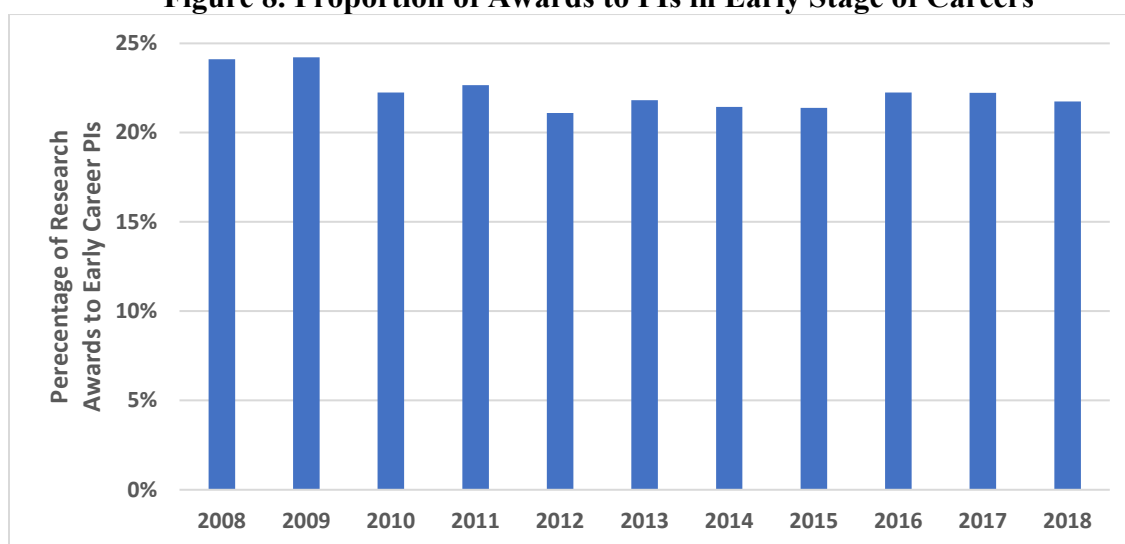
B. Competitive Proposals, Awards, and Proposal Funding Rates

The larger collection of all competitive proposals acted on by NSF in FY 2018 includes, in addition to research proposals, proposals for centers and facilities, grants for equipment, instrumentation, conferences and symposia, grants in the Small Business Innovation Research (SBIR) program, and education and training grants. For this collection, **Table 7** shows the change in the number of proposals, number of awards, and proposal funding rates through time.[16]

NSF completed action on 48,321 proposals in FY 2018, a 2.2% decrease from FY 2017, resulting in 11,702 awards, a 2.2% increase from FY 2017. Consequently, in FY 2018 the proposal funding rate was 24%, a 1% increase over FY 2017. The funding rate has been relatively stable over the past eight years, remaining between 22% and 24%. **Appendix 3** provides proposal, award, and funding rate data by NSF directorate and office.

Table 7. NSF Proposal, Award, and Proposal Funding Rates

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Proposals	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,321
Awards	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,702
Funding Rate	25%	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%

Source: NSF Enterprise Information System, 10/01/18.

C. Diversity of Participation

Table 8 provides data on proposals, awards, and funding rates by proposer characteristics (gender, under-represented ethnic or racial group, disability, new and prior PI status). Gender, disability, ethnic and racial data are based on self-reported information. About 84% of individuals who were PIs provided gender information, 83% identified a specific race (or mix of races), and 82% identified a specific ethnicity. Overall, 81% of proposals were from people who provided gender information,[17] 85% were from people for whom either the race or ethnicity was known,[18] and 67% were from people who provided information about disability status. The under-represented ethnic/racial PIs category in **Table 8** includes American Indian /Alaska Native, Black/African American, Hispanic or Latino, and Native Hawaiian/Pacific Islander. It does not include non-Hispanic Asian or White PIs.

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[16] The category of actions associated with "competitively reviewed proposals" excludes actions on preliminary proposals, contracts, IPA agreements, continuing grant increments, Graduate Research Fellowship applications, and similar categories.

[17] As a group, the funding rate for PIs who do not indicate their gender tends to be consistently lower than for PIs who do. For example, in FY 2018, the funding rate for PIs whose gender was not known was 20%.

[18] However, for only 80% of proposals was the information sufficient to determine whether the PI belonged to an under-represented racial or ethnic group, because some report only one of race or ethnicity.

Table 8. Proposals, Awards and Funding Rates, by PI Type[19]

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
All PIs (data from Table 7)	Proposals	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,321
	Awards	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,702
	Funding Rate	25%	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%
Female PIs	Proposals	9,431	9,727	11,903	11,488	10,795	11,152	11,142	11,444	11,598	11,322	10,858
	Awards	2,556	3,297	2,982	2,602	2,775	2,556	2,669	3,007	3,032	2,962	2,943
	Funding Rate	27%	34%	25%	23%	26%	23%	24%	26%	26%	26%	27%
Male PIs	Proposals	32,074	32,091	38,695	35,211	32,932	32,866	31,625	32,411	31,528	30,046	28,180
	Awards	7,986	10,437	9,080	7,739	7,816	7,316	7,286	7,810	7,512	6,930	6,884
	Funding Rate	25%	33%	23%	22%	24%	22%	23%	24%	24%	23%	24%
PIs from underrepresented racial or ethnic groups	Proposals	2,762	2,945	3,613	3,441	3,291	3,303	3,268	3,383	3,331	3,403	3,498
	Awards	670	889	812	735	718	651	681	788	778	806	853
	Funding Rate	24%	30%	22%	21%	22%	20%	21%	23%	23%	24%	24%
New PIs[20]	Proposals	16,483	16,840	21,545	19,238	17,943	17,635	17,405	18,276	18,348	18,757	18,596
	Awards	3,132	4,174	3,620	2,976	3,063	3,013	3,108	3,320	3,510	3,319	3,257
	Funding Rate	19%	25%	17%	15%	17%	17%	18%	18%	19%	18%	18%
Prior PIs	Proposals	27,424	28,341	33,997	32,324	30,670	31,364	30,646	31,344	30,937	30,658	29,725
	Awards	7,892	10,421	9,376	8,216	8,461	7,816	7,850	8,687	8,367	8,128	8,445
	Funding Rate	29%	37%	28%	25%	28%	25%	26%	28%	27%	27%	28%
PIs with disabilities	Proposals	448	470	545	543	483	488	468	562	496	491	453
	Awards	109	149	108	107	134	122	99	120	110	120	114
	Funding Rate	24%	32%	20%	20%	28%	25%	21%	21%	22%	24%	25%

Source: NSF Enterprise Information System, 10/01/18.

Gender

In general, while fewer proposals are received from women than from men, the funding rate for female PIs is slightly higher than that for male PIs. The proportion of proposals from female PIs was 27.8% in FY 2018 and the proportion of awards to women was 29.9%.[21]

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[19] Some of the awards in FY 2009 and FY 2010 were funded with a special appropriation made under the American Recovery and Reinvestment Act. See the FY 2015 Merit Review Report for additional details.

[20] In FY 2009, in conjunction with NSF's implementation of the American Recovery and Reinvestment Act, NSF revised its definition of a new PI; this became, "A new PI is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants)." This definition is used here. Previously, a new PI was considered to be any individual who had not previously been a PI on any NSF award.

[21] This is calculated as a percentage of the number of proposals from PIs who provided information about gender. The proportions for PIs from other under-represented groups are calculated similarly except that, in **Figure 10**, the number of PIs who provided information sufficient to determine whether they belong to an under-represented racial or ethnic group has been estimated for FY 2008 – FY 2009, by using the same fraction of PIs as was found in FY 2010. Based on fluctuations seen in FY 2010 – FY 2013, it is estimated that this may introduce errors in the percentages of proposals and awards from under-represented racial or ethnic groups that have an absolute magnitude of less than 0.05%, much less than the variation seen in **Figure 10**. Data in **Figure 11** are treated in a similar way.

Figure 9. Percentage of Proposals from and Awards to Women
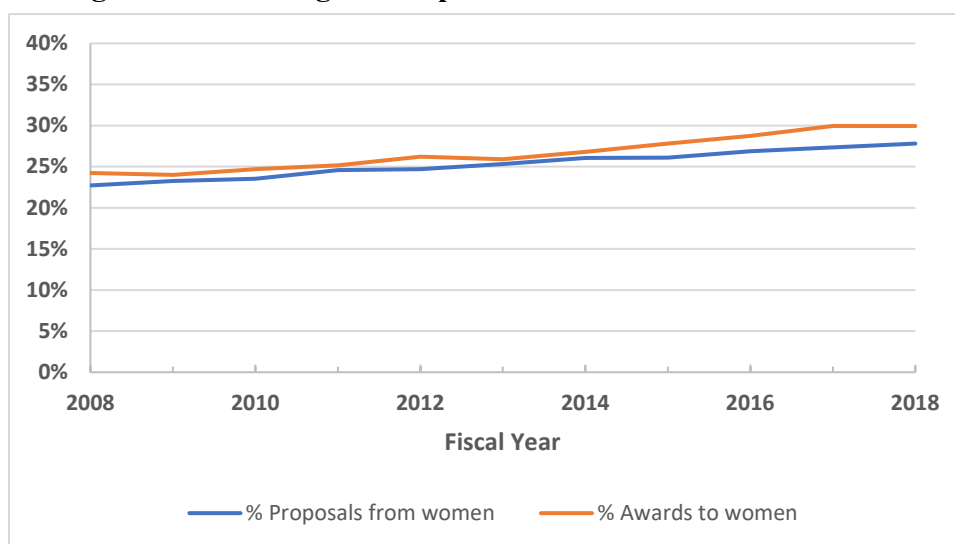
Source: NSF Enterprise Information System, 10/01/18.

As may be seen in **Figure 9**, over the past decade, there has been a relatively slow increase in the proportion of proposals submitted by women and a corresponding increase in the proportion of awards to women. The proportion of awards to women has remained slightly higher than the proportion of proposals from women. **Appendix 4** provides proposal, award, and funding rate information by directorate by PI gender.

Under-represented Racial or Ethnic Groups

The funding rate for PIs from under-represented racial or ethnic groups (URMs), 24.4%, is comparable to the average funding rate for all PIs, 24.2%. The proportion of proposals from such PIs remains low (see **Figure 10**), with a slight upward trend over the last 10 years.

Table 9 provides data on proposal, award, and funding rates by PI race and ethnicity. Very few PIs identify themselves as belonging to the categories American Indian/Alaska Native or Native Hawaiian/Pacific Islander. Because of the small numbers involved, the year-to-year fluctuations in funding rates for these groups tend to be greater than those for other ethnic groups. The proportion of submissions from under-represented racial and ethnic groups in FY 2018 (8.5%)[22] is smaller than their representation in the U.S. population but similar to their representation in the full-time faculty of academic institutions (8.6%).[23]

Among racial and ethnic groups that submitted more than 1,000 proposals in FY 2018, the funding rate is largest for the groups White (28%) and Hispanic or Latino (25%). It is smallest for Asian (19%).

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[22] The ratio of the number of PIs in an under-represented racial or ethnic minority to the total number of PIs who provided sufficient information to determine whether they belonged to such a minority.

[23] Data for full-time faculty members of institutions of higher education who hold doctorates in physical sciences, mathematics, computer sciences, life sciences, psychology, social sciences, or engineering. Available at https://www.nsf.gov/statistics/2018/nsb20181/assets/968/tables/at05-16.pdf ("Science and Engineering Indicators 2018").

Figure 10. Percentage of Proposals from and Awards to Researchers from Under-Represented Racial or Ethnic Groups
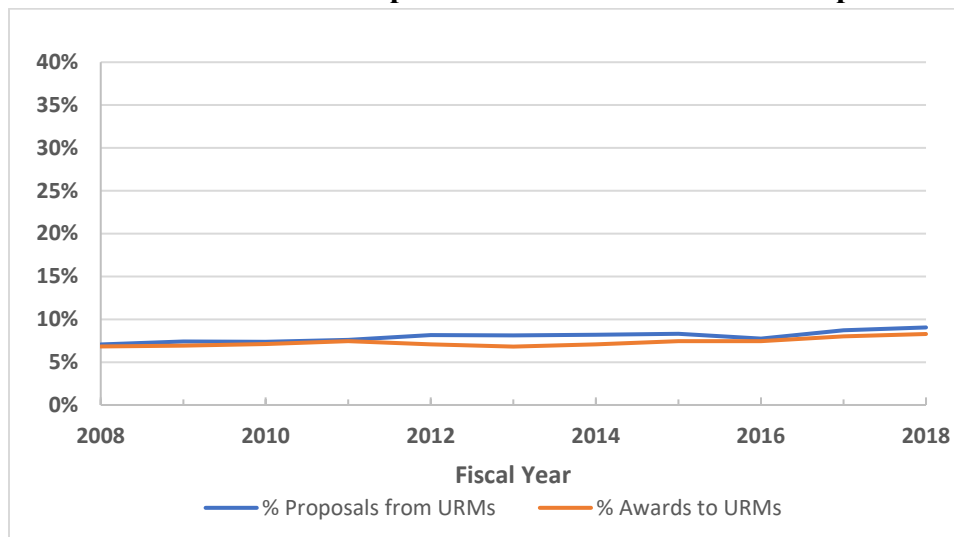
Source: NSF Enterprise Information System, 10/01/18.

PIs with a Disability

The proposal funding rate for PIs identifying themselves as having a disability is slightly higher (by 1%) than the overall funding rate for all PIs (**Table 8**). Unlike for women and under-represented racial and ethnic groups, the proportion of proposals that come from PIs with a disability has remained relatively steady from FY 2008 to FY 2018 (**Figure 11**), at approximately 1.5% in FY 2008 and 1.4% in FY 2018.[24]

Figure 11. Percentage of Proposals from and Awards to PIs with a Disability (PWDs)
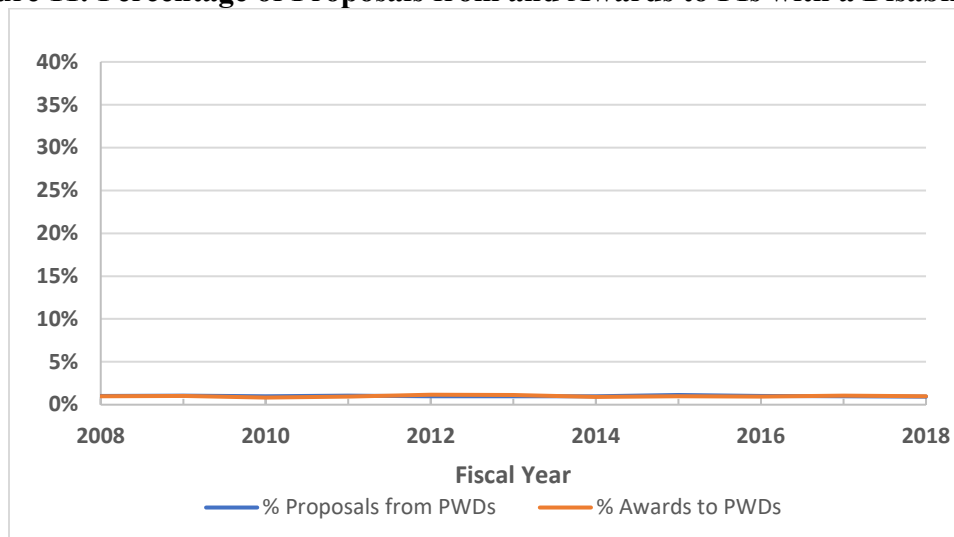
Source: NSF Enterprise Information System, 10/01/18.

