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Report to the National Science Board

on the

National Science Foundation's

Merit Review Process

Fiscal Year 2015

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FY 2015 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) 2015.

In FY 2015, NSF acted on 49,620 competitively reviewed full proposals. This is an increase of about 3.3% from the number of proposals acted on in FY 2014. 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 2015 (53,871) was 1.7% more than the total number of full proposals and preliminary proposals acted on in FY 2014 (52,962).

The Foundation made 12,007 awards in FY 2015, 1049 (9.6%) more than in FY 2014. 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 Education and Human Resources and Engineering, to a high of 28% in Mathematical and Physical Sciences.[1]

In FY 2015, 78% of program funds awarded went to academic institutions. This compares to 81% in FY 2014. Concomitantly, the funds to for-profit organizations increased from 5% to 8%.

FY 2015 saw a continuation of the recent emphasis on standard grants with 39% of funds being awarded as new standard grants compared to 10% as new continuing grants and 18% as continuing grant increments and supplements. In FY 2005, these numbers were 23%, 14%, and 29%, respectively.

Among proposals from PIs who provided information on their gender, race, ethnicity, or disability status, the proportion of proposals from PIs who identified themselves as female was 26%. The proportion of proposals from under-represented racial or ethnic minorities was 8.3% and the proportion from PIs with a disability was 1.6%.

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 2015, 76% 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 2015, 65% of proposals were reviewed by panel only, 25% by ad hoc + panel, and 5% by ad hoc only. These percentages are consistent with the trend over the

[1] The Office of International Science and Engineering and the Office of Integrative Activities are not included in this comparison.
[2] NSF FY 2015 Annual Performance Report

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 82% of proposals in FY 2015 were research proposals (see **Section III.F**). While the success rate for research proposals from men and women were similar (22% 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 Black/African-American PIs and Asian PIs were 17% and 19%, 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 24% of the total.[4]

The average number of months of salary support for individual Principal Investigators (PIs) or Co-PIs per research grant per year is now just over 0.7 months for single-PI awards and just under 0.8 months for multiple-PI awards. For multiple-PI awards, this number is comparable to the value in FY 2014. The average for single-PI awards continues the decline seen in the longer-term trend and is approximately 10% lower than in FY 2014.

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 2013 – FY 2015 and the moving three-year average PI success rate improved slightly to 37% from 36%.

Among research award recipients, the percentage of early-career PIs was 21% in FY 2015, similar to the decadal low seen in FY 2012 and FY 2014.

[3] Among research proposals from PIs who identified their gender, the proportion of proposals from women was 25%.
[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 27%.

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 the 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) activity[7] (see **Section III.F11** and **Appendix 11**).

This *FY 2015 Report on the NSF Merit Review Process* responds to a National Science Board (NSB) 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 <u>competitively reviewed proposals</u>. **Section III.F** primarily discusses <u>research proposals</u>. The research proposal category includes proposals for what could be considered a typical research project and consists of a large subset (82%) of the competitively reviewed proposals. Descriptions of the contents of these categories can be found in **Section III.A** and **Section III.F**.

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[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 October 1, 2014 to December 25th, 2014 is available at: http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/nsf14_1.pdf. The version of the PAPPG applicable for the remainder of FY 2015 may be found at: http://www.nsf.gov/pubs/policydocs/pappguide/nsf15001/nsf15_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%.

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 2015 are mentioned in the text of the report: OPP (Office of Polar Program), OCI (Office of Cyberinfrastructure), and OIIA (or IIA) (Office of International and Integrative Activities). A list of acronyms may be found in **Appendix 23**.

[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 2015.

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 rates[9] 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 49,620 proposals in FY 2015, a 3.3% increase from FY 2014, resulting in 12,007 awards, a 9.6% increase from FY 2014. Consequently, in FY 2015 the proposal success rate was 24%. Over the six years FY 2010 to FY 2015, 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

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Proposals	41,722	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620
Awards	9,757	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007
Success Rate	23%	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%

Source: NSF Enterprise Information System, 10/01/15.

In addition to the full proposals in **Table 1**, in FY 2015 NSF also acted on 4,251 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. For example, if a program processed 200 proposals in the year, making 50 awards and declining the remaining 150, then the "proposal success rate" for that program in that year would be 25%.

[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, motivated 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). Gender, disability, and ethnic or racial data are based on self-reported information in proposals. About 87% of PIs provided gender information and 89% provided some ethnic or racial information. (88% of proposals were from PIs who provided gender information,[12] 90% were from PIs who provided race or ethnicity information,[13] and 71% were from PIs 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.

Table 2 - Competitively Reviewed Proposals, Awards and Proposal Success Rates by PI Characteristics

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
All PIs	Proposals	41,722	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620
	Awards	9,757	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007
	Omnibus					*9,975*	*12,547*					
	ARRA					*4,620*	*449*					
	Funding Rate	23%	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%
Female PIs	Proposals	8,266	8,510	9,197	9,431	9,727	11,903	11,488	10,795	11,152	11,142	11,444
	Awards	2,107	2,233	2,493	2,556	3,297	2,982	2,602	2,775	2,556	2,669	3,007
	Omnibus					*2,247*	*2,887*					
	ARRA					*1,050*	*95*					
	Funding Rate	25%	26%	27%	27%	34%	25%	23%	26%	23%	24%	26%
Male PIs	Proposals	31,456	31,482	32,650	32,074	32,091	38,695	35,211	32,932	32,866	31,625	32,411
	Awards	7,305	7,765	8,451	7,986	10,437	9,080	7,739	7,816	7,316	7,286	7,810
	Omnibus					*7,169*	*8,760*					
	ARRA					*3,268*	*320*					
	Funding Rate	23%	25%	26%	25%	33%	23%	22%	24%	22%	23%	24%
PIs from under-represented racial or ethnic groups	Proposals	2,468	2,608	2,798	2,762	2,945	3,613	3,441	3,291	3,303	3,268	3,383
	Awards	569	638	713	670	889	812	735	718	651	681	788
	Omnibus					*649*	*790*					
	ARRA					*240*	*22*					
	Funding Rate	23%	24%	25%	24%	30%	22%	21%	22%	20%	21%	23%

[12] 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 2015, the success rate for PIs whose gender was not known was 21%.
[13] However, for only 82% 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.")

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
New PIs	Proposals	17,660	18,061	18,971	18,989	19,044	24,116	21,703	20,174	19,905	19,669	20,477
Former	Awards	3,001	3,240	3,660	3,622	4,706	4,024	3,322	3,408	3,327	3,448	3,731
Definition	*Omnibus*					*2,967*	*3,868*					
	ARRA					*1,739*	*156*					
	Funding Rate	17%	18%	19%	19%	25%	17%	15%	17%	17%	18%	18%
New PIs	Proposals	15,467	15,877	16,445	16,483	16,840	21,545	19,238	17,943	17,635	17,405	18,276
Revised	Awards	2,687	2,842	3,151	3,132	4,174	3,620	2,976	3,063	3,013	3,108	3,320
Definition[14]	*Omnibus*					*2,613*	*3,487*					
	ARRA					*1,561*	*133*					
	Funding Rate	17%	18%	19%	19%	25%	17%	15%	17%	17%	18%	18%
Prior PIs	Proposals	24,062	24,294	25,606	25,439	26,137	31,426	29,835	28,439	29,094	28,385	29,141
Former	Awards	6,756	7,185	7,803	7,527	9,889	8,972	7,849	8,116	7,502	7,513	8,276
Definition	*Omnibus*					*7,008*	*8,679*					
	ARRA					*2,881*	*293*					
	Funding Rate	28%	30%	30%	30%	38%	29%	26%	29%	26%	26%	28%
Prior PIs	Proposals	26,130	26,172	27,660	27,424	28,341	33,997	32,324	30,670	31,364	30,646	31,344
Revised	Awards	7,070	7,475	8,202	7,892	10,421	9,376	8,216	8,461	7,816	7,850	8,687
Definition	*Omnibus*					*7,362*	*9,060*					
	ARRA					*3,059*	*316*					
	Funding Rate	27%	29%	30%	29%	37%	28%	25%	28%	25%	26%	28%
PIs with	Proposals	454	434	448	448	470	545	543	483	488	468	562
Disabilities	Awards	95	107	104	109	149	108	107	134	122	99	120
	Omnibus					*105*	*105*					
	ARRA					*44*	*3*					
	Funding Rate	21%	25%	23%	24%	32%	20%	20%	28%	25%	21%	21%

Source: NSF Enterprise Information System, 10/01/15.

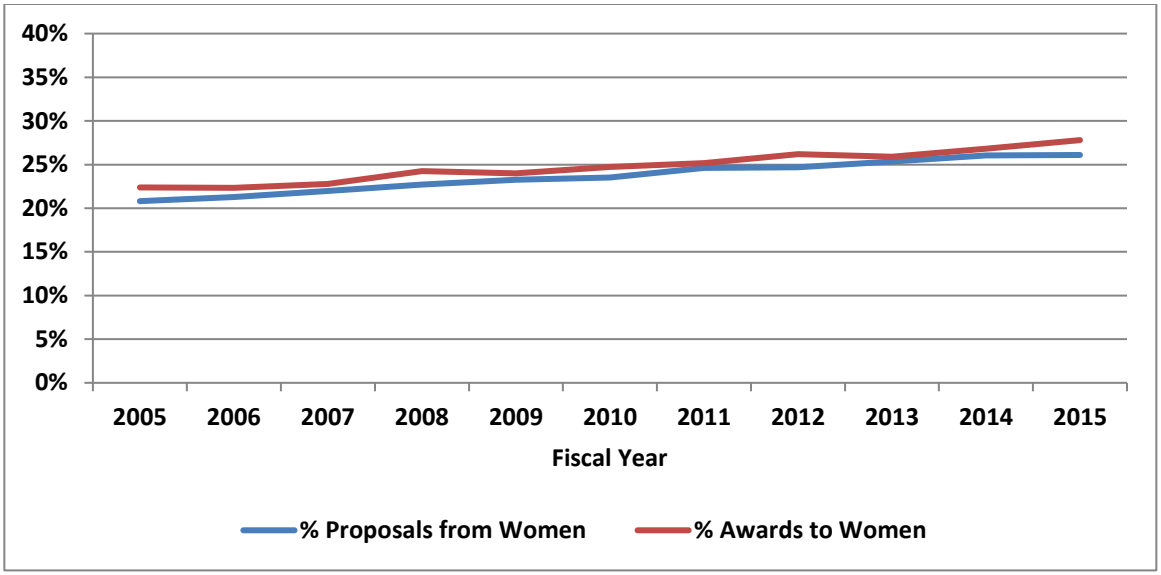
Gender

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 26.1% in FY 2015.[15] 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**.)

[14] 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.)" Previously, a new PI was considered to be any individual who had not previously been a PI on any NSF award.

[15] 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 2001 – 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.

Figure 1 - Percentage of Proposals from and Awards to Women

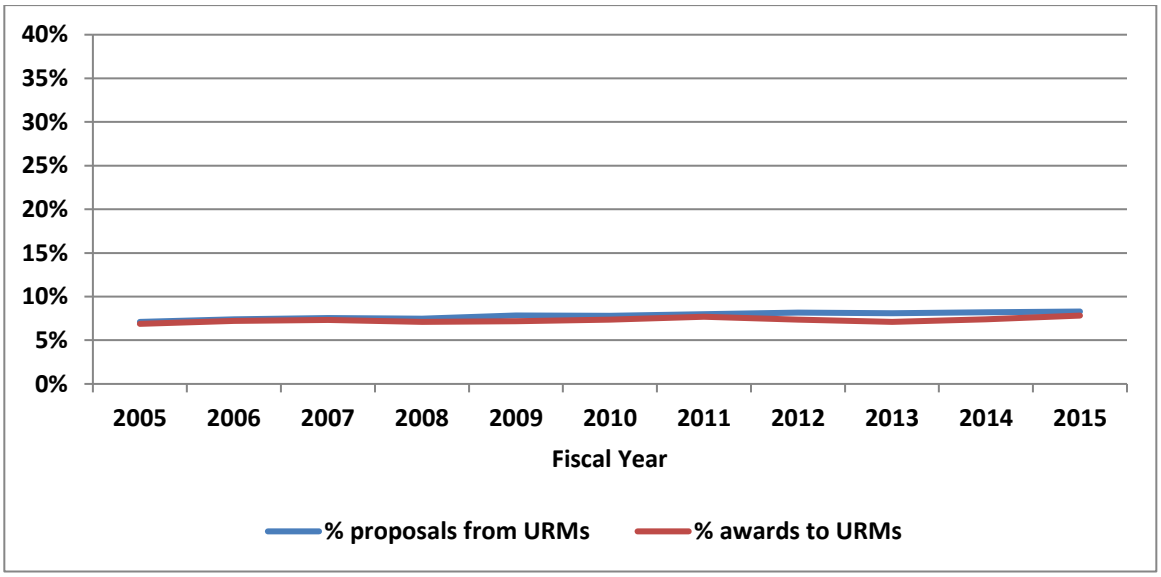


Source: NSF Enterprise Information System, 10/01/15.

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**) but the number of proposals from such PIs has grown more rapidly than the total number of proposals submitted to NSF.

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



Source: NSF Enterprise Information System, 10/01/15.

Between FY 2005 and FY 2015, the average rate of increase in proposals from PIs from under-represented racial or ethnic groups was 81% greater than the average rate of increase in the total

number of proposals. Compared to the preceding three years, the success rate of minority PIs improved as a fraction of the overall success rate. In FY 2015, the success rate for proposals from under-represented minorities was 96% of the overall success rate whereas the three-year average of the ratio of the two success rates was 91% in FY 2012 – 2014.

Table 3 provides data on proposal, award and success rates by PI race and ethnicity.

Table 3 – Competitively Reviewed Proposals, Awards and Success Rates, by PI Race and Ethnicity[16]

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
American Indian/Alaska Native	Proposals	94	112	97	91	88	118	129	83	113	103	104
	Total Awards	24	32	32	23	29	28	36	18	28	36	25
	Omnibus					*20*	*28*					
	ARRA					*9*	*0*					
	Funding Rate	26%	29%	33%	25%	33%	24%	28%	22%	25%	35%	24%
Black/ African American	Proposals	813	915	1,034	997	1,022	1,280	1,201	1,154	1,124	1,123	1,102
	Total Awards	193	201	240	246	298	270	243	263	203	204	233
	Omnibus					*233*	*262*					
	ARRA					*65*	*8*					
	Funding Rate	24%	22%	23%	25%	29%	21%	20%	23%	18%	18%	21%
Native Hawaiian/ Pacific Islander	Proposals	21	28	26	30	23	38	42	40	32	30	30
	Total Awards	4	9	6	8	8	10	11	6	5	5	2
	Omnibus					*5*	*8*					
	ARRA					*3*	*2*					
	Funding Rate	19%	32%	23%	27%	35%	26%	26%	15%	16%	17%	7%
Asian	Proposals	7,253	7,916	8,801	8,952	9,550	11,626	10,829	10,382	10,511	10,538	11,148
	Total Awards	1,278	1,530	1,801	1,780	2,465	2,124	1,907	1,914	1,887	1,925	2,256
	Omnibus					*1,691*	*2,071*					
	ARRA					*774*	*53*					
	Funding Rate	18%	19%	20%	20%	26%	18%	18%	18%	18%	18%	20%
White	Proposals	28,752	29,861	30,676	30,217	29,975	36,153	33,200	30,596	30,766	29,624	30,099
	Total Awards	7,305	7,885	8,499	8,153	10,499	9,306	7,826	8,020	7,372	7,390	7,902
	Omnibus					*7,144*	*8,958*					
	ARRA					*3,355*	*348*					
	Funding Rate	25%	26%	28%	27%	35%	26%	24%	26%	24%	25%	26%
Multiracial	Proposals	21	301	279	284	337	512	433	448	439	425	495
	Total Awards	4	78	81	76	112	118	99	113	110	114	151
	Omnibus					*80*	*112*					
	ARRA					*32*	*6*					
	Funding Rate	19%	26%	29%	27%	33%	23%	23%	25%	25%	27%	31%

[16] 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.

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Hispanic	Proposals	1,436	1,525	1,639	1,611	1,755	2,092	2,019	1,934	1,956	1,921	2,053
or	Total Awards	322	378	433	382	533	476	438	412	401	411	495
Latino	*Omnibus*					*373*	*465*					
	ARRA					*160*	*11*					
	Funding Rate	22%	25%	26%	24%	30%	23%	22%	21%	21%	21%	24%

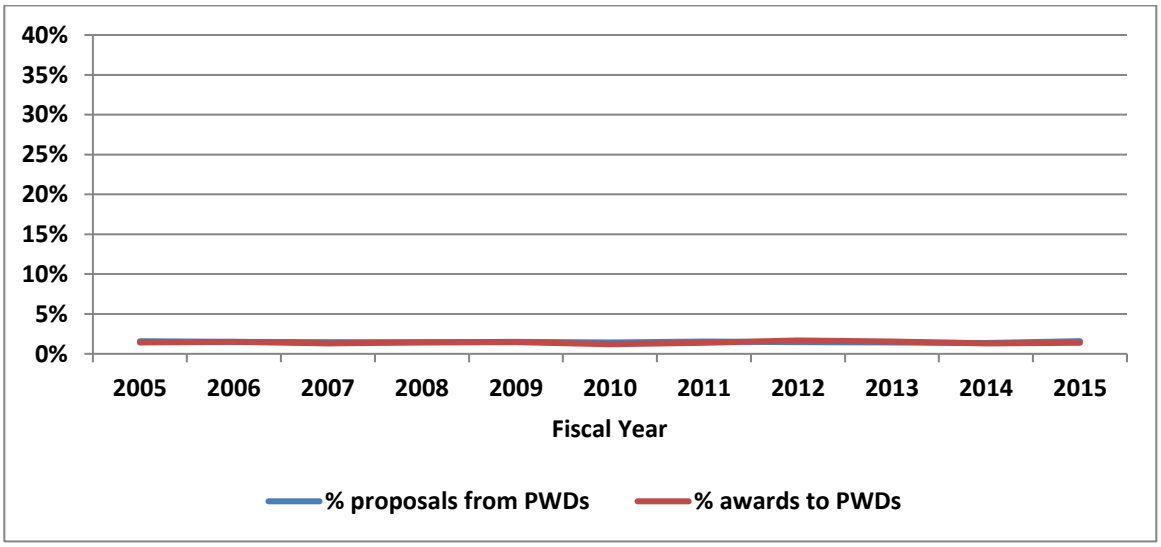
Source: NSF Enterprise Information System, 10/01/15.

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 2015 (8.3%)[17] is smaller than their representation in the U.S. population but is similar to their representation in the full-time faculty of academic institutions (8.3%).[18] Among racial and ethnic groups that submitted more than 1,000 proposals in FY 2015, the success rate is highest for the groups White (26%) and Hispanic or Latino (24%). It is lowest for Asian (20%) and Black/African American (21%). **Appendix 3** provides proposal, award, and funding rate information by PI race, ethnicity and gender, by directorate.

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 2005 - FY 2015 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, 10/01/15.

[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.

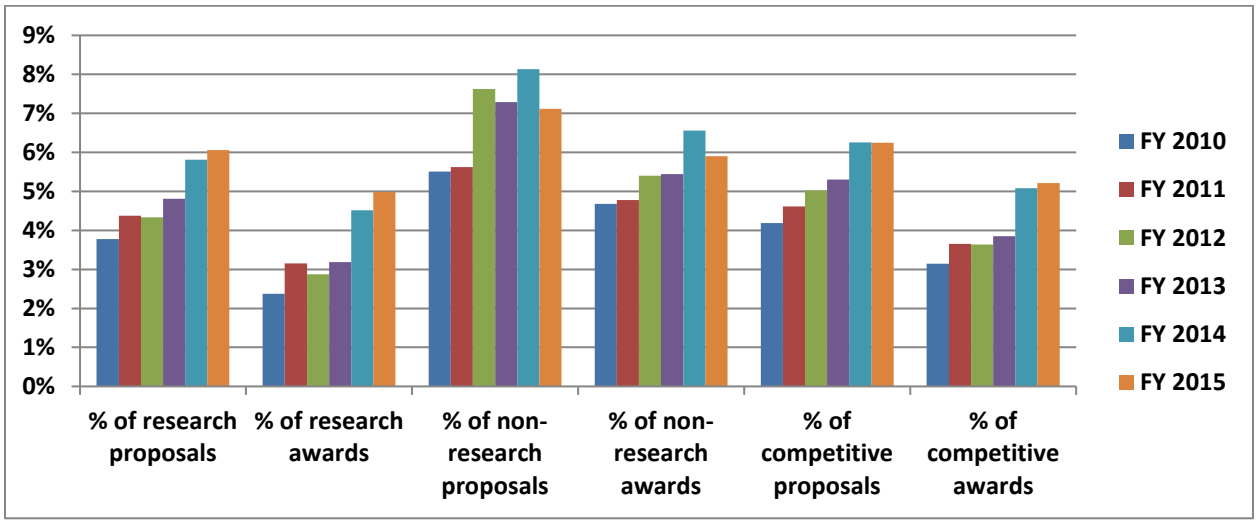
[18] Data for full-time faculty members of institutions of higher education who hold doctorates in physical sciences, mathematics, computer sciences, life sciences, psychology, social sciences, or engineering. Available at http://www.nsf.gov/statistics/2016/nsb20161/uploads/1/8/at05-15.pdf ("Science and Engineering Indicators 2016.")

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 2005 to FY 2015 (**Figure 3**), being approximately 1.6% in both FY 2005 and FY 2015, having dipped to approximately 1.4%[19] in FY 2014.

Minority-Serving Institutions

Figure 4 shows the proportion of proposals from and awards to minority-serving institutions[20] (MSIs) in recent years.

Figure 4 –Proposals from and Awards to MSIs, by Fiscal Year and Proposal Category[21]



Source: NSF Enterprise Information System, 10/01/10, 10/01/11, 10/01/12, 10/01/13, 10/01/14, 10/01/15.

Although the proportion of competitive proposals that come from minority-serving institutions is low, it increased noticeably from FY 2010 to FY 2015. The proportion of research awards going to minority-serving institutions also increased, going from 2.4% to 5.0%.

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 (18% compared to 28%; see **Table 2**). In FY 2015, the proportion of proposals from new PIs was 37% (**Figure 5**). Since FY 2001, this number has fluctuated between approximately 36% and 39%. Since FY 2010, the proportion of proposals from new PIs declined from 39%. **Appendix 4** provides funding rates by new PI and prior PI status, by directorate. New PIs are least successful relative to prior PIs in MPS and most successful in GEO.

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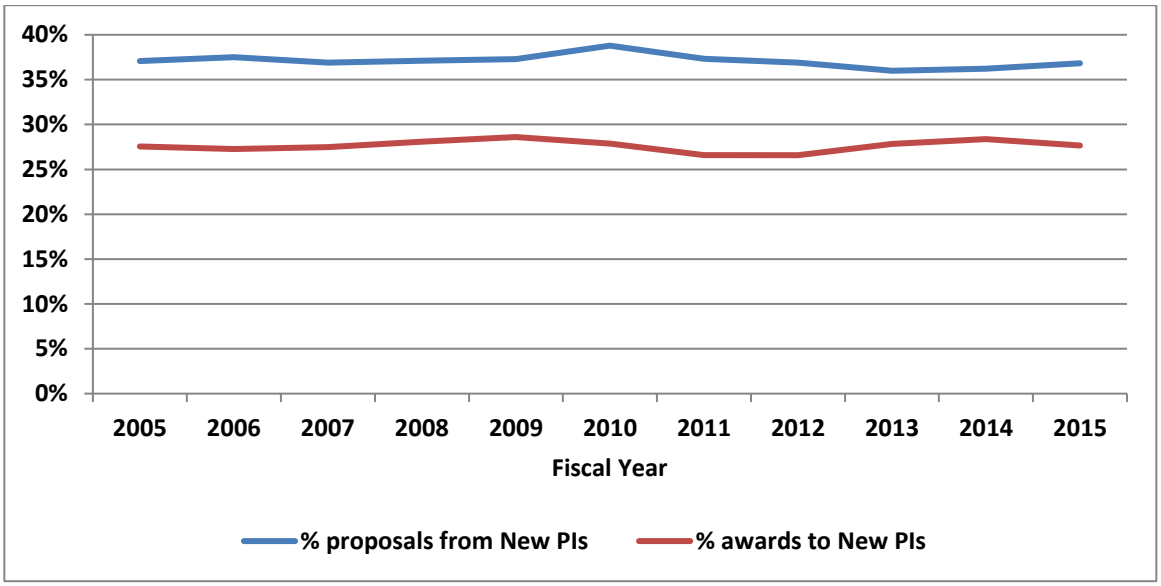
[19] In FY 2014, approximately 70% of competitively reviewed proposals were from PIs who indicated whether or not they had a disability. Of these, 1.4% reported that they did have a disability.

[20] These are institutions reported as Historically Black Colleges and Universities, Hispanic-Serving Institutions, or Tribal Colleges and Universities.

[21] Research proposals are defined at the beginning of **Section III.F**. Non-research proposals are those competitive proposals that are not research proposals. For each year, the data are for institutions that were MSIs at the end of the respective fiscal year. In the FY 2013 report, data were based on the status of institutions at the end of FY 2013.

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



Source: NSF Enterprise Information System, 10/01/15.

There has been a slight downturn in the proportion of awards going to new PIs in FY 2015 (**Figure 5**). The success rate of new PIs remained similar to that in FY 2014, 18% in both years, but the success rate of prior PIs increased from 26% to 28%.

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 2015, NSF devoted 39% 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.

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

Table 4 - Percentage of NSF Funding by Type of Award

CATEGORY	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Standard Grants	23%	25%	26%	28%	44%	37%	34%	35%	35%	39%	39%
New Continuing	14%	13%	14%	13%	8%	13%	11%	11%	12%	10%	10%
CGIs and Supplements	29%	28%	26%	26%	18%	18%	23%	22%	22%	20%	18%
Cooperative Agreements	24%	23%	22%	23%	21%	23%	23%	23%	23%	22%	22%
Other	10%	11%	11%	11%	9%	9%	9%	10%	8%	8%	11%

Source: NSF Enterprise Information System, 2/27/16. 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.

D. Awards by Sector and Type of Institution

In FY 2015, of the program funds awarded by NSF, approximately 78% went to academic institutions, 11% 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	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Academic Institutions	76%	76%	76%	76%	76%	77%	77%	80%	81%	81%	78%
Non-Profit and Other Organizations	15%	15%	15%	13%	13%	11%	13%	12%	11%	11%	11%
For-Profit	7%	7%	7%	8%	6%	6%	6%	5%	6%	5%	8%
Federal Agencies and Laboratories	2%	2%	3%	3%	4%	5%	5%	3%	3%	3%	3%

Source: NSF Enterprise Information System, 10/19/15. 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.

