

Report to the National Science Board
on the
National Science Foundation's
Merit Review Process
Fiscal Year 2016



August 2017

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FY 2016 Report on the NSF Merit Review Process

I. Executive Summary

This annual report to the National Science Board (NSB) includes data and other information about the National Science Foundation (NSF or the Foundation) Merit Review Process for fiscal year (FY) 2016.

The general picture presented by the data is one of a period of relative stability in the rate of proposal submissions and awards since FY 2012, when averaged across NSF as a whole. Some individual directorates have seen interannual fluctuations in proposal submissions that exceed 10% but these are not strongly correlated. In the remainder of this Summary, we describe the changes between FY 2016 and the prior fiscal year for a number of important variables.

In FY 2016, NSF acted on 49,285 competitively reviewed full proposals. This is similar to the number of proposals acted on in FY 2015 (49,620). In FY 2012, two large divisions began requiring the submission of preliminary proposals for most programs within those divisions. The total number of full proposals and preliminary proposals acted on by NSF in FY 2016 (53,869) was very close to the total number of full proposals and preliminary proposals acted on in FY 2015 (53,871).

The Foundation made 11,877 awards in FY 2016, 130 (1.1%) fewer than in FY 2015. This corresponds to a 24% success rate for competitively reviewed proposals. As indicated by data in **Appendix 1**, the average funding rate varies by NSF directorate, from a low of 20% in Engineering, to a high of 31% in Geosciences.¹

In FY 2016, 76% of program funds awarded went to academic institutions. This compares to 78% in FY 2015.

FY 2016 saw a continuation of the recent emphasis on standard grants with 41% of funds being awarded as new standard grants compared to 10% as new continuing grants and 16% as continuing grant increments and supplements. In FY 2006, these numbers were 25%, 13%, and 28%, respectively.

Among proposals from Principal Investigators (PIs) who provided information on their gender, race, ethnicity, or disability status, the proportion of proposals from PIs who identified themselves as female was 27%. The proportion of proposals from under-represented racial or ethnic minorities was 8.3% and the proportion from PIs with a disability was 1.4%.

¹ The Office of International Science and Engineering and the Office of Integrative Activities are not included in this comparison.

The Foundation achieved its “time to decision” goal of informing at least 75% of PIs of funding decisions within six months of receipt of their proposals.² In FY 2016, 77% of all proposals were processed within six months.

Proposals that are externally reviewed are reviewed by three methods: panel only, ad hoc + panel, and ad hoc only. In FY 2016, 67% of proposals were reviewed by panel only, 24% by ad hoc + panel, and 5% by ad hoc only. These percentages are consistent with the trend over the last 15 years towards greater reliance on panels. In addition, about 5% of proposals were not reviewed externally. The latter include, for example, proposals for travel, symposia, EARly Concept Grants for Exploratory Research (EAGER), Grants for Rapid Response Research (RAPID), and Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) Track 1 proposals.

Approximately 83% of proposals in FY 2016 were research proposals (see **Section III.F**). While the success rate for research proposals from men and women were similar (21% and 23%, respectively), the proportion of research proposals with self-identified female PIs remained low, 23%.³ As in previous years, average research proposal success rates vary noticeably with the self-identified racial identities of the PIs. The success rate for proposals from White PIs was 24% while the rates for proposals from Asian PIs and Black/African-American PIs were 17% and 18%, respectively. The proportion of research proposals that came from Black/African American PIs remained very low, only 2%. The proportion of research proposals from Asian PIs was 25% of the total.⁴ The success rate for the 1,602 research proposals from Hispanic or Latino PIs was 20%.

The average number of months of salary support for individual PIs or Co-PIs per research grant per year is now just over 0.7 months for both single-PI and multiple-PI awards. For single-PI awards this is approximately 3% lower than in FY 2015, and for multiple-PI awards this is approximately 10% lower than in FY 2015.

The running three-year mean number of research proposals a PI submitted before receiving an award remained 2.4 over the three-year period FY 2014 – FY 2016 and the moving three-year average PI success rate improved slightly from 37% to 38%.

Among research award recipients, the percentage of early-career PIs was 22% in FY 2016, slightly higher than the decadal low of 21% seen in FY 2012, FY 2014, and FY 2015.

² NSF FY 2016 Annual Performance Plan.

³ Among research proposals from PIs who identified their gender, the proportion of proposals from women was 26%.

⁴ Among research proposals from PIs who identified their race, the proportion of proposals from Black/African-American PIs was 2% and the proportion from Asian PIs was 29%.

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."⁵ NSF achieves its unique mission by making merit-based awards to researchers, educators, and students at over 1,800 U.S. colleges, universities and other institutions.

All proposals 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*. The language describing the merit review criteria in the *Proposal and Award Policies and Procedures Guide* was revised in October 2012 to incorporate new recommendations from the National Science Board. This revised language applied to proposals submitted on or after January 14, 2013, or in response to deadlines that occurred on or after January 14, 2013.⁶ Additional criteria, as stated in the program announcement or solicitation, may be required to highlight the specific objectives of certain programs or activities. About 95% of NSF's proposals are evaluated by external reviewers as well as by NSF staff. The remaining proposals fall into special categories that are, by NSF policy, exempt from external review and may be internally reviewed only, such as proposals for small workshops, EARly-concept Grants for Exploratory Research (EAGERs), Grants for Rapid Response Research (RAPIDs), and some proposals to the Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) activity⁷ (see **Section III.F11** and **Appendix 12**).

This *FY 2016 Report on the NSF Merit Review Process* responds to a National Science Board policy, endorsed in 1977 and amended in 1984, requesting that the NSF Director submit an annual report on the NSF merit review process. **Section III** of the report provides summary data about proposals, awards, and funding rates. Longitudinal data are given to provide a perspective over time. **Section IV** provides information about the process by which proposals are reviewed and awarded.

NSF's annual portfolio of funding actions (award or decline) is associated with proposals, requests for supplements, Intergovernmental Personnel Act agreements, and contracts. The bulk of this report deals with two overlapping subsets of these actions. Most of **Section III.A – E** looks at competitively reviewed proposals. **Section III.F** primarily discusses research proposals. The research proposal category includes proposals for what could be considered a typical research project and consists of a large subset (83%) of the competitively reviewed proposals. Descriptions of the contents of these categories can be found in **Section III.A** and **Section III.F**.

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

⁶ The *NSF Proposal and Award Policies and Procedures Guide* (PAPPG) applicable from December 26, 2014, to January 25, 2016, is available at: http://www.nsf.gov/pubs/policydocs/pappguide/nsf15001/nsf15_1.pdf. The version of the PAPPG applicable for the remainder of FY 2016 may be found at: https://www.nsf.gov/pubs/policydocs/pappguide/nsf16001/nsf16_1.pdf.

⁷ In FY 2012, NSF inaugurated the Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) activity. See **Section III.F11.2**.

In this document, two types of average are reported, the median and the arithmetic mean. The latter will be referred to simply as the mean. Funding rate and proposal success rate are used interchangeably to refer to the proportion of proposals acted on in a fiscal year that resulted in awards. For example, if a program processed 200 proposals in the year, making 50 awards and declining the remaining 150, then the “proposal success rate” or “proposal funding rate” for that program in that year would be 25%.

It should be noted that the success rates for the Directorate of Biological Sciences in FY 2014 to FY 2016 are inflated by a change instituted in 2012 by two of its divisions. Many of the programs in these divisions now require the submission of preliminary proposals. Only a minority of investigators who submit a preliminary proposal are then invited to submit a full proposal. The practice in the annual merit review report has been to focus on full proposals. More information about preliminary proposal submission and success rates in the Division of Environmental Biology and the Division of Integrative Organismal Systems may be found on these two Divisions’ web-pages.

Directorates are often referred to by their acronyms: 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,⁸ abbreviated as OISE (or ISE) and OIA, respectively. In some tables, these two program offices are referred to collectively as O/D since they form part of the Office of the Director rather than a directorate. Acronyms for three units that existed in some of the years prior to FY 2016 are mentioned in the text of the report: OPP (Office of Polar Programs), OCI (Office of Cyberinfrastructure), and OIIA (or IIA) (Office of International and Integrative Activities). A list of acronyms may be found in **Appendix 23**. 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. Since this change happened after the end of FY 2016, data for these units are not separately broken out in this report.

⁸ Effective April 6th, 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 (O/D Memorandum 15-09). With this change, the name of what had been known as the Office of International and Integrative Activities (IIA) 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 2016.

III. Proposals and Awards

A. Proposals, Awards, and Proposal Success Rates

Table 1 shows the change in the number of proposals, number of awards, and proposal success rates⁹ through time. These data are for all competitively reviewed proposals.¹⁰ The reader may also be interested in success rates for research proposals, which may be found in **Section III.F**. Note that a proposal is included in a given year based on whether the action (division director's recommendation to award or decline)¹¹ was taken that year, not whether the proposal was received in that year.

In this and many subsequent tables, 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.

NSF completed action on 49,285 proposals in FY 2016, a 0.7% decrease from FY 2015, resulting in 11,877 awards, a 1.1% decrease from FY 2015. Consequently, in FY 2016 the proposal success rate was 24%, as in FY 2015. Over the seven years FY 2010 to FY 2016, the success rate has been relatively stable, remaining between 22% and 24%. **Appendix 1** provides proposal, award, and success rate data by NSF directorate and office.

Table 1. NSF Proposal, Award, and Proposal Success Rate Trends

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Proposals	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285
Awards	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877
Success Rate	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%	24%

Source: NSF Enterprise Information System, 10/01/16.

In addition to the full proposals in **Table 1**, in FY 2016, NSF also acted on 4,584 preliminary proposals, which are required for some NSF programs. See **Appendix 2** for additional data and information on preliminary proposals.

⁹ This report uses the term “proposal success rate” to refer to the rate at which submitted proposals are successful in obtaining funding. See page 4 for a more elaborate definition of proposal success rate.

¹⁰ The category of actions associated with “competitively reviewed proposals,” excludes actions on preliminary proposals, contracts, IPA agreements, continuing grant increments, Graduate Research Fellowships, and similar categories.

¹¹ 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 and Financial Administration before an award is issued by NSF. More details may be found in **Section IV.B**.

B. Diversity of Participation

To advance the goals described in NSF's Strategic Plan, one of the core strategies described is broadening the participation in NSF's activities by members of groups that are currently under-represented in STEM disciplines. This includes ensuring the participation of researchers, educators and students from under-represented groups in NSF's programs as well as preparing and engaging a diverse STEM workforce to participate at the frontiers of research and education. **Table 2** provides data on proposal, award, and success rates by PI characteristics (gender, under-represented ethnic or racial group, disability, new and prior PI status).

Table 2. Competitively Reviewed Proposals, Awards and Success Rates, by PI Type¹²

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
All PIs	Proposal	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285
	Awards	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877
	Funding Rate	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%	24%
Female PIs	Proposal	8,510	9,197	9,431	9,727	11,903	11,488	10,795	11,152	11,142	11,444	11,598
	Awards	2,233	2,493	2,556	3,297	2,982	2,602	2,775	2,556	2,669	3,007	3,032
	Funding Rate	26%	27%	27%	34%	25%	23%	26%	23%	24%	26%	26%
Male PIs	Proposal	31,482	32,650	32,074	32,091	38,695	35,211	32,932	32,866	31,625	32,411	31,528
	Awards	7,765	8,451	7,986	10,437	9,080	7,739	7,816	7,316	7,286	7,810	7,512
	Funding Rate	25%	26%	25%	33%	23%	22%	24%	22%	23%	24%	24%
PIs from underrepresented racial or ethnic groups	Proposal	2,608	2,798	2,762	2,945	3,613	3,441	3,291	3,303	3,268	3,383	3,331
	Awards	638	713	670	889	812	735	718	651	681	788	778
	Funding Rate	24%	25%	24%	30%	22%	21%	22%	20%	21%	23%	23%
New PIs ¹³	Proposal	15,877	16,445	16,483	16,840	21,545	19,238	17,943	17,635	17,405	18,276	18,348
	Awards	2,842	3,151	3,132	4,174	3,620	2,976	3,063	3,013	3,108	3,320	3,510
	Funding Rate	18%	19%	19%	25%	17%	15%	17%	17%	18%	18%	19%
Prior PIs	Proposal	26,172	27,660	27,424	28,341	33,997	32,324	30,670	31,364	30,646	31,344	30,937
	Awards	7,475	8,202	7,892	10,421	9,376	8,216	8,461	7,816	7,850	8,687	8,367
	Funding Rate	29%	30%	29%	37%	28%	25%	28%	25%	26%	28%	27%
PIs with Disabilities	Proposal	434	448	448	470	545	543	483	488	468	562	496
	Awards	107	104	109	149	108	107	134	122	99	120	110
	Funding Rate	25%	23%	24%	32%	20%	20%	28%	25%	21%	21%	22%

Source: NSF Enterprise Information System, 10/01/16 and 11/02/16.

¹² Some of the awards in FY 2009 and FY 2010 were funded with a special appropriation made under the American Recovery and Reinvestment Act (ARRA). See the FY 2015 Merit Review Report for additional details.

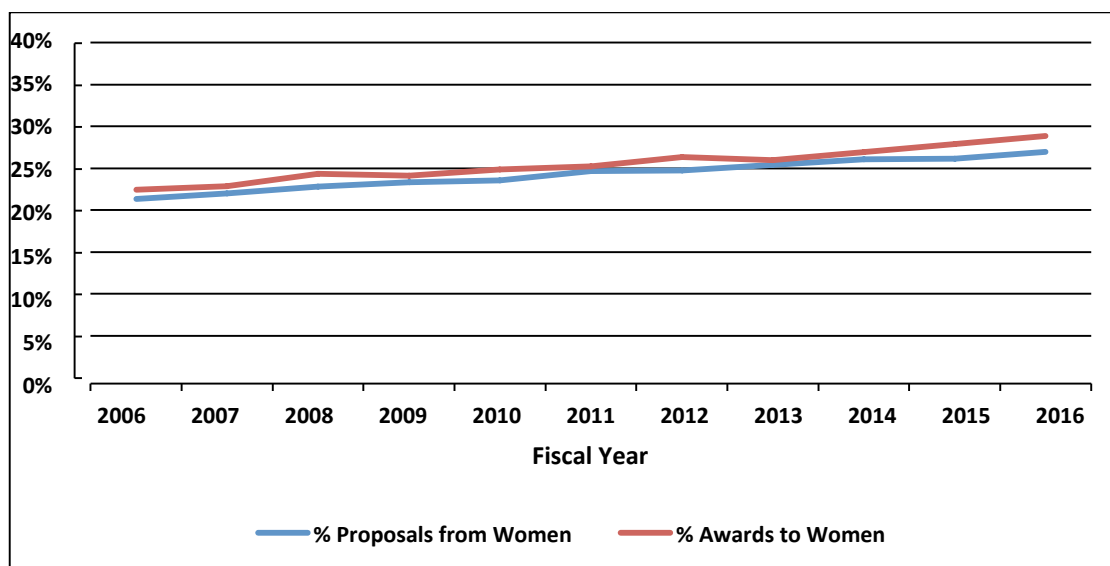
¹³ In FY 2009, in conjunction with NSF's implementation of the American Recovery and Reinvestment Act, NSF revised its definition of a new PI; this became, "A new PI is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants)." This definition is used here. Previously, a new PI was considered to be any individual who had not previously been a PI on any NSF award.

Gender, disability, and ethnic or racial data are based on self-reported information. About 86% of individuals who were PIs provided gender information, 85% identified a specific race (or mix of races) and 83% identified a specific ethnicity. A further 1% and 0.6% indicated that their race and ethnicity, respectively, were unknown. (88% of proposals were from people who provided gender information,¹⁴ 90% were from people for whom either the race or ethnicity was known,¹⁵ and 70% were from people who provided information about disability status.) The under-represented ethnic/racial PIs category in **Table 2** includes American Indian /Alaska Native, Black/African American, Hispanic or Latino, and Native Hawaiian/Pacific Islander but excludes Asian and White-Not of Hispanic Origin.

Gender

In general, while fewer proposals are received from women than men, the success rate for female PIs is slightly higher than that for male PIs. The proportion of proposals from female PIs was 26.9% in FY 2016 and the proportion of awards to women was 28.8%.¹⁶

Figure 1. Percentage of Proposals from and Awards to Women



Source: NSF Enterprise Information System, 10/01/16.

¹⁴ As a group, the success rate for PIs who do not indicate their gender tends to be consistently lower than PIs that do. For example, in FY 2016, the success rate for PIs whose gender was not known was 22%.

¹⁵ However, for only 87% of proposals was the information sufficient to determine whether or not the PI belonged to an under-represented racial or ethnic group. (Some report only one of race or ethnicity; some report “Unknown.”)

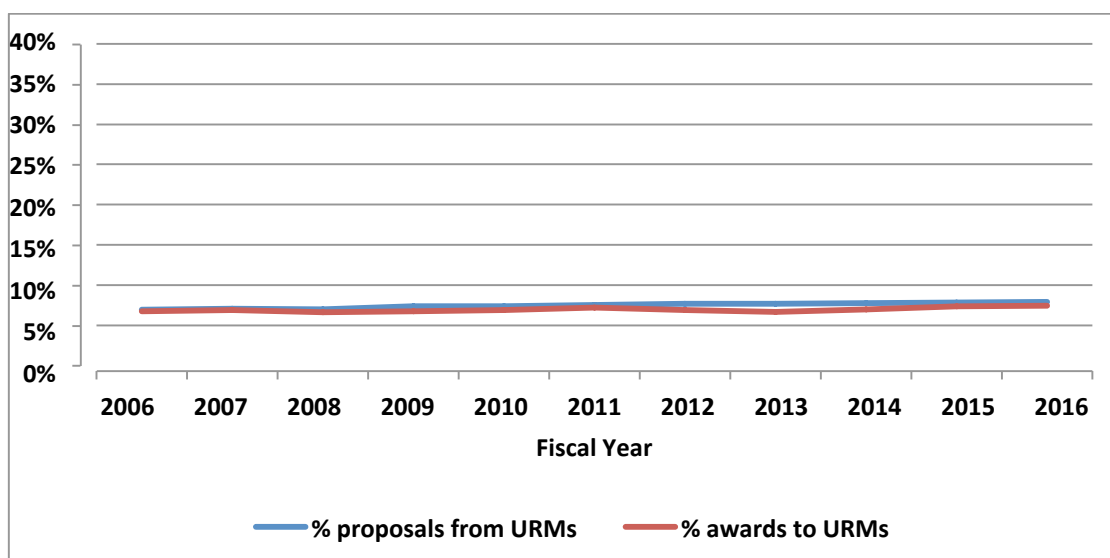
¹⁶ This is calculated as a percentage of the number of proposals from PIs who provided information about gender. The proportions for PIs from other under-represented groups are calculated similarly except that, in **Figure 2**, the number of PIs who provided information sufficient to determine whether they belong to an under-represented racial or ethnic group has been estimated for the years FY 2006 – FY 2009, by using the same fraction of PIs as was found in FY 2010. Based on fluctuations seen in FY 2010 – FY 2013, it is estimated that this may introduce errors in the percentages of proposals and awards from under-represented racial or ethnic groups that have an absolute magnitude of less than 0.05%, much less than the variation seen in **Figure 2**. Data in **Figure 3** are treated in a similar way.

As may be seen in **Figure 1**, over the past decade, there has been a relatively steady, if slow, rate of increase in the proportion of proposals that are submitted by women and a corresponding upward trend in the proportion of awards that are made to women. Since the success rate for women exceeds that for men, the proportion of awards to women is always slightly higher than the proportion of proposals from women. (The red curve lies above the blue curve in **Figure 1**.)

Under-represented Racial or Ethnic Groups

The success rate for PIs from under-represented racial or ethnic groups (URMs) is lower than the average success rate over all PIs. The proportion of proposals from such PIs remains low (see **Figure 2**). After an upward trend in recent years, the proportion of proposals that come from under-represented minority PIs declined in FY 2016.

Figure 2. Percentage of Proposals from and Awards to Researchers from Under-represented Racial or Ethnic Groups



Source: NSF Enterprise Information System, 11/02/16.

The success rate of under-represented minority PIs remained steady at 23%, just below the overall success rate for competitive proposals.

Table 3 provides data on proposal, award and success 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 success rates for these groups tend to be greater than for other ethnic groups. The proportion of submissions from under-represented racial and ethnic groups in FY 2016 (8.3%)¹⁷ is smaller than their representation in the U.S. population but similar to their representation in the full-time faculty of academic institutions (8.3%).¹⁸

¹⁷ The ratio of the number of PIs in an under-represented racial or ethnic minority to the total number of PIs who provided sufficient information to determine whether or not they belonged to such a minority.

¹⁸ 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 <http://www.nsf.gov/statistics/2016/nsb20161/uploads/1/8/at05-15.pdf> (“Science and Engineering Indicators 2016.”)

Table 3. Competitively Reviewed Proposals, Awards and Success Rates, by PI Race and Ethnicity¹⁹

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
American Indian/Alaska Native	Proposals	112	97	91	88	118	129	83	113	103	104	99
	Total Awards	32	32	23	29	28	36	18	28	36	25	29
	<i>Omnibus</i>				20	28						
	<i>ARRA</i>				9	0						
	Funding Rate	29%	33%	25%	33%	24%	28%	22%	25%	35%	24%	29%
Black/ African American	Proposals	915	1,034	997	1,022	1,280	1,201	1,154	1,124	1,123	1,102	1,134
	Total Awards	201	240	246	298	270	243	263	203	204	233	264
	<i>Omnibus</i>				233	262						
	<i>ARRA</i>				65	8						
	Funding Rate	22%	23%	25%	29%	21%	20%	23%	18%	18%	21%	23%
Native Hawaiian/ Pacific Islander	Proposals	28	26	30	23	38	42	40	32	30	30	41
	Total Awards	9	6	8	8	10	11	6	5	5	2	7
	<i>Omnibus</i>				5	8						
	<i>ARRA</i>				3	2						
	Funding Rate	32%	23%	27%	35%	26%	26%	15%	16%	17%	7%	17%
Asian	Proposals	7,916	8,801	8,952	9,550	11,626	10,829	10,382	10,511	10,538	11,148	11,623
	Total Awards	1,530	1,801	1,780	2,465	2,124	1,907	1,914	1,887	1,925	2,256	2,168
	<i>Omnibus</i>				1,691	2,071						
	<i>ARRA</i>				774	53						
	Funding Rate	19%	20%	20%	26%	18%	18%	18%	18%	18%	20%	19%
White	Proposals	29,861	30,676	30,217	29,975	36,153	33,200	30,596	30,766	29,624	30,099	29,031
	Total Awards	7,885	8,499	8,153	10,499	9,306	7,826	8,020	7,372	7,390	7,902	7,748
	<i>Omnibus</i>				7,144	8,958						
	<i>ARRA</i>				3,355	348						
	Funding Rate	26%	28%	27%	35%	26%	24%	26%	24%	25%	26%	27%
Multiracial	Proposals	301	279	284	337	512	433	448	439	425	495	508
	Total Awards	78	81	76	112	118	99	113	110	114	151	124
	<i>Omnibus</i>				80	112						
	<i>ARRA</i>				32	6						
	Funding Rate	26%	29%	27%	33%	23%	23%	25%	25%	27%	31%	24%
Hispanic or Latino	Proposals	1,525	1,639	1,611	1,755	2,092	2,019	1,934	1,956	1,921	2,053	1,950
	Total Awards	378	433	382	533	476	438	412	401	411	495	459
	<i>Omnibus</i>				373	465						
	<i>ARRA</i>				160	11						
	Funding Rate	25%	26%	24%	30%	23%	22%	21%	21%	21%	24%	24%

Source: NSF Enterprise Information System, 10/01/16.

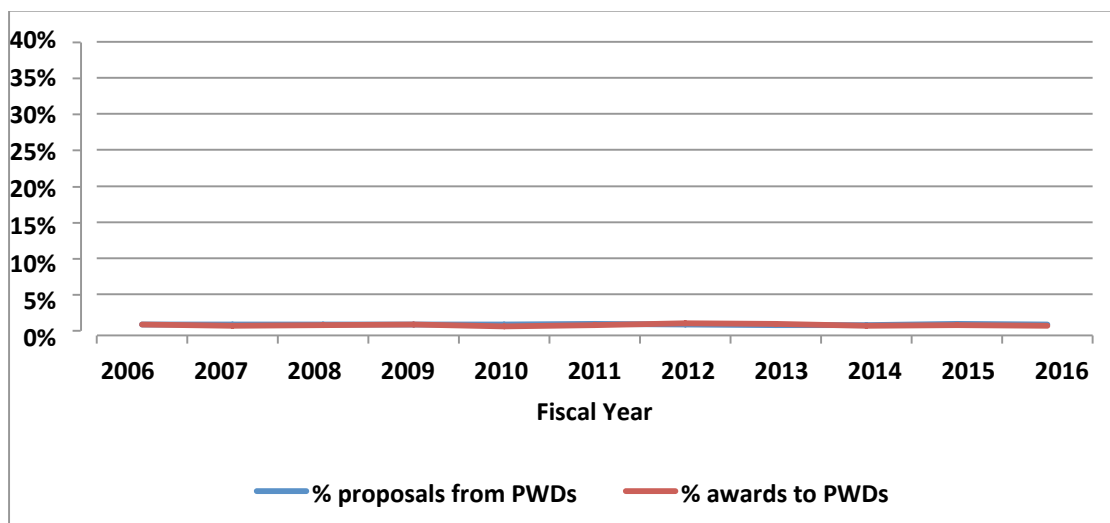
¹⁹ This table differs from a similar one included in reports for years up to FY 2011. Before FY 2012, individuals who identified a race and indicated that they were Hispanic or Latino were only counted in the Hispanic or Latino category. Beginning in FY 2012, such individuals are included in both the 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.

Among racial and ethnic groups that submitted more than 1,000 proposals in FY 2016, the success rate is highest for the groups White (27%) and Hispanic or Latino (24%). It is lowest for Asian (19%) and Black/African American (23%). **Appendices 3 and 4** provide proposal, award, and success rate information by directorate by PI gender and race/ethnicity, respectively.

PIs with a Disability

The proposal success rate for PIs identifying themselves as having a disability has remained comparable to the overall success rate for all PIs (**Table 2**), being slightly lower than the all-PI success rate for most of FY 2006 - FY 2016 but slightly higher in FY 2012 and FY 2013.

Figure 3. Percentage of Proposals from and Awards to PIs with a Disability (PWDs)



Source: NSF Enterprise Information System, 10/01/16.

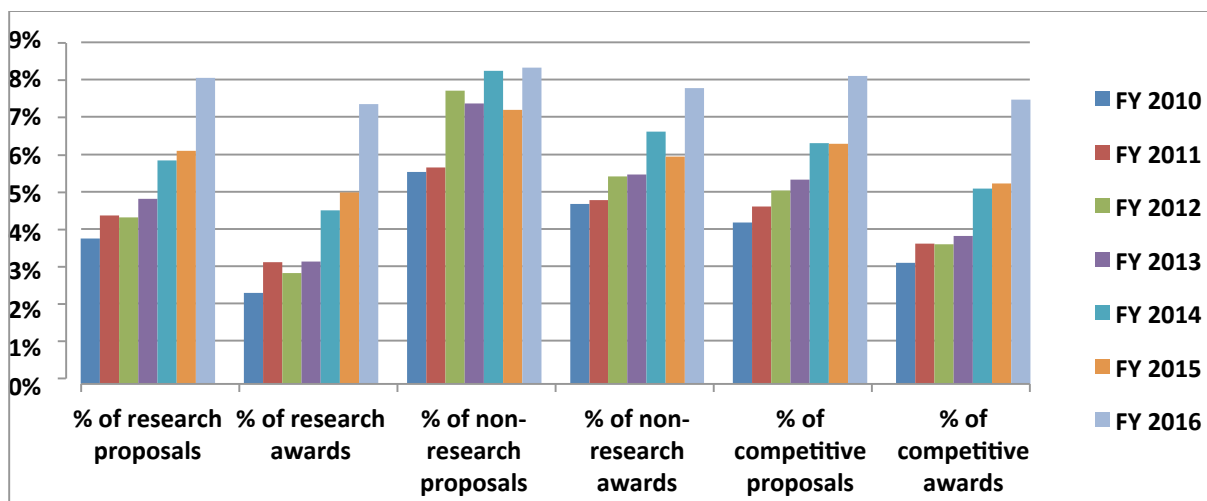
Unlike women and under-represented racial and ethnic groups, the proportion of proposals that come from researchers with disabilities has remained relatively steady from FY 2006 to FY 2016 (**Figure 3**), being approximately 1.5% in FY 2006 and 1.4% in FY 2016.²⁰

Minority-Serving Institutions

Figure 4 shows the proportion of proposals from and awards to Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions (HSIs), and Tribal Colleges and Universities (TCUs) as a group in recent years.

²⁰ In FY 2016, approximately 70% of competitively reviewed proposals were from PIs who indicated whether or not they had a disability. Of these, 1.4% reported that they did have a disability.

Figure 4. Proposals from and Awards to HBCUs, HSIs and TCUs, by Fiscal Year and Proposal Category²¹



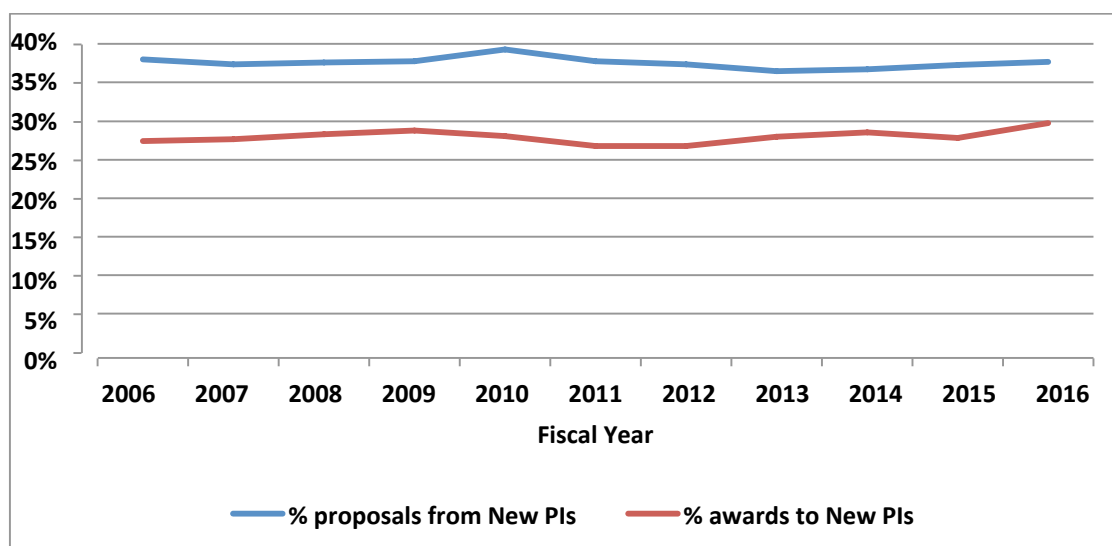
Source: NSF Enterprise Information System, 10/01/16 and 06/04/17.

Although the proportion of competitive proposals that come from HBCUs, HSIs and TCUs is low, it increased noticeably from FY 2010 to FY 2016. The proportion of research awards going to these types of institution also increased, going from 2.4% to 7.3%.

New PIs

The success rate for PIs who have not previously had an NSF award is lower than that for PIs who have previously submitted a successful NSF proposal (19% compared to 27%; see **Table 2**).

Figure 5. Percentage of Proposals from and Awards to New PIs



Source: NSF Enterprise Information System, 10/01/16.

²¹ Research proposals are defined at the beginning of **Section III.F**. Non-research proposals are those competitive proposals that are not research proposals. The number of institutions that represented in this figure tends to increase from year to year, primarily because of growth in the number of Hispanic-Serving Institutions.

In FY 2016, the proportion of proposals from new PIs was 37% (**Figure 5**). Since FY 2001, this number has fluctuated between approximately 36% and 39%. **Appendix 5** provides funding rates by new PI and prior PI status, by directorate. Among directorates, new PIs are least successful relative to prior PIs in MPS and most successful in BIO. There has been an increase in the proportion of awards going to new PIs in FY 2016 to a decadal high of 30% (**Figure 5**). The success rate of new PIs increased slightly in FY 2016 to 19% from 18% in FY 2015. Concomitantly, the success rate of prior PIs decreased from 28% to 27%.

C. 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 is the primary funding mechanism used by NSF. A grant 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, and managing funding rates. 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)²² until the project is completed. The 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 4**, in FY 2016, NSF devoted 41% of its total budget to new standard grants and 10% to new continuing grants.