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[24] In FY 2018, approximately 67% of competitively reviewed proposals were from PIs who indicated whether they had a disability. Of these, 1.4% reported that they did have a disability.

Table 9. Proposals, Awards, and Funding Rates, by PI Race and Ethnicity[25]

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
American Indian/Alaska Native	Proposals	91	88	118	129	83	113	103	104	99	134	112
	Total Awards	23	29	28	36	18	28	36	25	29	39	29
	Funding Rate	25%	33%	24%	28%	22%	25%	35%	24%	29%	29%	26%
Black/ African American	Proposals	997	1,022	1,280	1,201	1,154	1,124	1,123	1,102	1,134	1,135	1,159
	Total Awards	246	298	270	243	263	203	204	233	264	266	262
	Funding Rate	25%	29%	21%	20%	23%	18%	18%	21%	23%	23%	23%
Native Hawaiian/ Pacific Islander	Proposals	30	23	38	42	40	32	30	30	41	30	30
	Total Awards	8	8	10	11	6	5	5	2	7	5	5
	Funding Rate	27%	35%	26%	26%	15%	16%	17%	7%	17%	17%	17%
Asian	Proposals	8,952	9,550	11,626	10,829	10,382	10,511	10,538	11,148	11,623	11,552	11,362
	Total Awards	1,780	2,465	2,124	1,907	1,914	1,887	1,925	2,256	2,168	2,166	2,127
	Funding Rate	20%	26%	18%	18%	18%	18%	18%	20%	19%	19%	19%
White	Proposals	30,217	29,975	36,153	33,200	30,596	30,766	29,624	30,099	29,031	27,804	25,744
	Total Awards	8,153	10,499	9,306	7,826	8,020	7,372	7,390	7,902	7,748	7,170	7,138
	Funding Rate	27%	35%	26%	24%	26%	24%	25%	26%	27%	26%	28%
Multiracial	Proposals	284	337	512	433	448	439	425	495	508	550	550
	Total Awards	76	112	118	99	113	110	114	151	124	143	154
	Funding Rate	27%	33%	23%	23%	25%	25%	27%	31%	24%	26%	28%
Hispanic or Latino	Proposals	1,611	1,755	2,092	2,019	1,934	1,956	1,921	2,053	1,950	1,993	2,106
	Total Awards	382	533	476	438	412	401	411	495	459	460	534
	Funding Rate	24%	30%	23%	22%	21%	21%	21%	24%	24%	23%	25%

Source: NSF Enterprise Information System, 10/01/18 and NSF Report Server, 07/17/2019.

New PIs

The funding rate for PIs who have not previously had an NSF award is lower than that for PIs who have previously submitted a funded NSF proposal (18% compared to 28%; see **Table 8**). In FY 2018, the proportion of proposals from new PIs was 38% (**Figure 12**). Since FY 2001, this number has fluctuated between approximately 36% and 39%. The funding rate of new PIs remained at 18% in FY 2018. The funding rate of prior PIs rose 1% from 27% in FY 2017 to 28% in FY 2018.

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[25] This table differs from a similar one included in reports for years up to FY 2011. Before FY 2012, individuals who identified a race and indicated that they were Hispanic or Latino were only counted in the Hispanic or Latino category. Beginning in FY 2012, such individuals are included in both the appropriate racial group and in Hispanic or Latino. Previously, except for those who were Hispanic or Latino, individuals who identified multiple races were not included in the table. A "multiracial" category has been added to the table.

Figure 12. Percentage of Proposals from and Awards to New PIs
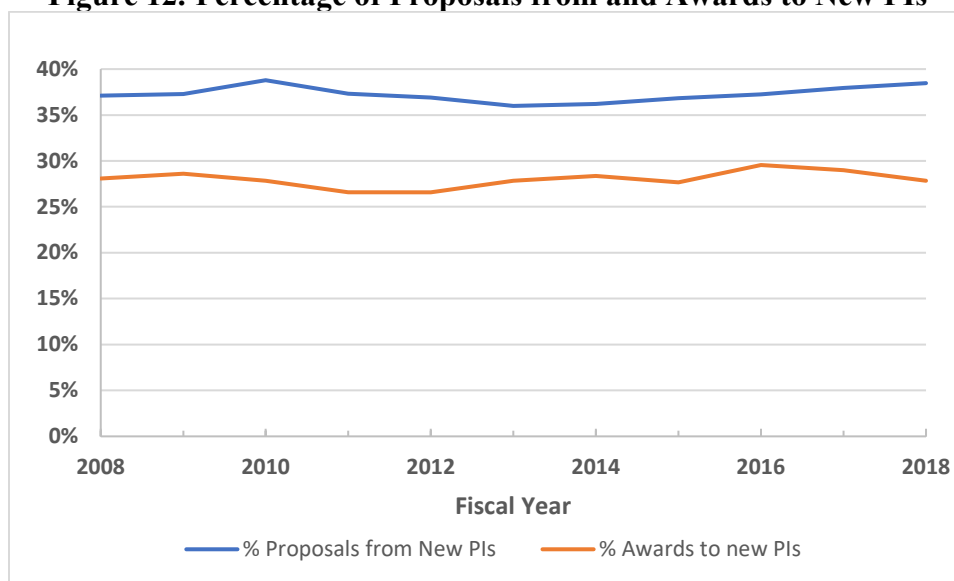
Source: NSF Enterprise Information System, 10/01/18.

D. **Types of Awards**

NSF uses three kinds of funding mechanisms: grants, cooperative agreements, and contracts. Most of NSF's projects support or stimulate scientific and engineering research and education and are funded using grants or cooperative agreements. A grant, which is the primary mechanism used by NSF, may be funded as either a standard award (in which funding for the full duration of the project, generally 1-5 years, is awarded in a single fiscal year) or a continuing award (in which funding of a multi-year project is provided in, usually annual, increments).

The use of standard and continuing grants allows NSF flexibility in balancing current and future obligations. For continuing grants, the initial funding increment is accompanied by a statement of intent to continue funding the project in subsequent increments (called "continuing grant increments" or CGIs)[26] until the project is completed. Continued funding is subject to NSF's judgment of satisfactory progress, availability of funds, and receipt and approval of required annual reports. As shown below in **Table 10**, in FY 2018, NSF devoted 43% of its total budget to new standard grants and 10% to new continuing grants.

Cooperative agreements are used when the project requires substantial agency involvement during the project performance period (e.g., research centers and multi-user facilities).

Contracts are used to acquire products, services and studies (e.g., program evaluations) required for NSF or other government use.

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[26] While the original award is a competitive action, the continuing grant increment is a non-competitive grant.

NSF's Merit Review Process: FY 2018 Digest — October 2019

Table 10. Percentage of NSF Funding by Type of Award

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Standard Grants	28%	44%	37%	34%	35%	35%	39%	39%	41%	40%	43%
New Continuing	13%	8%	13%	11%	11%	12%	10%	10%	10%	10%	10%
CGIs and Supplements	26%	18%	18%	23%	22%	22%	20%	18%	16%	17%	14%
Cooperative Agreements	23%	21%	23%	23%	23%	23%	22%	22%	22%	22%	23%
Other	11%	9%	9%	9%	10%	8%	8%	11%	11%	11%	10%

Source: NSF Enterprise Information System, 07/17/19. Percentages may not sum to 100 due to rounding. ARRA awards (in FY 2009 and FY 2010) were generally made as standard grants. "Other" includes contracts, fellowships, interagency agreements, and IPA agreements.

E. Awards by Sector and Type of Institution

In FY 2018, of the program funds awarded by NSF, approximately 77% went to academic institutions, 11% to non-profit and other organizations, 8% to for-profit businesses, and 4% to Federally Funded Research and Development Centers (**Table 11**).

Table 11. Distribution of Funds by Type of Organization

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Academic Institutions	76%	76%	77%	77%	80%	81%	81%	78%	76%	78%	77%
Non-Profit and Other Organizations	13%	13%	11%	13%	12%	11%	11%	11%	13%	10%	11%
For-Profit	8%	6%	6%	6%	5%	6%	5%	8%	8%	8%	8%
Federally Funded R&D Centers	3%	4%	5%	5%	3%	3%	3%	3%	3%	3%	4%

Source: NSF Enterprise Information System, 07/17/19. Percentages may not sum to 100 due to rounding. In FY 2015, some private, non-profit organizations, previously included in the For-Profit category, were moved to Non-Profit and Other Organizations.

Figure 13 shows the distribution of awards to academic institutions. Academic institutions are categorized according to the proportion of NSF funding received (i.e., grouping those receiving the largest proportion of NSF funding – the top 10, 50, and 100 academic institutions).

The Foundation tracks proposal funding rates for different types of academic institutions. For FY 2018, the average proposal funding rate was 27% for the Top 100 Ph.D.-granting institutions (classified according to the amount of FY 2018 funding received). In comparison, the rate was 18% for Ph.D.-granting institutions that are not in the Top 100 NSF-funded category. The proposal funding rate was 29% for four-year institutions[27] and 35% for two-year institutions. For minority-serving institutions, the FY 2018 proposal funding rate was 23%.[28]

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[27] Four-year institutions are those granting bachelor's degrees, regardless of whether they also offer graduate degrees.

[28] Additional information about the status of minorities in science and engineering can be found in the biennial publication *Women, Minorities and Persons with Disabilities in Science and Engineering* (https://ncses.nsf.gov/pubs/nsf19304/) and in a recent InfoBrief on funding to minority serving institutions (https://www.nsf.gov/statistics/2018/nsf18310/).

Figure 13. Percentage of Awards to Academic Institutions (By Amount Received)
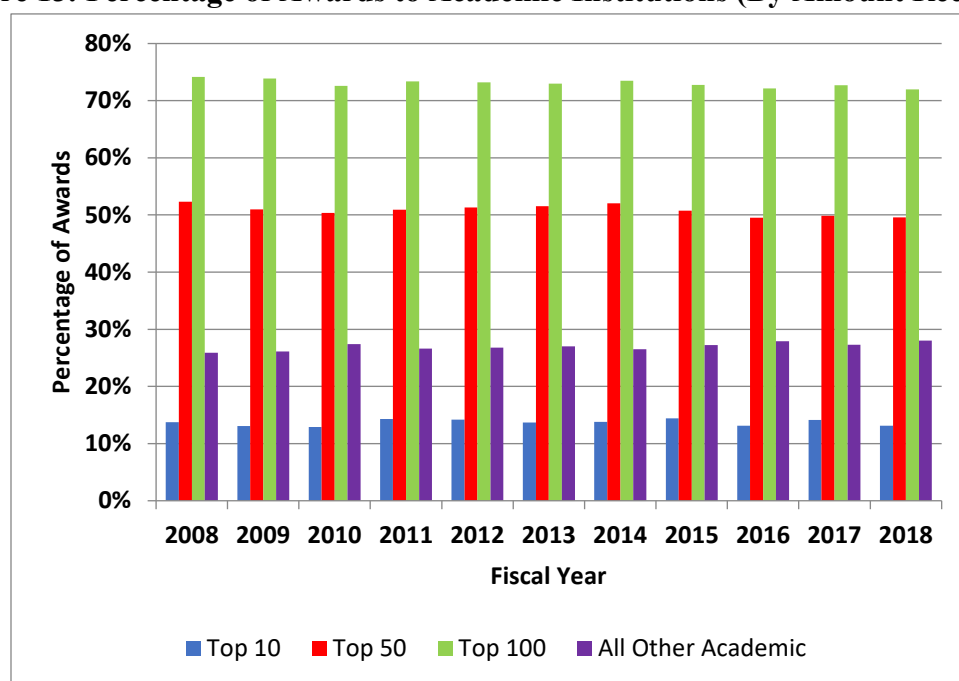
Source: NSF Enterprise Information System, 10/01/18.

The Foundation promotes geographic diversity in its programs. For example, the mission of the Established Program to Stimulate Competitive Research (EPSCoR) is to assist the NSF in its statutory function "to strengthen research and education in the sciences and engineering, including independent research by individuals, throughout the United States, and to avoid undue concentration of such research and education."[29] The EPSCoR program was designed for those jurisdictions that have historically received lesser amounts of NSF Research and Development funding. In FY 2018, 24 states, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, and Guam were eligible to participate in aspects of the program. **Appendix 5** provides data on proposals, awards, and proposal funding rates for the EPSCoR jurisdictions.

Outreach
NSF engages in several types of outreach in an effort to help increase participation and success in NSF programs. Outreach workshops are sponsored by individual NSF directorates, as well as by EPSCoR and other NSF-wide programs. Program officers frequently conduct outreach when visiting institutions or participating in scientific meetings.

NSF outreach to institutions in FY 2018 includes:

- One in-person Grants Conference was held in FY 2018, in Detroit, MI. This Foundation-wide conference was organized by the Policy Office in BFA's Division of Institution and Award Support. Each two-day conference brings about twenty-five NSF representatives from all sectors of the Foundation to meet with faculty and administrators from around

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[29] 42 U.S.C. §1862, https://www.law.cornell.edu/uscode/text/42/1862. EPSCoR was previously known as the Experimental Program to Stimulate Competitive Research. The name was changed in accordance with P.L. 114-329, the American Innovation and Competitiveness Act.

the nation to bring clarity to topics surrounding proposal preparation, the merit review process, and award administration issues.

- Four "NSF Days," organized by the Office of Legislative and Public Affairs, were held in Nashville, TN; Brookings, SD; Birmingham, AL; and Albuquerque, NM, hosted by Tennessee State University, South Dakota State University, University of Alabama at Birmingham, and The University of New Mexico, respectively. NSF Day programs bring about fifteen NSF program officers and other staff to meet with faculty about Directorate and cross-cutting programs and to provide an opportunity for networking.

NSF hosts informational booths at scientific meetings such as the annual meeting of the American Association for the Advancement of Science. In addition, several directorates host booths at conferences for members of under-represented groups in STEM, including the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), American Indian Science and Engineering Society (AISES), and the Annual Biomedical Research Conference for Minority Students (ABRCMS). NSF outreach to scientists and engineers from under-represented groups also includes activities such as attendance at workshops for tribal colleges and other minority-serving institutions.

F. Time to Decision (Proposal Dwell Time)

It is important for principal investigators to receive a timely funding decision. Since FY 2015, NSF has aimed to inform at least 75% of PIs of funding decisions (i.e., award or decline) within six months of the proposal deadline, target date, or receipt date, whichever is later. The dwell time performance goal was suspended in FY 2009 and FY 2017[30]. In FY 2018, 72% of funding decisions were communicated within the six-month target period.[31]

Table 12. Proposal Dwell Time: Percentage of Proposals Processed Within Six Months

2008	2009*	2010	2011	2012	2013	2014	2015	2016	2017*	2018
78%	61%	75%	78%	78%	76%	72%	76%	77%	71%	72%

Source: NSF Enterprise Information System, 10/01/18. *Dwell-time goal suspended in FY 2009 and FY 2017.

G. Mechanisms to Encourage Transformative Research

All NSF programs encourage and support potentially transformative research proposals. NSF also has several mechanisms particularly developed to encourage the submission of certain types of potentially transformative research proposals. These include EArly-concept Grants for

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[30] In FY 2017, the dwell time goal of 75% was suspended due to the relocation of NSF's headquarters building from Arlington, VA, to Alexandria, VA. In FY 2017, NSF informed 71% of applicants of funding decisions within six months. In FY 2009, the NSF dwell time performance goal (then, 70%) was suspended for the last three quarters to delay processing proposals that would have been declined due to lack of funding. This enabled some of these proposals to be funded with the ARRA appropriation.

