



National Science Board



National Science Foundation

# Merit Review Process

Fiscal Year 2019 Digest





COVER IMAGE:

An illustration of the Very Large Array (VLA), a collection of 27 radio antennas located at the National Radio Astronomy Observatory site in Socorro, New Mexico. The facility is operated by the National Radio Astronomy Observatory, which is managed by Associated Universities, Inc., under a cooperative agreement with the National Science Foundation (NSF). More than 3,000 researchers from around the world have used the VLA for more than 11,000 research projects.

Researchers use the VLA to study radio emissions from the cosmos, which has led to the discovery of star births, star deaths, black holes, colliding galaxies, and much more. The Array is also a high-precision spacecraft tracker used to keep tabs on robotic spacecrafts exploring the Solar System. VLA researchers are currently conducting a multi-year scan and survey of the entire sky, three times over.

*Illustration Credit: Nicolle R. Fuller/ National Science Foundation*

National Science Foundation's  
Merit Review Process  
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December 2020

## NSB Overview of the NSF Merit Review Process FY 2019

The National Science Board (NSB) is pleased to receive the FY 2019 Merit Review Digest (Digest) from the National Science Foundation (NSF). The electronic version of this Digest employs hyperlinks so that readers can download and explore underlying data.

NSB uses this annual Digest to assure its stakeholders that NSF implements the merit review process with integrity, and in a fair, competitive, and transparent manner. Additional high-level NSF mechanisms for understanding, safeguarding, and improving this critical Foundation process include meetings of external Advisory Committees (ACs), Committee of Visitor (COV) reports, and biennial surveys of proposers and reviewers. COV reports are a key factor in maintaining 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 well-documented rationale, and whether the resulting program portfolio is appropriately balanced.

### 2019 – An Atypical Year

In FY 2019 NSF acted on 41,024 competitively reviewed full proposals, only 85% of the FY 2018 number. There are two principal reasons for the decline. The largest effect appears to have resulted from the core programs of two directorates, Biological Sciences (BIO) and Engineering (ENG) becoming part of NSF's no-deadline pilot. In addition, there was a five-week government shutdown in December 2018 and January 2019 during which no review panels could be convened. The welcome increase in NSF's overall funding rate to 27% in FY 2019 may therefore be somewhat anomalous. On the other hand, funding rate increases in the directorates engaging in some no-deadline pilots may be more persistent. The BIO directorate increased nine percent, from 25 to 34 percent, and the ENG directorate saw a seven percent increase, from 19 to 26 percent. NSB looks forward to NSF's analysis of the no-deadline pilots, especially regarding the potential to increase funding rates and reduce burdens on proposers, NSF staff, and reviewers without introducing undesirable impacts.

### Delivering Benefits from Research

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 in accord with the Foundation's two main review criteria – Intellectual Merit and Broader Impacts. NSF's merit review process also seeks to ensure open-minded and thoughtful deliberations, with biases and conflicts minimized, and that proposers receive constructive and useful feedback. In this way, NSF-funded research can provide the greatest benefits to the American public. The 2019 Digest, together with the most recent COV reports and a preview of the 2019 Survey of proposers and reviewers leads the NSB to conclude the NSF's merit review process is working exceptionally well. Indeed, 74% percent of survey respondents agreed their proposal was

treated fairly in the review process, despite the fact that 73% of their proposals could not be funded.

At different times over the course of their careers, researchers in a field may be proposers or reviewers. Thus, survey respondents were asked to determine the extent to which participation as a reviewer may have influenced their subsequent submissions to NSF. Overwhelmingly, reviewers indicated that being an NSF reviewer enhanced their understanding of the processes involved in prioritizing proposals and provided important insights into improving their next submissions. The better quality of proposals is also a significant benefit for NSF.

### Broader Impacts

As stated in its recent [Vision 2030 report](#), NSB will focus its efforts in how the agency delivers benefits from NSF investments in creating new knowledge, developing STEM talent for America, expanding the geography of innovation within the U.S., and fostering a global S&E community. NSF's Broader Impacts merit review criterion is important for assessing the potential for NSF-sponsored projects to deliver benefits to society, including in the areas of translation and broadening participation.

Several COV reports issued in 2019 repeated observations that reviewers do not appear to understand the Broader Impacts criterion as well as the Intellectual Merit criterion. For example, one report explained that while COV members observed improvement in the conceptualization and discussion of broader impacts within proposals themselves, reviewers' assessments of proposals' broader impacts were less strong. This sometimes resulted in limited assessments such as, "broader impacts are acceptable," for awarded proposals. This level of detail is insufficient for evaluating a project's potential broader impacts.

The COMPETES Act revision to the NSF Act provides the broader impact goals for NSF's merit review process (42 USC §1862p—14). They are:

- (1) increasing US economic competitiveness
- (2) advancing the health and welfare of the American public
- (3) supporting the national defense
- (4) enhancing partnerships between academia and industry
- (5) developing an American STEM workforce that is globally competitive through improved pre-K through 12 STEM education
- (6) improving public scientific literacy and engagement with science and technology, and
- (7) expanding participation of women and individuals from underrepresented groups in STEM.

The Proposal & Award Policies & Procedures Guide (PAPPG) (Section II.C.2.d.(i)) provides examples for broader impact outcomes which incorporate the goals of the COMPETES Act

revision to the NSF Act and the American Innovation and Competitiveness Act.<sup>1</sup> The PAPPG emphasizes that proposers may include appropriate outcomes not covered by these examples.

Over the coming year NSB will take a detailed look at how the broader impact goals in proposals are reviewed, incorporated into program portfolios, and the results assessed. Based on its findings, NSB will continue discussions with NSF about appropriate metrics and measuring progress toward NSF's goals with a view to optimizing overall benefits from NSF grant funding.

## Outreach

The Digest provides data that illustrates the multiple ways in which NSF conducts outreach to help increase participation in NSF programs and to support enhancing the quality of proposals so that they are more likely to receive funding. NSB appreciates the many ways NSF engages with researchers throughout the year and encourages continued attention, especially during and after COVID-19, and particularly with underrepresented groups. There is a long-term need to grapple with the relatively low participation level of certain groups of researchers. Data in the Digest indicate that the number and percentage of total proposals submitted from women and underrepresented groups has remained approximately the same for 10 years. These underrepresented groups include American Indian/Alaska Native, Black/African American, Hispanic or Latino, and Native Hawaiian/Pacific Islanders. NSB will engage NSF and outside experts, including the Committee on Equal Opportunities in Science and Engineering, in discussions about current and prospective strategies to increase participation of underrepresented groups in NSF's programs and effectively benchmark results. NSF's strong outreach program is an important base on which to build.

## Analyzing the Merit Review Process

Consistent with the previous survey results, current survey respondents identified improved quality of the written reviews as the most important potential improvement to the merit review process. In response to this feedback, NSF developed a valuable 20-minute orientation video for reviewers to watch before beginning their reviews. The video discusses ways to efficiently structure an analytical review, describes the broader impact review criterion, and outlines ways to reduce the impact of unconscious associations including anchoring bias, confirmation bias, halo effect, and language bias. Almost all survey respondents who viewed

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<sup>1</sup> The PAPPG examples of broader impacts are:

1. full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM)
2. improved STEM education and educator development at any level
3. increased public scientific literacy and public engagement with science and technology
4. improved well-being of individuals in society
5. development of a diverse, globally competitive STEM workforce
6. increased partnerships between academia, industry, and others
7. improved national security
8. increased economic competitiveness of the U.S.; use of science and technology to inform public policy
9. enhanced infrastructure for research and education.

the video indicated they found it helpful. However, as of late 2020 only about one in five respondents who were reviewers indicated they had watched it. Considering the recognized need for such information and the enthusiastic response of the reviewers who did watch the orientation video, NSB plans to develop a policy that ensures reviewers are well prepared for their role by, for example, viewing this video.

## Greater Funding Rate Needed for Sustained STEM Leadership

The 2019 Digest data continue to show that NSF receives many more high-quality proposals than it can fund, even this year, which saw fewer proposals submitted. NSF was able to fund about 27% of its competitive proposals, and about 26% of its research proposals. NSB members believe that the long-term health of the research community and promised benefits to the nation demand a funding rate closer to the historical average of 30% or more in the 1990s, as shown in the FY 1998 Merit Review Report.

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 2019, 4,262 proposals that received ratings “Very Good” or higher had to be declined. These requests amounted to about \$2.8 billion. NSB affirms that the U.S. should continue its efforts to make the investments that are vital for the advancement of the nation’s science and engineering enterprise and for the U.S. to compete effectively in the 21st century global economy. 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.

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# The National Science Foundation's Merit Review Process: FY 2019 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) 2019.

NSF acted on 41,024 competitively reviewed full proposals in FY 2019, only 85% of the number acted on in FY 2018 (48,321). The Foundation made 11,243 awards in FY 2019, 459 fewer awards than in FY 2018, resulting in a funding rate of 27%, larger than the 24% seen in FY 2018 and above the range of between 22% and 24% seen from 2010 to 2018. Funding rates vary among directorates; in FY 2019, they ranged from 22% for Education and Human Resources to 37% for Geosciences.

Two significant differences between FY 2019 and FY 2018 were the suspension of most proposal and award processing activities for parts of December 2018 and January 2019, as a result of a five-week lapse in appropriations, and the adoption of the no-deadline pilot by two more directorates, Biological Sciences and Engineering. One consequence is that it is difficult to make meaningful comparisons between many of the quantitative metrics for the merit review process in FY 2019 and their counterparts in FY 2018.

In FY 2019, approximately 82% of NSF's competitively reviewed full proposals were research proposals. The funding rate for research proposals was 26% overall. This compares to values between 19% and 22% seen over the period FY 2010 to FY 2018. Directorate funding rates ranged from 16% in Education and Human Resources to 36% in Geosciences. The funding rate for research proposals from early-career Principal Investigators (PIs) was 23%, compared to 26% for other PIs. The funding rates for research proposals from men and women were 26% and 29%, respectively. Overall, the funding rate for research proposals from White PIs was 29%, while rates for proposals from Hispanic or Latino PIs, Black/African American PIs, and Asian PIs were 27%, 23%, and 21%, 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 FY 2017 and FY 2019, 39% received an award in that period. Over that three-year period, the average number of research proposals submitted to obtain an award was 2.3, a small reduction from 2.4 for FY 2016 – FY 2018.

The mean annual research award amount was \$189,015, 6% larger than in FY 2018, continuing a trend of increasing award size more rapidly than the rate of inflation that began in FY 2017. Nevertheless, when adjusted for inflation, it remains 0.2 % below the size of the average research award size for FY 2009. 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 \$32,743. NSF research

awards supported 27,159 graduate students and 4,230 post-doctoral associates in FY 2019, as well as 33,529 senior research personnel. The average number of months of salary support for individual PIs or Co-PIs per research grant per year in FY 2019 was 0.61 months for single-PI and 0.61 months for multiple-PI awards, about half of the support for PIs provided in research grants in FY 2009.

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 2019, 67% of proposals were reviewed by panel only, 21% by ad hoc plus panel, and 7% 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, conferences, or workshops.

NSF's goal is to inform 75% of applicants whether their proposals have been declined or recommended for funding within 182 days, or six months, of deadline, target, or receipt date, whichever is later.<sup>1</sup> In FY 2019, 61% of all proposals were processed within six months. NSF missed its goal due to the 35-day lapse in appropriations during December 2018-January 2019.

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<sup>1</sup> NSF FY 2019 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."<sup>2</sup> 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.<sup>3</sup>

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 NSF Merit Review Process – FY 2019 Digest* and the accompanying downloadable data tables provide summary statistics covering the period from October 1, 2018 to September 30, 2019.

This section of the Digest describes the NSF Merit Review process. **Section III** provides summary data about proposals, awards, and funding rates. **Section IV** delivers more detailed 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*.<sup>4</sup> 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 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 and the principles and criteria that guide review and decision making. The integrity

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

<sup>3</sup> NSF FY 2019 Performance and Financial Highlights: <https://www.nsf.gov/pubs/2020/nsf20003/nsf20003.pdf>.

<sup>4</sup> Two versions of the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) were applicable in FY 2019: from October 1, 2018 to February 24, 2019, the applicable version may be found at: [https://www.nsf.gov/pubs/policydocs/pappg18\\_1/nsf18\\_1.pdf](https://www.nsf.gov/pubs/policydocs/pappg18_1/nsf18_1.pdf); for February 25, 2019 on, the applicable version may be found at: [https://www.nsf.gov/pubs/policydocs/pappg19\\_1/nsf19\\_1.pdf](https://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf).



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 include 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 (awards and declines) 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 (82%) of the competitively reviewed proposals. **Sections III.B – F** summarize data on all competitively reviewed proposals.

Funding rate, also called 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 funding rate for that directorate in that year would be 25%.

Directorates are often referred to by their acronyms<sup>5</sup>: 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,<sup>6</sup> abbreviated as OISE and OIA, respectively. In some tables, these two program offices are referred to collectively as OD since they reside within the Office of the Director (see **Appendix 14** for NSF's organizational chart).

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<sup>5</sup> 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.

<sup>6</sup> 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 2019.

## Unexpected Impacts on the FY 2019 Merit Review Process

NSF's goal is to inform 75% of applicants whether their proposals have been declined or recommended for funding within 182 days, or six months, of deadline, target, or receipt date, whichever is later.<sup>7</sup> Between December 22, 2018 and January 25, 2019, NSF operations were largely suspended due to a lapse in appropriations. Following the lapse in appropriations, this goal was suspended for FY 2019 and, when normal operations resumed, NSF staff were asked to prioritize processing award decisions ahead of decline decisions. As a result, in FY 2019, 61% of all proposals were processed within six months.

Merit Review processes were also impacted in FY 2019 by the decisions of two large directorates, BIO and ENG, to join the no-deadline pilot for proposal submission. As a consequence of this and the lapse in appropriations, it is difficult to make meaningful comparisons between many of the quantitative metrics for the FY 2019 and 2018 merit review processes.

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<sup>7</sup> NSF FY 2019 Annual Performance Plan.

### 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 trends.<sup>8</sup> The number of new awards made in FY 2019 (8,580) was 5.1% fewer than in FY 2018 (9,043). The number of research proposals acted on decreased by 16.7%; the funding rate for research proposals increased by about 14%, rising from 22% to 26%.<sup>9,10,11</sup> Note that a proposal is included in a given fiscal year based on whether the action (division director’s recommendation to award or decline)<sup>12</sup> was taken that year, not whether the proposal was received in that year.

**Table 1. Research Proposals, Awards, and Funding Rates**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Proposals</b>	35,609	42,225	41,840	38,490	39,249	38,885	40,869	41,039	40,678	40,364	33,613
<b>Awards</b>	10,011	8,639	7,759	8,061	7,652	7,926	8,993	8,782	8,553	9,043	8,580
<b>Funding Rate</b>	28% <sup>13</sup>	20%	19%	21%	19%	20%	22%	21%	21%	22%	26%

Source: NSF Enterprise Information System, 10/01/19.

<sup>8</sup> The proposal funding rate often simply called “funding rate,” refers to the proportion of proposals acted on in a fiscal year that resulted in awards. Later in the document, a funding rate for individual principal investigators will also be described.

<sup>9</sup> The ratio of funding rates between FY 2019 and FY 2018 is 1.139 [= (8,580/33,613) ÷ (9,043/40,364)].

<sup>10</sup> EARly-Concept Grants for Exploratory Research (EAGER) and Rapid Response Research (RAPID) proposals, which have a high funding rate, were approximately 1.9% of the research proposals. If these are removed, then the FY 2019 funding rate for research proposals is reduced from 25.5% to 24.6%.

<sup>11</sup> As noted in the introduction, a five-week lapse in appropriations in FY 2019 reduced the overall number of proposals acted upon by NSF in FY 2019. In addition, two directorates joined the no deadline pilot resulting in a smaller number of proposals submitted to these directorates in FY 2019.

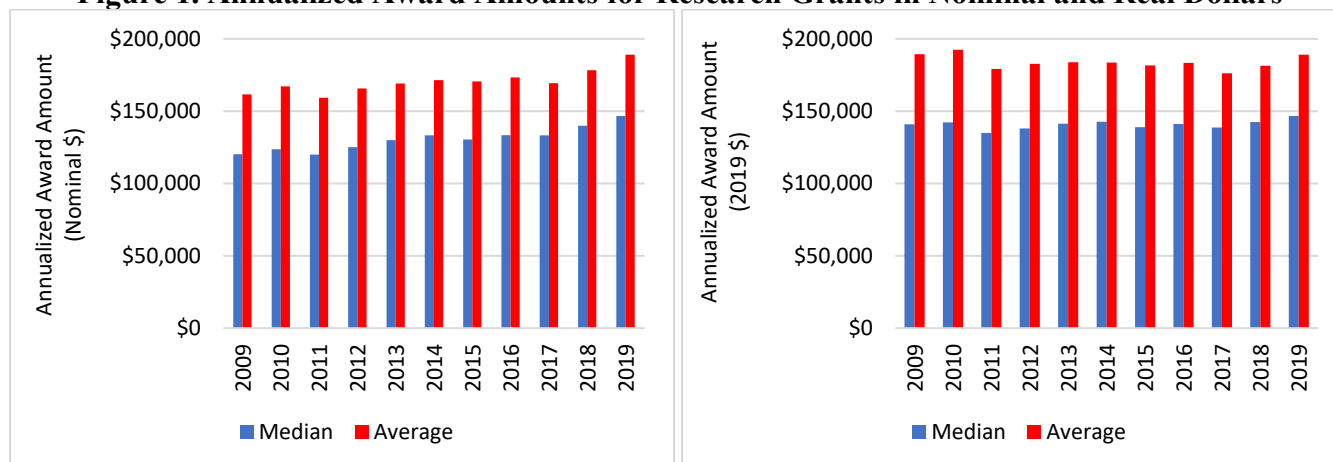
<sup>12</sup> The merit review process is managed by NSF’s program units (divisions and offices) and is completed when the division director or office head concurs with a program officer’s recommendation to award or decline a proposal. For simplicity, this step will be referred to as completion of an 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**.