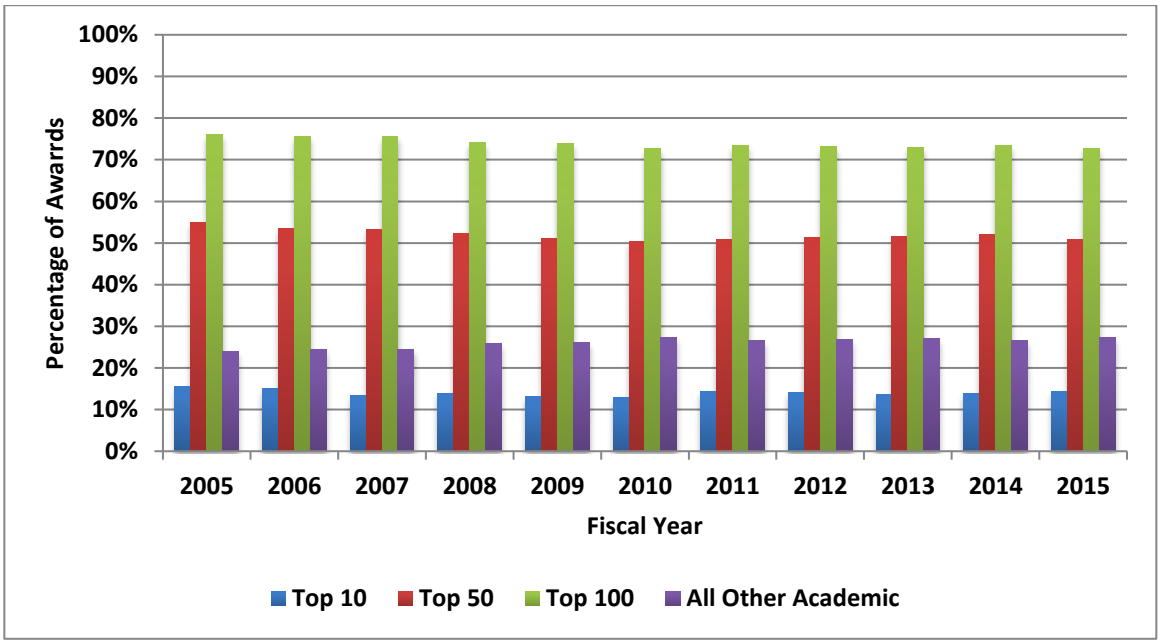
Figure 6 shows how funds to academic institutions are distributed. Academic institutions are categorized according to the proportion of NSF funding received (i.e., grouping those receiving the largest proportion of NSF funding – the top 10, 50, and 100 academic institutions).

The Foundation tracks proposal success rates for different types of academic institutions. For FY 2015, the average proposal success rate was 27% for the top 100 Ph.D.-granting institutions (classified according to the amount of FY 2015 funding received). In comparison, the rate was 19% for Ph.D.-granting institutions that are not in the top 100 NSF-funded category. The proposal success rate was 22% for four-year institutions and 27% for two-year institutions in FY 2015. For minority-serving institutions, the FY 2015 proposal success rate was 20%.

The Foundation promotes geographic diversity in its programs. For example, the mission of the Experimental 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."[23]

[23] 42 U.S.C. §1862, https://www.law.cornell.edu/uscode/text/42/1862.

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



Source: NSF Enterprise Information System, 10/01/15.

The EPSCoR program was designed for those jurisdictions that have historically received lesser amounts of NSF Research and Development funding. In FY 2015, 28 states, the Commonwealth of Puerto Rico, the U.S. Virgin Islands and Guam were eligible to participate in aspects of the program. For four of the 28 states, Iowa, Missouri, Tennessee, and Utah, the prior 3-year rolling average of NSF research funds received was over 0.75% of NSF's Research and Related Activities budget and these jurisdictions were not eligible to participate in new Research Infrastructure Improvement initiatives in FY 2015. **Appendix 5** 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 2015 in Arlington, VA and Tampa, FL. These were organized by the NSF Policy Office and were hosted by George Washington University and the State University System of Florida, respectively. A virtual NSF Grants Conference for Minority Serving Institutions was also held. This was a two-day webcast conference.
- Three "NSF Days," organized by the Office of Legislative and Public Affairs, were held during FY 2015 in Baltimore, MD, Bothell, WA, and Lubbock, TX, hosted by the Maryland Science Center, University of Washington – Bothell, and Texas Tech University, 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. A more focused "NSF Day" was held at Michigan State University, in East Lansing, MI, to describe the Graduate Research Fellowship Program and related programs.

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", "Improving Undergraduate STEM Education", and "Cyberlearning and Future Learning Technologies". Several outreach activities were associated with helping early-career investigators learn more about NSF's CAREER program, for example, the "CISE CAREER Proposal Writing Workshop" and the "CBET CAREER Webinar". 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)

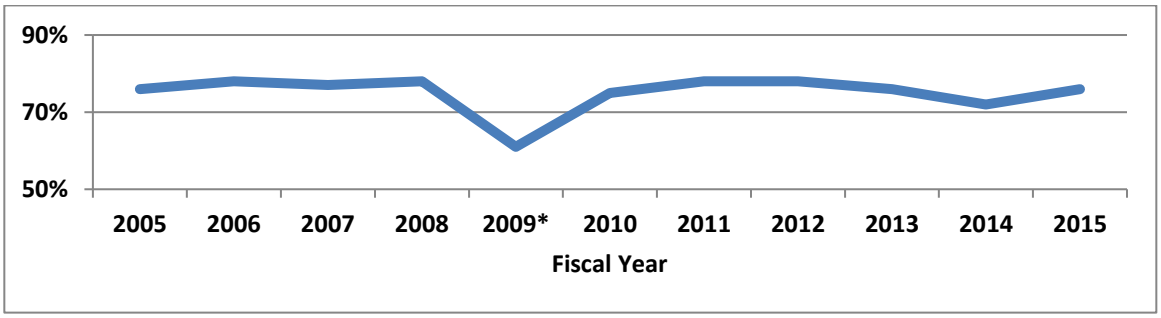
It is important for applicants to receive a timely funding decision. The Foundation's FY 2015 Government Performance and Results Act performance goal calls for informing at least 75% of PIs of funding decisions (i.e., award or decline) within six months of the proposal deadline, target date, or receipt date, whichever is later. In 2015, NSF exceeded the dwell time goal with 76% of applicants informed within 6 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 6 Months

2005	2006	2007	2008	2009*	2010	2011	2012	2013	2014	2015
76%	78%	77%	78%	61%	75%	78%	78%	76%	72%	76%

Source: NSF Enterprise Information System, 10/01/15. *Dwell-time goal suspended in FY 2009.

Figure 7 - Percentage of Proposals Processed within 6 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 2015 (8,993) was 13.5% higher than what was possible in FY 2014 (7,923) and was accompanied by a decrease in the inflation-adjusted mean annualized award size of 1.9%. The number of research proposals acted on increased by 5.1% and the success rate for research proposals increased by 8.0%,[24,25] reaching the previous high seen in FY 2007 (excluding the ARRA year of 2009). **Appendix 6** shows the numbers of research proposals and success rates broken out by NSF divisions.

Table 7 - Research Proposals, Award and Success Rate Trends

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Proposals	31,574	31,514	33,705	33,643	35,609	42,225	41,840	38,490	39,249	38,882	40,869
Awards	6,258	6,708	7,415	6,999	10,011	8,639	7,759	8,061	7,652	7,923	8,993
Omnibus					6,346	8,613					
ARRA					3,665	26					
Success Rate	20%	21%	22%	21%	28%	20%	19%	21%	19%	20%	22%

Source: NSF Enterprise Information System, 10/01/15.

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	21	49	12
Asian	23	9157	668
Black/African American	18	717	28
Native Hawaiian or Pacific Islander	3	20	0
White	1083	22238	1469
Multi-racial	42	329	17
Unknown	482	983	3510

[24] I.e., the ratio of success rates between FY 2015 and FY 2014 is 1.080 [= (8,993/40,869) ÷ (7,923/38,882)].
[25] EAGER and RAPID proposals, which have a high success rate, were approximately 2.4% of the research proposals. If these are removed, then the success rate for research proposals is reduced from 22.0% to 20.6%.

Table 9 - Research Awards, by Racial and Ethnic Group

	Hispanic	Non-Hispanic	Unknown
American Indian or Native Alaskan	4	11	0
Asian	4	1733	122
Black/African American	2	120	4
Native Hawaiian or Pacific Islander	0	1	0
White	240	5333	329
Multi-racial	7	88	2
Unknown	107	193	693

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.[26] 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, those of both Unknown race and Unknown ethnicity, and non-Hispanics of Unknown race. The first four of these are significant at the 99% confidence level while the latter is significant at the 98% confidence level.

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

	Hispanic	Non-Hispanic	Unknown
American Indian or Native Alaskan	19%	22%	0%
Asian	17%	19%	18%
Black/African American	11%	17%	14%
Native Hawaiian or Pacific Islander	0%	5%	N/A
White	22%	24%	22%
Multi-racial	17%	27%	12%
Unknown	22%	20%	20%

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

	Hispanic	Non-Hispanic	Unknown
American Indian or Native Alaskan	79%	94%	0%
Asian	73%	79%	76%
Black/African American	46%	70%	60%
Native Hawaiian or Pacific Islander	0%	21%	N/A
White	92%	100%	93%
Multi-racial	69%	112%	49%
Unknown	93%	82%	82%

Significant at 99% **Significant at 98%**

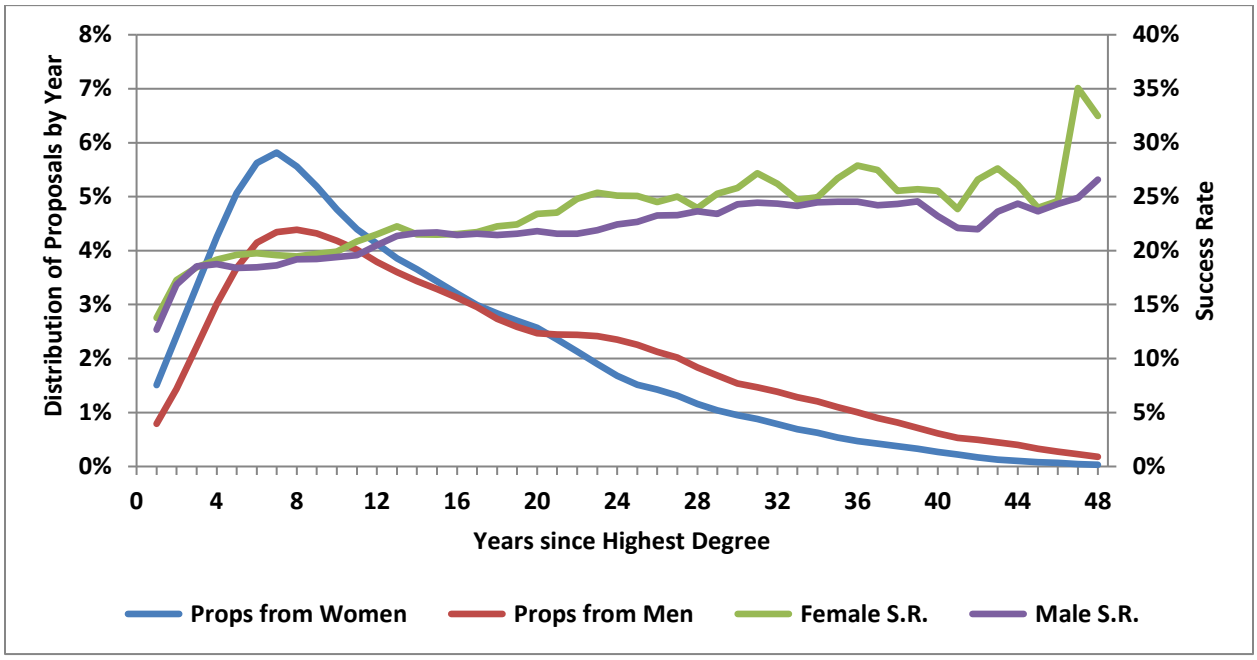
[26] For each minority group, if a and A are the number of awards going to the minority and majority group and p and P are the number of proposals coming from the minority and majority group, we test whether $a/(a+A)$ is significantly different from $p/(p+P)$. A two-tailed test is used.

If we aggregate all the groups whose members have indicated Hispanic ethnicity, the success rate is 90.8% of that of the majority group. The difference between this and the success rate of the majority group is not statistically significant at the 90% 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 2012 through 2015 are combined. To further smooth out some of the inherent variability, all four curves show the three-year running means (with respect to years since highest degree) of the quantities plotted. The horizontal axis corresponds to the middle year of the three-year intervals.

Figure 8 – Research Proposals and Success Rates, FY 2012 – FY 2015, by Years Since Highest Degree and by Gender



Source: NSF Enterprise Information System, 10/1/15.

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.

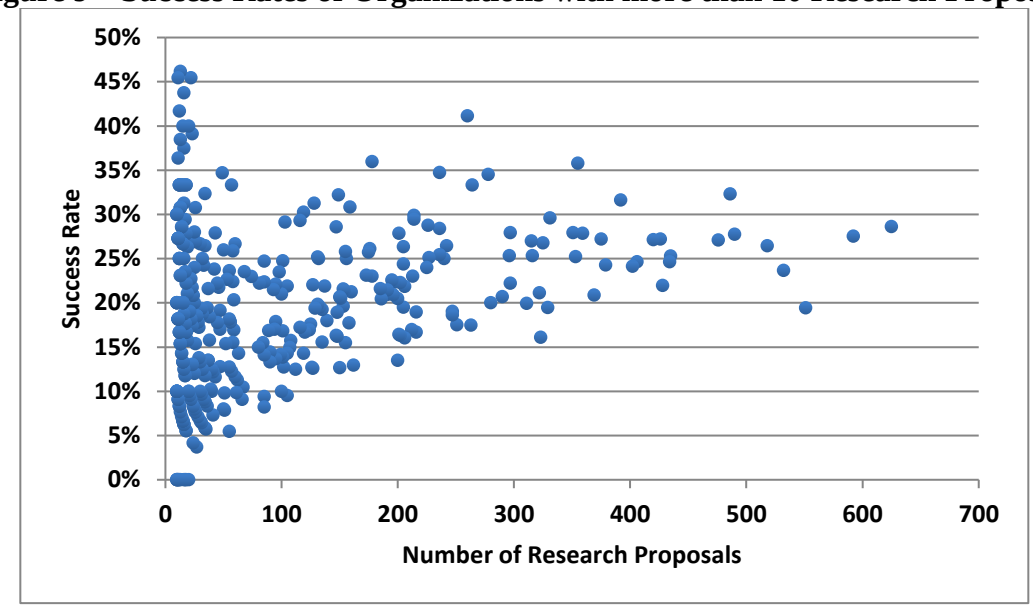
F3. Institutional Success Rates

In FY 2015, 368 submitting organizations[27] had 10 or more research proposals awarded or declined by NSF. **Figure 9** shows the considerable variation in the number of submissions and

[27] 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.

in the success rates of different organizations. Among organizations with 200 or more research proposals acted on in FY 2015, the organizational success rate varies between 13.5% and 41.2%.

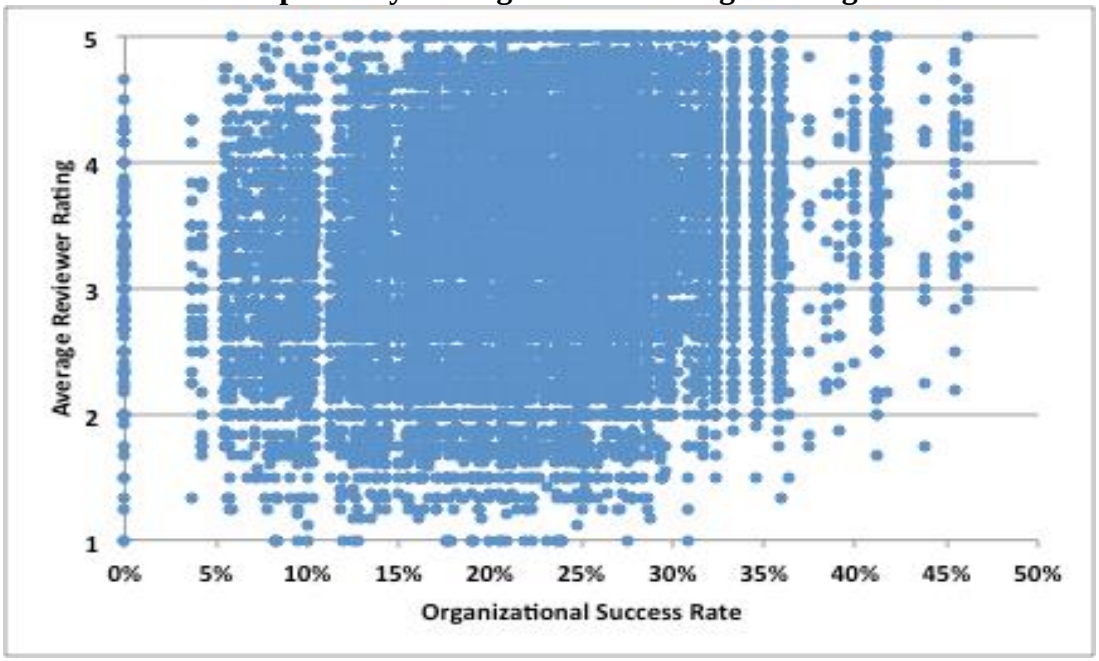
Figure 9 – Success Rates of Organizations with more than 10 Research Proposals



Source: NSF Enterprise Information System, 10/1/15.

Figure 10 shows the scatter of the average review ratings of proposals and the FY 2015 success rates of the organizations submitting the proposals. Regardless of the success rate of the organization, there is a large scatter in the mean ratings of proposals, suggesting that the organization from which a proposal is submitted is not a significant factor in reviewers' evaluations of proposals.

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



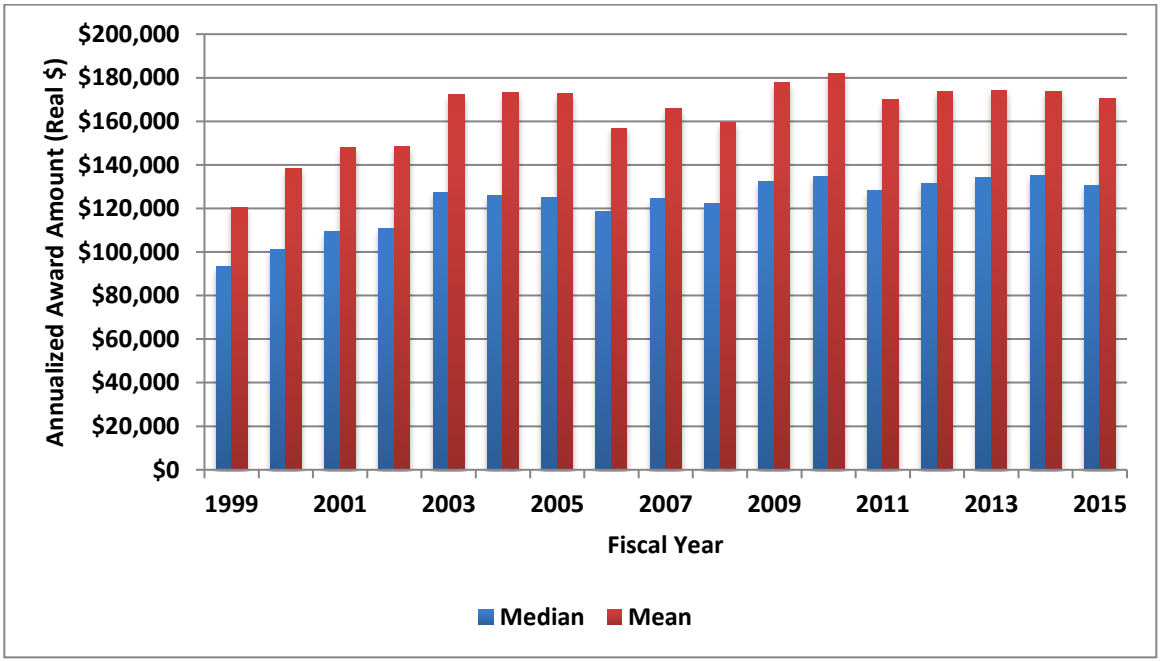
Source: NSF Enterprise Information System, 10/1/15.

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 2015, the annualized median award size was $130,444, a 2.2% decrease from FY 2014 in nominal dollars and the annualized mean award amount was $170,605, a 0.5% decrease from FY 2014. The inflation-adjusted average annual award sizes are shown in **Figure 11.**

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



*****FY 2009 and FY 2010 include ARRA funding. Source: NSF Enterprise Information System, 10/01/15 and OMB Historical Table 10.1 "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2021", at http://www.whitehouse.gov/sites/default/files/omb/budget/fy2017/assets/hist10z1.xls, accessed on 02/22/16. Real dollars use FY 2015 as a baseline.

In real (i.e., inflation-adjusted) dollars, the FY 2015 annualized mean award amount ($170,605) was 1.9% lower than the FY 2014 amount ($173,855).[28] The mean annual award size in *nominal* dollars increased by 18.8% from FY 2005 to FY 2015. The mean annual award size in *real* dollars fluctuated but remained relatively steady over the same period. 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 commitments such as funding for continuing grant increments. (See Section III.C for a description of continuing grant increments.)

[28] 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 2015 is the reference year (one FY 2015 dollar equals one real dollar).

Data on award size and duration organized by NSF directorate for the last ten years are presented in **Appendix 7**. 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.[29] 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

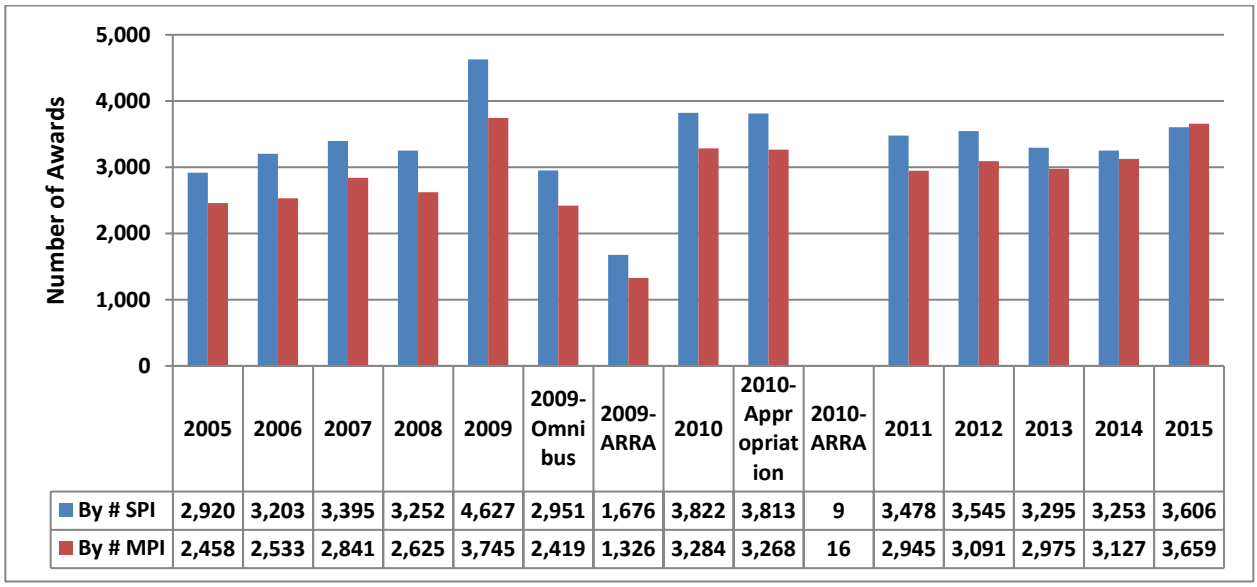
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Duration (Years)	3.0	2.9	2.9	3.0	3.0	2.9	2.9	2.9	3.0	3.0	2.9

Source: NSF Enterprise Information System, 10/01/15.

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



	2005	2006	2007	2008	2009	2009-Omnibus	2009-ARRA	2010	2010-Appropriation	2010-ARRA	2011	2012	2013	2014	2015
By # SPI	2,920	3,203	3,395	3,252	4,627	2,951	1,676	3,822	3,813	9	3,478	3,545	3,295	3,253	3,606
By # MPI	2,458	2,533	2,841	2,625	3,745	2,419	1,326	3,284	3,268	16	2,945	3,091	2,975	3,127	3,659

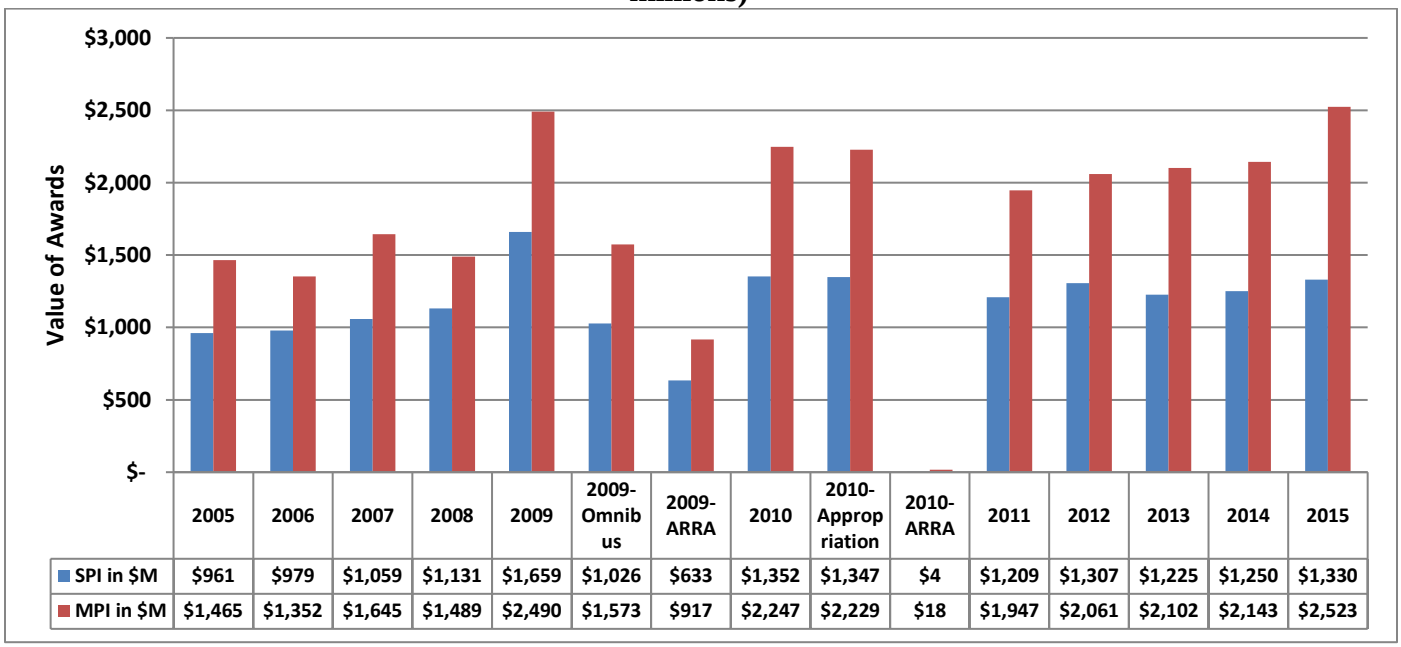
Source: NSF Enterprise Information System, 10/01/15. Note: In FY2010, a total of only 25 research projects were funded from the ARRA appropriation (including one collaborative project). These are barely visible in the figure.

For the first time, the number of MPI projects was greater than the number of SPI projects.

Figure 13 indicates the total amount of funds awarded to SPI research projects in comparison to the amount of funds awarded to MPI research projects.