[31] The dwell time goal was not included in any employee performance plans for the General Work Force performance period April 2017-March 2018. The FY 2018 result likely reflects this change in employee performance plans.

Exploratory Research (EAGER), Research Advanced by Interdisciplinary Science and Engineering (RAISE)[32], Creativity Extensions, and Accomplishment-Based Renewals. Information on the latter two types of awards may be found in **Appendix 6**.

G1. Small Grants for Exploratory Research (SGER), EArly-concept Grants for Exploratory Research (EAGER) and Grants for Rapid Response Research (RAPID)

From FY 1990 through January 2009, Small Grants for Exploratory Research (SGER) permitted program officers to make small-scale grants without formal external review. The SGER funding mechanism was replaced in 2009 with two separate funding mechanisms, EAGER and RAPID, in part to emphasize the importance of funding both potentially transformative research and research requiring an urgent response.

- **EArly-concept Grants for Exploratory Research (EAGER)**
  The EAGER funding mechanism is used to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches. The work may be considered especially "high-risk/high-payoff" in the sense that it, for example, involves radically different approaches, applies new expertise, or engages novel disciplinary or inter-disciplinary perspectives. Requests may be for up to $300,000 and up to two years duration.

- **Grants for Rapid Response Research (RAPID)**
  The RAPID funding mechanism is used for proposals having a severe urgency regarding availability of, or access to, data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events. Requests may be for up to $200,000 and of one year in duration.

EAGER and RAPID proposals are commonly reviewed using only internal reviewers. Program officers may also elect to obtain external reviews to inform their decisions. The PI is informed if the proposal will be reviewed externally.

Figure 14 shows the number of SGER, EAGER, and RAPID awards from 2008 to 2018 by Directorate. Additional information on SGER, RAPID, and EAGER awards is in **Appendix 7**. For years prior to FY 2013, data for the Office of Polar Programs (OPP) and the Office of Cyberinfrastructure (OCI) are included in the numbers for GEO and CISE. Data for OISE and OIA are combined into the category OD, barely visible in **Figure 14**.

There is considerable variation across directorates in the use of EAGER and RAPID awards. (See **Appendix 7**.) For example, during the past three years, CISE and ENG received far more EAGER proposals than any other directorate. RAPID proposals are proportionally more common in GEO than in other directorates.

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[32] The *Proposal and Award Policies and Procedures Guide* effective January 30, 2017 (NSF 17-1) introduced a new category of proposal intended to encourage transformative research, called Research Advanced by Interdisciplinary Science and Engineering (RAISE). The former Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) program has been phased out.

Figure 14. SGER, EAGER, and RAPID Awards, by Directorate or Office
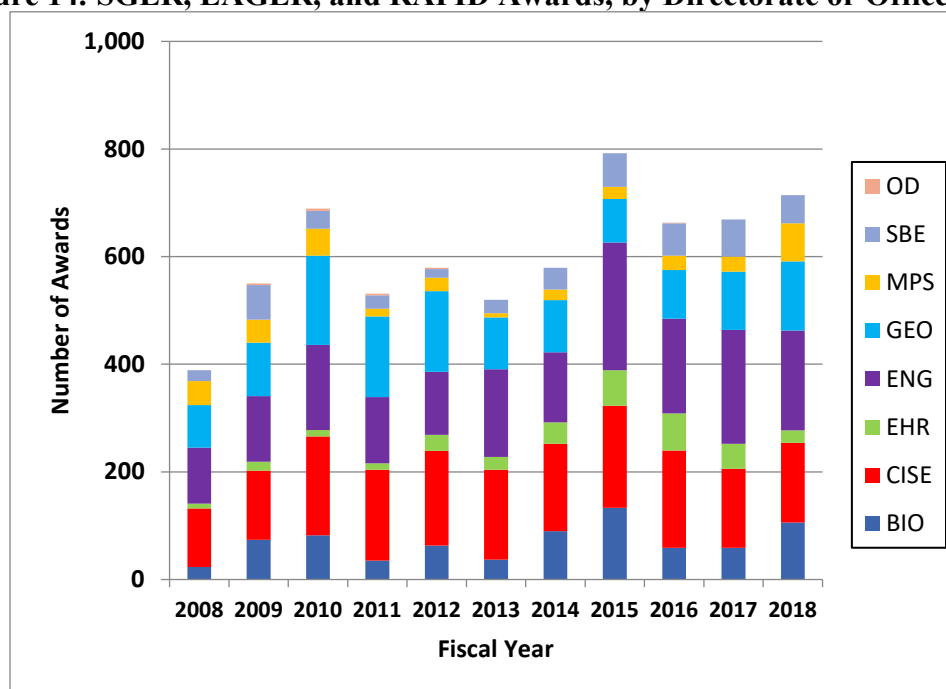
Source: NSF Enterprise Information System, 10/01/18.

In their use of EAGER and RAPID awards, the directorates fall into clusters (see **Table 13**). CISE, ENG, and GEO have received the most EAGER and RAPID proposals since their introduction and made the most awards. In the past five years, together these directorates accounted for almost 68% of these proposals and 67% of the awards. SBE, EHR, and MPS accounted for 20% of EAGER and RAPID proposals and 20% of the awards. BIO received 12% of the proposals and made 13% of the awards. BIO, EHR, and MPS had the largest average EAGER and RAPID award sizes in FY 2018. GEO and SBE made the smallest EAGER and RAPID awards, on average, in FY 2018.

Table 13. Investments in EAGER and RAPID awards by Directorate, FY 2014 – FY 2018

	ENG	CISE	GEO	BIO	SBE	EHR	MPS
% of FY 14-18 awards	27.5%	24.2%	14.8%	13.1%	8.3%	7.1%	4.9%
FY 14-18 investment ($ million)	138.3	145.3	47.8	88.4	32.3	48.9	36.3
FY 18 investment ($ million)	32.7	27.2	14.2	20.2	5.8	4.8	16.2
Mean FY 18 award ($ thousand)	176	184	111	191	111	207	229

G2. Research Advanced by Interdisciplinary Science and Engineering (RAISE)

RAISE is a type of proposal that may be used to support bold, interdisciplinary projects whose:
- Scientific advances lie in great part outside the scope of a single program or discipline, such that substantial funding support from more than one program or discipline is necessary;
- Lines of research promise transformational advances; and

- Prospective discoveries reside at the interfaces of disciplinary boundaries that may not be recognized through traditional review or co-review.

To receive funding as a RAISE-appropriate project, all three criteria must be met.

In FY 2018, NSF made thirty-three Research Advanced by Interdisciplinary Science and Engineering (RAISE) awards, all but one in response to Dear Colleague Letters inviting proposals exploring three of NSF's "Big Ideas" – Growing Convergence Research, Understanding the Rules of Life, and Quantum Leap.

IV. The NSF Merit Review Process

A. Merit Review Criteria

The National Science Board (NSB) approved the use of the two NSF merit review criteria in FY 1998 and modified the criteria to promote potentially transformative research in FY 2007. In FY 2012, the NSB revised the elements to be considered by reviewers in the application of the merit review criteria and articulated the principles upon which the criteria are based.[33] The language in the *Proposal and Award Policies and Procedures Guide,* describing the merit review criteria and the underlying principles, was revised to incorporate the recommendations from the NSB.[34] This revised language applies to proposals submitted on or after January 14, 2013 and is reproduced in **Appendix 8**.

The two NSF merit review criteria are Intellectual Merit and Broader Impacts. The Intellectual Merit criterion encompasses the potential to advance knowledge. The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes. Programs may have additional review criteria particular to the goals and objectives of the program. All relevant review criteria are described in the program announcement or solicitation.

NSF returns without review (RWR) proposals that fail to separately address both merit review criteria within the Project Summary (effective as of FY 2003). In addition, proposals are returned without review if they duplicate an existing award, are not responsive to the funding opportunity to which they were submitted, do not comply with the requirements of the *Proposal and Award Policies and Procedures Guide* and/or specific solicitation, as well as in several other circumstances.

B. Description of the Merit Review Process

The NSF merit review process includes the steps listed below (and depicted in **Figure 15**):

The proposal arrives electronically and is assigned to the appropriate program(s) for review. Some programs include preliminary proposals as part of the application process. See **Appendix 9** for more information about preliminary proposals. Proposals that do not comply with NSF regulations (Chapter IV.B of the *Proposal and Award Policies and Procedures Guide*) may be returned without review. See **Table 14** and **Appendix 10** for more information.

Table 14. Proposals Returned Without Review (RWR)

Fiscal Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Number of Proposals RWR	1287	1741	2628	1794	1813	1871	1659	1843	1399	1144	1101
Percent of all Proposal Decisions	2.8%	3.7%	4.5%	3.4%	3.6%	3.7%	3.3%	3.6%	2.8%	2.3%	2.3%

Source: NSF Report Server, 07/17/19.

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[33] *The National Science Foundation's Merit Review Criteria: Review and Revisions.* (2011) NSB/MR-11-22.
[34] The NSF *Proposal and Award Policies and Procedures Guide* (PAPPG) current at the time of this writing is available at: http://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf.

NSF improved electronic pre-submission checks of proposals to help PIs ensure that their proposals comply with NSF requirements, reducing the number of proposals returned without review.

The program officer (or team of program officers) is responsible for the following:

o *Determining the appropriate level of merit review*. (Some proposal types do not require external review; e.g., EAGER, RAPID, RAISE, and proposals for small conferences, workshops, or symposia.)

o *Selecting ad hoc reviewers and/or panel members*. The NSF guidelines for the selection of reviewers are designed to ensure selection of experts who can give program officers the proper information needed to make a recommendation in accordance with the NSB-approved merit review criteria. Optimally, reviewers have:

　　1. Special knowledge of the science and engineering subfields involved in the proposals to be reviewed to evaluate competence, intellectual merit, and utility of the proposed activity. Within reasonable limits, reviewers' fields of specialty should be complementary within a reviewer group.

　　2. Broader or more generalized knowledge of the science and engineering subfields involved in the proposals to be reviewed to evaluate the broader impacts of the proposed activity. Reviewers with broad expertise are required for proposals involving substantial size or complexity, broad disciplinary or multidisciplinary content, or significant national or international implications.

　　3. Broad knowledge of the infrastructure of the science and engineering enterprise, and its educational activities, to evaluate contributions to societal goals, scientific and engineering personnel, and distribution of resources to organizations and geographical areas.

　　4. To the extent possible, diverse representation within the review group. The goal is to achieve a balance among various characteristics. Important factors to consider include: type of organization represented, demographics, experience, and geographic balance.

o *Checking for conflicts of interest*. In addition to checking proposals and selecting appropriate reviewers with no apparent potential conflicts, NSF staff members provide reviewers guidance and instruct them how to identify and declare potential conflicts of interest. All NSF program officers and division directors receive annual conflict of interest training.

o *Synthesizing the comments of the reviewers and review panel* (if reviewed by a panel), as provided in the individual reviews and panel summaries.

o *Recommending action to award or decline the proposal*, after scientific, technical and programmatic review, and consideration of appropriate factors such as portfolio balance and the amount of funding available.

The review process is overseen by the cognizant division director, or other appropriate NSF official. Program officer recommendations are reviewed by the division director, or other

designated official, before the funding recommendation is made. Large awards may receive additional levels of review. The Director's Review Board examines award recommendations with an average annual award amount of 2.5% or more of the awarding division's annual budget (based on the prior year current plan). The NSB reviews recommended awards with an annual award amount at or above 1% of the awarding directorate's prior year current plan or 0.1% of NSF's prior year total budget, whichever is greater.[35] In FY 2018, the NSB authorized 6 new funding items.

Figure 15. Diagram of the NSF Merit Review Process
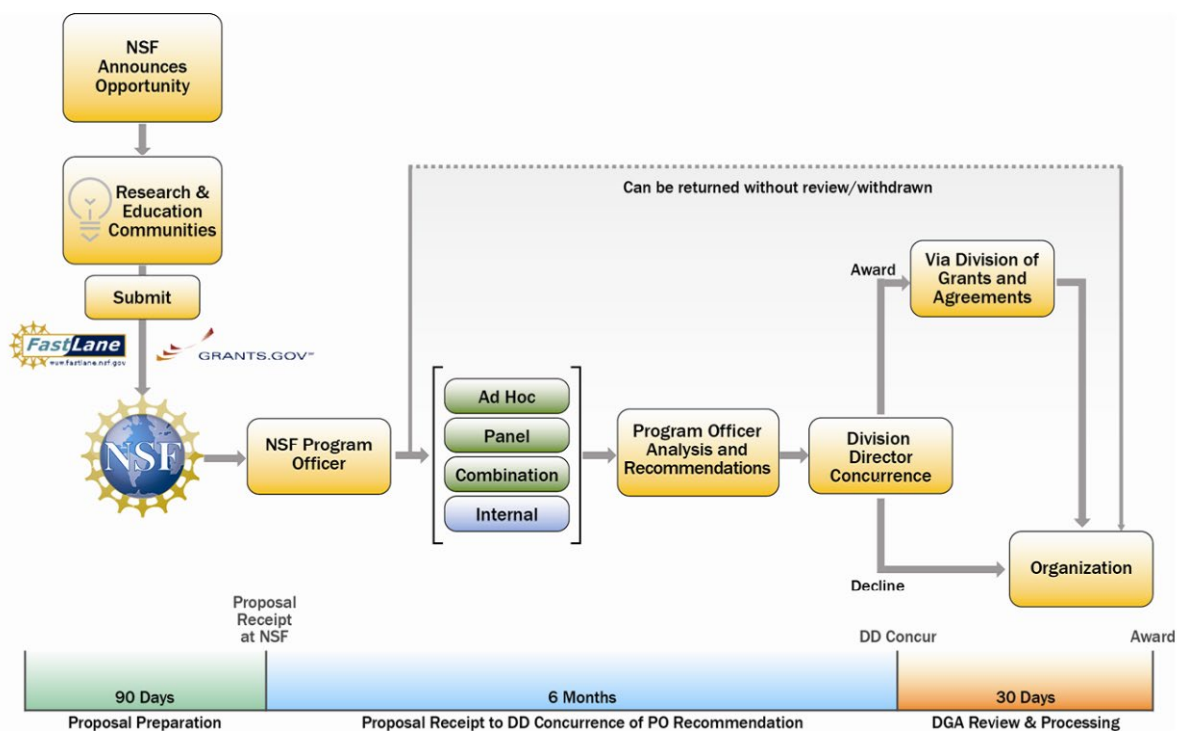
If the program recommendation is for an award and final division/office or other programmatic approval is obtained, then the recommendation goes to the Division of Grants and Agreements (DGA) or the Division of Acquisition and Cooperative Support (DACS) for review of business, financial, and policy implications. After the completion of this review, a final decision is made to fund or decline the proposal.

NSF has several external oversight and advisory mechanisms that are designed to ensure the continuing integrity and efficiency of the merit review process.

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[35]Other items requiring NSB approval include any awards from the Major Research Equipment and Facilities Construction (MREFC) account. The NSB and the Director consult on programs that either represent a significant long-term investment of program resources, particularly if funded as an ongoing NSF-wide activity, or involve substantive policy, interagency, or international issues.

- Every 4-5 years, external Committees of Visitors (COVs) assess each major NSF program or division. COVs examine the integrity and efficiency of merit review processes and the structure of the award portfolio. The COV reports and NSF responses are publicly available on the [NSF website](#).

- Directorate and Office Advisory Committees review COV reports and responses from directorates and offices and provide guidance to the Foundation.