<sup>13</sup> 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.

## A2. Research Grant Size and Duration

In FY 2019, the annualized median award size was \$146,667, a 4.8% increase from FY 2018 in nominal dollars, and the annualized mean award amount was \$189,015, a 6% increase from FY 2018. The nominal and inflation-adjusted annual award sizes are shown in **Figure 1**.

**Figure 1. Annualized Award Amounts for Research Grants in Nominal and Real Dollars**



Source: NSF Enterprise Information System, 10/01/19 and Office of Management and Budget Historical Table 10.1 "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2025", [https://www.whitehouse.gov/wp-content/uploads/2020/02/hist10z1\\_fy21.xlsx](https://www.whitehouse.gov/wp-content/uploads/2020/02/hist10z1_fy21.xlsx), accessed on 04/13/2020. Real dollars use FY 2019 as a baseline. FY 2009 and FY 2010 include ARRA funding.

In real (i.e., inflation-adjusted) dollars, the FY 2019 annualized mean award amount (\$189,015) was 4.2% larger than the FY 2018 amount (\$181,467).<sup>14</sup> The mean annual award size in *nominal* dollars increased by 17% from FY 2009 to FY 2019. The mean annual award size in *real* dollars fluctuated over the same period and was 0.2% lower in FY 2019 than in FY 2009.

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.<sup>15</sup>

**Table 2. Mean Award Duration for Research Grants**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Duration (Yrs)</b>	3.0	2.9	2.9	2.9	3.0	3.0	2.9	2.9	2.9	3.0	3.0

Source: NSF Enterprise Information System, 10/01/19.

<sup>14</sup> 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 2019 is the reference year (one FY 2019 dollar equals one real dollar).

<sup>15</sup> The number of years is rounded to one decimal place. This is the initial duration for new awards in each year and does not consider no-cost extensions.



### A3. Diversity of Participation

To advance the goals described in NSF's Strategic Plan,<sup>16</sup> an important strategy is broadening the participation in NSF's activities by members of groups that are currently underrepresented 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 acted on in FY 2019 provided information about their gender, race, ethnicity, or disability status 78%, 78%, 77% or 71% of the time, respectively.<sup>17</sup>

#### 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	27	40	†	††
Asian	20	7,533	590	<b>8,143</b>
Black/African American	23	626	21	<b>670</b>
Native Hawaiian or Pacific Islander	†	29	†	††
White	795	15,023	986	<b>16,804</b>
Multi-racial	54	308	21	<b>383</b>
Unknown	334	1,040	6,135	<b>7,509</b>
<b>TOTAL</b>	<b>1,253</b>	<b>24,599</b>	<b>7,761</b>	<b>33,613</b>

† = 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	†	15	†	33%
Asian	†	1,620	112	21%
Black/African American	†	146	†	23%
Native Hawaiian or Pacific Islander	†	†	†	††
White	214	4,469	243	29%
Multi-racial	14	83	†	27%
Unknown	94	244	1,291	22%
<b>Funding Rate</b>	<b>27%</b>	<b>27%</b>	<b>21%</b>	

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

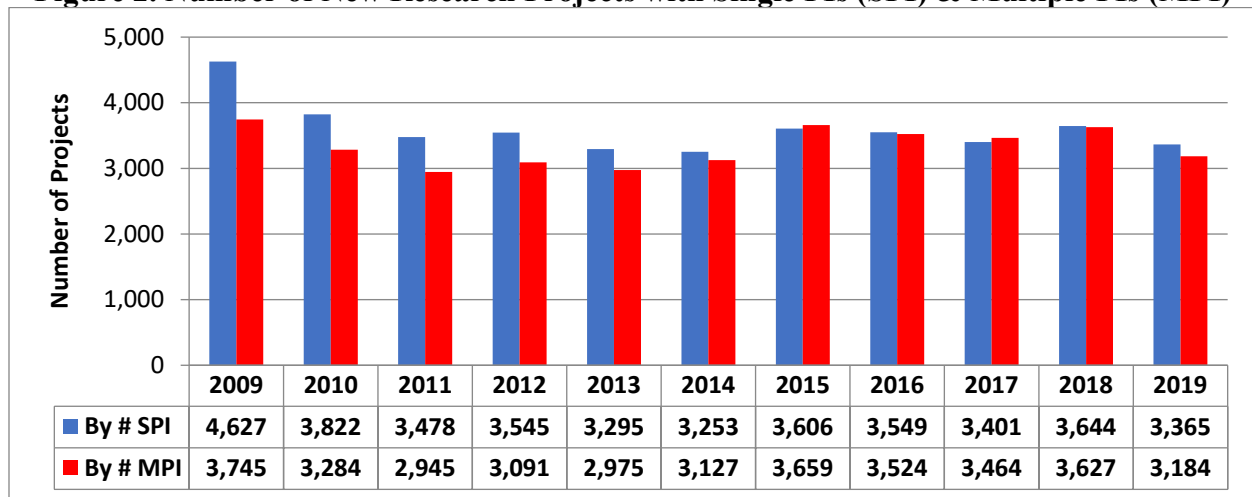
<sup>16</sup>NSF Strategic Plan for Fiscal Years (FY) 2018-2022 <https://www.nsf.gov/pubs/2018/nsf18045/nsf18045.pdf>.

<sup>17</sup> I.e., 78% of research proposals came from PIs who provided information about their gender, 77% of PIs whose proposals were awarded or declined by NSF in FY 2019 provided information about their gender.

#### 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.

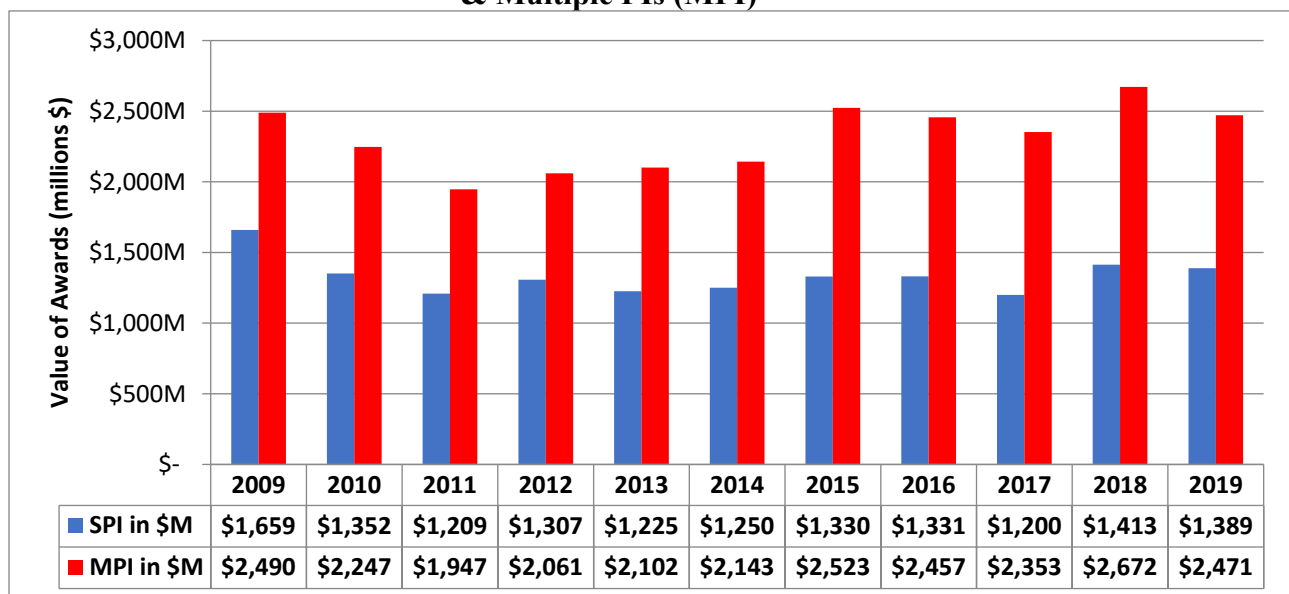
**Figure 2. Number of New Research Projects with Single PIs (SPI) & Multiple PIs (MPI)**



Source: NSF Enterprise Information System, 10/01/19.

In FY 2019, the number of SPI projects was more than 5% greater than the number of MPI projects. For FY 2014 – FY 2018, the numbers of MPI projects and SPI projects funded were closer to each other. **Figure 3** shows the total amount of funds awarded to SPI and MPI research projects.

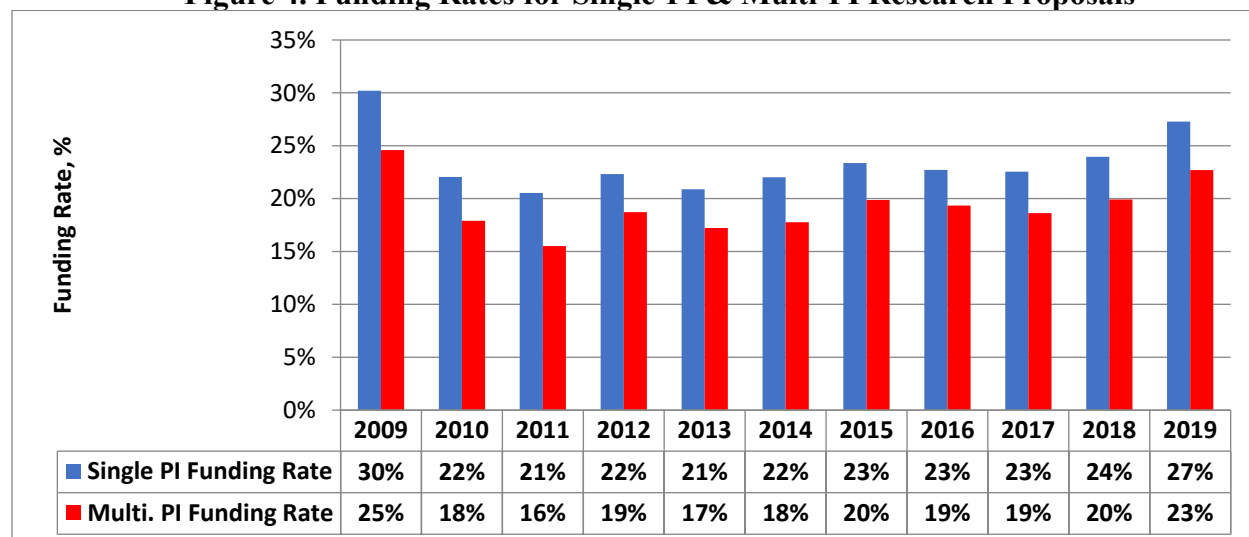
**Figure 3. Amounts Awarded for Research Projects with Single PIs (SPI) & Multiple PIs (MPI)**



Source: NSF Enterprise Information System, 10/01/19.

**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**



Source: NSF Enterprise Information System, 10/01/19.

#### 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 2017 – 2019.<sup>18</sup>

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

	One	Two	Three	Four or more
Fiscal Years 2017-2019	81%	15%	3%	1%

Source: NSF Enterprise Information System, 10/01/19.

#### 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.<sup>19</sup> 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 2018 to FY 2019, the number of graduate students supported by research grants

<sup>18</sup> The distribution is the same as it was for 2016-2018.

<sup>19</sup> The research grant category does not include most individual post-doctoral fellowships, NSF Graduate Research Fellowship awards (approximately 2,000 per year; FY 2010-2019), and other individual awards to graduate students. However, most NSF-supported post-doctoral associates and graduate students are supported as part of research grants.

increased by 0.6% and the number of post-doctoral associates supported by research grants decreased by 6.3%.

**Table 6. Number of People Supported on NSF Research Grants**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	% Change, 2019 - 2009
<b>Senior Personnel</b>	33,536	33,650	35,523	39,862	32,829	31,650	33,831	35,326	33,296	35,870	33,529	-0.02%
<b>Postdocs</b>	5,580	4,653	4,751	4,596	4,447	4,286	4,586	4,460	4,442	4,516	4,230	-24%
<b>Graduate Students</b>	33,371	24,554	24,855	25,550	25,161	26,317	26,882	27,099	26,693	26,997	27,159	-19%

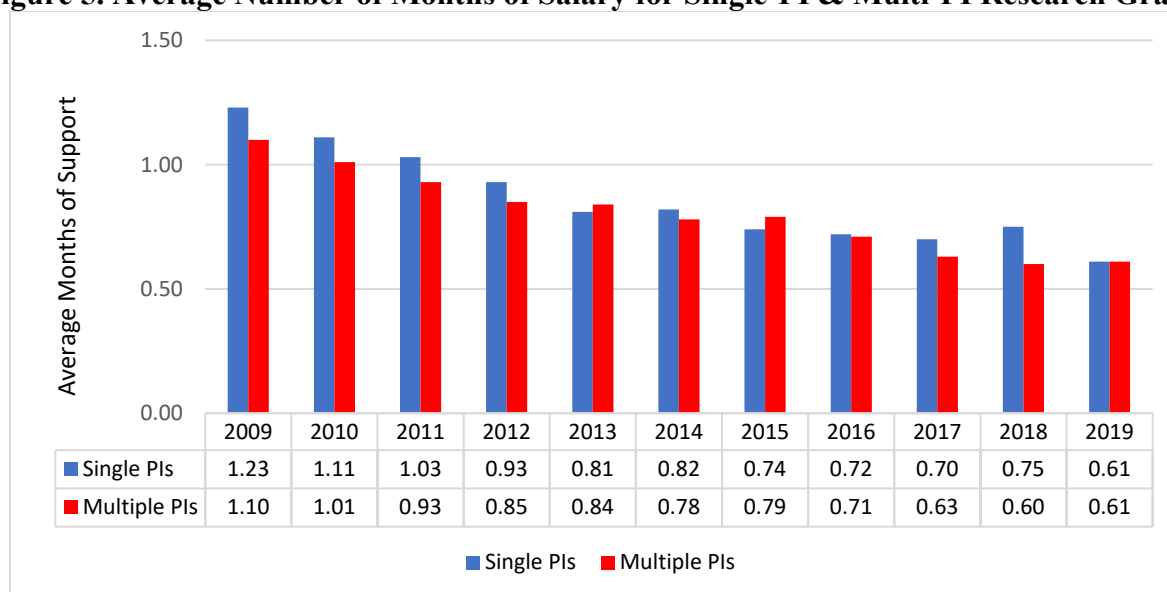
Source: NSF Enterprise Information System, 10/01/19.

**Appendix 2** provides further details on the levels of support in research grants for PIs, graduate students and post-doctoral associates across NSF's individual directorates and offices.

#### **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-PI 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.)

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



Source: NSF Report server as of 02/05/2020.

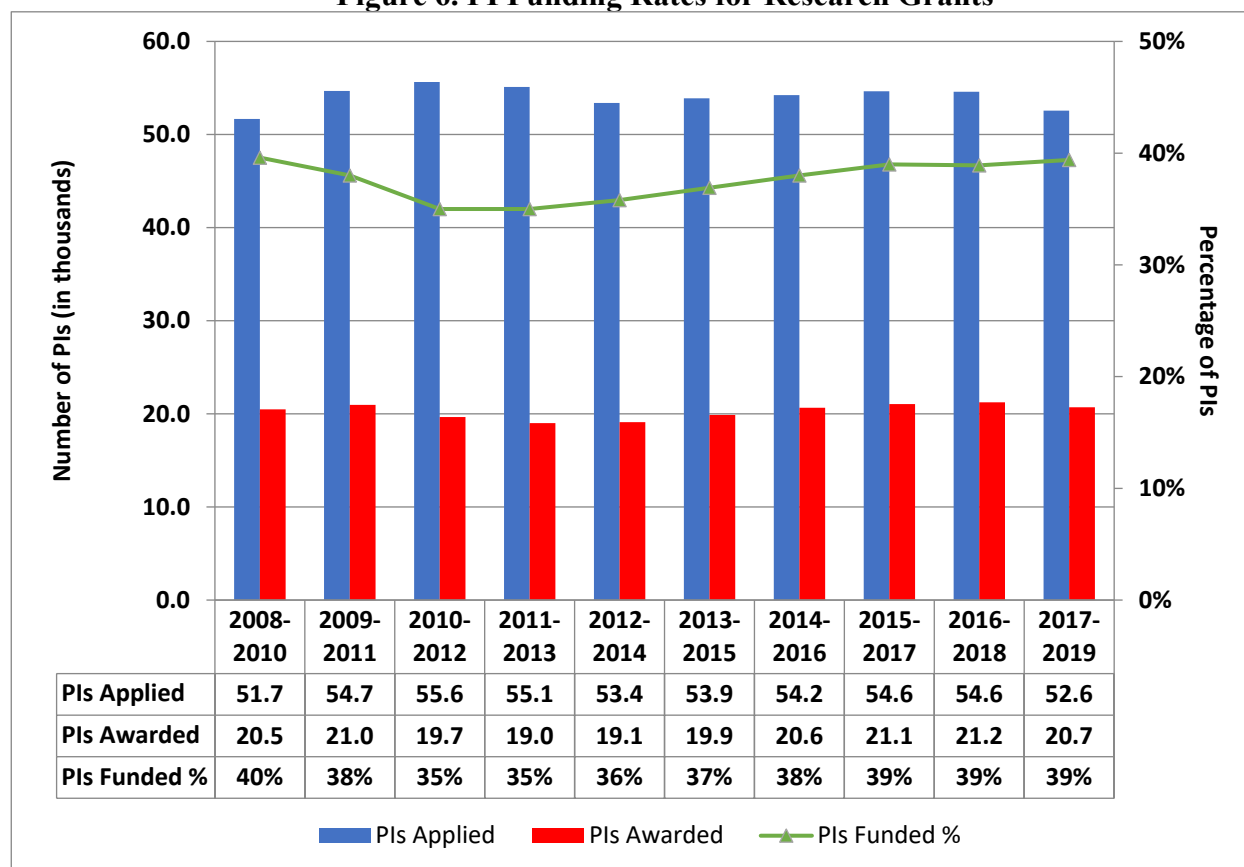


The number of per-individual PI/co-PI months of support per grant has dropped considerably since the period prior to 2009. In FY 2019, support was approximately half the levels a decade earlier. The data by directorate in **Appendix 2** show that, in comparison to NSF as a whole, ENG awards tend to provide fewer months of salary support for PIs and co-PIs, approximately half the NSF average.