[29] 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 - Research Projects with Single PIs (SPI) & Multiple PIs (MPI), by Dollar Amount (in millions)

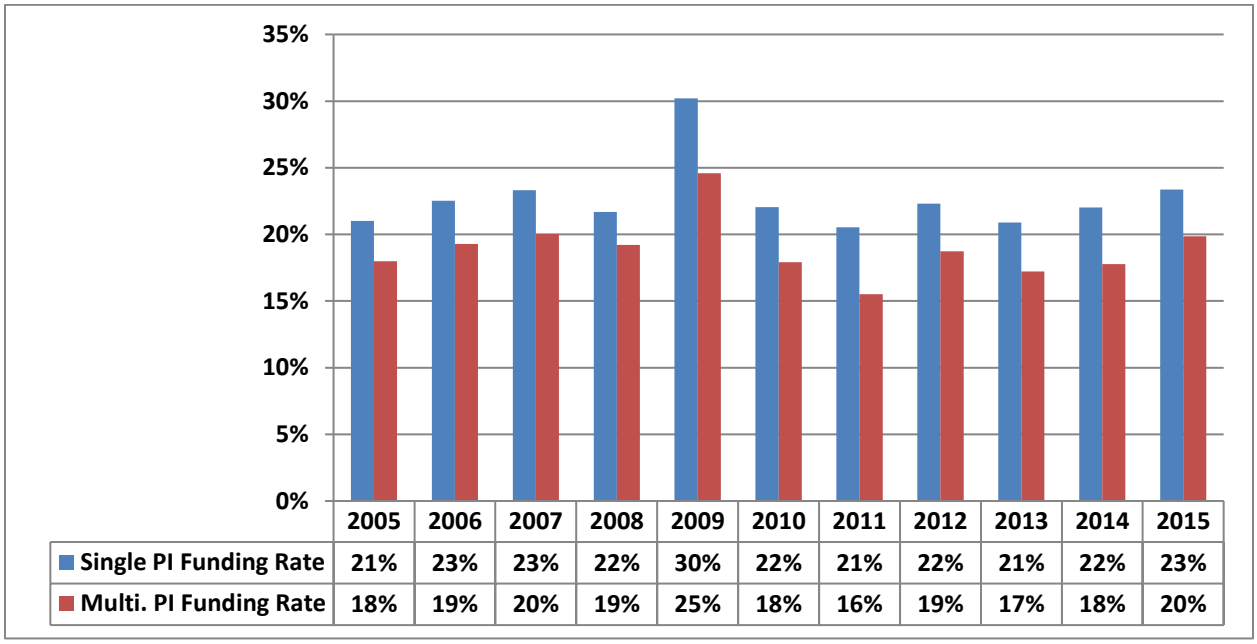


	2005	2006	2007	2008	2009	2009-Omnibus	2009-ARRA	2010	2010-Appropriation	2010-ARRA	2011	2012	2013	2014	2015
SPI in $M	$961	$979	$1,059	$1,131	$1,659	$1,026	$633	$1,352	$1,347	$4	$1,209	$1,307	$1,225	$1,250	$1,330
MPI in $M	$1,465	$1,352	$1,645	$1,489	$2,490	$1,573	$917	$2,247	$2,229	$18	$1,947	$2,061	$2,102	$2,143	$2,523

Source: NSF Enterprise Information System, 10/01/15. Note: In FY2010, a total of only 25 research projects were funded from the ARRA appropriation (including one collaborative project). These are barely visible in the figure.

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



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Single PI Funding Rate	21%	23%	23%	22%	30%	22%	21%	22%	21%	22%	23%
Multi. PI Funding Rate	18%	19%	20%	19%	25%	18%	16%	19%	17%	18%	20%

Source: NSF Enterprise Information System, 10/01/15.

F6. Number of Research Grants per PI

Table 13 indicates the number of active research grants per PI averaged over the three-year period 2013 - 2015.

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

	One	Two	Three	Four or More
Fiscal Years 2013-2015	81%	15%	3%	1%

Source: NSF Enterprise Information System, 10/01/15.

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.[30] 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 2014 to FY 2015, both the number of post-doctoral associates and the number of graduate students supported by research grants increased, by 7.0% and 2.1%, respectively; however, these increases are smaller than the percentage increase in the number of research awards.

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

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% Change, 2005 - 2015
Senior Personnel Supported	22,255	23,186	26,176	26,494	33,536	33,650	35,523	39,862	32,829	31,650	33,831	52%
Postdocs Supported	4,068	4,023	4,034	3,909	5,580	4,653	4,751	4,596	4,447	4,286	4,586	13%
Graduate Students Supported	20,442	20,949	22,777	22,936	33,371	24,554	24,855	25,550	25,161	26,317	26,882	32%

Source: NSF Enterprise Information System, 10/01/15.

Appendix 8 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. In comparison to FY 2014, the numbers of undergraduate students, K-12 students and K-12 teachers involved in NSF awards increased.[31] In FY 2015, the graduate students supported on research grants made up about 64% of the graduate students involved in activities supported by all NSF active awards.

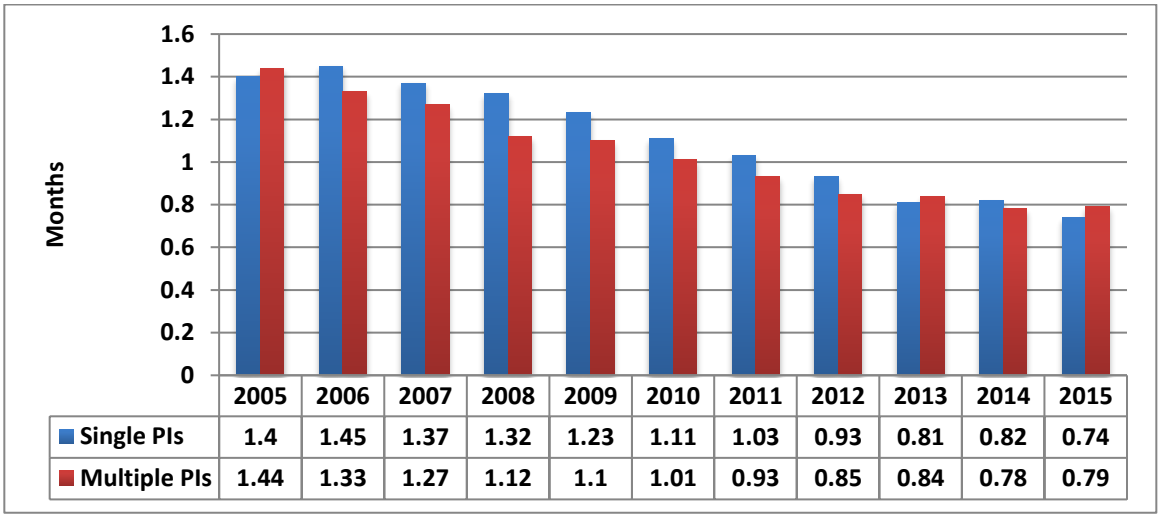
[30] The research grant category does not include most individual post-doctoral fellowships and graduate student fellowship grants. However, the majority of NSF-supported post-doctoral associates and graduate students are supported as part of research grants.

[31] 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- & 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. In FY 2013 and FY 2014, they were approximately equal (within 5%). In FY 2015, while both were low, 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 9** 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 2015 numbers being less than 40% of the 2002 number for single PIs. The data by directorate in **Appendix 9** 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- & Multi-PI Research Grants



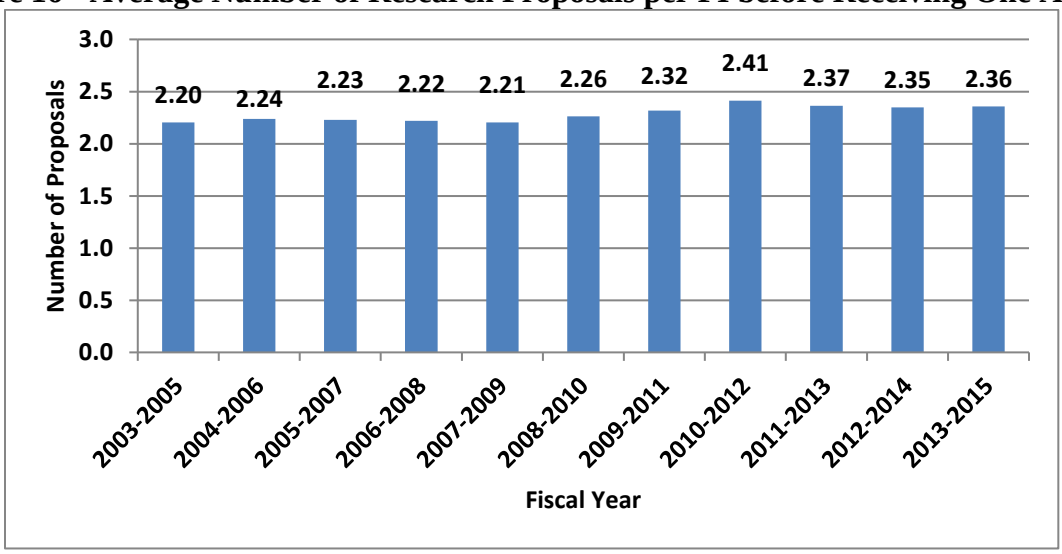
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Single PIs	1.4	1.45	1.37	1.32	1.23	1.11	1.03	0.93	0.81	0.82	0.74
Multiple PIs	1.44	1.33	1.27	1.12	1.1	1.01	0.93	0.85	0.84	0.78	0.79

Source: NSF Report Server, 01/19/16.

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 three years. This average is calculated across all PIs, including both new and previous PIs. **Appendix 10** 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.

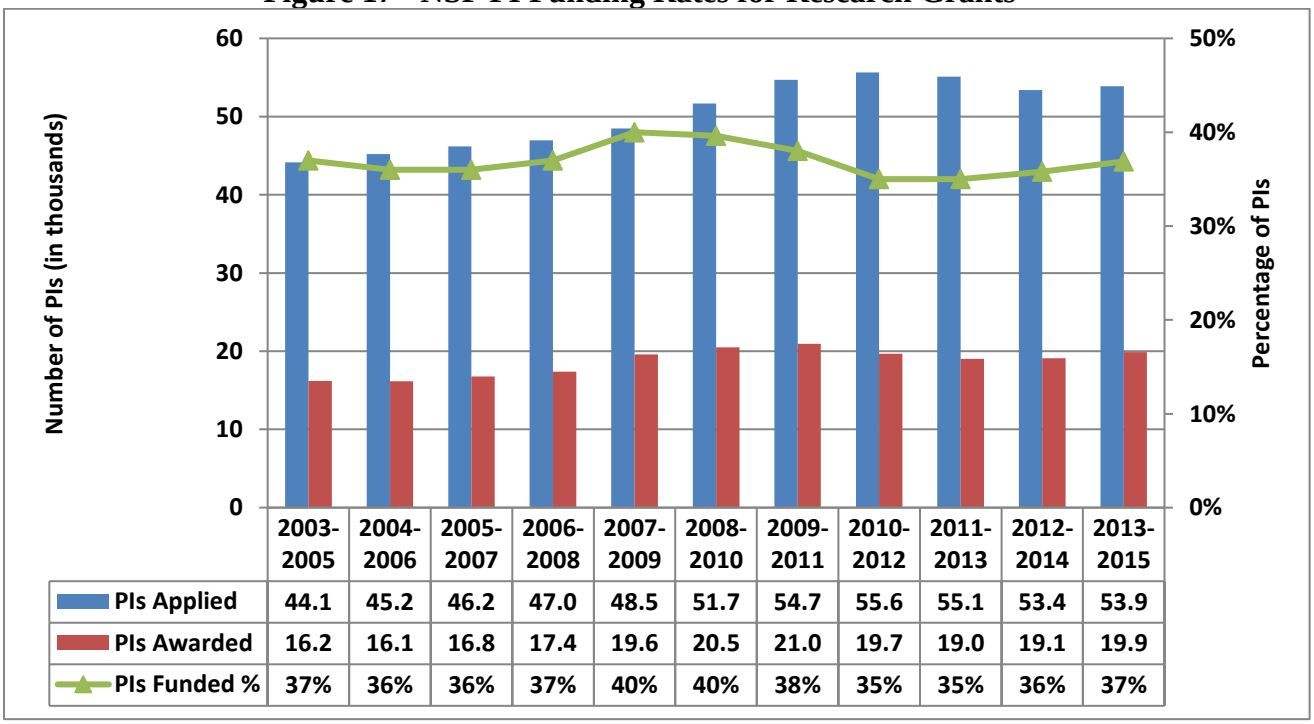
Figure 16 - Average Number of Research Proposals per PI before Receiving One Award



Source: NSF Enterprise Information System, 1/25/16.

Figure 17 shows the funding rate 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 a decade ago.

Figure 17 - NSF PI Funding Rates for Research Grants



	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015
PIs Applied	44.1	45.2	46.2	47.0	48.5	51.7	54.7	55.6	55.1	53.4	53.9
PIs Awarded	16.2	16.1	16.8	17.4	19.6	20.5	21.0	19.7	19.0	19.1	19.9
PIs Funded %	37%	36%	36%	37%	40%	40%	38%	35%	35%	36%	37%

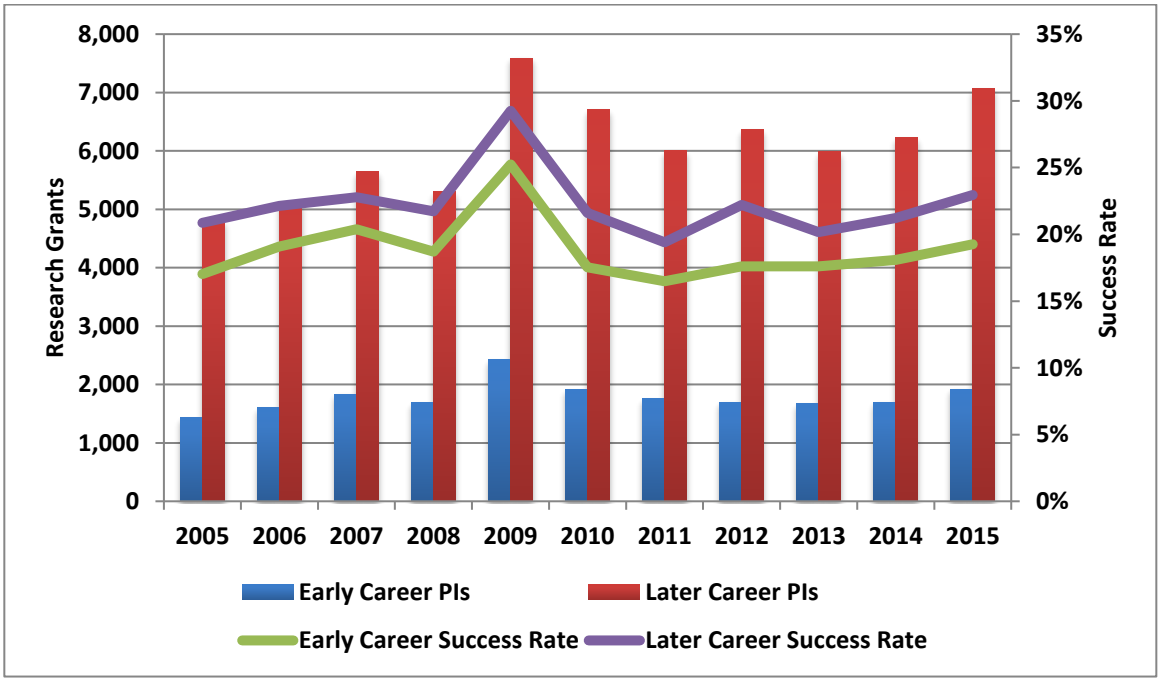
Source: NSF Enterprise Information System, 1/25/16.

In 2013-2015, as in 2003-2005, 63% of PIs who submitted proposals during that three-year period did not receive any research award. The number of PIs who submitted proposals in 2013-2015 was 22% higher than the number in 2003-2005.

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.

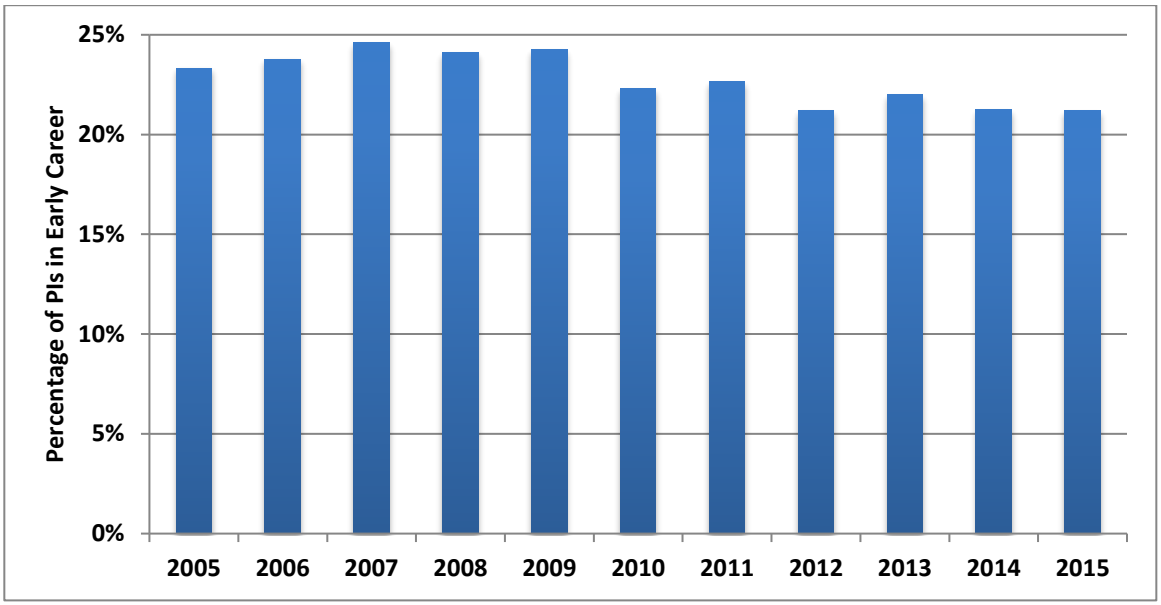
Figure 18 – Research Grants Awarded to PIs in Early & Later Stages of Career and Research Proposal Success Rates



Source: NSF Enterprise Information System, 10/01/15.

The success rates for both early and later career PIs increased in FY 2015 but the gap between them continued to widen (**Figure 18**). The percentage of research awards to early career PIs remained 21% (**Figure 19**).

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



Source: NSF Enterprise Information System, 10/01/15.

F11. Mechanisms to Encourage Transformative Research

The March 2007 NSB report, *Enhancing Support of Transformative Research at the National Science Foundatio*n (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), Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE), Creativity Extensions, and Accomplishment-Based Renewals. Information on the latter two types of awards may be found in **Appendix 20**.

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

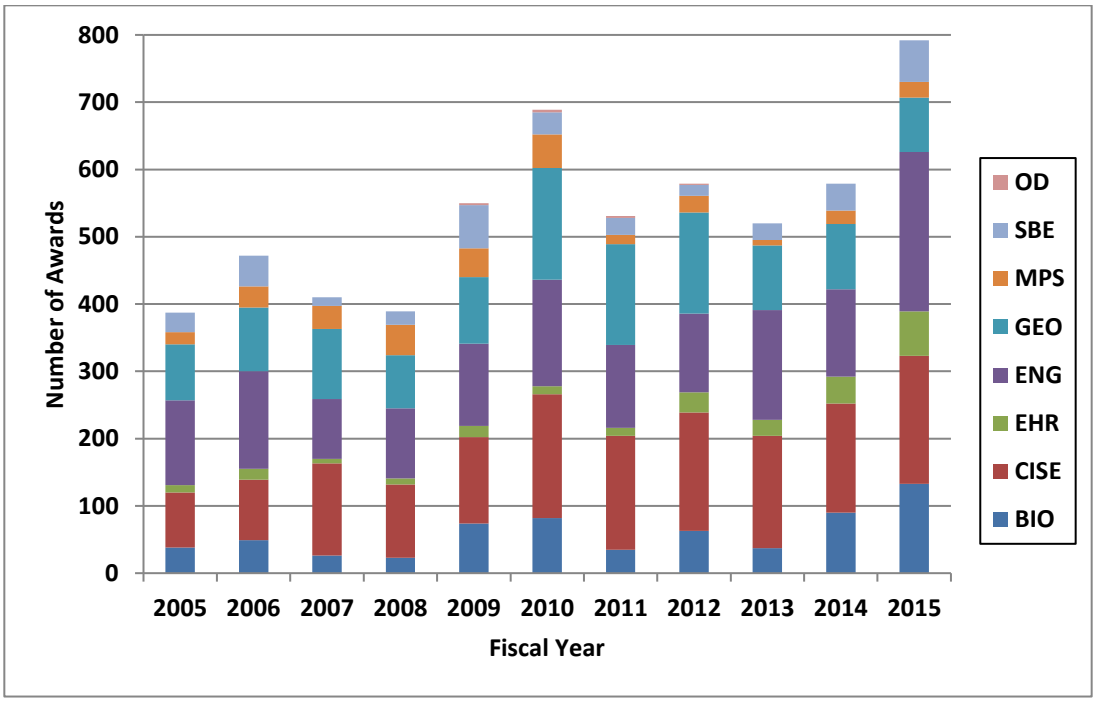
From FY 1990, the Small Grants for Exploratory Research (SGER) option permitted program officers throughout the Foundation to make small-scale grants without formal external review. Effective January 2009, the SGER funding mechanism was replaced by two separate funding mechanisms EAGER and RAPID, in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

- **EArly-concept Grants for Exploratory Research (EAGER)**
  The EAGER funding mechanism is used to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches. The work may be considered especially "high-risk/high-payoff" in the sense that it, for example, involves radically different approaches, applies new expertise, or engages novel disciplinary or inter-disciplinary perspectives. Requests may be for up to $300,000 and up to two years duration.
- **Grants for Rapid Response Research (RAPID)**
  The RAPID funding mechanism is used for proposals having a severe urgency 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 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 2005 to 2015 by Directorate. Additional information on SGERs, RAPIDs, and EAGERs can be found in **Appendix 11**. 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, 10/01/15.

In FY 2009, the total number of SGER, RAPID and EAGER awards was 550, slightly higher than in previous years (see **Appendix 11** for a comparison with SGERs since FY 2004).

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 reached their highest number ever, almost 800. Compared to the previous two years, there was a significant increase in the numbers of both RAPID and EAGER proposals received. The success rate for EAGER proposals declined to 79%. It was 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 11**.) For example, in FY 2014 and FY 2015, CISE received roughly twice as many EAGER proposals as BIO and nearly ten times as many as MPS. RAPID proposals are proportionally more common in GEO than in other units. In FY 2015, ENG received more than twice as many EAGER proposals as in FY 2014, the most of any of the 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 20% of the EAGER and RAPID awards, accounting for three-quarters of these awards. BIO, SBE, MPS and EHR have made 12%, 6%, 5% and 4%. However, with the exception of SBE, the mean award size is larger for this second group of directorates than for the first group. GEO tends to make smaller EAGER and RAPID awards, on average.

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

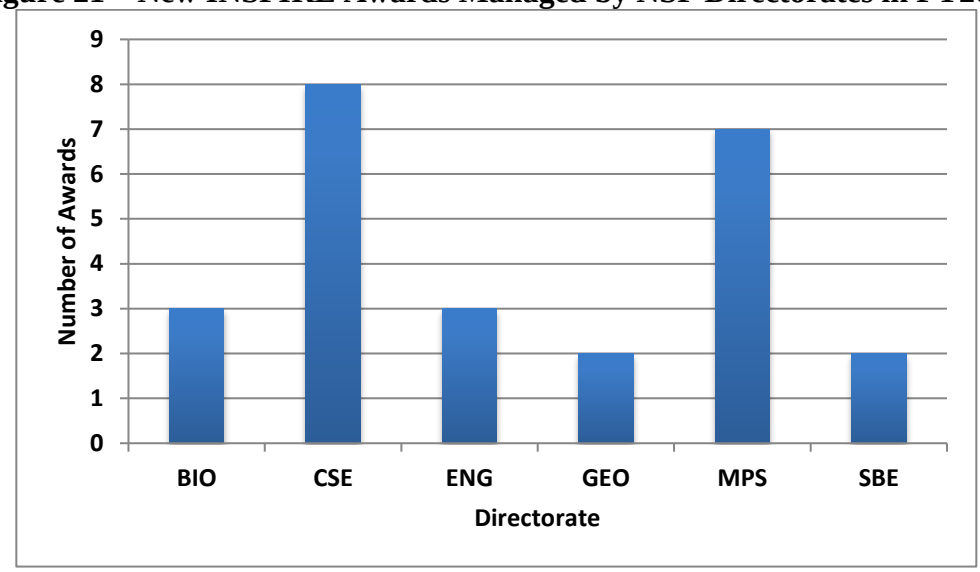
	CISE	ENG	GEO	BIO	SBE	MPS	EHR
% of FY 09-15 awards	28.1%	24.9%	19.6%	12.1%	6.0%	4.2%	4.8%
FY 09-15 investment ($ million)	187	120	68.5	93	24	30	43.5
FY 15 investment ($ million)	31.1	37.0	7.2	23.6	6.5	4.4	12.8
Mean FY 15 award ($ thousand)	163	156	89	178	105	192	195

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 is intended to support transformative, cross-disciplinary science, creating a new type of funding opportunity. INSPIRE is designed to attract unusually creative, high-risk / high-reward interdisciplinary proposals. No favored topics are designated, and the funding opportunity is open to innovative, interdisciplinary proposals that fall within the overall span of NSF-supported areas of science, engineering, and education research. Program managers are encouraged to use new tools, collaboration modes and techniques in the merit review process to widen the pool of prospective discoveries. The program creates new interdisciplinary research opportunities. The parameters of the program have evolved since FY 2012.

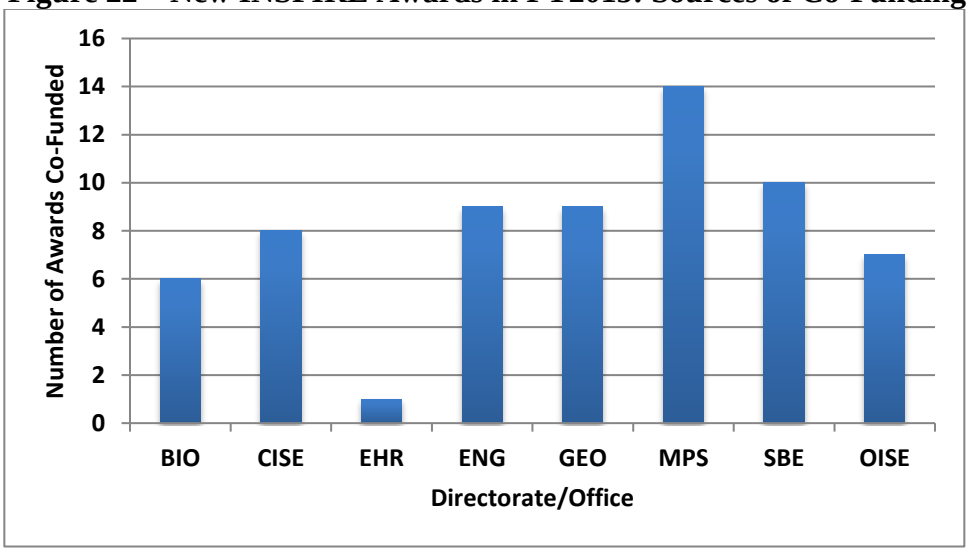
In FY 2015, 27 INSPIRE proposals were awarded (25) or declined (2) by NSF programs. (One of those declined was a Track 2 proposal submitted in FY 2013 that had been held for further consideration.) **Figure 21** shows the number of new INSPIRE awards managed by each directorate in FY2015. **Figure 22** shows how many each directorate or office co-funded.