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

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

Table 4. Percentage of NSF Funding by Type of Award

CATEGORY	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Standard Grants	25%	26%	28%	44%	37%	34%	35%	35%	39%	39%	41%
New Continuing	13%	14%	13%	8%	13%	11%	11%	12%	10%	10%	10%
CGIs and Supplements	28%	26%	26%	18%	18%	23%	22%	22%	20%	18%	16%
Cooperative Agreements	23%	22%	23%	21%	23%	23%	23%	23%	22%	22%	22%
Other	11%	11%	11%	9%	9%	9%	10%	8%	8%	11%	11%

Source: NSF Enterprise Information System, 5/3/17. Percentages may not sum to 100 due to rounding. ARRA awards were generally made as standard grants. "Other" includes contracts, fellowships, interagency agreements, and IPA agreements.

²² While the original award is a competitive action, the continuing grant increment is a non-competitive grant.

D. Awards by Sector and Type of Institution

In FY 2016, of the program funds awarded by NSF, approximately 76% went to academic institutions, 13% to non-profit and other organizations, 8% to for-profit businesses, and 3% to Federal agencies and laboratories (Table 5).

Table 5. Distribution of Funds by Type of Organization

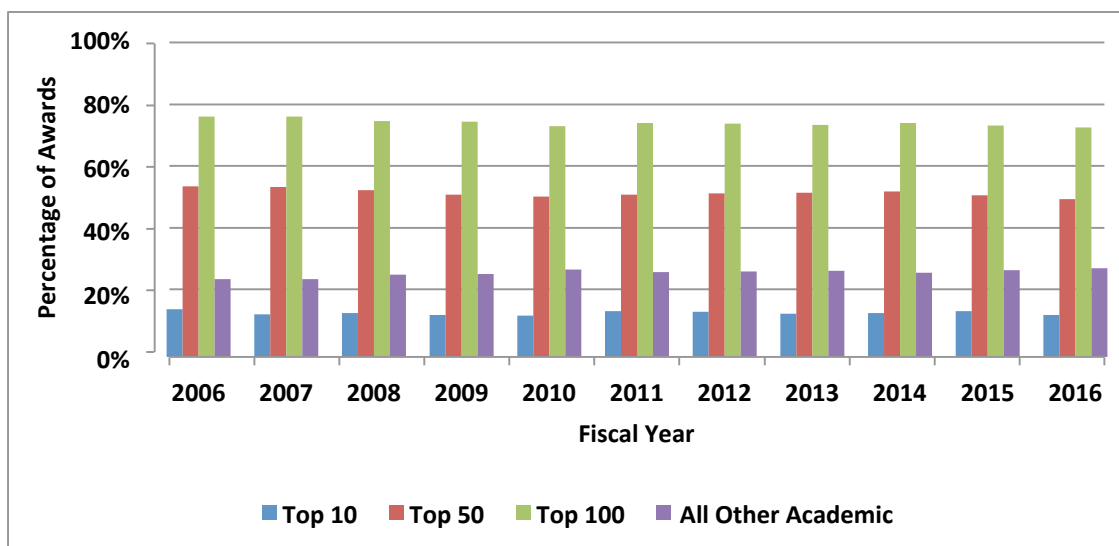
Sector/Institution	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Academic Institutions	76%	76%	76%	76%	77%	77%	80%	81%	81%	78%	76%
Non-Profit and Other Organizations	15%	15%	13%	13%	11%	13%	12%	11%	11%	11%	13%
For-Profit	7%	7%	8%	6%	6%	6%	5%	6%	5%	8%	8%
Federal Agencies and Laboratories	2%	3%	3%	4%	5%	5%	3%	3%	3%	3%	3%

Source: NSF Enterprise Information System, 10/19/16. 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 6 shows how funds to academic institutions are distributed. 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 success rates for different types of academic institutions. For FY 2016, the average proposal success rate was 26% for the top 100 Ph.D.-granting institutions (classified according to the amount of FY 2016 funding received). In comparison, the rate was 18% for Ph.D.-granting institutions that are not in the top 100 NSF-funded category. The proposal success rate was 26% for four-year institutions²³ and 33% for two-year institutions in FY 2016, increasing from 22% and 27%, respectively, in FY 2015. For minority-serving institutions, the FY 2016 proposal success rate was 22%, increasing from 20% in FY 2015.

Figure 6. Percentage of Awards to Academic Institutions (By Amount Received)



Source: NSF Enterprise Information System, 10/01/16.

²³ Four-year institutions are those granting bachelor degrees, regardless of whether they also offer graduate degrees.

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.”²⁴

The EPSCoR program was designed for those jurisdictions that have historically received lesser amounts of NSF Research and Development funding. In FY 2016, 25 states, the Commonwealth of Puerto Rico, the U.S. Virgin Islands and Guam were eligible to participate in aspects of the program. For one of the 25 states, Missouri, the prior 3-year rolling average of NSF research funds received was over 0.75% of NSF’s Research and Related Activities budget and this jurisdiction was not eligible to participate in new Research Infrastructure Improvement initiatives in FY 2016. **Appendix 6** provides data on proposals, awards, and proposal success rates for the EPSCoR jurisdictions.

Outreach

NSF made a number of outreach presentations to institutions across the country in an effort to help increase their participation and success in NSF programs:

- Two in-person Grants Conferences were held in FY 2016 in Arlington, VA and Portland, OR. These were organized by the NSF Policy Office and were hosted by Georgetown University and Portland State University, respectively.
- Six “NSF Days,” organized by the Office of Legislative and Public Affairs, were held during FY 2016. One was held virtually. The other five were held in Dover, DE; Fargo, ND; Anchorage, AK; Pasadena, CA; and Atlanta, GA, hosted by Delaware State University, North Dakota State University, University of Alaska Anchorage, Pasadena City College, and Spelman College, respectively.

Representatives from most of NSF’s directorates and offices attended these conferences. They held separate focus sessions on program opportunities in specific disciplines in addition to providing general information about proposal preparation and the merit review process.

As in prior years, NSF hosted informational booths at scientific meetings such as the annual meeting of the American Association for the Advancement of Science. In addition to these, outreach workshops were sponsored by several of the individual NSF directorates, as well as by EPSCoR and other NSF-wide programs. Some programs and offices held webinars for people interested in learning more about the programs or policies involved. Examples included, “Updates to the NSF Proposal & Award Policies & Procedures Guide”, “The NSF Electronic Research Administration Forum”, “NSF CAREER Program”, “Improving Undergraduate STEM Education: GEOPATHS”, and “Integrative Strategies for Understanding Neural and Cognitive Systems Program”. Several outreach activities were associated with EPSCoR jurisdictions; for example, a webinar focused on NSF’s Graduate Research Fellowship Program. Others were

²⁴ 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.

aimed at helping early-career investigators learn more about NSF’s CAREER program, for example, CAREER proposal writing workshops organized by CISE, CMMI and CBET. Finally, program officers frequently conduct outreach when visiting institutions or participating in scientific meetings. NSF outreach to scientists and engineers from under-represented groups also includes activities such as attendance at workshops for tribal colleges and other minority-serving institutions.

E. Time to Decision (Proposal Dwell Time)

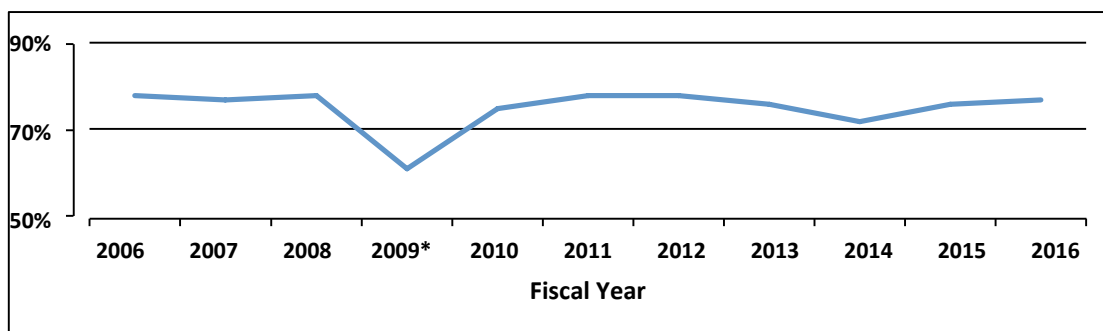
It is important for applicants to receive a timely funding decision. The Foundation’s FY 2016 Government Performance and Results Act performance goal calls for informing at least 75% of PIs of funding decisions (i.e., award or decline) within six months of the proposal deadline, target date, or receipt date, whichever is later. In 2016, NSF exceeded the dwell time goal with 77% of applicants informed within six months. NSF has consistently exceeded its dwell time goal with the exception of FY 2009. (Before FY 2015, the goal was to inform at least 70% of PIs of funding decisions within six months of the proposal deadline.) In FY 2009, the NSF dwell time performance measure was suspended for the last three quarters to delay processing proposals that would have been declined due to lack of funding. This enabled some of these proposals to be funded with the ARRA appropriation.

Table 6. Proposal Dwell Time: Percentage of Proposals Processed Within Six Months

2006	2007	2008	2009*	2010	2011	2012	2013	2014	2015	2016
78%	77%	78%	61%	75%	78%	78%	76%	72%	76%	77%

Source: NSF Enterprise Information System, 10/01/16. * Dwell-time goal suspended in FY 2009.

Figure 7. Percentage of Proposals Processed within Six Months



F. Data on Research Grants

The purpose of this section is to provide data on what are referred to as “research grants.” The term research grant is used by NSF to represent what could be considered a typical research award, particularly with respect to the award size. Education research grants are included. Excluded are large awards such as centers and facilities, equipment and instrumentation grants, grants for conferences and symposia, grants in the Small Business Innovation Research program, Small Grants for Exploratory Research (through FY 2009), and education and training grants.

F1. Research Proposal, Award, & Success Rate Trends

Table 7 provides the proposal, grant, and success rate trends for NSF research grants. The number of new awards made in FY 2016 (8,782) was 2.3% lower than in FY 2015 (8,993) and was accompanied by a small increase in the inflation-adjusted mean annualized award size of 0.4%. The number of research proposals acted on increased by 0.4% and the success rate for research proposals decreased by 2.7%.^{25,26} **Appendix 7** shows the numbers of research proposals and success rates broken out by NSF divisions.

Table 7. Research Proposals, Award and Success Rate Trends

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Proposals	31,514	33,705	33,643	35,609	42,225	41,840	38,490	39,249	38,882	40,869	41,034
Awards	6,708	7,415	6,999	10,011	8,639	7,759	8,061	7,652	7,923	8,993	8,782
Omnibus				6,346	8,613						
ARRA				3,665	26						
Success Rate	21%	22%	21%	28%	20%	19%	21%	19%	20%	22%	21%

Source: NSF Enterprise Information System, 10/01/16.

F2. Diversity of Participation

Proposals from Various Racial and Ethnic Groups

Table 8 and **Table 9** show the numbers of research proposals and awards for various racial and ethnic groups.

Table 8. Research Proposals, by Racial and Ethnic Group

	Hispanic	Non-Hispanic	Unknown
American Indian or Native Alaskan	17	43	11
Asian	19	9,666	687
Black/African American	13	777	29
Native Hawaiian or Pacific Islander	†	25	†
White	1,062	21,566	1,404
Multi-racial	57	331	23
Unknown	431	1,022	3,844

† = number less than 10

²⁵ I.e., the ratio of success rates between FY 2016 and FY 2015 is 0.973 [= (8,782/41,034) ÷ (8,993/40,869)].

²⁶ EAGER and RAPID proposals, which have a high success rate, were approximately 2.2% of the research proposals. If these are removed, then the success rate for research proposals is reduced from 21.4% to 20.3%.

Table 9. Research Awards, by Racial and Ethnic Group

	Hispanic	Non-Hispanic	Unknown
American Indian or Native Alaskan	†	10	†
Asian	†	1,630	122
Black/African American	†	140	†
Native Hawaiian or Pacific Islander	†	†	†
White	211	5,254	293
Multi-racial	11	65	†
Unknown	96	194	732

† = number less than 10

Table 10 shows the success rates of research grant proposals from various racial and ethnic groups while **Table 11** shows the ratio of the success rates of proposals from these various groups to the success rate of the most numerous group, those who are White but not Hispanic. In **Table 11**, the shading indicates whether or not the result is statistically significant.²⁷ While the relative success rates (the ratio of the success rate of a particular group to that of the majority group) vary, only a small number of success rates are significantly different from that for proposals from White but not Hispanic PIs. These are: non-Hispanic Asians, Asians of Unknown ethnicity, non-Hispanic Black/African Americans, White Hispanics, those of both Unknown race and Unknown ethnicity, and non-Hispanics of Unknown race.

Table 10. Research Proposal Success Rates by Racial and Ethnic Group

	Hispanic	Non-Hispanic	Unknown
American Indian or Native Alaskan	†	23%	†
Asian	†	17%	18%
Black/African American	†	18%	†
Native Hawaiian or Pacific Islander	†	†	†
White	20%	24%	21%
Multi-racial	19%	20%	†
Unknown	22%	19%	19%

Table 11. Research Proposal Success Rates Relative to White, Non-Hispanic

	Hispanic	Non-Hispanic	Unknown
American Indian or Native Alaskan	†	95%	†
Asian	†	69%	73%
Black/African American	†	74%	†
Native Hawaiian or Pacific Islander	†	†	†
White	82%	100%	86%
Multi-racial	79%	81%	†
Unknown	91%	78%	78%

† = number of awards less than 10

Significant at 99%

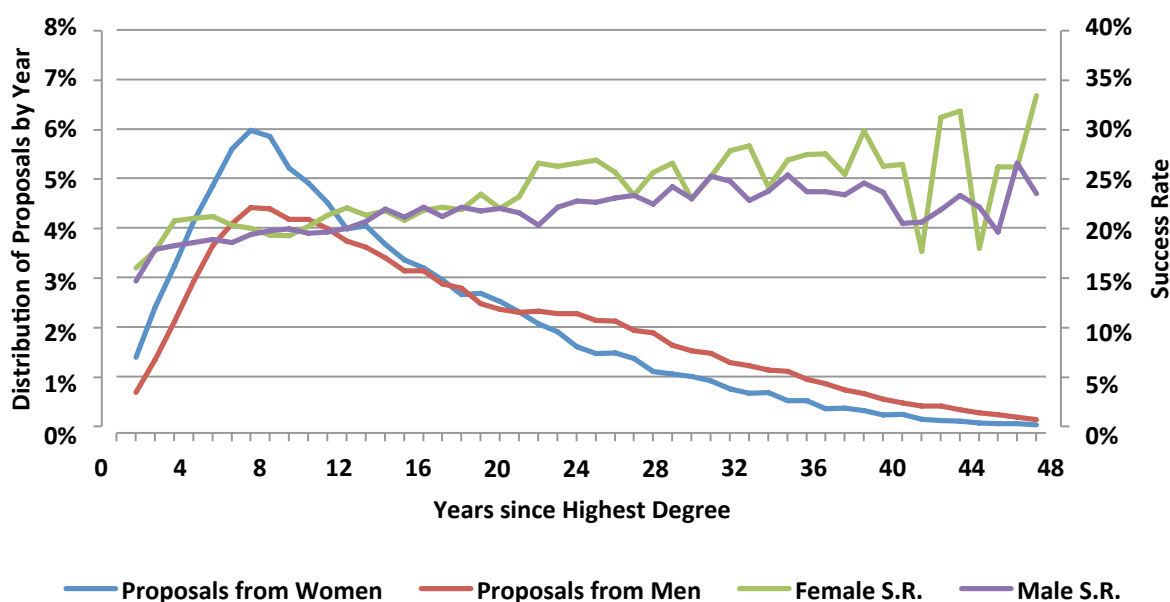
²⁷ For each minority group, if a and A are the number of awards going to the minority and majority group and p and P are the number of proposals coming from the minority and majority group, we test whether $a/(a+A)$ is significantly different from $p/(p+P)$. A two-tailed test is used.

If we aggregate all the groups whose members have indicated Hispanic ethnicity, the success rate is 84% of that of the majority group. The difference between this and the success rate of the majority group is statistically significant at the 99% confidence level.

Proposal Submission and Success Rates by Gender and Experience

Figure 8 shows the distribution of research proposals from men and women and the associated success rates, as functions of the years since the PI obtained his or her highest degree. To reduce the impact of natural variability in these numbers, data from the four fiscal years 2013 through 2016 are combined.

Figure 8. Research Proposals and Success Rates, FY 2013 – FY 2016, by Years Since Highest Degree and by Gender



Source: NSF Enterprise Information System, 10/1/16.

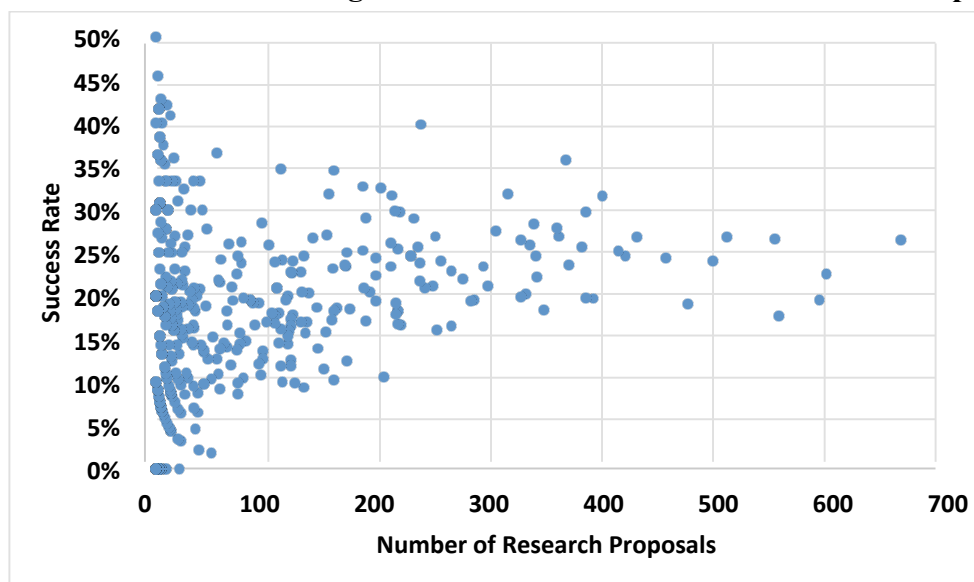
The success rate for women is typically the same or slightly higher than that for men at both the early career stage and in the remainder of their careers. The distribution of experience among male and female PIs, measured in terms of years since highest degree, the red and blue curves, show that proportionally more of the proposals from women are from researchers in the first 16 years of their post-doctoral career than is the case for men.

F3. Institutional Success Rates

In FY 2016, 372 submitting organizations²⁸ had 10 or more research proposals awarded or declined by NSF. **Figure 9** shows the considerable variation in the number of submissions and in the success rates of different organizations. Among organizations with 200 or more research proposals acted on in FY 2016, the organizational success rate varies between 11% and 40%.

²⁸ As used here, a submitting organization corresponds to a unique institution ID in the Enterprise Information System. In a few instances, a submitting organization may submit proposals on behalf of several institutions. For example, there are several state university systems in which a smaller campus does not have a full Office of Sponsored Programs (OSP) and submits proposals to NSF through the OSP of a larger campus in the system.

Figure 9. Success Rates of Organizations with more than 10 Research Proposals



Source: NSF Enterprise Information System, 10/1/16.

Figure 10 shows the scatter of the average review ratings of research proposals from each of eight proposing organizations with different FY 2016 organizational success rates.²⁹ Regardless of the success rate of the organization as a whole, there is a large scatter in the mean ratings of proposals, suggesting that reviewers' evaluations of proposals focus more on the quality of an individual proposal than on the identity of the organization.

Figure 10. Research Proposals by Average Review Rating and Organization Success Rate



Source: NSF Enterprise Information System, 10/1/16.

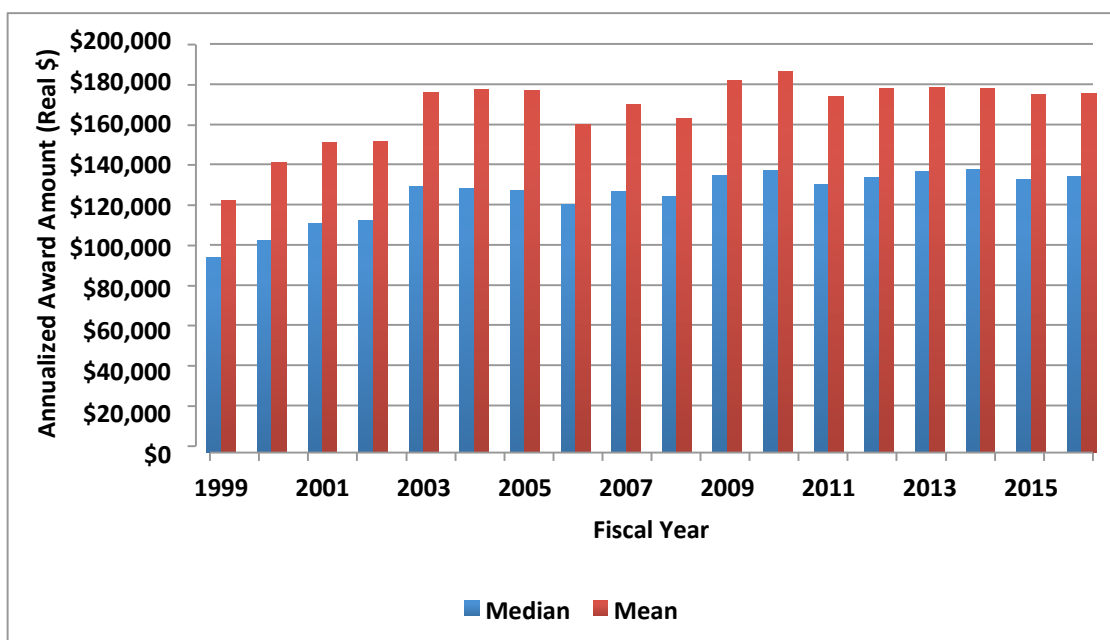
²⁹ The eight organizations are chosen by selecting the ones with success rates closest to 40%, 35%, 30%, etc. from among those organizations with over 100 research proposal decisions in FY 2016, except for the organization closest to 5% which has a proposal count slightly lower than 100.

F4. Research Grant Size and Duration

Adequate award size and duration are important for enabling science of the highest quality and ensuring that the proposed work can be accomplished as planned. Larger award size and longer award duration may also permit the participation of more students and allow investigators to devote a greater portion of their time to conducting research.

In FY 2016, the annualized median award size was \$133,455, a 2.3% increase from FY 2015 in nominal dollars and the annualized mean award amount was \$173,369, a 1.6% increase from FY 2015. The inflation-adjusted average annual award sizes are shown in **Figure 11**.

Figure 11. Annualized Award Amounts for Research Grants in Real Dollars



Source: NSF Enterprise Information System, 10/01/15 and OMB Historical Table 10.1 "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2022", <https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/budget/fy2018/hist10z1.xls>, accessed on 06/08/16. Real dollars use FY 2016 as a baseline. FY 2009 and FY 2010 include ARRA funding.

In real (i.e., inflation-adjusted) dollars, the FY 2016 annualized mean award amount (\$173,369) was almost the same as the FY 2015 amount (\$172,640).³⁰ The mean annual award size in *nominal* dollars increased by 28.8% from FY 2006 to FY 2016. The mean annual award size in *real* dollars fluctuated over the same period and was 9.3% higher in FY 2016 than in FY 2006. The ARRA appropriation made possible an increase in average annual award size in FY 2009 and FY 2010, relative to FY 2008. The ARRA appropriation also helped to reduce out-year

³⁰ 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 11**, FY 2016 is the reference year (one FY 2016 dollar equals one real dollar).

commitments such as funding for continuing grant increments. (See **Section III.C** for a description of continuing grant increments.)

Data on award size organized by NSF directorate for the past decade are presented in **Appendix 8**. There is considerable variation between directorates; for example, BIO, CISE and GEO award larger grants on average, while ENG, MPS and SBE award smaller grants.

As **Table 12** shows, the average award duration has remained relatively constant.³¹ Program officers must balance competing requirements, such as increasing award size, increasing duration of awards, or striving to maintain proposal success rates.

Table 12. Mean Award Duration for Research Grants

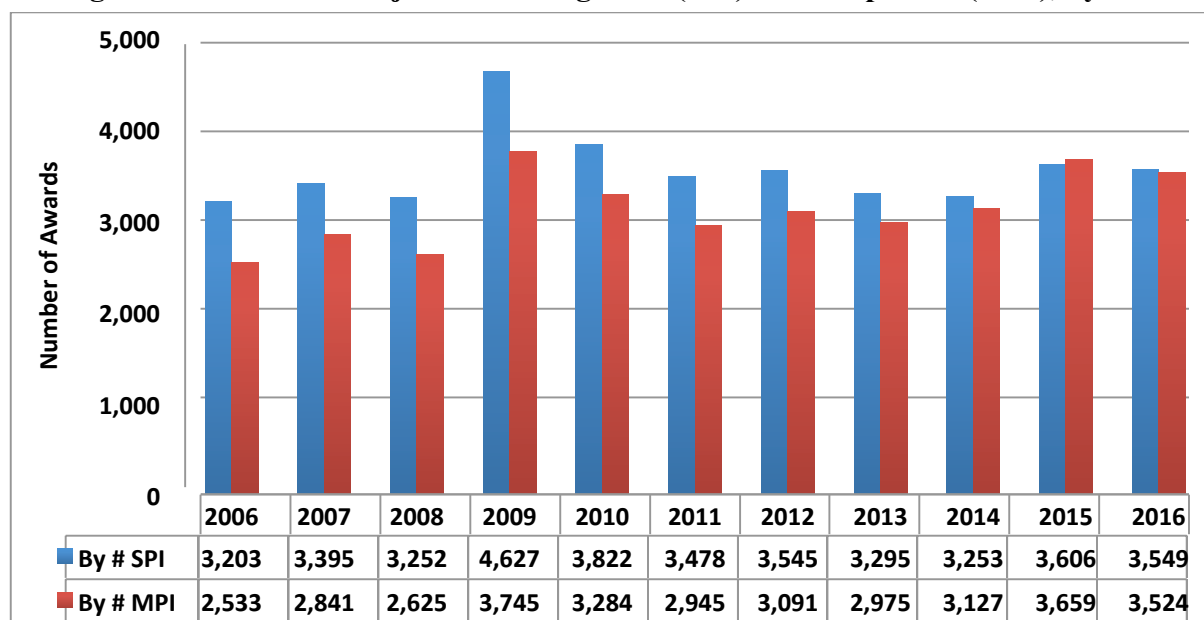
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Duration (Years)	2.9	2.9	3.0	3.0	2.9	2.9	2.9	3.0	3.0	2.9	2.9

Source: NSF Enterprise Information System, 10/01/16.

F5. Number of Investigators per Research Project

Figure 12 shows the number of new research projects with single PIs (SPI) compared to the number of research projects with multiple PIs (MPI).

Figure 12. Research Projects with Single PIs (SPI) & Multiple PIs (MPI), by Number



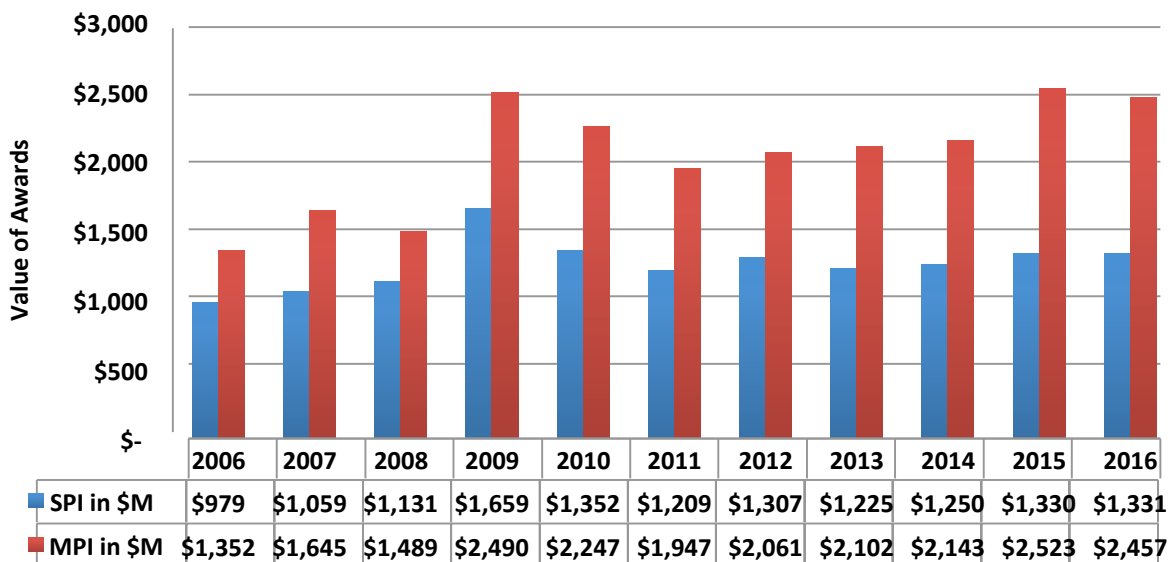
Source: NSF Enterprise Information System, 10/01/16. Note: In FY2009, approximately 3000 additional research projects were funded with the ARRA appropriation. In FY2010, 25 research projects were funded from the remaining ARRA appropriation.

The numbers of MPI projects and SPI projects funded in FY 2016 were approximately equal.

³¹ The number of years is rounded to one decimal place. This duration is the initial duration for new awards in each year and does not take into account no-cost extensions.

Figure 13 shows the total amount of funds awarded to SPI and MPI research projects.

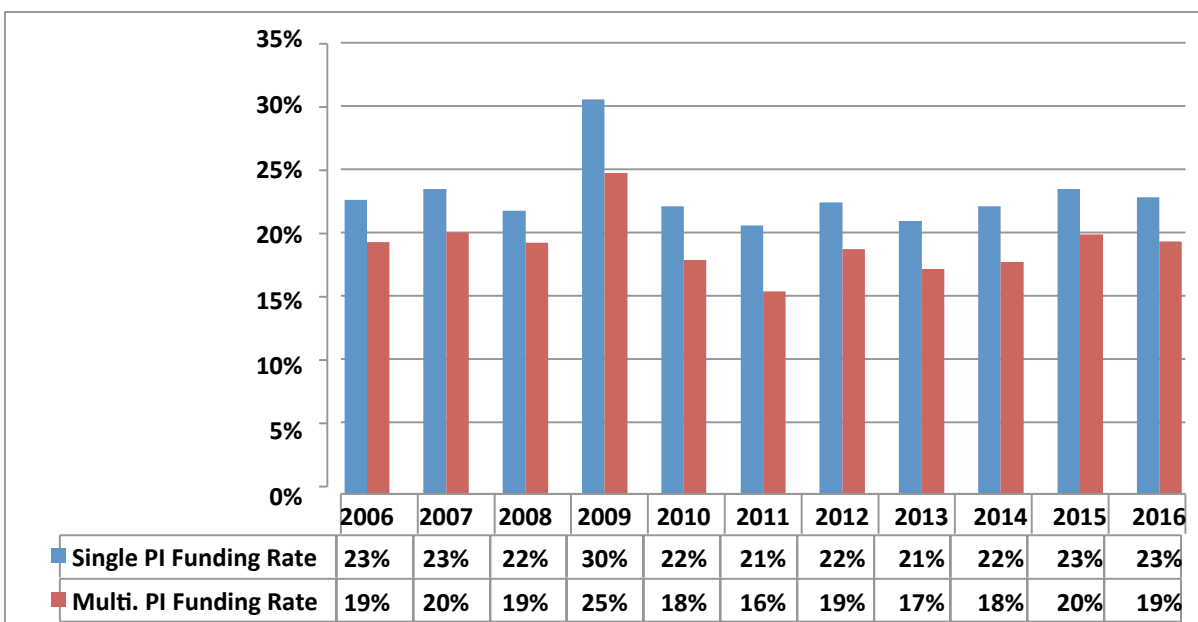
Figure 13. Research Projects with Single PIs (SPI) & Multiple PIs (MPI), by Dollar Amount (in millions)



Source: NSF Enterprise Information System, 10/01/16. Note: The amounts for FY 2009 and FY 2010 include awards made with the ARRA appropriation.

Figure 14 shows the success rates for SPI and MPI research proposals (as distinct from projects). The difference between the SPI and MPI success rates has varied over the last ten years, but the SPI success rate has been consistently higher.

Figure 14. Success Rates for Single-PI & Multiple-PI Research Proposals



Source: NSF Enterprise Information System, 10/01/16.

F6. Number of Research Grants per PI

Table 13 indicates the number of active research grants per PI averaged over the three-year period 2014 - 2016.

Table 13. Number of Grants per PI, by percentage of PIs

	One	Two	Three	Four or More
Fiscal Years 2014-2016	80%	15%	3%	2%

Source: NSF Enterprise Information System, 10/01/16.

F7. Number of People Supported on Research Grants

Table 14 shows the number of graduate students, post-doctoral associates, and senior personnel supported on NSF research grants.³² 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, but subsequently declined. From FY 2015 to FY 2016, the number of post-doctoral associates supported by research grants decreased by 2.7% while the number of graduate students continued its recent increase, going up by 0.8%.