External oversight committees comprise scientists, engineers, administrators, and educators, from academia, other non-profit organizations, and industry, as appropriate. Additional information about COVs and NSF Advisory Committees is given in **Appendix 11**.

C. <u>Program Officer Recommendations</u>

The narrative comments and summary ratings provided by external reviewers are essential inputs to program officers, who use their professional judgment to make award and decline recommendations to NSF senior management.

NSF program officers are experts themselves in the scientific areas that they manage. They have advanced educational or professional training in science or engineering (e.g., a Ph.D., P.E. or equivalent credentials) and relevant experience in research, education and/or administration. All program officers are required to complete over thirty hours of training in their first six months at NSF, covering all aspects of the merit review process. Topics include conflicts of interest, unconscious bias, communications with reviewers and PIs, and tools for portfolio balance, in addition to training on the logistics of proposal review and post-award management. Program officers continue to receive refresher training on these topics throughout their NSF careers.

Program officers are expected to produce and manage a portfolio of awards that addresses a variety of considerations and objectives. When making funding recommendations, in addition to information contained in the external proposal reviews, NSF program officers evaluate proposals in the larger context of their overall portfolio and consider issues such as:

- Support for high-risk proposals with potential for transformative advances in a field;
- Different approaches to significant research and education questions;
- Capacity-building in a new and promising research area;
- Potential impact on human resources and infrastructure;
- NSF core strategies, such as: (1) the integration of research and education and (2) broadening participation;
- Achievement of special program objectives and initiatives;
- Other available funding resources; and
- Geographic distribution.

In addition, decisions on a given proposal are made in the context of both other current proposals and previously funded projects.

D. Review Information for Proposers and the Reconsideration Process

Proposers receive notification of the award/decline decision on their proposals, unattributed verbatim copies of peer reviews, and a copy of the panel summary when a panel review was conducted. Program officers are expected to provide additional information to proposers in writing or by phone if the basis for the decision is not provided in the panel summary.

If, after receiving the reviews and other documentation of the decision, an declined proposer would like additional information, he or she may ask the program officer for further clarification. Most inquiries are settled through such dialogue. However, if, after considering that additional information, the proposer is not satisfied that the proposal was fairly handled and reasonably reviewed, he or she may request formal reconsideration. Information about the reconsideration process is included in decline notifications.[36] A reconsideration request can be based on the proposer's perception of procedural errors or on disagreements over the substantive issues dealt with by reviewers. If the relevant NSF Assistant Director or Office Head upholds the original action, the applicant's institution may request a second reconsideration from the Foundation's Deputy Director. In years when NSF does not have a Senate-approved Deputy Director, the second reconsideration decision is provided by the Chief Operating Officer.

NSF declines approximately 37,000 proposals per year and typically receives 25 – 50 requests (0.1%) for formal reconsideration annually. The number of requests for formal reconsideration and resulting decisions at both the Assistant Director (first level) and Deputy Director (second level) from FY 2008 through FY 2018 are displayed in **Appendix 12**. NSF received 11 requests for directorate-level reconsideration in FY 2018. One of these was also reviewed at the second level. All 12 decline decisions were upheld.

E. Methods of External Review

The Foundation's merit review process relies on the use of knowledgeable experts from outside NSF. As stated in the *Proposal and Award Policies and Procedures Guide*, proposals usually receive at least three external reviews. Under some circumstances, the requirement for external review can be waived.[37]

NSF programs obtain external peer review by three principal methods: (1) "ad hoc-only," (2) "panel-only," and (3) "ad hoc + panel" review.

In the "ad hoc-only" review method, reviewers are sent links to proposals and asked to submit their reviews to NSF through FastLane, NSF's web-based system for electronic proposal submission and review.

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[36] Certain types of proposal actions are not eligible for reconsideration. See NSF *Proposal and Award Policies and Procedures Guide* Section IV.D.3 at https://www.nsf.gov/pubs/policydocs/pappg18_1/nsf18_1.pdf.

[37] Exemptions that program officers may choose to exercise, for example, include proposals for EAGER, RAPID, RAISE, and certain categories of workshop and symposium proposals. See **Appendix 7** for more information about EAGER and RAPID proposals.

"Panel-only" refers to the process of soliciting reviews from panelists who convene in person or virtually to discuss their reviews and provide advice as a group to the program officer.

Many proposals submitted to NSF are reviewed using a combination of these two processes. Programs that employ the "ad hoc + panel" review process have developed several different configurations, such as:

- Ad hoc reviewers submit reviews before the panel convenes; the panel's discussion is informed by the ad hoc reviews.

- A panel meets to discuss proposals. The panel and/or program staff may identify proposals where additional reviewing expertise would be helpful. After the panel, appropriate reviewers are asked to submit ad hoc reviews to supplement the panel's advice.

The total numbers of individual, narrative reviews and the average numbers of reviews per proposal obtained by the three different review methods are presented in **Table 15**.[38]

Table 15. Reviews per Proposal, FY 2018

	All Methods	**Ad hoc + Panel**	**Ad hoc-Only**	**Panel-Only**
Reviews[*]	178,714	50,450	8,669	119,595
Proposals	46,042	10,566	2,238	33,238
Rev/Prop	3.9	4.8	3.9	3.6

Source: NSF Enterprise Information System, 10/01/18.
[*] Only written reviews prepared by individuals, whether an ad hoc reviewer or a panelist, are counted.

The ad hoc-plus-panel method resulted in the largest number of reviews per proposal, averaging 4.8, while the panel-only method averaged 3.6. The use of various review methods has changed markedly over time, as shown in **Figure 16**. **Appendix 13** provides FY 2018 data on the review methods used by directorates and offices.

In addition, site visits (on-site and reverse-site) by NSF staff and external members of the community are often used to review proposals for facilities and centers. NSF program officers are given discretion in the specific use of review methods, subject to approval by the division director or other appropriate NSF official.

The trends in **Figure 16** show an increase in the percentage of proposals reviewed by panels. The panel review process has the advantage that different perspectives can be discussed and integrated, if appropriate. Using only panels in the review process tends to reduce proposal processing time (time-to-decision) compared to ad hoc-only reviews. For example, in FY 2018, 74% of all proposals reviewed by panel only were processed within six months, compared to

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[38] The table includes only reviews written by individuals. Panel discussions may, and often do, include the input of reviewers who have read the proposal but have not been asked to provide a separate written review. A panel summary therefore often represents a review perspective that is larger than that captured in the written reviews. The number of reviews per proposal in the last line of the table therefore underestimates the amount of reviewer input when a panel is part of the review process.

63% for ad hoc + panel and 64% for ad hoc only.[39] In FY 2017, the corresponding numbers were 72%, 68% and 61%.

Figure 16. NSF Review Method, FY 2008-2018
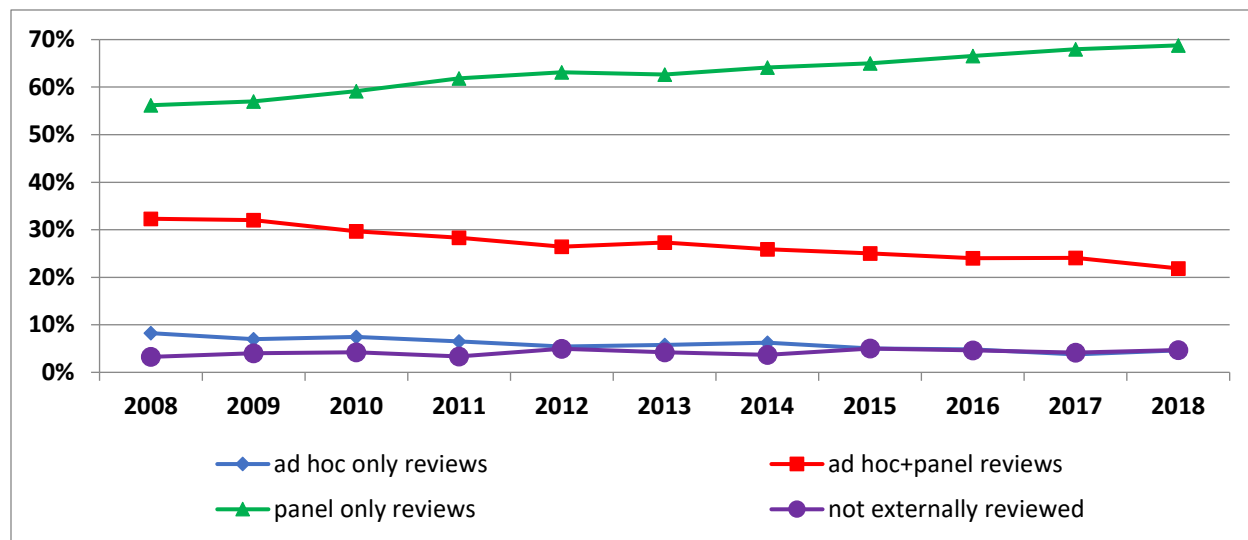
Source: NSF Enterprise Information System, 10/01/18.

One advantage of ad hoc review is that the expertise of the reviewers can be more precisely matched to the proposal. The ad hoc + panel review process combines the in-depth expertise of ad hoc review with the comparative analysis of panel review.

The average number of proposals that a panelist is asked to review in a funding cycle is considerably larger than the number of reviews asked of an ad hoc reviewer. This high workload may deter some individuals who would otherwise be willing to participate in the review process.

F. Data on Reviewers

The Foundation maintains a central electronic database of more than 479,000 reviewers who may be asked to participate in ad hoc or panel reviews. Program officers frequently add new reviewers to this database.

Approximately 32,315 individuals served on panels, conducted an ad hoc review for one or more proposals, or served in both functions for proposals for which an award or decline decision was made in FY 2018. Of these, approximately 14,640 (45%) served as panelists (of whom about 2,715 also served as ad hoc reviewers) and 17,675 (55%) served as ad hoc reviewers only. Approximately 6,225 (19%) of these reviewers had never reviewed an NSF proposal before.

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[39] The lower value for "ad hoc only" may reflect the fact that a number of the programs that use this method do not have submission deadlines, rather than being a direct consequence of the method of obtaining reviews.

Reviewers were from all 50 states as well as from the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands. Approximately 2,710 reviewers were from outside the United States by address of record.[40] Reviewers were from a range of institutions, including two-year and four-year colleges and universities, Master's level and Ph.D.-granting universities, industry, for-profit and non-profit institutions, K-12 systems, informal science institutions, and government. NSF also maintains data on numbers of reviewers from each state, territory, and country as well as by type of institution.

The NSF library continually updates its resources to help NSF staff identify reviewers. This includes the collection and sharing of potential reviewer data from associations that work with under-represented groups in science and engineering. Reviewers are also identified through literature searches and professional activities, as well as through a new, internally-developed tool that makes use of text analysis techniques to identify past reviewers of similar proposals. Some NSF divisions actively solicit new reviewers through their web-pages and outreach activities. Chapter III.B of the *Proposal and Award Policies and Procedures Guide* describes how NSF program officers select reviewers.

Participation in the merit review process is voluntary. It benefits the reviewer with increased familiarity with NSF programs, knowledge of the state of research and education nationally, and increased awareness of the elements of a competitive proposal. Panelists are reimbursed for expenses, but ad hoc reviewers receive no financial compensation. For proposals in FY 2018, NSF requested 49,366 ad hoc reviews, of which there were 35,535 positive responses.[41] The response rate varies by program and is typical of recent years.

G. Reviewer Proposal Ratings and the Impact of Budget Constraints

All funded proposals are determined to be highly meritorious based on a combination of individual reviews, panel deliberations and program officer evaluations.

Over 90% of proposals are reviewed by a panel of experts (**Figure 16**). A panel conducts its evaluation based on a discussion of the proposals. These in-depth discussions can uncover weaknesses that might not have been reflected in the initial reviews or identify strengths in proposals that might not have been rated highly by the initial reviewers.

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[40] In recent years, there has been a steady decline in the proportion of reviewers from outside the United States. The proportion of such reviewers has declined as follows:

Fiscal Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
% non-US Reviewers	15.6%	14.3%	12.7%	12.3%	12.3%	11.3%	10.8%	10.2%	8.4%

[41] This number tracks requests that are recorded in the Proposal and Reviewer System (PARS). For example, when potential reviewers are sent a formal invitation via eCorrespondence, the reviewer is entered in PARS. Some potential reviewers are first invited informally by email or telephone. If they decline this initial invitation, there is usually no follow-up in eCorrespondence. Numbers given here reflect the rate of positive responses to formal invitations and overestimate the practical positive response rate.

The expertise of the NSF program officer making the final recommendation is an important voice in the process. Program officers look not only at the ratings provided by reviewers but also weigh the *comments* that reviewers provide on the intrinsic merits of proposals. Program officers also take into consideration other factors that might not have been considered by expert reviewers. For example, proposals for innovative new ideas often use methods or techniques that might be considered risky by reviewers and panelists. Such "risky" proposals may result in transformative research that accelerates the pace of discovery. Although program officers consider concerns about risk expressed by panels, they also see the value of funding potentially transformative research. Even if the program officer decides not to fully fund the proposal, proposals that do not review well in a panel due to methods that are unproven or risky can be given small awards to allow enough work for a "proof of concept." Program officers will also consider broader impacts that might not be obvious to reviewers, such as filling an infrastructure need that will serve a large number of researchers. There are many dimensions of portfolio balance that may influence the final recommendation. Program officers strive to fund proposals from diverse institution types across all 50 states, from both new and experienced investigators.

Figure 17. Cumulative Requested Amounts for Declined Proposals by Average Reviewer Rating for FY 2018
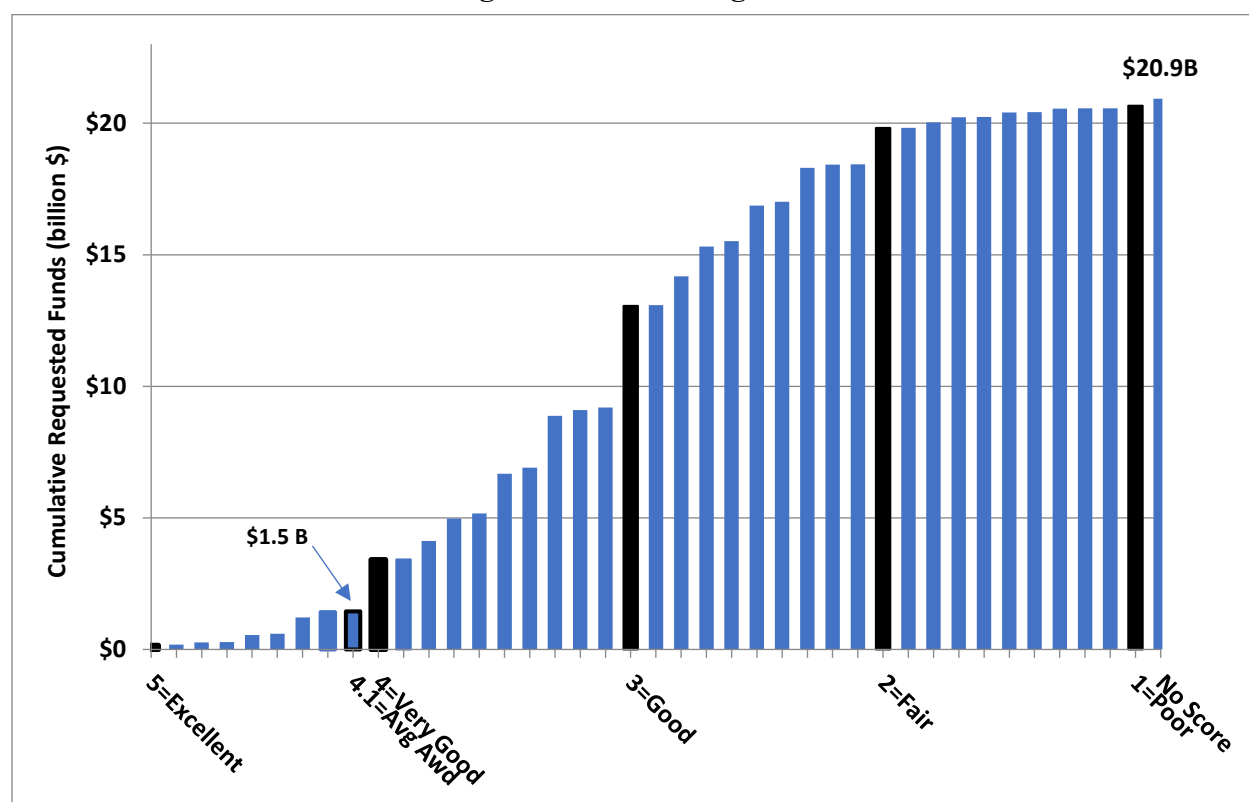
Source: NSF Enterprise Information System, 10/01/18

A large number of potentially fundable proposals are declined each year. As shown in **Figure 17**, approximately $1.5 billion was requested for 1835 declined proposals that received ratings at least as high as the average rating (4.1 out of 5.0) for all awarded proposals. Approximately $3.4 billion was requested for declined proposals that were rated Very Good or higher in the merit review process (about 5440 declined proposals received ratings of 4.0 or greater). These declined

proposals represent a rich portfolio of unfunded opportunities – proposals that, if funded, may have produced substantial research and education benefits.