Figure 21 – New INSPIRE Awards Managed by NSF Directorates in FY2015



Source: Enterprise Information System, 10/1/15.

Figure 22 – New INSPIRE Awards in FY2015: Sources of Co-Funding



Source: INSPIRE Program, 04/14/16.

Reflecting the interdisciplinary nature of these projects, all INSPIRE awards were supported by at least two different units within NSF. [32]

[32] 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

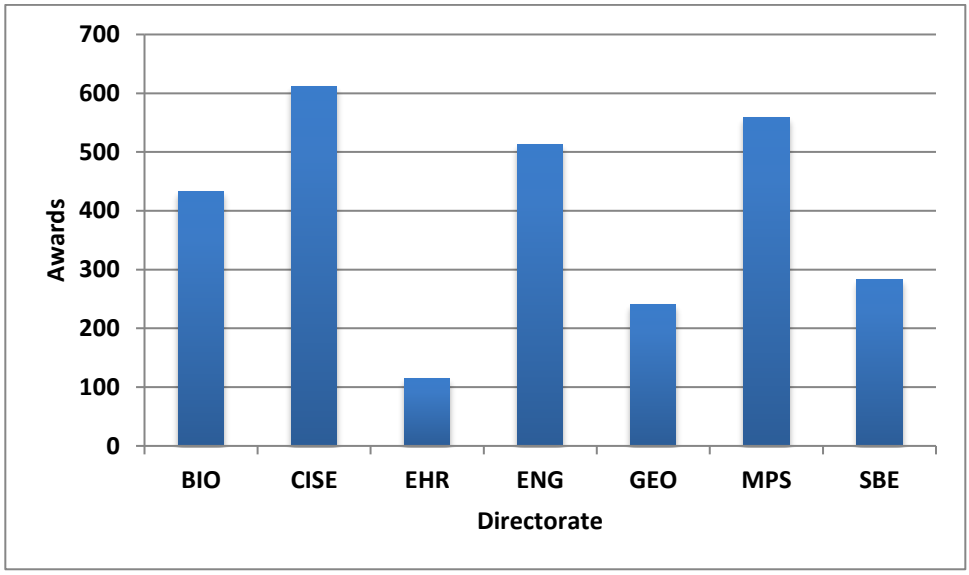
F12. Multi-Panel Review and Inter-Divisional Co-Funding

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 elusive[33] 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 23** shows the distribution of co-funding for research awards that received funding from more than one division at NSF in FY 2015.[34]

Figure 23 - FY 2015 Awards Co-funded



Source: NSF Enterprise Information System, 10/01/15 and 4/18/16.

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.

[33] 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.)

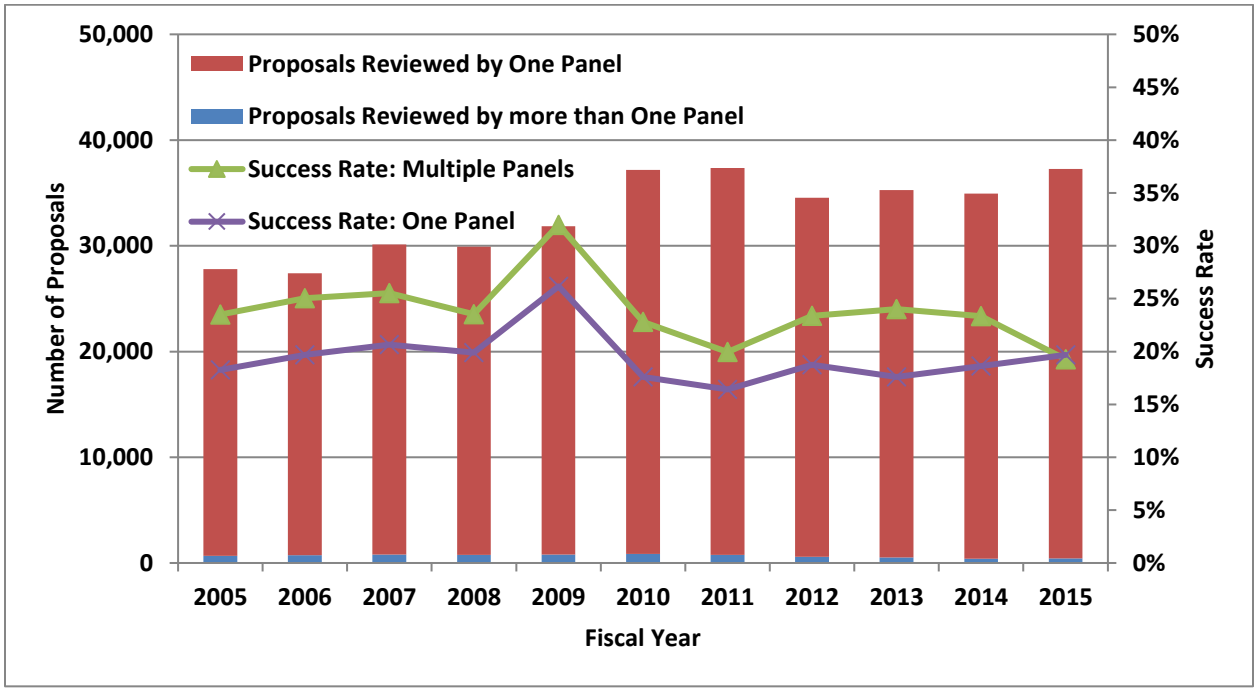
[34] This differs from previous years' reports in which competitive proposals were discussed.

The total number of unique, co-funded research awards included in **Figure 23** is 1,125, which is approximately 12.5% of FY 2015 research awards. 437 of these awards are co-funded wholly within a directorate. The average number of divisions contributing to a co-funded award is 2.4.[35] Co-funding associated with EPSCoR or international activities does not, of itself, imply interdisciplinary proposal content and is not included in **Figure 23**. 18 of the awards in the figure were also co-funded by OISE and 12, 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.

Figure 24 – Proposals Undergoing Single- and Multi-Panel Reviews and their Success Rates



Among proposals reviewed by panels, **Figure 24** 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).

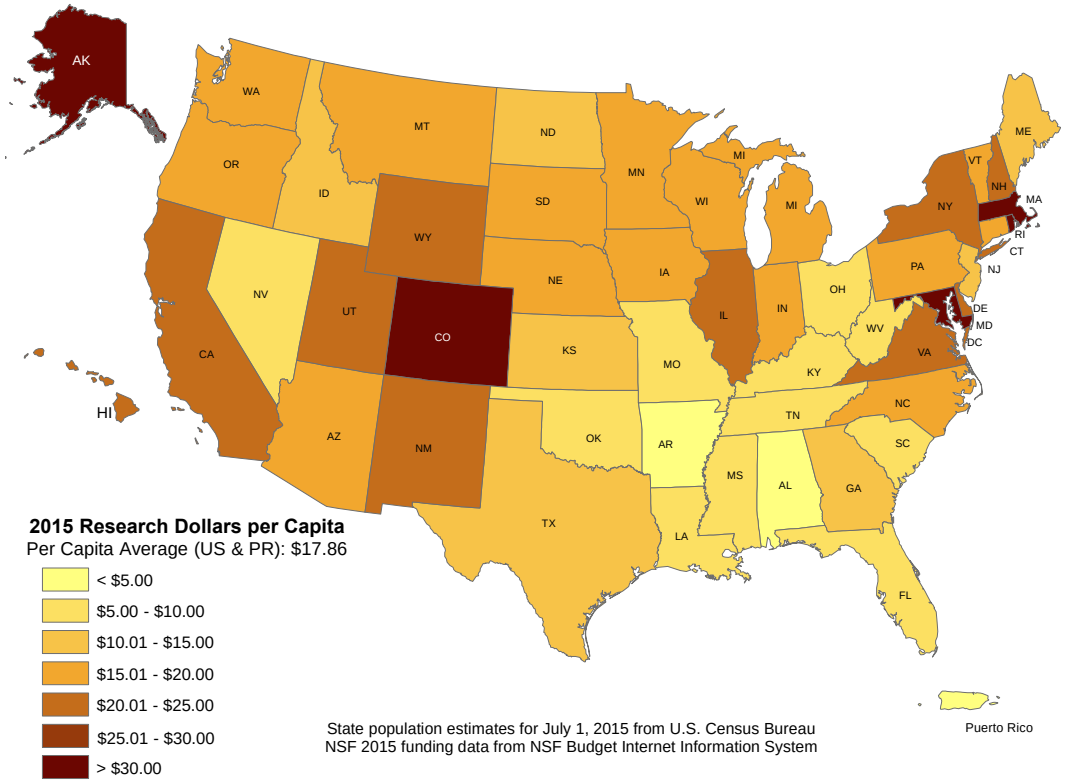
[35] In **Figure 23**, awards appear once for each distinct funding source at the level of a division. Awards that receive co-funding from distinct divisions within the same directorate are included. (E.g., an award co-funded by the Division of Physics and the Division of Chemistry would be counted twice 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 23** 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.

The proportion of empanelled proposals going through multi-panel review is small (1.2% of the total in FY 2015). This number was 2.7% in FY 2006 and has declined nearly every year since then. Most multidisciplinary proposals are not reviewed by multiple panels. However, over the decade, the success rate for proposals reviewed by more than one panel is consistently 4 to 6 percentage points higher than the rate for proposals that are only reviewed by a single panel, except for FY 2015. In the most recent year, the two success rates are approximately the same.

F13. Geographic Distribution of Research Awards

Figure 25 shows the distribution of the total value of NSF research funds awarded in FY 2015 by state.[36] In **Figure 25**, the shading indicates the NSF research funding by state for FY 2015 normalized by population, based on state population estimates for July 1, 2015 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 $17.86. The median of FY 2015 funding per capita in the various states, the District of Columbia and Puerto Rico is $16.54 per capita.

Figure 25 – NSF Research Funding per Capita



[36] Data on research funding were accessed from the NSF Budget Internet Information System on 3/2/2016. The data include both new awards and the FY 2015 annual increments for continuing grants and cooperative agreements. Data for the District of Columbia are not shown on the map.

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.[37] 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.[38] 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 12**.

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 26**:

- 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 13**.)

- The review process is overseen by a division director, or other appropriate NSF official.

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[37] "The National Science Foundation's Merit Review Criteria: Review and Revisions." (2011) NSB/MR-11-22.
[38] The NSF *Proposal and Award Policies and Procedures Guide* (PAPPG) applicable from October 1, 2014 to December 25th, 2014 is available at: http://www.nsf.gov/pubs/policydocs/pappguide/nsf14001/nsf14_1.pdf. The version of the PAPPG applicable for the remainder of FY 2015 may be found at: http://www.nsf.gov/pubs/policydocs/pappguide/nsf15001/nsf15_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, EAGERs, RAPIDs, INSPIRE Track 1s, 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)

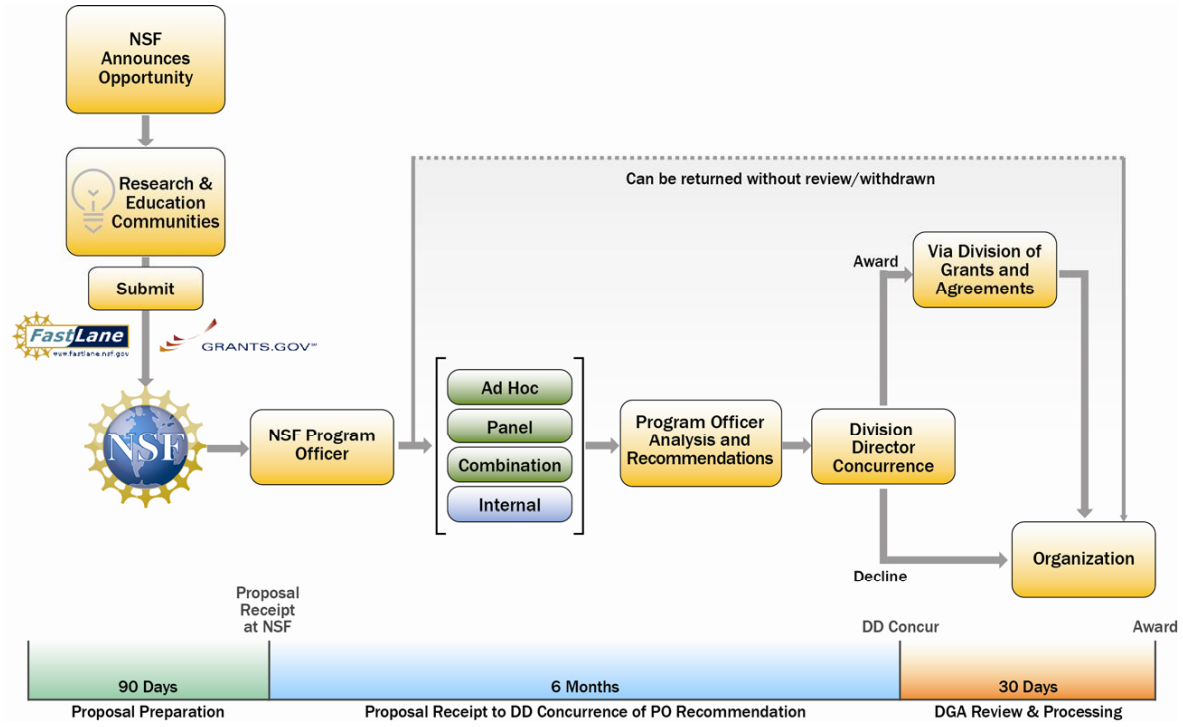
Fiscal Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Number of Proposals RWR	1216	1306	1505	1287	1741	2628	1794	1813	1871	1659	1843
Percent of all Proposal Decisions	2.8%	3.0%	3.3%	2.8%	3.7%	4.5%	3.4%	3.6%	3.7%	3.3%	3.6%

Source: NSF Enterprise Information System, 10/01/15.

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.[39] In FY 2015, the NSB authorized 4 funding items: 1 new award, 2 increases to existing awards, and one continuation of an existing award with no additional funds.

[39] 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 26 -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 3-5 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 14**.

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.[40] A reconsideration request can be based on the applicant's perception of procedural errors or on

[40] 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/pappguide/nsf16001/gpg_4.jsp#IVD.

disagreements over the substantive issues dealt with by reviewers. If the relevant NSF assistant director or office head upholds the original action, the applicant's institution may request a second reconsideration from the Foundation's Office of the Deputy Director.

NSF declines approximately 37,000 – 40,000 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 2005 through FY 2015 are displayed in **Appendix 15**. NSF received 35 formal reconsideration requests in FY 2015; 31 decline decisions and a return without review were upheld and 3 decline decisions were reversed.

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.[41]

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**.[42]

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[41] Exemptions that program officers may choose to exercise, for example, include proposals for EAGER, RAPID, some INSPIRE proposals, and certain categories of workshop and symposia proposals. See **Appendix 11** for more information about EAGER and RAPID proposals.

[42] 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

Table 17 - Reviews per Proposal, FY 2015

	All Methods	Ad Hoc + Panel	Ad-Hoc-Only	Panel-Only
Reviews*	185,403	60,436	10,312	114,655
Proposals	47,282	12,488	2,650	32,144
Rev/Prop	3.9	4.8	3.9	3.6

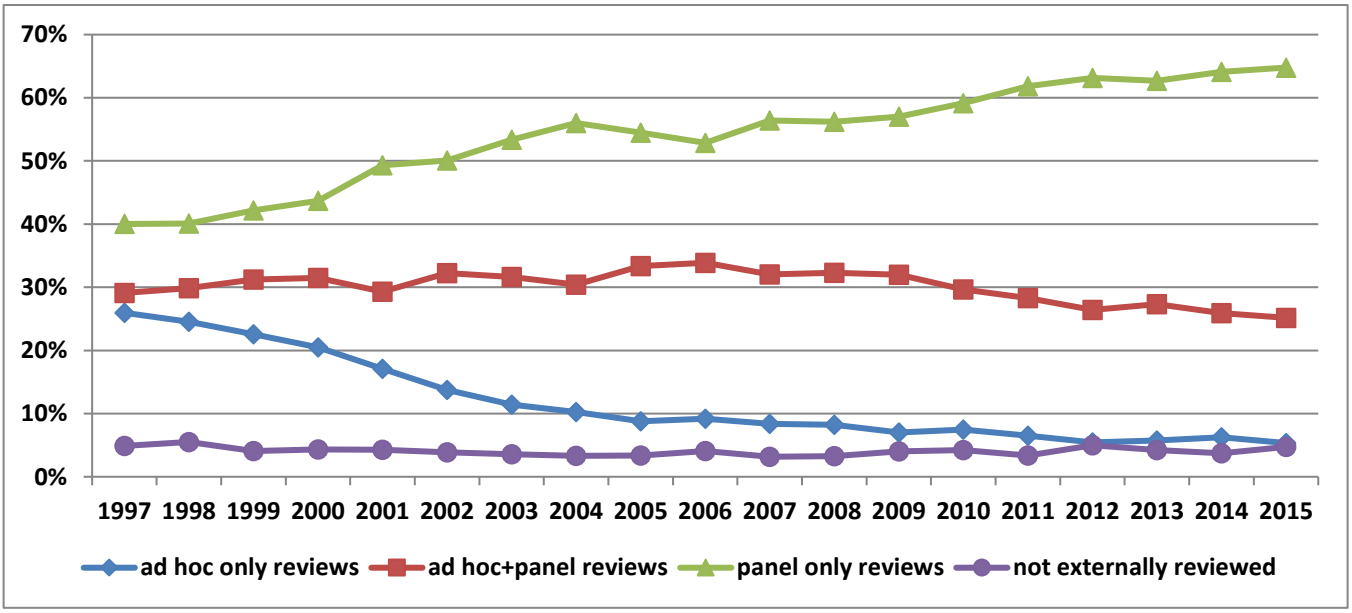
Source: NSF Enterprise Information System, 10/01/15.

The ad-hoc-plus-panel method had the highest number of reviews per proposal, averaging 4.8, while the panel-only method averaged 3.6. Directorate-level data for FY 2015 are presented in **Appendix 16.**

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 27.** The data for FY 2005 - 2015 are provided in **Appendix 17,** and **Appendix 18** provides FY 2015 data on the review methods used by directorates and offices. **Appendix 19** shows the average review ratings that result from the different methods of review.

Figure 27 - FY 1997-2015 Trend, NSF Review Method



Source: NSF Enterprise Information System, 10/01/15.

There are a number of reasons for the trends in **Figure 27**. Panels allow reviewers to discuss and compare proposals. The panel review process has the advantage that different perspectives can

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.

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

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 hoc only reviews. For example, in FY 2015, 79% of all proposals reviewed by panel only were processed within six months, compared to 68% for ad hoc + panel and 55% for ad hoc only.[43]

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.

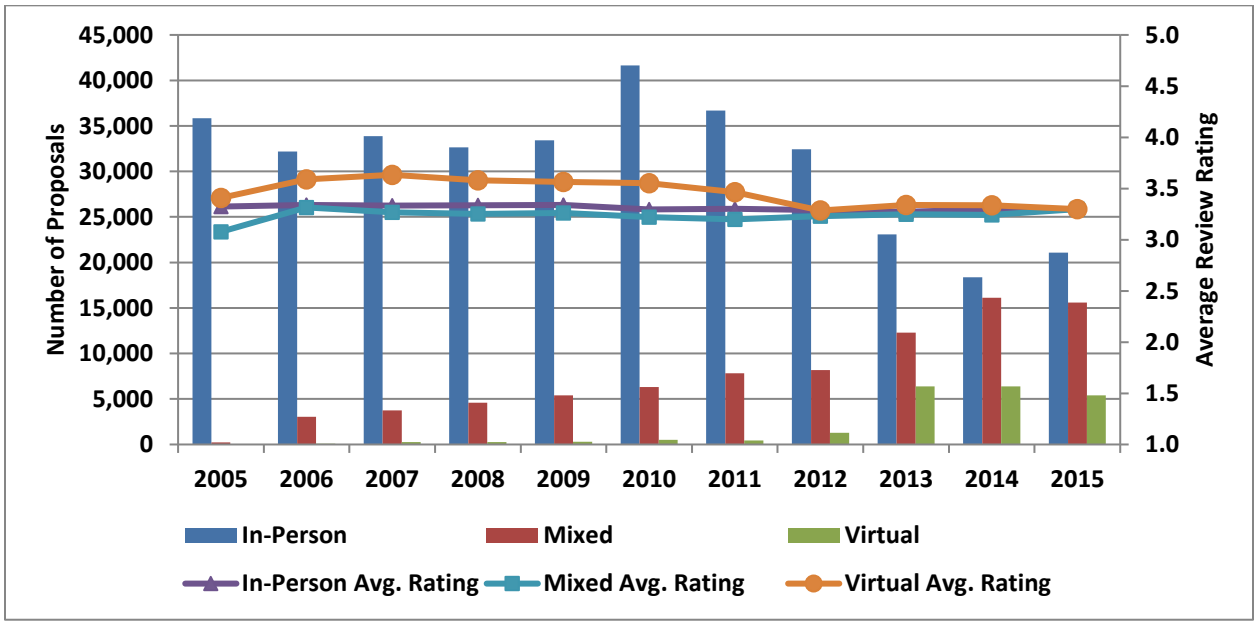
In recent years, "virtual panels" have emerged as an alternative to in-person review panels. In FY2015, approximately 27%[44] of panels at NSF were held virtually. Virtual panels can help address some of the drawbacks noted with in-person panels, while retaining the comparative analysis provided by a 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 28** shows the number of proposals reviewed by different types of panels since FY 2005 and the proposal ratings by panel review type (in-person, virtual, and mixed).[45] 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

[43] 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.
[44] Data provided by NSF's Division of Administrative Services. They include virtual panels used by the Graduate Research Fellowship Program.
[45] 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.

works best when the size of the panel and the number of proposals considered are relatively small. This is reflected in the statistics of the three types of panels shown in **Table 18**.

Figure 28 - FY 2005-2015 Usage and Proposal Rating by Panel Review Type[46]



Source: NSF Enterprise Information System, 10/01/15 and 12/11/2015. In FY 2005 and FY 2006, the numbers of proposals reviewed by virtual panels are below 100 and imperceptible on the figure.

Table 18 - Data on Virtual, Mixed and In-Person Panels held in FY 2015[47]

	Virtual	Mixed	In-Person	TOTAL
Panels	452	663	767	1,882
Proposals*	6,132	20,737	24,719	51,588
% of Total Panels	24.0%	35.2%	40.8%	100.0%
% of Total Proposals	11.9%	40.2%	47.9%	100.0%
Proposals/Panel	13.6	31.3	32.2	27.4
Panelists	2,574	6,558	7,123	16,255
Panelists/Panel	5.7	9.9	9.3	8.6
Proposals/Panelist	2.4	3.2	3.5	3.2

*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 13.6 and 32.2, respectively), only 11.9% of proposals that were reviewed by panels went through virtual panels in FY 2015.

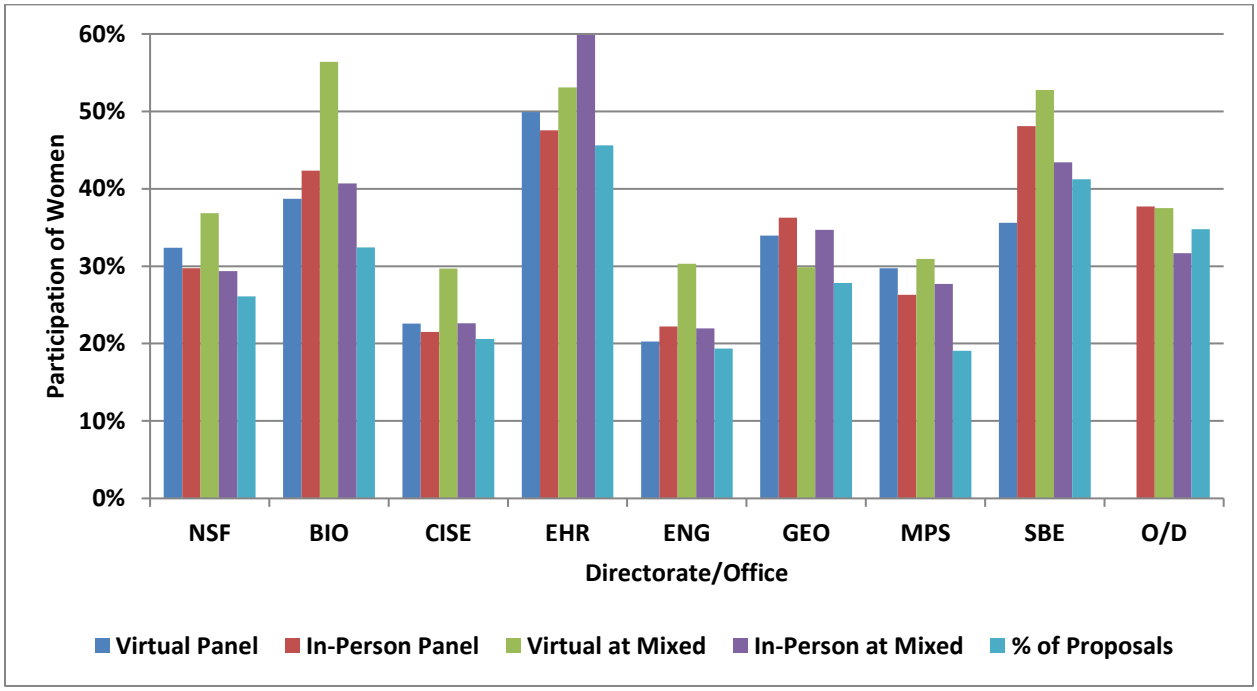
[46] As in previous years, the data in **Figure 24** correspond to panels that reviewed proposals that were recommended for award or decline by division directors in the stated fiscal year. Thus, for example, some of the panels associated with FY 2015 occurred prior to the beginning of FY 2015 and some of the panels that occurred late in FY 2015 are not associated with FY 2015 because proposals from these panels were not recommended until FY 2016.

[47] Unlike **Figure 24**, 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.

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

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 29**.

Figure 29 – Participation of Female Reviewers in Virtual, In-Person, and Mixed Panels during FY 2015 [48]



Source: NSF Enterprise Information System, 1/11/16.

Of the 16,255 panelists[49] in FY 2015, gender information was available for 80.3%. 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, 29.7% of panelists on in-person panels and 32.4% of panelists on virtual panels were women. For both types of panels, women participate at a slightly higher rate than their representation amongst proposers (26.1% for competitive proposals and 25.4% for research proposals).