Table 14. Number of People Supported on NSF Research Grants, by Recipient Type

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	% Change, 2006 - 2016
Senior Personnel Supported	23,186	26,176	26,494	33,536	33,650	35,523	39,862	32,829	31,650	33,831	35,326	52%
Postdocs Supported	4,023	4,034	3,909	5,580	4,653	4,751	4,596	4,447	4,286	4,586	4,460	11%
Graduate Students Supported	20,949	22,777	22,936	33,371	24,554	24,855	25,550	25,161	26,317	26,882	27,099	29%

Source: NSF Enterprise Information System, 10/01/16.

Appendix 9 provides data on the estimated number of individuals involved in activities supported by all NSF active awards, including senior researchers, post-doctoral associates, teachers, and students across all educational levels. The numbers of undergraduate students, K-12 students and K-12 teachers involved in NSF awards increased again in FY 2016.³³

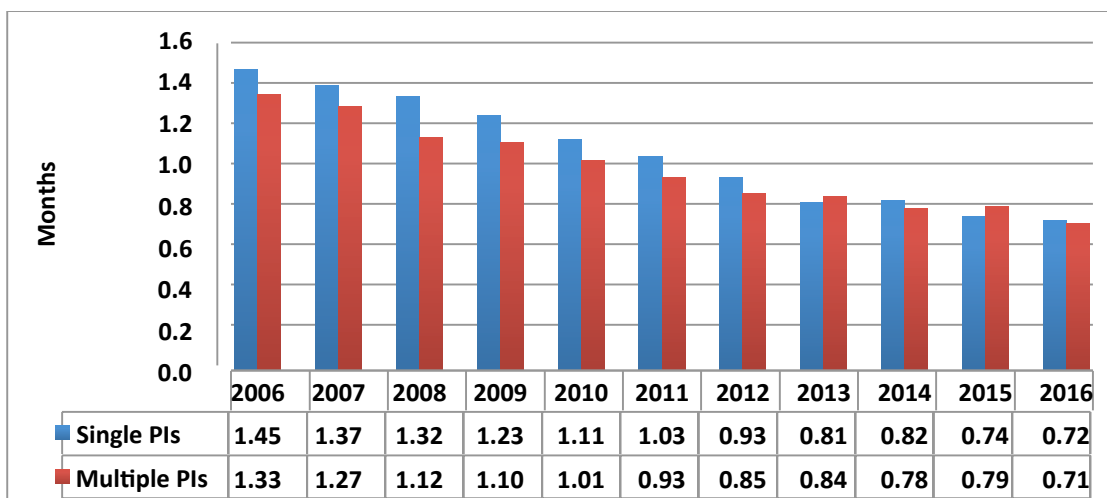
³² The research grant category does not include most individual post-doctoral fellowships and graduate student fellowship grants. However, the majority of NSF-supported post-doctoral associates and graduate students are supported as part of research grants.

³³ Beginning with Fiscal Year 2011, the methodology used to produce estimates of K-12 students involved was changed. See NSF FY2012 Agency Financial Report, Chapter 2, p. II-40 & 41 for more information.

F8. Average Number of Months of Budgeted Salary Support for Single-PI & Multiple-PI Research Grants

Figure 15 indicates the mean number of months of salary support per individual in the award budgets of single-PI and multiple-PI research grants. Months of salary support are for PIs and Co-PIs only. There has been a dramatic change in the past decade. Since FY 2002 (not shown), the average number of months of support has generally decreased for both single and multiple-PI awards. The per-person numbers for single and multiple-PI grants were comparable in 2003-2005, but from FY 2006 through FY 2012, PIs on multiple-PI awards consistently averaged fewer months of support than single PIs. Since then, the levels of support have been approximately equal for both types of grant, with the exception of 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. (See **Appendix 10** for directorate or office level data on months of support.) The per-individual months of support per grant has dropped considerably since the period prior to 2003, with the 2016 numbers being less than half of the 2002 numbers. The data by directorate in **Appendix 10** 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. CISE awards also have relatively low amounts of support for PIs.

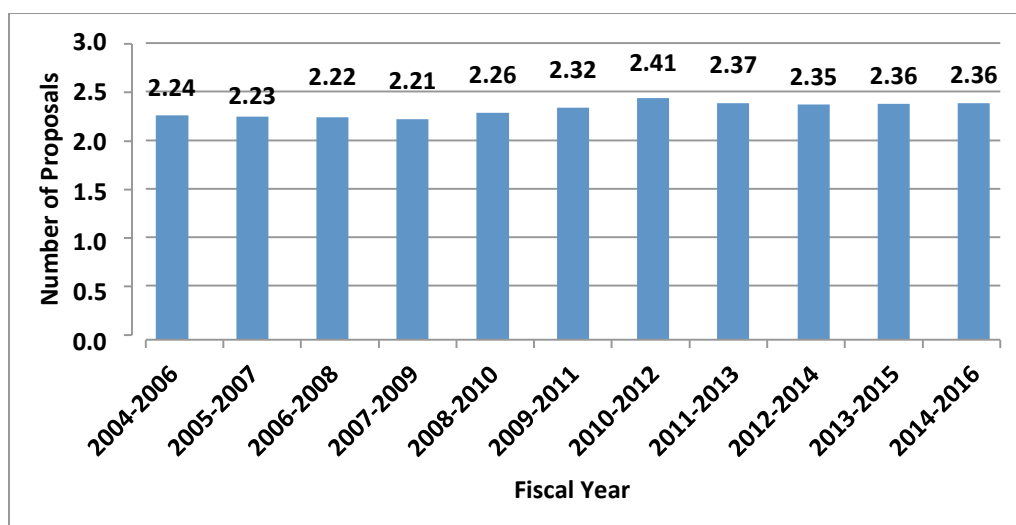
Figure 15. Average Number of Months of Salary for Single-PI & Multi-PI Research Grants



Source: NSF Report Server, 01/10/17.

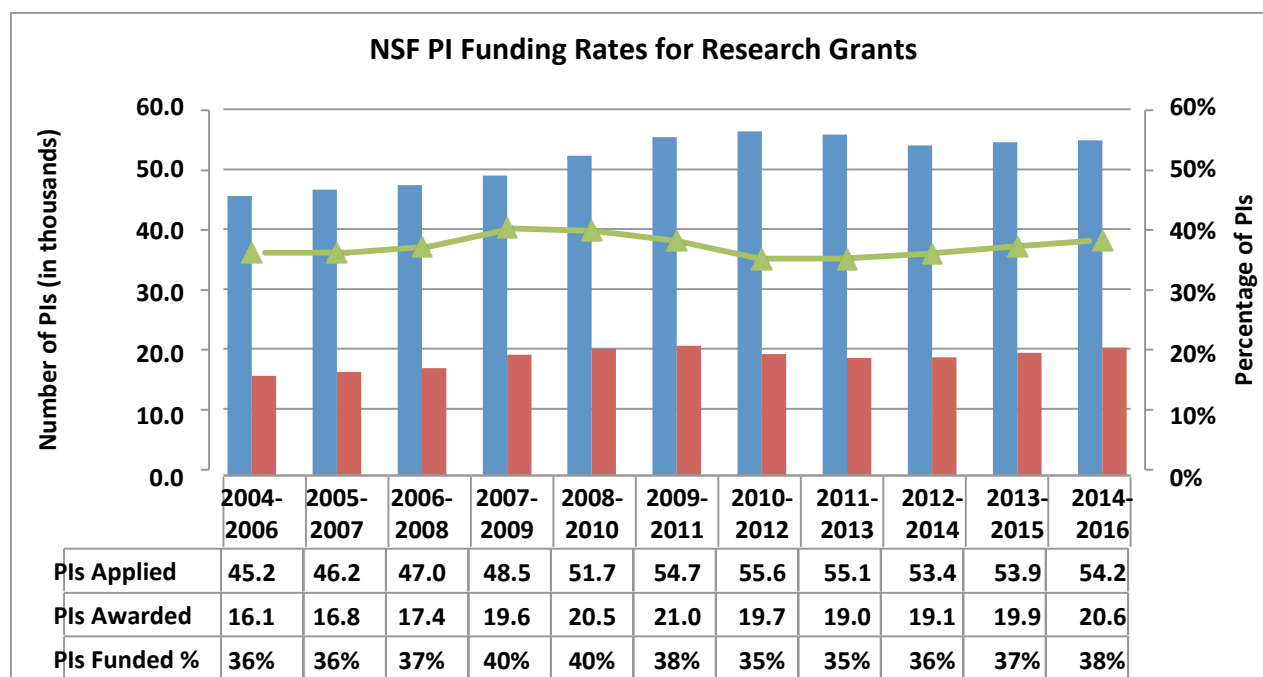
F9. Investigator Submission and Funding Rates

Figure 16 shows that, on average, the number of proposals an investigator submits before receiving an award has remained relatively constant for the past four years. This average is calculated across all PIs, including both new and previous PIs. **Appendix 11** provides a directorate-level breakout of the average number of research proposals per PI before receiving one award. This metric is largest for CISE, ENG and GEO. Note that the NSF average is higher than the value for the majority of directorates, suggesting that a number of people are submitting research proposals to multiple directorates before receiving an award.

Figure 16. Average Number of Research Proposals per PI before Receiving One Award

Source: NSF Enterprise Information System, 10/6/16.

Figure 17 shows the funding rate (the green curve) for investigators in a three-year period (the number of investigators receiving a grant divided by the number of investigators submitting proposals in the same three-year window). The number of investigators submitting proposals grew over the first part of the past decade causing the success rate of PIs to decline. The decline in PI success rate was temporarily reversed by the funds appropriated under ARRA but then resumed, reaching a low in FY 2011 – FY 2013. Since then, the rate has recovered to the level seen just over a decade ago.

Figure 17. NSF PI Funding Rates for Research Grants

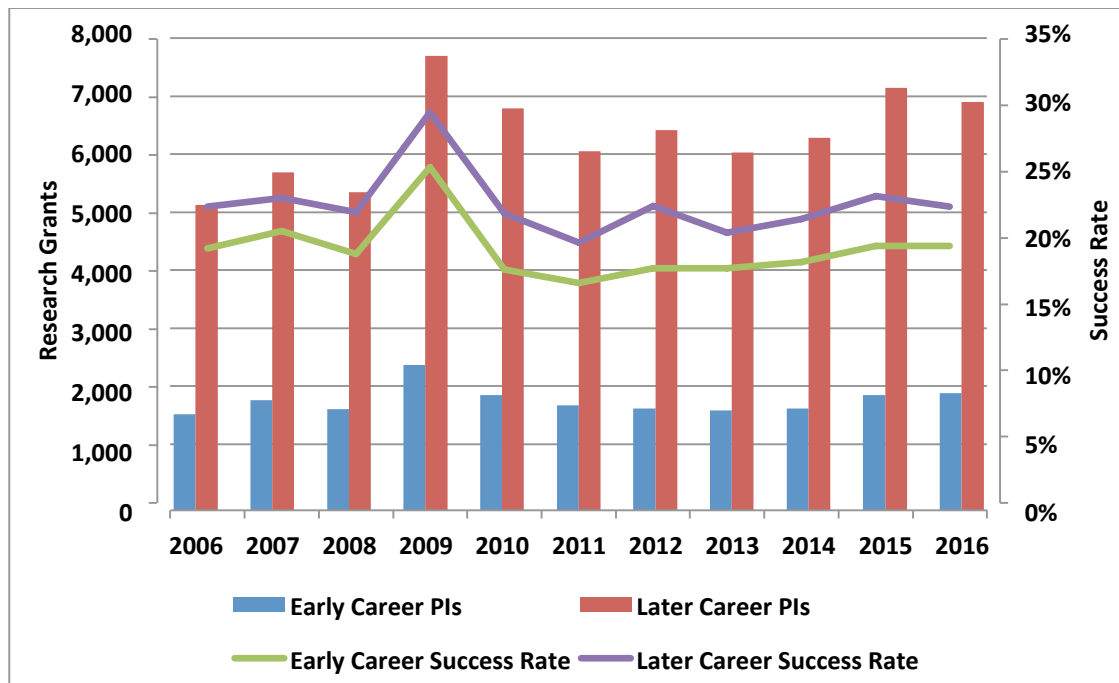
Source: NSF Enterprise Information System, 10/6/16.

In 2014-2016, 62% of PIs who submitted proposals during that three-year period did not receive any research award. This is better than the 64% seen in 2004 – 2006, even though the number of PIs who submitted proposals in 2014-2016 was 20% higher than the number in 2004-2006.

F10. Early and Later Career PIs

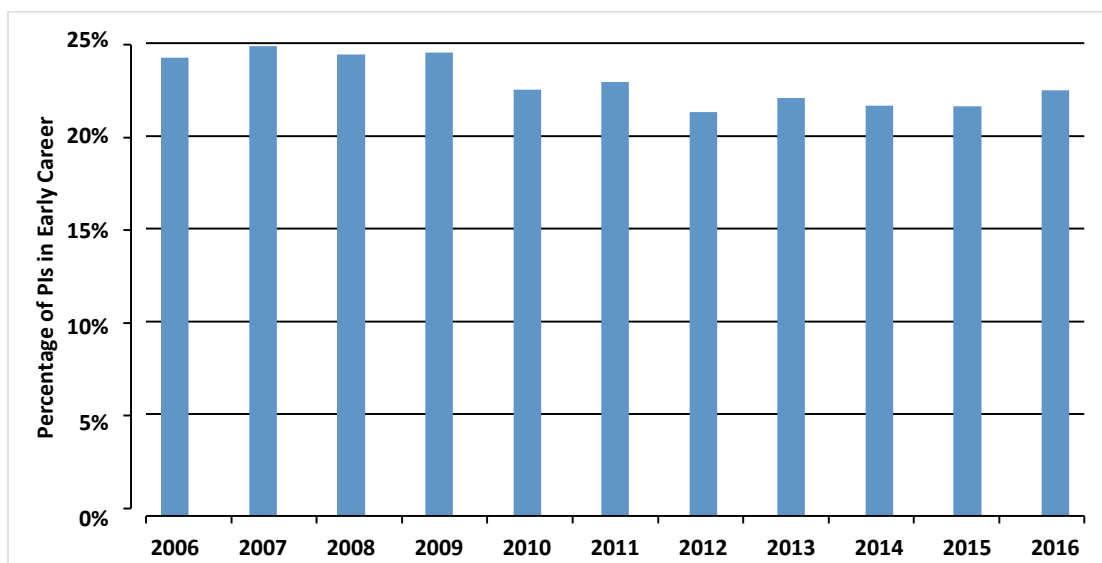
Figure 18 and **Figure 19** indicate the number and percentage of NSF PIs of research awards that are in the early or later stages of their careers. An early career PI is defined as someone within seven years of receiving his or her last degree at the time of the award. For the purposes of this report, PIs who received their last degree more than seven years before the time of their first NSF award are considered later career PIs.

Figure 18. Research Grants Awarded to PIs in Early & Later Stages of Career and Research Proposal Success Rates



Source: NSF Enterprise Information System, 10/01/16.

The success rate for early career PIs remained steady, but the success rate for later career PIs decreased in FY 2016, reducing the gap between the two slightly (**Figure 18**). The percentage of research awards to early career PIs increased to 22%, from 21% in FY 2015 (**Figure 19**).

Figure 19. Relative Proportion of PIs in Early Stage of Careers

Source: NSF Enterprise Information System, 10/01/16.

F11. Mechanisms to Encourage Transformative Research

The March 2007 NSB report, *Enhancing Support of Transformative Research at the National Science Foundation* (NSB 07-32), has been instrumental in informing NSF's efforts to promote and support potentially transformative research. The statement of the Intellectual Merit review criterion was modified, effective January 5, 2008, to make explicit reference to transformative research. An Important Notice, No. 130, was sent on September 24, 2007, from the NSF Director to presidents of universities and colleges, and heads of other NSF grantee organizations, to inform the community of the change in the merit review criteria and NSF's effort to promote and support potentially transformative concepts.

All NSF programs encourage and support potentially transformative research proposals. NSF also has several mechanisms particularly developed to encourage the submission of certain types of potentially transformative research proposals. These include EARly-concept Grants for Exploratory Research (EAGER), Creativity Extensions, and Accomplishment-Based Renewals.³⁴ Information on the latter two types of awards may be found in **Appendix 21**.

F11.1 Small Grants for Exploratory Research (SGER), EARly-concept Grants for Exploratory Research (EAGER) and Grants for Rapid Response Research (RAPID)

From FY 1990, the Small Grants for Exploratory Research (SGER) option permitted program officers throughout the Foundation to make small-scale grants without formal external review. Effective January 2009, the SGER funding mechanism was replaced by two separate funding

³⁴ 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. This is 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.

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.

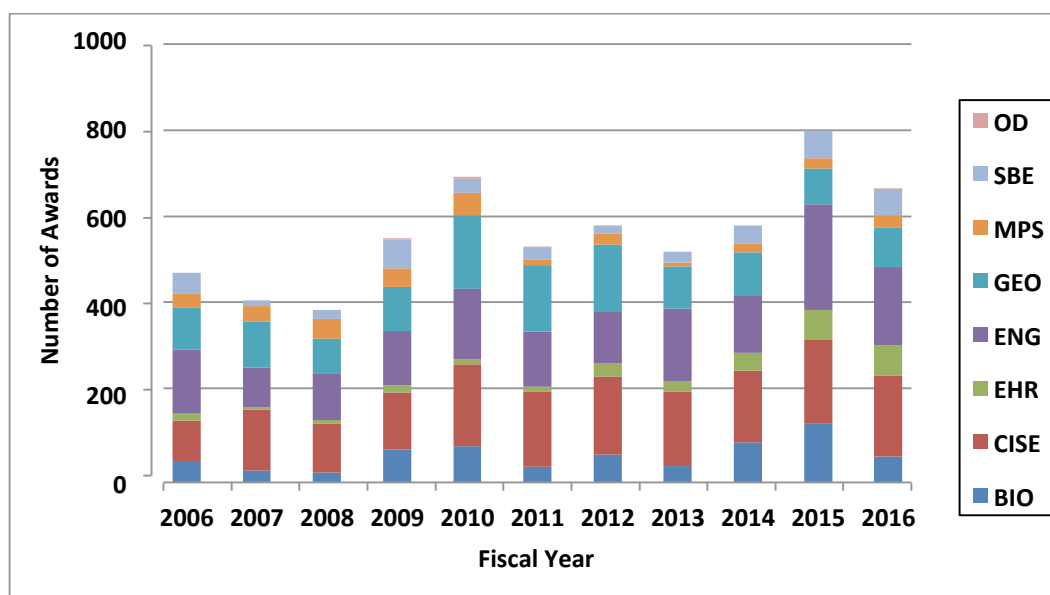
- **Grants for Rapid Response Research (RAPID)**

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

Only internal merit review is required for EAGER and RAPID proposals. Program officers may elect to obtain external reviews to inform their decision. If external review is to be obtained, then the PI is informed of this.

Figure 20 shows the change in SGERs, EAGERs and RAPIDs from 2006 to 2016 by Directorate. Additional information on SGERs, RAPIDs, and EAGERs can be found in **Appendix 12**. For years prior to FY 2013, OPP and OCI data are included in the numbers for GEO and CISE. Data for OISE and OIA are combined into the category OD, barely visible in **Figure 20**.

Figure 20. SGER, EAGER and RAPID Awards, by Directorate or Office



Source: NSF Enterprise Information System, 10/01/16.

In FY 2009, the total number of SGER, RAPID and EAGER awards was 550, slightly higher than in previous years. FY 2010 saw an increase in the total, to 689, primarily because of RAPIDs awarded to enable researchers to respond to unusual events (earthquakes in Haiti and Chile, and the Gulf of Mexico oil spill). The total number of EAGER and RAPID awards decreased to 531 in FY 2011 and fluctuated in the three subsequent years. Notwithstanding the year-to-year fluctuations, the number of these awards in each year of the period FY 2009 – FY 2014 (annual mean = 575) was larger than anytime during the period FY 2004 – FY 2008 (annual mean = 408), before EAGER and RAPID awards were introduced. In FY 2015, the number of such awards increased to almost 800 but in FY 2016 it fell back to 663. Both FY 2015 and FY 2016 saw a larger number of EAGER proposals received than in prior years. The success rate for EAGER proposals continued the downward trend seen in recent years, declining to 68% from 79% in FY 2015, 86% in FY 2014, and 90% or more in the preceding four years.

There is a considerable variation across directorates in the use of EAGER and RAPID awards. (See **Appendix 12.**) For example, during the past two 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.

In their use of EAGER and RAPID awards, the directorates fall into two clusters (see **Table 15**). Since their introduction, CISE, ENG and GEO have made 28%, 25% and 19% of the EAGER and RAPID awards, accounting for almost three-quarters of these awards. BIO, SBE, EHR and MPS have made 12%, 6%, 6% and 4%. BIO, CISE and MPS tend to make larger EAGER and RAPID awards. GEO tends to make smaller EAGER and RAPID awards, on average.

Table 15. Investments in EAGER and RAPID awards since inception, by directorate

	CISE	ENG	GEO	BIO	SBE	MPS	EHR
% of FY 09-16 awards	28.0%	25.1%	18.8%	11.7%	6.4%	4.1%	5.6%
FY 09-16 investment (\$ million)	221	144	77	106	30	36	53
FY 16 investment (\$ million)	34.6	23.9	8.7	13.2	6.2	6	9.6
Mean FY 16 award (\$ thousand)	191	136	97	224	104	224	139

F11.2 Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) Awards

FY 2012 saw the inauguration of the **Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)** program. INSPIRE was intended to support transformative, cross-disciplinary science, creating a new type of funding opportunity. INSPIRE was designed to attract unusually creative, high-risk / high-reward interdisciplinary proposals. No favored topics were designated, and the funding opportunity was open to innovative, interdisciplinary proposals that fall within the overall span of NSF-supported areas of science, engineering, and education research. Program managers were encouraged to use new tools, collaboration modes, and techniques in the merit review process to widen the pool of prospective discoveries. The program created new interdisciplinary research opportunities. The parameters of the program evolved during the years of its existence.

In FY16, 12 INSPIRE awards were supported at an average award size of \$856K. These awards totaled \$10.28M, with OIA co-funding comprising \$3.38M of that total. All directorates co-funded at least one INSPIRE, with most co-funding multiple awards. OISE co-funded two INSPIRE awards. At the division level, 15 divisions supported at least one INSPIRE award. Directorate funding came from a combination of programmatic and central directorate or division funds. Two INSPIRE proposals were declined.

Reflecting the interdisciplinary nature of these projects, all INSPIRE awards were supported by at least two different units within NSF.³⁵

F12. Multi-Panel Review and Inter-Divisional Co-Funding

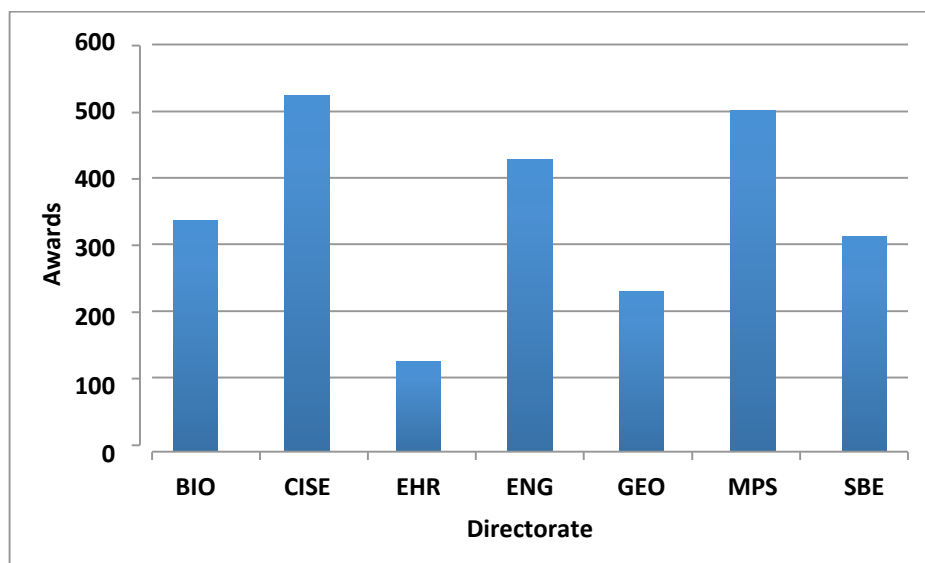
NSF does not ask PIs to identify formally whether or not a proposal is interdisciplinary, and it is not possible currently to make a direct count of the number of interdisciplinary proposals NSF receives. Indeed, a precise definition of interdisciplinarity is elusive³⁶ and likely to be time-dependent. For example, a research area that, when it emerges, straddles the boundary of two different disciplines may, over time, come to be recognized as a new discipline. However, one can examine a number of characteristics of proposals, awards and the review process that may have operational utility by providing information on proposals that cross the boundaries of NSF's established program areas. This section of the report describes two such characteristics.

Inter-Divisional Co-funding

One indicator of the number of interdisciplinary awards is the number of awards that are funded by more than one part of NSF. **Figure 21** shows the distribution of co-funding for research awards that received funding from more than one division at NSF in FY 2016.

³⁵ In FY 2013, guidance on submission to the INSPIRE program was provided by the solicitation NSF 13-518. This included two different main proposal tracks. INSPIRE Track 1 awards were limited to a maximum award size of \$1,000,000, a maximum duration of five years and must be substantially co-funded by *two* or more intellectually distinct NSF divisions or programs. INSPIRE Track 2 awards were for mid-scale, interdisciplinary projects and could be for up to \$3,000,000 with a maximum duration of five years. Guidance for FY 2015 INSPIRE proposals was instead provided by a Dear Colleague Letter, NSF 14-106. The Track 1 and 2 categories were eliminated and the limitations on size and duration were similar to those for the former Track 1 category. For FY 2016, a further Dear Colleague Letter was issued, NSF 16-023; the limits on award size and duration were unchanged.

³⁶ Multiple definitions of interdisciplinarity appear in the literature as well as debate over the distinction between multidisciplinary, interdisciplinary and transdisciplinary. Nor is there a universally accepted definition of "discipline." In a 2005 report, the National Research Council noted that, "No single definition is likely to encompass the diverse range of activities that have been described under the heading of IDR [Interdisciplinary Research]." The report provided the following description: "Interdisciplinary research (IDR) is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or field of research practice." (From "Facilitating Interdisciplinary Research," National Academies Press, 2005.)

Figure 21. FY 2015 Awards Co-funded

Source: NSF Enterprise Information System, 10/01/16 and 6/27/17.

The total number of unique, co-funded research awards included in **Figure 21** is 1,051, which is approximately 12% of FY 2016 research awards. 383 of these awards are co-funded wholly within a directorate. The average number of divisions contributing to a co-funded award is 2.3.³⁷ Co-funding associated with EPSCoR or international activities does not, of itself, imply interdisciplinary proposal content and is not included in **Figure 21**. 17 of the awards in the figure were also co-funded by OISE and 13, by EPSCoR.

Multi-Panel Review

Interdisciplinary proposals are reviewed in a variety of ways. A relatively small fraction of them are reviewed by multiple panels. One question of interest is whether review by more than one panel leads to a lower success rate than review by a single panel.

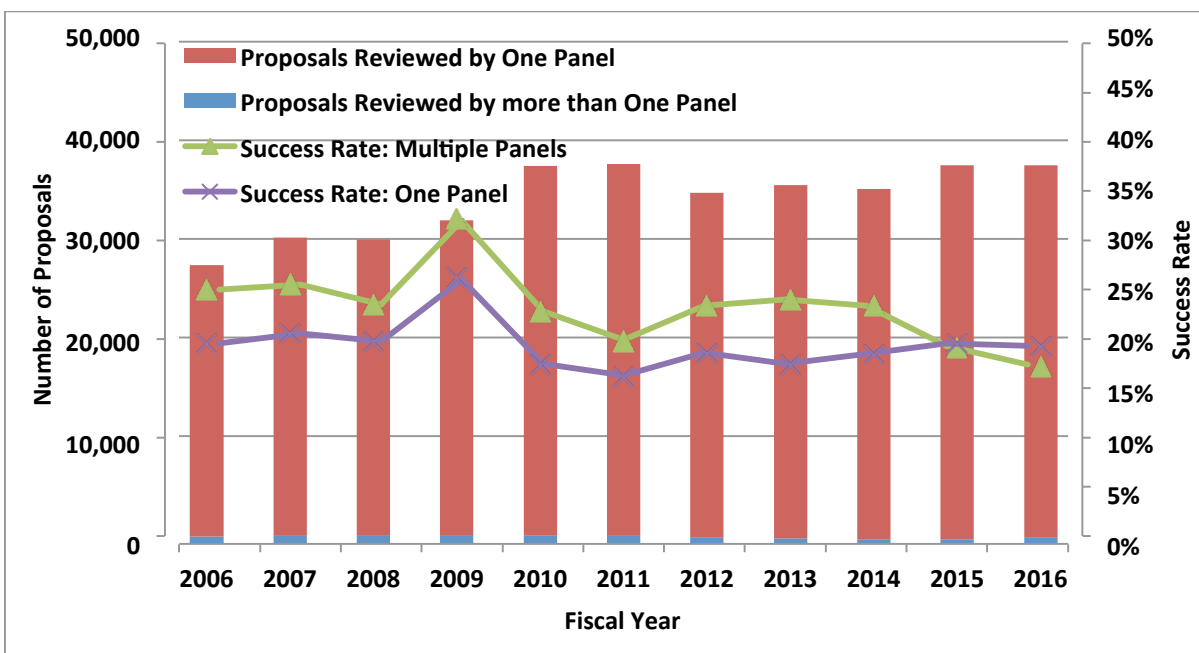
Among proposals reviewed by panels, **Figure 22** shows the number of research proposals that were considered by one panel (red bars), the number reviewed by more than one panel (blue bars), the success rate for single-panel review (purple line), and the success rate for multi-panel review (green line).

The proportion of empanelled proposals going through multi-panel review is small (1.6% of the total in FY 2016). This number was 2.7% in FY 2006 and declined nearly every year since then

³⁷ In **Figure 21**, awards appear once for each distinct funding source at the level of a division. Awards that receive co-funding from distinct divisions within the same directorate are included. (E.g., an award co-funded by the Division of Physics and the Division of Chemistry would be counted twice in the MPS total.) Many directorates have special divisions or offices that help promote multi-disciplinary activities within a directorate. These are counted as a separate funding source in **Figure 21** when they co-fund with another part of the directorate. However, projects funded solely by such an office are not included. The figure does not include co-funding by different programs within the same division.

through FY 2015 (1.2%) before increasing in FY 2016. Most multidisciplinary proposals are not reviewed by multiple panels. In the past, the success rate for proposals reviewed by more than one panel was consistently 4 to 6 percentage points higher than the rate for proposals that were only reviewed by a single panel; however that changed in FY 2015 and in FY 2016 the success rate for proposals reviewed by multiple panels was 2 percentage points lower than the rate for proposals reviewed only by a single panel.

Figure 22. Proposals Undergoing Single- and Multi-Panel Reviews and their Success Rates



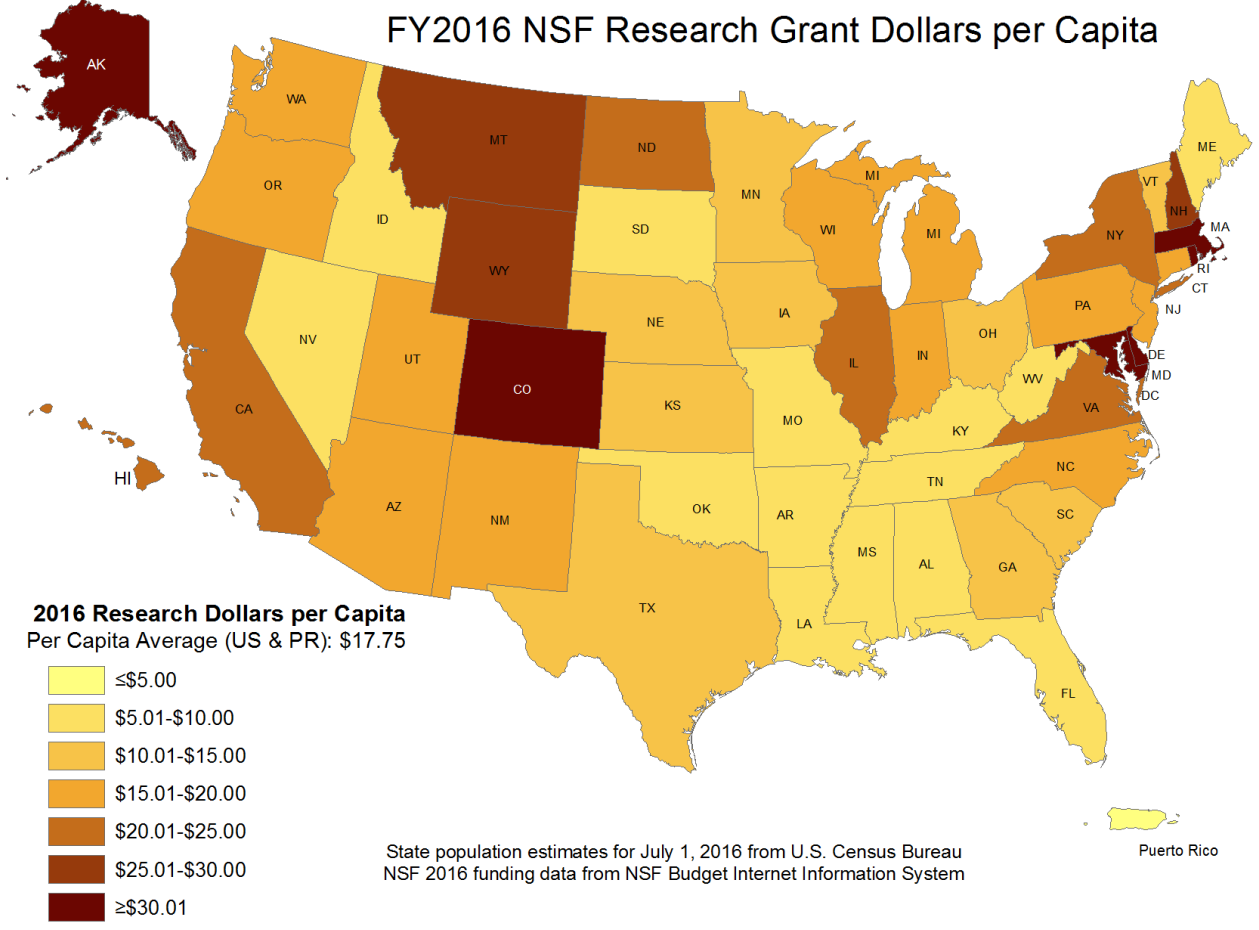
Source: NSF Enterprise Information System, 4/10/17.