H. Program Officer Characteristics

Table 16 shows information about NSF's program officers. In FY 2018, the number of program officers increased to 525 from 509 the prior year. All incoming NSF program officers receive training in the merit review process.

Table 16. Distribution of NSF Program Officers by Characteristics

Program Officers	Total	Percent
Total	**525**	**100%**
Gender		
Male	280	53%
Female	245	47%
Race and Ethnicity		
Racial or Ethnic Minority	154	29%
Non-Minority	371	71%
Employment		
Permanent	288	55%
Visiting Scientists, Engineers & Educators (VSEE)	44	8%
Temporary	45	9%
Intergovernmental Personnel Act (IPA)	148	28%

Source: NSF Division of Human Resource Management, 09/30/2018. Data are for the end of FY 2018.

Program officers can be permanent NSF employees or non-permanent employees. As shown in **Table 16**, 55% are permanent program officers and 45% are not permanent. Some non-permanent program officers are "Visiting Scientists, Engineers, and Educators" (VSEEs), "on loan" for up to three years from their host institutions. Others are supported through grants to their home institutions under the terms of the Intergovernmental Personnel Act (IPA). In FY 2018, the number of permanent program officers increased by 4 relative to FY 2017 and the number of IPAs increased by 16. Relative to FY 2017, the proportion of VSEEs remained constant at 8% of the total, and the proportion of IPAs increased from 28% to 26%.

Compared to FY 2017, the numbers of program officers who are women or members of a racial or ethnic minority grew by 25 and 16, respectively. At the end of FY 2018, approximately 47% of program officers were female and approximately 29% were from a racial or ethnic minority.

Appendices

**Appendix 1 - Median and Mean Annualized Award Amounts for Research Grants,
by Directorate or Office**

**Table 1.1 – Median and Mean Annualized Award Amounts for Research Grants
(Nominal Dollars in Thousands)**

		Fiscal Year										
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
NSF	Median	$110	$120	$124	$120	$125	$130	$133	$130	$133	$133	$140
	Mean	$143	$162	$167	$159	$166	$169	$172	$171	$173	$169	$178
BIO	Median	$150	$161	$171	$178	$177	$182	$178	$186	$200	$198	$197
	Mean	$180	$200	$222	$226	$214	$228	$217	$237	$243	$223	$226
CISE	Median	$94	$110	$118	$141	$150	$161	$166	$161	$155	$156	$166
	Mean	$131	$169	$172	$174	$206	$204	$199	$187	$198	$187	$199
ENG	Median	$100	$100	$100	$100	$107	$103	$112	$103	$102	$107	$113
	Mean	$112	$120	$122	$119	$125	$122	$131	$122	$124	$125	$131
GEO	Median	$89	$101	$100	$116	$125	$141	$141	$144	$150	$150	$166
	Mean	$122	$153	$134	$162	$170	$193	$201	$183	$185	$190	$216
MPS	Median	$105	$113	$115	$111	$117	$116	$120	$125	$122	$120	$123
	Mean	$133	$138	$150	$141	$143	$130	$141	$149	$142	$138	$146
OIA	Median	$146	$391	$391	$393	$170	$156	$171	$713	$156	$152	$150
	Mean	$146	$366	$431	$379	$178	$948	$173	$554	$514	$260	$262
OISE	Median	$30	$25	$50	$49	$50	$31	$49	$82	$83	$84	$100
	Mean	$29	$33	$198	$60	$200	$53	$142	$149	$102	$318	$161
SBE	Median	$100	$101	$100	$98	$98	$101	$109	$112	$117	$119	$123
	Mean	$116	$114	$116	$113	$120	$139	$134	$138	$136	$146	$141

Source: NSF Enterprise Information System, 10/01/18.

EHR is not included in this table because the number of awards included in the "research grant"
category is small relative to the number of education awards managed by that directorate.

Appendix 2 - Mean Levels of PI, Graduate Student, and Post-Doctoral Associate Support in Research Grants

Table 2.1 – Mean Number of Months of Salary Support per PI/co-PI for Single- and Multi-PI Research Grants, by Directorate or Office

Directorate or Office	Type of Award	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
NSF	Single PI Grants	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.7	0.8
	Multi-PI Grants	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.6	0.6
	NSF Average	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.8	0.7	0.7	0.7
BIO	Single PI Grants	1.8	1.3	1.2	1.3	1.1	1.0	1.0	0.9	0.9	0.7	0.7
	Multi-PI Grants	1.7	1.6	1.2	1.1	1.1	1.3	1.0	1.1	0.9	0.7	0.8
	BIO Average	1.8	1.4	1.2	1.2	1.1	1.1	1.0	0.9	0.9	0.7	0.7
CISE	Single PI Grants	0.7	0.8	0.8	0.9	0.7	0.7	0.7	0.6	0.6	0.6	0.6
	Multi-PI Grants	0.5	0.6	0.6	0.8	0.7	0.6	0.7	0.5	0.5	0.5	0.5
	CSE Average	0.6	0.7	0.7	0.9	0.7	0.6	0.7	0.6	0.6	0.6	0.6
EHR	Single PI Grants	2.0	1.6	1.9	1.7	1.4	1.4	1.0	0.9	0.8	0.7	0.9
	Multi-PI Grants	1.2	1.6	1.8	2.2	1.7	1.0	0.9	0.8	0.7	0.8	0.7
	EHR Average	1.5	1.6	1.8	2.1	1.6	1.1	0.9	0.8	0.7	0.8	0.8
ENG	Single PI Grants	0.9	0.9	0.4	0.4	0.6	0.4	0.3	0.4	0.4	0.3	0.3
	Multi-PI Grants	0.7	0.7	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	ENG Average	0.8	0.8	0.4	0.4	0.5	0.4	0.3	0.4	0.3	0.3	0.3
GEO	Single PI Grants	1.1	1.0	1.1	1.0	1.0	0.9	1.0	1.0	0.9	0.8	1.4
	Multi-PI Grants	1.2	1.1	1.1	1.0	1.3	1.3	1.2	1.2	1.1	1.2	1.0
	GEO Average	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.0	1.0	0.9	1.3
MPS	Single PI Grants	1.3	1.5	1.3	1.3	1.1	1.0	1.0	0.8	0.8	0.8	0.8
	Multi-PI Grants	1.4	1.5	1.2	1.2	0.9	0.9	0.9	0.9	0.8	0.7	0.6
	MPS Average	1.4	1.5	1.3	1.3	1.0	1.0	1.0	0.9	0.8	0.8	0.8
OIA	Single PI Grants	3.3	0.4	2.4	1.3	1.2	1.1	1.2	0.8	1.0	0.4	0.9
	Multi-PI Grants	N/A	1.1	0.4	0.2	N/A	N/A	0.7	N/A	0.4	0.6	1.4
	OIA Average	3.3	1.0	1.1	0.9	1.2	1.1	0.8	0.8	0.5	0.5	1.2
OISE	Single PI Grants	N/A	1.0	0.3	2.2	0.3	0.8	0.5	0.6	0.6	0.3	0.8
	Multi-PI Grants	1.0	0.9	1.8	0.8	0.7	0.5	0.5	0.8	0.7	0.6	1.1
	OISE Average	1.0	1.0	1.4	1.1	0.6	0.7	0.5	0.7	0.7	0.6	1.0
SBE	Single PI Grants	2.0	1.5	1.7	1.2	1.2	1.1	1.1	1.1	1.0	1.1	0.8
	Multi-PI Grants	1.1	1.0	1.3	0.9	0.9	1.2	1.2	1.6	1.4	0.6	0.7
	SBE Average	1.7	1.4	1.6	1.1	1.1	1.1	1.2	1.3	1.1	0.9	0.8

Source: NSF Enterprise Information System, 10/01/18.

Table 2.2 – Mean Annualized Graduate Student Support on Research Grants

Fiscal Year	Mean Annualized Level of Graduate Student Support per Research Grant[42]	
	All Research Grants	Research Grants with Graduate Student Support
2008	$15,415	$21,100
2009	$16,907	$22,684
2010	$15,780	$22,086
2011	$17,182	$24,259
2012	$19,884	$28,101
2013	$20,937	$29,101
2014	$21,028	$29,381
2015	$20,842	$29,875
2016	$21,408	$30,657
2017	$21,440	$30,766
2018	$21,547	$31,182

Source: NSF Report Server 07/17/19.

Table 2.3 – Mean Annualized Post-Doctoral Associate Support on Research Grants

Fiscal Year	Mean Annualized Level of Post-Doctoral Researcher Support per Research Grant	
	All Research Grants	Research Grants with Post-Doc. Support
2007	$4,491	$25,814
2008	$4,214	$24,998
2009	$4,718	$26,747
2010	$5,183	$28,587
2011	$5,377	$29,639
2012	$5,992	$35,593
2013	$6,060	$34,674
2014	$5,492	$34,142
2015	$5,970	$35,889
2016	$5,894	$36,339
2017	$5,680	$36,700
2018	$5,838	$35,861

Source: NSF Report Server 07/17/19.

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[42] Not all research grant proposals request support for graduate students. This table shows the total amount of annualized graduate student support in research grants divided, respectively, by the total number of research grants and by the total number of research grants that include graduate student support.

Appendix 3 - Proposals, Awards, and Funding Rates, by Directorate or Office

Table 3.1 – Proposals, Awards, and Funding Rates by Directorate or Office

		Fiscal Year										
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
NSF[43]	Proposals	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,321
	Awards	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,702
	Funding Rate	25%	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%
BIO	Proposals	6,598	6,578	8,059	7,439	5,269	5,934	4,784	5,119	5,206	5,005	4,765
	Awards	1,291	1,823	1,556	1,310	1,293	1,250	1,272	1,379	1,330	1,142	1,190
	Funding Rate	20%	28%	19%	18%	25%	21%	27%	27%	26%	23%	25%
CISE	Proposals	6,067	6,001	7,317	6,702	7,703	7,821	7,434	8,032	8,299	8,722	9,150
	Awards	1,449	1,926	1,755	1,527	1,749	1,616	1,680	1,886	1,918	1,819	2,098
	Funding Rate	24%	32%	24%	23%	23%	21%	23%	23%	23%	21%	23%
EHR	Proposals	3,887	3,699	5,055	4,660	4,281	4,501	4,049	4,242	4,423	4,294	4,160
	Awards	1,111	1,009	930	807	889	793	701	830	915	899	892
	Funding Rate	29%	27%	18%	17%	21%	18%	17%	20%	21%	21%	21%
ENG	Proposals	9,643	10,611	13,226	12,314	11,338	10,738	11,878	12,326	12,570	13,028	13,092
	Awards	1,966	2,688	2,375	2,064	2,065	2,212	2,145	2,504	2,499	2,455	2,458
	Funding Rate	20%	25%	18%	17%	18%	21%	18%	20%	20%	19%	19%
GEO	Proposals	5,101	4,991	5,614	5,187	5,243	6,087	5,790	5,812	4,999	4,793	3,775
	Awards	1,563	2,226	1,970	1,705	1,637	1,565	1,487	1,463	1,526	1,520	1,407
	Funding Rate	31%	45%	35%	31%	31%	26%	26%	25%	31%	32%	37%
MPS	Proposals	7,837	7,883	9,411	8,796	9,006	8,903	8,855	9,133	9,199	8,848	8,803
	Awards	2,269	3,122	2,669	2,352	2,523	2,201	2,343	2,593	2,432	2,334	2,593
	Funding Rate	29%	40%	28%	27%	28%	25%	26%	28%	26%	26%	29%
OIA	Proposals	21	109	200	138	44	98	78	91	102	117	211
	Awards	17	36	89	25	14	27	29	36	30	54	68
	Funding Rate	81%	33%	45%	18%	32%	28%	37%	40%	29%	46%	32%
OISE	Proposals	910	781	1,042	1,214	951	484	677	582	313	298	235
	Awards	357	428	395	404	333	245	307	275	236	194	53

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[43] Several organizational changes occurred over the decade. Data from prior years have been realigned with the organizational structure in effect for FY 2018 to show historical trends. A realignment in FY 2013 moved the Office of Polar Programs (OPP) and Office of CyberInfrastructure (OCI) from the Office of the Director to GEO and CISE, respectively, preserving their identity as separate divisions. Additionally, the Office of International Science & Engineering (OISE) and the Office of Integrative Activities (OIA) became the Office of International and Integrative Activities (OIIA). In a further realignment, in FY 2015, OIIA was again separated into the Office of International Science & Engineering (OISE) and the Office of Integrative Activities (OIA). See **Appendix 14**.

		Fiscal Year										
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
	Funding Rate	39%	55%	38%	33%	35%	51%	45%	47%	75%	65%	23%
SBE	Proposals	4,364	4,525	5,618	5,112	4,776	4,433	4,506	4,283	4,174	4,310	4,130
	Awards	1,126	1,337	1,257	998	1,019	920	994	1,041	991	1,030	943
	Funding Rate	26%	30%	22%	20%	21%	21%	22%	24%	24%	24%	23%
Other[44]	Proposals		3			2						
	Awards		0			2						
	Funding Rate		0%			100%						

Source: NSF Enterprise Information System, 10/01/18.

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[44] The 'Other' category includes, for example, non-contract awards made on behalf of the Office of the Inspector General. The following are not included in the FY 2018 statistics: 4,265 continuing grant increments (CGIs), 3,330 supplements, and 365 contracts.