Mixed panels exhibit a difference between the demographics of those panelists who attend in-person and of those that participate virtually. Averaging across all of the mixed panels in FY 2015, 74.8% of panelists attended in person and 25.2% attended virtually. Looking only at those

[48] The reviewer participation data include only those panels that took place in the given fiscal year, FY 2015. Also shown is the percentage of competitively reviewed proposals with award or decline actions approved by division directors in FY 2015 that came from female PIs.
[49] Because some reviewers serve on more than one panel, this number represents 13,704 distinct individuals.

panelists for whom gender information was available, 29.4% of the panelists who attended in-person were women while 36.8% of panelists who participated virtually were women. This difference is statistically significant.[50] The difference seen in the demographics of in-person and virtual participation in mixed panels in FY 2015 is similar to what was seen in the prior three years. The most prominent changes are: (a) an increase in the proportion of in-person participants in mixed EHR panels who are women (from 50.4% in FY 2014 to 59.9% in FY 2015); (b) changes in the virtual participation rates for women in SBE (the rate of participation in virtual panels declined from 42.1% to 35.6%, while the rate of participation virtually in mixed panels increased from 36.7% to 52.8%); and (c) the absence of virtual panels in OIA and OISE in FY2015.

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 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 is continuing its efforts to improve 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. A brief description of each pilot follows. 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 has experimented with having reviewers participate "virtually" in review panel discussions, using technologies like teleconferencing, videoconferencing or "virtual worlds."[51] 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. Motivations for this included: an opportunity to attract potentially untapped reviewer pool resources by removing barriers that might hinder panelists who may not be able to travel due to physical limitations, family responsibilities, or other travel restrictions; greater opportunities to utilize international

[50] $p < 0.00001$.
[51] An example of a virtual world technology that has been used for panel review is the Second Life system.

panelists who are often faced with large travel times and other restrictions; greater flexibility in how virtual panels are structured; enhanced opportunities for reviewer training; and reducing the potential impacts of inclement weather. However, there are also actual and potential challenges, including: matching technology to the size and purpose of the panel; technology stability and acceptance; security and policy issues; the possibility that panelists may be distracted by factors in their local environment; and a potential reduction in the value of panel participation to some panelists because of less opportunity to exchange ideas with colleagues. Examining these challenges and testing approaches were among the reasons for implementing a pilot activity.

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/ACI'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

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. Based on experience in FY 2012, it was anticipated that at least 15% of review panels in FY 2014 would be wholly virtual.[52] As it turned out, NSF programs embraced virtual panels to a greater degree than anticipated; 31% of panels held in FY 2014 (29% of proposal panels) were wholly virtual. In FY 2015, these numbers declined slightly to 27% of all panels and 24% of proposal panels.

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 4 or 5-page preliminary proposals to be submitted each January. These are reviewed in panels and then, informed by the reviewers' input, program officers invite fewer than half [53] of the proposers to submit full proposals by a 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.

In IOS, the pilot has achieved its goal of reducing the numbers of reviewers required. As can be seen in **Table 20**, while the number of preliminary proposals submitted in FY 2015 was 16% larger than the number of full proposals submitted in FY 2011, the number of reviewers needed decreased by 47%. Since some of the FY 2011 full proposals were multi-institutional collaborative projects, this amounts to a reduction by more than a factor of two in the total number of reviewers needed per project idea compared to the former practice.

Table 20. FY 2011 and FY 2015 submissions and reviewers for IOS core programs [54]

	Number of Reviewers	Number of Preliminary Proposals	Number of Full Proposals
FY11	3366	0	1614
FY15	1794	1866	730

Source: Directorate for Biological Sciences, 10/16/15 and 03/04/16. Preliminary proposal count includes renewals.

However, there has also been a change in the distribution of types of reviewers; relative to FY 2011, FY 2015 saw the use of fewer ad hoc reviewers and more panelists with the decline in the former larger than the increase in the latter.

[52] See NSF's discussion of Virtual Merit Review Panels in the Performance Plan included in the President's FY 2014 budget, submitted to Congress in February, 2013.
[53] The proportion varied between divisions and over the life of the pilot.
[54] Preliminary proposal numbers in **Table 20** and **21** are EIS counts of core program preliminary proposals received and reviewed by DEB and IOS. Full proposal numbers are counts of competitive research grant proposals from all sources reviewed as part of the fall core program competitions in DEB and IOS. Full proposals include submissions resulting from preliminary proposal invitations made during the preceding fiscal year and CAREER, RCN, OPUS, and LTREB renewal proposals submitted directly to their respective solicitations as full proposals. EAGER and RAPID proposals are not included.

For DEB, the corresponding numbers are shown in **Table 21**. DEB saw a smaller reduction in the number of reviewers used, by 34%. For the two divisions, the situation in FY 2015 is similar; the number of reviewers required for the whole process, divided by the number of preliminary proposals received is very close in the two cases, 1.0 for IOS and 1.02 for DEB. However, in FY 2011, the corresponding ratio of reviewers to full proposals received showed greater differences, being 2.1 for IOS but only 1.3 for DEB.

Table 21. Comparison of FY 2011 and FY 2015 submissions and reviewers for DEB core programs.

	Number of Reviewers	Number of Preliminary Proposals	Number of Full Proposals
FY11	2298	0	1720
FY15	1519	1495	719

Source: Directorate for Biological Sciences, 10/16/15 and 03/03/15. Preliminary proposal count includes renewals.

The overall number of awards in core programs made by the two divisions was not affected by the pilot. The ratio of awards in FY 2015 to awards in FY 2011 was 0.99 for IOS and 1.00 for DEB.

The transition from semi-annual deadlines to annual deadlines and the introduction of a limit of two core proposals per PI per cycle, which are important parts of the structure of the pilot, do not seem to have reduced the number of ideas submitted to the core programs in either division. For example, in the case of DEB, although the number of preliminary proposals in FY 2015 is lower than the number of full proposals in FY 2011, the number of submitted project ideas was larger in FY 2015 than in FY 2011. Taking into account the joint submission of proposals for collaborative projects, the 1720 full proposals in FY 2011 corresponded to 1329 separate projects. Taking into account full proposals that were not preceded by preliminary proposals, such as CAREER and RCN proposals, the number of separate "ideas" submitted in FY 2015 was approximately 1750. (At the preliminary proposal stage, only one preliminary proposal is submitted for each project, even if the project is a multi-institutional collaboration.)

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.

Comparing FY 2013, FY 2014 and FY 2015 to FY 2012, 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. **Table 22** shows the comparison between these four fiscal years. ("Proposals Reviewed" include some non-core proposals such as CAREER and co-reviews.)

Table 22. Comparison of FY 2012 (before pilot), FY 2013, FY 2014, and FY 2015 submission and funding rates for proposals evaluated by GSS

Review Round	Proposals Reviewed by GSS	Proposals Funded by GSS	Success Rate
FY12	**307**	**37**	**12.1%**
Fall 11	166	18	10.8%
Spring 12	141	19	13.5%
FY 13	**255**	**38**	**14.9%**
Fall 12	215	28	13.0%
Spring 13	40	10	25.0%
FY14	**207**	**30**	**14.5%**
Fall 13	177	22	12.4%
Spring 14	30	8	26.7%
FY15	**235**	**36**	**15.3%**
Fall 14	208	26	12.5%
Spring 15	27	10	37.1%

Source: NSF Geography and Spatial Sciences Program, 10/09/15.

In FY 2012, the year before the pilot started, the two semi-annual review cycles handled roughly similar numbers of proposals (166 and 141). In FY 2013, the first year of the pilot, in the months following the now annual deadline in Fall 2012, GSS reviewed more proposals than either of the two previous semi-annual cycles alone, 215, but fewer than the combined total of the two semi-annual cycles in FY 2012. In the second year of the pilot, FY 2014, the number of proposals reviewed in the months following the annual deadline in Fall 2013 dropped to a number, 177, that was closer to that seen for the semi-annual review cycles. The number of submissions rose in FY 2015 because GSS issued a new solicitation, but the total was still substantially less than in FY 2012, before the pilot started. The reduction in proposal pressure meant that GSS was able to increase its annual proposal success rate from 12.1% to at least 14.5%.

The success rate for invited resubmissions was high. Of the Fall 2012 proposals declined, 21 were resubmitted in response to invitations to do so and 7 (33%) of these were funded. Of the Fall 2013 proposals declined, 11 were resubmitted and 6 (55%) were funded.

Asynchronous Reviewer Discussions

This activity pilots 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. The experience of CNS serves to illustrate the approach. CNS ran asynchronous discussions as part of eight virtual panels to review medium-scale proposals within its Computer Systems Research (CSR) core program. On average:

- Each panel reviewed no more than 9 proposals;
- Each panelist read every proposal assigned to the panel so that the entire panel could participate in asynchronous conversations;
- Each panel first met (virtually, synchronously for "day 1") to go over the review criteria and asynchronous discussion process, and to go through brief introductions of all proposals (provided, for a given proposal, by the panelists assigned as the scribes);
- An asynchronous phase, lasting for one week, then followed. During this time, panel summaries were crafted based on the online comments submitted through the "Comments" section of the Interactive Panel System in FastLane;
- Panel summaries were submitted two days prior to the panel's reconvening synchronously for final comments/edits from panelists and to allow NSF program staff time to read the summaries;
- At the end of the asynchronous review period, each panelist entered a statement accepting the summary; and

- Approximately one week following the first virtual meeting, the panel reconvened (synchronously and virtually for "day 2") in order to read aloud and approve the panel summaries.

Timing was adjusted slightly from that described above to accommodate panel-specific circumstances. The asynchronous discussions varied between panels. In some cases, panels experienced rich, detailed discussions over the entire week; in others, panels had lively discussions about some proposals but little to no asynchronous discussion about others.

The program officers managing the panels indicated that this asynchronous pilot was more efficient than 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.

Mechanism Design

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.

The mechanism design approach to proposal review is based on the mathematical theory of games, or, more precisely, reverse game theory, namely how the rules of the game should be designed in order to obtain certain desired goals. This method of review relies on ad hoc review of proposals with the reviewers assigned from among the set of PIs whose proposals are being reviewed. Proposals are assembled into relatively homogeneous groups of 30 - 40 proposals per group. Each proposal is assigned for review to seven otherwise non-conflicted PIs from the same group. The reviewers remain anonymous within their group and do not communicate with one another. The reviewers must provide both a written review and an ordering of the seven proposals to which they are assigned. The written review summarizes the strengths and weaknesses of the proposal as perceived by the reviewer. Based on their interpretation of the proposals they have reviewed, each reviewer is asked to provide an ordering of the proposals in what they anticipate will be the consensus ordering of the group. The score of the PI's own proposal is then supplemented with "bonus points" depending upon the degree to which his or her ranking agrees with the consensus ranking. The award of bonus points is the step that game theory suggests should provide an incentive to each reviewer to give a fair and thorough rating and ranking of the proposals to which he or she is assigned. The NSF program officer then uses the reviewers' comments, ratings and rankings as the primary input for his or her funding recommendations.

Some of the potential benefits of such an approach are:

- To reduce the submission of multiple proposals and repeated resubmission of previously declined proposals;
- To reduce the overall burden on the reviewer community;
- To improve the overall quality of the proposals submitted to the program;
- To make it easier to maintain multiple proposal submission windows per year; and
- To reduce the costs and other resources, such as rooms, needed for proposal review.

This pilot activity occurred in FY 2014 using a cohort of proposals submitted in October 2013. Because of the unconventional nature of this approach, the program undertook a considerable amount of outreach to and discussion with the research community in FY 2013. Researchers proved to be interested in the process; 131 projects were proposed, the largest number seen for several years. The program officer conducting the pilot was pleased with the quality of the reviews received. One result of this approach is that proposals received a more comprehensive review than had been previously been the norm for this program.

The prospect of participation in the Mechanism Design pilot did not deter investigators from submitting proposals to the program. The number of projects submitted to the FY 2014 Fall deadline was larger than for any of the preceding 14 proposal cycles.

The net time required by administrative support staff, per proposal, was similar to what was involved in earlier proposal cycles. Many of the administrative steps in the review process are the same for the Mechanism Design pilot as for a typical panel review. Proposals go through the same compliance check, and reviewer information must be verified or added to the internal NSF system. Proposals in the pilot were divided into four groups, which, logistically, were treated as panels for the purposes of communicating with reviewers and collecting reviews.

For the program officer managing the review process, the workload was substantially less overall compared to a typical panel review but distributed differently in time. More time was required in the early stage of the process to identify potential conflicts of interests between the reviewers and the proposals.

Once proposals had been assigned to reviewers, the administrative burden was low. Unlike in the normal review cycle used by the program, there was no expenditure of time and funds on the logistics of arranging a panel meeting.

Since the total workload per proposal of NSF staff was a little less than that needed for the panel process that the pilot replaced, no additional staff cost was incurred. Since there were no panel meetings and, therefore no panelist travel or participation costs, there was a reduction in costs to program funds.

Transcribing a rating of “Excellent” as 5 and “Poor” as 1, the average review score for proposals (as opposed to projects) reviewed by the SSS program during FY 2007 – FY 2013 was 3.2 ± 0.6. In the pilot, the average score for the proposals reviewed was 3.1 ± 0.4. This suggests that the pilot did not result in reviews with a significantly different distribution of review scores. Calculating the standard deviation of the review scores for an individual proposal and then averaging this over all of the proposals in the pilot, the average standard deviation was 0.74. The

corresponding average over FY 2007 – FY 2013 was 0.44. While one would expect the historical average to be smaller because of small-sample bias in the standard deviation, the difference is larger than what one would expect to see just from the smaller number of reviewers used historically (usually 3-4 instead of the 7 used in the pilot). A possible explanation is that the absence of the discussion among reviewers that occurs on panels results in a greater spread of reviewer scores for each proposal, on average.

Other assessments made were: (1) a comparison of the length (number of words) in the reviews; and (2) an assessment of the content of the reviews of five proposals (35 reviews) by a group of program directors from CMMI. Historically, reviews averaged approximately 265 ± 120 words in length. During the pilot, the reviews were on average 40% longer, at 375 ± 135 words. The program director evaluations of the reviews were mixed. Overall the reviews were considered to be comparable with or somewhat lower in quality than what the program directors typically received in their own programs. However, this may be affected by variations in the norms of the research communities served by different programs.

Umbrella-Amendment Solicitation

The EarthCube Umbrella-Amendment Solicitation is a pilot between GEO and CISE/ACI. 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. The second Amendment was released in February 2013, the third Amendment was released in December 2013 for a March 2014 deadline date, and a fourth Amendment was released in December 2014 for a March 2015 deadline.

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 accept proposals at any time and their proposal load has seen less dramatic increases than is the average for NSF programs in recent years. The Division of Earth Sciences undertook an experiment in which one of its programs, 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. The final regular deadline was in July 2011. Beginning in late July 2012, proposals were accepted at any time. The year between, FY 2012, was a transition year and atypical in that, for budgetary reasons, proposals for equipment acquisition were not solicited in FY 2012. The annual numbers of proposals received before and after the transition year are shown in **Table 23**.

Table 23 – Proposals received by EAR/IF before and after a transition to no deadlines

Fiscal Year[55]	Proposals received
2007	177
2008	198
2009	176
2010	192
2011	187
2013	87
2014	67
2015	66

Source: NSF Division of Earth Sciences, 10/30/15.

Based on these results, the pilot was extended to four additional programs in the Division of Earth Sciences 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. Preliminary data, shown in **Table 24**, exhibit the same noticeable reduction in proposal pressure. This is accompanied by an increase in the proposal success rate.

Table 24 – Proposals received by four EAR programs before and after a transition to no deadlines in Spring 2015

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

Source: NSF Division of Earth Sciences, 04/12/16.

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

[55] In the transition year, FY 2012, proposals for Acquisition or Upgrade of Research Equipment were not accepted. These normally form a large part of the IF program portfolio. Other types of proposals were accepted, including: Development of New Instrumentation, Analytical Techniques or Software, Support of National or Regional Multi-User Facilities, and Support for Early Career Investigators. Consequently, only 125 proposals were received in FY 2012.

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 are 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.

Three ad hoc reviews were solicited for each proposal before the review panel phase. Reviewers from both the College of Reviewers and the larger community were asked to provide ad hoc reviews to ensure that each proposal was reviewed by individuals with the appropriate expertise. College of Reviewers members accounted for 28% of the reviews submitted for PAC proposals in FY13 and FY14 (310 reviews out of a total of 1089). Once the ad hoc reviews were received, any proposal that had no ratings of "Excellent" and not more than one review rating of "Very Good" was considered not competitive and was not reviewed by the PAC review panel, reducing the workload of the panel. A similar approach has since been adopted by the Development and Learning Sciences Program.

The workload of administrative staff is high in the first week of the review cycle because compliance checking needs to be done very quickly (within one week of the submission deadline). Panel-related workload is reduced because panels are smaller and fewer panelists need to be appointed, be assisted with travel arrangements, be reimbursed, etc.

The workload for program officers shifted to earlier in the review cycle. Ad hoc reviews need to be solicited in a very short time frame (one month). The use of the College of Reviewers (COR) mitigated this, even though only a portion of the ad hoc reviewers came from the College of Reviewers. Another factor contributing to the program officer workload early in the review cycle arises because the program officers must read each review carefully as it is submitted. These reviews form the basis for determining whether a proposal goes to panel and, for those proposals that are not competitive, the reviews will be the only substantive feedback the PI receives in the absence of a panel summary. With the latter point in mind, the program officer may ask the ad hoc reviewer to elaborate when necessary.

The return rates for external reviews are far greater when a COR member is asked to review a proposal than when reviews are sought from non-COR reviewers. This reduces the effort required to obtain three ad hoc reviews, relative to the average before the pilot.

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 all praised the pilot panel experience. In discussion with program staff, these experienced panelists also indicated 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 all 86 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."

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. 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**, notably, participation in the virtual panel pilot. The results are summarized in **Appendix 21**.

Among respondents who had reviewed proposals both before and after the beginning of FY 2012, 80% thought that the degree of creativity and risk in proposals had either stayed the same or increased; only 20% thought that it had declined.

Over 10,000 respondents said that they had reviewed both interdisciplinary and monodisciplinary proposals since the beginning of FY 2012. Among these, more than half, 54%, thought that the interdisciplinary proposals they reviewed had a greater potential to advance knowledge, 39% thought that the monodisciplinary proposals had greater potential, and the remaining 8% thought that there was no difference.

55% of approximately 23,400 respondents who were PIs said that they had submitted an interdisciplinary proposal since the beginning of FY 2012. For most of these, the respondent had been the PI on an interdisciplinary collaborative proposal but for one in nine, their interdisciplinary proposals had only been single-investigator projects. 27.5% of the 23,400 had submitted both interdisciplinary and monodisciplinary proposals since the start of FY 2012.

Those who submitted interdisciplinary proposals were equally likely to have done so as an unsolicited proposal as in response to a targeted solicitation that specifically asked for interdisciplinary proposals.

In all research domains, reviewers who had participated in both face-to-face and virtual panels were more satisfied with face-to-face panels than with virtual panels. They felt that the quality of the panel discussions of proposals and the interactions between panelists were better in face-to-face panels. They also thought that face-to-face panels produced panel summaries that were of higher quality. However, of the over 4,200 reviewers that had participated in virtual panels, one-third had, at some point, declined to participate in a face-to-face panel with over half of them saying that this was because of research or teaching commitments.

When asked what NSF could do to improve the experience of serving on virtual panels, the three most common responses were: facilitate more interaction among co-panelists (56%); integrate virtual meeting technology and the FastLane Interactive Panel System so that there is no need to run two applications simultaneously (44%); and, reduce proposal volume (36%).

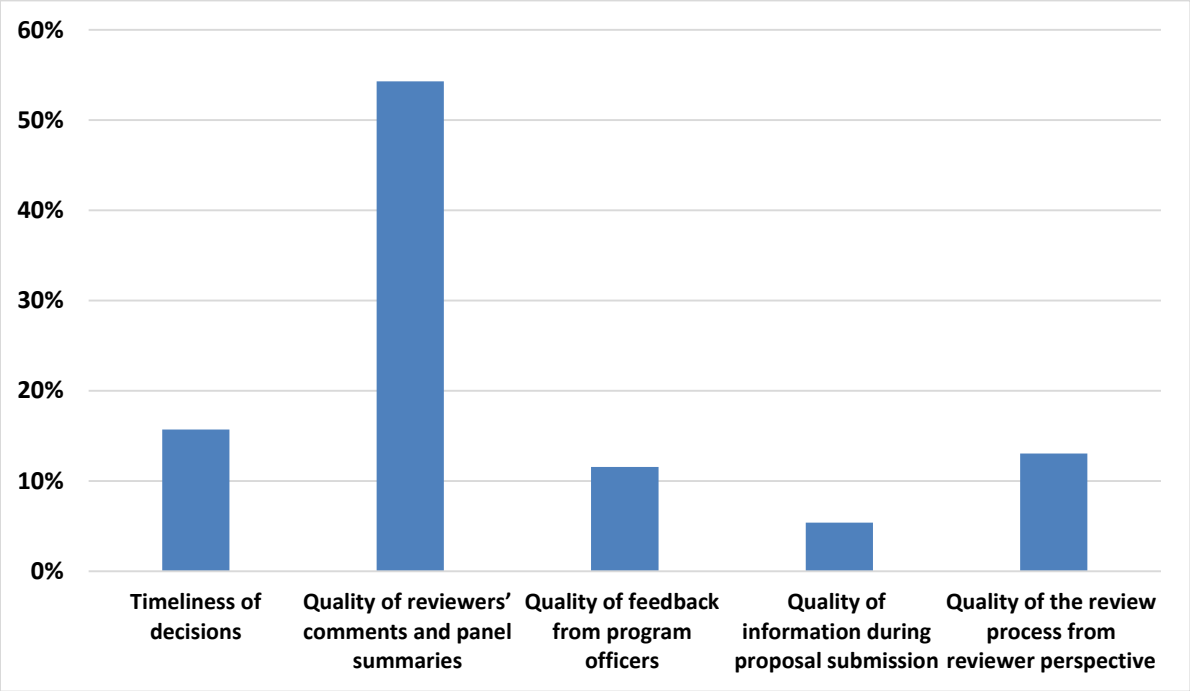
Just over 600 reviewers who had reviewed for DEB or IOS both before and after the introduction of the requirement that preliminary proposals be submitted for core programs compared the two processes. Among these, in two important areas, the quality of the submitted full proposals and the quality of the panel discussions of full proposals, there was a clear preference for the process that required the submission of preliminary proposals.

Three-quarters of PIs thought that researchers were treated fairly in NSF's merit review process.

One prominent area of concern for respondents who were PIs was the quality of the feedback contained in written reviews and panel summaries. Only 55% of the PIs who responded (over 22,000) found the written reviews to be thorough, although 63% found them to be technically sound. Except among PIs whose primary research was associated with EHR and SBE, there is a perception that the quality of the feedback provided in written reviews has declined in recent years. When asked to choose what, from among five possible improvements to the merit review process, would make the most significant impact, more than half of the respondents chose improving the quality of the feedback in written reviews and panel summaries. (See **Figure 30**.)

Figure 30 shows the preferences of almost 31,000 PIs and reviewers who responded to the following question, "In your opinion, improving which **one** of the following factors in [the merit review] process will have the most significant effect in fostering the progress of science?" They were asked to select one from among five factors, summarized on the horizontal axis of the figure. More detailed descriptions of these factors may be found in **Appendix 21**.

Figure 30 – Proportion of Respondents Choosing Which of Five Aspects of the Merit Review Process Would Have the Greatest Benefit if That Aspect Were Improved



PIs were asked the extent to which factors other than a desire to make contributions to science motivated them to submit proposals to any funding source. The most prominent factor was to enable the PI to involve students (graduate, undergraduate or high school) in research.

The majority of PIs are too pessimistic in their estimates of program success rates. Slightly more than half of responding PIs thought that the success rate was 10% or lower in programs to which they were applying. In fact, for 2015, in all directorates the success rate was 18% or more. While a few research programs have success rates below 10%, these attract far fewer than half the proposal submissions.

PIs were asked which they would prefer from a series of scenarios in which average award size and duration were changed, with various effects on proposal success rate. The two most preferred options (out of five scenarios) were, increasing success rate by decreasing the mean award size and duration (preferred by 36%), and, leaving things as they are, (34%). The least favored option was increasing award size and duration at the cost of a reduced success rate; only 8% preferred this.

Using the amount of time that PIs reported devoting to preparing proposals and the number of research proposals acted on in FY 2015 (**Section III.F**) one can obtain an estimate of the amount of person-years of effort expended in one year by researchers preparing and submitting research proposals to NSF. That estimate is between 1,700 and 1,800 person-years.

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.

Type of Review

Approximately 35,462 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 within FY 2015. Of these individuals, approximately 13,810 (39%) served as panelists (of whom about 2,638 also served as *ad hoc* reviewers) and 21,652 (61%) served as *ad hoc* reviewers only. Approximately 7,406 (21%) of these reviewers had never reviewed an NSF proposal before.

Demographics

Reviewers were from all 50 states as well as the District of Columbia, Guam, Puerto Rico and the US Virgin Islands. Approximately 4,000 reviewers were from outside the United States by address of record.[56] 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.

In FY 2015, out of a total of 35,462 distinct reviewers who returned reviews, 13,309 (38%) provided information about some aspect of gender, race, ethnicity and disability status. Of those reporting these data, 5,351 (40%) indicated that they are members of a group under-represented in science and engineering. Specifically, of the reviewers who reported some demographic data, 4,402 (33%) reported being female, 1,370 (10%) reported being from an under-represented race or ethnic minority, and 208 (1.6%) reported a disability. Of the 1,370 reviewers that reported they are from an under-represented race or ethnic group, 817 (60%) reported Hispanic or Latino, 508 (37%) reported Black or African American, 61 (4.5%) reported American Indian or Alaskan Native, and 8 (0.6%) reported Hawaiian or Pacific Islander. (Some individuals indicated that they belonged to more than one under-represented demographic group.) The provision of demographic data is voluntary and the low response rate remains a challenge.

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.

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[56] 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%.

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 2015, NSF requested 68,408 ad hoc reviews, of which there were 45,629 positive responses.[57] This 67% response rate is similar to that for the prior two years. The response rate varies by program.

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. As explained in the previous section, 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.