F13. Geographic Distribution of Research Awards

Figure 23 shows the distribution of the total value of NSF research funds awarded in FY 2016 by state.³⁸ In **Figure 23**, the shading indicates the NSF research support by state for FY 2016 normalized by population, based on state population estimates for July 1, 2016 from the U.S. Census Bureau. The darker colors indicate a higher amount of funding per capita. The national average (mean) amount per capita is \$17.75. The median of FY 2016 funding per capita in the various states, the District of Columbia and Puerto Rico is \$16.28 per capita.

³⁸ Data on research funding were accessed from the NSF Budget Internet Information System on 6/10/2017. The data include both new awards and the FY 2016 annual increments for continuing grants and cooperative agreements. Data for the District of Columbia are not shown on the map.

Figure 23. NSF Research Support per Capita



IV. The NSF Merit Review Process

A. Merit Review Criteria

In FY 1998, the National Science Board approved the use of the two NSF merit review criteria. In 2007, the NSB modified the criteria to promote potentially transformative research. In December 2011, the NSB completed a review of the merit review criteria. The outcome of that review was to retain the existing two NSF merit review criteria but to revise the elements to be considered by reviewers in the application of those criteria.³⁹ In addition, the NSB articulated principles upon which the two Merit Review Criteria are based. The language in the *Proposal and Award Policies and Procedures Guide*, describing the merit review criteria and the principles on which they are based, was revised in October 2012 to incorporate the recommendations from the National Science Board.⁴⁰ This revised language applied to proposals submitted on or after January 14, 2013, or in response to deadlines that were on or after January 14, 2013, and is reproduced in **Appendix 13**.

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

Effective October 1, 2002, NSF returned without review proposals that failed to separately address both merit review criteria within the Project Summary. In addition, proposals are returned without review if they duplicate an existing award, are not responsive to the funding opportunity to which they were submitted, do not comply with the requirements of the *Proposal and Award Policies and Procedures Guide* and/or specific solicitation, as well as in a number of other circumstances.

B. Description of the Merit Review Process

The NSF merit review process includes the steps listed below and is depicted in **Figure 24**:

- The proposal arrives electronically and is assigned to the appropriate program(s) for review. Some programs also include preliminary proposals as part of the application process. See **Appendix 2** for more information about preliminary proposals. Proposals that do not comply with NSF regulations, as stated in the *Proposal and Award Policies and Procedures Guide*, may be returned without review. (See **Table 16** and **Appendix 14**.)
- The review process is overseen by a division director, or other appropriate NSF official.

³⁹ “The National Science Foundation’s Merit Review Criteria: Review and Revisions.” (2011) NSB/MR-11-22.

⁴⁰ The NSF *Proposal and Award Policies and Procedures Guide* (PAPPG) applicable from December 26, 2014, to January 25, 2016, is available at: http://www.nsf.gov/pubs/policydocs/pappguide/nsf15001/nsf15_1.pdf. The version of the PAPPG applicable for the remainder of FY 2016 may be found at: https://www.nsf.gov/pubs/policydocs/pappguide/nsf16001/nsf16_1.pdf.

- The program officer (or team of program officers) is responsible for the following:
 - Reviewing the proposal and determining the appropriate level of merit review. (Some proposals do not require external review. These include, for example, EAGER, RAPID, INSPIRE Track 1, RAISE, and proposals for small conferences, workshops, or symposia.)
 - Selecting ad hoc reviewers and panel members. Selection may be based on the program officer's knowledge, references listed in the proposal, individuals cited in recent publications or relevant journals, presentations at professional meetings, reviewer recommendations, bibliographic and citation databases, or proposal authors' suggestions.
 - Checking for conflicts of interest. In addition to checking proposals and selecting 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 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, taking into account external reviews, panel discussion, and other factors such as portfolio balance and the amount of funding available.

Table 16. Proposals Returned Without Review (RWR)

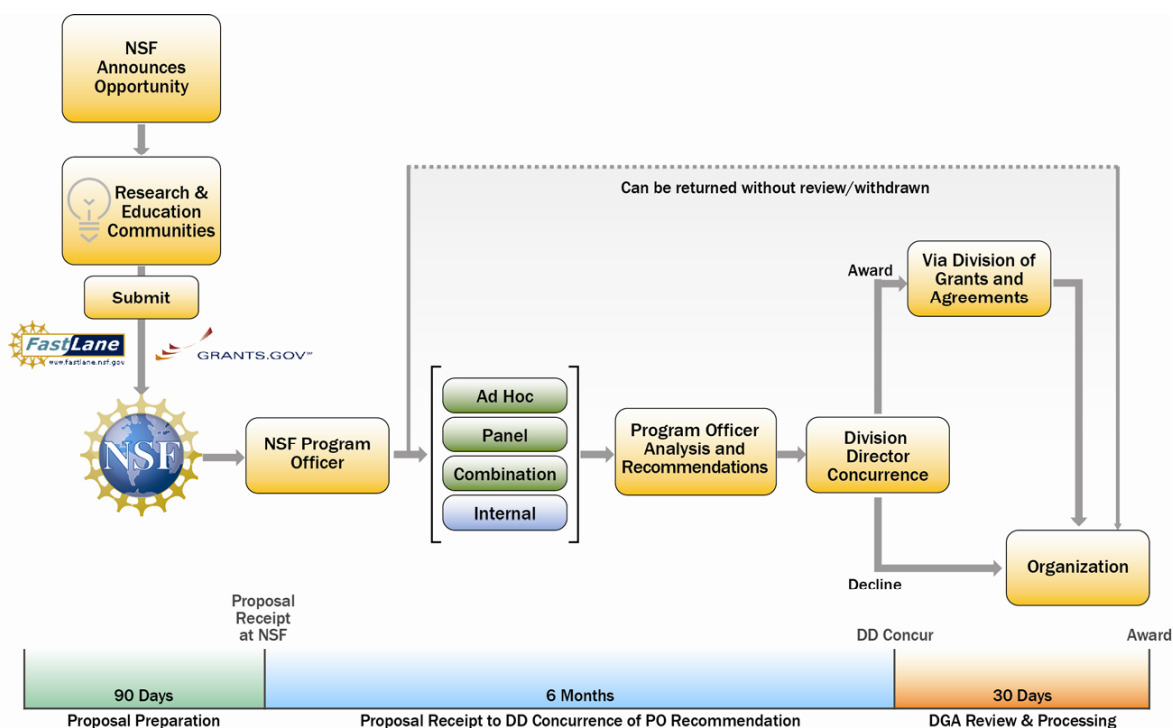
Fiscal Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Number of Proposals RWR	1306	1505	1287	1741	2628	1794	1813	1871	1659	1843	1399
Percent of all Proposal Decisions	3.0%	3.3%	2.8%	3.7%	4.5%	3.4%	3.6%	3.7%	3.3%	3.6%	2.8%

Source: NSF Enterprise Information System, 10/01/16.

The division director, or other appropriate NSF official, reviews all program officer recommendations. 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 (prior year current plan). The National Science Board (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.⁴¹ In FY 2016, the NSB authorized 7 funding items: 5 new awards, 1 increase to an existing award, and 1 transfer of previously authorized funds to a new awardee.

⁴¹ Other items requiring NSB prior approval include new programs that either represent a substantial investment of Program resources (threshold defined as the total awards to be made by the proposed Program in a given fiscal year exceed 3% of the awarding Directorate's or Office's prior year current plan) or are to be funded as an ongoing Foundation-wide activity, major construction projects that meet certain specifications, as well as programs and awards involving policy issues.

Figure 24. Diagram of the NSF Merit Review Process



After a division forwards an award recommendation to the Office of Budget, Finance, and Award Management (BFA), a grants and agreements officer performs an administrative review of the recommendation. If the results of this review are satisfactory, BFA makes the award.

NSF has several oversight and advisory mechanisms relevant to the merit review process:

- External Committees of Visitors (COV), the membership of which is comprised of scientists, engineers, and educators, assess each major NSF program every 4-5 years. COVs examine the integrity and efficiency of merit review processes and the structure of the award portfolio.
- NSF directorates and offices have Advisory Committees comprised of scientists, engineers, administrators, and educators, from academia, other non-profit organizations, and industry. One of the tasks of these Advisory Committees is to review COV reports and responses from directorates and offices in order to provide guidance to the Foundation. The COV reports and NSF responses are publicly available on the NSF website.
- An external contractor performs an independent verification and validation of programmatic performance measurements, which include aspects of the merit review process.

Additional information about COVs and NSF Advisory Committees is given in **Appendix 15**.

C. Program Officer Award/Decline Recommendations

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

NSF program officers are experts themselves in the scientific areas that they manage. They have advanced educational or professional training (e.g., a Ph.D., P.E., or equivalent credentials) in science or engineering and relevant experience in research, education, and/or administration. They are expected to produce and manage a balanced portfolio of awards that addresses a variety of considerations and objectives. When making funding recommendations, in addition to information contained in the external proposal reviews, NSF program officers evaluate proposals in the larger context of their overall portfolio and consider issues such as:

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

In addition, decisions on a given proposal are made considering 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, copies of all reviews used in the decision with reviewer-identifying information redacted, and a copy of the panel summary (if a panel review was conducted). A "context statement" is also sent that explains the broader context within which any given proposal was reviewed. Program officers are expected to provide additional communication (either in writing or by phone) to proposers in the case of a decline recommendation, if the basis for the decision is not provided in the panel summary.

If, after receiving the reviews and other documentation of the decision, an unsuccessful proposer would like additional information, he or she may ask the program officer for further clarification. If, after considering the additional information, the applicant is not satisfied that the proposal was fairly handled and reasonably reviewed, he or she may request formal reconsideration. Information about the reconsideration process is included in decline notifications.⁴² A reconsideration request can be based on the applicant's perception of procedural errors or on disagreements over the substantive issues dealt with by reviewers. If the relevant NSF assistant

⁴² Certain types of proposal actions are not eligible for reconsideration. See NSF *Proposal and Award Policies and Procedures Guide* (PAPPG) at http://www.nsf.gov/pubs/policydocs/pappg17_1/pappg_4.jsp#IVD.

director or office head upholds the original action, the applicant's institution may request a second reconsideration from the Foundation's Office of the Deputy Director.

NSF declines approximately 37,000 – 38,000 proposals per year but usually receives only 30-50 requests for formal reconsideration annually. The number of requests for formal reconsideration and resulting decisions at both the Assistant Director and Deputy Director levels from FY 2006 through FY 2016 are displayed in **Appendix 16**. NSF received 25 formal reconsideration requests in FY 2016; all 25 decline decisions were upheld (one of them, in FY 2017).

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* (PAPPG), proposals usually receive at least three external reviews. Under some circumstances, the requirement for external review can be waived.⁴³

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 written comments 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 to discuss their reviews and provide advice as a group to the program officer.

Many proposals submitted to NSF are reviewed using some combination of these two processes. Those 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 and 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 17**.⁴⁴

⁴³ Exemptions that program officers may choose to exercise, for example, include proposals for EAGER, RAPID, RAISE, some INSPIRE proposals, and certain categories of workshop and symposia proposals. See **Appendix 12** for more information about EAGER and RAPID proposals.

⁴⁴ The table only shows 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 which is 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.

Table 17. Reviews per Proposal, FY 2016

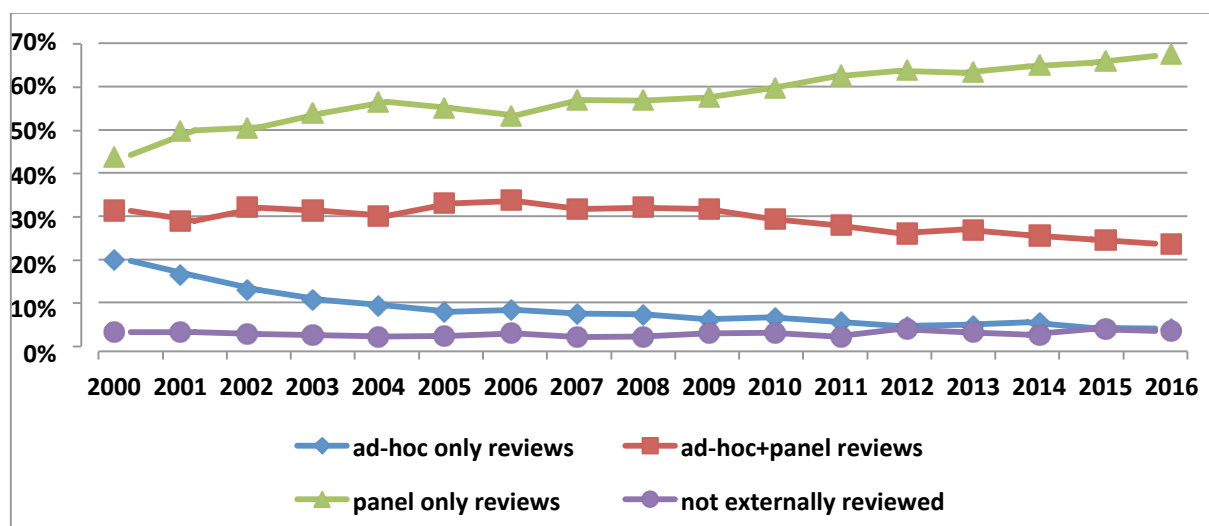
	All Methods	Ad Hoc + Panel	Ad-Hoc-Only	Panel-Only
Reviews*	178,907	56,330	9,105	113,458
Proposals	47,017	11,827	2,375	32,815
Rev/Prop	3.8	4.8	3.8	3.5

Source: NSF Enterprise Information System, 10/01/16.

The ad-hoc-plus-panel method had the highest number of reviews per proposal, averaging 4.8, while the panel-only method averaged 3.5. Directorate-level data for FY 2016 are presented in **Appendix 17**.

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

The use of various review methods has changed markedly over time, as shown in **Figure 25**. The data for FY 2006 - 2016 are provided in **Appendix 18**, and **Appendix 19** provides FY 2016 data on the review methods used by directorates and offices. **Appendix 20** shows the average review ratings that result from the different methods of review.

Figure 25. FY 2000-2016 Trend, NSF Review Method

Source: NSF Enterprise Information System, 10/01/16.

There are a number of reasons for the trends in **Figure 25**. Panels allow reviewers to discuss and compare proposals. The panel review process has the advantage that different perspectives can be discussed and integrated, if appropriate. Panels tend to be used for programs that have deadlines and target dates, as opposed to unrestricted submission windows. Using only panels in the review process tends to reduce proposal processing time (time-to-decision), compared to ad

* Only written reviews prepared by individuals, whether an ad hoc reviewer or a panelist, are counted in **Table 17**.

hoc only reviews. For example, in FY 2016, 80% of all proposals reviewed by panel only were processed within six months, compared to 68% for ad hoc + panel and 61% for ad hoc only.⁴⁵

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.

In-person review panels have some drawbacks. For example, some qualified individuals may find it difficult to be absent from home or work for the several days that might be required to travel to NSF and participate in a panel. In addition, the average number of proposals that a panelist is asked to review in a funding cycle is considerably higher 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.

In recent years, “virtual panels” have emerged as an alternative to in-person review panels. In FY2016, approximately 28%⁴⁶ of panels at NSF were held virtually and 32% of panelists participated virtually. Virtual panels can help address some of the drawbacks noted with in-person panels, while retaining the comparative analysis provided by a panel review. In addition, virtual panels offer NSF staff and panelists greater flexibility in structuring the panel review. In virtual panels, panelists participate from their remote locations and interact using NSF’s Interactive Panel System (IPS), accompanied by a teleconference, videoconference, or a virtual world system such as Second Life. Use of virtual panels supports NSF’s efforts to improve career-life balance and broaden the participation of highly qualified individuals in the review process. Examples of groups who may face difficulties participating in in-person review panels include: researchers with young children or who provide elder care; researchers with disabilities that make travel difficult or whose home environment provides special assistive technologies; and researchers with heavy teaching commitments or other work commitments that would make a two-day or three-day absence difficult. **Figure 26** shows the number of proposals reviewed by different types of panels since FY 2006 and the proposal ratings by panel review type (in-person, virtual, and mixed).⁴⁷ Mixed panels are panels in which some reviewers participate in person and some use a telephone or video connection to participate from a remote location. Mixed panels tend to have more complicated social dynamics and can be more difficult to moderate; however, they can be useful in broadening participation in the review process or when unforeseen events prevent a reviewer from travelling to an in-person panel.

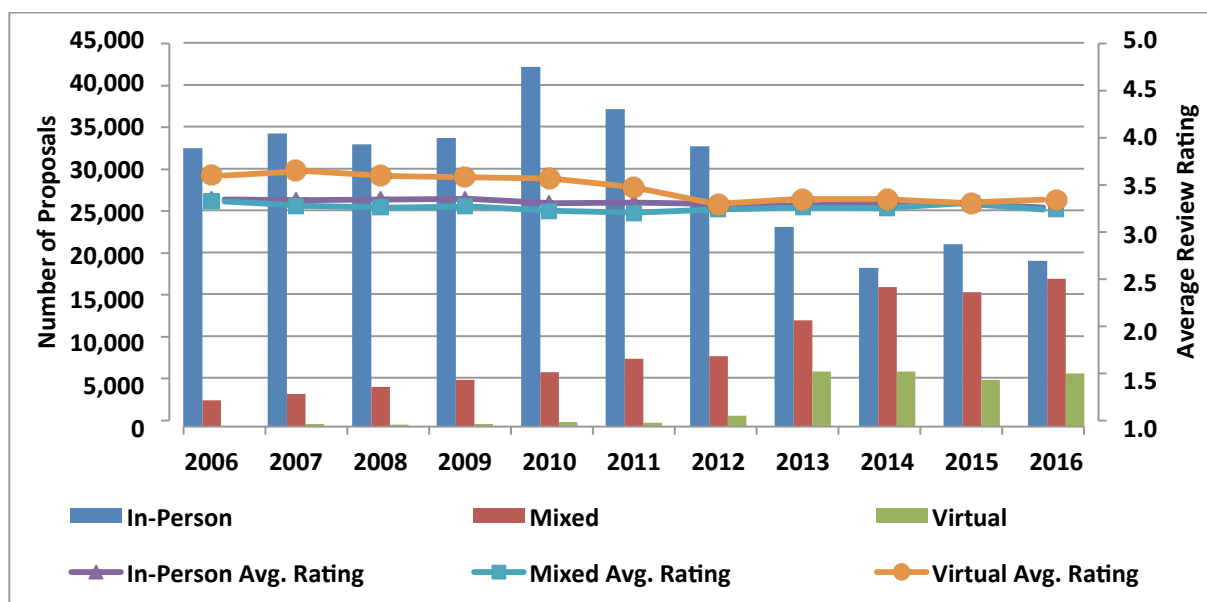
The fundamental mode of operation of panels is the same whether they are virtual, in-person or mixed; however, for a number of reasons, NSF believes that the use of a virtual panel approach works best when the size of the panel and the number of proposals considered are relatively small. This is reflected in the data for the three types of panels shown in **Table 18**.

⁴⁵ The lower value for “ad hoc only” may be a reflection of the fact that a number of the programs that use this method do not have submission deadlines, rather than a direct consequence of the method of obtaining reviews.

⁴⁶ Data provided by NSF’s Division of Administrative Services. They include virtual panels used by the Graduate Research Fellowship Program, which exclusively uses this approach.

⁴⁷ For consistency with prior years’ reports, we repeat the practice of basing this figure on a subset of the competitively reviewed proposals from which certain proposals, such as fellowship proposals, have been excluded.

Figure 26. FY 2005-2015 Usage and Proposal Rating by Panel Review Type⁴⁸



Source: NSF Enterprise Information System, 10/01/16 and 04/19/2017. In FY 2006, the number of proposals reviewed by virtual panels is below 100 and imperceptible on the figure.

Table 18. Data on Virtual, Mixed and In-Person Panels held in FY 2016⁴⁹

	Virtual	Mixed	In-Person	TOTAL
Panels	466	675	741	1882
Proposals*	6768	20733	22773	50274
% of Total Panels	24.8%	35.9%	39.4%	100.0%
% of Total Proposals	13.5%	41.2%	45.3%	100.0%
Proposals/Panel	14.5	30.7	30.7	26.7
Panelists	2653	6705	6829	16187
Panelists/Panel	5.7	9.9	9.2	8.6
Proposals/Panelist	2.6	3.1	3.3	3.1

* Proposals reviewed by more than one panel are counted once for each panel to which they went. Collaborative projects are only included once for each panel in which they are reviewed. Individual reviewers are counted once for each panel on which they serve.

Because virtual panels, on average, review fewer proposals per panel than in-person panels (averaging 14.5 and 30.7, respectively), only 13.5% of proposals that were reviewed by panels went through virtual panels in FY 2016.

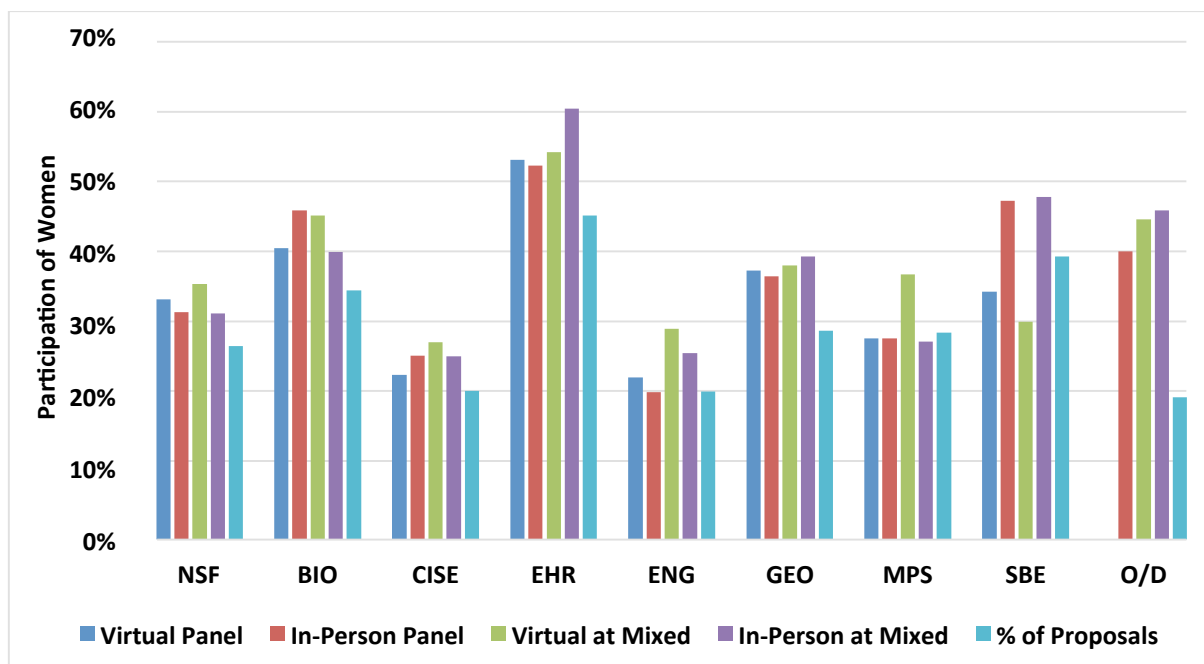
In addition to avoiding the burden of travel to NSF, virtual panelists are also, on average, assigned a smaller workload than in-person panelists.

⁴⁸ As in previous years, the data in **Figure 26** correspond to panels that reviewed proposals that were recommended for award or decline by division directors in the stated fiscal year. Thus, for example, some of the panels associated with FY 2016 occurred prior to the beginning of FY 2016 and some of the panels that occurred late in FY 2016 are not associated with FY 2016 because proposals from these panels were not recommended until FY 2017.

⁴⁹ Unlike **Figure 26**, the data in this table include only those panels that took place in the given fiscal year. Panels reviewing items not assigned proposal numbers are excluded. Panels reviewing preliminary proposals are included.

As noted earlier, demographic data for reviewers are relatively sparse. This is particularly true for race, ethnicity and disability status. However, information on the gender of panelists is more complete and is summarized in **Figure 27**.

Figure 27. Participation of Female Reviewers in Different Types of Panels during FY 2016⁵⁰



Source: NSF Enterprise Information System, 6/26/17.

Of the 16,187 panelists⁵¹ in FY 2016, gender information was available for 79.3%. This permitted an examination of whether there was any significant difference between the ratio of male and female panelists in virtual panels and that in in-person panels. Amongst panelists for whom gender information was recorded, 31.5% of panelists on in-person panels and 33.3% of panelists on virtual panels were women. For both types of panels, women participate at a slightly higher rate than their representation amongst proposers (26.9% for competitive proposals and 26.4% for research proposals).

Mixed panels exhibit a difference between the demographics of those panelists who attend in-person and of those who participate virtually. Averaging across all of the mixed panels in FY 2016, 77.5% of panelists attended in person and 22.5% attended virtually. Looking only at those panelists for whom gender information was available, 31.4% of the panelists who attended in-person were women while 35.4% of panelists who participated virtually were women. The difference seen in the demographics of in-person and virtual participation in mixed panels in FY

⁵⁰ The reviewer participation data include only those panels that took place in the given fiscal year, FY 2016. Also shown is the percentage of competitively reviewed proposals with award or decline actions approved by division directors in FY 2016 that came from female PIs.

⁵¹ Because some reviewers serve on more than one panel, this number represents 13,704 distinct individuals.

2016 is smaller than in FY 2015, although this difference is statistically significant.⁵² The most prominent changes are: (a) an increase in the proportion of women participating in in-person EHR panels (from 47.6% in FY 2015 to 51.9% in FY 2016); (b) changes in the virtual participation rates for women in SBE (the rate of participation in virtual panels declined from 35.6% to 34.4%, while the rate of participation virtually in mixed panels fell from 52.8% to 30.2%); and (c) the decline in the rate of participation of women in virtual panels in BIO (from 56.4% in FY 2015 to 45.0% in FY 2016).

Both in-person and virtual panels use the Interactive Panel System (IPS). A part of FastLane, IPS permits the viewing of proposals, reviews, basic panel discussions, collaboration on panel summaries, and approval of the draft panel summary through the World-Wide Web. It can also be used to support asynchronous discussions between reviewers.

As noted above, videoconferencing is used by some programs to enhance the participation of virtual panelists. Videoconferencing is also employed in award management and oversight for large center-type projects. The Foundation uses web-based and electronic means of communication to contribute to the quality of the merit review and award oversight processes.

F. Merit Review Pilots

In addition to the forms of merit review used above, in FY 2012 – 2015, NSF conducted several pilot activities incorporating different variations of the more familiar approaches to merit review. **Table 19** lists these pilots. Brief descriptions of each pilot may be found in the FY 2015 Merit Review Report (NSB-2016-41). Proposals for pilot activities that involve deviations from established NSF policies undergo an internal review process established in FY 2012. Pilot activities that can be implemented within existing NSF policies do not require such formal review although programs are encouraged to engage the research community in advance of beginning the pilot and to notify prospective proposers of the forthcoming changes. Examples in this latter category include the use of preliminary proposals for core programs and the elimination of the use of program deadlines.

Virtual Panels

For several years, NSF experimented with having reviewers participate “virtually” in review panel discussions, using technologies like teleconferencing, videoconferencing or “virtual worlds.”⁵³ In each of FY 2010 and FY 2011, approximately 1% of proposals were reviewed by wholly virtual panels. Based on that experience, NSF began planning a pilot activity to look at the challenges and impacts associated with expanding the use of virtual panels. The virtual panel pilot activity began in FY 2012 with an assessment of several technological and organizational approaches to virtual meetings, the development of training modules for NSF staff and reviewers, and outreach activities with NSF staff. Since then, NSF’s experience with enabling panelists to participate using remote connections has grown and this has become a routine part of NSF’s merit review process. More information about virtual participation by reviewers may be found in Section **IV.E**.

⁵² $p < 0.01$.

⁵³ An example of a virtual world technology that has been used for panel review is the Second Life system.

Table 19. Merit Review Pilots

Pilot	Nature of pilot	Units participating
Virtual Panels	The expanded use of review panels in which all panelists participate electronically from distributed locations such as their offices or homes.	NSF-wide
Preliminary Proposals for Core Programs	Core programs move from semi-annual deadlines for full proposals to an annual deadline for preliminary proposals.	BIO/DEB, BIO/IOS
One-Plus	Investigators with promising but unfunded proposals may revise and resubmit their ideas for possible funding in the second half of the annual funding cycle, but only if invited to do so.	SBE/BCS's Geography and Spatial Sciences program
Asynchronous Reviewer Discussions	The use of an access-controlled, program director-moderated message board, open to reviewers over a specified period, to enable the sharing of comments and discussion of a set of proposals.	CISE/CNS, MPS/PHY
Mechanism Design	A review mechanism in which techniques from game theory are used to allow investigators who submit proposals also to take part in the review process.	ENG/CMMI's Sensors and Sensing Systems program
Umbrella-Amendment Solicitation	A proposal-generating mechanism that is designed to implement a community-developed infrastructure. A flexible solicitation mechanism that accommodates both overarching, long-term goals and the ability to be responsive to changing community requirements.	GEO's & CISE/OAC's EarthCube program
Elimination of Program Deadline	A core program that has traditionally had two proposal deadlines per year switched to accepting proposals at any time to see if proposal pressure would be affected.	GEO/EAR's Instrumentation and Facilities Program
Electronic Polling	A web-based voting tool is employed to enable panels to conduct anonymous straw polls.	MPS/AST
College of Reviewers	Reviewers are enrolled in a College of Reviewers. Reviewers from the College are included among groups of ad hoc reviewers of proposals to speed identification of ad hoc reviewers and improve the overall quality of reviews. Information in the ad hoc reviews is used to limit the number of proposals for which subsequent discussion by a review panel is required.	SBE/BCS's Perception, Action and Cognition Program

Preliminary Proposals for Core Programs

Faced with increasing proposal numbers, reviewer requirements, and declining success rates, in January 2012, two divisions in the Directorate for Biological Sciences, the Division of Environmental Biology (DEB) and the Division of Integrated Organismal Systems (IOS), embarked on a three-year pilot activity to mitigate the stresses involved. This activity replaced semi-annual, full proposal deadlines with an annual proposal submission and review process accomplished in two stages. The first stage requires 5-page preliminary proposals to be submitted early in the year. These are reviewed in panels and then, informed by the reviewers' input, program officers invite fewer than half⁵⁴ of the proposers to submit full proposals by a

⁵⁴ The proportion varied between divisions and over the life of the pilot.

second deadline in late summer. In the second stage, full proposals submitted in response to these invitations are reviewed in the fall by a combination of panels and ad hoc reviewers; award/decline decisions are made based on the reviews of the full proposals. At the end of the pilot phase, NSF engaged a consultant to examine the outcomes of the pilot activity. The consultant's report was completed in Spring 2017 and is being analyzed by the Directorate for Biological Sciences.

One-Plus

One of the goals of the One-Plus pilot was to accelerate support for highly significant, potentially transformative research. Starting in Fall 2012, the Geography and Spatial Sciences program (GSS) moved from a semi-annual proposal deadline to accepting core research proposals only once each year, with a deadline in early September. However, reviewers were asked to explicitly comment separately on the potential larger-scale, longer-term significance of a project (as outlined in the proposal) if the project *were* to be conducted successfully, as well as the likelihood that the project (as outlined in the proposal) *would* be conducted successfully.