Appendix 4 - Proposals, Awards, and Funding Rates, by PI Gender

Table 4.1 – FY 2018 Proposals, Awards, and Funding Rates, by PI Gender*

		Total	Female	Male	Unknown
NSF	Proposals	48,321	10,858	28,180	9,283
	% of Total		22%	58%	19%
	Awards	11,702	2,943	6,884	1,875
	Funding Rate	24%	27%	24%	20%
BIO	Proposals	4,765	1,447	2,648	670
	% of Total		30%	56%	14%
	Awards	1,190	403	670	117
	Funding Rate	25%	28%	25%	17%
CISE	Proposals	9,150	1,611	5,750	1,789
	% of Total		18%	63%	20%
	Awards	2,098	416	1,303	379
	Funding Rate	23%	26%	23%	21%
EHR	Proposals	4,160	1,594	1,630	936
	% of Total		38%	39%	23%
	Awards	892	375	320	197
	Funding Rate	21%	24%	20%	21%
ENG	Proposals	13,092	2,170	8,010	2,912
	% of Total		17%	61%	22%
	Awards	2,458	489	1,487	482
	Funding Rate	19%	23%	19%	17%
GEO	Proposals	3,775	990	2,349	436
	% of Total		26%	62%	12%
	Awards	1,407	370	903	134
	Funding Rate	37%	37%	38%	31%
MPS	Proposals	8,803	1,532	5,833	1,438
	% of Total		17%	66%	16%
	Awards	2,593	497	1,743	353
	Funding Rate	29%	32%	30%	25%
OIA	Proposals	211	58	105	48
	% of Total		27%	50%	23%
	Awards	68	25	27	16
	Funding Rate	32%	43%	26%	33%
OISE	Proposals	235	62	149	24
	% of Total		26%	63%	10%
	Awards	53	19	30	4
	Funding Rate	23%	31%	20%	17%
SBE	Proposals	4,130	1,394	1,706	1,030
	% of Total		34%	41%	25%
	Awards	943	349	401	193
	Funding Rate	23%	25%	24%	19%

Source: NSF Enterprise Information System, 10/01/18.

*Demographic data are voluntarily self-reported by the PI. In FY 2018, approximately 80.8% of competitive proposals and 82.5% of research proposals were from PIs who provided gender information. "Total" is the count of unique proposals. Columns are counts of proposals from PIs in the corresponding category.

Table 4.2 – FY 2018 Research Proposals, Awards, and Funding Rates, by PI Gender

		Total	Female	Male	Unknown
NSF	Proposals	40,364	9,047	24,258	7,059
	% of Total		22%	60%	17%
	Awards	9,043	2,219	5,477	1,347
	Funding Rate	22%	25%	23%	19%
BIO	Proposals	4,205	1,250	2,399	556
	% of Total		30%	57%	13%
	Awards	992	329	573	90
	Funding Rate	24%	26%	24%	16%
CISE	Proposals	8,749	1,525	5,490	1,734
	% of Total		17%	63%	20%
	Awards	1,823	349	1,123	351
	Funding Rate	21%	23%	20%	20%
EHR	Proposals	3,106	1,250	1,191	665
	% of Total		40%	38%	21%
	Awards	472	217	158	97
	Funding Rate	15%	17%	13%	15%
ENG	Proposals	9,899	1,733	6,468	1,698
	% of Total		18%	65%	17%
	Awards	1,844	379	1,173	292
	Funding rate	19%	22%	18%	17%
GEO	Proposals	3,403	905	2,120	378
	% of Total		27%	62%	11%
	Awards	1,195	324	761	110
	Funding rate	35%	36%	36%	29%
MPS	Proposals	7,619	1,293	5,096	1,230
	% of Total		17%	67%	16%
	Awards	2,072	387	1,399	286
	Funding rate	27%	30%	27%	23%
OIA	Proposals	107	29	54	24
	% of Total		27%	50%	22%
	Awards	9	5	1	3
	Funding rate	8%	17%	2%	13%
OISE	Proposals	226	58	146	22
	% of Total		26%	65%	10%
	Awards	44	15	27	2
	Funding rate	19%	26%	18%	9%
SBE	Proposals	3,050	1,004	1,294	752
	% of Total		33%	42%	25%
	Awards	592	214	262	116
	Funding rate	19%	21%	20%	15%

Source: NSF Enterprise Information System, 10/01/18.

Appendix 5 - EPSCoR: Jurisdictions, Proposal, Award, and Funding Data

Twenty-four states, the Commonwealth of Puerto Rico, Guam and the U.S. Virgin Islands were eligible to participate in aspects of the NSF Established Program to Stimulate Competitive Research (EPSCoR) program in FY 2018.[45] The states are: Alabama, Alaska, Arkansas, Delaware, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Maine, Mississippi, Montana, Nebraska, Nevada, New Hampshire, New Mexico[46], North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Vermont, West Virginia, and Wyoming.[47]

In FY 2018, the NSF EPSCoR program invested $27.59 million in co-funding 143 NSF awards. This investment was leveraged with $47.67 million from NSF Directorates and other Offices, for a total investment of $75.26 million. Since 1998, when the co-funding initiative was formally established, approximately 4,600 co-funded awards have been made. The latter represent a total NSF investment of about $1.78 billion, of which $678 million was co-funding provided by the EPSCoR program.[48]

Figure 5.1 shows the change over time for the proposal funding rate of EPSCoR jurisdictions relative to the overall NSF proposal funding rate for all of the United States. The gap in funding rates has narrowed since FY 2015.

Figure 5.1 – Proposal Funding Rates for EPSCoR Jurisdictions and all NSF Proposals

Source: EPSCoR Office 08/08/19.

Table 5.1 shows the number of proposals, awards, and proposal funding rates for EPSCoR jurisdictions. Below the name of the EPSCoR jurisdiction is the year in which the jurisdiction joined EPSCoR.

Table 5.1 – Proposal Funding Rates, by EPSCoR Jurisdiction
(Date under the state name is the year the state joined EPSCoR)

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
All NSF	Awards	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,702
	Proposals	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,321
	Funding Rate	25%	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%
All EPSCoR Juris-dictions	Awards	1,564	2,474	2,181	1,846	1,960	1,897	1,892	1,980	1,676	1,457	1,565
	Proposals	7,349	8,476	10,513	9,640	9,680	9,766	9,477	9,679	7,815	7,041	6,806
	Funding Rate	21%	29%	21%	19%	20%	19%	20%	20%	21%	21%	23%
Alabama **-1985**	Awards	85	148	119	98	110	94	102	85	102	116	113
	Proposals	489	606	708	614	669	647	665	583	607	655	672
	Funding Rate	17%	24%	17%	16%	16%	15%	15%	15%	17%	18%	17%
Alaska **-2000**	Awards	52	77	65	71	65	60	50	49	59	61	56
	Proposals	204	186	235	213	199	221	205	246	193	169	149
	Funding Rate	25%	41%	28%	33%	33%	27%	24%	20%	31%	36%	38%
Arkansas **-1980**	Awards	36	41	60	40	33	46	33	30	35	45	45
	Proposals	197	194	276	246	229	260	207	184	196	222	229
	Funding Rate	18%	21%	22%	16%	14%	18%	16%	16%	18%	20%	20%
Delaware **-2003**	Awards	68	77	80	70	79	70	67	64	80	50	77
	Proposals	283	244	295	292	278	287	283	273	301	257	278
	Funding Rate	24%	32%	27%	24%	28%	24%	24%	23%	27%	19%	28%
Guam **-2012**	Awards	†	†	†	†	†	†	†	†	†	†	†
	Proposals	5	3	7	5	8	7	4	6	2	3	1
	Funding Rate	†	†	†	†	†	†	†	†	†	†	†
Hawaii **-2001**	Awards	73	109	99	80	60	54	68	62	78	64	71
	Proposals	276	277	379	285	281	282	294	267	285	234	217
	Funding Rate	26%	39%	26%	28%	21%	19%	23%	23%	27%	27%	33%
Idaho **-1987**	Awards	44	44	35	37	47	41	35	37	41	40	38
	Proposals	201	168	199	202	185	214	230	234	206	203	201
	Funding Rate	22%	26%	18%	18%	25%	19%	15%	16%	20%	20%	19%
Kansas **-1992**	Awards	82	88	92	88	91	65	67	94	71	92	73
	Proposals	387	399	464	423	402	393	389	407	396	430	410
	Funding Rate	21%	22%	20%	21%	23%	17%	17%	23%	18%	21%	18%
Kentucky **-1985**	Awards	62	78	81	64	63	58	68	69	83	59	67
	Proposals	300	356	429	437	434	391	401	399	399	377	336
	Funding Rate	21%	22%	17%	15%	15%	15%	17%	17%	21%	16%	20%

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Louisiana	Awards	98	132	149	102	88	91	74	99	91	88	111
-1987	Proposals	471	583	715	621	484	463	402	460	459	470	501
	Funding Rate	21%	27%	21%	16%	18%	20%	18%	22%	20%	19%	22%
Maine	Awards	65	60	58	42	46	52	48	50	44	42	55
-1980	Proposals	199	172	190	209	182	211	201	189	175	185	183
	Funding Rate	33%	35%	31%	20%	25%	25%	24%	26%	25%	23%	30%
Mississippi	Awards	34	76	72	42	43	28	32	40	47	43	53
-1987	Proposals	271	301	358	287	264	262	260	240	256	224	253
	Funding Rate	13%	25%	20%	15%	16%	11%	12%	17%	18%	19%	21%
Montana	Awards	57	78	51	35	50	50	45	51	52	59	59
-1980	Proposals	232	207	251	222	204	214	183	210	183	229	191
	Funding Rate	25%	38%	20%	16%	25%	23%	25%	24%	28%	26%	31%
Nebraska	Awards	54	64	56	60	40	59	51	59	58	62	68
-1992	Proposals	255	248	324	309	258	305	281	307	300	326	297
	Funding Rate	21%	26%	17%	19%	16%	19%	18%	19%	19%	19%	23%
Nevada	Awards	43	61	39	37	29	33	58	40	42	38	54
-1985	Proposals	261	232	295	263	236	217	245	230	266	281	296
	Funding Rate	16%	26%	13%	14%	12%	15%	24%	17%	16%	14%	18%
New	Awards	58	108	76	61	75	64	64	65	74	62	65
Hampshire	Proposals	230	251	311	282	280	273	295	253	285	256	244
-2004	Funding Rate	25%	43%	24%	22%	27%	23%	22%	26%	26%	24%	27%
New	Awards	102	115	105	91	69	81	76	88	107	92	80
Mexico	Proposals	444	389	506	416	399	404	398	474	449	379	394
-2001	Funding Rate	23%	30%	21%	22%	17%	20%	19%	19%	24%	24%	20%
North	Awards	19	31	35	23	18	21	26	20	32	21	24
Dakota	Proposals	158	141	171	161	161	172	174	171	185	150	147
-1985	Funding Rate	12%	22%	20%	14%	11%	12%	15%	12%	17%	14%	16%
Oklahoma	Awards	67	112	74	79	68	59	69	68	76	76	56
-1985	Proposals	378	420	457	460	384	394	339	388	372	377	342
	Funding Rate	18%	27%	16%	17%	18%	15%	20%	18%	20%	20%	16%
Puerto	Awards	24	37	34	19	9	8	16	15	22	14	34
Rico	Proposals	148	183	203	163	153	105	86	102	90	111	115
-1985	Funding Rate	16%	20%	17%	12%	6%	8%	19%	15%	24%	13%	30%
Rhode	Awards	129	176	148	131	146	127	138	131	132	125	145
Island	Proposals	357	350	442	400	393	399	404	361	349	351	390
-2004	Funding Rate	36%	50%	33%	33%	37%	32%	34%	36%	38%	36%	37%
South	Awards	87	152	136	108	117	115	97	117	98	103	113
Carolina	Proposals	470	527	671	650	562	594	585	603	556	565	495
-1980	Funding Rate	19%	29%	20%	17%	21%	19%	17%	19%	18%	18%	23%

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
South Dakota -1987	Awards	20	31	33	24	20	28	32	25	24	23	23
	Proposals	116	132	184	162	150	163	135	139	150	155	131
	Funding Rate	17%	23%	18%	15%	13%	17%	24%	18%	16%	15%	18%
U.S. Virgin Islands -2002	Awards	†	†	†	†	†	†	†	†	†	†	†
	Proposals	5	1	3	11	5	8	7	3	10	11	11
	Funding Rate	†	†	†	†	†	†	†	†	†	†	†
Vermont -1985	Awards	27	42	23	22	24	21	22	18	24	27	31
	Proposals	144	120	126	121	90	89	104	96	133	127	94
	Funding Rate	19%	35%	18%	18%	27%	24%	21%	19%	18%	21%	33%
West Virginia -1980	Awards	25	33	27	21	32	22	23	37	29	28	29
	Proposals	119	130	160	151	163	158	159	187	169	175	139
	Funding Rate	21%	25%	17%	14%	20%	14%	14%	20%	17%	16%	21%
Wyoming -1985	Awards	27	44	35	31	20	18	24	27	21	21	19
	Proposals	121	123	146	122	105	115	129	129	128	119	90
	Funding Rate	22%	36%	24%	25%	19%	16%	19%	21%	16%	18%	21%

† = award numbers suppressed to maintain privacy.

Appendix 6 - Accomplishment-Based Renewals and Creativity Extensions

Accomplishment-Based Renewals

In an accomplishment-based renewal, the project description is replaced by copies of no more than six reprints of publications resulting from the research supported by NSF (or research supported by other sources that is closely related to the NSF-supported research) during the preceding three- to five-year period. In addition, a brief (not to exceed four pages) summary of plans for the proposed support period must be submitted, together with information on human resources development at the post-doctoral, graduate, and undergraduate levels. All other information required for NSF proposal submission remains the same. The proposals undergo merit review in the tradition of the specific program. In FY 2018, there were 41 requests for accomplishment-based renewals, 9 of which were awarded. **Table 6.1** shows the number of accomplishment-based renewals by directorate or office.

Creativity Extensions

A program officer may recommend the extension of funding for certain research grants beyond the initial period for which the grant was awarded, for a period of up to two years. The objective of such extensions is to offer the most creative investigators an extended opportunity to attack adventurous, "high-risk" opportunities in the same general research area, but not necessarily covered by the original/current award. Awards eligible for such an extension are generally three-year continuing grants. Special Creativity Extensions are normally initiated by the NSF program officer based on progress during the first two years of the grant.[49] In FY 2018, 21 Special Creativity Extensions were awarded.

Table 6.1 – Accomplishment-Based Renewals by Directorate or Office

Directorate or Office		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
NSF	Award	28	40	34	19	30	19	14	29	17	18	9
	Decline	51	54	52	43	41	52	35	44	35	26	32
	Mean Ann. Awd	$164,211	$225,438	$150,171	$253,026	$255,959	$414,467	$174,227	$137,480	$199,034	$171,270	$279,318
BIO	Award	3	5	8	3	2	4	3	2	0	3	1
	Decline	13	16	11	6	3	6	5	2	4	7	5
	Mean Ann. Awd	$62,444	$123,533	$151,999	$344,742	$78,815	$835,142	$298,359	$189,961	N/A	$156,044	$89,991
CISE	Award	1	2	1	0	0	2	0	1	5	1	4
	Decline	1	0	2	2	2	1	0	0	1	0	1
	Mean Ann. Awd	$60,010	$267,851	$272,833	N/A	N/A	$819,996	N/A	$233,333	$369,350	$140,000	$461,539
EHR	Award	2	3	3	1	2	0	1	0	0	2	0
	Decline	3	7	6	5	4	4	4	6	3	2	2
	Mean Ann. Awd	$390,611	$361,873	$304,579	$33,352	$530,633	N/A	$354,796	N/A	N/A	$442,664	N/A
ENG	Award	1	1	1	2	4	3	3	6	1	0	0
	Decline	6	13	7	5	7	10	2	9	9	1	5
	Mean Ann. Awd	$54,117	$124,977	$152,483	$121,725	$194,881	$207,017	$45,309	$105,606	$50,000	N/A	N/A
GEO	Award	8	10	8	4	12	5	1	6	7	6	2
	Decline	3	3	8	4	3	6	9	8	3	0	2
	Mean Ann. Awd	$113,891	$343,864	$144,094	$143,699	$234,306	$222,092	$118,252	$126,876	$131,244	$140,437	$157,299
MPS	Award	12	16	11	8	10	5	6	14	3	4	2
	Decline	19	12	13	15	18	21	14	15	14	14	13
	Mean Ann. Awd	$219,868	$188,219	$115,657	$354,936	$297,020	$155,611	$155,854	$139,064	$171,330	$109,747	$161,659
SBE	Award	1	3	1	1	0	0	0	0	1	2	0
	Decline	6	3	3	5	4	4	1	3	1	2	3
	Mean Ann. Awd	$76,993	$67,808	$75,789	$82,187	N/A	N/A	N/A	N/A	$224,440	$138,476	N/A
OD	Award			1	0				0			0
	Decline			2	1				1			1
	Mean Ann. Awd			$50,000	N/A				N/A			N/A

Source: NSF Enterprise Information System, 10/01/18. "N/A" = No accomplishment-based renewals awarded.