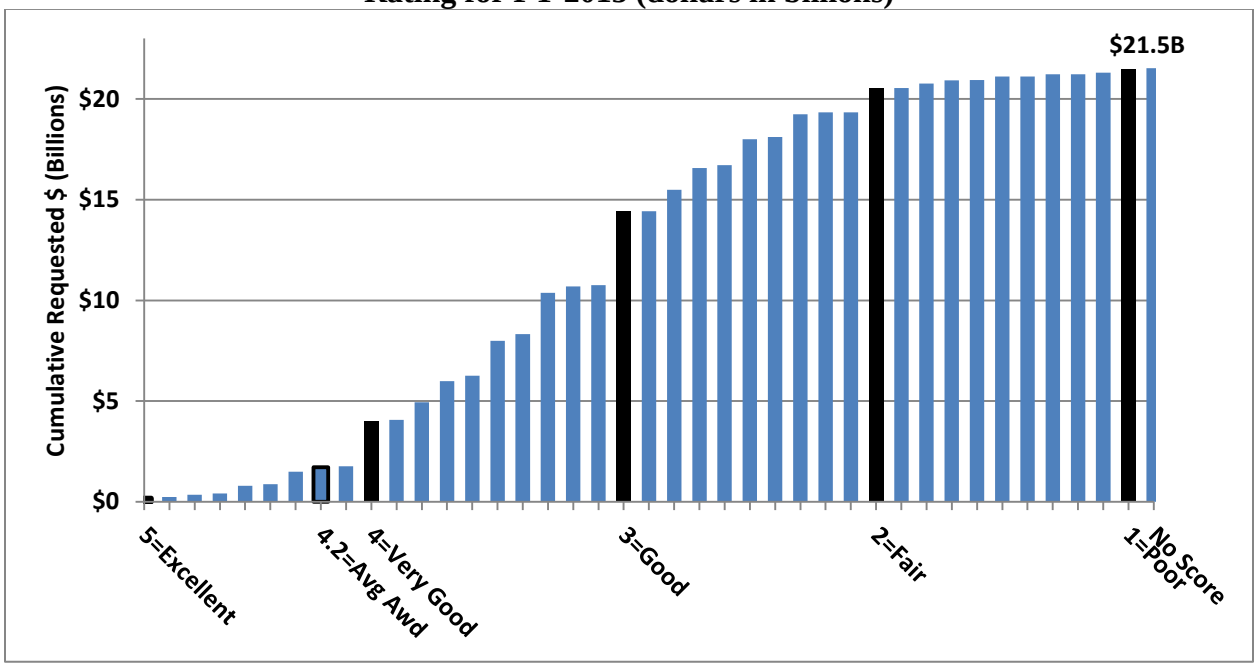
The expertise of the NSF program officer making the final recommendation is an important voice in the process. Reviewers' numeric ratings of proposals, while a useful indicator, are not, by themselves, a robust metric of the relative merits of proposals. Program officers look not only at the ratings 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

[57] 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.

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 31**, approximately $1.71 billion was requested for declined proposals that had received ratings at least as high as the average rating (4.2 out of 5.0) for all awarded proposals. Approximately $3.99 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 31 - Cumulative Requested Amounts for Declined Proposals by Average Reviewer Rating for FY 2015 (dollars in billions)



Source: NSF Enterprise Information System, 10/01/15

J. Program Officer Characteristics and Workload

Table 25 shows information about NSF's program officers. The number of program officers remained unchanged from FY 2014 at 496. Program officers can be permanent NSF employees or non-permanent employees. As shown in **Table 25**, 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 2015, the number of permanent program officers decreased by 10 relative to FY 2014 and the number of IPAs decreased by 6. The largest relative changes were in the proportion of VSEEs, which rose from 4% to 6% of the total, and in the

proportion of "Temporary Federal Employees," which rose from 11% to 12%. Whether they are recruited as non-permanent or permanent staff members, incoming NSF program officers receive training in the merit review process.

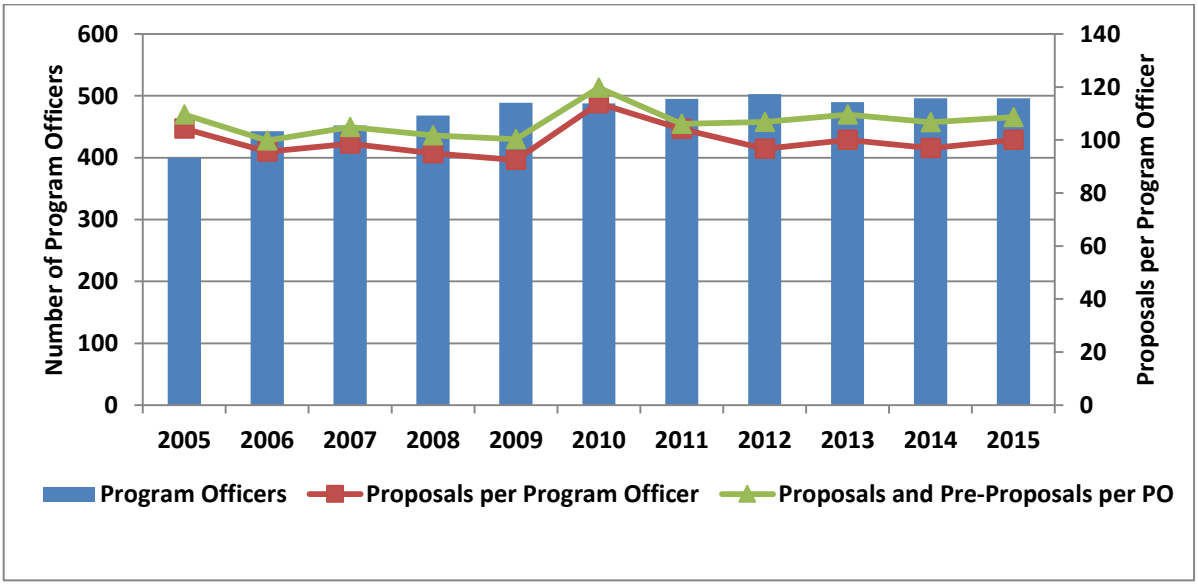
Table 25 - Distribution of NSF Program Officers by Characteristics

Program Officers	Total	Percent
Total	**496**	**100%**
Gender		
Male	287	58%
Female	209	42%
Race and Ethnicity		
Racial or Ethnic Minority	117	24%
Non-Minority	379	76%
Employment		
Permanent	256	52%
Visiting Scientists, Engineers & Educators (VSEE)	31	6%
Temporary	59	12%
Intergovernmental Personnel Act (IPA)	150	30%

Source: NSF Division of Human Resource Management, 02/01/16. Data are for the end of FY 2015.

In comparison to FY 2014, the number of male program officers decreased by 1.7% and the number of female program officers again increased by 2.5%. The number of program officers who are from racial or ethnic minorities decreased by 4.9%, while the number of non-minority program officers increased by 1.6%. At the end of FY 2015, approximately 42% of program officers were female and approximately 24% were from a racial or ethnic minority.

Figure 32 - Proposals per Program Officer



Source: NSF Division of Human Resource Management, 2/01/16.

The annual fluctuations in the ratio of proposals to program officers are shown in **Figure 32.** There was an increase from FY 2014 in the number of full proposals that were submitted. This resulted in a 3.3% increase in proposals processed per program officer. If preliminary proposals are included in the workload, then the workload per program officer increased by 1.8% from FY 2014 to FY 2015.

Not all individuals listed as program officers in **Table 25** process proposals, so the average proposal workload shown in **Figure 32** 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. Effective August 1, 2013 (OD 13-15 Merit Review Training Requirements for New Program Officers) 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. 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										
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
NSF[58]	Proposals	41,722	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,620
	Awards	9,757	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,007
	Omnibus					*9,975*	*12,547*					
	ARRA					*4,620*	*449*					
	Success Rate	23%	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%
BIO	Proposals	6,475	6,617	6,728	6,598	6,578	8,059	7,439	5,269	5,934	4,784	5,119
	Awards	1,355	1,202	1,303	1,291	1,823	1,556	1,310	1,293	1,250	1,272	1,379
	Omnibus					*1,261*	*1,476*					
	ARRA					*562*	*80*					
	Success Rate	21%	18%	19%	20%	28%	19%	18%	25%	21%	27%	27%
CISE	Proposals	5,354	4,973	6,048	6,067	6,001	7,317	6,702	7,703	7,821	7,434	8,032
	Awards	1,163	1,322	1,699	1,449	1,926	1,755	1,527	1,749	1,616	1,680	1,886
	Omnibus					*1,452*	*1,723*					
	ARRA					*474*	*32*					
	Success Rate	22%	27%	28%	24%	32%	24%	23%	23%	21%	23%	23%
EHR	Proposals	3,699	3,254	4,248	3,887	3,699	5,055	4,660	4,281	4,501	4,049	4,242
	Awards	736	824	903	1,111	1,009	930	807	889	793	701	830
	Omnibus					*919*	*908*					
	ARRA					*90*	*22*					
	Success Rate	20%	25%	21%	29%	27%	18%	17%	21%	18%	17%	20%
ENG	Proposals	8,692	9,423	9,574	9,643	10,611	13,226	12,314	11,338	10,738	11,878	12,326
	Awards	1,493	1,730	1,955	1,966	2,688	2,375	2,064	2,065	2,212	2,145	2,504
	Omnibus					*1,771*	*2,321*					
	ARRA					*917*	*54*					
	Success Rate	17%	18%	20%	20%	25%	18%	17%	18%	21%	18%	20%
GEO	Proposals	5,492	5,378	5,567	5,101	4,991	5,614	5,187	5,243	6,087	5,790	5,812
	Awards	1,596	1,656	1,711	1,563	2,226	1,970	1,705	1,637	1,565	1,487	1,463
	Omnibus					*1,152*	*1,917*					
	ARRA					*1,074*	*53*					
	Success Rate	29%	31%	31%	31%	45%	35%	31%	31%	26%	26%	25%

[58] Several organizational changes occurred over the decade. Data from prior years have been realigned with the organizational structure in effect for FY 2015 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										
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
MPS	Proposals	7,083	7,466	7,315	7,837	7,883	9,411	8,796	9,006	8,903	8,855	9,133
	Awards	2,071	2,221	2,360	2,269	3,122	2,669	2,352	2,523	2,201	2,343	2,593
	Omnibus					*2,004*	*2,529*					
	ARRA					*1,118*	*140*					
	Success Rate	29%	30%	32%	29%	40%	28%	27%	28%	25%	26%	28%
OIA	Proposals	14	8	24	21	109	200	138	44	98	78	91
	Awards	6	7	23	17	36	89	25	14	27	29	36
	Omnibus					*21*	*29*					
	ARRA					*15*	*60*					
	Success Rate	43%	88%	96%	81%	33%	45%	18%	32%	28%	37%	40%
OISE	Proposals	822	712	776	910	781	1,042	1,214	951	484	677	582
	Awards	333	319	353	357	428	395	404	333	245	307	275
	Omnibus					*339*	*395*					
	ARRA					*89*	*0*					
	Success Rate	41%	45%	45%	39%	55%	38%	33%	35%	51%	45%	47%
SBE	Proposals	4,089	4,520	4,284	4,364	4,525	5,618	5,112	4,776	4,433	4,506	4,283
	Awards	1,004	1,144	1,143	1,126	1,337	1,257	998	1,019	920	994	1,041
	Omnibus					*1,056*	*1,249*					
	ARRA					*281*	*8*					
	Success Rate	25%	25%	27%	26%	30%	22%	20%	21%	21%	22%	24%
Other [59]	Proposals	2	1	13		3			2			
	Awards	0	0	13		0			2			
	Omnibus											
	ARRA											
	Success Rate	0%	0%	100%		0%			100%			

Source: NSF Enterprise Information System, 10/01/15.

[59] 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 2015 statistics: 5,315 Continuing Grant Increments, 3,232 Supplements, and 553 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	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Total # Preliminary Proposals	2,120	1,874	2,842	3,203	3,856	2,883	965	5,135	4,691	4,911	4,251
Non-Binding (NB) Total*	1,302	1,279	1,540	669	1,140	1,384	357	459	457	92	1
NB Encouraged	512	509	662	333	519	636	128	222	296	29	0
NB Discouraged	790	770	878	336	621	748	229	237	161	63	1
Binding Total*	816	594	1,301	2,534	2,500	1,273	572	4,484	4,087	4,761	4,199
Binding Invite	246	136	252	572	685	372	245	1,236	942	1,083	1,045
Binding Non-invite	570	458	1,049	1,962	1,815	901	327	3,248	3,145	3,678	3,154

Source: NSF Report Server, 01/25/16.

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 Demographics*

Table 3.1 - FY2015 Competitive Proposals, Awards and Success Rates, by PI Gender

		Total	Female	Male	Unknown
NSF	Proposals	49,620	11,444	32,411	5,765
	% of Total		23%	65%	12%
	Awards	12,007	3,007	7,810	1,190
	Success Rate	24%	26%	24%	21%
BIO	Proposals	5,119	1,519	3,166	434
	% of Total		30%	62%	8%
	Awards	1,379	448	840	91
	Success Rate	27%	29%	27%	21%
CSE	Proposals	8,032	1,459	5,629	944
	% of Total		18%	70%	12%
	Awards	1,886	399	1,260	227
	Success Rate	23%	27%	22%	24%
EHR	Proposals	4,242	1,645	1,961	636
	% of Total		39%	46%	15%
	Awards	830	359	362	109
	Success Rate	20%	22%	18%	17%
ENG	Proposals	12,326	2,079	8,662	1,585
	% of Total		17%	70%	13%
	Awards	2,504	451	1,786	267
	Success Rate	20%	22%	21%	17%
GEO	Proposals	5,812	1,499	3,885	428
	% of Total		26%	67%	7%
	Awards	1,463	386	983	94
	Success Rate	25%	26%	25%	22%
MPS	Proposals	9,133	1,557	6,615	961
	% of Total		17%	72%	11%
	Awards	2,593	466	1,908	219
	Success Rate	28%	30%	29%	23%
SBE	Proposals	4,283	1,485	2,116	682
	% of Total		35%	49%	16%
	Awards	1,041	392	517	132
	Success Rate	24%	26%	24%	19%
OIA	Proposals	91	17	70	4
	% of Total		19%	77%	4%
	Awards	36	8	26	2
	Success Rate	40%	47%	37%	50%
OISE	Proposals	582	184	307	91
	% of Total		32%	53%	16%
	Awards	275	98	128	49
	Success Rate	47%	53%	42%	54%

Source: NSF Enterprise Information System, 10/1/15.

*Demographic data are voluntarily self-reported by the PI. In FY2015, approximately 88% of proposals were from PIs who provided gender information and approximately 90% from PIs who provided some information on ethnicity or race. "Total" is the count of unique proposals. Columns are counts of proposals from PIs in the corresponding category.

Table 3.2 – FY 2015 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	49620	2053	104	11148	1102	495	30	30099	6642
	% of Total	100%	4%	0%	22%	2%	1%	0%	61%	13%
	Awards	12007	495	25	2256	233	151	2	7902	1438
	Success Rate	24%	24%	24%	20%	21%	31%	7%	26%	22%
BIO	Proposals	5119	267	15	613	61	70	5	3837	518
	% of Total	100%	5%	0%	12%	1%	1%	0%	75%	10%
	Awards	1379	76	4	118	21	21	†	1097	117
	Success Rate	27%	28%	27%	19%	34%	30%	†	29%	23%
CSE	Proposals	8032	240	6	2803	110	66	3	3880	1164
	% of Total	100%	3%	0%	35%	1%	1%	0%	48%	14%
	Awards	1886	63	†	598	20	18	†	955	293
	Success Rate	23%	26%	†	21%	18%	27%	†	25%	25%
EHR	Proposals	4242	214	8	552	298	48	3	2617	716
	% of Total	100%	5%	0%	13%	7%	1%	0%	62%	17%
	Awards	830	34	†	96	68	16	†	527	122
	Success Rate	20%	16%	†	17%	23%	33%	†	20%	17%
ENG	Proposals	12326	503	24	4036	303	93	5	6105	1760
	% of Total	100%	4%	0%	33%	2%	1%	0%	50%	14%
	Awards	2504	93	5	705	52	23	†	1409	310
	Success Rate	20%	18%	21%	17%	17%	25%	†	23%	18%
GEO	Proposals	5812	218	13	625	51	60	6	4525	532
	% of Total	100%	4%	0%	11%	1%	1%	0%	78%	9%
	Awards	1463	48	4	141	14	19	†	1162	123
	Success Rate	25%	22%	31%	23%	27%	32%	†	26%	23%
MPS	Proposals	9133	372	13	2015	156	80	2	5820	1047
	% of Total	100%	4%	0%	22%	2%	1%	0%	64%	11%
	Awards	2593	111	4	478	32	26	†	1790	263
	Success Rate	28%	30%	31%	24%	21%	33%	†	31%	25%
SBE	Proposals	4283	190	21	386	103	59	4	2919	791
	% of Total	100%	4%	0%	9%	2%	1%	0%	68%	18%
	Awards	1041	39	3	77	21	16	†	772	152
	Success Rate	24%	21%	14%	20%	20%	27%	†	26%	19%
OIA	Proposals	91	6	1	20	0	1	0	58	11
	% of Total	100%	7%	1%	22%	0%	1%	0%	64%	12%
	Awards	36	†	†	6	0	†	0	24	5
	Success Rate	40%	†	†	30%	N/A	†	N/A	41%	45%
OISE	Proposals	582	43	3	98	20	18	2	338	103
	% of Total	100%	7%	1%	17%	3%	3%	0%	58%	18%
	Awards	275	29	†	37	5	12	†	166	53
	Success Rate	47%	67%	†	38%	25%	67%	†	49%	51%

Source: NSF Enterprise Information System, 10/1/15. Hispanic individuals are also included in one of the racial categories. † Indicates that data are omitted to reduce the likelihood of identifying individual investigators.

Table 3.3 - FY2015 Research Proposals, Awards and Success Rates, by PI Gender

		Total	Female	Male	Unknown
NSF	Proposals	40,869	9,326	27,347	4,196
	% of Total		23%	67%	10%
	Awards	8,993	2,127	6,065	801
	Success Rate	22%	23%	22%	19%
BIO	Proposals	4,300	1,263	2,664	373
	% of Total		29%	62%	9%
	Awards	1,030	328	632	70
	Success Rate	24%	26%	24%	19%
CSE	Proposals	7,621	1,361	5,360	900
	% of Total		18%	70%	12%
	Awards	1,589	314	1,079	196
	Success Rate	21%	23%	20%	22%
EHR	Proposals	2,872	1,231	1,268	373
	% of Total		43%	44%	13%
	Awards	514	236	223	55
	Success Rate	18%	19%	18%	15%
ENG	Proposals	9,332	1,643	6,871	818
	% of Total		18%	74%	9%
	Awards	1,851	339	1,369	143
	Success Rate	20%	21%	20%	17%
GEO	Proposals	5,299	1,351	3,576	372
	% of Total		25%	67%	7%
	Awards	1,239	309	856	74
	Success Rate	23%	23%	24%	20%
MPS	Proposals	8,061	1,342	5,857	862
	% of Total		17%	73%	11%
	Awards	2,050	351	1,517	182
	Success Rate	25%	26%	26%	21%
SBE	Proposals	2,990	1,025	1,512	453
	% of Total		34%	51%	15%
	Awards	639	229	332	78
	Success Rate	21%	22%	22%	17%
OIA	Proposals	26	8	17	1
	% of Total		31%	65%	4%
	Awards	20	5	14	1
	Success Rate	77%	63%	82%	100%
OISE	Proposals	368	102	222	44
	% of Total		28%	60%	12%
	Awards	61	16	43	2
	Success Rate	17%	16%	19%	5%

Source: NSF Enterprise Information System, 10/1/15.

Table 3.4 – FY 2015 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	40869	1672	82	9848	763	388	23	24790	4975
	% of Total	100%	4%	0%	24%	2%	1%	0%	61%	12%
	Awards	8993	364	15	1859	126	97	1	5902	993
	Success Rate	22%	22%	18%	19%	17%	25%	4%	24%	20%
BIO	Proposals	4300	218	13	554	51	59	5	3177	441
	% of Total	100%	5%	0%	13%	1%	1%	0%	74%	10%
	Awards	1030	52	2	99	15	13	†	813	87
	Success Rate	24%	24%	15%	18%	29%	22%	†	26%	20%
CSE	Proposals	7621	227	5	2696	103	61	3	3647	1106
	% of Total	100%	3%	0%	35%	1%	1%	0%	48%	15%
	Awards	1589	51	†	527	16	15	†	780	250
	Success Rate	21%	22%	†	20%	16%	25%	†	21%	23%
EHR	Proposals	2872	137	6	311	136	33	1	1954	431
	% of Total	100%	5%	0%	11%	5%	1%	0%	68%	15%
	Awards	514	24	†	48	17	10	†	375	64
	Success Rate	18%	18%	†	15%	13%	30%	†	19%	15%
ENG	Proposals	9332	399	17	3433	214	65	2	4597	1004
	% of Total	100%	4%	0%	37%	2%	1%	0%	49%	11%
	Awards	1851	73	5	590	36	15	†	1021	184
	Success Rate	20%	18%	29%	17%	17%	23%	†	22%	18%
GEO	Proposals	5299	201	12	590	42	54	6	4131	464
	% of Total	100%	4%	0%	11%	1%	1%	0%	78%	9%
	Awards	1239	40	3	123	12	15	†	991	95
	Success Rate	23%	20%	25%	21%	29%	28%	†	24%	20%
MPS	Proposals	8061	327	9	1862	125	64	1	5054	946
	% of Total	100%	4%	0%	23%	2%	1%	0%	63%	12%
	Awards	2050	86	†	402	22	17	†	1387	221
	Success Rate	25%	26%	†	22%	18%	27%	†	27%	23%
SBE	Proposals	2990	140	18	326	77	45	4	1997	523
	% of Total	100%	5%	1%	11%	3%	2%	0%	67%	17%
	Awards	639	29	3	56	8	11	†	478	83
	Success Rate	21%	21%	17%	17%	10%	24%	†	24%	16%
OIA	Proposals	26	2	0	5	0	0	0	16	5
	% of Total	100%	8%	0%	19%	0%	0%	0%	62%	19%
	Awards	20	†	0	†	0	0	0	12	†
	Success Rate	77%	†	N/A	†	N/A	N/A	N/A	75%	†
OISE	Proposals	368	21	2	71	15	7	1	217	55
	% of Total	100%	6%	1%	19%	4%	2%	0%	59%	15%
	Awards	61	7	†	10	0	†	†	45	†
	Success Rate	17%	33%	†	14%	0%	†	†	21%	†

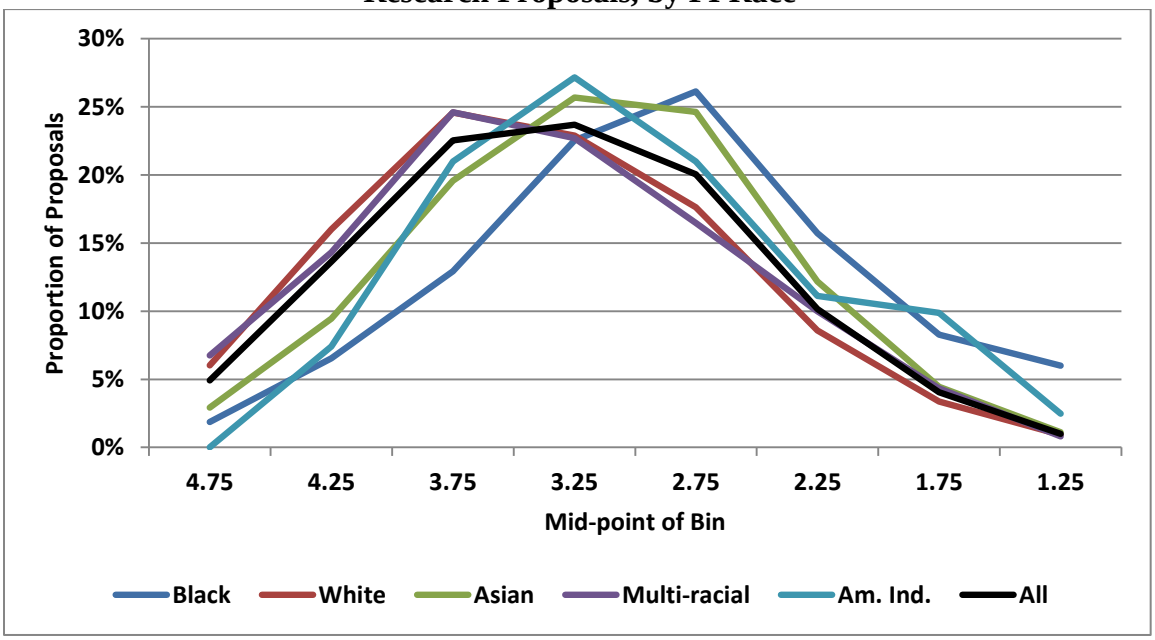
Source: NSF Enterprise Information System, 10/1/15. Hispanic individuals are also included in one of the racial categories. † Indicates that data are omitted to reduce the likelihood of identifying individual investigators.

The following figures show the way in which research proposals are distributed by review score 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 score associated with them.

Figure 3.1 and **Figure 3.2** show the distributions of scores and the success rate as a function of score 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 3.1** also shows the distribution for all of the externally reviewed research proposals. The curves associated with the five racial groups plotted represent 88% of that total. Except for 0.05% from Native Hawaiians/Pacific Islanders, the remaining 12% are from PIs of unknown race.

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 3.1** shows the proportion of the externally reviewed proposals from PIs of a particular racial group that had average review scores in each bin except for the black curve, which shows the distribution for all externally reviewed research proposals. The distributions of scores for White and Multi-racial PIs are very similar. The distributions of scores for proposals from Asian and American Indian/Native Alaskan PIs are also somewhat similar to each other.

Figure 3.1 – FY 2015 Distribution of Average Review Scores for Externally Reviewed Research Proposals, by PI Race



Source: NSF Enterprise Information System, 10/1/15.

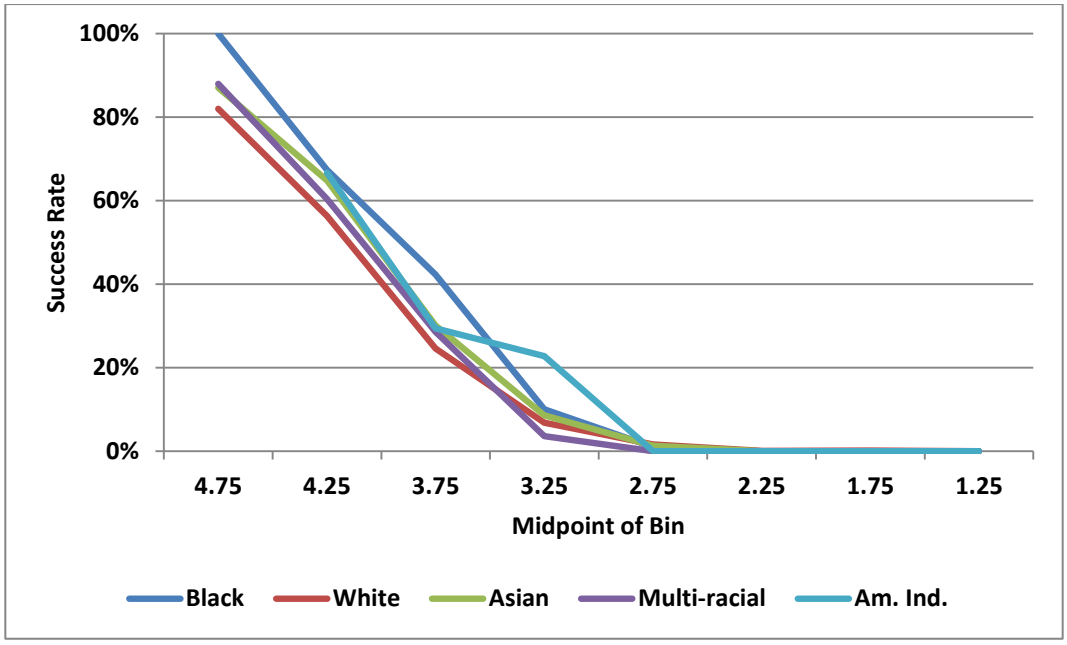
The distributions of scores for White and Multi-racial PIs have similar means and medians. The distributions of scores for Asian, American Indian/Native Alaskan and Black/African-American PIs are displaced roughly a quarter, a third and one half of a rating towards lower ratings from that of White PIs. **Table 3.5** shows the means and medians of the distributions.