After funding decisions were made, program officers invited a limited number of PIs whose proposals had been declined to revise and resubmit a proposal roughly two months after they received the decline notification. This opportunity was provided based on the identification of projects whose significance and potentially transformative character were evaluated as being high. All other declined PIs had to wait until the next annual deadline for unsolicited proposals before submitting a new or revised proposal.

Proposals submitted for the secondary deadline were evaluated with ad hoc reviews complementing a panel review of the revised proposals.

As described in the FY 2015 Merit Review Report, the results of this pilot were: a reduction in the workload of reviewers, NSF staff, and PIs; an increase in proposal success rate; and a reduction in panel costs. The Geography and Spatial Sciences program now routinely uses the One-Plus approach.

Asynchronous Reviewer Discussions

This activity piloted an approach to merit review in which, after submitting written individual reviews of their assigned proposals, reviewers use an access-controlled online message board to participate in an asynchronous discussion of the merits of the proposals. The online discussion is moderated by program staff.

The approach is well known to some research communities; for example, some areas of computer science have used it extensively in the review of submissions to research conferences.

For the pilot in FY 2013, asynchronous panel discussions were used as a pre-cursor to face-to-face or virtual panel meetings. They served to identify those proposals on which there was consensus about their merit (either high or low) and to explore the reasons for divergence when individual reviewers had very different perspectives on proposals. This enabled the subsequent panel meetings to focus their time more effectively.

Using feedback from the reviewers and the program staff involved, it was concluded that the approach showed promise but that the commercial technology used was too cumbersome in comparison to other platforms for asynchronous discussion used by the research community. Consequently, no additional asynchronous reviewer discussions were scheduled in FY 2014.

In FY 2015, using a different technology, NSF's Interactive Panel System (IPS), the two divisions that piloted asynchronous discussions in FY 2013, the Division of Physics (PHY) and the Division of Computer and Network Systems (CNS), again conducted tests of the asynchronous discussion approach. Details of the approach may be found in the FY 2015 Merit Review Report.

The program officers involved indicated that the process based on IPS, used in FY 2015, was less cumbersome than the technology used in the FY 2013 pilot. The FastLane IPS interface, though not designed for discussion, provided a stable place for comments and was quite easy to use. Monitoring discussions in IPS was much less cumbersome than in the FY 2013 pilot.

While the technology was better than in the FY 2013 pilot, it was not evident that the substance of the asynchronous discussions nor the degree of panelist participation were significantly different from the FY 2013 pilot. It was also unclear whether the asynchronous discussion phase resulted in more thoughtful individual reviews and ratings, panel summaries, or panel rankings, etc., than traditional in-person or virtual panels. As a result, this pilot was not continued.

Mechanism Design

In FY 2014, the Sensors and Sensing Systems (SSS) program developed a merit review pilot to test the efficacy of using techniques from game theory to create a review mechanism in which the investigators who submit proposals also take part in the review process. A detailed description may be found in the FY 2015 Merit Review Report. This pilot demonstrated the feasibility of the approach; however, the use of this approach has not been repeated.

Umbrella-Amendment Solicitation

The EarthCube Umbrella-Amendment Solicitation is a pilot between GEO and CISE/OAC. It implements a flexible solicitation mechanism that accommodates both overarching, long-term goals, like a program announcement, and the ability to quickly respond to changing community requirements. The umbrella part of the solicitation describes the vision and reasons for the program and does not change over time. This facilitates the tracking of submissions and awards associated with the umbrella theme, and subsequent portfolio analysis, since the solicitation number remains the same. The amendment section of the solicitation specifies the funding mechanism(s) to be employed for the call, proposal due dates or submission windows, and any special review criteria and/or reporting conditions. As the EarthCube design develops with community guidance, new amendments replace old amendments. The pilot began with the EarthCube solicitation (NSF 13-529), released in December 2012. This included the Umbrella portion of the solicitation and the first Amendment section. A further four Amendments have subsequently been issued.

Elimination of Program Deadlines

It has been conjectured that, in some programs, the existence of recurring proposal deadlines may increase the number of proposals submitted to the program. There are a few core programs that traditionally have accepted proposals at any time. These have not experienced the dramatic increases in proposal pressure seen in many other NSF programs in recent years. The Division of Earth Sciences (EAR) undertook an experiment in which one of its programs, Infrastructure and Facilities, that had been using two proposal deadlines per year, switched to accepting proposals without deadlines or target dates to see how proposal pressure would be affected. Data in the FY 2015 Merit Review Report demonstrated a dramatic reduction in the number of proposals submitted to the program each year. This effect was sustained from year to year.

Based on the experience of the Infrastructure and Facilities program, the pilot was extended to four more programs in EAR in FY 2015. The first full 12-month period in which proposals were accepted at any time for these four programs opened in April 2015. The data shown in **Table 20** exhibit the same noticeable reduction in proposal pressure. This is accompanied by an increase in the proposal success rate. Additional programs are joining this pilot in FY 2017.

Table 20. Proposals received by four EAR programs before and after a transition to no deadlines in Spring 2015

Program	2013	2014	2015-2016	2016-2017
	01/01/2014 - 12/31/2014	01/01/2014 - 12/31/2014	04/09/2015 - 04/09/2016	04/10/2016 - 04/09/2017
Geobiology and Low-Temperature Geochemistry	203	214	83	83
Sedimentary Geology and Paleontology	214	217	119	125
Geomorphology and Land-Use Dynamics	157	137	68	62
Hydrologic Sciences	261	237	97	89

Source: NSF Division of Earth Sciences, 04/12/16 and 06/30/17.

Electronic Polling

NSF review panels group proposals into different categories of merit, based on the panel discussion. Some panels employ a ‘straw-poll’ of panelists to get a sense of where the panel is inclined to situate a proposal. While very useful, this consumes a certain amount of time and there is a potential for inaccuracies to arise when calculating the results of the ‘straw poll’. One division experimented with the use of a web-based voting tool for panel ‘straw-polls’ as a way of reducing the time burden and improving the accuracy of the process. The results were very satisfactory and the approach was subsequently adopted across the division.

College of Reviewers

The program in Perception, Action, and Cognition (PAC), a program that uses a semi-annual review cycle, carried out a pilot project to streamline the review procedure. Before the pilot, the review procedure used was to solicit ad hoc reviews and then to convene a panel to discuss the proposals in the light of the ad hoc reviews and the panelists’ own expertise. The streamlined process is similar but proposals that did not review well in the ad hoc phase were not taken to

panel. To facilitate a timely completion of a high-quality ad hoc phase, the program officers recruited researchers to participate in a “College of Reviewers.” Each agreed to provide ad hoc reviews of proposals with a limitation that they would be asked to provide no more than three reviews in a review cycle. Initially, the College contained 86 reviewers. This has subsequently been increased to over 100. The goals of the pilot were to reduce the workload of panelists (by reducing the size and duration of panels) and NSF staff, to increase the time available for the review panel to discuss the competitive proposals, to reduce the average time required for funding decisions, and to reduce the cost of the review process. More details may be found in the FY 2015 Merit Review report. Feedback from stakeholders is summarized below.

Feedback from Panelists

The "streamlining" procedure limits the number of proposals PAC takes to panel and has resulted in better discussion of proposals at panel because more time can be spent on each. Panelists who have served on multiple NSF panels praised the pilot panel experience. In discussion with NSF staff, these experienced panelists also said that they thought that the review quality improved.

Feedback from Members of the College of Reviewers

After the first year, PAC program officers sent a letter to the members of the PAC College of Reviewers asking for their assessment of the process. All of the responses were positive. When the members of the College were asked if they would like to no longer be called upon or would be willing to serve a new term of three years, all but one elected to continue.

Feedback from Committee of Visitors

In reviewing the PAC program in FY 2015, the Committee of Visitors (COV) found that the use of the College of Reviewers “seemed to provide a means of calibration for evaluating the proposals and therefore increased level of consistency in the reviews across proposals.” The COV had a favorable view of both aspects of this pilot, saying that, “Two relatively new aspects of the review process seem to work well and should be continued: One, the use of a College of Reviewers for obtaining quality ad hoc reviews in a timely manner and two, the use of a streamlining procedure based on at least three ad hoc reviews to determine which proposals are reviewed by a panel.”

Based on the success of the pilot, the Perception, Action and Cognition program now uses this approach in its normal operations.

G. Merit Review Survey

In the fall of 2015, NSF conducted a survey of researchers who had submitted proposals to and/or reviewed for NSF during or after FY 2012. This was intended as the first in a biennial series of surveys about the NSF’s merit review process. The survey yielded information on how the research community participates in the merit review system. The survey also included questions about researchers’ experiences with some of the merit review pilots described in IV.F. The results of the survey are summarized in the FY 2015 Merit Review Report.

The FY 2017 merit review survey is underway as this report is being written and results will be described in the FY 2017 Merit Review Report.

H. Data on Reviewers

The Foundation maintains a central electronic database of several hundred thousand reviewers who can potentially be drawn upon to participate in ad hoc or panel reviews. Program officers frequently add new reviewers to this database. Program officers identify potential reviewers using a variety of sources including their own knowledge of the discipline, applicant suggestions, references attached to proposals, published papers, scientific citation indices and other similar databases, as well as input from other reviewers.

Approximately 34,181 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 2016. Of these, approximately 13,967 (41%) served as panelists (of whom about 2,989 also served as *ad hoc* reviewers) and 20,214 (59%) served as *ad hoc* reviewers only. Approximately 6,950 (20%) of these reviewers had never reviewed an NSF proposal before.

Reviewers were from all 50 states as well as the District of Columbia, Guam, Puerto Rico and the US Virgin Islands. Approximately 3,700 reviewers were from outside the United States by address of record.⁵⁵ Reviewers were from a range of institutions, including two-year and four-year colleges and universities, Master's level and Ph.D.-granting universities, industry, for-profit and non-profit institutions, K-12 systems, informal science institutions, and government. NSF also maintains data on numbers of reviewers from each state, territory, and country as well as by type of institution.

The NSF library continually updates its resources to help NSF staff identify reviewers. This includes the collection and sharing of potential reviewer data from associations that work with under-represented groups in science and engineering. Frequent tutorials on finding reviewers are available for program officers.

Reviewers are also identified through literature searches and professional activities such as workshops and conferences. Some NSF divisions actively solicit new reviewers through their web-pages and outreach activities. To promote transparency, Chapter III.B of the *Proposal and Award Policies and Procedures Guide* describes how NSF program officers select reviewers.

Participation in the peer review process is voluntary. It brings with it 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 2016, NSF requested 61,882 ad hoc reviews, of which there were 42,010 positive responses.⁵⁶ This 68% response rate is similar to that for the prior two years. The response rate varies by program.

⁵⁵ In recent years, there has been a steady decline in the proportion of reviewers from outside the United States. From FY 2010, the proportion of such reviewers varied as follows: FY 2010 – 15.6%; FY 2011 – 14.3%; FY 2012 – 12.7%; FY 2013 – 12.3%; FY 2014 – 12.3%; FY 2015 – 11.3%; FY 2016 – 10.8%.

⁵⁶ This number tracks requests that are recorded in the Proposal and Reviewer System (PARS). For example, when potential reviewers are sent a formal invitation via eCorrespondence, the reviewer is entered in PARS. Some potential reviewers are first invited informally by email or telephone. If they decline this initial invitation, there is usually no follow-up in eCorrespondence. Numbers given here reflect the rate of positive responses to formal invitations and overestimate the practical positive response rate.

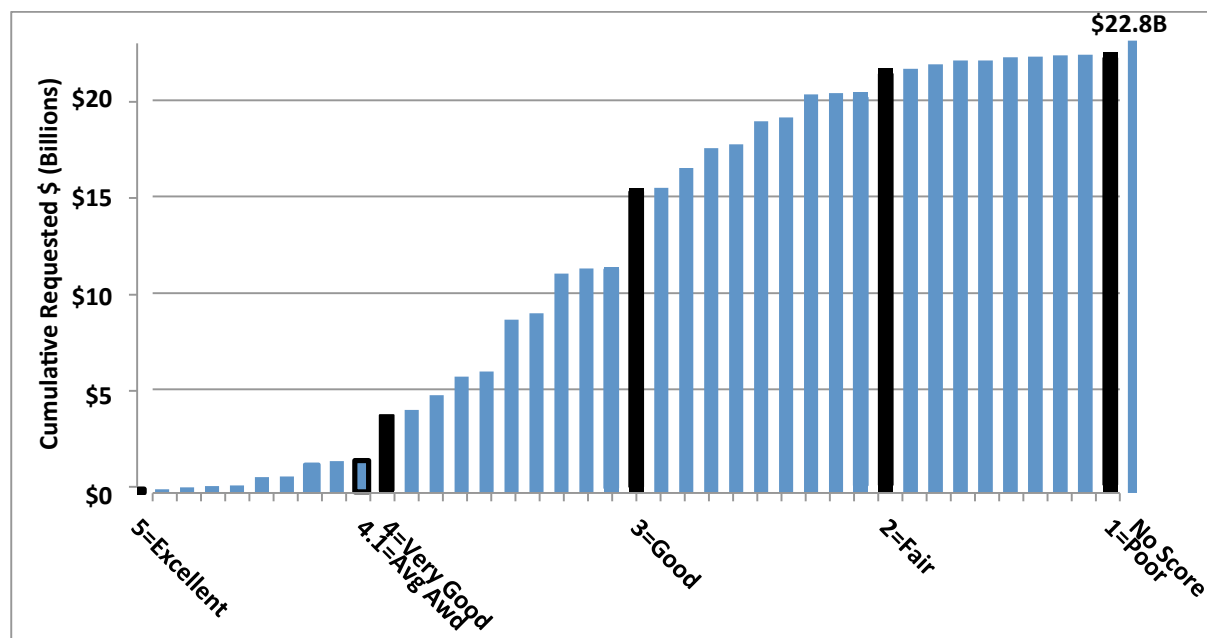
I. Reviewer Proposal Ratings and the Impact of Budget Constraints

All funded proposals are determined to be highly meritorious based on a combination of individual reviews, panel deliberations and program officer evaluations. On average, NSF proposals are reviewed by 3-5 reviewers, depending on the type of review mechanism used, although there is variation between programs. Each of the reviewers is chosen for specific types of expertise and adds different points of view to the decision-making process. The reviewers provide written reviews that describe the strengths and weaknesses of proposals in the context of the NSB merit review criteria. Many proposals are reviewed by a panel of experts. The panel clusters proposals into groups based on a discussion of the proposals. These in-depth discussions can uncover weaknesses that might not have been reflected in the initial reviews or identify strengths in proposals that might not have been rated highly by the initial reviewers.

The expertise of the NSF program officer making the final recommendation is an important voice in the process. Reviewers' ratings of proposals, while a useful indicator, are not, by themselves, a robust metric of the relative merits of proposals. 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 at 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 an infrastructure need that will serve a large number of people. 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 young and experienced investigators.

A large number of potentially fundable proposals are declined each year. As shown in **Figure 28**, approximately \$1.63 billion was requested for declined proposals that had received ratings at least as high as the average rating (4.1 out of 5.0) for all awarded proposals. Approximately \$3.92 billion was requested for declined proposals that were rated Very Good or higher in the merit review process. These declined proposals represent a rich portfolio of unfunded opportunities, proposals that, if funded, may have produced substantial research and education benefits.

Figure 28. Cumulative Requested Amounts for Declined Proposals by Average Reviewer Rating for FY 2016 (dollars in billions)



Source: NSF Enterprise Information System, 10/01/16

J. Program Officer Characteristics and Workload

Table 21 shows information about NSF's program officers. The number of program officers increased to 506 from 496 in FY 2015.

Table 21. Distribution of NSF Program Officers by Characteristics

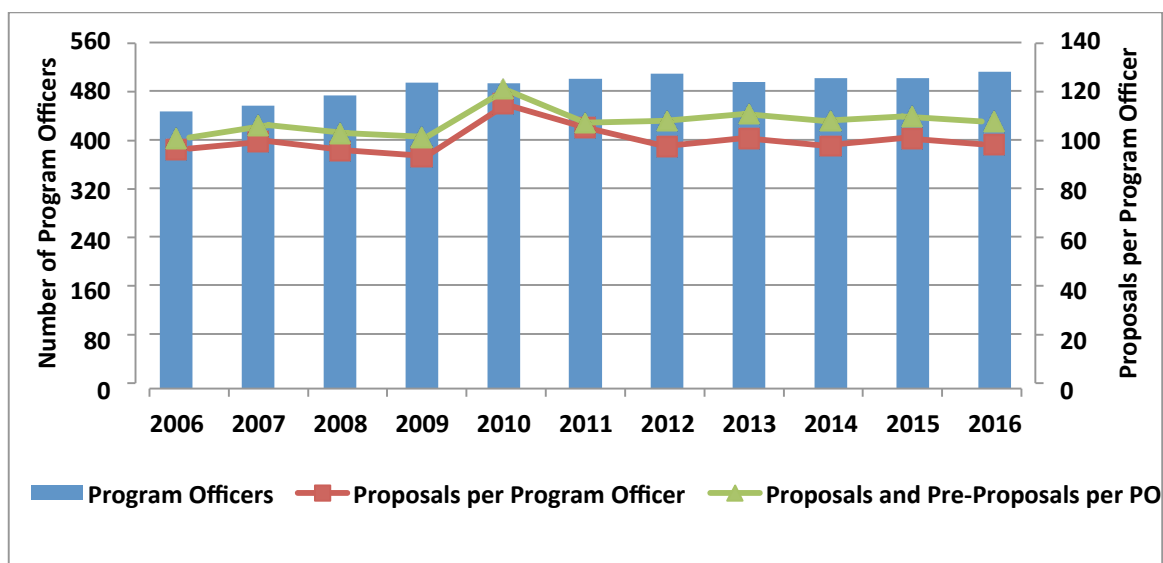
Program Officers	Total	Percent
Total	506	100%
Gender		
Male	287	57%
Female	219	43%
Race and Ethnicity		
Racial or Ethnic Minority	134	26%
Non-Minority	372	74%
Employment		
Permanent	265	52%
Visiting Scientists, Engineers & Educators (VSEE)	39	8%
Temporary	63	13%
Intergovernmental Personnel Act (IPA)	139	28%

Source: NSF Division of Human Resource Management, 03/13/17. Data are for the end of FY 2016.

Program officers can be permanent NSF employees or non-permanent employees. As shown in **Table 21**, 52% are permanent program officers and 48% are not permanent. Some non-permanent program officers are “on loan” as “Visiting Scientists, Engineers, and Educators” (VSEEs) 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 2016, the number of permanent program officers increased by 9 relative to FY 2015 and the number of IPAs decreased by 11. The largest relative changes were in the proportion of VSEEs, which rose from 6% to 8% of the total, and in the proportion of IPAs, which decreased from 30% to 28%. Whether they are recruited as non-permanent or permanent staff members, incoming NSF program officers receive training in the merit review process.

Compared to FY 2015, the numbers of program officers who are women or members of a racial or ethnic minority grew by 10 and 17, respectively. At the end of FY 2016, approximately 43% of program officers were female and approximately 26% were from a racial or ethnic minority.

Figure 29. Proposals per Program Officer



Source: NSF Division of Human Resource Management, 3/13/17.

The annual fluctuations in the ratio of proposals to program officers are shown in **Figure 29**. When preliminary proposals are included in the workload, the nominal workload per program officer has been relatively stable since FY 2011. However, this average does not reflect the very varied nature of programs, projects, and the activities carried out by program officers.

Not all individuals listed as program officers in **Table 21** process proposals, so the average proposal workload shown in **Figure 29** is an underestimate. The growing emphasis on interdisciplinary and cross-directorate programs, together with innovative approaches to encouraging transformative research proposals, has led to a growth in coordination activities. Program officers are also tasked with an increasing number of programmatic activities, e.g., increased program accountability, training, outreach, and mentoring new staff.

In recent years, NSF has revitalized its professional development opportunities for program staff, offering in-house courses in project management, leadership, and communication through the NSF Academy. NSF policy requires that all new NSF program officers take Merit Review Basics Sessions I and II within 90 days of beginning work at NSF and encourages them to take the other elements of program management training, including the Program Management Seminar, within the first six months to one year of their appointment. These provide an orientation to NSF and training in the merit review process.

Appendices

Appendix 1 - Proposals, Awards and Funding Rates, by Directorate or Office

		Fiscal Year										
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NSF ⁵⁷	Proposals	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285
	Awards	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877
	<i>Omnibus</i>				9,975	12,547						
	<i>ARRA</i>				4,620	449						
	Success Rate	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%	24%
BIO	Proposals	6,617	6,728	6,598	6,578	8,059	7,439	5,269	5,934	4,784	5,119	5,206
	Awards	1,202	1,303	1,291	1,823	1,556	1,310	1,293	1,250	1,272	1,379	1,330
	<i>Omnibus</i>				1,261	1,476						
	<i>ARRA</i>				562	80						
	Success Rate	18%	19%	20%	28%	19%	18%	25%	21%	27%	27%	26%
CISE	Proposals	4,973	6,048	6,067	6,001	7,317	6,702	7,703	7,821	7,434	8,032	8,299
	Awards	1,322	1,699	1,449	1,926	1,755	1,527	1,749	1,616	1,680	1,886	1,918
	<i>Omnibus</i>				1,452	1,723						
	<i>ARRA</i>				474	32						
	Success Rate	27%	28%	24%	32%	24%	23%	23%	21%	23%	23%	23%
EHR	Proposals	3,254	4,248	3,887	3,699	5,055	4,660	4,281	4,501	4,049	4,242	4,423
	Awards	824	903	1,111	1,009	930	807	889	793	701	830	915
	<i>Omnibus</i>				919	908						
	<i>ARRA</i>				90	22						
	Success Rate	25%	21%	29%	27%	18%	17%	21%	18%	17%	20%	21%
ENG	Proposals	9,423	9,574	9,643	10,611	13,226	12,314	11,338	10,738	11,878	12,326	12,570
	Awards	1,730	1,955	1,966	2,688	2,375	2,064	2,065	2,212	2,145	2,504	2,499
	<i>Omnibus</i>				1,771	2,321						
	<i>ARRA</i>				917	54						
	Success Rate	18%	20%	20%	25%	18%	17%	18%	21%	18%	20%	20%
GEO	Proposals	5,378	5,567	5,101	4,991	5,614	5,187	5,243	6,087	5,790	5,812	4,999
	Awards	1,656	1,711	1,563	2,226	1,970	1,705	1,637	1,565	1,487	1,463	1,526
	<i>Omnibus</i>				1,152	1,917						
	<i>ARRA</i>				1,074	53						
	Success Rate	31%	31%	31%	45%	35%	31%	31%	26%	26%	25%	31%

⁵⁷ Several organizational changes occurred over the decade. Data from prior years have been realigned with the organizational structure in effect for FY 2016 in order to show historical trends. The Office of Cyberinfrastructure (OCI) was created in July 2005 from what had previously been the Division of Shared Cyberinfrastructure (SCI) in CISE. In FY 2007, management of the EPSCoR program was transferred from EHR to OIA. A realignment in FY 2013 moved the Office of Polar Programs (OPP) and 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 Office of Integrative Activities (OIA) became the Office of International and Integrative Activities (IIA). In a further realignment, in FY 2015, IIA was again separated into the Office of International Science & Engineering (OISE) and the Office of Integrative Activities (OIA). See **Appendix 22**.

		Fiscal Year										
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MPS	Proposals	7,466	7,315	7,837	7,883	9,411	8,796	9,006	8,903	8,855	9,133	9,199
	Awards	2,221	2,360	2,269	3,122	2,669	2,352	2,523	2,201	2,343	2,593	2,432
	<i>Omnibus ARRA</i>				2,004	2,529						
	Success Rate	30%	32%	29%	40%	28%	27%	28%	25%	26%	28%	26%
OIA	Proposals	8	24	21	109	200	138	44	98	78	91	102
	Awards	7	23	17	36	89	25	14	27	29	36	30
	<i>Omnibus ARRA</i>				21	29						
	Success Rate	88%	96%	81%	33%	45%	18%	32%	28%	37%	40%	29%
OISE	Proposals	712	776	910	781	1,042	1,214	951	484	677	582	313
	Awards	319	353	357	428	395	404	333	245	307	275	236
	<i>Omnibus ARRA</i>				339	395						
	Success Rate	45%	45%	39%	55%	38%	33%	35%	51%	45%	47%	75%
SBE	Proposals	4,520	4,284	4,364	4,525	5,618	5,112	4,776	4,433	4,506	4,283	4,174
	Awards	1,144	1,143	1,126	1,337	1,257	998	1,019	920	994	1,041	991
	<i>Omnibus ARRA</i>				1,056	1,249						
	Success Rate	25%	27%	26%	30%	22%	20%	21%	21%	22%	24%	24%
Other ⁵⁸	Proposals	1	13		3			2				
	Awards	0	13		0			2				
	<i>Omnibus ARRA</i>											
	Success Rate	0%	100%		0%			100%				

Source: NSF Enterprise Information System, 10/01/16.

⁵⁸ 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 2016 statistics: 5,023 Continuing Grant Increments, 3,381 Supplements, and 486 Contracts.

Appendix 2 - Preliminary Proposals

Several NSF programs utilize preliminary proposals in an effort to limit the workload of PIs and to increase the quality of full proposals. The annual number of preliminary proposals varies considerably as a result of competitions being held in a given 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 only accepted from PIs that are invited to submit them. In general, programs obtain advice from external peer reviewers before making binding decisions about preliminary proposals.

Number of Preliminary Proposals and Subsequent Actions

Fiscal Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total # Preliminary Proposals	1,874	2,842	3,203	3,856	2,883	965	5,135	4,691	4,911	4,251	4,584
Non-Binding (NB) Total*	1,279	1,540	669	1,140	1,384	357	459	457	92	1	239
NB Encouraged	509	662	333	519	636	128	222	296	29	0	122
NB Discouraged	770	878	336	621	748	229	237	161	63	1	117
Binding Total*	594	1,301	2,534	2,500	1,273	572	4,484	4,087	4,761	4,199	4,281
Binding Invite	136	252	572	685	372	245	1,236	942	1,083	1,045	1,124
Binding Non-invite	458	1,049	1,962	1,815	901	327	3,248	3,145	3,678	3,154	3,157

Source: NSF Report Server.

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.

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

Appendix 3 - Proposals, Awards and Success Rates, by PI Gender

Table 3.1 - FY2016 Competitive Proposals, Awards and Success Rates, by PI Gender*

		Total	Female	Male	Unknown
NSF	Proposals	49,285	11,598	31,528	6,159
	% of Total		24%	64%	12%
	Awards	11,877	3,032	7,512	1,333
	Success Rate	24%	26%	24%	22%
BIO	Proposals	5,206	1,623	3,075	508
	% of Total		31%	59%	10%
	Awards	1,330	454	788	88
	Success Rate	26%	28%	26%	17%
CSE	Proposals	8,299	1,485	5,720	1,094
	% of Total		18%	69%	13%
	Awards	1,918	381	1,288	249
	Success Rate	23%	26%	23%	23%
EHR	Proposals	4,423	1,708	2,090	625
	% of Total		39%	47%	14%
	Awards	915	364	422	129
	Success Rate	21%	21%	20%	21%
ENG	Proposals	12,570	2,221	8,606	1,743
	% of Total		18%	68%	14%
	Awards	2,499	500	1,646	353
	Success Rate	20%	23%	19%	20%
GEO	Proposals	4,999	1,333	3,268	398
	% of Total		27%	65%	8%
	Awards	1,526	413	1,019	94
	Success Rate	31%	31%	31%	24%
MPS	Proposals	9,199	1,624	6,613	962
	% of Total		18%	72%	10%
	Awards	2,432	485	1,726	221
	Success Rate	26%	30%	26%	23%
OIA	Proposals	102	27	67	8
	% of Total		26%	66%	8%
	Awards	30	8	19	3
	Success Rate	29%	30%	28%	38%
OISE	Proposals	313	101	156	56
	% of Total		32%	50%	18%
	Awards	236	84	102	50
	Success Rate	75%	83%	65%	89%
SBE	Proposals	4,174	1,476	1,933	765
	% of Total		35%	46%	18%
	Awards	991	343	502	146
	Success Rate	24%	23%	26%	19%

Source: NSF Enterprise Information System, 10/1/16.

*Demographic data are voluntarily self-reported by the PI. In FY2016, approximately 87.5% of competitive proposals and 88.6% 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 3.2 - FY2016 Research Proposals, Awards and Success Rates, by PI Gender

		Total	Female	Male	Unknown
NSF	Proposals	41,034	9,604	26,755	4,675
	% of Total		23%	65%	11%
	Awards	8,782	2,178	5,748	856
	Funding Rate	21%	23%	21%	18%
BIO	Proposals	4,306	1,317	2,555	434
	% of Total		31%	59%	10%
	Awards	937	304	572	61
	Funding Rate	22%	23%	22%	14%
CSE	Proposals	7,907	1,394	5,464	1,049
	% of Total		18%	69%	13%
	Awards	1,621	302	1,106	213
	Funding Rate	21%	22%	20%	20%
EHR	Proposals	3,266	1,369	1,430	467
	% of Total		42%	44%	14%
	Awards	530	234	228	68
	Funding Rate	16%	17%	16%	15%
ENG	Proposals	9,859	1,850	6,993	1,016
	% of Total		19%	71%	10%
	Awards	1,772	371	1,226	175
	Funding Rate	18%	20%	18%	17%
GEO	Proposals	4,601	1,231	3,033	337
	% of Total		27%	66%	7%
	Awards	1,313	354	887	72
	Funding Rate	29%	29%	29%	21%
MPS	Proposals	7,978	1,357	5,791	830
	% of Total		17%	73%	10%
	Awards	1,929	377	1,378	174
	Funding Rate	24%	28%	24%	21%
OIA	Proposals	34	9	23	2
	% of Total		26%	68%	6%
	Awards	12	5	6	1
	Funding Rate	35%	56%	26%	50%
OISE	Proposals	107	29	69	9
	% of Total		27%	64%	8%
	Awards	31	12	15	4
	Funding Rate	29%	41%	22%	44%
SBE	Proposals	2,976	1,048	1,397	531
	% of Total		35%	47%	18%
	Awards	637	219	330	88
	Funding Rate	21%	21%	24%	17%

Source: NSF Enterprise Information System, 10/1/16.

In the remainder of this Appendix, data are for research proposals: (a) for which the decision to award or decline the proposal was finalized (approved by a division director or equivalent) in the fiscal year stated; and (b) that were submitted no earlier than the beginning of the fourth fiscal year prior to each fiscal year.⁵⁹ Data are from Report Server, Spring 2017.

⁵⁹ Because of this, the number of proposals and awards in a given fiscal year may not match that shown elsewhere. For a variety of administrative reasons, a proposal record may occasionally be reopened in a later fiscal year.

Table 3.3 – Proportion of Research Proposals from Women, by Directorate

FY	NSF	BIO	CSE	EHR	ENG	GEO	MPS	SBE
2001	16.5%	23.5%	15.2%	26.8%	9.9%	17.4%	10.9%	29.6%
2002	17.7%	26.1%	14.8%	29.8%	12.8%	16.8%	11.5%	32.8%
2003	17.3%	24.3%	13.8%	32.9%	12.9%	17.1%	10.8%	33.4%
2004	18.4%	27.0%	15.4%	42.8%	12.5%	17.3%	12.8%	30.5%
2005	19.3%	26.8%	15.7%	44.2%	13.1%	18.7%	13.3%	33.5%
2006	19.6%	27.0%	15.8%	48.1%	13.3%	18.5%	13.8%	35.7%
2007	20.4%	26.5%	16.9%	43.8%	14.7%	20.0%	14.1%	35.9%
2008	21.0%	27.4%	16.8%	51.1%	15.3%	20.2%	14.8%	35.3%
2009	21.8%	28.4%	18.1%	56.5%	16.0%	21.7%	15.3%	37.5%
2010	22.0%	27.8%	17.8%	42.6%	17.0%	22.1%	15.3%	36.6%
2011	23.9%	28.0%	19.2%	43.5%	17.5%	23.1%	16.6%	38.2%
2012	23.7%	28.9%	19.8%	50.1%	18.4%	26.5%	17.4%	38.4%
2013	24.3%	29.7%	20.1%	50.8%	18.3%	26.7%	18.9%	38.2%
2014	24.7%	30.1%	20.5%	51.6%	19.0%	27.6%	17.8%	39.7%
2015	25.4%	32.3%	20.2%	49.4%	19.2%	27.5%	18.6%	40.4%
2016	26.4%	34.0%	20.3%	49.0%	20.9%	28.9%	19.0%	43.0%

Table 3.4 – Proportion of Research Awards to Women, by Directorate

FY	NSF	BIO	CSE	EHR	ENG	GEO	MPS	SBE
2001	16.1%	25.1%	15.2%	77.8%	10.5%	13.6%	10.6%	29.1%
2002	17.0%	26.6%	15.9%	40.0%	13.5%	15.5%	11.8%	28.4%
2003	18.3%	24.4%	17.5%	48.3%	16.4%	16.3%	12.6%	31.0%
2004	18.0%	27.0%	16.6%	40.9%	16.1%	14.8%	12.6%	28.7%
2005	20.0%	29.0%	16.5%	49.0%	17.3%	18.4%	14.2%	30.6%
2006	19.7%	29.6%	16.9%	42.5%	14.7%	17.8%	13.9%	33.1%
2007	20.4%	27.0%	19.4%	55.7%	16.4%	20.3%	14.3%	33.2%
2008	21.6%	27.7%	17.4%	62.6%	18.9%	20.1%	15.7%	35.0%
2009	22.2%	30.8%	20.2%	61.1%	17.6%	22.0%	16.9%	32.5%
2010	22.4%	32.0%	18.1%	58.6%	18.1%	21.5%	16.1%	35.9%
2011	22.8%	28.9%	20.4%	54.1%	18.7%	20.0%	16.5%	36.9%
2012	23.7%	29.0%	20.6%	50.3%	20.1%	22.8%	19.7%	37.1%
2013	24.2%	33.3%	18.9%	54.1%	19.5%	25.9%	19.1%	35.4%
2014	25.1%	28.9%	21.1%	53.7%	22.2%	26.1%	18.5%	39.4%
2015	25.9%	34.2%	22.4%	51.0%	19.9%	26.5%	18.8%	40.6%
2016	27.5%	34.7%	21.4%	50.5%	23.2%	28.6%	21.6%	39.8%

Ordinarily this would cause the proposal to be counted in both fiscal years. In the data in Tables 3.3 to 3.6, such duplicates have been removed. A small number of proposals submitted more than four years prior to the beginning of each fiscal year are excluded to create a more contemporaneous picture.