## A8. Principal Investigator Funding Rates

**Figure 6** shows the PI funding rate (the green curve) in a three-year period. PI funding rate is 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 in the same three-year window, as well as the PI funding rate, increased temporarily in 2009 due to the funds appropriated under ARRA. The PI funding rate then declined, reaching a low between 2010 and 2013. Since then, it has slowly recovered and the FY 2017-19 rate has reached the level seen in FY 2008-2010..

**Figure 6. PI Funding Rates for Research Grants**



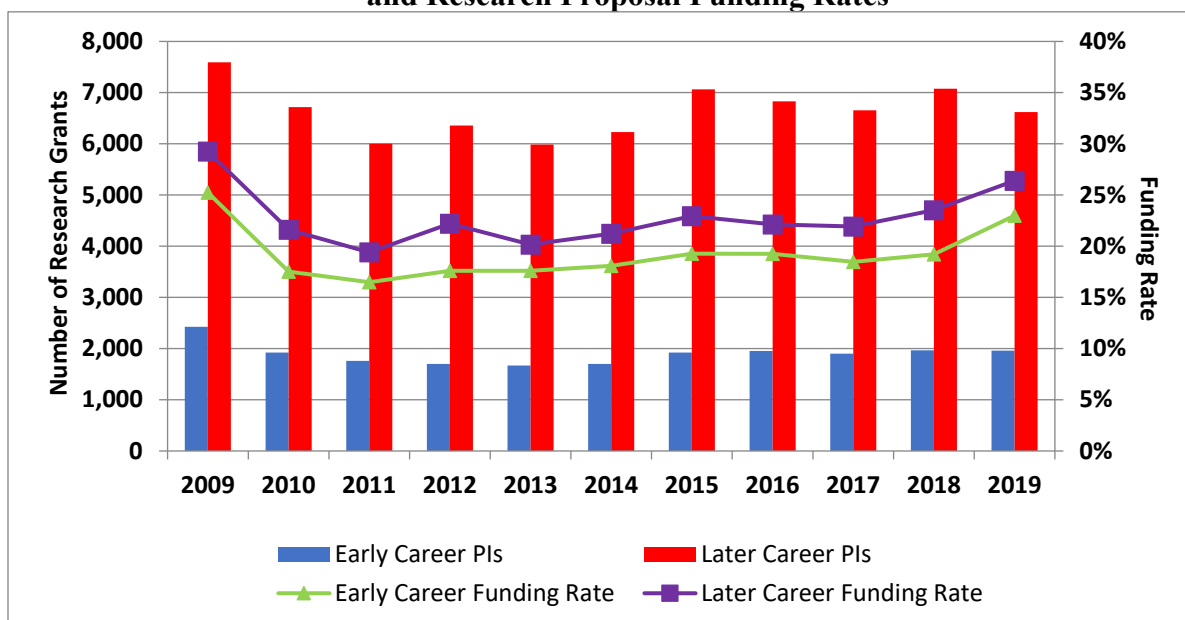
Source: NSF Enterprise Information System, 10/01/19.

In FY 2017 – 2019, PIs who received an award submitted, on average, 2.3 proposals per award. This is similar to what was seen in FY 2008-2010.

## A9. Early and Later Career PIs

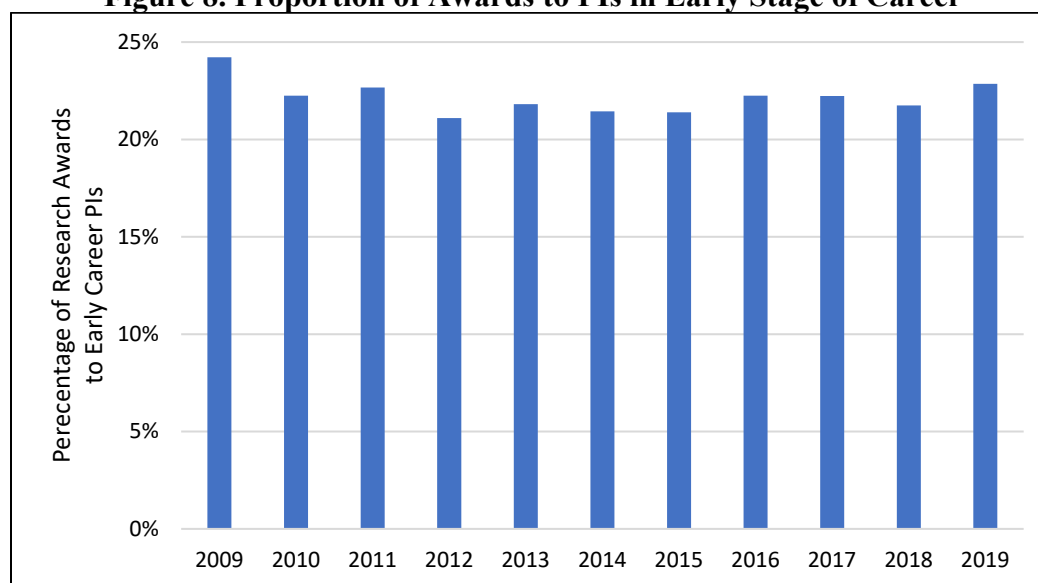
**Figure 7** and **Figure 8** show the number and percentage, respectively, of NSF PIs of research awards that are in the early or later stages of their careers. An early career PI is defined as someone within seven years of receiving their last degree at the time of the award. In this document, PIs who received their last degree more than seven years before the time of their first NSF award are considered later career PIs.

**Figure 7. Research Grants Awarded to PIs in Early and Later Stages of Career and Research Proposal Funding Rates**



Source: NSF Enterprise Information System, 10/01/19.

**Figure 8. Proportion of Awards to PIs in Early Stage of Career**



Source: NSF Enterprise Information System, 10/01/19.

In FY 2019 the proposal funding rate for later career PhDs was 26%, slightly higher than the FY 2018 funding rate of 24% (**Figure 7**). For early career PIs, the rate increased from 19% to 23% year over year. (**Figure 8**).

## **B. Competitive Proposals, Awards, and Proposal Funding Rates**

The larger collection of all competitive proposals acted on by NSF in FY 2019 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.<sup>20</sup>

NSF completed action on 41,024 proposals in FY 2019, a 15% decrease from FY 2018, resulting in 11,243 awards, a 3.9% decrease from FY 2018. Consequently, in FY 2019 the proposal funding rate was 27%, up from 24% in FY 2018. Prior to FY 2019, the funding rate had been relatively stable over nine 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**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Proposals</b>	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,321	41,024
<b>Awards</b>	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,702	11,243
<b>Funding Rate</b>	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%	27%

Source: NSF Enterprise Information System, 10/01/19.

## **C. Diversity of Participation**

**Table 8** provides data on proposals, awards, and funding rates by proposer characteristics (gender, underrepresented ethnic or racial group, disability, new and prior PI status). Gender, disability, ethnic and racial data are based on self-reported information. About 75% of individuals who were PIs provided gender information, 74% identified their race, and 74% identified their ethnicity. Overall, 76% of proposals were from people who provided gender information,<sup>21</sup> 80% provided either the race or ethnicity,<sup>22</sup> and 70% provided information about disability status. The underrepresented 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.

<sup>20</sup> 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.

<sup>21</sup> 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 2019, the funding rate for PIs whose gender was not provided was 23%.

<sup>22</sup> For only 75% of proposals was there information sufficient to determine whether the PI belonged to an underrepresented racial or ethnic group, because some report only one of race or ethnicity.

**Table 8. Proposals, Awards, and Funding Rates, by PI Type<sup>23</sup>**

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
All PIs (data from Table 7)	Proposals	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,321	41,024
	Awards	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,702	11,243
	Funding Rate	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%	27%
Female PIs	Proposals	9,727	11,903	11,488	10,795	11,152	11,142	11,444	11,598	11,322	10,858	9,076
	Awards	3,297	2,982	2,602	2,775	2,556	2,669	3,007	3,032	2,962	2,943	2,843
	Funding Rate	34%	25%	23%	26%	23%	24%	26%	26%	26%	27%	31%
Male PIs	Proposals	32,091	38,695	35,211	32,932	32,866	31,625	32,411	31,528	30,046	28,180	22,277
	Awards	10,437	9,080	7,739	7,816	7,316	7,286	7,810	7,512	6,930	6,884	6,157
	Funding Rate	33%	23%	22%	24%	22%	23%	24%	24%	23%	24%	28%
PIs from underrepresented racial or ethnic groups	Proposals	2,945	3,613	3,441	3,291	3,303	3,268	3,383	3,331	3,403	3,498	2,714
	Awards	889	812	735	718	651	681	788	778	806	853	766
	Funding Rate	30%	22%	21%	22%	20%	21%	23%	23%	24%	24%	28%
New PIs	Proposals	16,840	21,545	19,238	17,943	17,635	17,405	18,276	18,348	18,757	18,596	15,654
	Awards	4,174	3,620	2,976	3,063	3,013	3,108	3,320	3,510	3,319	3,257	3,252
	Funding Rate	25%	17%	15%	17%	17%	18%	18%	19%	18%	18%	21%
Prior PIs	Proposals	28,341	33,997	32,324	30,670	31,364	30,646	31,344	30,937	30,658	29,725	25,370
	Awards	10,421	9,376	8,216	8,461	7,816	7,850	8,687	8,367	8,128	8,445	7,991
	Funding Rate	37%	28%	25%	28%	25%	26%	28%	27%	27%	28%	31%
PIs with disabilities	Proposals	470	545	543	483	488	468	562	496	491	453	373
	Awards	149	108	107	134	122	99	120	110	120	114	103
	Funding Rate	32%	20%	20%	28%	25%	21%	21%	22%	24%	25%	28%

Source: NSF Enterprise Information System, 10/01/19.

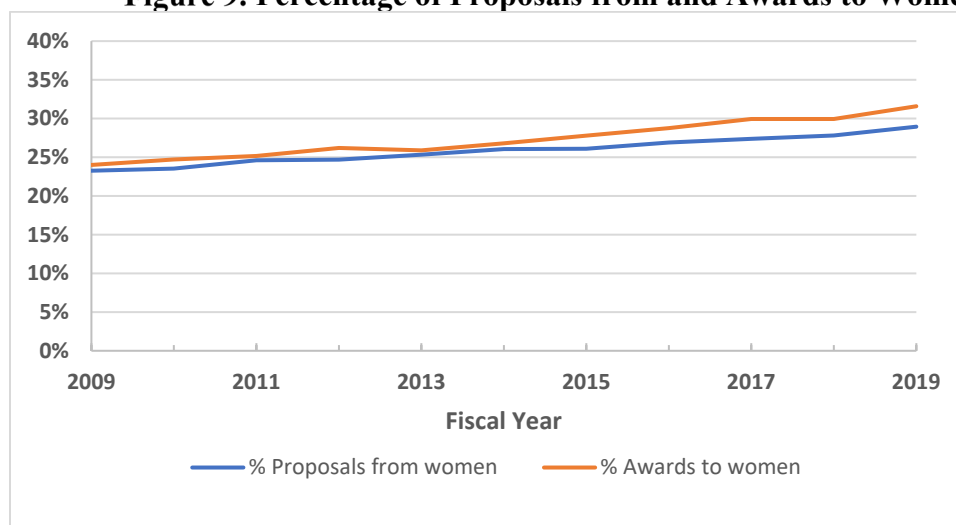
### **Gender**

Just under one quarter of proposals received in FY 2019 were from PIs who did not indicate their gender. Among proposals for which PI gender is known, fewer proposals are received from women than from men and the funding rate for proposals from female PIs is slightly higher than that for male PIs. The proportion of proposals from female PIs was 28.9% in FY 2019 and the proportion of awards to women was 31.6%.<sup>24</sup>

<sup>23</sup> 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.

<sup>24</sup> This is calculated as a percentage of the number of proposals from PIs who provided information about gender. The proportions for PIs from other underrepresented groups are calculated similarly except that, in **Figure 11**, the number of PIs who provided information sufficient to determine whether they belong to an underrepresented racial or ethnic group has been estimated for 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 underrepresented racial or ethnic groups that have an absolute magnitude of less than 0.05%, much less than the variation seen in **Figure 11**. Data in **Figure 12** are treated in a similar way.



**Figure 9. Percentage of Proposals from and Awards to Women**

Source: NSF Enterprise Information System, 10/01/19.

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. This gap has been wider over the past five years than it was before FY 2015. **Appendix 4** provides proposal, award, and funding rate information, by directorate, by PI gender.

### **Underrepresented Racial or Ethnic Groups**

The funding rate for PIs from underrepresented racial or ethnic groups (URMs), 28.2%, is comparable to the average funding rate for all PIs, 27.4%. **Figure 10** shows the funding rate of various racial and ethnic groups that submitted more than 100 proposals in FY 2019. The proportion of proposals from such PIs remains low (see **Figure 11**), with a slight upward trend over the last 10 years.

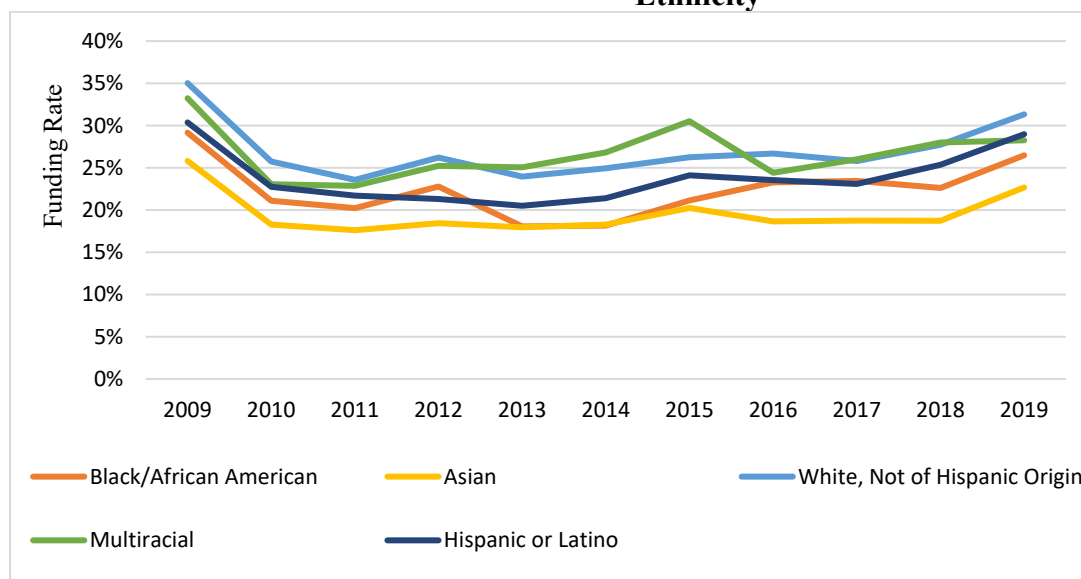
**Table 9** provides data on proposal, award, and funding rates by PI race and ethnicity. Very few PIs identify themselves as belonging to the categories American Indian/Alaska Native or Native Hawaiian/Pacific Islander. Because of the small numbers involved, the year-to-year fluctuations in funding rates for these groups tend to be greater than those for other ethnic groups. The proportion of submissions from underrepresented racial and ethnic groups in FY 2019 (8.5%)<sup>25</sup> 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%).<sup>26</sup>

<sup>25</sup> The ratio of the number of PIs in an underrepresented racial or ethnic minority to the total number of PIs who provided sufficient information to determine whether they belonged to such a minority.

<sup>26</sup> 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").