Table 3.5 – Mean and Median of Distributions of Mean Review Scores, by Race

RACE	MEAN	MEDIAN
American Indian or Alaskan Native	3.11	3.33
Asian	3.23	3.25
Black or African American	2.98	3.00
Multi-racial	3.43	3.50
Native Hawaiian or Pacific Islander	3.10	3.00
White	3.46	3.50

Figure 3.2 shows the success rate within each mean review rating bin for various racial groups.

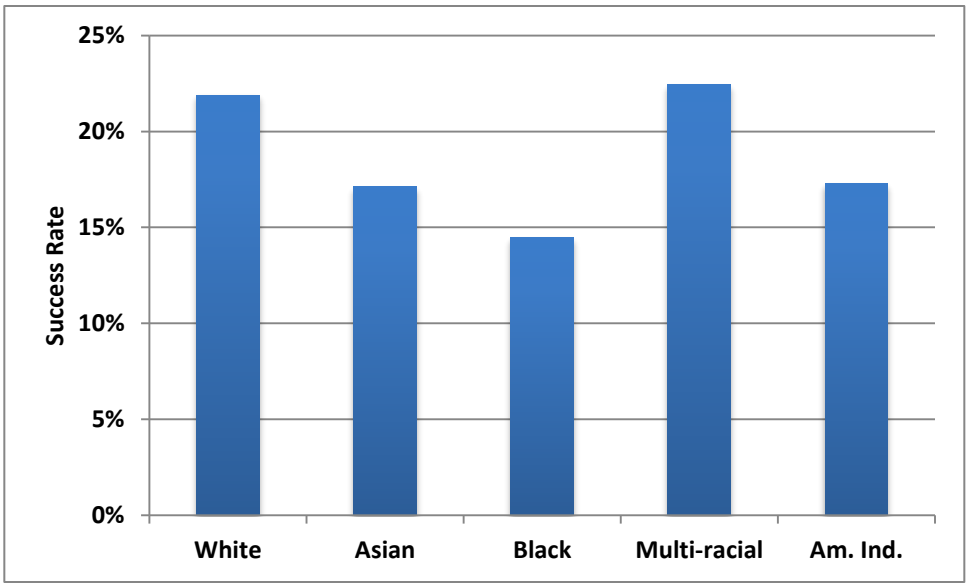
Figure 3.2 – FY 2015 Success Rates for Externally Reviewed Research Proposals, by Average Review Score and PI Race



Source: NSF Enterprise Information System, 10/1/15.

Figure 3.3 shows the success rate of the same groups independent of the review scores.

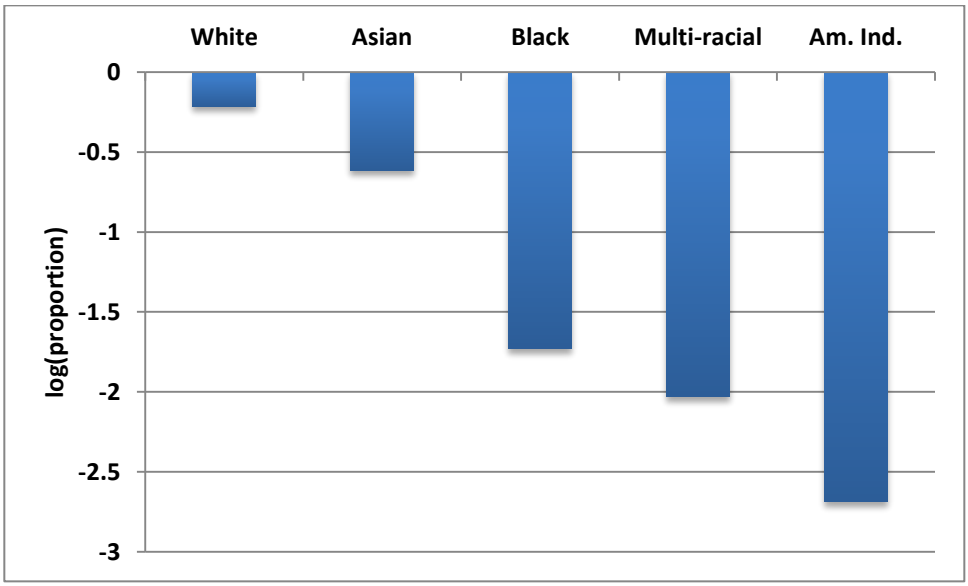
Figure 3.3 – FY 2015 Success Rates for Externally Reviewed Research Proposals, by PI Race



Source: NSF Enterprise Information System, 10/1/15.

As may be seen in **Table 3.4** above, the number of proposals from each racial group varies considerably. **Figure 3.4** 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 0.61 (61%) while that from American Indian/Alaskan Native PIs is 0.002 (0.2%). Not shown is the proportion from Native Hawaiian/Pacific Islander PIs, 0.0005, or from PIs whose race is not known, 0.12.

Figure 3.4 – Proportion of Externally Reviewed Research Proposals, from PIs of different races in FY 2015 (Logarithmic Scale)



Source: NSF Enterprise Information System, 10/1/15.

Appendix 4 – Proposal Success Rates of New PIs and Prior PIs, by Directorate or Office

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
New PIs	BIO	15%	14%	14%	15%	23%	14%	12%	18%	16%	20%	21%
Former	CISE	15%	19%	22%	18%	25%	18%	18%	16%	15%	17%	18%
Definition	EHR	16%	21%	17%	23%	21%	14%	13%	16%	13%	14%	16%
	ENG	13%	15%	17%	16%	21%	14%	13%	13%	17%	14%	15%
	GEO	24%	23%	23%	23%	33%	26%	24%	21%	20%	20%	19%
	MPS	20%	19%	20%	19%	29%	17%	17%	17%	15%	18%	18%
	OIA	86%	100%	100%	80%	50%	53%	8%	33%	13%	21%	9%
	OISE	39%	42%	43%	36%	55%	37%	30%	34%	59%	49%	56%
	SBE	18%	18%	20%	20%	21%	16%	14%	16%	15%	17%	19%
New PIs	BIO	15%	14%	14%	15%	23%	14%	12%	18%	16%	20%	20%
Revised	CISE	16%	18%	21%	18%	26%	19%	18%	17%	16%	18%	18%
*Definition**	EHR	15%	20%	16%	22%	20%	13%	12%	16%	12%	13%	15%
	ENG	14%	15%	17%	16%	21%	13%	13%	14%	18%	15%	14%
	GEO	22%	23%	22%	22%	32%	26%	25%	20%	21%	20%	19%
	MPS	20%	19%	20%	19%	29%	18%	17%	18%	16%	18%	18%
	OIA		100%	N/A	100%	13%	51%	2%	30%	6%	22%	6%
	OISE	39%	42%	44%	35%	55%	37%	30%	35%	60%	50%	58%
	SBE	18%	18%	21%	20%	22%	17%	14%	16%	16%	18%	20%
Prior PIs	BIO	25%	21%	24%	23%	32%	23%	21%	29%	25%	31%	31%
Former	CISE	26%	32%	32%	27%	35%	27%	25%	26%	23%	25%	26%
Definition	EHR	24%	29%	25%	35%	34%	23%	22%	26%	22%	21%	24%
	ENG	20%	21%	23%	24%	29%	22%	20%	22%	23%	21%	25%
	GEO	31%	34%	34%	34%	49%	39%	37%	36%	28%	28%	28%
	MPS	35%	37%	40%	35%	47%	36%	33%	35%	32%	32%	35%
	OIA	58%	71%	95%	81%	28%	42%	24%	27%	33%	47%	27%
	OISE	44%	51%	52%	54%	55%	42%	43%	38%	29%	34%	34%
	SBE	32%	32%	35%	32%	39%	30%	26%	27%	27%	27%	30%
Prior PIs	BIO	25%	21%	23%	23%	31%	23%	21%	28%	24%	30%	31%
Revised	CISE	25%	31%	31%	26%	34%	26%	24%	25%	22%	24%	26%
*Definition**	EHR	24%	28%	24%	34%	33%	22%	21%	24%	21%	20%	22%
	ENG	19%	21%	23%	23%	28%	21%	19%	21%	23%	20%	24%
	GEO	31%	33%	33%	33%	49%	38%	35%	35%	27%	28%	27%
	MPS	34%	36%	39%	34%	46%	35%	32%	33%	29%	31%	34%
	OIA		75%	80%	100%	13%	34%	15%	28%	33%	42%	47%
	OISE	43%	50%	51%	55%	55%	40%	42%	36%	31%	34%	25%
	SBE	32%	32%	33%	32%	38%	29%	25%	28%	27%	27%	30%

Source: NSF Enterprise Information System 10/01/15.

* In FY 2009, in conjunction with NSF's implementation of the American Recovery and Reinvestment Act, NSF revised its definition of a new PI to, "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.)" Previously, a new PI was considered to be any individual who had not previously been a PI on any NSF award.

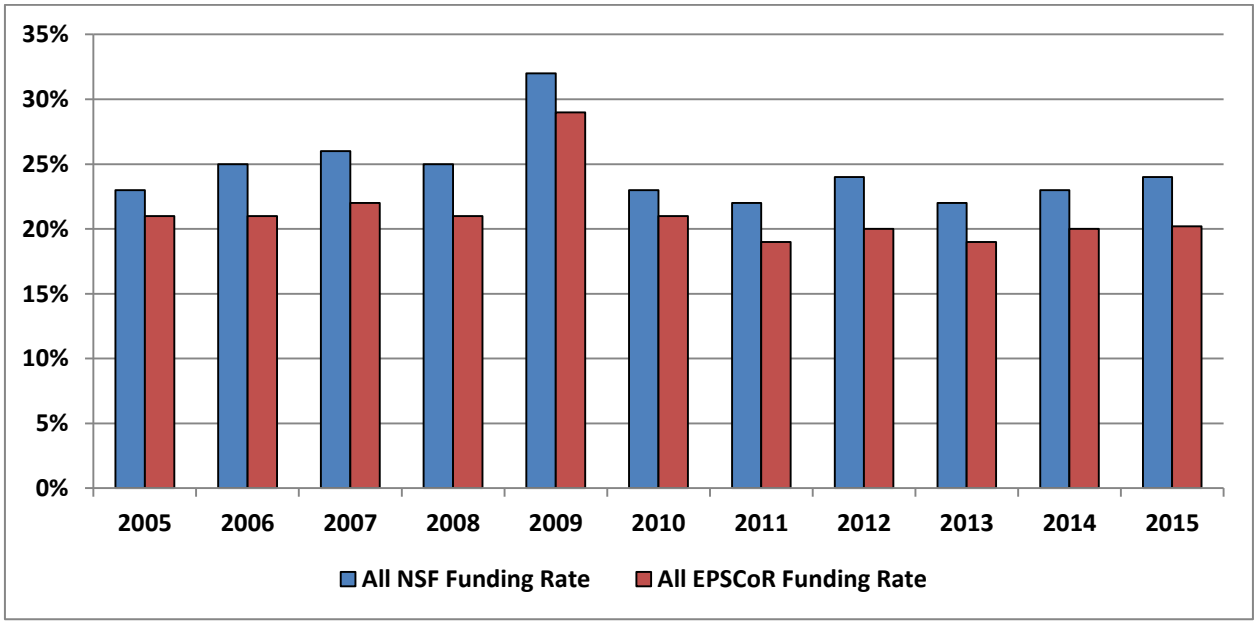
Appendix 5 - EPSCoR: Jurisdictions, Proposal, Award, and Funding Data

Twenty-eight 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 2015. The states are: Alabama, Alaska, Arkansas, Delaware, Hawaii, Idaho, Iowa, Kansas, Kentucky, Louisiana, Maine, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, West Virginia, and Wyoming. For four of the 28 states, Iowa, Missouri, Tennessee, and Utah, the prior 3-year rolling average of NSF research funds received was over 0.75% of NSF's Research and Related Activities budget and these jurisdictions were not eligible to participate in new Research Infrastructure Improvement initiatives in FY 2015.

In FY 2015, the NSF EPSCoR program invested $26.6 million in co-funding 146 NSF awards. This investment was leveraged with $47.2 million from NSF Directorates and other Offices for a total investment of $73.8 million. Since 1998, when the co-funding initiative was formally established, approximately 4,100 co-funded awards have been made. The latter represent a total NSF investment of about $1.6 billion of which $596 million was co-funding provided by the EPSCoR program.

Figure 5.1 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 5.1 - Overall Proposal Success Rates for EPSCoR Jurisdictions and Overall NSF Proposal Success Rates



Source: EPSCoR Office 1/29/16.

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

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
All NSF	Awards	9,757	10,425	11,463	11,149	14,595	12,996	11,192	11,524	10,829	10,958	12,016
	Proposals	41,722	42,352	44,577	44,428	45,181	55,542	51,562	48,613	48,999	48,051	49,633
	Funding Rate	23%	25%	26%	25%	32%	23%	22%	24%	22%	23%	24%
All EPSCoR Juris-dictions	Awards	1,433	1,489	1,653	1,564	2,474	2,181	1,846	1,960	1,897	1,892	1,980
	Proposals	6,802	7,037	7,392	7,349	8,476	10,513	9,640	9,680	9,766	9,477	9,679
	Funding Rate	21%	21%	22%	21%	29%	21%	19%	20%	19%	20%	20%
Alabama -1985	Awards	78	84	86	85	148	119	98	110	94	102	85
	Proposals	483	530	508	489	606	708	614	669	647	665	583
	Funding Rate	16%	16%	17%	17%	24%	17%	16%	16%	15%	15%	15%
Alaska -2000	Awards	52	63	75	52	77	65	71	65	60	50	49
	Proposals	203	209	246	204	186	235	213	199	221	205	246
	Funding Rate	26%	30%	30%	25%	41%	28%	33%	33%	27%	24%	20%
Arkansas -1980	Awards	29	47	58	36	41	60	40	33	46	33	30
	Proposals	191	209	244	197	194	276	246	229	260	207	184
	Funding Rate	15%	22%	24%	18%	21%	22%	16%	14%	18%	16%	16%
Delaware -2003	Awards	54	50	67	68	77	80	70	79	70	67	64
	Proposals	254	247	283	283	244	295	292	278	287	283	273
	Funding Rate	21%	20%	24%	24%	32%	27%	24%	28%	24%	24%	23%
Guam -2012	Awards	N/A	1	0	2	0	2	2	2	1	0	2
	Proposals	N/A	1	2	5	3	7	5	8	7	4	6
	Funding Rate	N/A	100%	0%	40%	0%	29%	40%	25%	14%	0%	33%
Hawaii -2001	Awards	89	77	74	73	109	99	80	60	54	68	62
	Proposals	265	240	276	276	277	379	285	281	282	294	267
	Funding Rate	34%	32%	27%	26%	39%	26%	28%	21%	19%	23%	23%
Idaho -1987	Awards	31	29	34	44	44	35	37	47	41	35	37
	Proposals	140	148	161	201	168	199	202	185	214	230	234
	Funding Rate	22%	20%	21%	22%	26%	18%	18%	25%	19%	15%	16%
Iowa -2009	Awards	106	109	99	132	142	136	114	116	113	116	122
	Proposals	501	524	491	524	564	661	613	558	566	524	579
	Funding Rate	21%	21%	20%	25%	25%	21%	19%	21%	20%	22%	21%
Kansas -1992	Awards	88	76	78	82	88	92	88	91	65	67	94
	Proposals	367	393	404	387	399	464	423	402	393	389	407
	Funding Rate	24%	19%	19%	21%	22%	20%	21%	23%	17%	17%	23%

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Kentucky -1985	Awards	62	52	60	62	78	81	64	63	58	68	69
	Proposals	307	293	330	300	356	429	437	434	391	401	399
	Funding Rate	20%	18%	18%	21%	22%	17%	15%	15%	15%	17%	17%
Louisiana -1987	Awards	100	117	96	98	132	149	102	88	91	74	99
	Proposals	514	548	495	471	583	715	621	484	463	402	460
	Funding Rate	19%	21%	19%	21%	27%	21%	16%	18%	20%	18%	22%
Maine -1980	Awards	50	36	58	65	60	58	42	46	52	48	50
	Proposals	192	181	200	199	172	190	209	182	211	201	189
	Funding Rate	26%	20%	29%	33%	35%	31%	20%	25%	25%	24%	26%
Mississippi -1987	Awards	32	48	40	34	76	72	42	43	28	32	40
	Proposals	226	293	251	271	301	358	287	264	262	260	240
	Funding Rate	14%	16%	16%	13%	25%	20%	15%	16%	11%	12%	17%
Missouri -2012	Awards	137	150	146	160	180	144	135	136	139	114	137
	Proposals	702	693	742	699	713	795	727	715	716	636	685
	Funding Rate	20%	22%	20%	23%	25%	18%	19%	19%	19%	18%	20%
Montana -1980	Awards	43	52	61	57	78	51	35	50	50	45	51
	Proposals	193	242	238	232	207	251	222	204	214	183	210
	Funding Rate	22%	21%	26%	25%	38%	20%	16%	25%	23%	25%	24%
Nebraska -1992	Awards	41	59	51	54	64	56	60	40	59	51	59
	Proposals	226	238	250	255	248	324	309	258	305	281	307
	Funding Rate	18%	25%	50%	21%	26%	17%	19%	16%	19%	18%	19%
Nevada -1985	Awards	40	42	50	43	61	39	37	29	33	58	40
	Proposals	203	200	231	261	232	295	263	236	217	245	230
	Funding Rate	20%	21%	22%	16%	26%	13%	14%	12%	15%	24%	17%
New Hampshire -2004	Awards	64	53	60	58	108	76	61	75	64	64	65
	Proposals	280	243	240	230	251	311	282	280	273	295	253
	Funding Rate	23%	22%	25%	25%	43%	24%	22%	27%	23%	22%	26%
New Mexico -2001	Awards	80	91	104	102	115	105	91	69	81	76	88
	Proposals	352	348	401	444	389	506	416	399	404	398	474
	Funding Rate	23%	26%	26%	23%	30%	21%	22%	17%	20%	19%	19%
North Dakota -1985	Awards	19	22	15	19	31	35	23	18	21	26	20
	Proposals	154	170	139	158	141	171	161	161	172	174	171
	Funding Rate	12%	13%	11%	12%	22%	20%	14%	11%	12%	15%	12%
Oklahoma -1985	Awards	55	74	66	67	112	74	79	68	59	69	68
	Proposals	327	342	338	378	420	457	460	384	394	339	388
	Funding Rate	17%	22%	20%	18%	27%	16%	17%	18%	15%	20%	18%
Puerto Rico -1985	Awards	16	19	32	24	37	34	19	9	8	16	15
	Proposals	119	140	153	148	183	203	163	153	105	86	102
	Funding Rate	13%	14%	21%	16%	20%	17%	12%	6%	8%	19%	15%

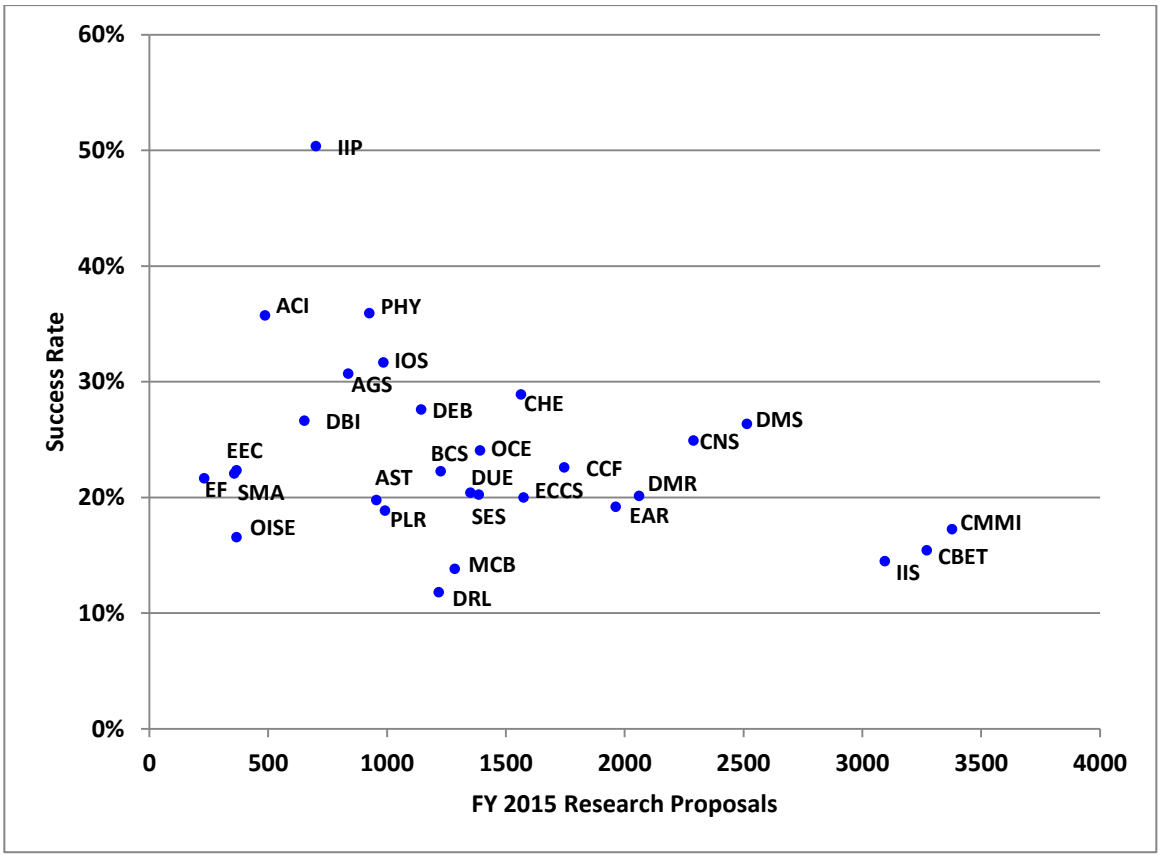
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Rhode Island -2004	Awards	117	140	127	129	176	148	131	146	127	138	131
	Proposals	334	353	390	357	350	442	400	393	399	404	361
	Funding Rate	35%	40%	33%	36%	50%	33%	33%	37%	32%	34%	36%
South Carolina -1980	Awards	90	86	122	87	152	136	108	117	115	97	117
	Proposals	453	464	523	470	527	671	650	562	594	585	603
	Funding Rate	20%	19%	23%	19%	29%	20%	17%	21%	19%	17%	19%
South Dakota -1987	Awards	21	14	21	20	31	33	24	20	28	32	25
	Proposals	101	97	97	116	132	184	162	150	163	135	139
	Funding Rate	21%	14%	22%	17%	23%	18%	15%	13%	17%	24%	18%
Tennessee -2004	Awards	113	99	145	124	183	133	138	144	144	136	151
	Proposals	585	564	642	633	608	759	709	687	667	696	711
	Funding Rate	19%	18%	23%	20%	30%	18%	19%	21%	22%	20%	21%
U.S. Virgin Islands -2002	Awards	2	1	0	2	0	1	3	2	0	2	1
	Proposals	5	6	4	5	1	3	11	5	8	7	3
	Funding Rate	40%	17%	0%	40%	10%	33%	27%	40%	0%	29%	33%
Utah -2009	Awards	106	94	95	111	135	129	115	118	135	137	127
	Proposals	474	466	449	492	464	595	596	532	569	554	563
	Funding Rate	22%	20%	21%	23%	29%	22%	19%	21%	24%	25%	23%
Vermont -1985	Awards	22	16	26	27	42	23	22	24	21	22	18
	Proposals	129	119	129	144	120	126	121	90	89	104	96
	Funding Rate	17%	13%	20%	19%	35%	18%	18%	27%	24%	21%	19%
West Virginia -1980	Awards	16	19	21	25	33	27	21	32	22	23	37
	Proposals	100	121	128	119	130	160	151	163	158	159	187
	Funding Rate	16%	16%	16%	21%	25%	17%	14%	20%	14%	14%	20%
Wyoming -1985	Awards	29	23	26	27	44	35	31	20	18	24	27
	Proposals	99	99	91	121	123	146	122	105	115	129	129
	Funding Rate	29%	23%	29%	22%	36%	24%	25%	19%	16%	19%	21%

Source: All-NSF data - NSF Enterprise Information System, 10/1/15; EPSCoR jurisdiction data - NSF Budget Internet Information System, January 2016.

Appendix 6 - Research Proposals and Success Rates, by Division

Figure 6.1 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 2015. Only divisions with at least 200 research proposals in FY 2015 are included. The Division of Graduate Education (DGE) and the Division of Human Resource Development (HRD) do not appear in the plot as these received fewer than 200 research proposals in FY 2015. The Division of Research on Learning in Formal and Informal Settings (DRL) and the Division of Undergraduate Education (DUE) are included. Several units that handle proposals in a way similar to divisions are included as separate entities. These are Emerging Frontiers (EF) in the Directorate for Biological Sciences, the Office of Multidisciplinary Activities (SMA) in the Directorate for Social, Behavioral, and Economic Sciences, and the Office of International Science and Engineering (OISE) in the Office of the Director. Division acronyms are listed in **Appendix 23.** Data do not reflect preliminary proposal submissions, which are high for IOS and DEB.

Figure 6.1 – FY 2015 Research Proposals and Success Rates, by Division



Source: NSF Enterprise Information System, 10/01/15.

Appendix 7 - Median and Mean Annualized Award Amounts for Research Grants, by Directorate or Office (Nominal Dollars in Thousands)*

		Fiscal Year										
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
NSF	Median	$104	$102	$110	$110	$120	$124	$120	$125	$130	$133	$130
	Mean	$144	$135	$146	$143	$162	$167	$159	$166	$169	$172	$171
BIO	Median	$140	$140	$142	$150	$161	$171	$178	$177	$182	$178	$186
	Mean	$184	$191	$182	$180	$200	$222	$226	$214	$228	$217	$237
CSE	Median	$88	$90	$92	$94	$110	$118	$141	$150	$161	$166	$161
	Mean	$120	$114	$120	$131	$169	$172	$174	$206	$204	$199	$187
ENG	Median	$97	$90	$100	$100	$100	$100	$100	$107	$103	$112	$103
	Mean	$117	$110	$116	$112	$120	$122	$119	$125	$122	$131	$122
GEO	Median	$90	$87	$93	$89	$101	$100	$116	$125	$141	$141	$144
	Mean	$126	$113	$137	$122	$153	$134	$162	$170	$193	$201	$183
MPS	Median	$100	$100	$106	$105	$113	$115	$111	$117	$116	$120	$125
	Mean	$135	$120	$130	$133	$138	$150	$141	$143	$130	$141	$149
OIA	Median		$53	$160	$146	$391	$391	$393	$170	$156	$171	$713
	Mean		$490	$130	$146	$366	$431	$379	$178	$948	$173	$554
OISE	Median	$15	$33	$47	$30	$25	$50	$49	$50	$31	$49	$82
	Mean	$91	$59	$157	$29	$33	$198	$60	$200	$53	$142	$149
SBE	Median	$84	$85	$94	$100	$101	$100	$98	$98	$101	$109	$112
	Mean	$110	$103	$115	$116	$114	$116	$113	$120	$139	$134	$138

Source: NSF Enterprise Information System, 10/1/15.

*EHR is not included in this appendix 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 8 - Number of People Involved in NSF-funded Activities[60]

In FY2015, approximately 355,000 senior researchers, post-doctoral associates, teachers and students across all levels were directly involved in NSF research and education programs and activities.