Table 3.3 and **Table 3.4** show the proportion of proposals that are from women and the proportion of awards that are to women. The proportions shown are obtained by dividing the number of proposals or awards from or to women by the total number of proposals or awards from or to PIs of known gender. The counts of research proposals and awards by gender are shown in **Tables 3.5** and **3.6**. The symbols F, M and U indicate self-identified gender and stand for “Female”, “Male”, and “Unknown”.

Table 3.5 – Number of Research Proposals by Gender, by Directorate, by Fiscal Year

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NSF	F	3775	4391	4874	5709	5952	6010	6666	6789	7406	8776	9352	8496	8840	8826	9420	9644
	M	19070	20483	23336	25242	24840	24602	26041	25565	26579	31076	29850	27335	27505	26846	27621	26844
	U	249	324	421	702	728	886	1075	1277	1612	2358	2623	2644	2880	3201	3810	4543
BIO	F	959	1071	1080	1282	1395	1471	1498	1453	1533	1770	1702	1187	1347	1073	1277	1320
	M	3118	3040	3364	3460	3815	3970	4163	3854	3856	4600	4372	2914	3189	2490	2681	2562
	U	25	33	37	82	112	128	130	165	204	317	346	224	313	262	342	423
CSE	F	512	600	717	909	763	686	875	831	930	1037	1027	1222	1389	1326	1374	1399
	M	2854	3457	4476	5007	4088	3654	4309	4118	4198	4776	4328	4951	5519	5144	5432	5485
	U	49	86	133	172	149	165	189	234	248	324	366	506	576	622	814	1023
EHR	F	63	28	79	118	187	89	240	284	393	589	1216	685	841	911	1251	1380
	M	172	66	161	158	236	96	308	272	302	795	1582	682	814	853	1282	1436
	U	17	3	18	8	10	8	30	30	62	153	355	202	244	247	338	449
ENG	F	400	599	732	766	851	869	1026	1076	1354	1590	1579	1527	1448	1646	1654	1852
	M	3654	4080	4939	5347	5648	5659	5966	5978	7129	7789	7432	6760	6486	7016	6950	7020
	U	29	49	78	86	100	96	151	156	268	361	371	396	436	590	727	987
GEO	F	532	588	615	640	741	722	746	730	756	899	873	977	1411	1363	1362	1236
	M	2528	2921	2973	3061	3221	3181	2987	2888	2731	3172	2902	2713	3880	3584	3582	3039
	U	13	23	25	34	49	82	64	73	116	169	170	217	298	353	338	325
MPS	F	510	561	590	713	753	842	842	918	985	1111	1162	1284	1361	1268	1356	1364
	M	4155	4304	4885	4849	4929	5258	5127	5300	5465	6163	5819	6110	5859	5842	5925	5809
	U	59	58	55	111	117	173	195	250	306	411	407	496	565	621	780	804
SBE	F	626	796	882	1066	968	1073	1050	1053	1088	1284	1204	1086	950	1095	1034	1055
	M	1486	1634	1760	2425	1924	1932	1877	1928	1814	2225	1950	1742	1539	1661	1525	1400
	U	41	62	70	182	153	192	202	256	316	449	386	382	402	441	429	521

Table 3.6 – Number of Research Awards by Gender, by Directorate, by Fiscal Year

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NSF	F	994	1135	1247	1156	1227	1294	1495	1470	2152	1866	1692	1816	1736	1852	2140	2182
	M	5178	5530	5567	5267	4917	5280	5847	5339	7562	6455	5719	5842	5434	5539	6114	5758
	U	47	60	56	78	86	129	130	190	297	318	348	403	482	532	738	842
BIO	F	238	260	232	247	266	236	259	245	397	351	275	257	282	254	330	304
	M	710	717	720	668	650	561	702	639	892	745	675	630	564	626	634	572
	U	6	2	6	10	7	7	9	13	27	34	32	32	31	62	66	61
CSE	F	117	141	172	134	141	164	246	174	285	230	224	249	238	267	315	302
	M	654	744	810	672	712	806	1023	826	1128	1040	874	961	1018	1001	1093	1109
	U	9	18	18	17	24	33	41	46	70	80	74	84	117	137	181	210
EHR	F	14	4	28	27	25	31	34	62	69	58	98	88	106	124	238	235
	M	4	6	30	39	26	42	27	37	44	41	83	87	90	107	229	230
	U	0	0	0	0	0	1	2	4	3	10	11	17	29	23	47	65
ENG	F	88	139	161	152	143	140	180	216	312	252	249	278	281	316	343	371
	M	754	888	821	790	682	810	918	928	1458	1138	1086	1104	1161	1105	1379	1229
	U	3	7	11	11	15	7	14	14	32	33	49	57	62	75	129	172
GEO	F	147	170	182	163	183	194	207	207	306	291	224	238	330	313	310	355
	M	931	927	932	936	810	895	814	823	1083	1062	895	807	943	885	861	887
	U	3	10	4	5	5	18	12	24	28	42	46	38	60	65	67	71
MPS	F	158	187	214	199	223	236	261	262	400	315	286	375	310	323	354	379
	M	1338	1400	1486	1385	1352	1464	1559	1411	1970	1638	1451	1532	1316	1421	1525	1379
	U	12	15	10	20	15	35	28	47	75	63	76	99	122	110	171	171
SBE	F	169	168	175	168	193	228	218	228	245	250	192	199	169	222	229	219
	M	412	423	390	417	438	461	439	423	510	446	328	337	308	341	335	331
	U	7	5	4	12	16	23	19	33	39	42	36	41	53	55	75	87

Figures 3.1 and 3.2 show the data presented in Tables 3.3 and 3.4, except that the curves for EHR are omitted because the numbers are relatively small and those curves are noisy.

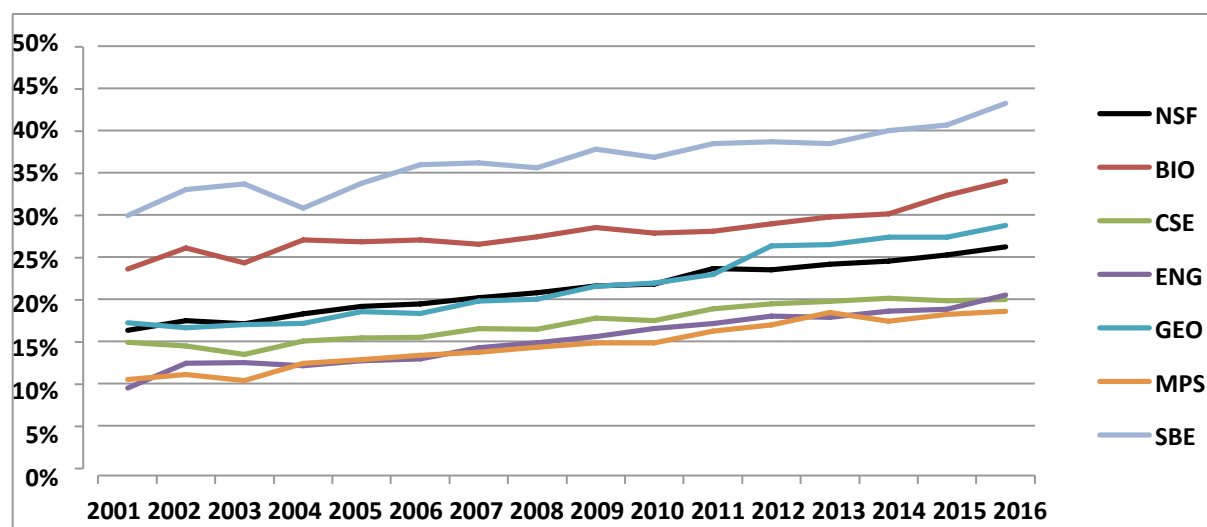
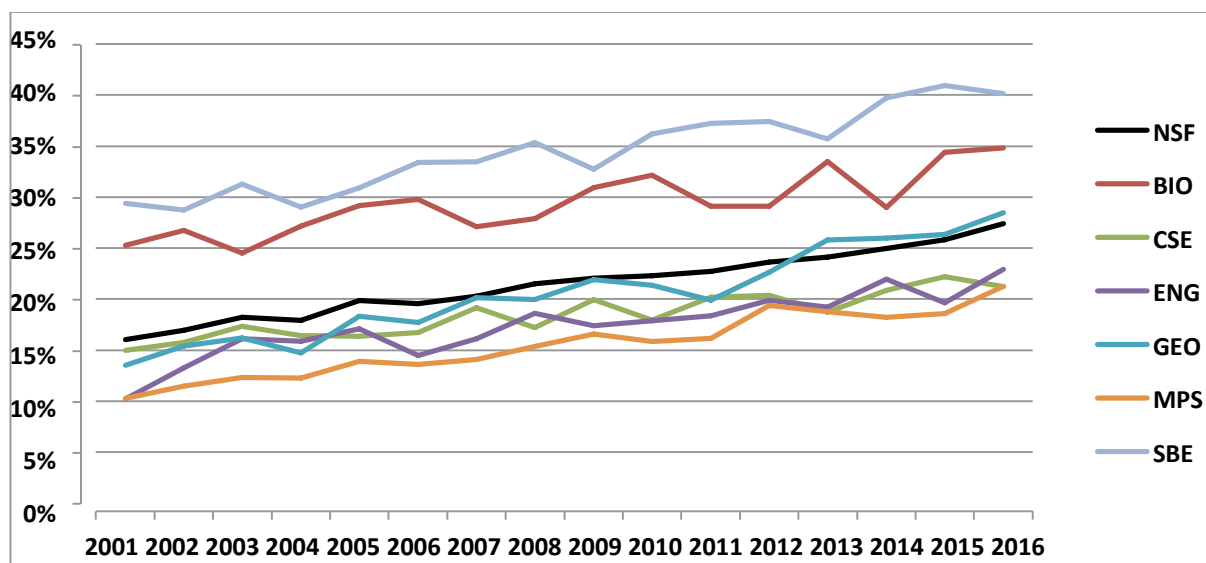
Figure 3.1. Proportion of Research Proposals from Women

Figure 3.2. Proportion of Research Awards to Women



Appendix 4 - Proposals, Awards and Success Rates, by PI Race and Ethnicity
Table 4.1 – FY 2016 Competitive Proposals, Awards & Success Rates, by PI Race/Ethnicity

		Total	Hispanic	American Indian/ Alaskan	Asian	Black/ African-American	Multi-Racial	Native Hawaiian/ Pac Island	White	Unknown
NSF	Proposals	49285	1950	99	11623	1134	508	41	29031	6849
	% of Total	100%	4%	0%	24%	2%	1%	0%	59%	14%
	Awards	11877	459	29	2168	264	124	7	7748	1537
	Success Rate	24%	24%	29%	19%	23%	24%	17%	27%	22%
BIO	Proposals	5206	265	17	676	70	85	†	3792	560
	% of Total	100%	5%	0%	13%	1%	2%	†	73%	11%
	Awards	1330	63	†	111	22	16	†	1055	118
	Success Rate	26%	24%	†	16%	31%	19%	†	28%	21%
CSE	Proposals	8299	214	†	2967	110	74	†	3875	1265
	% of Total	100%	3%	†	36%	1%	1%	†	47%	15%
	Awards	1918	52	†	599	25	16	†	990	287
	Success Rate	23%	24%	†	20%	23%	22%	†	26%	23%
EHR	Proposals	4423	195	17	595	300	50	†	2769	684
	% of Total	100%	4%	0%	13%	7%	1%	†	63%	15%
	Awards	915	44	†	101	73	†	†	579	148
	Success Rate	21%	23%	†	17%	24%	†	†	21%	22%
ENG	Proposals	12570	499	17	4299	333	108	12	5894	1907
	% of Total	100%	4%	0%	34%	3%	1%	0%	47%	15%
	Awards	2499	102	†	707	65	24	†	1317	382
	Success Rate	20%	20%	†	16%	20%	22%	†	22%	20%
GEO	Proposals	4999	185	15	547	49	48	†	3869	463
	% of Total	100%	4%	0%	11%	1%	1%	†	77%	9%
	Awards	1526	56	†	126	11	17	†	1240	122
	Success Rate	31%	30%	†	23%	22%	35%	†	32%	26%
MPS	Proposals	9199	379	10	2107	160	76	†	5784	1059
	% of Total	100%	4%	0%	23%	2%	1%	†	63%	12%
	Awards	2432	89	†	429	42	22	†	1679	257
	Success Rate	26%	23%	†	20%	26%	29%	†	29%	24%
SBE	Proposals	4174	183	18	377	92	55	†	2795	836
	% of Total	100%	4%	0%	9%	2%	1%	†	67%	20%
	Awards	991	36	†	69	16	11	†	726	165
	Success Rate	24%	20%	†	18%	17%	20%	†	26%	20%
OIA	Proposals	102	†	0	20	†	†	0	61	14
	% of Total	100%	†	0%	20%	†	†	0%	60%	14%
	Awards	30	†	0	†	†	†	0	15	†
	Success Rate	29%	†	N/A	†	†	†	N/A	25%	†
OISE	Proposals	313	24	0	35	14	11	†	192	61
	% of Total	100%	8%	0%	11%	4%	4%	†	61%	19%
	Awards	236	15	0	24	†	9	†	147	51
	Success Rate	75%	63%	N/A	69%	†	82%	†	77%	84%

Table 4.2 – FY 2016 Research Proposals, Awards and Success Rates, by PI Race and Ethnicity

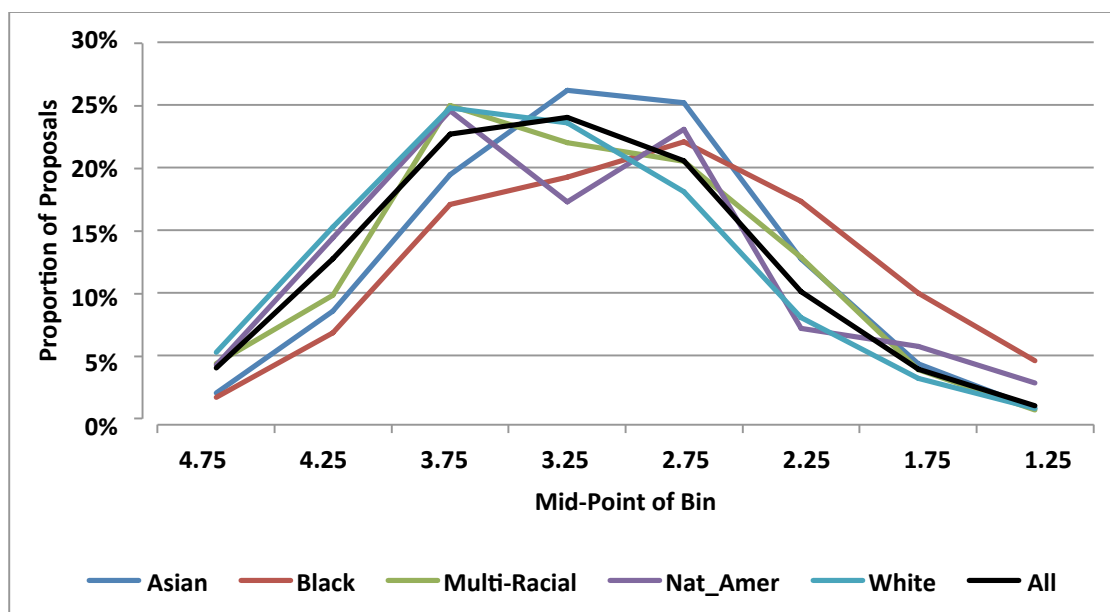
		Total	Hispanic	American Indian/ Alaskan	Asian	Black/ African-American	Multi-Racial	Native Hawaiian/ Pac Island	White	Unknown
NSF	Proposals	41034	1602	71	10372	819	411	32	24032	5297
	% of Total	100%	4%	0%	25%	2%	1%	0%	59%	13%
	Awards	8782	328	16	1755	145	80	6	5758	1022
	Success Rate	21%	20%	23%	17%	18%	19%	19%	24%	19%
BIO	Proposals	4306	213	10	612	53	60	†	3099	466
	% of Total	100%	5%	0%	14%	1%	1%	†	72%	11%
	Awards	937	39	†	92	11	†	†	747	77
	Success Rate	22%	18%	†	15%	21%	†	†	24%	17%
CSE	Proposals	7907	204	†	2853	99	73	†	3669	1205
	% of Total	100%	3%	†	36%	1%	1%	†	46%	15%
	Awards	1621	44	†	520	16	16	†	828	240
	Success Rate	21%	22%	†	18%	16%	22%	†	23%	20%
EHR	Proposals	3266	136	10	388	164	44	†	2140	514
	% of Total	100%	4%	0%	12%	5%	1%	†	66%	16%
	Awards	530	21	†	51	20	†	†	373	79
	Success Rate	16%	15%	†	13%	12%	†	†	17%	15%
ENG	Proposals	9859	402	10	3733	244	87	†	4583	1195
	% of Total	100%	4%	0%	38%	2%	1%	†	46%	12%
	Awards	1772	72	†	563	46	17	†	932	212
	Success Rate	18%	18%	†	15%	19%	20%	†	20%	18%
GEO	Proposals	4601	171	14	516	43	42	†	3572	406
	% of Total	100%	4%	0%	11%	1%	1%	†	78%	9%
	Awards	1313	50	†	106	†	12	†	1076	102
	Success Rate	29%	29%	†	21%	†	29%	†	30%	25%
MPS	Proposals	7978	327	10	1938	132	56	†	4921	920
	% of Total	100%	4%	0%	24%	2%	1%	†	62%	12%
	Awards	1929	74	†	366	25	15	†	1316	205
	Success Rate	24%	23%	†	19%	19%	27%	†	27%	22%
SBE	Proposals	2976	138	12	314	69	47	†	1962	571
	% of Total	100%	5%	0%	11%	2%	2%	†	66%	19%
	Awards	637	28	†	52	13	†	†	462	99
	Success Rate	21%	20%	†	17%	19%	†	†	24%	17%
OIA	Proposals	34	†	0	†	†	0	0	21	†
	% of Total	100%	†	0%	†	†	0%	0%	62%	†
	Awards	12	†	0	†	†	0	0	†	†
	Success Rate	35%	†	N/A	†	†	N/A	N/A	†	†
OISE	Proposals	107	†	0	15	10	†	0	65	15
	% of Total	100%	†	0%	14%	9%	†	0%	61%	14%
	Awards	31	†	0	†	†	†	0	20	†
	Success Rate	29%	†	N/A	†	†	†	N/A	31%	†

In **Tables 4.1** and **4.2**: the data source is the NSF Enterprise Information System, 10/1/16; Hispanic individuals are also included in one of the racial categories; † Indicates that data are omitted to reduce the likelihood of identifying individual investigators; “Total” is the count of unique proposals; and columns are counts of proposals from PIs in the corresponding category. Demographic data are voluntarily self-reported by the PI. In FY2016, approximately 91% of research proposals came from PIs who had provided some information on ethnicity or race. 87% had provided information about race and 86% had provided information about ethnicity.

The following figures show the way in which research proposals are distributed by review rating and various demographic characteristics. The figures show the information noted for the subset of research proposals that were externally reviewed and so have an average review rating associated with them.

Figure 4.1 and **Figure 4.2** show the distributions of mean review ratings and the success rate as a function of mean ratings for proposals from PIs who had identified herself or himself as belonging to one of the following racial groups: American Indian/Alaskan Native, Asian, Black/African-American, Multi-racial or White. Omitted are research proposals from PIs who did not indicate a race or who identified their race as unknown. The group composed of Native Hawaiians/Pacific Islanders is also omitted because of the small numbers involved. **Figure 4.1** shows the distribution for all of the externally reviewed research proposals. The curves associated with the five racial groups plotted represent 87% of that total. Except for 0.08% from Native Hawaiians/Pacific Islanders, the remaining 13% are from PIs of unknown race.

Figure 4.1 – FY 2016 Distribution of Mean Review Ratings for Externally Reviewed Research Proposals, by PI Race



Source: NSF Enterprise Information System, 10/1/16.

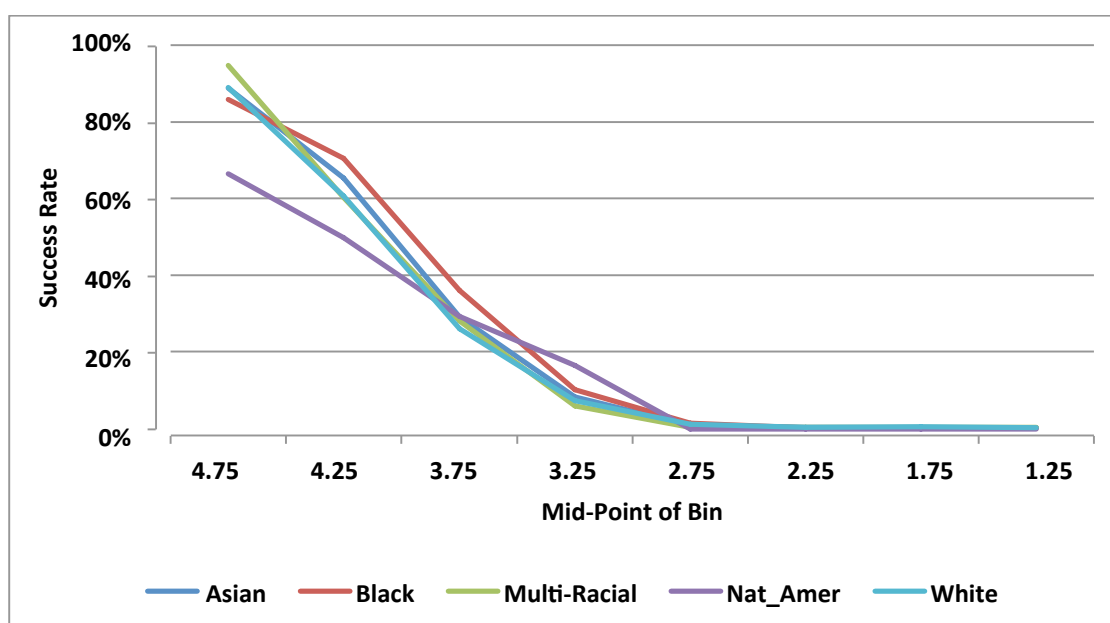
Reviewer ratings of Excellent, Very Good, Good, Fair and Poor are translated into numerical values of 5.0, 4.0, 3.0, 2.0, and 1.0 respectively. The per-proposal average of the reviewer

ratings for a given proposal is allocated to one of a set of bins of half-integer width with mid-points of 4.75 (the highest bin), 4.25, 3.75, 3.25, 2.75, 2.25, 1.75 and 1.25 (the lowest). Scores of 5.0 are included in the bin with mid-point 4.75, 4.0 is included in bin 3.75, etc. The bin with mid-point 1.25 also includes scores of 1.0. Each curve in **Figure 4.1** shows the proportion of the externally reviewed proposals from PIs of a particular racial group that had average review ratings in each bin except for the black curve, which shows the distribution for all externally reviewed research proposals.

The distribution of ratings of proposals from White PIs has a higher average than the distributions for proposals from other racial groups. The distributions of ratings for Asian, American Indian/Native Alaskan and Black/African-American PIs are displaced roughly a quarter, a sixth and one half of a rating towards lower ratings from that of White PIs.

Figure 4.2 shows the success rate within each mean review rating bin for various racial groups.

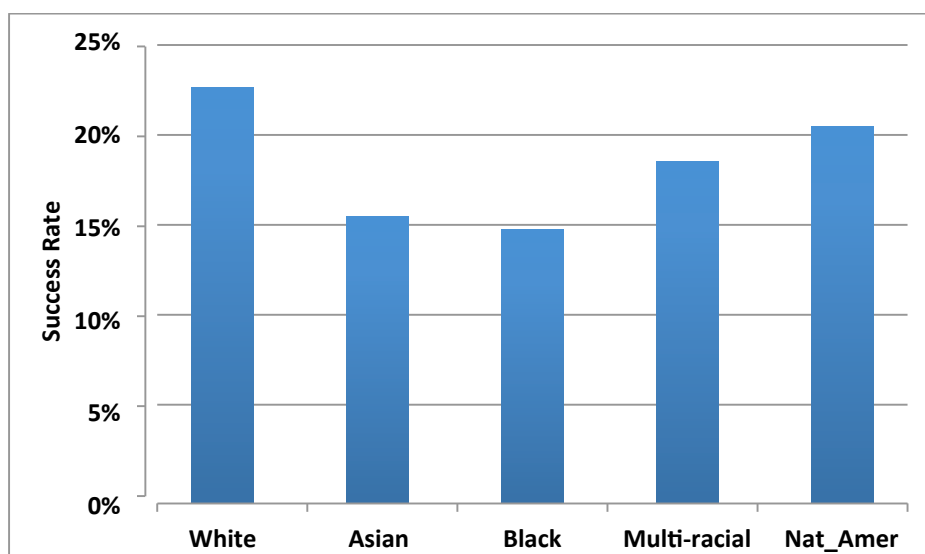
Figure 4.2 – FY 2016 Success Rates for Externally Reviewed Research Proposals, by Mean Review Rating and PI Race



Source: NSF Enterprise Information System, 10/1/16.

Figure 4.3 shows the success rate of the same groups independent of the review scores.

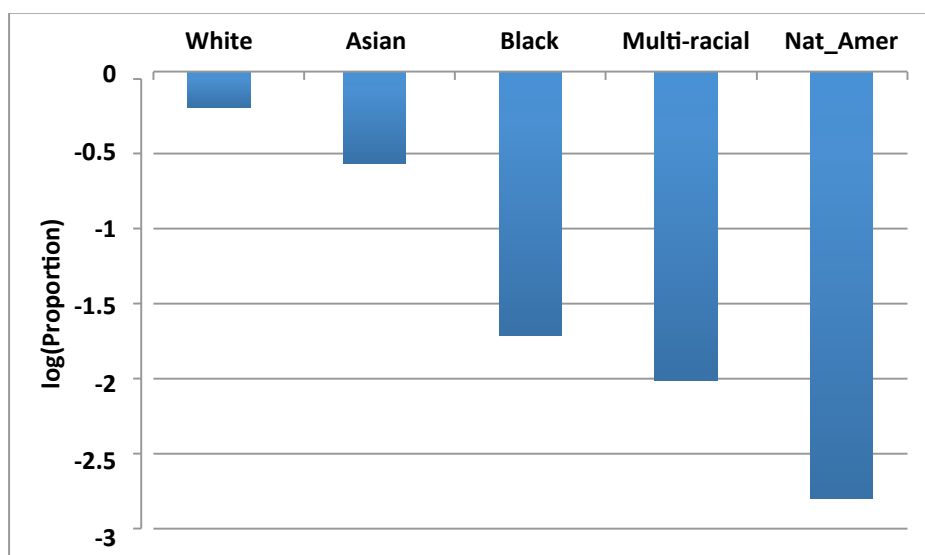
Figure 4.3 – FY 2016 Success Rates for Externally Reviewed Research Proposals, by PI Race



Source: NSF Enterprise Information System, 10/1/16.

As may be seen in **Table 4.2** above, the number of proposals from each group varies considerably. **Figure 4.4** visualizes this by plotting the proportion of all externally reviewed research proposals received from each group on a logarithmic scale. Thus the proportion of such proposals that come from White PIs is 0.59 (59%) while that from American Indian/Alaskan Native PIs is 0.002 (0.2%). Not shown is the proportion from Native Hawaiian/Pacific Islander PIs, 0.0008, or from PIs whose race is not known, 0.13.

Figure 4.4 – Proportion of Externally Reviewed Research Proposals, from PIs of different races in FY 2016 (Logarithmic Scale)



Source: NSF Enterprise Information System, 10/1/16.

Appendix 5 - Proposal Success Rates of New PIs and Prior PIs, by Directorate or Office

Table 5.1

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
New PIs*	BIO	14%	14%	15%	23%	14%	12%	18%	16%	20%	20%	21%
	CISE	18%	21%	18%	26%	19%	18%	17%	16%	18%	18%	19%
	EHR	20%	16%	22%	20%	13%	12%	16%	12%	13%	15%	16%
	ENG	15%	17%	16%	21%	13%	13%	14%	18%	15%	14%	16%
	GEO	23%	22%	22%	32%	26%	25%	20%	21%	20%	19%	22%
	MPS	19%	20%	19%	29%	18%	17%	18%	16%	18%	18%	18%
	OIA	100%	N/A	100%	13%	51%	2%	30%	6%	22%	6%	36%
	OISE	42%	44%	35%	55%	37%	30%	35%	60%	50%	58%	84%
	SBE	18%	21%	20%	22%	17%	14%	16%	16%	18%	20%	20%
Prior PIs	BIO	21%	23%	23%	31%	23%	21%	28%	24%	30%	31%	29%
	CISE	31%	31%	26%	34%	26%	24%	25%	22%	24%	26%	25%
	EHR	28%	24%	34%	33%	22%	21%	24%	21%	20%	22%	23%
	ENG	21%	23%	23%	28%	21%	19%	21%	23%	20%	24%	22%
	GEO	33%	33%	33%	49%	38%	35%	35%	27%	28%	27%	33%
	MPS	36%	39%	34%	46%	35%	32%	33%	29%	31%	34%	31%
	OIA	75%	80%	100%	13%	34%	15%	28%	33%	42%	47%	28%
	OISE	50%	51%	55%	55%	40%	42%	36%	31%	34%	25%	41%
	SBE	32%	33%	32%	38%	29%	25%	28%	27%	27%	30%	28%

Source: NSF Enterprise Information System 10/01/16.

* 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 postdoctoral fellowships, research planning grants, or conferences, symposia and workshop grants.)

For research proposals that received external reviews, **Figure 5.1** shows the success rates of all people submitting such proposals together with the success rates for new PIs and prior PIs, as a function of the average review rating of the PI's proposal. The per-proposal average of the reviewer ratings for a given proposal is allocated to one of a set of bins of half-integer width with mid-points of 4.75 (the highest bin), 4.25, 3.75, 3.25, 2.75, 2.25, 1.75 and 1.25 (the lowest). These bins are defined in the same way as in **Appendix 4**. Within any given rating bin, the success rates of proposals from new and prior PIs are very similar. The reason for the differences in the overall success rates of new and prior PIs seen in **Table 5.1** is because the distribution of average review ratings of proposals from new PIs is skewed to lower ratings than the distribution of average ratings of proposals from prior PIs, as may be seen in **Figure 5.2**.