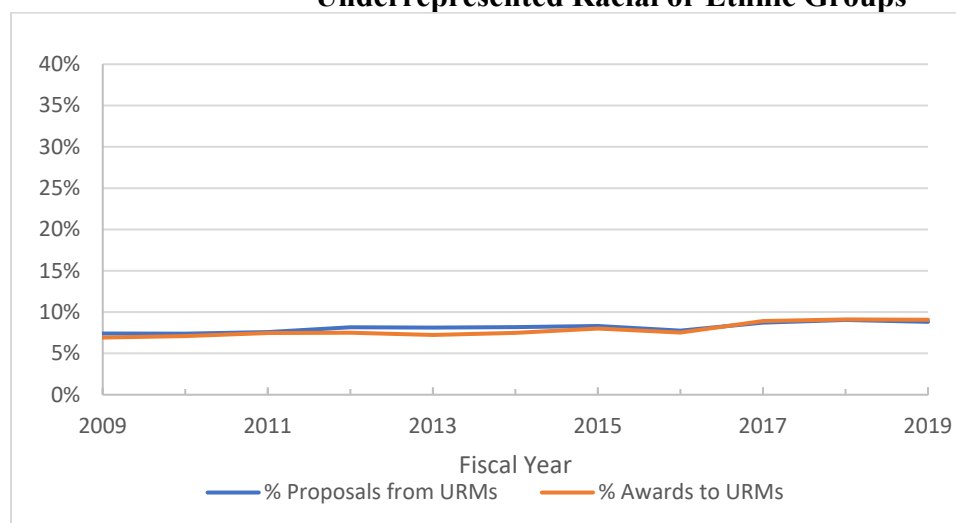
Among racial and ethnic groups that submitted more than 1,000 proposals in FY 2019, the funding rate is largest for the groups White (31%) and Hispanic or Latino (29%). It is smallest for Asian (23%).

**Figure 10. Funding Rate of Competitively Reviewed Awards by PI Race and Ethnicity**



Source: NSF Enterprise Information System, 10/01/19

**Figure 11. Percentage of Proposals from and Awards to Researchers from Underrepresented Racial or Ethnic Groups**



Source: NSF Enterprise Information System, 10/01/19.

**Table 9. Proposals, Awards, and Funding Rates, by PI Race and Ethnicity<sup>27</sup>**

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
American Indian/Alaska Native	Proposals	88	118	129	83	113	103	104	99	134	112	90
	Total Awards	29	28	36	18	28	36	25	29	39	29	33
	Funding Rate	33%	24%	28%	22%	25%	35%	24%	29%	29%	26%	37%
Black/African American	Proposals	1,022	1,280	1,201	1,154	1,124	1,123	1,102	1,134	1,135	1,159	929
	Total Awards	298	270	243	263	203	204	233	264	266	262	246
	Funding Rate	29%	21%	20%	23%	18%	18%	21%	23%	23%	23%	26%
Native Hawaiian/Pacific Islander	Proposals	23	38	42	40	32	30	30	41	30	30	47
	Total Awards	8	10	11	6	5	5	2	7	5	5	14
	Funding Rate	35%	26%	26%	15%	16%	17%	7%	17%	17%	17%	30%
Asian	Proposals	9,550	11,626	10,829	10,382	10,511	10,538	11,148	11,623	11,552	11,362	9,141
	Total Awards	2,465	2,124	1,907	1,914	1,887	1,925	2,256	2,168	2,166	2,127	2,073
	Funding Rate	26%	18%	18%	18%	18%	18%	20%	19%	19%	19%	23%
White	Proposals	29,975	36,153	33,200	30,596	30,766	29,624	30,099	29,031	27,804	25,744	20,400
	Total Awards	10,499	9,306	7,826	8,020	7,372	7,390	7,902	7,748	7,170	7,138	6,389
	Funding Rate	35%	26%	24%	26%	24%	25%	26%	27%	26%	28%	31%
Multiracial	Proposals	337	512	433	448	439	425	495	508	550	550	467
	Total Awards	112	118	99	113	110	114	151	124	143	154	132
	Funding Rate	33%	23%	23%	25%	25%	27%	31%	24%	26%	28%	28%
Hispanic or Latino	Proposals	1,755	2,092	2,019	1,934	1,956	1,921	2,053	1,950	1,993	2,106	1,549
	Total Awards	533	476	438	412	401	411	495	459	460	534	449
	Funding Rate	30%	23%	22%	21%	21%	21%	24%	24%	23%	25%	29%

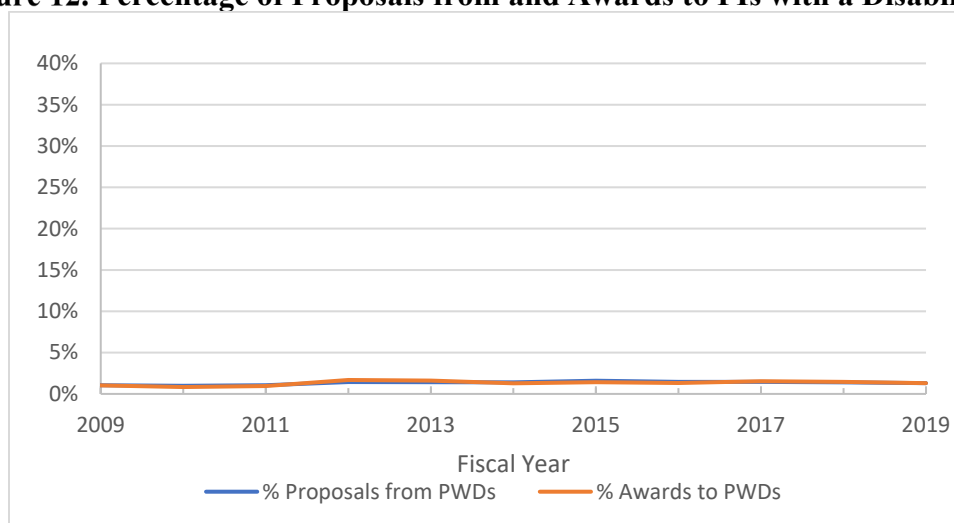
Source: NSF Enterprise Information System, 10/01/19 and NSF Report Server, 10/01/2019.

### **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 underrepresented racial and ethnic groups, the proportion of proposals that come from PIs with a disability has remained relatively steady from FY 2009 to FY 2019 (**Figure 12**), at approximately 1.5% in FY 2009 and 1.3% in FY 2019.<sup>28</sup>

<sup>27</sup> 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.

<sup>28</sup> In FY 2019, approximately 70% of competitively reviewed proposals were from PIs who indicated whether they had a disability. Of these, 1.3% reported that they did have a disability.

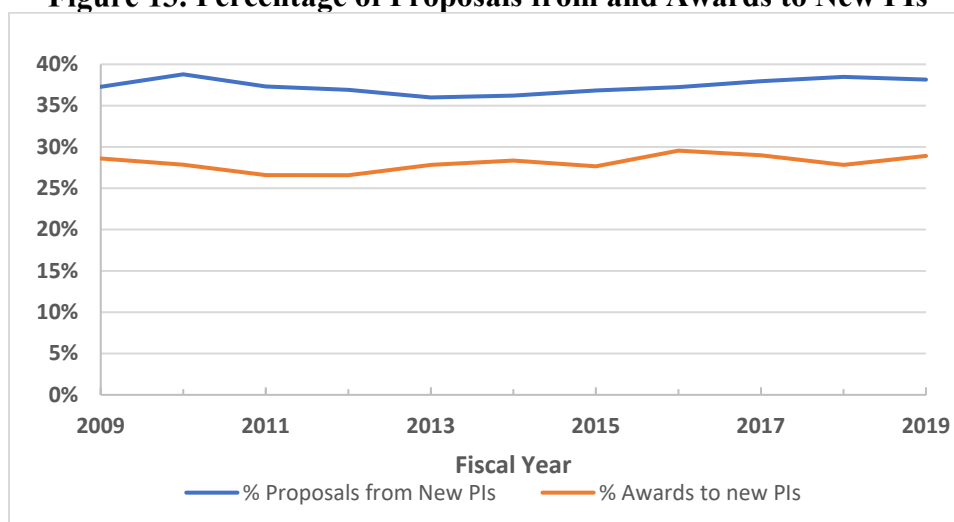
**Figure 12. Percentage of Proposals from and Awards to PIs with a Disability (PWDs)**

Source: NSF Enterprise Information System, 10/01/19.

### **New PIs**

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). The funding rate for new PIs is lower than that for PIs who have previously submitted a funded NSF proposal (21% compared to 31%; see **Table 8**).

In FY 2019, the proportion of proposals from new PIs was 38% (**Figure 13**). Since FY 2001, this number has fluctuated between approximately 36% and 39%. The funding rate rose 3% for new PIs and prior PIs, from 18% in FY 2018 to 21% in FY 2019 and from 28% in FY 2018 to 31% in FY 2019, respectively.

**Figure 13. Percentage of Proposals from and Awards to New PIs**

Source: NSF Enterprise Information System, 10/01/19.

#### **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)<sup>29</sup> 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 2019, NSF devoted 43% of its total budget to new standard grants and 11% 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.

**Table 10. Percentage of NSF Funding by Type of Award**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Standard Grants</b>	44%	37%	34%	35%	35%	39%	39%	41%	40%	43%	43%
<b>New Continuing</b>	8%	13%	11%	11%	12%	10%	10%	10%	10%	10%	11%
<b>CGIs and Supplements</b>	18%	18%	23%	22%	22%	20%	18%	16%	17%	14%	14%
<b>Cooperative Agreements</b>	21%	23%	23%	23%	23%	22%	22%	22%	22%	23%	22%
<b>Other</b>	9%	9%	9%	10%	8%	8%	11%	11%	11%	10%	11%

Source: NSF Enterprise Information System, 02/05/20. 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 2019, of the program funds awarded by NSF, approximately 78% went to academic institutions, 9% to non-profit and other organizations, 9% to for-profit businesses, and 4% to Federally Funded Research and Development Centers (**Table 11**).

<sup>29</sup> While the original award is a competitive action, the continuing grant increment is a non-competitive grant.

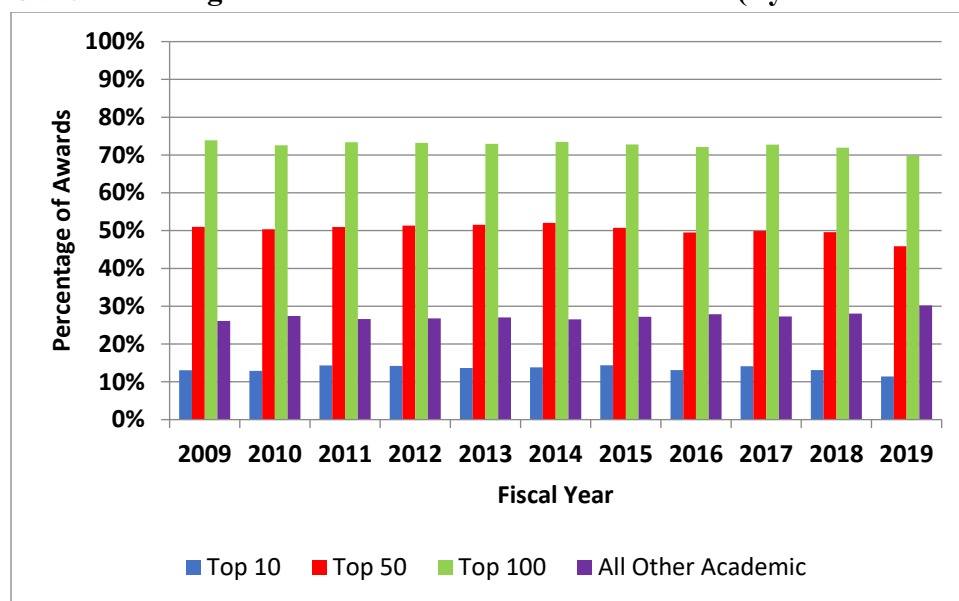
**Table 11. Distribution of Funds by Type of Organization**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Academic Institutions</b>	76%	77%	77%	80%	81%	81%	78%	76%	78%	77%	78%
<b>Non-Profit and Other Organizations</b>	13%	11%	13%	12%	11%	11%	11%	13%	10%	11%	9%
<b>For-Profit</b>	6%	6%	6%	5%	6%	5%	8%	8%	8%	8%	9%
<b>Federally Funded R&amp;D Centers</b>	4%	5%	5%	3%	3%	3%	3%	3%	3%	4%	4%

Source: NSF Enterprise Information System, 10/17/19. 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 14** 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 2019, the average proposal funding rate was 31% for the Top 100 Ph.D.-granting institutions (classified according to the amount of FY 2019 funding received). In comparison, the rate was 22% for Ph.D.-granting institutions that are not in the Top 100 NSF-funded category. The proposal funding rate was 28% for four-year institutions<sup>30</sup> and 34% for two-year institutions. For minority-serving institutions, the FY 2019 proposal funding rate was 25%.<sup>31</sup>

**Figure 14. Percentage of Awards to Academic Institutions (By Amount Received)**

Source: NSF Enterprise Information System, 10/01/19.

<sup>30</sup> Four-year institutions are those granting bachelor's degrees, regardless of whether they also offer graduate degrees.

<sup>31</sup> 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://nces.nsf.gov/pubs/nsf19304/>) and in a recent InfoBrief on funding to minority serving institutions (<https://www.nsf.gov/statistics/2019/nsf19314/>).

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.”<sup>32</sup> The EPSCoR program was designed for those jurisdictions that have historically received lesser amounts of NSF Research and Development funding. In FY 2019, 25 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 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.

Outreach to institutions includes the NSF Grants Conference held in Boston, MA in FY 2019. The two-day conference brought about twenty-five NSF representatives from all sectors of the Foundation to meet with faculty and administrators from around the nation to bring clarity to topics surrounding proposal preparation, the merit review process, and award administration issues.

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 underrepresented 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 underrepresented 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, FY 2017, and FY 2019.<sup>33</sup> In FY 2019, 61% of funding decisions were communicated within the six-month target period.

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<sup>32</sup> 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.

<sup>33</sup> 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



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

2009*	2010	2011	2012	2013	2014	2015	2016	2017*	2018 <sup>34</sup>	2019*
61%	75%	78%	78%	76%	72%	76%	77%	71%	72%	61%

Source: NSF Enterprise Information System, 10/01/19.

\*Dwell-time goal suspended in FY 2009, FY2017, and FY 2019.

## **G. Mechanisms to Encourage Transformative Research**

All NSF programs encourage and support potentially transformative research proposals. NSF also has several mechanisms developed to encourage the submission of certain types of potentially transformative research proposals. These include EARly-concept Grants for Exploratory Research (EAGER), Research Advanced by Interdisciplinary Science and Engineering (RAISE)<sup>35</sup>, 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 interdisciplinary 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-

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be funded with the ARRA appropriation. In FY 2017, the dwell time goal 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 2019, the dwell time goal was suspended because from December 22, 2018 – January 25, 2019 agency operations were suspended due to a lapse in appropriations. Following the lapse in appropriations, NSF staff were requested to prioritize processing awards, thereby delaying the processing of proposals that would be declined which reduced the overall number of proposals acted upon in FY 2019.

<sup>34</sup> The dwell time goal was not included in any employee performance plans for the General Work Force performance period April 2017-March 2018. The beginning of FY 2018 was marked by NSF beginning operations in its new Alexandria, VA location.

<sup>35</sup> 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.

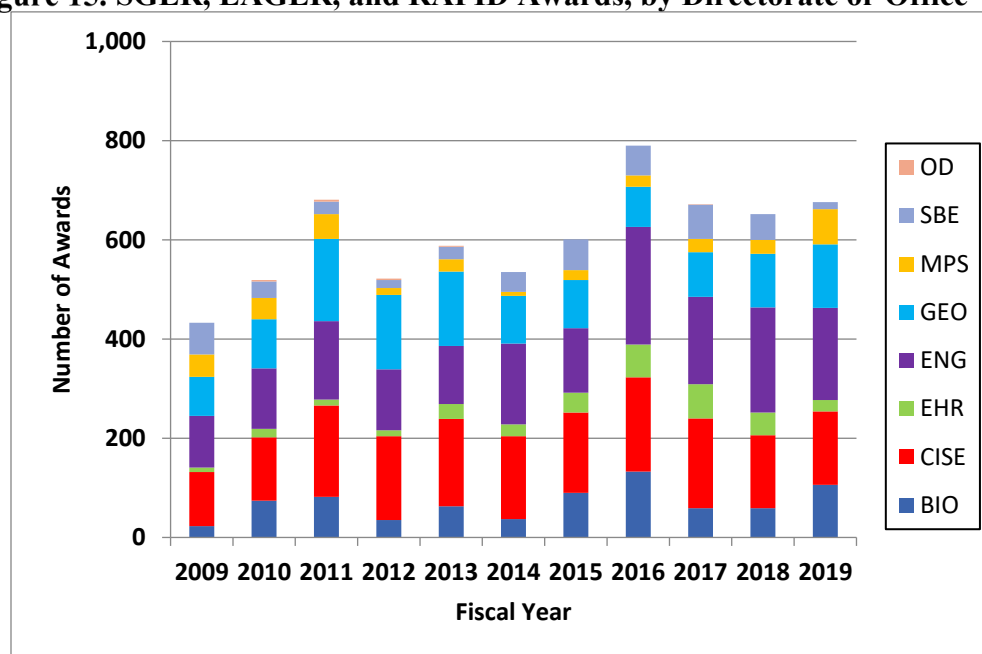
response research on natural or anthropogenic disasters and similar unanticipated events. Requests may be for up to \$200,000 and of one year in duration.

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 15** shows the number of SGER, EAGER, and RAPID awards from 2009 to 2019 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 15**.

There is considerable variation across directorates in the use of EAGER and RAPID awards. (See **Appendix 7**.) For example, during the past five 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.

**Figure 15. SGER, EAGER, and RAPID Awards, by Directorate or Office**



Source: NSF Enterprise Information System, 10/01/19.

In their use of EAGER and RAPID awards, the directorates fall into clusters (see **Table 13**). CISE and ENG have received the most EAGER and RAPID proposals since their introduction and made the most awards. In the past five years, together these two directorates accounted for almost 56% of these proposals and 52% of the awards. SBE, EHR, and MPS accounted for 19% of EAGER and RAPID proposals and 19% of the awards. GEO and BIO received 26% of the proposals and made 28.7% of the awards. SBE and MPS had the largest average EAGER and RAPID award sizes in FY 2019. GEO and ENG made the smallest EAGER and RAPID awards, on average, in FY 2019.