Appendix 7 - Small Grants for Exploratory Research (SGER), EArly-concept Grants for Exploratory Research (EAGER), and Grants for Rapid Response Research (RAPID)

Figures 7.1, 7.2, and **Table 7.1** provide funding trends for EAGERs, RAPIDs, and SGERs. Effective January 2009, the SGER funding mechanism was replaced by two separate funding mechanisms (EAGER and RAPID), so FY 2009 includes all three types of awards.

Figure 7.1 – Numbers of SGER, EAGER, and RAPID Awards
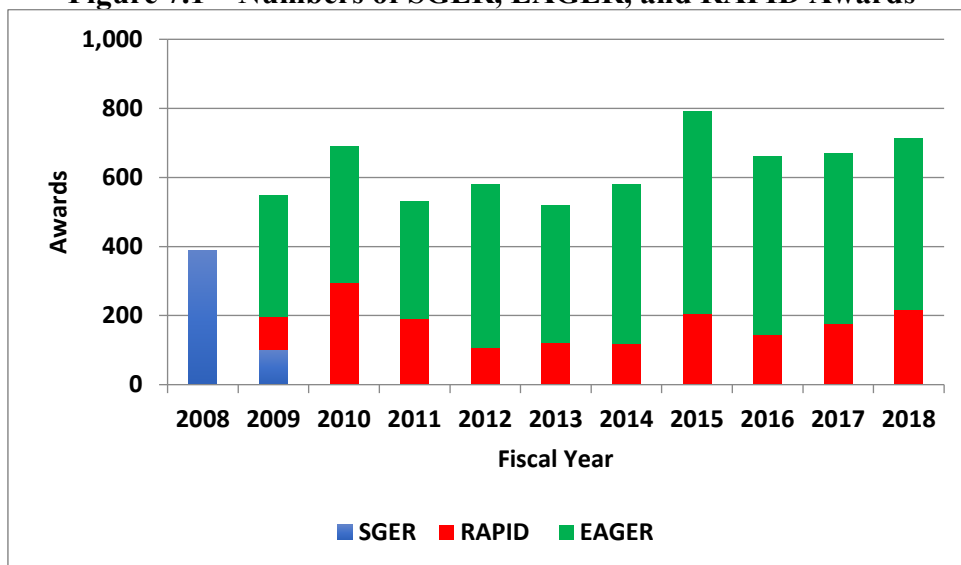
Source: NSF Enterprise Information System 10/01/18.

Figure 7.2 – Investments in SGER, EAGER, and RAPID Awards

Source: NSF Enterprise Information System 10/01/18.

NSF's Merit Review Process: FY 2018 Digest — October 2019
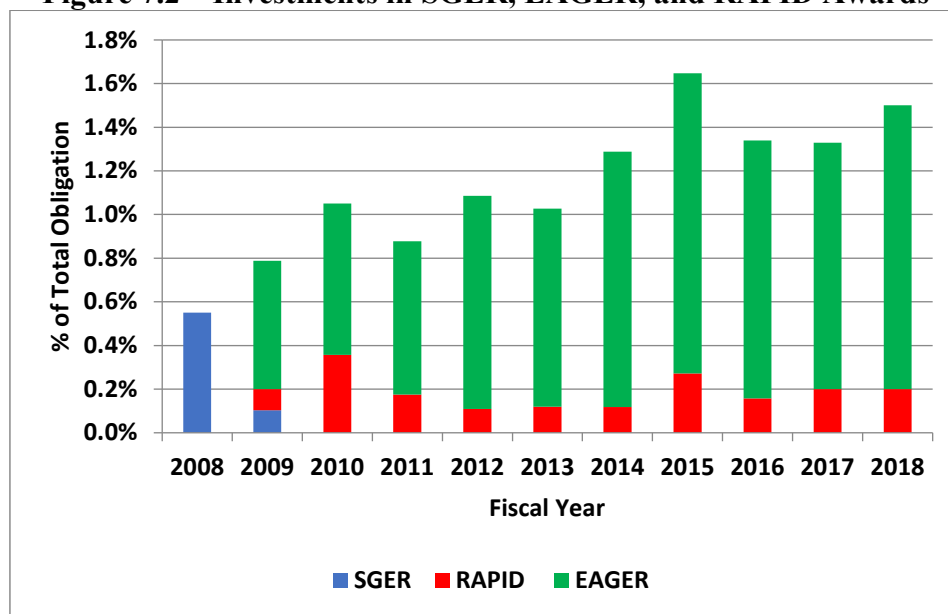
Table 7.1 – Early-concept Grants for Exploratory Research (EAGER) and Grants for Rapid Response Research (RAPID): Funding Trends by Directorate or Office

		2013		2014		2015		2016		2017		2018	
		RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER
NSF	Proposals	123	441	127	537	238	743	155	765	182	681	276	666
	Awards	121	399	117	462	207	585	145	518	176	493	216	498
	Funding Rate	98%	90%	92%	86%	87%	79%	94%	68%	97%	72%	78%	75%
	Total $ (Millions)	$8.4	$64.2	$8.6	$85.0	$20.3	$103.0	$12.1	$90.7	$14.8	$83.6	$19.3	$102.4
	% of Obligations	0.1%	0.9%	0.1%	1.2%	0.3%	1.4%	0.2%	1.2%	0.2%	1.1%	0.2%	1.3%
	Average $ (1000s)	$70	$161	$73	$184	$98	$176	$84	$175	$84	$170	$89	$206
BIO	Proposals	13	32	17	80	38	117	25	44	22	40	58	81
	Awards	12	25	13	77	29	104	19	40	22	37	38	68
	Funding Rate	92%	78%	76%	96%	76%	89%	76%	91%	100%	93%	66%	84%
	Total $ (Millions)	$1.5	$6.1	$1.4	$19.1	$3.9	$19.7	$2.8	$10.4	$2.4	$8.3	$4.3	$16.0
	% of Obligations	0.2%	0.8%	0.2%	2.3%	0.5%	2.6%	0.3%	1.2%	0.3%	1.1%	0.6%	2.1%
	Average $ (1000s)	$124	$243	$111	$247	$134	$190	$150	$260	$111	$225	$113	$235
CISE	Proposals	2	171	3	193	37	209	5	257	18	239	16	161
	Awards	2	165	3	159	27	163	5	176	18	129	12	136
	Funding Rate	100%	96%	100%	82%	73%	78%	100%	68%	100%	54%	75%	84%
	Total $ (Millions)	$0.1	$27.6	$0.4	$28.9	$3.3	$27.8	$0.8	$33.7	$1.7	$21.5	$0.6	$26.6
	% of Obligations	0.0%	3.0%	0.0%	3.2%	0.4%	3.1%	0.1%	3.6%	0.2%	2.3%	0.1%	2.8%
	Average $ (1000s)	$45	$168	$144	$182	$121	$170	$168	$192	$92	$167	$51	$195
EHR	Proposals	5	33	3	50	21	81	27	72	7	54	10	16
	Awards	5	19	3	37	21	45	26	43	7	39	8	15
	Funding Rate	100%	58%	100%	74%	100%	56%	96%	60%	100%	72%	80%	94%
	Total $ (Millions)	$0.8	$4.9	$0.7	$9.4	$2.1	$10.8	$1.5	$8.1	$1.6	$10.0	$1.3	$3.4
	% of Obligations	0.1%	0.5%	0.1%	1.0%	0.2%	1.1%	0.1%	0.8%	0.2%	1.0%	0.1%	0.3%
	Average $ (1000s)	$153	$258	$231	$253	$100	$239	$57	$188	$228	$257	$168	$229
ENG	Proposals	38	134	35	108	41	258	24	273	38	220	42	260
	Awards	38	125	34	96	34	203	21	155	36	176	33	153
	Funding Rate	100%	93%	97%	89%	83%	79%	88%	57%	95%	80%	79%	59%
	Total $ (Millions)	$1.8	$16.4	$1.6	$14.6	$3.3	$33.7	$1.2	$22.7	$2.8	$25.7	$2.2	$30.5
	% of Obligations	0.2%	2.0%	0.2%	1.7%	0.4%	3.7%	0.1%	2.5%	0.3%	2.8%	0.2%	3.1%
	Average $ (1000s)	$49	$131	$47	$152	$97	$166	$56	$146	$78	$146	$66	$199
GEO	Proposals	47	51	51	47	55	27	45	48	60	54	91	45
	Awards	47	49	51	46	55	26	45	45	57	51	87	41
	Funding Rate	100%	96%	100%	98%	100%	96%	100%	94%	95%	94%	96%	91%
	Total $ (Millions)	$3.1	$5.0	$3.0	$5.1	$3.7	$3.5	$3.5	$5.2	$3.0	$6.5	$7.3	$6.9
	% of Obligations	0.2%	0.4%	0.2%	0.4%	0.3%	0.3%	0.3%	0.4%	0.2%	0.5%	0.5%	0.5%
	Average $ (1000s)	$66	$103	$60	$112	$68	$135	$78	$115	$52	$127	$84	$168
MPS	Proposals	2	9	1	20	6	21	0	28	1	39	3	79
	Awards	2	6	1	19	6	17	0	27	1	27	2	69
	Funding Rate	100%	67%	100%	95%	100%	81%	N/A	96%	100%	69%	67%	87%
	Total $ (Millions)	$0.3	$2.3	$0.2	$3.5	$0.9	$3.5	$0.0	$6.0	$0.1	$5.8	$0.2	$16.0
	% of Obligations	0.0%	0.2%	0.0%	0.3%	0.1%	0.2%	0.0%	0.4%	0.0%	0.4%	0.0%	1.0%
	Average $ (1000s)	$163	$386	$209	$183	$151	$207	N/A	$224	$79	$216	$105	$232

		2013		**2014**		**2015**		**2016**		**2017**		**2018**	
		RAPID	**EAGER**	**RAPID**	**EAGER**	**RAPID**	**EAGER**	**RAPID**	**EAGER**	**RAPID**	**EAGER**	**RAPID**	**EAGER**
SBE	Proposals	16	11	17	39	40	30	28	43	36	35	56	24
	Awards	15	10	12	28	35	27	28	32	35	34	36	16
	Funding Rate	94%	91%	71%	72%	88%	90%	100%	74%	97%	97%	64%	67%
	Total $ (Millions)	$0.6	$1.3	$1.0	$4.2	$3.1	$3.4	$2.1	$4.2	$3.2	$5.4	$3.3	$2.5
	% of Obligations	0.2%	0.5%	0.4%	1.6%	1.1%	1.3%	0.8%	1.5%	1.2%	2.0%	1.3%	1.0%
	Average $ (1000s)	$40	$132	$81	$151	$88	$127	$74	$130	$91	$160	$91	$157
OD	Proposals	0	0	0	0	0	0	1	0	0	0	0	0
	Awards	0	0	0	0	0	0	1	0	0	0	0	0
	Funding Rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total $ (Millions)	$0.4	$0.5	$0.3	$0.5	$0.0	$0.6	$0.2	$0.4	$0.1	$0.2	$0.1	$0.5
	% of Obligations	0.1%	0.2%	0.1%	0.2%	0.0%	0.2%	0.0%	0.1%	0.1%	0.2%	0.0%	0.1%
	Average $ (1000s)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: NSF Enterprise Information System, 10/01/18 and 07/17/19.

No distinction is made between funds obligated by a directorate to awards managed by that directorate and funds obligated by a directorate as co-funding for awards managed by other directorates. OD obligation totals include co-funding by EPSCoR and the Office of International Science and Engineering.

Appendix 8 - Description of Merit Review Principles and Criteria[50]

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary Federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and [have] a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through [the] use of two National Science Board-approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. PAPPG Chapter II.C.2.d.(i) contains additional information for use by proposers in development of the Project

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[50] From NSF *Proposal and Award Policies and Procedures Guide*, http://www.nsf.gov/pubs/policydocs/pappguide/nsf13001/gpg_index.jsp. Effective from January 14, 2013.

Description section of the proposal. Reviewers are strongly encouraged to familiarize themselves with the criteria, including PAPPG Chapter II.C.2.d.(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **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.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to:
   a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
   b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Appendix 9 - Preliminary Proposals

Several NSF programs utilize preliminary proposals to reduce the workload of PIs and to increase the quality of full proposals. The number of preliminary proposals varies considerably as a result of competitions being held in a given fiscal year. For some programs, preliminary proposals are externally reviewed; other programs provide internal review only.

Decisions regarding preliminary proposals may be non-binding or binding. Non-binding decisions regarding preliminary proposals are recommendations; a PI may choose to submit a full proposal even if it has been discouraged. Binding decisions, however, are restrictive in that full proposals are accepted only from the preliminary proposal PIs invited to submit them. In general, programs obtain advice from external peer reviewers before making binding decisions about preliminary proposals.

Table 9.1 - Number of Preliminary Proposals and Subsequent Actions

Fiscal Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total # Preliminary Proposals	3,203	3,856	2,883	965	5,135	4,691	4,911	4,251	4,584	4,564	771
Non-Binding (NB) Total*	669	1,140	1,384	357	459	457	92	1	239	602	447
NB Encouraged	333	519	636	128	222	296	29	0	122	268	312
NB Discouraged	336	621	748	229	237	161	63	1	117	334	135
Binding Total*	2,534	2,500	1,273	572	4,484	4,087	4,761	4,199	4,281	3,895	322
Binding Invite	572	685	372	245	1,236	942	1,083	1,045	1,124	1,172	100
Binding Non-invite	1,962	1,815	901	327	3,248	3,145	3,678	3,154	3,157	2,723	222

*Non-binding and binding totals do not include preliminary proposals that have been withdrawn or returned without review.

Source: NSF Report Server, 07/17/2019.

In FY 2012, the Directorate for Biological Sciences instituted a new requirement that PIs who wished to submit full proposals to the Divisions of Environmental Biology and Integrative Organismal Systems, in response to core program solicitations, the Research at Undergraduate Institutions solicitation, or the Long-term Research in Environmental Biology solicitation, must first submit a preliminary proposal. This pilot was terminated through the issuance of a Dear Colleague Letter (NSF 18-011) on October 5, 2017, as part of the Directorate for Biological Sciences' transition to a no-deadline submission process beginning in summer 2018.