Figure 5.1 – Success Rates for New and Prior PIs, by Average Review Rating

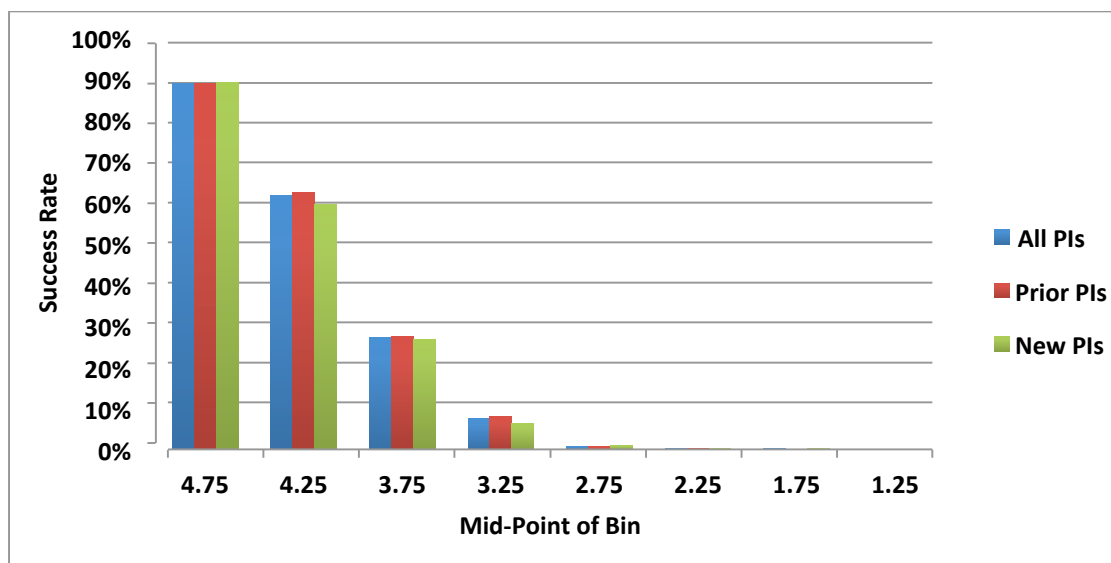
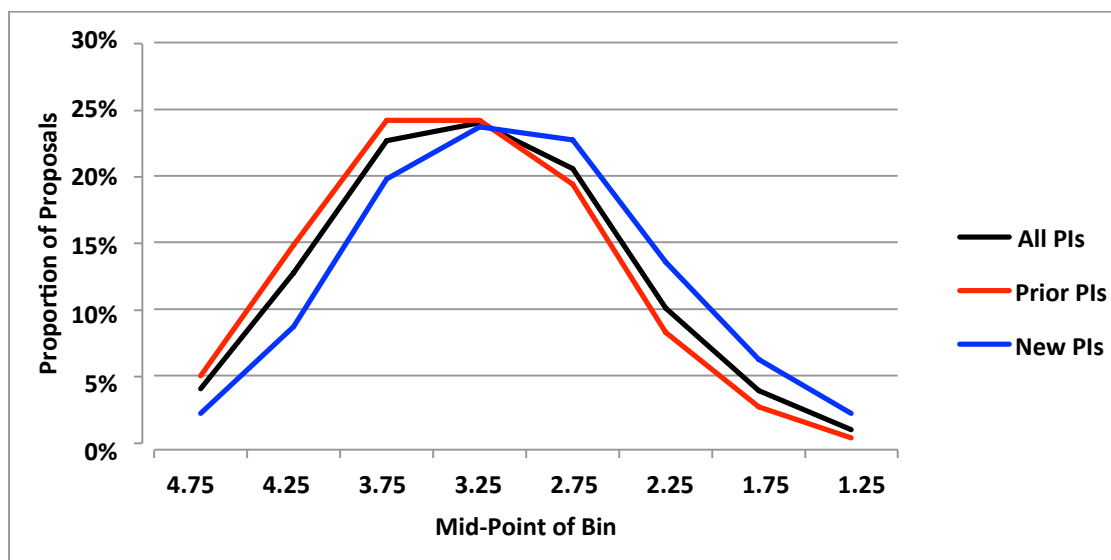


Figure 5.2 – Distribution of Proposals by Average Review Rating for New and Prior PIs



For comparison, the equivalent information for early-career PIs and later-career PIs is shown in **Figure 5.3** and **Figure 5.4**. From **Figure 5.3**, within any given rating bin, the success rate of proposals from early-career PIs is slightly higher than that for later-career PIs. Despite this, the overall success rate of later-career PIs is slightly higher than that of early-career PIs (see **Figure 18** in **III.F.10**) because the distribution of average review ratings of proposals from early-career PIs is skewed to lower ratings than the distribution of average ratings of proposals from later-career PIs, as may be seen in **Figure 5.4**. However, neither that skew nor the difference in success rates is as large as those seen for new and prior PIs.

Figure 5.3 – Success Rates for Early and Later-Career PIs, by Average Review Rating

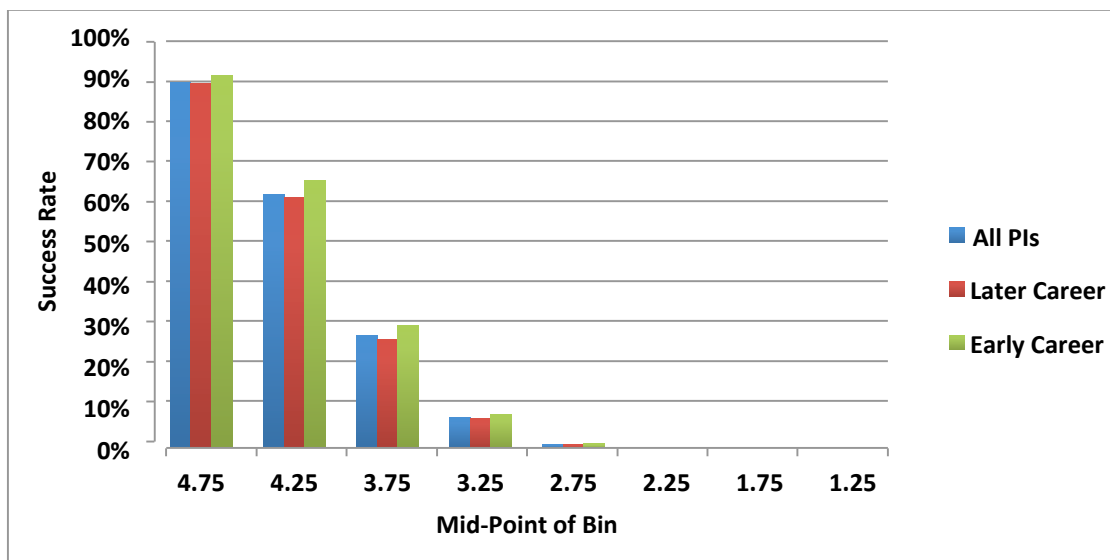
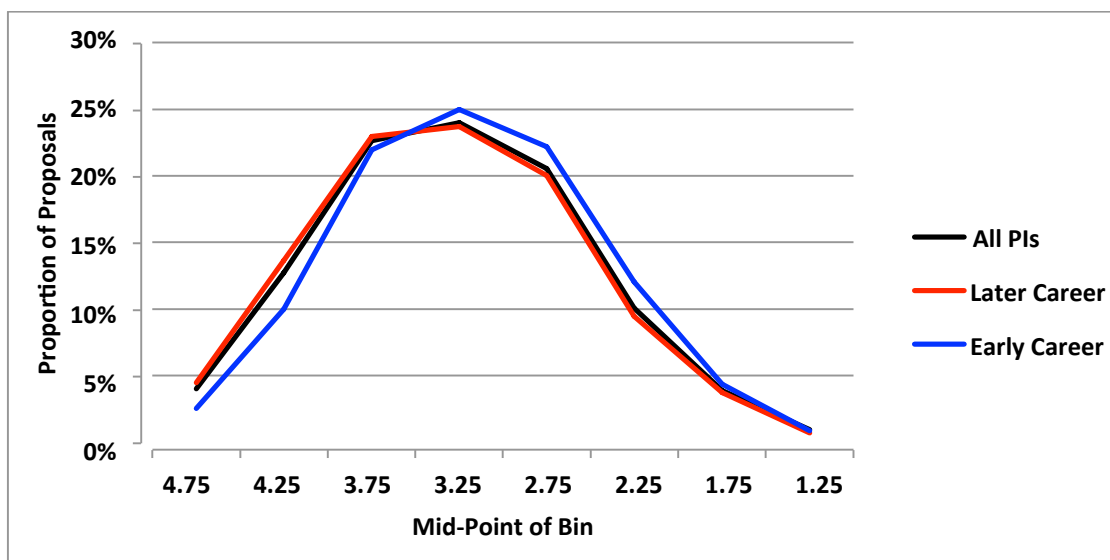


Figure 5.4 – Distribution of Proposals by Average Review Rating for Early and Later-Career PIs



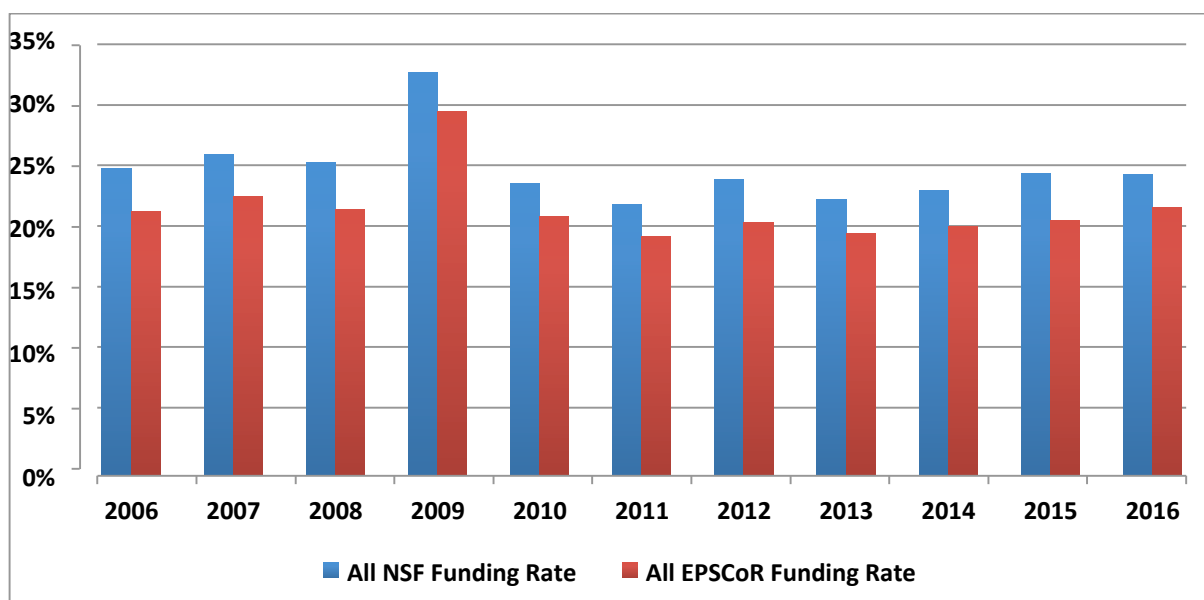
Appendix 6 - EPSCoR: Jurisdictions, Proposal, Award, and Funding Data

Twenty-five states, the Commonwealth of Puerto Rico, Guam and the U.S. Virgin Islands were eligible to participate in aspects of the NSF Experimental Program to Stimulate Competitive Research (EPSCoR) program in FY 2016.⁶⁰ The states are: Alabama, Alaska, Arkansas, Delaware, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Maine, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Vermont, West Virginia, and Wyoming. For one of the 25 states, Missouri, the prior 3-year rolling average of NSF research funds received was over 0.75% of NSF's Research and Related Activities budget and this jurisdiction was not eligible to participate in new Research Infrastructure Improvement initiatives in FY 2016.

In FY 2016, the NSF EPSCoR program invested \$27.7 million in co-funding 160 NSF awards. This investment was leveraged with \$40.5 million from NSF Directorates and other Offices for a total investment of \$68.1 million. Since 1998, when the co-funding initiative was formally established, approximately 4,300 co-funded awards have been made. The latter represent a total NSF investment of about \$1.7 billion of which \$624 million was co-funding provided by the EPSCoR program.

Figure 6.1 shows the change over time for the proposal success rate of EPSCoR jurisdictions relative to the overall NSF proposal success rate for all of the United States.

Figure 6.1 - Overall Proposal Success Rates for EPSCoR Jurisdictions and Overall NSF Proposal Success Rates



Source: EPSCoR Office 2/17/17.

⁶⁰ In January 2017, the EPSCoR program was renamed the Established Program to Stimulate Competitive Research.

Table 6.1 shows the number of proposals, awards, and proposal success rates for EPSCoR jurisdictions. Below the name of the EPSCoR jurisdiction is the year in which the jurisdiction joined EPSCoR.

Table 6.1 – Proposal Success Rates, by EPSCoR Jurisdiction
(Date under the state name is the year the state joined EPSCoR)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
All NSF	Awards	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007	11,877
	Proposals	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620	49,285
	Funding Rate	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%	24%
All EPSCoR Juris-dictions	Awards	1,489	1,653	1,564	2,474	2,181	1,846	1,960	1,897	1,892	1,980	1,676
	Proposals	7,037	7,392	7,349	8,476	10,513	9,640	9,680	9,766	9,477	9,679	7,815
	Funding Rate	21%	22%	21%	29%	21%	19%	20%	19%	20%	20%	21%
Alabama -1985	Awards	84	86	85	148	119	98	110	94	102	85	102
	Proposals	530	508	489	606	708	614	669	647	665	583	607
	Funding Rate	16%	17%	17%	24%	17%	16%	16%	15%	15%	15%	17%
Alaska -2000	Awards	63	75	52	77	65	71	65	60	50	49	59
	Proposals	209	246	204	186	235	213	199	221	205	246	193
	Funding Rate	30%	30%	25%	41%	28%	33%	33%	27%	24%	20%	31%
Arkansas -1980	Awards	47	58	36	41	60	40	33	46	33	30	35
	Proposals	209	244	197	194	276	246	229	260	207	184	196
	Funding Rate	22%	24%	18%	21%	22%	16%	14%	18%	16%	16%	18%
Delaware -2003	Awards	50	67	68	77	80	70	79	70	67	64	80
	Proposals	247	283	283	244	295	292	278	287	283	273	301
	Funding Rate	20%	24%	24%	32%	27%	24%	28%	24%	24%	23%	27%
Guam -2012	Awards	1	0	2	0	2	2	2	1	0	2	0
	Proposals	1	2	5	3	7	5	8	7	4	6	2
	Funding Rate	100%	0%	40%	0%	29%	40%	25%	14%	0%	33%	0%
Hawaii -2001	Awards	77	74	73	109	99	80	60	54	68	62	78
	Proposals	240	276	276	277	379	285	281	282	294	267	285
	Funding Rate	32%	27%	26%	39%	26%	28%	21%	19%	23%	23%	27%
Idaho -1987	Awards	29	34	44	44	35	37	47	41	35	37	41
	Proposals	148	161	201	168	199	202	185	214	230	234	206
	Funding Rate	20%	21%	22%	26%	18%	18%	25%	19%	15%	16%	20%
Kansas -1992	Awards	76	78	82	88	92	88	91	65	67	94	71
	Proposals	393	404	387	399	464	423	402	393	389	407	396
	Funding Rate	19%	19%	21%	22%	20%	21%	23%	17%	17%	23%	18%
Kentucky -1985	Awards	52	60	62	78	81	64	63	58	68	69	83
	Proposals	293	330	300	356	429	437	434	391	401	399	399
	Funding Rate	18%	18%	21%	22%	17%	15%	15%	15%	17%	17%	21%

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Louisiana -1987	Awards	117	96	98	132	149	102	88	91	74	99	91
	Proposals	548	495	471	583	715	621	484	463	402	460	459
	Funding Rate	21%	19%	21%	27%	21%	16%	18%	20%	18%	22%	20%
Maine -1980	Awards	36	58	65	60	58	42	46	52	48	50	44
	Proposals	181	200	199	172	190	209	182	211	201	189	175
	Funding Rate	20%	29%	33%	35%	31%	20%	25%	25%	24%	26%	25%
Mississippi -1987	Awards	48	40	34	76	72	42	43	28	32	40	47
	Proposals	293	251	271	301	358	287	264	262	260	240	256
	Funding Rate	16%	16%	13%	25%	20%	15%	16%	11%	12%	17%	18%
Missouri -2012	Awards	150	146	160	180	144	135	136	139	114	137	151
	Proposals	693	742	699	713	795	727	715	716	636	685	715
	Funding Rate	22%	20%	23%	25%	18%	19%	19%	19%	18%	20%	21%
Montana -1980	Awards	52	61	57	78	51	35	50	50	45	51	52
	Proposals	242	238	232	207	251	222	204	214	183	210	183
	Funding Rate	21%	26%	25%	38%	20%	16%	25%	23%	25%	24%	28%
Nebraska -1992	Awards	59	51	54	64	56	60	40	59	51	59	58
	Proposals	238	250	255	248	324	309	258	305	281	307	300
	Funding Rate	25%	50%	21%	26%	17%	19%	16%	19%	18%	19%	19%
Nevada -1985	Awards	42	50	43	61	39	37	29	33	58	40	42
	Proposals	200	231	261	232	295	263	236	217	245	230	266
	Funding Rate	21%	22%	16%	26%	13%	14%	12%	15%	24%	17%	16%
New Hampshire -2004	Awards	53	60	58	108	76	61	75	64	64	65	74
	Proposals	243	240	230	251	311	282	280	273	295	253	285
	Funding Rate	22%	25%	25%	43%	24%	22%	27%	23%	22%	26%	26%
New Mexico -2001	Awards	91	104	102	115	105	91	69	81	76	88	107
	Proposals	348	401	444	389	506	416	399	404	398	474	449
	Funding Rate	26%	26%	23%	30%	21%	22%	17%	20%	19%	19%	24%
North Dakota -1985	Awards	22	15	19	31	35	23	18	21	26	20	32
	Proposals	170	139	158	141	171	161	161	172	174	171	185
	Funding Rate	13%	11%	12%	22%	20%	14%	11%	12%	15%	12%	17%
Oklahoma -1985	Awards	74	66	67	112	74	79	68	59	69	68	76
	Proposals	342	338	378	420	457	460	384	394	339	388	372
	Funding Rate	22%	20%	18%	27%	16%	17%	18%	15%	20%	18%	20%
Puerto Rico -1985	Awards	19	32	24	37	34	19	9	8	16	15	22
	Proposals	140	153	148	183	203	163	153	105	86	102	90
	Funding Rate	14%	21%	16%	20%	17%	12%	6%	8%	19%	15%	24%
Rhode Island -2004	Awards	140	127	129	176	148	131	146	127	138	131	132
	Proposals	353	390	357	350	442	400	393	399	404	361	349
	Funding Rate	40%	33%	36%	50%	33%	33%	37%	32%	34%	36%	38%

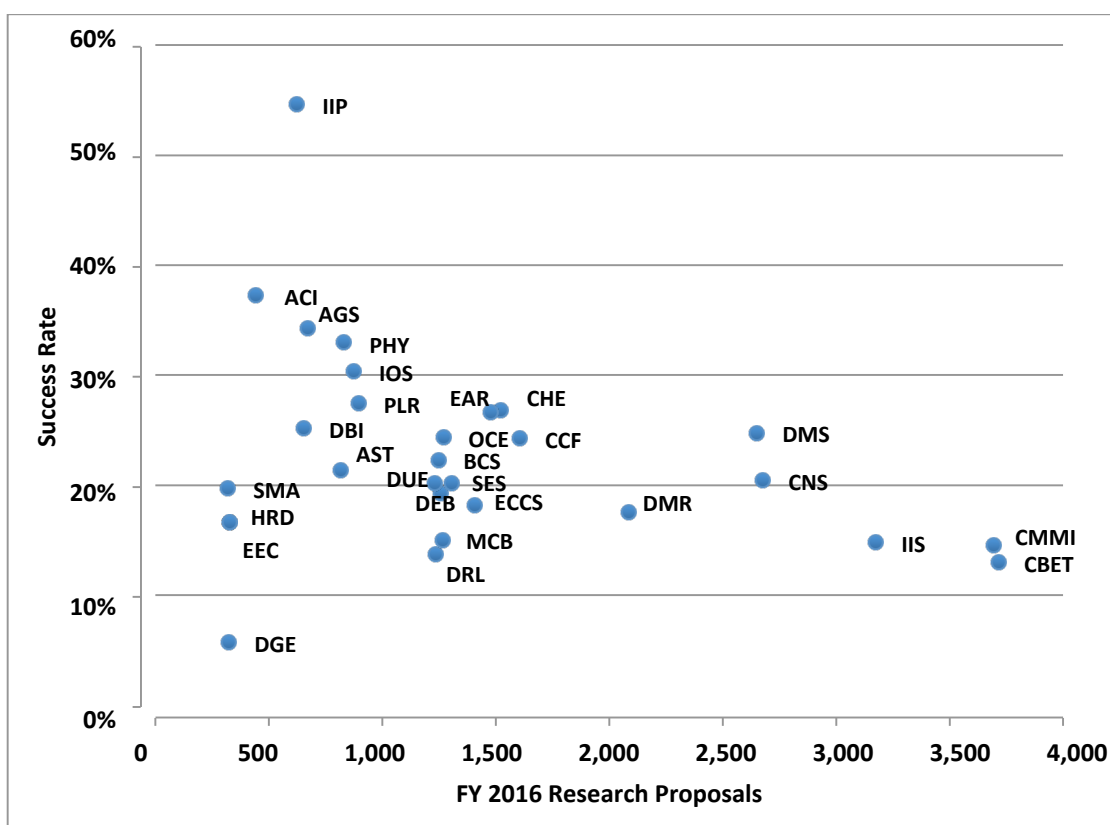
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
South Carolina -1980	Awards	86	122	87	152	136	108	117	115	97	117	98
	Proposals	464	523	470	527	671	650	562	594	585	603	556
	Funding Rate	19%	23%	19%	29%	20%	17%	21%	19%	17%	19%	18%
South Dakota -1987	Awards	14	21	20	31	33	24	20	28	32	25	24
	Proposals	97	97	116	132	184	162	150	163	135	139	150
	Funding Rate	14%	22%	17%	23%	18%	15%	13%	17%	24%	18%	16%
U.S. Virgin Islands -2002	Awards	1	0	2	0	1	3	2	0	2	1	3
	Proposals	6	4	5	1	3	11	5	8	7	3	10
	Funding Rate	17%	0%	40%	10%	33%	27%	40%	0%	29%	33%	30%
Vermont -1985	Awards	16	26	27	42	23	22	24	21	22	18	24
	Proposals	119	129	144	120	126	121	90	89	104	96	133
	Funding Rate	13%	20%	19%	35%	18%	18%	27%	24%	21%	19%	18%
West Virginia -1980	Awards	19	21	25	33	27	21	32	22	23	37	29
	Proposals	121	128	119	130	160	151	163	158	159	187	169
	Funding Rate	16%	16%	21%	25%	17%	14%	20%	14%	14%	20%	17%
Wyoming -1985	Awards	23	26	27	44	35	31	20	18	24	27	21
	Proposals	99	91	121	123	146	122	105	115	129	129	128
	Funding Rate	23%	29%	22%	36%	24%	25%	19%	16%	19%	21%	16%

Source: All-NSF data - NSF Enterprise Information System, 10/1/16; EPSCoR jurisdiction data - NSF Budget Internet Information System, February 2017.

Appendix 7 - Research Proposals and Success Rates, by Division

Figure 7.1 shows a scatter plot of the NSF divisions along axes corresponding to the number of research proposals acted on and the success rate, for FY 2016. Only divisions with at least 200 research proposals in FY 2016 are included. A unit that handles proposals in a way similar to divisions is included as a separate entity, the Office of Multidisciplinary Activities (SMA) in the Directorate for Social, Behavioral, and Economic Sciences. Division acronyms are listed in **Appendix 23**. Data do not reflect preliminary proposal submissions, which are high for IOS and DEB. The points for HRD and EEC lie on top of each other.

Figure 7.1 – FY 2016 Research Proposals and Success Rates, by Division



Source: NSF Enterprise Information System, 10/01/16.

**Appendix 8 - Median and Mean Annualized Award Amounts for Research Grants, by
Directorate or Office (Nominal Dollars in Thousands)**

		Fiscal Year										
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NSF	Median	\$102	\$110	\$110	\$120	\$124	\$120	\$125	\$130	\$133	\$130	\$133
	Mean	\$135	\$146	\$143	\$162	\$167	\$159	\$166	\$169	\$172	\$171	\$173
BIO	Median	\$140	\$142	\$150	\$161	\$171	\$178	\$177	\$182	\$178	\$186	\$200
	Mean	\$191	\$182	\$180	\$200	\$222	\$226	\$214	\$228	\$217	\$237	\$243
CSE	Median	\$90	\$92	\$94	\$110	\$118	\$141	\$150	\$161	\$166	\$161	\$155
	Mean	\$114	\$120	\$131	\$169	\$172	\$174	\$206	\$204	\$199	\$187	\$198
ENG	Median	\$90	\$100	\$100	\$100	\$100	\$100	\$107	\$103	\$112	\$103	\$102
	Mean	\$110	\$116	\$112	\$120	\$122	\$119	\$125	\$122	\$131	\$122	\$124
GEO	Median	\$87	\$93	\$89	\$101	\$100	\$116	\$125	\$141	\$141	\$144	\$150
	Mean	\$113	\$137	\$122	\$153	\$134	\$162	\$170	\$193	\$201	\$183	\$185
MPS	Median	\$100	\$106	\$105	\$113	\$115	\$111	\$117	\$116	\$120	\$125	\$122
	Mean	\$120	\$130	\$133	\$138	\$150	\$141	\$143	\$130	\$141	\$149	\$142
OIA	Median	\$53	\$160	\$146	\$391	\$391	\$393	\$170	\$156	\$171	\$713	\$156
	Mean	\$490	\$130	\$146	\$366	\$431	\$379	\$178	\$948	\$173	\$554	\$514
OISE	Median	\$33	\$47	\$30	\$25	\$50	\$49	\$50	\$31	\$49	\$82	\$83
	Mean	\$59	\$157	\$29	\$33	\$198	\$60	\$200	\$53	\$142	\$149	\$102
SBE	Median	\$85	\$94	\$100	\$101	\$100	\$98	\$98	\$101	\$109	\$112	\$117
	Mean	\$103	\$115	\$116	\$114	\$116	\$113	\$120	\$139	\$134	\$138	\$136

Source: NSF Enterprise Information System, 10/1/16.

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

Appendix 9 - Number of People Involved in NSF-funded Activities⁶¹

In FY2016, approximately 362,000 senior researchers, post-doctoral associates, teachers and students across all levels were directly involved in NSF research and education programs and activities.

	FY 2016 Actual Estimate
Senior Researchers	43,852
Other Professionals	14,127
Postdoctoral Associates	5,677
Graduate Students	40,884
Undergraduate Students	38,448
K-12 Teachers	44,123
K-12 Students	174,810
Total Number of People	361,921

Source: NSF FY 2018 Budget Request to Congress, p. Summary Tables - 5.

In addition, NSF programs indirectly impact many millions of people. These programs reach K-12 students, K-12 teachers, the general public, and researchers. Outreach activities include workshops, activities at museums, television, educational videos, journal articles, and the dissemination of improved curricula and teaching methods.

⁶¹ These data are estimates based on the budget details of awards active in the year indicated, with modifications made, as appropriate, based on additional information provided by the managing directorates or offices. The numbers for senior researchers, other professionals, post-doctoral associates, and graduate students are more directly informed by data from award budgets than the other three categories.

Appendix 10 - Mean Levels of PI, Graduate Student and Post-Doctoral Associate Support in Research Grants

Table 10.1 Mean Number of Months of Salary Support for Single- and Multi-PI Research Grants, by Directorate or Office

Directorate or Office	Type of Award	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NSF	Single PI Grants	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.7
	Multi-PI Grants	1.3	1.3	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.8	0.7
	NSF Average	1.4	1.3	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.8	0.7
BIO	Single PI Grants	1.6	2.0	1.8	1.3	1.2	1.3	1.1	1.0	1.0	0.9	0.9
	Multi-PI Grants	2.0	2.0	1.7	1.6	1.2	1.1	1.1	1.3	1.0	1.1	0.9
	BIO Average	1.7	2.0	1.8	1.4	1.2	1.2	1.1	1.1	1.0	0.9	0.9
CSE	Single PI Grants	1.1	0.9	0.7	0.8	0.8	0.9	0.7	0.7	0.7	0.6	0.6
	Multi-PI Grants	0.6	0.7	0.5	0.6	0.6	0.8	0.7	0.6	0.7	0.5	0.5
	CSE Average	0.9	0.8	0.6	0.7	0.7	0.9	0.7	0.6	0.7	0.6	0.6
EHR	Single PI Grants	1.5	1.6	2.0	1.6	1.9	1.7	1.4	1.4	1.0	0.9	0.8
	Multi-PI Grants	1.8	1.5	1.2	1.6	1.8	2.2	1.7	1.0	0.9	0.8	0.7
	EHR Average	1.7	1.5	1.5	1.6	1.8	2.1	1.6	1.1	0.9	0.8	0.7
ENG	Single PI Grants	1.2	1.2	0.9	0.9	0.4	0.4	0.6	0.4	0.3	0.4	0.4
	Multi-PI Grants	0.7	0.8	0.7	0.7	0.4	0.3	0.3	0.3	0.3	0.3	0.3
	ENG Average	1.0	1.0	0.8	0.8	0.4	0.4	0.5	0.4	0.3	0.4	0.3
GEO	Single PI Grants	1.4	1.3	1.1	1.0	1.1	1.0	1.0	0.9	1.0	1.0	0.9
	Multi-PI Grants	1.5	1.3	1.2	1.1	1.1	1.0	1.3	1.3	1.2	1.2	1.1
	GEO Average	1.4	1.3	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.0	1.0
MPS	Single PI Grants	1.4	1.3	1.3	1.5	1.3	1.3	1.1	1.0	1.0	0.8	0.8
	Multi-PI Grants	1.5	1.5	1.4	1.5	1.2	1.2	0.9	0.9	0.9	0.9	0.8
	MPS Average	1.4	1.3	1.4	1.5	1.3	1.3	1.0	1.0	1.0	0.9	0.8
OIA	Single PI Grants	0.8	8.6	3.3	0.4	2.4	1.3	1.2	1.1	1.2	0.8	1.0
	Multi-PI Grants	2.5	4.5	N/A	1.1	0.4	0.2	N/A	N/A	0.7	N/A	0.4
	OIA Average	1.7	6.5	3.3	1.0	1.1	0.9	1.2	1.1	0.8	0.8	0.5
OISE	Single PI Grants	2.9	0.5	N/A	1.0	0.3	2.2	0.3	0.8	0.5	0.6	0.6
	Multi-PI Grants	0.6	0.9	1.0	0.9	1.8	0.8	0.7	0.5	0.5	0.8	0.7
	OISE Average	2.2	0.9	1.0	1.0	1.4	1.1	0.6	0.7	0.5	0.7	0.7
SBE	Single PI Grants	1.9	1.6	2.0	1.5	1.7	1.2	1.2	1.1	1.1	1.1	1.0
	Multi-PI Grants	1.4	1.4	1.1	1.0	1.3	0.9	0.9	1.2	1.2	1.6	1.4
	SBE Average	1.7	1.5	1.7	1.4	1.6	1.1	1.1	1.1	1.2	1.3	1.1

Source: NSF Enterprise Information System, 10/1/16 and NSF Report Server 1/10/17.

Table 10.2 Mean Annualized Graduate Student Support on Research Grants

	Mean Annualized Level of Graduate Student Support per Research Grant	
Fiscal Year	All Research Grants	Research Grants with Graduate Student Support
2006	\$14,220	\$20,182
2007	\$14,811	\$20,411
2008	\$15,415	\$21,100
2009	\$16,907	\$22,684
2010	\$15,780	\$22,086
2011	\$17,182	\$24,259
2012	\$19,884	\$28,101
2013	\$20,937	\$29,101
2014	\$21,028	\$29,381
2015	\$20,842	\$29,875
2016	\$21,408	\$30,657

Table 10.3 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
2006	\$4,214	\$23,987
2007	\$4,491	\$25,814
2008	\$4,214	\$24,998
2009	\$4,718	\$26,747
2010	\$5,183	\$28,587
2011	\$5,377	\$29,639
2012	\$5,992	\$35,593
2013	\$6,060	\$34,674
2014	\$5,492	\$34,142
2015	\$5,970	\$35,889
2016	\$5,894	\$36,339

Appendix 11 - Mean Number of Research Proposals per PI before Receiving One Award, by Directorate or Office, by Fiscal Year Triads

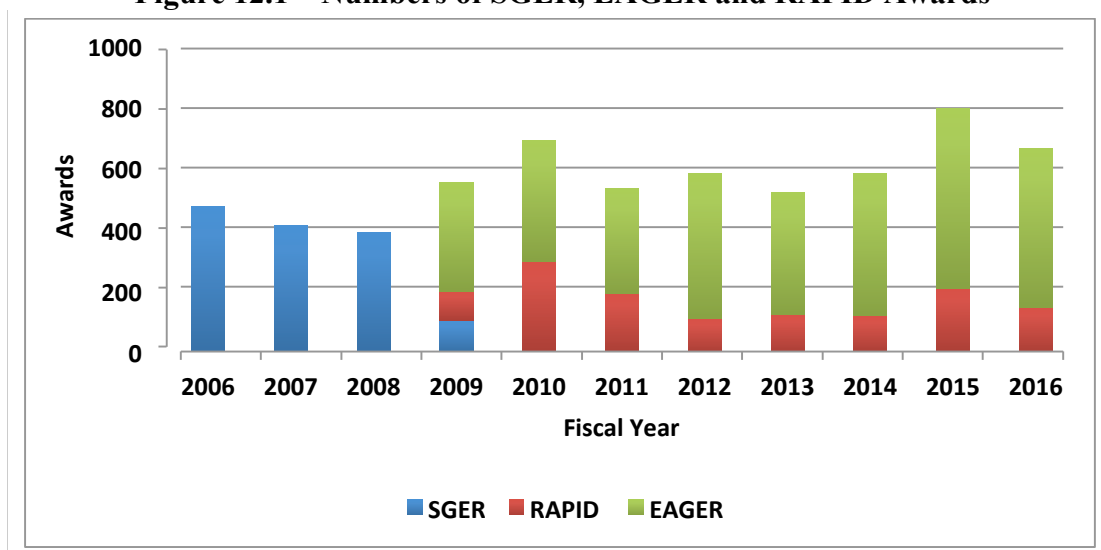
	2004- 2006	2005- 2007	2006- 2008	2007- 2009	2008- 2010	2009- 2011	2010- 2012	2011- 2013	2012- 2014	2013- 2015	2014- 2016
NSF	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.4	2.4	2.4	2.4
BIO	2.0	2.2	2.2	2.1	2.1	2.1	2.1	1.9	1.7	1.7	1.7
CISE	2.6	2.4	2.4	2.4	2.6	2.5	2.6	2.6	2.7	2.6	2.6
EHR	1.3	1.4	1.3	1.4	1.4	1.4	1.5	1.7	1.7	1.6	1.7
ENG	2.4	2.6	2.5	2.5	2.6	2.7	2.8	2.6	2.6	2.4	2.4
GEO	2.2	2.3	2.2	2.1	2.0	2.0	2.1	2.2	2.2	2.3	2.3
MPS	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7
O/D	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.2	1.2
SBE	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6	1.6

Source: NSF Enterprise Information System, 10/06/16.