**Table 13. Investments in EAGER and RAPID awards by Directorate, FY 2015 – FY 2019**

	<b>ENG</b>	<b>CISE</b>	<b>GEO</b>	<b>BIO</b>	<b>SBE</b>	<b>EHR</b>	<b>MPS</b>
% of FY 15-19 awards	28.2%	23.6%	16.3%	12.4%	7.8%	6.5%	5.1%
FY 15-19 investment (\$ million)	140.2	139.7	54.7	78.9	30.7	41.5	37.3
FY 19 investment (\$ million)	18.1	23.7	15.1	11.1	3.6	2.6	4.7
Mean FY 19 award (\$ thousand)	148	210	114	217	255	220	235

Source: NSF Enterprise Information System, 02/05/20.

## **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 2019, NSF made forty-one Research Advanced by Interdisciplinary Science and Engineering (RAISE) awards, all but five were 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

In FY 1998, the National Science Board (NSB) approved NSF's two fundamental merit review criteria. These criteria were modified in FY 2007 to promote potentially transformative research. 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.<sup>36</sup> The language in the *Proposal and Award Policies and Procedures Guide*, describing the merit review criteria and the underlying principles, incorporates the recommendations from the NSB<sup>37</sup> and is reproduced in **Appendix 8**.

The two NSF merit review criteria are Intellectual Merit and Broader Impacts. Intellectual Merit encompasses the potential to advance knowledge, while Broader Impacts addresses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes. Individual 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.

### B. Description of the Merit Review Process

The NSF merit review process includes the steps listed below (and depicted in **Figure 18**):

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. NSF returns without review (RWR) proposals that fail to separately address each of the two merit review criteria within the Project Summary. Proposals are also 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. **Table 14** and **Appendix 10** provide additional information.

**Table 14. Proposals Returned Without Review (RWR)**

Fiscal Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of Proposals RWR	1741	2628	1794	1813	1871	1659	1843	1399	1144	1101	770
Percent of all Proposal Decisions	3.7%	4.5%	3.4%	3.6%	3.7%	3.3%	3.6%	2.8%	2.3%	2.3%	1.8%

Source: NSF Report Server, 02/05/20.

Beginning in FY 2016, NSF has continuously 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.

<sup>36</sup> *The National Science Foundation's Merit Review Criteria: Review and Revisions*. (2011) NSB/MR-11-22.

<sup>37</sup> 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](http://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf).

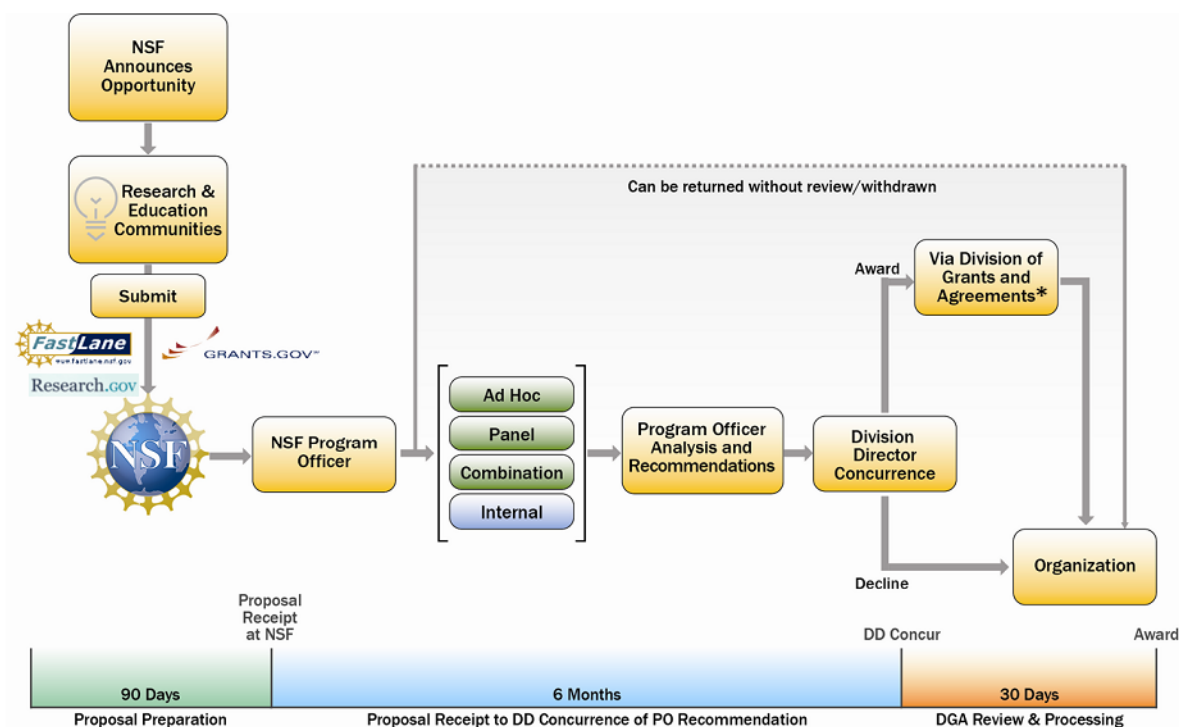
The program officer (or team of program officers) is responsible for the following:

- *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.)
- *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.
- *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.
- *Synthesizing the comments of the reviewers and review panel* (if reviewed by a panel), as provided in the individual reviews and panel summaries.
- *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.<sup>38</sup> In FY 2019, the NSB authorized three new funding items.

**Figure 16. Diagram of the NSF Merit Review Process**



\* A small number of cooperative agreements are awarded by the Division of Acquisition and Cooperative support.

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.

- 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](#).

<sup>38</sup>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.

- 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. Program Officer Recommendations**

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

NSF program officers are experts 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, as well as 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 encompasses a variety of considerations and objectives. When making funding recommendations, in addition to information from 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.

Decisions on a given proposal are also 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, a declined proposer would like additional information, she or he 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, she or he may request formal reconsideration. Information about the reconsideration process is included in decline notifications.<sup>39</sup> 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 30,000 or more 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 2009 through FY 2019 are displayed in **Appendix 12**. NSF received 18 requests for directorate-level reconsideration in FY 2019. Three of these were also reviewed at the second level. All 18 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.<sup>40</sup>

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.

"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.

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<sup>39</sup> 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/pappg19\\_1/nsf19\\_1.pdf](https://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf).

<sup>40</sup> 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.

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**.<sup>41</sup>

**Table 15. Reviews per Proposal, FY 2019**

	<b>All Methods</b>	<b>Ad hoc + Panel</b>	<b>Ad hoc-Only</b>	<b>Panel-Only</b>
Reviews*	154,694	41,641	10,425	102,628
Proposals	39,054	8,721	2,707	27,626
Rev/Prop	4.0	4.8	3.9	3.7

Source: NSF Enterprise Information System, 10/01/19.

\* 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 3.7. The use of various review methods has changed markedly over time, as shown in **Figure 17**. **Appendix 13** provides FY 2019 data on the review methods used by directorates and offices.

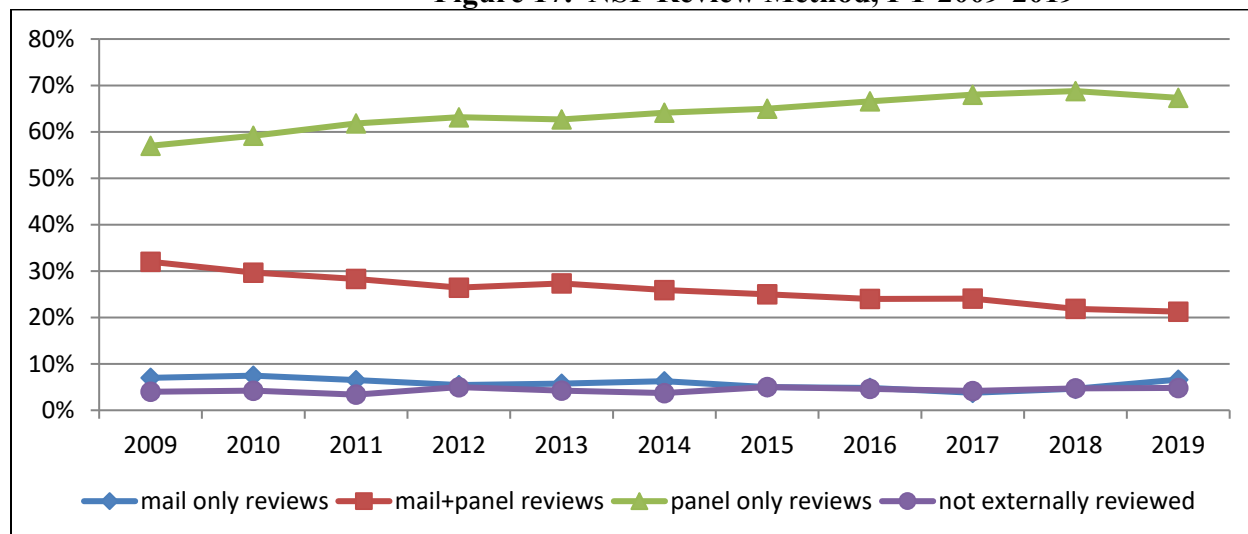
In addition, site visits (on-site and reverse-site) by NSF staff and external members of the community are often used to review proposals for facilities and centers. NSF program officers are given discretion in the specific use of review methods, subject to approval by the division director or other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

**Figure 17** shows that approximately two-thirds of proposals are reviewed by panels only. 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 2019, 63% of all proposals reviewed by panel only were processed within six months, compared to

<sup>41</sup> 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.

50% for ad hoc + panel and 46% for ad hoc only.<sup>42</sup> In FY 2018, the corresponding numbers were 74%, 63% and 64%.

**Figure 17. NSF Review Method, FY 2009-2019**



Source: NSF Enterprise Information System, 10/01/19.

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 in a panel-only review 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 29,076 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 2019, 10% fewer than in FY 2018. Of these, approximately 13,393 (46%) served as panelists (of whom about 2,601 also served as ad hoc reviewers) and 15,683 (54%) served as ad

<sup>42</sup> The lower value for “ad hoc only” may reflect several factors that are not a direct consequence of the method of obtaining reviews. For example, a number of the programs that use this method do not have submission deadlines; and following the lapse in appropriations, some proposals previously scheduled for review panels were instead reviewed by ad hoc review.

hoc reviewers only. Approximately, 5,440 (19%) of these reviewers had never reviewed an NSF proposal before.

Reviewers were from all 50 states as well as from the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands. Approximately 2,196 reviewers were from outside the United States by address of record.<sup>43</sup> 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 underrepresented groups in science and engineering. Reviewers are also identified through literature searches and professional activities, as well as through internally developed tools that makes use of text analysis techniques to identify past reviewers of similar proposals or authors of research papers in similar fields. Some NSF divisions actively solicit new reviewers through their webpages 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 2019, NSF requested 44,685 ad hoc reviews, of which there were 31,920 positive responses.<sup>44</sup> 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.

In FY 2019, 89% of proposals were reviewed by a panel of experts (**Figure 17**). A panel conducts its evaluation based on a discussion of the proposals. These in-depth discussions can

<sup>43</sup> 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:

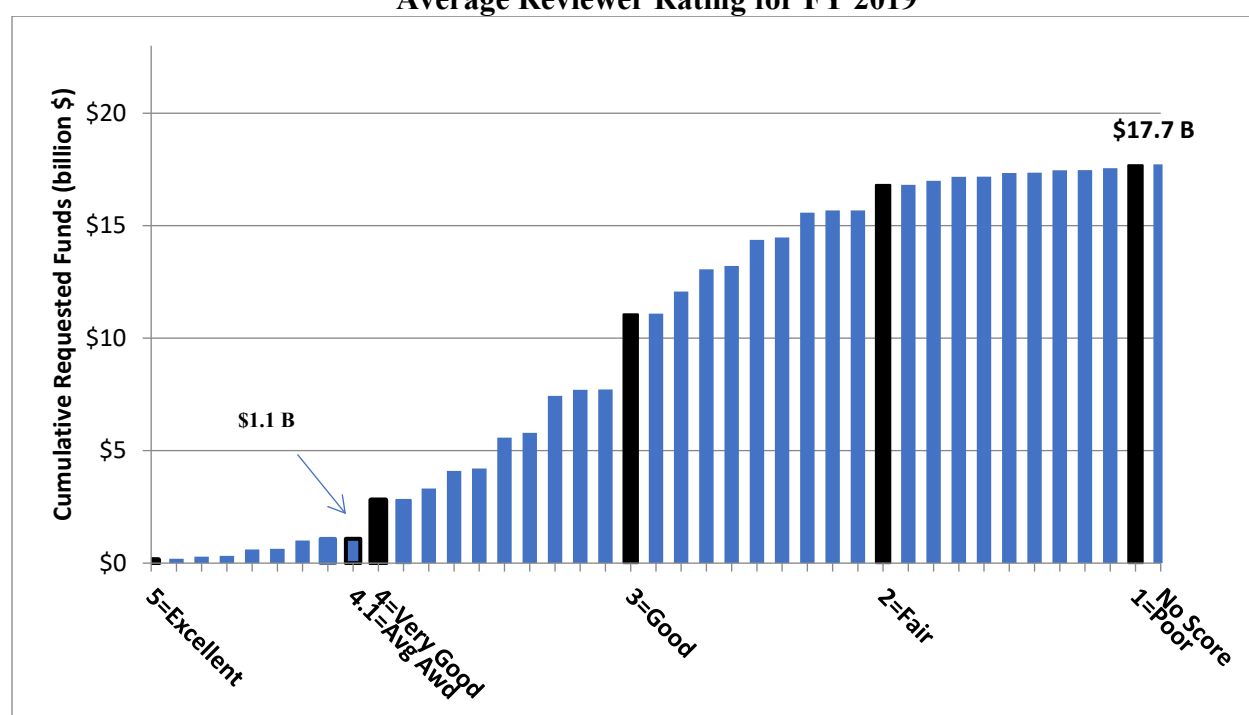
Fiscal Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
% non-US Reviewers	15.6%	14.3%	12.7%	12.3%	12.3%	11.3%	10.8%	10.2%	8.4%	7.6%

<sup>44</sup> This number tracks requests that are recorded in the MyNSF system. For example, when potential reviewers are sent a formal invitation via eCorrespondence, the reviewer is entered in MyNSF. 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.

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.

Many potentially fundable proposals are declined each year. As shown in **Figure 18**, approximately \$1.1 billion was requested for 1,501 declined proposals that received ratings at least as high as the average rating (4.1 out of 5.0) for all awarded proposals. Approximately \$2.8 billion was requested for declined proposals that were rated Very Good or higher in the merit review process (about 4,262 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.

**Figure 18. Cumulative Requested Amounts for Declined Proposals by Average Reviewer Rating for FY 2019**



Source: NSF Enterprise Information System, 10/01/19

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.

## **H. Program Officer Characteristics**

**Table 16** shows information about NSF’s program officers. In FY 2019, the number of program officers increased to 529 from 525 the prior year. All incoming NSF program officers receive training in the merit review process.

**Table 16. Distribution of NSF Program Officers by Characteristics**

<b>Program Officers</b>	<b>Total</b>	<b>Percent</b>
<b>Total</b>	529	100%
<b><i>Gender</i></b>		
Male	281	53%
Female	248	47%
<b><i>Race and Ethnicity</i></b>		
Racial or Ethnic Minority	152	29%
Non-Minority	377	71%
<b><i>Employment</i></b>		
Permanent	300	57%
Visiting Scientists, Engineers & Educators (VSEE)	36	7%
Temporary	36	7%
Intergovernmental Personnel Act (IPA)	157	30%

NSF Division of Human Resource Management, 09/30/2019. Data are for the end of FY 2019

Program officers can be permanent NSF employees or non-permanent employees. As shown in **Table 16**, 57% are permanent program officers and 43% 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 2019, the number of permanent program officers increased by 4 relative to FY 2018 and the number of IPAs increased by 9. Relative to FY 2018, the proportion of VSEE and Temporary program officers decreased by 1% and 2%, respectively, and the proportion of IPAs increased from 28% to 30%.

Compared to FY 2018, the numbers of program officers who are women increased by 3 while the number of program officers from racial or ethnic minorities decreased by 2. At the end of FY 2019, approximately 47% of program officers were female and approximately 29% were from a racial or ethnic minority which is the same as 2018.