Appendix 10 - Mean Number of Reviews per Proposal

Table 10.1 – Mean Number of Reviews per Proposal, by Method and Directorate or Office

		Methods of Review						
		All Methods	**Ad Hoc + Panel**	**Ad Hoc Only**	**Panel Only**	**Internally Reviewed***	**Returned without Review**	**Withdrawn Proposals**
NSF	Reviews	178,714	50,450	8,669	119,595			
	Proposals	46,042	10,566	2,238	33,238	2,279	1,101	234
	Rev/Prop	3.9	4.8	3.9	3.6			
BIO	Reviews	19,649	12,269	330	7,050			
	Proposals	4,516	2,356	83	2,077	249	66	19
	Rev/Prop	4.4	5.2	4.0	3.4			
CISE	Reviews	35,320	3,012	676	31,632			
	Proposals	8,715	627	185	7,903	434	95	70
	Rev/Prop	4.1	4.8	3.7	4.0			
EHR	Reviews	16,588	1,104	460	15,024			
	Proposals	4,055	250	124	3,681	105	130	4
	Rev/Prop	4.1	4.4	3.7	4.1			
ENG	Reviews	43,611	1,939	856	40,816			
	Proposals	12,433	427	257	11,749	657	510	24
	Rev/Prop	3.5	4.5	3.3	3.5			
GEO	Reviews	15,830	12,311	1,962	1,557			
	Proposals	3,516	2,562	498	456	261	67	15
	Rev/Prop	4.5	4.8	3.9	3.4			
MPS	Reviews	29,029	7,068	3,765	18,196			
	Proposals	8,392	1,676	936	5,780	412	142	81
	Rev/Prop	3.5	4.2	4.0	3.1			
OIA	Reviews	699	605	36	58			
	Proposals	201	178	9	14	10	16	1
	Rev/Prop	3.5	3.4	4.0	4.1			
OISE	Reviews	849	333	7	509			
	Proposals	224	73	2	149	11	4	0
	Rev/Prop	3.8	4.6	3.5	3.4			
SBE	Reviews	17,139	11,809	577	4,753			
	Proposals	3,990	2,417	144	1,429	140	71	20
	Rev/Prop	4.3	4.9	4.0	3.3			

Source: NSF Enterprise Information System, 10/01/18.

*The proposals totals shown in the "All Methods" category do not include the proposals shown in the "Internally Reviewed" category. Proposals that are not externally reviewed typically include RAPIDs, EAGERs, and small grants for travel and symposia. Beginning in 2017, they also include RAISE proposals.

The "Internally Reviewed" category includes award and decline actions for proposals that were reviewed by NSF experts in the relevant topical areas but did not receive external reviews, while the "Returned without Review" and "Withdrawn Proposals" categories reflect proposals that were neither awarded nor declined.

The counts of panel reviews do not include panel summaries. There were approximately 45,075 panel summaries in FY 2018.

Withdrawn proposals include only those that underwent merit review.

The reviews of an individual participating as both an ad hoc reviewer and a panel reviewer for the same proposal are counted as one review in this table.

Appendix 11 - Oversight and Advisory Mechanisms

NSF relies on the judgment of external experts to provide advice and recommendations to maintain high standards of program support for research, education, and infrastructure; to facilitate policy deliberations, program development, and management; to identify disciplinary needs and areas of opportunities; and to promote openness to the research and education community served by the Foundation.

Committees of Visitors

Committees of Visitors (COV) provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations; and (2) program-level technical and managerial matters pertaining to proposal decisions.

COV reviews are conducted at regular intervals of approximately four years for programs that award grants or cooperative agreements and whose main focus is the support of NSF research and education in science and engineering. The COVs evaluate the integrity and efficiency of the processes used for proposal review and program decision-making. In addition, the COVs examine program management and portfolio balance. The COV reports, written as answers and commentary to specific questions, are reviewed by Advisory Committees and then submitted to the directorates and the NSF Director. The recommendations of COVs are reviewed by management and taken into consideration by NSF when evaluating existing programs and future directions for the Foundation.[51]

Advisory Committees

Each directorate has an external advisory committee that typically meets twice a year. Advisory committees provide advice and recommendations about the portfolio, a base of contact with the scientific community to inform NSF of the impact of its research support and NSF-wide policies on the scientific community, and broad input into long-range plans and partnership opportunities. They provide advice on program management, overall program balance, and other aspects of program performance. In addition to directorate advisory committees, NSF has several committees that focus on specific topics: astronomy and astrophysics; environmental research and education; equal opportunities in science and engineering; direction, development and enhancement of innovations; and business and operations. Advisory committees are typically composed of 15 – 25 experts who have experience relevant to the programs or topics and are broadly drawn from academia, industry, and government. As part of their mission, directorate and some other advisory committees review COV reports and staff responses.

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[51] The COV reports and directorate responses are available electronically at
http://www.nsf.gov/od/oia/activities/cov/covs.jsp.

Appendix 12 - Requests for Formal Reconsideration of Declined Proposals

Table 12.1 – Requests for Formal Reconsideration by Directorate or Office

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
First Level Reviews (Assistant Directors):												
BIO	Requests	5	3	1	4	2	2	0	6	3	4	2
	- Upheld	5	3	1	3	0	2	0	4	3	4	2
	- Reversed	0	0	0	1	2	0	0	2	0	0	0
CISE	Request	0	0	2	3	5	1	4	2	1	3	1
	- Upheld	0	0	2	3	5	1	3	1	1	3	1
	- Reversed	0	0	0	0	0	0	0	1	0	0	0
EHR	Request	7	2	2	2	3	4	2	4[+]	3	4	1
	- Upheld	7	2	2	2	3	4	2	4	3	4	1
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
ENG	Request	3	3	11	8	5	7**	11	3	5	8	5
	- Upheld	3	3	9	7	5	5	11	3	5	8	5
	- Reversed	0	0	2	1	0	1	0	0	0	0	0
GEO	Request	0	2	3	2	2	1	1	2	0	1	0
	- Upheld	0	1	3	2	2	1	1	2	0	1	0
	- Reversed	0	1	0	0	0	0	0	0	0	0	0
MPS	Request	14	9	14^	11	22	12	12	10[++]	8^^	6	2
	- Upheld	14	7	12	11	21	11	12	10	8	6	2
	- Reversed	0	2	0	0	1	1	0	0	0	0	0
SBE	Request	2	1	1	0	0	0	0	1	0	0	0
	- Upheld	2	1	1	0	0	0	0	1	0	0	0
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
Other*	Request	0	1	0	0	1	0	0	0	1	0	0
	- Upheld	0	0	0	0	1	0	0	0	1	0	0
	- Reversed	0	1	0	0	0	0	0	0	0	0	0
Second Level Reviews (Deputy Director):												
O/DD	Request	3	2	3	3	6	1	3	7	4	6	1
	- Upheld	3	2	3	1	6	1	3	7	4	6	1
	- Reversed	0	0	0	2	0	0	0	0	0	0	0
Total Reviews First & Second Level												
NSF	Request	34	23	37^	33	46	28	33	35	25	32	12
	- Upheld	34	19	33	29	43	25	32	32	25	32	12
	- Reversed	0	4	2	4	3	2	0	3	0	0	0

Source: Office of the Director, 08/05/19.

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* From 2008 to 2012, the "Other" category includes OCI, OIA, OPP, and OISE. For FY 2013 and FY 2014, it included OIIA. From FY 2015, it included OIA and OISE.

^ The number of decisions (upheld or reversed) may not equal the number of requests in each year due to carry over of a pending reconsideration request. ^^ One request received in FY 2016 was decided in FY 2017.

** One reconsideration request was returned for failure to follow the procedure described in the *Proposal and Award Policies and Procedures Guide*.

[+] Includes a reconsideration of a Return Without Review action. [++] Includes a reconsideration request received after the 90-day window.

Appendix 13 - Methods of NSF Proposal Review

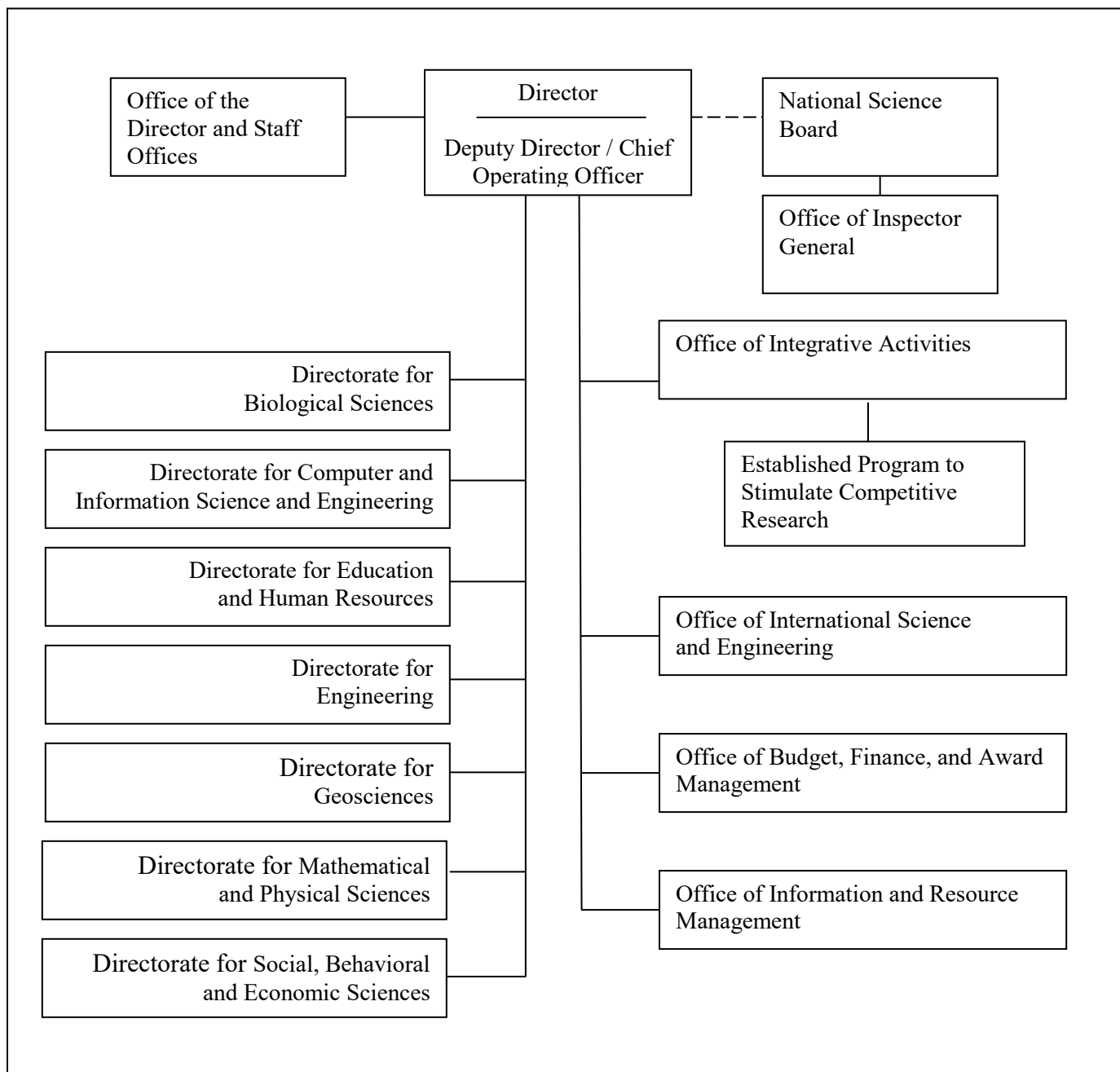**Table 13.1 – Methods of NSF Proposal Review by Directorate or Office**

Directorate	[52]Total Proposals	Ad Hoc + Panel		Ad Hoc Only		Panel Only		Internally Reviewed	
		Proposals	Percent	Proposals	Percent	Proposals	Percent	Proposals	Percent
NSF	48,321	10,566	22%	2,238	5%	33,238	69%	2,279	5%
BIO	4,765	2,356	49%	83	2%	2,077	44%	249	5%
CISE	9,149	627	7%	185	2%	7,903	86%	434	5%
EHR	4,160	250	6%	124	3%	3,681	88%	105	3%
ENG[53]	13,090	427	3%	257	2%	11,749	90%	657	5%
GEO	3,777	2,562	68%	498	13%	456	12%	261	7%
MPS	8,804	1,676	19%	936	11%	5,780	66%	412	5%
OIA	211	178	84%	9	4%	14	7%	10	5%
OISE	235	73	31%	2	1%	149	63%	11	5%
SBE	4,130	2,417	59%	144	3%	1,429	35%	140	3%

Source: NSF Enterprise Information System, 10/01/18.

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[52] Totals in this column do not necessarily match those in the FY 2018 column of Table 3.1. The differences reflect the small number of situations (3) in which a proposal was managed by one organization, but reviewed by a panel associated with a different Directorate.

[53] This total includes Small Business Innovation Research Program and Small Business Technology Transfer Program proposals.

Appendix 14 - National Science Foundation Organization Chart

Office of the Director and Staff Offices	Director Deputy Director / Chief Operating Officer	National Science Board
		Office of Inspector General
		Office of Integrative Activities
Directorate for Biological Sciences		Established Program to Stimulate Competitive Research
Directorate for Computer and Information Science and Engineering		
Directorate for Education and Human Resources		Office of International Science and Engineering
Directorate for Engineering		
Directorate for Geosciences		Office of Budget, Finance, and Award Management
Directorate for Mathematical and Physical Sciences		Office of Information and Resource Management
Directorate for Social, Behavioral and Economic Sciences		

The figure shows the organizational structure in place at the end of FY 2018. Staff offices not explicitly shown include the Office of Diversity and Inclusion, the Office of the General Counsel, and the Office of Legislative and Public Affairs.

Appendix 15 - Acronyms

Acronym	**Definition**
ACI	Division of Advanced Cyberinfrastructure
ARRA	American Recovery and Reinvestment Act
BFA	Office of Budget, Finance and Award Management
BIO	Directorate for Biological Sciences
CGI	Continuing Grant Increment
CISE	Directorate for Computer and Information Science and Engineering
COV	Committee of Visitors
DD	Division Director
EAGER	EArly-concept Grants for Exploratory Research
EHR	Directorate for Education and Human Resources
ENG	Directorate for Engineering
EPSCoR	Established Program to Stimulate Competitive Research
FY	Fiscal Year (October 1 – September 30)
GDP	Gross Domestic Product
GEO	Directorate for Geosciences
INSPIRE	Integrated NSF Support Promoting Interdisciplinary Research and Education
IPAs	Temporary employees hired through the Intergovernmental Personnel Act
K-12	Kindergarten to 12th grade
MPI	Multiple PI
MPS	Directorate for Mathematical and Physical Sciences
MSI	Minority-Serving Institution
NSB	National Science Board
NSF	National Science Foundation
OAC	Office of Advanced Cyberinfrastructure
OCI	Office of Cyberinfrastructure
OD	Office of the Director
ODD	Office of the Deputy Director
OIA	Office of Integrative Activities
OIIA	Office of International and Integrative Activities
OISE	Office of International Science and Engineering
OPP	Office of Polar Programs
PAPPG	Proposal and Award Policies and Procedures Guide
PARS	Proposal, PI and Reviewer System
PI	Principal Investigator
PLR	Division of Polar Programs
PWD	PI (or Person) With a Disability
RAISE	Research Advanced by Interdisciplinary Science and Engineering
RAPID	Grants for Rapid Response Research
RWR	Return Without Review

SBE	Directorate for Social, Behavioral and Economic Sciences
SBIR	Small Business Innovative Research
SGER	Small Grants for Exploratory Research
SPI	Single PI
STEM	Science, Technology, Engineering and Mathematics
URM	Under-Represented Minority
US	United States
VSEE	Visiting Scientists, Engineers and Educators