Appendix 12 - Small Grants for Exploratory Research (SGER), EARly-concept Grants for Exploratory Research (EAGER), and Grants for Rapid Response Research (RAPID)

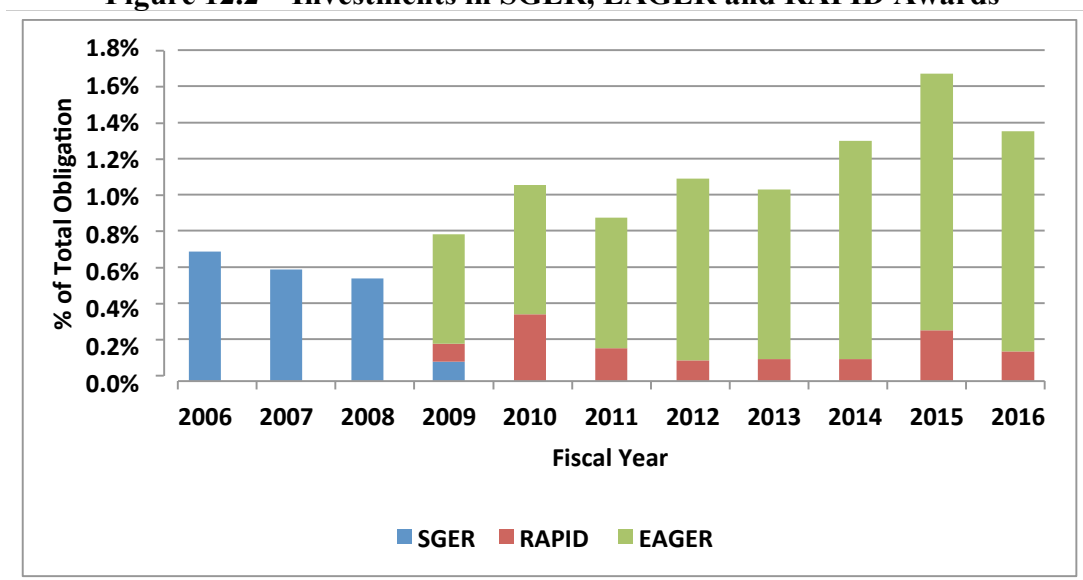
Figures 12.1, 12.2 and Table 12.1 provide funding trends for EAGERS, RAPIDs, and SGERs. Effective January 2009, the SGER funding mechanism was replaced by two separate funding mechanisms EAGER and RAPID so FY 2009 included all three types of awards.

Figure 12.1 – Numbers of SGER, EAGER and RAPID Awards



Source: NSF Enterprise Information System 10/01/16.

Figure 12.2 – Investments in SGER, EAGER and RAPID Awards



Source: NSF Enterprise Information System 10/01/16 and 04/10/17.

Table 12.1 - EARly-concept Grants for Exploratory Research (EAGER) and Grants for Rapid Response Research (RAPID): Funding Trends, by Directorate or Office

		2011		2012		2013		2014		2015		2016	
		RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER
NSF	Proposals	237	360	114	519	123	441	127	537	238	743	155	765
	Awards	190	341	107	472	121	399	117	462	207	585	145	518
	Funding Rate	80%	95%	94%	91%	98%	90%	92%	86%	87%	79%	94%	68%
	Total \$ (Millions)	\$12.3	\$49.3	\$7.9	\$70.3	\$8.4	\$64.2	\$8.6	\$85.0	\$20.3	\$103.0	\$12.1	\$90.7
	% of Obligations	0.2%	0.7%	0.1%	1.0%	0.1%	0.9%	0.1%	1.2%	0.3%	1.4%	0.2%	1.2%
	Average \$ (1000s)	\$65	\$145	\$74	\$149	\$70	\$161	\$73	\$184	\$98	\$176	\$84	\$175
BIO	Proposals	10	34	14	54	13	32	17	80	38	117	25	44
	Awards	8	27	13	50	12	25	13	77	29	104	19	40
	Funding Rate	80%	79%	93%	93%	92%	78%	76%	96%	76%	89%	76%	91%
	Total \$ (Millions)	\$0.9	\$5.8	\$1.2	\$9.0	\$1.5	\$6.1	\$1.4	\$19.1	\$3.9	\$19.7	\$2.8	\$10.4
	% of Obligations	0.1%	0.8%	0.1%	1.2%	0.2%	0.8%	0.2%	2.3%	0.5%	2.6%	0.3%	1.2%
	Average \$ (1000s)	\$107	\$214	\$89	\$181	\$124	\$243	\$111	\$247	\$134	\$190	\$150	\$260
CSE	Proposals	28	148	11	173	2	171	3	193	37	209	5	257
	Awards	24	145	10	166	2	165	3	159	27	163	5	176
	Funding Rate	86%	98%	91%	96%	100%	96%	100%	82%	73%	78%	100%	68%
	Total \$ (Millions)	\$1.5	\$22.6	\$1.2	\$28.1	\$0.1	\$27.6	\$0.4	\$28.9	\$3.3	\$27.8	\$0.8	\$33.7
	% of Obligations	0.2%	2.4%	0.1%	3.0%	0.0%	3.0%	0.0%	3.2%	0.4%	3.1%	0.1%	3.6%
	Average \$ (1000s)	\$61	\$156	\$116	\$169	\$45	\$168	\$144	\$182	\$121	\$170	\$168	\$192
EHR	Proposals	9	4	5	48	5	33	3	50	21	81	27	72
	Awards	8	4	5	25	5	19	3	37	21	45	26	43
	Funding Rate	89%	100%	100%	52%	100%	58%	100%	74%	100%	56%	96%	60%
	Total \$ (Millions)	\$1.5	\$1.2	\$0.7	\$6.3	\$0.8	\$4.9	\$0.7	\$9.4	\$2.1	\$10.8	\$1.5	\$8.1
	% of Obligations	0.2%	0.1%	0.1%	0.6%	0.1%	0.5%	0.1%	1.0%	0.2%	1.1%	0.1%	0.8%
	Average \$ (1000s)	\$184	\$303	\$146	\$252	\$153	\$258	\$231	\$253	\$100	\$239	\$57	\$188
ENG	Proposals	62	92	12	109	38	134	35	108	41	258	24	273
	Awards	35	88	10	107	38	125	34	96	34	203	21	155
	Funding Rate	56%	96%	83%	98%	100%	93%	97%	89%	83%	79%	88%	57%
	Total \$ (Millions)	\$1.9	\$8.9	\$0.4	\$12.7	\$1.8	\$16.4	\$1.6	\$14.6	\$3.3	\$33.7	\$1.2	\$22.7
	% of Obligations	0.2%	1.1%	0.1%	1.5%	0.2%	2.0%	0.2%	1.7%	0.4%	3.7%	0.1%	2.5%
	Average \$ (1000s)	\$53	\$101	\$42	\$119	\$49	\$131	\$47	\$152	\$97	\$166	\$56	\$146
GEO	Proposals	99	60	63	93	47	51	51	47	55	27	45	48
	Awards	93	57	61	89	47	49	51	46	55	26	45	45
	Funding Rate	94%	95%	97%	96%	100%	96%	100%	98%	100%	96%	100%	94%
	Total \$ (Millions)	\$5.2	\$6.8	\$3.8	\$8.2	\$3.1	\$5.0	\$3.0	\$5.1	\$3.7	\$3.5	\$3.5	\$5.2
	% of Obligations	0.4%	0.5%	0.3%	0.6%	0.2%	0.4%	0.2%	0.4%	0.3%	0.3%	0.3%	0.4%
	Average \$ (1000s)	\$56	\$120	\$62	\$92	\$66	\$103	\$60	\$112	\$68	\$135	\$78	\$115
MPS	Proposals	2	14	2	29	2	9	1	20	6	21	0	28
	Awards	2	12	1	24	2	6	1	19	6	17	0	27
	Funding Rate	100%	86%	50%	83%	100%	67%	100%	95%	100%	81%	N/A	96%
	Total \$ (Millions)	\$0.2	\$2.2	\$0.0	\$4.3	\$0.3	\$2.3	\$0.2	\$3.5	\$0.9	\$3.5	\$0.0	\$6.0
	% of Obligations	0.0%	0.2%	0.0%	0.3%	0.0%	0.2%	0.0%	0.3%	0.1%	0.2%	0.0%	0.4%
	Average \$ (1000s)	\$125	\$183	\$23	\$181	\$163	\$386	\$209	\$183	\$151	\$207	N/A	\$224

		2011		2012		2013		2014		2015		2016	
		RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER
SBE	Proposals	26	6	7	11	16	11	17	39	40	30	28	43
	Awards	19	6	7	9	15	10	12	28	35	27	28	32
	Funding Rate	73%	100%	100%	82%	94%	91%	71%	72%	88%	90%	100%	74%
	Total \$ (Millions)	\$0.9	\$1.0	\$0.6	\$1.2	\$0.6	\$1.3	\$1.0	\$4.2	\$3.1	\$3.4	\$2.1	\$4.2
	% of Obligations	0.4%	0.4%	0.2%	0.5%	0.2%	0.5%	0.4%	1.6%	1.1%	1.3%	0.8%	1.5%
	Average \$ (1000s)	\$50	\$172	\$80	\$130	\$40	\$132	\$81	\$151	\$88	\$127	\$74	\$130
OD	Proposals	1	2	0	2	0	0	0	0	0	0	1	0
	Awards	1	2	0	2	0	0	0	0	0	0	1	0
	Funding Rate	100%	100%	N/A	100%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total \$ (Millions)	\$0.3	\$0.8	\$0.1	\$0.4	\$0.4	\$0.5	\$0.3	\$0.5	\$0.0	\$0.6	\$0.2	\$0.4
	% of Obligations	0.1%	0.2%	0.0%	0.2%	0.1%	0.2%	0.1%	0.2%	0.0%	0.2%	0.0%	0.1%
	Average \$ (1000s)	\$261	\$376	N/A	\$196	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: NSF Enterprise Information System, 10/01/16 and 04/10/17. No distinction is made between funds obligated by a directorate to awards managed by that directorate and funds obligated by a directorate as co-funding for awards managed by other directorates. OD obligation totals include co-funding by EPSCoR and the Office of International Science and Engineering.

Appendix 13 - Description of Merit Review Principles and Criteria⁶²

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 activities that the PI intends to do, and [to 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. (GPG Chapter II.C.2.d.(i) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including GPG Chapter II.C.2.d.(i), prior to the review of a proposal.

⁶² From NSF *Proposal and Award Policies and Procedures Guide*, http://www.nsf.gov/pubs/policydocs/pappguide/nsf13001/gpg_index.jsp. Effective from January 14th, 2013.

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 14 - Proposals Returned Without Review, by Reason

Full Proposals	
Reason	Number returned
Inappropriate for NSF	56
Insufficient lead time	8
Preliminary proposal did not result in an invitation to submit a full proposal	4
Duplicates a proposal in review	50
Format problem	147
Does not contain a required section	299
Not responsive to solicitation, program announcement, or Proposal and Award Policies and Procedures Guide	608
Received past the deadline	136
Not substantially revised after a previous declination	75
Duplicates an existing award	16
TOTAL	1,399

Preliminary Proposals	
Reason	Number returned
Inappropriate for NSF	4
Duplicates a proposal in review	3
Format problem	9
Does not contain a required section	17
Not responsive to solicitation, program announcement, or Proposal and Award Policies and Procedures Guide	30
Received past the deadline	1
TOTAL	64

Source: NSF Report Server, 1/11/17.

Appendix 15 - Oversight and Advisory Mechanisms

- **Committees of Visitors.**

To ensure the highest quality in processing and recommending proposals for awards, NSF convenes external groups of experts, called Committees of Visitors (COVs), to review each major program approximately every four to five years. This includes disciplinary programs in the various directorates and offices, and the cross-disciplinary programs managed across directorates. The COVs (comprised of scientists, engineers and educators from academia, industry, and government) convene at NSF for a one to three-day assessment. These experts 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. Questions include aspects of the program portfolio, such as the balance of high-risk, multidisciplinary, and innovative projects. The recommendations of COVs are reviewed by management and taken into consideration by NSF when evaluating existing programs and future directions for the Foundation.⁶³

- **Advisory Committees Reporting on Directorate/Office Performance.**

Advisory Committees regularly provide community perspectives to the research and education directorates as well as on cross-cutting NSF topics such as cyberinfrastructure, international science and engineering, environmental research and education, business and operations, and equal opportunities in science and engineering. They 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. Advisory Committees, as part of their mission, review COV reports and staff responses.

⁶³ The COV reports and directorate responses are available electronically at <http://www.nsf.gov/od/oia/activities/cov/covs.jsp>.

Appendix 16 - Requests for Formal Reconsideration of Declined Proposals

		Fiscal Year										
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
First Level Reviews (Assistant Directors):												
BIO	Request	4	2	5	3	1	4	2	2	0	6	3
	- Upheld	4	2	5	3	1	3	0	2	0	4	3
	- Reversed	0	0	0	0	0	1	2	0	0	2	0
CISE	Request	1	1	0	0	2	3	5	1	4	2	1
	- Upheld	1	1	0	0	2	3	5	1	3	1	1
	- Reversed	0	0	0	0	0	0	0	0	0	1	0
EHR	Request	4	6	7	2	2	2	3	4	2	4 ⁺	3
	- Upheld	4	6	7	2	2	2	3	4	2	4	3
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
ENG	Request	6	3	3	3	11	8	5	7 ^{**}	11	3	5
	- Upheld	6	3	3	3	9	7	5	5	11	3	5
	- Reversed	0	0	0	0	2	1	0	1	0	0	0
GEO	Request	0	2	0	2	3	2	2	1	1	2	0
	- Upheld	0	2	0	1	3	2	2	1	1	2	0
	- Reversed	0	0	0	1	0	0	0	0	0	0	0
MPS	Request	16	16	14	9	14 [^]	11	22	12	12	10 ⁺⁺	8 ^{^^}
	- Upheld	15	15	14	7	12	11	21	11	12	10	8
	- Reversed	1	1	0	2	0	0	1	1	0	0	0
SBE	Request	4	0	2	1	1	0	0	0	0	1	0
	- Upheld	4	0	2	1	1	0	0	0	0	1	0
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
Other[*]	Request	0	3	0	1	0	0	1	0	0	0	1
	- Upheld	0	3	0	0	0	0	1	0	0	0	1
	- Reversed	0	0	0	1	0	0	0	0	0	0	0
Second Level Reviews (Deputy Director):												
O/DD	Request	0	1	3	2	3	3	6	1	3	7	4
	- Upheld	0	1	3	2	3	1	6	1	3	7	4
	- Reversed	0	0	0	0	0	2	0	0	0	0	0
Total Reviews First & Second Level												
NSF	Request	35	34	34	23	37 [^]	33	46	28	33	35	25
	- Upheld	34	33	34	19	33	29	43	25	32	32	25
	- Reversed	1	1	0	4	2	4	3	2	0	3	0

Source: Office of the Director, 07/06/17.

* From 2006 to 2012, the “Other” category includes OCI, OIA, OPP, and OISE. For FY 2013 and FY 2014, it included OIIA. For FY 2015 and FY 2016, it included OIA and OISE.

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

^{**} One reconsideration request was returned to the PI for failure to follow the procedure described in the *Proposal and Award Policies and Procedures Guide*. ⁺ Includes a reconsideration of a Return Without Review action.

⁺⁺ Includes a reconsideration request received after the 90-day window.

Appendix 17 - Mean Number of Reviews per Proposal, by Method and Directorate or Office - FY 2016

		Methods of Review						
		All Methods	Ad Hoc + Panel	Ad Hoc Only	Panel Only	Not Reviewed *	Returned without Review	Withdrawn Proposals
NSF	Reviews	178,893	56,330	9,105	113,458			
	Proposals	47,013	11,827	2,375	32,811	2,272	1,399	193
	Rev/Prop	3.8	4.8	3.8	3.5			
BIO	Reviews	21,152	13,288	175	7,689			
	Proposals	5,035	2,627	43	2,365	171	148	22
	Rev/Prop	4.2	5.1	4.1	3.3			
CSE	Reviews	31,500	3,474	436	27,590			
	Proposals	7,795	658	114	7,023	502	84	42
	Rev/Prop	4	5.3	3.8	3.9			
EHR	Reviews	17,195	1,190	288	15,717			
	Proposals	4,246	259	75	3,912	177	125	4
	Rev/Prop	4	4.6	3.8	4			
ENG	Reviews	39,007	1,821	462	36,724			
	Proposals	11,803	471	132	11,200	767	721	14
	Rev/Prop	3.3	3.9	3.5	3.3			
GEO	Reviews	21,624	17,667	2,219	1,738			
	Proposals	4,823	3,685	578	560	176	101	15
	Rev/Prop	4.5	4.8	3.8	3.1			
MPS	Reviews	30,012	6,526	4,621	18,865			
	Proposals	8,854	1,578	1,175	6,101	345	145	81
	Rev/Prop	3.4	4.1	3.9	3.1			
OIA	Reviews	441	358	31	52			
	Proposals	102	69	7	26	0	13	0
	Rev/Prop	4.3	5.2	4.4	2			
OISE	Reviews	651	277	39	335			
	Proposals	274	65	24	185	39	5	1
	Rev/Prop	2.4	4.3	1.6	1.8			
SBE	Reviews	17,311	11,729	834	4,748			
	Proposals	4,081	2,415	227	1,439	95	57	14
	Rev/Prop	4.2	4.9	3.7	3.3			

Source: NSF Enterprise Information System, 10/01/16.

* The proposals totals shown in the “All Methods” category do not include the proposals shown in the “Not Reviewed” category. Proposals which are not reviewed typically include RAPIDs, EAGERS, INSPIRE Track 1s, and small grants for travel and symposia. Beginning in 2017, they also include RAISE proposals.

The “Not Reviewed” category includes award and decline actions for proposals that were not reviewed, while the “Returned without Review” and “Withdrawn Proposals” categories reflect proposals that were neither awarded nor declined.

The counts of panel reviews do not include panel summaries. There were approximately 46,117 panel summaries in FY 2016.

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 18 - Methods of NSF Proposal Review

FY	Total	Ad Hoc + Panel		Ad Hoc Only		Panel Only		Not Externally Reviewed	
	Proposals	Proposals	Percent	Proposals	Percent	Proposals	Percent	Proposals	Percent
2016	49,285	11,827	24%	2,375	5%	32,811	67%	2,272	5%
2015	49,620	12,488	25%	2,650	5%	32,144	65%	2,338	5%
2014	48,051	12,452	26%	3,001	6%	30,816	64%	1,782	4%
2013	48,999	13,394	27%	2,814	6%	30,710	63%	2,081	4%
2012	48,613	12,851	26%	2,639	5%	30,700	63%	2,423	5%
2011	51,562	14,594	28%	3,352	7%	31,878	62%	1,738	3%
2010	55,542	16,483	30%	3,853	7%	32,859	59%	2,347	4%
2009	45,181	14,262	32%	3,370	7%	25,835	57%	1,714	4%
2008	44,428	14,355	32%	3,662	8%	24,966	56%	1,445	3%
2007	44,577	14,292	32%	3,737	8%	25,135	56%	1,413	3%
2006	42,352	14,349	34%	3,895	9%	22,384	53%	1,724	4%

Source: NSF Enterprise Information System, 10/01/16.

Appendix 19 - Methods of NSF Proposal Review, by Directorate or Office – FY 2016

Directorate	Total Proposals	Ad Hoc + Panel		Ad Hoc Only		Panel Only		Not Reviewed	
		Proposals	Percent	Proposals	Percent	Proposals	Percent	Proposals	Percent
NSF	49,285	11,827	24%	2,375	5%	32,811	67%	2,272	5%
BIO	5,206	2,627	50%	43	1%	2,365	45%	171	3%
CSE	8,297	658	8%	114	1%	7,023	85%	502	6%
EHR	4,423	259	6%	75	2%	3,912	88%	177	4%
ENG	12,570	471	4%	132	1%	11,200	89%	767	6%
GEO	4,999	3,685	74%	578	12%	560	11%	176	4%
MPS	9,199	1,578	17%	1,175	13%	6,101	66%	345	4%
OIA	102	69	1%	7	0%	26	0%	0	0%
OISE	313	65	21%	24	8%	185	59%	39	12%
SBE	4,176	2,415	58%	227	5%	1,439	35%	95	2%

Source: NSF Enterprise Information System, 10/01/16.

Appendix 20 - Mean Reviewer Ratings, by Method of Review - FY 2016

Source: NSF Enterprise Information System, 10/01/16.

Appendix 21 - 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 2016, there were 52 requests for accomplishment-based renewals, 17 of which were awarded. **Table 21.1** 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.⁶⁴ In FY 2016, 24 Special Creativity Extensions were awarded.

⁶⁴ From NSF Award and Administration Guide (AAG), http://www.nsf.gov/pubs/policydocs/pappguide/nsf16001/aag_1.jsp#ID3d.

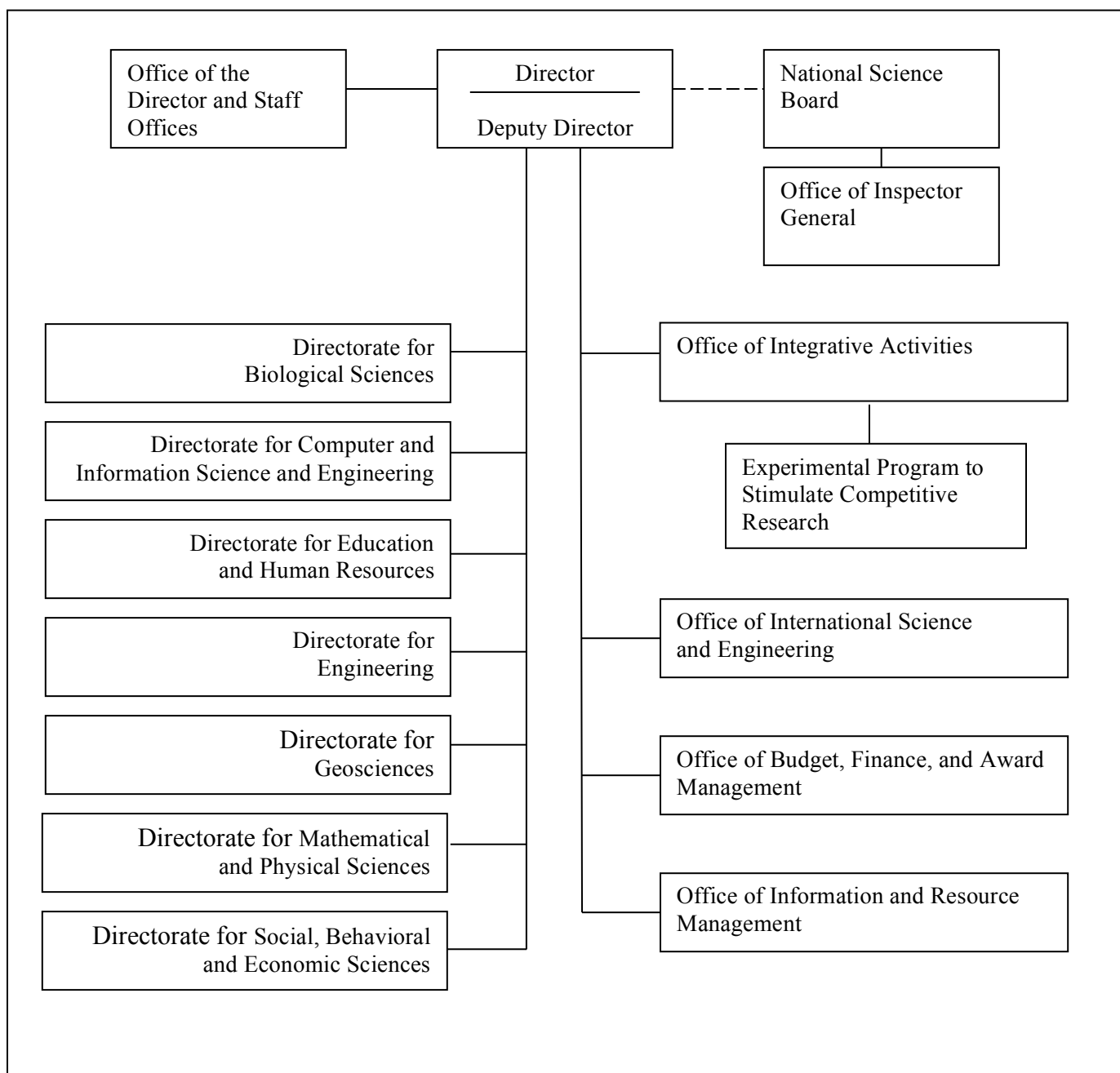
Table 21.1 - Accomplishment-Based Renewals, by Directorate or Office

Directorate or Office		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NSF	Award	32	27	28	40	34	19	30	19	14	29	17
	Decline	70	70	51	54	52	43	41	52	35	44	35
	Mean Ann. Awd	\$106,188	\$146,658	\$164,211	\$225,438	\$150,171	\$253,026	\$255,959	\$414,467	\$174,227	\$137,480	\$199,034
BIO	Award	5	4	3	5	8	3	2	4	3	2	0
	Decline	20	25	13	16	11	6	3	6	5	2	4
	Mean Ann. Awd	\$109,684	\$82,697	\$62,444	\$123,533	\$151,999	\$344,742	\$78,815	\$835,142	\$298,359	\$189,961	N/A
CISE	Award	1	1	1	2	1	0	0	2	0	1	5
	Decline	2	3	1	0	2	2	2	1	0	0	1
	Mean Ann. Awd	\$62,500	\$37,500	\$60,010	\$267,851	\$272,833	N/A	N/A	\$819,996	N/A	\$233,333	\$369,350
EHR	Award	2	2	2	3	3	1	2	0	1	0	0
	Decline	14	6	3	7	6	5	4	4	4	6	3
	Mean Ann. Awd	\$154,495	\$117,877	\$390,611	\$361,873	\$304,579	\$33,352	\$530,633	N/A	\$354,796	N/A	N/A
ENG	Award	3	2	1	1	1	2	4	3	3	6	1
	Decline	14	13	6	13	7	5	7	10	2	9	9
	Mean Ann. Awd	\$49,997	\$83,542	\$54,117	\$124,977	\$152,483	\$121,725	\$194,881	\$207,017	\$45,309	\$105,606	\$50,000
GEO	Award	8	8	8	10	8	4	12	5	1	6	7
	Decline	3	4	3	3	8	4	3	6	9	8	3
	Mean Ann. Awd	\$134,802	\$74,091	\$113,891	\$343,864	\$144,094	\$143,699	\$234,306	\$222,092	\$118,252	\$126,876	\$131,244
MPS	Award	7	10	12	16	11	8	10	5	6	14	3
	Decline	13	16	19	12	13	15	18	21	14	15	14
	Mean Ann. Awd	\$126,032	\$253,195	\$219,868	\$188,219	\$115,657	\$354,936	\$297,020	\$155,611	\$155,854	\$139,064	\$171,330
SBE	Award	6	0	1	3	1	1	0	0	0	0	1
	Decline	4	3	6	3	3	5	4	4	1	3	1
	Mean Ann. Awd	\$52,954	N/A	\$76,993	\$67,808	\$75,789	\$82,187	N/A	N/A	N/A	N/A	\$224,440
OD	Award					1	0				0	
	Decline					2	1				1	
	Mean Ann. Awd					\$50,000	N/A				N/A	

Source: NSF Enterprise Information System, 10/01/16. "N/A" = No accomplishment-based renewals awarded.

Mean annual award size is based on the annualized award size of each award. The latter is the total awarded, including supplements, divided by the award duration, including extensions. Since supplements and extensions occur post-award, the mean annual award amount for each directorate in prior years may change with time.

Appendix 22 - National Science Foundation Organization Chart



The figure shows the organizational structure in place at the end of FY 2016. 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 23 - Acronyms

<u>Acronym</u>	<u>Definition</u>
ACI	Division of Advanced Cyberinfrastructure
AGS	Division of Atmospheric and Geospace Sciences
ARRA	American Recovery and Reinvestment Act
AST	Division of Astronomical Sciences
BCS	Division of Behavioral and Cognitive Sciences
BFA	Office of Budget, Finance and Award Management
BIO	Directorate for Biological Sciences
CBET	Division of Chemical, Bioengineering, Environmental and Transport Systems
CCF	Division of Computing and Communication Foundations
CFR	Code of Federal Regulations
CGI	Continuing Grant Increment
CHE	Division of Chemistry
CISE	Directorate for Computer and Information Science and Engineering
CMMI	Division of Civil, Mechanical and Manufacturing Innovation
CNS	Division of Computer and Network Systems
COV	Committee of Visitors
CSE	Directorate for Computer and Information Science and Engineering
DBI	Division of Biological Infrastructure
DD	Division Director
DEB	Division of Environmental Biology
DGE	Division of Graduate Education
DMR	Division of Materials Research
DMS	Division of Mathematical Sciences
DRL	Division of Research on Learning in Formal and Informal Settings
DUE	Division of Undergraduate Education
EAGER	EARly-concept Grants for Exploratory Research
EAR	Division of Earth Sciences
ECCS	Division of Electrical, Communications and Cyber Systems
EEC	Division of Engineering Education and Centers
EF	Emerging Frontiers
EFRI	Emerging Frontiers in Research and Innovation
EHR	Directorate for Education and Human Resources
ENG	Directorate for Engineering
EPSCoR	Experimental Program to Stimulate Competitive Research
FY	Fiscal Year (October 1 – September 30)
GDP	Gross Domestic Product
GEO	Directorate for Geosciences
GSS	Geography and Spatial Sciences program
HRD	Division of Human Resource Development

IF	Infrastructure and Facilities program
IIA	Office of International and Integrative Activities
IIP	Division of Industrial Innovation and Partnerships
IIS	Division of Information and Intelligent Systems
IOS	Division of Integrative Organismal Systems
INSPIRE	Integrated NSF Support Promoting Interdisciplinary Research and Education
IPAs	Temporary employees hired through the Intergovernmental Personnel Act
IPS	Interactive Panel System
ISE	International Science & Engineering
K-12	Kindergarten to 12 th grade
MCB	Division of Molecular and Cellular Biosciences
MPI	Multiple PI
MPS	Directorate for Mathematical and Physical Sciences
MSI	Minority-Serving Institution
NSB	National Science Board
NSF	National Science Foundation
OCE	Division of Ocean Sciences
OCI	Office of Cyberinfrastructure
OD	Office of the Director
ODD	Office of the Deputy Director
OIA	Office of Integrative Activities
OISE	Office of International Science & 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
PHY	Division of Physics
PWD	PI (or Person) With a Disability
RAPID	Grants for Rapid Response Research
RWR	Return Without Review
SBE	Directorate for Social, Behavioral and Economic Sciences
SCI	Division of Shared Cyberinfrastructure
SES	Division of Social and Economic Sciences
SGER	Small Grants for Exploratory Research
SMA	Office of Multidisciplinary Activities in the Directorate for Social, Behavioral and Economic Sciences
SPI	Single PI
STEM	Science, Technology, Engineering and Mathematics
URM	Under-Represented Minority
US	United States
VSEE	Visiting Scientists, Engineers and Educators