## 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										
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>NSF</b>	Median	\$120	\$124	\$120	\$125	\$130	\$133	\$130	\$133	\$133	\$140	\$147
	Mean	\$162	\$167	\$159	\$166	\$169	\$172	\$171	\$173	\$169	\$178	\$189
<b>BIO</b>	Median	\$161	\$171	\$178	\$177	\$182	\$178	\$186	\$200	\$198	\$197	\$215
	Mean	\$200	\$222	\$226	\$214	\$228	\$217	\$237	\$243	\$223	\$226	\$263
<b>CISE</b>	Median	\$110	\$118	\$141	\$150	\$161	\$166	\$161	\$155	\$156	\$166	\$167
	Mean	\$169	\$172	\$174	\$206	\$204	\$199	\$187	\$198	\$187	\$199	\$210
<b>ENG</b>	Median	\$100	\$100	\$100	\$107	\$103	\$112	\$103	\$102	\$107	\$113	\$117
	Mean	\$120	\$122	\$119	\$125	\$122	\$131	\$122	\$124	\$125	\$131	\$135
<b>GEO</b>	Median	\$101	\$100	\$116	\$125	\$141	\$141	\$144	\$150	\$150	\$166	\$155
	Mean	\$153	\$134	\$162	\$170	\$193	\$201	\$183	\$185	\$190	\$216	\$224
<b>MPS</b>	Median	\$113	\$115	\$111	\$117	\$116	\$120	\$125	\$122	\$120	\$123	\$130
	Mean	\$138	\$150	\$141	\$143	\$130	\$141	\$149	\$142	\$138	\$146	\$151
<b>OIA</b>	Median	\$391	\$391	\$393	\$170	\$156	\$171	\$713	\$156	\$152	\$150	\$948
	Mean	\$366	\$431	\$379	\$178	\$948	\$173	\$554	\$514	\$260	\$262	\$817
<b>OISE</b>	Median	\$25	\$50	\$49	\$50	\$31	\$49	\$82	\$83	\$84	\$100	\$101
	Mean	\$33	\$198	\$60	\$200	\$53	\$142	\$149	\$102	\$318	\$161	\$167
<b>SBE</b>	Median	\$101	\$100	\$98	\$98	\$101	\$109	\$112	\$117	\$119	\$123	\$129
	Mean	\$114	\$116	\$113	\$120	\$139	\$134	\$138	\$136	\$146	\$141	\$155

Source: NSF Enterprise Information System, 10/01/19.

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.

An organizational realignment was implemented in FY 2013 which moved the Office of Polar Programs and Office of Cyberinfrastructure from the Office of the Director to the Directorate for Geosciences and the Directorate for Computer & Information Science and Engineering, respectively. Additionally, the Office of International Science & Engineering became part of the Office of International and Integrative Activities.

An organizational realignment was implemented in FY 2015 which moved the Office of International Science & Engineering out of the Office of Integrative Activities.

Data from prior years have been realigned in order to show historical trends.



## 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	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NSF	Single PI Grants	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.7	0.8	0.6
	Multi-PI Grants	1.1	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.6	0.6	0.6
	NSF Average	1.2	1.1	1.0	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.6
BIO	Single PI Grants	1.3	1.2	1.3	1.1	1.0	1.0	0.9	0.9	0.7	0.7	0.6
	Multi-PI Grants	1.6	1.2	1.1	1.1	1.3	1.0	1.1	0.9	0.7	0.8	0.8
	BIO Average	1.4	1.2	1.2	1.1	1.1	1.0	0.9	0.9	0.7	0.7	0.7
CISE	Single PI Grants	0.8	0.8	0.9	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
	Multi-PI Grants	0.6	0.6	0.8	0.7	0.6	0.7	0.5	0.5	0.5	0.5	0.5
	CSE Average	0.7	0.7	0.9	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.5
EHR	Single PI Grants	1.6	1.9	1.7	1.4	1.4	1.0	0.9	0.8	0.7	0.9	1.0
	Multi-PI Grants	1.6	1.8	2.2	1.7	1.0	0.9	0.8	0.7	0.8	0.7	0.7
	EHR Average	1.6	1.8	2.1	1.6	1.1	0.9	0.8	0.7	0.8	0.8	0.8
ENG	Single PI Grants	0.9	0.4	0.4	0.6	0.4	0.3	0.4	0.4	0.3	0.3	0.4
	Multi-PI Grants	0.7	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	ENG Average	0.8	0.4	0.4	0.5	0.4	0.3	0.4	0.3	0.3	0.3	0.3
GEO	Single PI Grants	1.0	1.1	1.0	1.0	0.9	1.0	1.0	0.9	0.8	1.4	0.7
	Multi-PI Grants	1.1	1.1	1.0	1.3	1.3	1.2	1.2	1.1	1.2	1.0	0.9
	GEO Average	1.1	1.1	1.0	1.1	1.0	1.1	1.0	1.0	0.9	1.3	0.7
MPS	Single PI Grants	1.5	1.3	1.3	1.1	1.0	1.0	0.8	0.8	0.8	0.8	0.7
	Multi-PI Grants	1.5	1.2	1.2	0.9	0.9	0.9	0.9	0.8	0.7	0.6	0.6
	MPS Average	1.5	1.3	1.3	1.0	1.0	1.0	0.9	0.8	0.8	0.8	0.7
OIA	Single PI Grants	0.4	2.4	1.3	1.2	1.1	1.2	0.8	1.0	0.4	0.9	0.9
	Multi-PI Grants	1.1	0.4	0.2	N/A	N/A	0.7	N/A	0.4	0.6	1.4	1.3
	OIA Average	1.0	1.1	0.9	1.2	1.1	0.8	0.8	0.5	0.5	1.2	1.2
OISE	Single PI Grants	1.0	0.3	2.2	0.3	0.8	0.5	0.6	0.6	0.3	0.8	0.4
	Multi-PI Grants	0.9	1.8	0.8	0.7	0.5	0.5	0.8	0.7	0.6	1.1	0.8
	OISE Average	1.0	1.4	1.1	0.6	0.7	0.5	0.7	0.7	0.6	1.0	0.6
SBE	Single PI Grants	1.5	1.7	1.2	1.2	1.1	1.1	1.1	1.0	1.1	0.8	0.7
	Multi-PI Grants	1.0	1.3	0.9	0.9	1.2	1.2	1.6	1.4	0.6	0.7	0.8
	SBE Average	1.4	1.6	1.1	1.1	1.1	1.2	1.3	1.1	0.9	0.8	0.7

Source: NSF Enterprise Information System as of February 2, 2020 and NSF Report Server as of February 4, 2020

**Table 2.2 – Mean Annualized Graduate Student Support on Research Grants**

	Mean Annualized Level of Graduate Student Support per Research Grant <sup>45</sup>	
Fiscal Year	All Research Grants	Research Grants with Graduate Student Support
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
2019	\$23,471	\$32,743

Source: NSF Report Server 02/04/20.

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

	Mean Annualized Level of Post-Doctoral Researcher Support per Research Grant	
Fiscal Year	All Research Grants	Research Grants with Post-Doc. Support
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
2019	\$6,556	\$39,633

Source: NSF Report Server 02/04/20.

<sup>45</sup> 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										
		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NSF <sup>46</sup>	Proposals	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,321	41,024
	Awards	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,702	11,243
	Funding Rate	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%	27%
BIO	Proposals	6,578	8,059	7,439	5,269	5,934	4,784	5,119	5,206	5,005	4,765	3,110
	Awards	1,823	1,556	1,310	1,293	1,250	1,272	1,379	1,330	1,142	1,190	1,046
	Funding Rate	28%	19%	18%	25%	21%	27%	27%	26%	23%	25%	34%
CISE	Proposals	6,001	7,317	6,702	7,703	7,821	7,434	8,032	8,299	8,722	9,150	8,616
	Awards	1,926	1,755	1,527	1,749	1,616	1,680	1,886	1,918	1,819	2,098	2,009
	Funding Rate	32%	24%	23%	23%	21%	23%	23%	23%	21%	23%	23%
EHR	Proposals	3,699	5,055	4,660	4,281	4,501	4,049	4,242	4,423	4,294	4,160	3,781
	Awards	1,009	930	807	889	793	701	830	915	899	892	842
	Funding Rate	27%	18%	17%	21%	18%	17%	20%	21%	21%	21%	22%
ENG	Proposals	10,611	13,226	12,314	11,338	10,738	11,878	12,326	12,570	13,028	13,092	9,024
	Awards	2,688	2,375	2,064	2,065	2,212	2,145	2,504	2,499	2,455	2,458	2,379
	Funding Rate	25%	18%	17%	18%	21%	18%	20%	20%	19%	19%	26%
GEO	Proposals	4,991	5,614	5,187	5,243	6,087	5,790	5,812	4,999	4,793	3,775	4,099
	Awards	2,226	1,970	1,705	1,637	1,565	1,487	1,463	1,526	1,520	1,407	1,534
	Funding Rate	45%	35%	31%	31%	26%	26%	25%	31%	32%	37%	37%
MPS	Proposals	7,883	9,411	8,796	9,006	8,903	8,855	9,133	9,199	8,848	8,803	8,045
	Awards	3,122	2,669	2,352	2,523	2,201	2,343	2,593	2,432	2,334	2,593	2,415
	Funding Rate	40%	28%	27%	28%	25%	26%	28%	26%	26%	29%	30%
OIA	Proposals	109	200	138	44	98	78	91	102	117	211	200
	Awards	36	89	25	14	27	29	36	30	54	68	89
	Funding Rate	33%	45%	18%	32%	28%	37%	40%	29%	46%	32%	45%
OISE	Proposals	781	1,042	1,214	951	484	677	582	313	298	235	416
	Awards	428	395	404	333	245	307	275	236	194	53	58
	Funding Rate	55%	38%	33%	35%	51%	45%	47%	75%	65%	23%	14%

<sup>46</sup> 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**.

		<b>Fiscal Year</b>										
		<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
SBE	Proposals	4,525	5,618	5,112	4,776	4,433	4,506	4,283	4,174	4,310	4,130	3,733
	Awards	1,337	1,257	998	1,019	920	994	1,041	991	1,030	943	871
	Funding Rate	30%	22%	20%	21%	21%	22%	24%	24%	24%	23%	23%
Other <sup>47</sup>	Proposals	3			2							
	Awards	0			2							
	Funding Rate	0%			100%							

Source: NSF Enterprise Information System, 10/01/19.

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<sup>47</sup> 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 2019 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 2019 Proposals, Awards, and Funding Rates, by PI Gender\***

		Total	Female	Male	Unknown
NSF	Proposals	41,024	9,076	22,277	9,671
	% of Total		22%	54%	24%
	Awards	11,243	2,843	6,157	2,243
	Funding Rate	27%	31%	28%	23%
BIO	Proposals	3,110	1,007	1,489	614
	% of Total		32%	48%	20%
	Awards	1,046	362	539	145
	Funding Rate	34%	36%	36%	24%
CSE	Proposals	8,616	1,491	5,199	1,926
	% of Total		17%	60%	22%
	Awards	2,009	424	1,144	441
	Funding Rate	23%	28%	22%	23%
EHR	Proposals	3,781	1,347	1,435	999
	% of Total		36%	38%	26%
	Awards	842	314	306	222
	Funding Rate	22%	23%	21%	22%
ENG	Proposals	9,024	1,419	4,999	2,606
	% of Total		16%	55%	29%
	Awards	2,379	453	1,342	584
	Funding Rate	26%	32%	27%	22%
GEO	Proposals	4,099	1,077	2,310	712
	% of Total		26%	56%	17%
	Awards	1,534	431	858	245
	Funding Rate	37%	40%	37%	34%
MPS	Proposals	8,045	1,387	5,077	1,581
	% of Total		17%	63%	20%
	Awards	2,415	485	1,549	381
	Funding Rate	30%	35%	31%	24%
OIA	Proposals	200	37	112	51
	% of Total		19%	56%	26%
	Awards	89	23	46	20
	Funding Rate	45%	62%	41%	39%
OISE	Proposals	416	106	232	78
	% of Total		25%	56%	19%
	Awards	58	17	33	8
	Funding Rate	14%	16%	14%	10%
SBE	Proposals	3,733	1,205	1,424	1,104
	% of Total		32%	38%	30%
	Awards	871	334	340	197
	Funding Rate	23%	28%	24%	18%

Source: NSF Enterprise Information System, 10/01/19.

\*Demographic data are voluntarily self-reported by the PI. In FY 2019, approximately 76.4% of competitive proposals and 78.4% 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 2019 Research Proposals, Awards, and Funding Rates, by PI Gender**

		Total	Female	Male	Unknown
NSF	Proposals	33,613	7,396	18,951	7,266
	% of Total		22%	56%	22%
	Awards	8,580	2,123	4,872	1,585
	Funding Rate	26%	29%	26%	22%
BIO	Proposals	2,457	754	1,241	462
	% of Total		31%	51%	19%
	Awards	810	272	432	106
	Funding Rate	33%	36%	35%	23%
CSE	Proposals	8,252	1,388	4,997	1,867
	% of Total		17%	61%	23%
	Awards	1,708	333	986	389
	Funding Rate	21%	24%	20%	21%
EHR	Proposals	3,107	1,189	1,164	754
	% of Total		38%	37%	24%
	Awards	512	220	170	122
	Funding Rate	16%	19%	15%	16%
ENG	Proposals	5,932	1,014	3,655	1,263
	% of Total		17%	62%	21%
	Awards	1,642	315	1,006	321
	Funding Rate	28%	31%	28%	25%
GEO	Proposals	3,692	961	2,119	612
	% of Total		26%	57%	17%
	Awards	1,311	366	751	194
	Funding Rate	36%	38%	35%	32%
MPS	Proposals	7,017	1,169	4,460	1,388
	% of Total		17%	64%	20%
	Awards	1,923	381	1,240	302
	Funding Rate	27%	33%	28%	22%
OIA	Proposals	92	23	48	21
	% of Total		25%	52%	23%
	Awards	74	21	35	18
	Funding Rate	80%	91%	73%	86%
OISE	Proposals	412	104	231	77
	% of Total		25%	56%	19%
	Awards	54	15	32	7
	Funding Rate	13%	14%	14%	9%
SBE	Proposals	2,652	794	1,036	822
	% of Total		30%	39%	31%
	Awards	546	200	220	126
	Funding Rate	21%	25%	21%	15%

Source: NSF Enterprise Information System, 10/01/19.

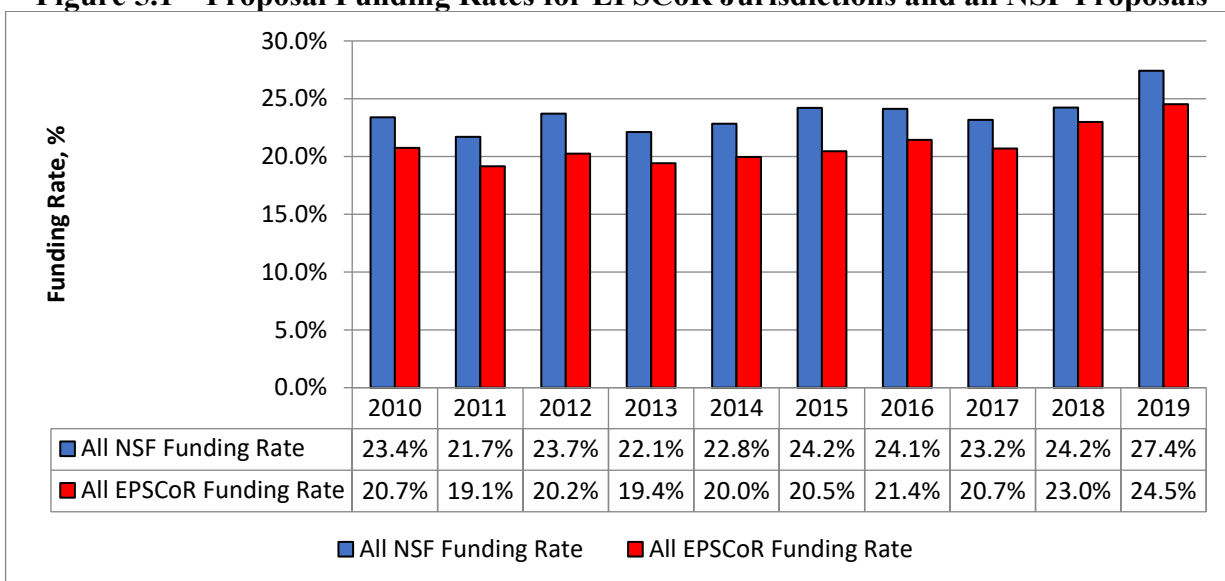
## Appendix 5 - EPSCoR: Jurisdictions, Proposal, Award, and Funding Data

Twenty-five 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 2019.<sup>48</sup> The states are: Alabama, Alaska, Arkansas, Delaware, Hawaii, Idaho, Iowa,<sup>49</sup> Kansas, Kentucky, Louisiana, Maine, Mississippi, Montana, Nebraska, Nevada, New Hampshire, New Mexico,<sup>50</sup> North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Vermont, West Virginia, and Wyoming.<sup>51</sup>

In FY 2019, the NSF EPSCoR program invested \$30.08 million in co-funding 185 NSF awards. This investment was leveraged with \$75.91 million from NSF Directorates and other Offices, for a total investment of \$105.99 million. Since 1998, when the co-funding initiative was formally established, approximately 4,800 co-funded awards have been made. The latter represent a total NSF investment of about \$1.81 billion, of which \$708 million was co-funding provided by the EPSCoR program.<sup>52</sup>

**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 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 04/08/20.

<sup>48</sup> In January 2017, the EPSCoR program was renamed the Established Program to Stimulate Competitive Research. Previously, it had been the Experimental Program to Stimulate Competitive Research.

<sup>49</sup> Iowa was first EPSCoR-eligible in FY 2009 and exited program eligibility in FY 2013. Iowa became eligible for EPSCoR again in FY 2019.

<sup>50</sup> Similar to Iowa, New Mexico was originally EPSCoR-eligible in 2001 and rose above the eligibility threshold in 2018. New Mexico became eligible for EPSCoR again in FY 2019.

<sup>51</sup> Additional information about each state's program can be found at:

[https://www.nsf.gov/od/oia/programs/epscor/nsf\\_oia\\_epscor\\_EPSCoRstatewebsites.jsp](https://www.nsf.gov/od/oia/programs/epscor/nsf_oia_epscor_EPSCoRstatewebsites.jsp)

<sup>52</sup> Details about FY 2018 direct and co-funding to EPSCoR jurisdictions are provided in the annual report to Congress: [https://www.nsf.gov/about/budget/fy2021/pdf/21\\_fy2021.pdf](https://www.nsf.gov/about/budget/fy2021/pdf/21_fy2021.pdf).



**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)

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>All NSF</b>	Awards	14,641	12,996	11,192	11,524	10,829	10,958	12,007	11,877	11,447	11,716	11,250
	Proposals	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285	49,415	48,334	41,030
	Funding Rate	32%	23%	22%	24%	22%	23%	24%	24%	23%	24%	27%
<b>All EPSCoR Jurisdictions</b>	Awards	2,474	2,181	1,846	1,960	1,897	1,892	1,980	1,676	1,457	1,565	1,508
	Proposals	8,476	10,513	9,640	9,680	9,766	9,477	9,679	7,815	7,041	6,806	6,149
	Funding Rate	29%	21%	19%	20%	19%	20%	20%	21%	21%	23%	25%
<b>Alabama</b> -1985	Awards	148	119	98	110	94	102	85	102	116	113	98
	Proposals	606	708	614	669	647	665	583	607	655	672	525
	Funding Rate	24%	17%	16%	16%	15%	15%	15%	17%	18%	17%	19%
<b>Alaska</b> -2000	Awards	77	65	71	65	60	50	49	59	61	56	52
	Proposals	186	235	213	199	221	205	246	193	169	149	156
	Funding Rate	41%	28%	33%	33%	27%	24%	20%	31%	36%	38%	33%
<b>Arkansas</b> -1980	Awards	41	60	40	33	46	33	30	35	45	45	41
	Proposals	194	276	246	229	260	207	184	196	222	229	177
	Funding Rate	21%	22%	16%	14%	18%	16%	16%	18%	20%	20%	23%
<b>Delaware</b> -2003	Awards	77	80	70	79	70	67	64	80	50	77	65
	Proposals	244	295	292	278	287	283	273	301	257	278	261
	Funding Rate	32%	27%	24%	28%	24%	24%	23%	27%	19%	28%	25%
<b>Guam</b> -2012	Awards	0	2	2	2	1	0	2	0	3	0	2
	Proposals	3	7	5	8	7	4	6	2	3	1	2
	Funding Rate	0%	29%	40%	25%	14%	0%	33%	0%	100%	0%	100%
<b>Hawaii</b> -2001	Awards	109	99	80	60	54	68	62	78	64	71	68
	Proposals	277	379	285	281	282	294	267	285	234	217	199
	Funding Rate	39%	26%	28%	21%	19%	23%	23%	27%	27%	33%	34%
<b>Idaho</b> -1987	Awards	44	35	37	47	41	35	37	41	40	38	30
	Proposals	168	199	202	185	214	230	234	206	203	201	175
	Funding Rate	26%	18%	18%	25%	19%	15%	16%	20%	20%	19%	17%
<b>Iowa*</b> -2019	Awards	142	136	114	116	113	116	121	133	113	120	121
	Proposals	564	661	613	558	566	524	578	573	552	576	483
	Funding Rate	25%	21%	19%	21%	20%	22%	21%	23%	20%	21%	25%
<b>Kansas</b> -1992	Awards	88	92	88	91	65	67	94	71	92	73	82
	Proposals	399	464	423	402	393	389	407	396	430	410	334
	Funding Rate	22%	20%	21%	23%	17%	17%	23%	18%	21%	18%	25%

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Kentucky</b> <b>-1985</b>	Awards	78	81	64	63	58	68	69	83	59	67	51
	Proposals	356	429	437	434	391	401	399	399	377	336	286
	Funding Rate	22%	19%	15%	15%	15%	17%	17%	21%	16%	20%	18%
<b>Louisiana</b> <b>-1987</b>	Awards	132	149	102	88	91	74	99	91	88	111	93
	Proposals	583	715	621	484	463	402	460	459	470	501	377
	Funding Rate	23%	21%	16%	18%	20%	18%	22%	20%	19%	22%	25%
<b>Maine</b> <b>-1980</b>	Awards	60	58	42	46	52	48	50	44	42	55	38
	Proposals	172	190	209	182	211	201	189	175	185	183	158
	Funding Rate	35%	31%	20%	25%	25%	24%	26%	25%	23%	30%	24%
<b>Mississippi</b> <b>-1987</b>	Awards	76	72	42	43	28	32	40	47	43	53	36
	Proposals	301	358	287	264	262	260	240	256	224	253	190
	Funding Rate	25%	20%	15%	16%	11%	12%	17%	18%	19%	21%	19%
<b>Montana</b> <b>-1980</b>	Awards	78	51	35	50	50	45	51	52	59	59	46
	Proposals	207	251	222	204	214	183	210	183	229	191	150
	Funding Rate	38%	20%	16%	25%	23%	25%	24%	28%	26%	31%	31%
<b>Nebraska</b> <b>-1992</b>	Awards	64	56	60	40	59	51	59	58	62	68	50
	Proposals	248	324	309	258	305	281	307	300	326	297	230
	Funding Rate	26%	17%	19%	16%	19%	18%	19%	19%	19%	23%	22%
<b>Nevada</b> <b>-1985</b>	Awards	61	39	37	29	33	58	40	42	38	54	59
	Proposals	232	295	263	236	217	245	230	266	281	296	248
	Funding Rate	26%	13%	14%	12%	15%	24%	17%	16%	14%	18%	24%
<b>New Hampshire</b> <b>-2004</b>	Awards	108	76	61	75	64	64	65	74	62	65	61
	Proposals	251	311	282	280	273	295	253	285	256	244	210
	Funding Rate	43%	24%	22%	27%	23%	22%	26%	26%	24%	27%	29%
<b>New Mexico*</b> <b>-2019</b>	Awards	115	105	91	69	81	76	88	107	92	80	84
	Proposals	389	506	416	399	404	398	474	449	379	394	307
	Funding Rate	30%	21%	22%	17%	20%	19%	19%	24%	24%	20%	27%
<b>North Dakota</b> <b>-1985</b>	Awards	31	35	23	18	21	26	20	32	21	24	15
	Proposals	141	171	161	161	172	174	171	185	150	147	114
	Funding Rate	22%	20%	14%	11%	12%	15%	12%	17%	14%	16%	13%
<b>Oklahoma</b> <b>-1985</b>	Awards	112	74	79	68	59	69	68	76	76	56	70
	Proposals	420	457	460	384	394	339	388	372	377	342	303
	Funding Rate	27%	16%	17%	18%	15%	20%	18%	20%	20%	16%	23%
<b>Puerto Rico</b> <b>-1985</b>	Awards	37	34	19	9	8	16	15	22	14	34	16
	Proposals	183	203	163	153	105	86	102	90	111	115	74
	Funding Rate	20%	17%	12%	6%	8%	19%	15%	24%	13%	30%	22%
<b>Rhode Island</b> <b>-2004</b>	Awards	176	148	131	146	127	138	131	132	125	145	135
	Proposals	350	442	400	393	399	404	361	349	351	390	336
	Funding Rate	50%	33%	33%	37%	32%	34%	36%	38%	36%	37%	40%

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>South Carolina</b> <b>-1980</b>	Awards	152	136	108	117	115	97	117	98	103	113	99
	Proposals	527	671	650	562	594	585	603	556	565	495	427
	Funding Rate	29%	20%	17%	21%	19%	17%	19%	18%	18%	23%	23%
<b>South Dakota</b> <b>-1987</b>	Awards	31	33	24	20	28	32	25	24	23	23	26
	Proposals	132	184	162	150	163	135	139	150	155	131	102
	Funding Rate	23%	18%	15%	13%	17%	24%	18%	16%	15%	18%	25%
<b>U.S. Virgin Islands</b> <b>-2002</b>	Awards	0	1	3	2	0	2	1	3	3	6	3
	Proposals	1	3	11	5	8	7	3	10	11	11	6
	Funding Rate	0%	33%	27%	40%	0%	29%	33%	30%	27%	55%	50%
<b>Vermont</b> <b>-1985</b>	Awards	42	23	22	24	21	22	18	24	27	31	16
	Proposals	120	126	121	90	89	104	96	133	127	94	78
	Funding Rate	35%	18%	18%	27%	24%	21%	19%	18%	21%	33%	21%
<b>West Virginia</b> <b>-1980</b>	Awards	33	27	21	32	22	23	37	29	28	29	22
	Proposals	130	160	151	163	158	159	187	169	175	139	127
	Funding Rate	25%	17%	14%	20%	14%	14%	20%	17%	16%	21%	17%
<b>Wyoming</b> <b>-1985</b>	Awards	44	35	31	20	18	24	27	21	21	19	29
	Proposals	123	146	122	105	115	129	129	128	119	90	114
	Funding Rate	36%	24%	25%	19%	16%	19%	21%	16%	18%	21%	25%

† = award numbers suppressed to maintain privacy.

\* Iowa was first EPSCoR-eligible in FY 2009 and exited program eligibility in FY 2013. Iowa became eligible for EPSCoR again in FY 2019. Similarly, New Mexico was originally EPSCoR-eligible in 2001 and rose above the eligibility threshold in 2018. New Mexico became eligible for EPSCoR again in FY 2019.

Source: All-NSF data - NSF Enterprise Information System, 10/01/19; EPSCoR jurisdiction data - NSF Budget Internet Information System, April 2020.

## 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 2019, there were 27 requests for accomplishment-based renewals, 8 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.<sup>53</sup> In FY 2019, 15 Special Creativity Extensions were awarded.

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<sup>53</sup>From NSF's Proposal and Award Policies & Procedures Guide, Section II.D.d, [https://www.nsf.gov/pubs/policydocs/pappg19\\_1/nsf19\\_1.pdf](https://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf).

**Table 6.1 – Accomplishment-Based Renewals by Directorate or Office**

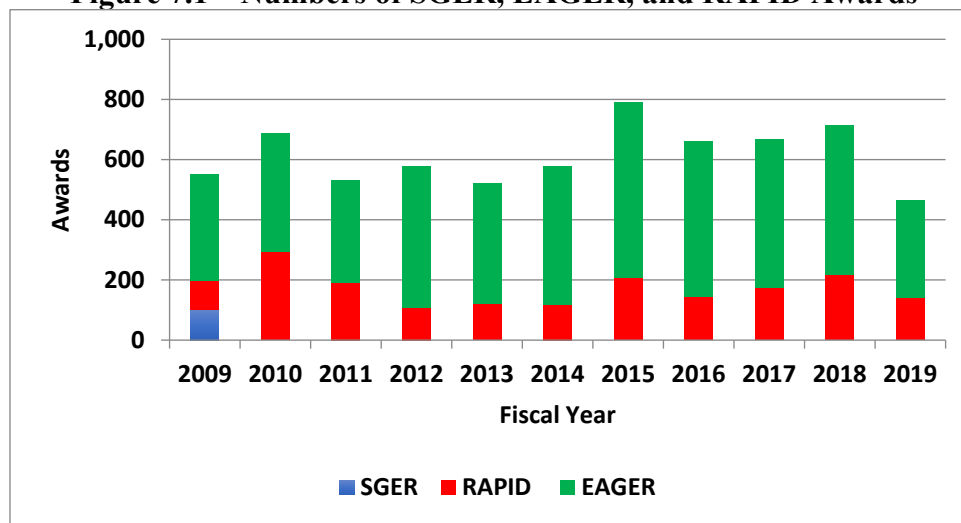
Directorate or Office		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NSF	Award	40	34	19	30	19	14	29	17	18	9	8
	Decline	54	52	43	41	52	35	44	35	26	32	19
	Mean Ann. Awd	\$225,438	\$150,171	\$253,026	\$255,959	\$414,467	\$174,227	\$137,480	\$199,034	\$171,270	\$279,318	\$270,018
BIO	Award	5	8	3	2	4	3	2	0	3	1	3
	Decline	16	11	6	3	6	5	2	4	7	5	1
	Mean Ann. Awd	\$123,533	\$151,999	\$344,742	\$78,815	\$835,142	\$298,359	\$189,961	N/A	\$156,044	\$89,991	\$242,145
CISE	Award	2	1	0	0	2	0	1	5	1	4	2
	Decline	0	2	2	2	1	0	0	1	0	1	5
	Mean Ann. Awd	\$267,851	\$272,833	N/A	N/A	\$819,996	N/A	\$233,333	\$369,350	\$140,000	\$461,539	\$572,378
EHR	Award	3	3	1	2	0	1	0	0	2	0	0
	Decline	7	6	5	4	4	4	6	3	2	2	1
	Mean Ann. Awd	\$361,873	\$304,579	\$33,352	\$530,633	N/A	\$354,796	N/A	N/A	\$442,664	N/A	N/A
ENG	Award	1	1	2	4	3	3	6	1	0	0	0
	Decline	13	7	5	7	10	2	9	9	1	5	1
	Mean Ann. Awd	\$124,977	\$152,483	\$121,725	\$194,881	\$207,017	\$45,309	\$105,606	\$50,000	N/A	N/A	N/A
GEO	Award	10	8	4	12	5	1	6	7	6	2	0
	Decline	3	8	4	3	6	9	8	3	0	2	2
	Mean Ann. Awd	\$343,864	\$144,094	\$143,699	\$234,306	\$222,092	\$118,252	\$126,876	\$131,244	\$140,437	\$157,299	N/A
MPS	Award	16	11	8	10	5	6	14	3	4	2	2
	Decline	12	13	15	18	21	14	15	14	14	13	7
	Mean Ann. Awd	\$188,219	\$115,657	\$354,936	\$297,020	\$155,611	\$155,854	\$139,064	\$171,330	\$109,747	\$161,659	\$220,000
SBE	Award	3	1	1	0	0	0	0	1	2	0	0
	Decline	3	3	5	4	4	1	3	1	2	3	2
	Mean Ann. Awd	\$67,808	\$75,789	\$82,187	N/A	N/A	N/A	N/A	\$224,440	\$138,476	N/A	N/A
OD	Award		1	0				0			0	1
	Decline		2	1				1			1	0
	Mean Ann. Awd		\$50,000	N/A				N/A			N/A	\$101,295

Source: NSF Enterprise Information System, 10/01/19. “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)

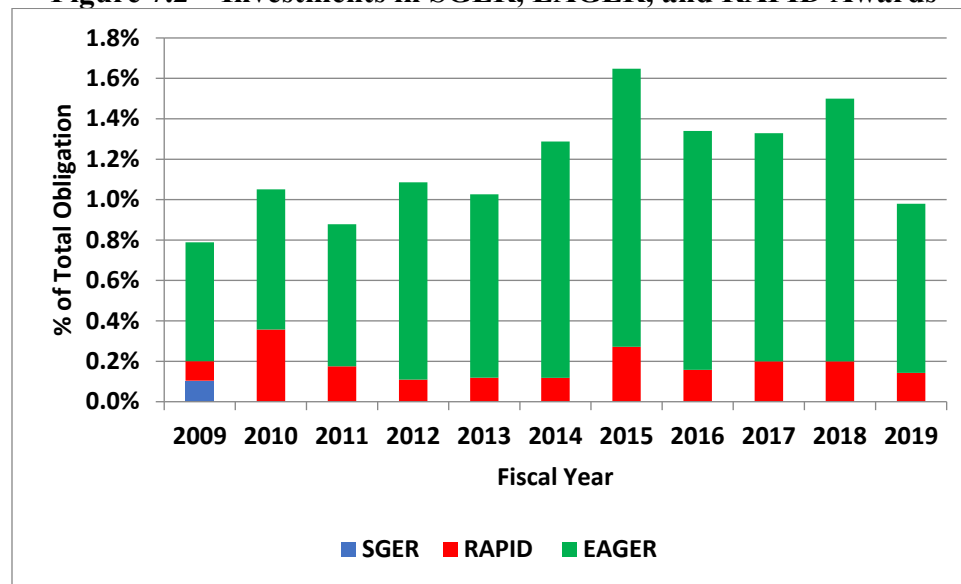
Figures 7.1, 7.2, and Table 7.1 provide funding trends for EAGERS, RAPIDs, and SGERs. Effective January 2009, the SGER funding mechanism was replaced by two separate funding mechanisms (EAGER and RAPID), so FY 2009 includes all three types of awards.

**Figure 7.1 – Numbers of SGER, EAGER, and RAPID Awards**



Source: NSF Enterprise Information System 10/01/19.

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



Source: NSF Enterprise Information System 10/01/19.

**Table 7.1 – Early-concept Grants for Exploratory Research (EAGER) and Grants for Rapid Response Research (RAPID): Funding Trends by Directorate or Office\*\***

		2014		2015		2016		2017		2018		2019	
		RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER
<b>NSF</b>	Proposals	127	537	238	743	155	765	182	681	276	666	195	454
	Awards	117	462	207	585	145	518	176	493	216	498	142	323
	Funding Rate	92%	86%	87%	79%	94%	68%	97%	72%	78%	75%	73%	71%
	Total \$ (Millions)	\$8.6	\$85.0	\$20.3	\$103.0	\$12.1	\$90.7	\$14.8	\$83.6	\$19.3	\$102.4	\$11.5	\$67.5
	% of Obligations	0.1%	1.2%	0.3%	1.4%	0.2%	1.2%	0.2%	1.1%	0.2%	1.3%	0.1%	0.8%
	Average \$ (1000s)	\$73	\$184	\$98	\$176	\$84	\$175	\$84	\$170	\$89	\$206	\$81	\$209
<b>BIO</b>	Proposals	17	80	38	117	25	44	22	40	58	81	15	64
	Awards	13	77	29	104	19	40	22	37	38	68	13	38
	Funding Rate	76%	96%	76%	89%	76%	91%	100%	93%	66%	84%	87%	59%
	Total \$ (Millions)	\$1.4	\$19.1	\$3.9	\$19.7	\$2.8	\$10.4	\$2.4	\$8.3	\$4.3	\$16.0	\$1.8	\$9.3
	% of Obligations	0.2%	2.3%	0.5%	2.6%	0.3%	1.2%	0.3%	1.1%	0.6%	2.1%	0.2%	1.2%
	Average \$ (1000s)	\$111	\$247	\$134	\$190	\$150	\$260	\$111	\$225	\$113	\$235	\$140	\$244
<b>CISE</b>	Proposals	3	193	37	209	5	257	18	239	16	161	12	166
	Awards	3	159	27	163	5	176	18	129	12	136	4	109
	Funding Rate	100%	82%	73%	78%	100%	68%	100%	54%	75%	84%	33%	66%
	Total \$ (Millions)	\$0.4	\$28.9	\$3.3	\$27.8	\$0.8	\$33.7	\$1.7	\$21.5	\$0.6	\$26.6	\$0.5	\$23.2
	% of Obligations	0.0%	3.2%	0.4%	3.1%	0.1%	3.6%	0.2%	2.3%	0.1%	2.8%	0.0%	2.4%
	Average \$ (1000s)	\$144	\$182	\$121	\$170	\$168	\$192	\$92	\$167	\$51	\$195	\$118	\$213
<b>EHR</b>	Proposals	3	50	21	81	27	72	7	54	10	16	3	10
	Awards	3	37	21	45	26	43	7	39	8	15	2	10
	Funding Rate	100%	74%	100%	56%	96%	60%	100%	72%	80%	94%	67%	100%
	Total \$ (Millions)	\$0.7	\$9.4	\$2.1	\$10.8	\$1.5	\$8.1	\$1.6	\$10.0	\$1.3	\$3.4	\$0.4	\$2.2
	% of Obligations	0.1%	1.0%	0.2%	1.1%	0.1%	0.8%	0.2%	1.0%	0.1%	0.3%	0.0%	0.2%
	Average \$ (1000s)	\$231	\$253	\$100	\$239	\$57	\$188	\$228	\$257	\$168	\$229	\$213	\$222
<b>ENG</b>	Proposals	35	108	41	258	24	273	38	220	42	260	73	130
	Awards	34	96	34	203	21	155	36	176	33	153	38	84
	Funding Rate	97%	89%	83%	79%	88%	57%	95%	80%	79%	59%	52%	65%
	Total \$ (Millions)	\$1.6	\$14.6	\$3.3	\$33.7	\$1.2	\$22.7	\$2.8	\$25.7	\$2.2	\$30.5	\$2.8	\$15.3
	% of Obligations	0.2%	1.7%	0.4%	3.7%	0.1%	2.5%	0.3%	2.8%	0.2%	3.1%	0.3%	1.6%
	Average \$ (1000s)	\$47	\$152	\$97	\$166	\$56	\$146	\$78	\$146	\$66	\$199	\$74	\$182
<b>GEO</b>	Proposals	51	47	55	27	45	48	60	54	91	45	76	60
	Awards	51	46	55	26	45	45	57	51	87	41	74	59
	Funding Rate	100%	98%	100%	96%	100%	94%	95%	94%	96%	91%	97%	98%
	Total \$ (Millions)	\$3.0	\$5.1	\$3.7	\$3.5	\$3.5	\$5.2	\$3.0	\$6.5	\$7.3	\$6.9	\$4.6	\$10.5
	% of Obligations	0.2%	0.4%	0.3%	0.3%	0.3%	0.4%	0.2%	0.5%	0.5%	0.5%	0.3%	0.6%
	Average \$ (1000s)	\$60	\$112	\$68	\$135	\$78	\$115	\$52	\$127	\$84	\$168	\$62	\$179
<b>MPS</b>	Proposals	1	20	6	21	0	28	1	39	3	79	2	18
	Awards	1	19	6	17	0	27	1	27	2	69	2	18
	Funding Rate	100%	95%	100%	81%	N/A	96%	100%	69%	67%	87%	100%	100%
	Total \$ (Millions)	\$0.2	\$3.5	\$0.9	\$3.5	\$0.0	\$6.0	\$0.1	\$5.8	\$0.2	\$16.0	\$0.4	\$4.3
	% of Obligations	0.0%	0.3%	0.1%	0.2%	0.0%	0.4%	0.0%	0.4%	0.0%	1.0%	0.0%	0.3%
	Average \$ (1000s)	\$209	\$183	\$151	\$207	N/A	\$224	\$79	\$216	\$105	\$232	\$186	\$240

		2014		2015		2016		2017		2018		2019	
		RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER
<b>OIA</b>	Proposals	0	0	0	0	0	0	0	0	0	0	0	0
	Awards	0	0	0	0	0	0	0	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)	\$0.3	\$0.5	\$0.0	\$0.6	\$0.0	\$0.3	\$0.0	\$0.2	\$0.1	\$0.5	\$0.0	\$0.1
	% of Obligations	0.1%	0.2%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
	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
<b>OISE</b>	Proposals	0	0	0	0	1	0	0	0	0	0	0	0
	Awards	0	0	0	0	1	0	0	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)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.2	\$0.1	\$0.1	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	% of Obligations	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%
	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
<b>SBE</b>	Proposals	17	39	40	30	28	43	36	35	56	24	14	6
	Awards	12	28	35	27	28	32	35	34	36	16	9	5
	Funding Rate	71%	72%	88%	90%	100%	74%	97%	97%	64%	67%	64%	83%
	Total \$ (Millions)	\$1.0	\$4.2	\$3.1	\$3.4	\$2.1	\$4.2	\$3.2	\$5.4	\$3.3	\$2.5	\$1.0	\$1.2*
	% of Obligations	0.4%	1.6%	1.1%	1.3%	0.8%	1.5%	1.2%	2.0%	1.3%	1.0%	0.4%	0.9%
	Average \$ (1000s)	\$81	\$151	\$88	\$127	\$74	\$130	\$91	\$160	\$91	\$157	\$114	\$234

Source: NSF Enterprise Information System, 02/05/19.

\*\* In general, 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.

\*The total funding for SBE EAGER awards is for new awards supported by SBE in FY 2019. It does not include SBE co-funding on 18 awards with CISE and one continuing grant increment.



## Appendix 8 - Description of Merit Review Principles and Criteria<sup>54</sup>

### 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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<sup>54</sup> From NSF *Proposal and Award Policies and Procedures Guide*, [http://www.nsf.gov/pubs/policydocs/pappguide/nsf13001/gpg\\_index.jsp](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**

<b>Fiscal Year</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
Total # Preliminary Proposals	3,856	2,883	965	5,135	4,691	4,911	4,251	4,584	4,564	771	1,972
Non-Binding (NB) Total*	1,140	1,384	357	459	457	92	1	239	602	447	299
NB Encouraged	519	636	128	222	296	29	0	122	268	312	228
NB Discouraged	621	748	229	237	161	63	1	117	334	135	71
Binding Total*	2,500	1,273	572	4,484	4,087	4,761	4,199	4,281	3,895	322	1,653
Binding Invite	685	372	245	1,236	942	1,083	1,045	1,124	1,172	100	467
Binding Non-invite	1,815	901	327	3,248	3,145	3,678	3,154	3,157	2,723	222	1,186

\*Non-binding and binding totals do not include preliminary proposals that have been withdrawn or returned without review or deleted for another administrative reason.

Source: NSF Report Server, 02/05/2020.

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	154,694	41,641	10,425	102,628			
	Proposals	39,054	8,721	2,707	27,626	1,970	770	280
	Rev/Prop	4.0	4.8	3.9	3.7			
BIO	Reviews	12,805	7,248	431	5,126			
	Proposals	2,923	1,426	116	1,381	186	62	27
	Rev/Prop	4.4	5.1	3.7	3.7			
CISE	Reviews	34,775	2,900	616	31,259			
	Proposals	8,258	568	168	7,522	358	67	72
	Rev/Prop	4.2	5.1	3.7	4.2			
EHR	Reviews	15,534	1,358	385	13,791			
	Proposals	3,720	293	103	3,324	61	105	26
	Rev/Prop	4.2	4.6	3.7	4.1			
ENG	Reviews	30,581	2,772	895	26,914			
	Proposals	8,365	638	257	7,470	659	237	19
	Rev/Prop	3.7	4.3	3.5	3.6			
GEO	Reviews	16,933	10,690	2,914	3,329			
	Proposals	3,813	2,173	717	923	286	69	20
	Rev/Prop	4.4	4.9	4.1	3.6			
MPS	Reviews	25,978	4,779	4,359	16,840			
	Proposals	7,729	1,166	1,138	5,425	317	148	92
	Rev/Prop	3.4	4.1	3.8	3.1			
OIA	Reviews	650	402	12	236			
	Proposals	181	103	3	75	19	11	0
	Rev/Prop	3.6	3.9	4.0	3.1			
OISE	Reviews	1,627	751	21	855			
	Proposals	411	171	4	236	5	4	1
	Rev/Prop	4.0	4.4	5.3	3.6			
SBE	Reviews	15,811	10,741	792	4,278			
	Proposals	3,654	2,183	201	1,270	79	67	23
	Rev/Prop	4.3	4.9	3.9	3.4			

Source: NSF Enterprise Information System, 10/01/19.

\* The proposal totals shown in the "All Methods" category do not include the proposals shown in the "Internally Reviewed" category. Proposals which are not externally reviewed typically include RAPIDs, EAGERS, RAISE proposals, and small grants for travel and symposia.

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 37,344 panel summaries in FY 2019.

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.<sup>55</sup>

### **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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<sup>55</sup> 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**

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>BIO</b>	Requests	3	1	4	2	2	0	6	3	4	2	2
	- Upheld	3	1	3	0	2	0	4	3	4	2	2
	- Reversed	0	0	1	2	0	0	2	0	0	0	0
<b>CISE</b>	Request	0	2	3	5	1	4	2	1	3	1	2
	- Upheld	0	2	3	5	1	3	1	1	3	1	2
	- Reversed	0	0	0	0	0	0	1	0	0	0	0
<b>EHR</b>	Request	2	2	2	3	4	2	4 <sup>+</sup>	3	4	1	2
	- Upheld	2	2	2	3	4	2	4	3	4	1	2
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
<b>ENG</b>	Request	3	11	8	5	7 <sup>**</sup>	11	3	5	8	5	4
	- Upheld	3	9	7	5	5	11	3	5	8	5	4
	- Reversed	0	2	1	0	1	0	0	0	0	0	0
<b>GEO</b>	Request	2	3	2	2	1	1	2	0	1	0	0
	- Upheld	1	3	2	2	1	1	2	0	1	0	0
	- Reversed	1	0	0	0	0	0	0	0	0	0	0
<b>MPS</b>	Request	9	14 <sup>^</sup>	11	22	12	12	10 <sup>++</sup>	8 <sup>^^</sup>	6	2	5
	- Upheld	7	12	11	21	11	12	10	8	6	2	5
	- Reversed	2	0	0	1	1	0	0	0	0	0	0
<b>SBE</b>	Request	1	1	0	0	0	0	1	0	0	0	0
	- Upheld	1	1	0	0	0	0	1	0	0	0	0
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
<b>Other<sup>*</sup></b>	Request	1	0	0	1	0	0	0	1	0	0	0
	- Upheld	0	0	0	1	0	0	0	1	0	0	0
	- Reversed	1	0	0	0	0	0	0	0	0	0	0
<b>O/DD</b>	Request	2	3	3	6	1	3	7	4	6	1	3
	- Upheld	2	3	1	6	1	3	7	4	6	1	3
	- Reversed	0	0	2	0	0	0	0	0	0	0	0
<b>NSF</b>	Request	23	37 <sup>^</sup>	33	46	28	33	35	25	32	12	18
	- Upheld	19	33	29	43	25	32	32	25	32	12	18
	- Reversed	4	2	4	3	2	0	3	0	0	0	0

\* 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.

<sup>^</sup> 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. <sup>^^</sup> One request received in FY 2016 was decided in FY 2017.

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

<sup>+</sup> Includes a reconsideration of a Return Without Review action. <sup>++</sup> 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	<sup>56</sup> Total Proposals	Ad Hoc + Panel		Ad Hoc Only		Panel Only		Internally Reviewed	
		Proposals	Percent	Proposals	Percent	Proposals	Percent	Proposals	Percent
NSF	41,024	8,721	21%	2,707	7%	27,626	67%	1,970	5%
BIO	3,109	1,426	46%	116	4%	1,381	44%	186	6%
CISE	8,616	568	7%	168	2%	7,522	87%	358	4%
EHR	3,781	293	8%	103	3%	3,324	88%	61	2%
ENG <sup>57</sup>	9,024	638	7%	257	3%	7,470	83%	659	7%
GEO	4,099	2,173	53%	717	17%	923	23%	286	7%
MPS	8,046	1,166	14%	1,138	14%	5,425	67%	317	4%
OIA	200	103	52%	3	2%	75	38%	19	10%
OISE	416	171	41%	4	1%	236	57%	5	1%
SBE	3,733	2,183	58%	201	5%	1,270	34%	79	2%

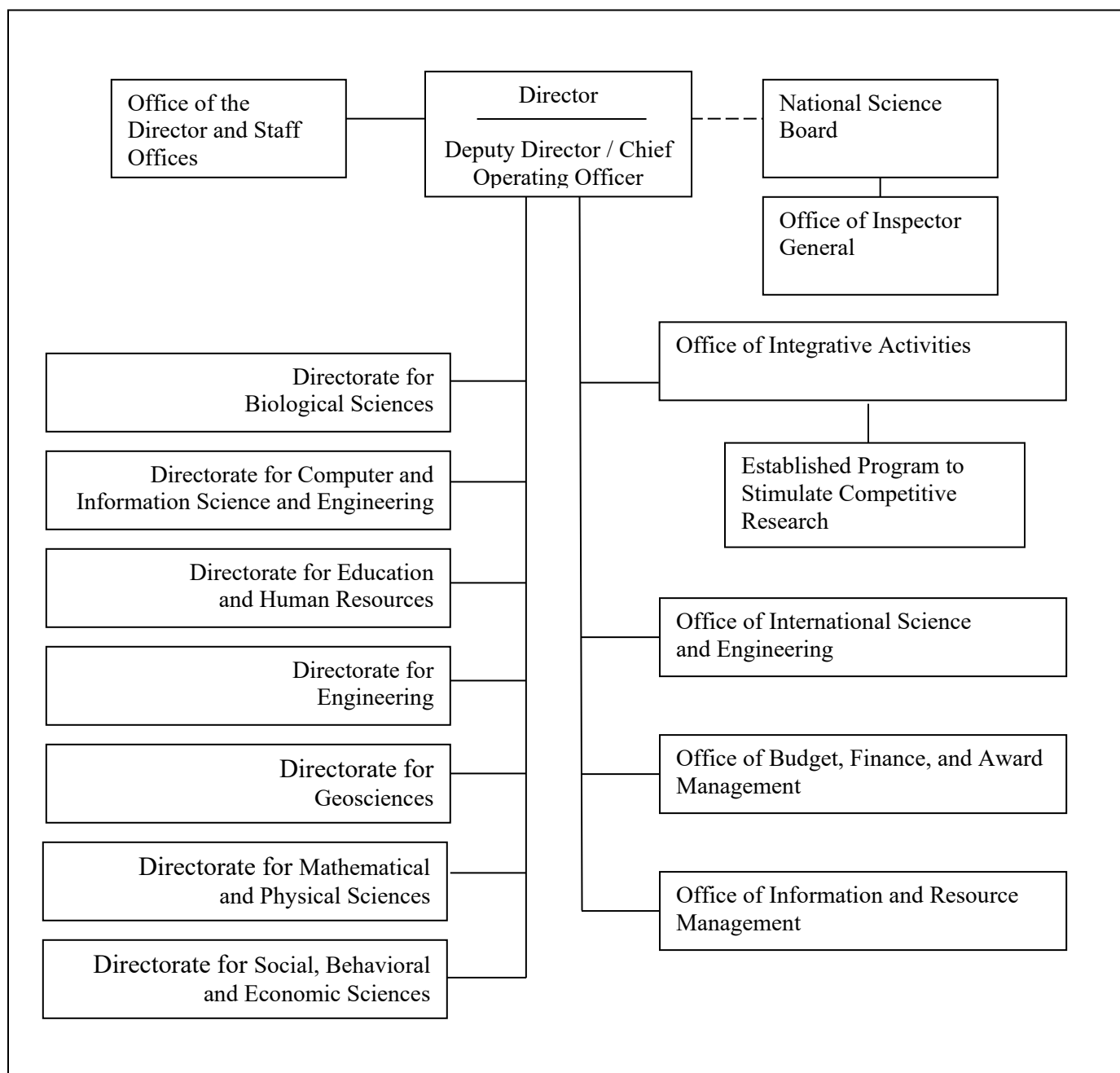
Source: NSF Enterprise Information System, 10/01/19.

Totals in this column do not necessarily match those in the FY 2019 column of Table 3.1. The differences, if any, reflect the small number of situations in which a proposal was managed by one organization, but reviewed by a panel associated with a different Directorate.

<sup>57</sup> This total includes Small Business Innovation Research Program and Small Business Technology Transfer Program proposals.



### Appendix 14 - National Science Foundation Organization Chart



The figure shows the organizational structure in place at the end of FY 2019. 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

<b><u>Acronym</u></b>	<b><u>Definition</u></b>
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 12 <sup>th</sup> 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	Underrepresented Minority
US	United States
VSEE	Visiting Scientists, Engineers and Educators

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