	FY 2015 Actual Estimate
Senior Researchers	42,241
Other Professionals	13,990
Post-doctoral Associates	6,043
Graduate Students	42,114
Undergraduate Students	35,785
K-12 Students	173,128
K-12 Teachers	41,330
Total Number of People	**354,631**

Source: NSF FY 2017 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.

[60] 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 9 – Mean Levels of PI, Graduate Student and Post-Doctoral Associate Support in Research Grants

Table 9.1 Mean Number of Months of Salary Support for Single- and Multi-PI Research Grants, by Directorate or Office

Directorate or Office	Type of Award	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NSF	Single PI Grants	1.4	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7
	Multi-PI Grants	1.4	1.3	1.3	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.8
	NSF Average	1.4	1.4	1.3	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.8
BIO	Single PI Grants	1.9	1.6	2.0	1.8	1.3	1.2	1.3	1.1	1.0	1.0	0.9
	Multi-PI Grants	2.3	2.0	2.0	1.7	1.6	1.2	1.1	1.1	1.3	1.0	1.1
	BIO Average	2.0	1.7	2.0	1.8	1.4	1.2	1.2	1.1	1.1	1.0	0.9
CSE	Single PI Grants	1.0	1.1	0.9	0.7	0.8	0.8	0.9	0.7	0.7	0.7	0.6
	Multi-PI Grants	0.8	0.6	0.7	0.5	0.6	0.6	0.8	0.7	0.6	0.7	0.5
	CSE Average	0.9	0.9	0.8	0.6	0.7	0.7	0.9	0.7	0.6	0.7	0.6
EHR	Single PI Grants	2.0	1.5	1.6	2.0	1.6	1.9	1.7	1.4	1.4	1.0	0.9
	Multi-PI Grants	2.0	1.8	1.5	1.2	1.6	1.8	2.2	1.7	1.0	0.9	0.8
	EHR Average	2.0	1.7	1.5	1.5	1.6	1.8	2.1	1.6	1.1	0.9	0.8
ENG	Single PI Grants	1.0	1.2	1.2	0.9	0.9	0.4	0.4	0.6	0.4	0.3	0.4
	Multi-PI Grants	0.9	0.7	0.8	0.7	0.7	0.4	0.3	0.3	0.3	0.3	0.3
	ENG Average	1.0	1.0	1.0	0.8	0.8	0.4	0.4	0.5	0.4	0.3	0.4
GEO	Single PI Grants	1.4	1.4	1.3	1.1	1.0	1.1	1.0	1.0	0.9	1.0	1.0
	Multi-PI Grants	1.6	1.5	1.3	1.2	1.1	1.1	1.0	1.3	1.3	1.2	1.2
	GEO Average	1.4	1.4	1.3	1.1	1.1	1.1	1.0	1.1	1.0	1.1	1.0
MPS	Single PI Grants	1.4	1.4	1.3	1.3	1.5	1.3	1.3	1.1	1.0	1.0	0.8
	Multi-PI Grants	1.4	1.5	1.5	1.4	1.5	1.2	1.2	0.9	0.9	0.9	0.9
	MPS Average	1.4	1.4	1.3	1.4	1.5	1.3	1.3	1.0	1.0	1.0	0.9
OIA	Single PI Grants	2.4	0.8	8.6	3.3	0.4	2.4	1.3	1.2	1.1	1.2	0.8
	Multi-PI Grants	N/A	2.5	4.5	N/A	1.1	0.4	0.2	N/A	N/A	0.7	N/A
	OIA Average	2.4	1.7	6.5	3.3	1.0	1.1	0.9	1.2	1.1	0.8	0.8
OISE	Single PI Grants	N/A	2.9	0.5	N/A	1.0	0.3	2.2	0.3	0.8	0.5	0.6
	Multi-PI Grants	1.1	0.6	0.9	1.0	0.9	1.8	0.8	0.7	0.5	0.5	0.8
	OISE Average	1.1	2.2	0.9	1.0	1.0	1.4	1.1	0.6	0.7	0.5	0.7
SBE	Single PI Grants	1.7	1.9	1.6	2.0	1.5	1.7	1.2	1.2	1.1	1.1	1.1
	Multi-PI Grants	1.3	1.4	1.4	1.1	1.0	1.3	0.9	0.9	1.2	1.2	1.6
	SBE Average	1.6	1.7	1.5	1.7	1.4	1.6	1.1	1.1	1.1	1.2	1.3

Source: NSF Enterprise Information System, 10/1/15 and NSF Report Server 1/19/16.

Table 9.2 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
2005	$14,306	$20,464
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

Table 9.3 Mean Annualized Post-Doctoral Associate Support on Research Grants

	Mean Annualized Level of Post-Doctoral Researcher Support per Research Grant	
	All Research Grants	Research Grants with Post-Doc. Support
2005	$4,840	$24,909
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

Appendix 10 - Mean Number of Research Proposals per PI before Receiving One Award, by Directorate or Office, by Fiscal Year Triads

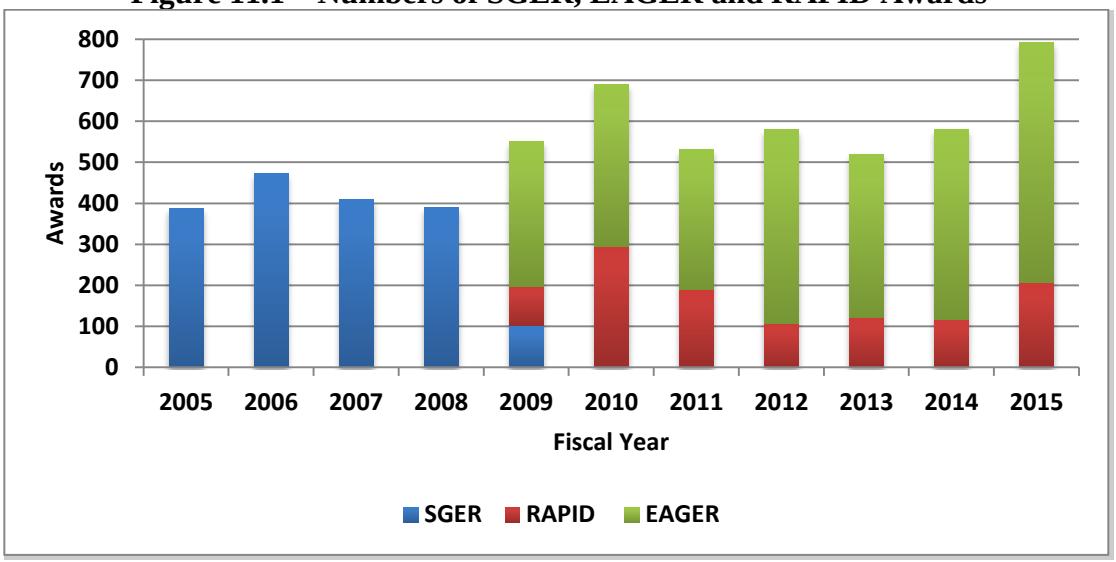
	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015
NSF	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.3**	**2.3**	**2.4**	**2.4**	**2.4**	**2.4**
BIO	2.0	2.0	2.2	2.2	2.1	2.1	2.1	2.1	1.9	1.7	1.7
CISE	2.6	2.6	2.4	2.4	2.4	2.6	2.5	2.6	2.6	2.7	2.6
EHR	1.3	1.3	1.4	1.3	1.4	1.4	1.4	1.5	1.7	1.7	1.6
ENG	2.3	2.4	2.6	2.5	2.5	2.6	2.7	2.8	2.6	2.6	2.4
GEO	2.2	2.2	2.3	2.2	2.1	2.0	2.0	2.1	2.2	2.2	2.3
MPS	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7
O/D	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.2
SBE	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.6

Source: NSF Enterprise Information System, 02/08/16.

Appendix 11 - Small Grants for Exploratory Research (SGER), EArly-concept Grants for Exploratory Research (EAGER), and Grants for Rapid Response Research (RAPID)

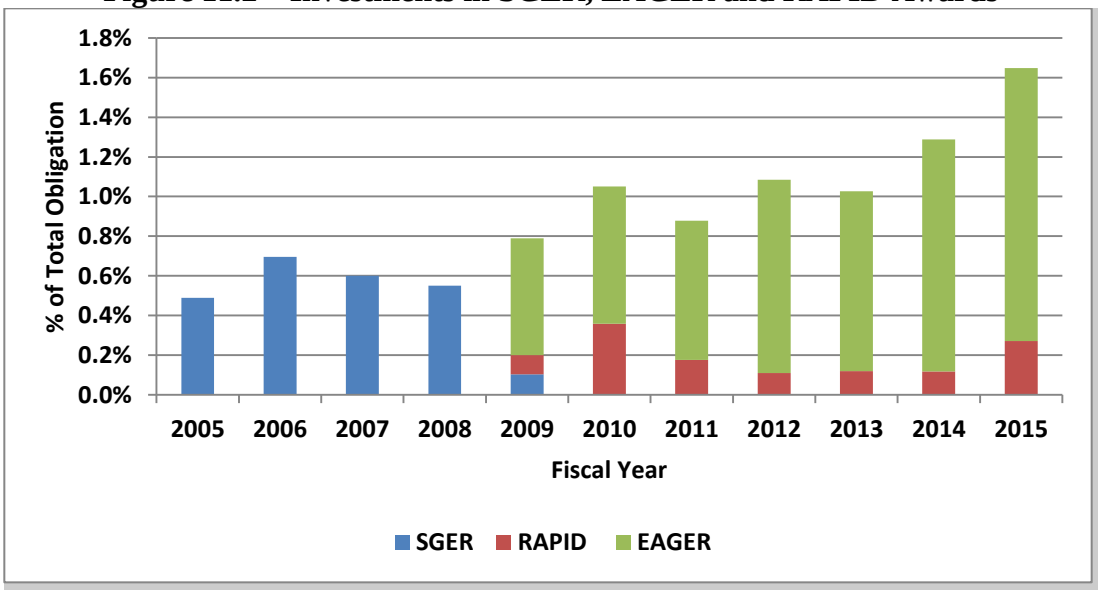
Figures 11.1, 11.2 and **Table 11.1** provide funding trends for EAGERs, RAPIDs, and SGERs. Effective January 2009, the SGER funding mechanism was replaced by two separate funding mechanisms EAGER and RAPID so FY 2009 included all three types of awards.

Figure 11.1 – Numbers of SGER, EAGER and RAPID Awards



Source: NSF Enterprise Information System 10/01/15.

Figure 11.2 – Investments in SGER, EAGER and RAPID Awards



Source: NSF Enterprise Information System 10/01/15 and 02/09/16.

Table 11.1 - EArly-concept Grants for Exploratory Research (EAGER) and Grants for Rapid Response Research (RAPID): Funding Trends, by Directorate or Office

		2010		2011		2012		2013		2014		2015	
		RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER
NSF	Proposals	341	440	237	360	114	519	123	441	127	537	238	743
	Awards	294	395	190	341	107	472	121	399	117	462	207	585
	Funding Rate	86%	90%	80%	95%	94%	91%	98%	90%	92%	86%	87%	79%
	Total $ (Millions)	$27.4	$53.2	$12.3	$49.3	$7.9	$70.3	$8.4	$64.2	$8.6	$85.0	$20.3	$103.0
	% of Obligations	0.4%	0.7%	0.2%	0.7%	0.1%	1.0%	0.1%	0.9%	0.1%	1.2%	0.3%	1.4%
	Average $ (1000s)	$93	$135	$65	$145	$74	$149	$70	$161	$73	$184	$98	$176
BIO	Proposals	52	45	10	34	14	54	13	32	17	80	38	117
	Awards	41	41	8	27	13	50	12	25	13	77	29	104
	Funding Rate	79%	91%	80%	79%	93%	93%	92%	78%	76%	96%	76%	89%
	Total $ (Millions)	$5.1	$8.3	$0.9	$5.8	$1.2	$9.0	$1.5	$6.1	$1.4	$19.1	$3.9	$19.7
	% of Obligations	0.7%	1.1%	0.1%	0.8%	0.1%	1.2%	0.2%	0.8%	0.2%	2.3%	0.5%	2.6%
	Average $ (1000s)	$124	$202	$107	$214	$89	$181	$124	$243	$111	$247	$134	$190
CSE	Proposals	13	197	28	148	11	173	2	171	3	193	37	209
	Awards	12	172	24	145	10	166	2	165	3	159	27	163
	Funding Rate	92%	87%	86%	98%	91%	96%	100%	96%	100%	82%	73%	78%
	Total $ (Millions)	$1.4	$23.1	$1.5	$22.6	$1.2	$28.1	$0.1	$27.6	$0.4	$28.9	$3.3	$27.8
	% of Obligations	0.2%	2.7%	0.2%	2.4%	0.1%	3.0%	0.0%	3.0%	0.0%	3.2%	0.4%	3.1%
	Average $ (1000s)	$115	$134	$61	$156	$116	$169	$45	$168	$144	$182	$121	$170
EHR	Proposals	13	2	9	4	5	48	5	33	3	50	21	81
	Awards	12	0	8	4	5	25	5	19	3	37	21	45
	Funding Rate	92%	0%	89%	100%	100%	52%	100%	58%	100%	74%	100%	56%
	Total $ (Millions)	$1.9	$0.2	$1.5	$1.2	$0.7	$6.3	$0.8	$4.9	$0.7	$9.4	$2.1	$10.8
	% of Obligations	0.2%	0.0%	0.2%	0.1%	0.1%	0.6%	0.1%	0.5%	0.1%	1.0%	0.2%	1.1%
	Average $ (1000s)	$162	N/A	$184	$303	$146	$252	$153	$258	$231	$253	$100	$239
ENG	Proposals	95	96	62	92	12	109	38	134	35	108	41	258
	Awards	66	92	35	88	10	107	38	125	34	96	34	203
	Funding Rate	69%	96%	56%	96%	83%	98%	100%	93%	97%	89%	83%	79%
	Total $ (Millions)	$5.0	$9.1	$1.9	$8.9	$0.4	$12.7	$1.8	$16.4	$1.6	$14.6	$3.3	$33.7
	% of Obligations	0.6%	1.1%	0.2%	1.1%	0.1%	1.5%	0.2%	2.0%	0.2%	1.7%	0.4%	3.7%
	Average $ (1000s)	$76	$99	$53	$101	$42	$119	$49	$131	$47	$152	$97	$166
GEO	Proposals	119	49	99	60	63	93	47	51	51	47	55	27
	Awards	118	48	93	57	61	89	47	49	51	46	55	26
	Funding Rate	99%	98%	94%	95%	97%	96%	100%	96%	100%	98%	100%	96%
	Total $ (Millions)	$10.3	$4.8	$5.2	$6.8	$3.8	$8.2	$3.1	$5.0	$3.0	$5.1	$3.7	$3.5
	% of Obligations	0.7%	0.3%	0.4%	0.5%	0.3%	0.6%	0.2%	0.4%	0.2%	0.4%	0.3%	0.3%
	Average $ (1000s)	$87	$99	$56	$120	$62	$92	$66	$103	$60	$112	$68	$135
MPS	Proposals	19	41	2	14	2	29	2	9	1	20	6	21
	Awards	16	34	2	12	1	24	2	6	1	19	6	17
	Funding Rate	84%	83%	100%	86%	50%	83%	100%	67%	100%	95%	100%	81%
	Total $ (Millions)	$1.6	$6.7	$0.2	$2.2	$0.0	$4.3	$0.3	$2.3	$0.2	$3.5	$0.9	$3.5
	% of Obligations	0.1%	0.4%	0.0%	0.2%	0.0%	0.3%	0.0%	0.2%	0.0%	0.3%	0.1%	0.2%
	Average $ (1000s)	$98	$197	$125	$183	$23	$181	$163	$386	$209	$183	$151	$207

		2010		2011		2012		2013		2014		2015	
		RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER	RAPID	EAGER
SBE	Proposals	30	5	26	6	7	11	16	11	17	39	40	30
	Awards	29	4	19	6	7	9	15	10	12	28	35	27
	Funding Rate	97%	80%	73%	100%	100%	82%	94%	91%	71%	72%	88%	90%
	Total $ (Millions)	$1.6	$0.6	$0.9	$1.0	$0.6	$1.2	$0.6	$1.3	$1.0	$4.2	$3.1	$3.4
	% of Obligations	0.6%	0.2%	0.4%	0.4%	0.2%	0.5%	0.2%	0.5%	0.4%	1.6%	1.1%	1.3%
	Average $ (1000s)	$56	$139	$50	$172	$80	$130	$40	$132	$81	$151	$88	$127
OD	Proposals	0	5	1	2	0	2	0	0	0	0	0	0
	Awards	0	4	1	2	0	2	0	0	0	0	0	0
	Funding Rate	N/A	80%	100%	100%	N/A	100%	N/A	N/A	N/A	N/A	N/A	N/A
	Total $ (Millions)	$0.7	$0.6	$0.3	$0.8	$0.1	$0.4	$0.4	$0.5	$0.3	$0.5	$0.0	$0.6
	% of Obligations	0.2%	0.1%	0.1%	0.2%	0.0%	0.2%	0.1%	0.2%	0.1%	0.2%	0.0%	0.2%
	Average $ (1000s)	N/A	$150	$261	$376	N/A	$196	N/A	N/A	N/A	N/A	N/A	N/A

Source: NSF Enterprise Information System, 10/01/15 and 02/09/16. 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 12 – Description of Merit Review Principles and Criteria[61]

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.

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[61] 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 13 –Proposals Returned Without Review, by Reason

Full Proposals	
Reason	**Number returned**
Inappropriate for NSF	101
Insufficient lead time	6
Preliminary proposal did not result in an invitation to submit a full proposal	5
Duplicates a proposal in review	56
Format problem	467
Does not contain a required section	397
Not responsive to solicitation, program announcement, or Proposal and Award Policies and Procedures Guide	568
Received past the deadline	171
Not substantially revised after a previous declination	57
Duplicates an existing award	15
TOTAL	**1843**

Preliminary Proposals	
Reason	**Number returned**
Inappropriate for NSF	2
Duplicates a proposal in review	4
Format problem	11
Does not contain a required section	11
Not responsive to solicitation, program announcement, or Proposal and Award Policies and Procedures Guide	16
Received past the deadline	7
TOTAL	**51**

Source: NSF Enterprise Information System, 1/28/16.

Appendix 14 - 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 three 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.[62]

- **Advisory Committee 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.

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

Appendix 15 - Requests for Formal Reconsideration of Declined Proposals

		Fiscal Year										
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
First Level Reviews (Assistant Directors):												
BIO	Request	2	4	2	5	3	1	4	2	2	0	6
	- Upheld	2	4	2	5	3	1	3	0	2	0	4
	- Reversed	0	0	0	0	0	0	1	2	0	0	2
CISE	Request	3	1	1	0	0	2	3	5	1	4	2
	- Upheld	3	1	1	0	0	2	3	5	1	3	1
	- Reversed	0	0	0	0	0	0	0	0	0	0	1
EHR	Request	7	4	6	7	2	2	2	3	4	2	4+
	- Upheld	7	4	6	7	2	2	2	3	4	2	4
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
ENG	Request	3	6	3	3	3	11	8	5	7**	11	3
	- Upheld	3	6	3	3	3	9	7	5	5	11	3
	- Reversed	0	0	0	0	0	2	1	0	1	0	0
GEO	Request	0	0	2	0	2	3	2	2	1	1	2
	- Upheld	0	0	2	0	1	3	2	2	1	1	2
	- Reversed	0	0	0	0	1	0	0	0	0	0	0
MPS	Request	15	16	16	14	9	14^	11	22	12	12	10++
	- Upheld	15	15	15	14	7	12	11	21	11	12	10
	- Reversed	0	1	1	0	2	0	0	1	1	0	0
SBE	Request	3	4	0	2	1	1	0	0	0	0	1
	- Upheld	3	4	0	2	1	1	0	0	0	0	1
	- Reversed	0	0	0	0	0	0	0	0	0	0	0
Other*	Request	0	0	3	0	1	0	0	1	0	0	0
	- Upheld	0	0	3	0	0	0	0	1	0	0	0
	- Reversed	0	0	0	0	1	0	0	0	0	0	0
Second Level Reviews (Deputy Director):												
O/DD	Request	2	0	1	3	2	3	3	6	1	3	7
	- Upheld	2	0	1	3	2	3	1	6	1	3	7
	- Reversed	0	0	0	0	0	0	2	0	0	0	0
Total Reviews First & Second Level												
NSF	Request	35	35	34	34	23	37^	33	46	28	33	35
	- Upheld	35	34	33	34	19	33	29	43	25	32	32
	- Reversed	0	1	1	0	4	2	4	3	2	0	3

Source: Office of the Director, 05/11/16.

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* From 2005 to 2012, the "Other" category includes OCI, OIA, OPP, and OISE. For FY 2013 and FY 2014, it included OIIA. For FY 2015, it included OIA and OISE.

^ The number of decisions (upheld or reversed) may not equal the number of requests in each year due to carry over of a pending reconsideration request.

** One 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 16 - Mean Number of Reviews per Proposal, by Method and Directorate or Office - FY 2015

		Methods of Review						
		All Methods	Ad Hoc + Panel	Ad Hoc Only	Panel Only	Not Reviewed *	Returned without Review	Withdrawn Proposals
NSF	Reviews	185,403	60,436	10,312	114,655			
	Proposals	47,282	12,488	2,650	32,144	2,338	1,842	276
	Rev/Prop	3.9	4.8	3.9	3.6			
BIO	Reviews	20,324	12,732	212	7,380			
	Proposals	4,864	2,548	53	2,263	255	121	20
	Rev/Prop	4.2	5.0	4.0	3.3			
CSE	Reviews	30,712	3,909	378	26,425			
	Proposals	7,512	751	107	6,654	519	113	63
	Rev/Prop	4.1	5.2	3.5	4.0			
EHR	Reviews	17,033	1,301	372	15,360			
	Proposals	4,083	287	102	3,694	159	115	9
	Rev/Prop	4.2	4.5	3.6	4.2			
ENG	Reviews	41,792	2,236	410	39,146			
	Proposals	11,655	510	120	11,025	671	1,071	25
	Rev/Prop	3.6	4.4	3.4	3.6			
GEO	Reviews	25,410	19,734	3,079	2,597			
	Proposals	5,617	4,051	803	763	201	148	40
	Rev/Prop	4.5	4.9	3.8	3.4			
MPS	Reviews	30,072	7,401	4,596	18,075			
	Proposals	8,747	1,756	1,112	5,879	385	133	94
	Rev/Prop	3.4	4.2	4.1	3.1			
OIA	Reviews	313	243	15	55			
	Proposals	70	54	3	13	0	21	2
	Rev/Prop	4.5	4.5	5.0	4.2			
OISE	Reviews	1,768	491	23	1,254			
	Proposals	596	82	9	505	7	17	4
	Rev/Prop	3.0	6.0	2.6	2.5			
SBE	Reviews	17,979	12,389	1,227	4,363			
	Proposals	4,138	2,449	341	1,348	141	103	19
	Rev/Prop	4.3	5.1	3.6	3.2			

Source: NSF Enterprise Information System, 10/01/15.

* 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 include RAPIDs, EAGERs, INSPIRE Track 1s, and small grants for travel and symposia.

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 46,030 panel summaries in FY 2015.

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 17 - Methods of NSF Proposal Review

FY	Total Proposals	Ad Hoc + Panel Proposals	Ad Hoc + Panel Percent	Ad Hoc Only Proposals	Ad Hoc Only Percent	Panel Only Proposals	Panel Only Percent	Not Externally Reviewed Proposals	Not Externally Reviewed Percent
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%
2005	41,722	13,919	33%	3,656	9%	22,735	54%	1,412	3%

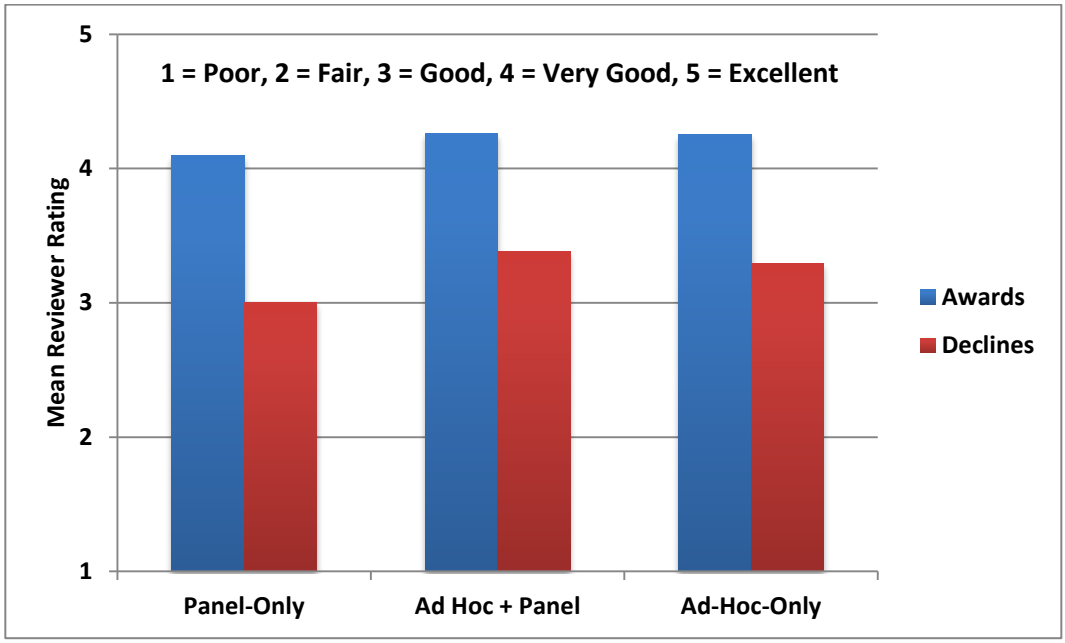
Source: NSF Enterprise Information System, 10/01/15.

Appendix 18 - Methods of NSF Proposal Review, by Directorate or Office – FY 2015

Directorate	Total Proposals	Ad Hoc + Panel		Ad Hoc Only		Panel Only		Not Reviewed	
		Proposals	Percent	Proposals	Percent	Proposals	Percent	Proposals	Percent
NSF	**49,620**	**12,488**	**25%**	**2,650**	**5%**	**32,144**	**65%**	**2,338**	**5%**
BIO	5,119	2,548	50%	53	1%	2,263	44%	255	5%
CSE	8,031	751	9%	107	1%	6,654	83%	519	6%
EHR	4,242	287	7%	102	2%	3,694	87%	159	4%
ENG	12,326	510	4%	120	1%	11,025	89%	671	5%
GEO	5,818	4,051	70%	803	14%	763	13%	201	3%
MPS	9,132	1,756	19%	1,112	12%	5,879	64%	385	4%
OIA	70	54	77%	3	4%	13	19%	0	0%
OISE	603	82	14%	9	1%	505	84%	7	1%
SBE	4,279	2,449	57%	341	8%	1,348	32%	141	3%

Source: NSF Enterprise Information System, 10/01/15.

Appendix 19 - Mean Reviewer Ratings, by Method of Review - FY 2015



Source: NSF Enterprise Information System, 10/01/15.

Appendix 20 - 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 2015, there were 73 requests for accomplishment-based renewals, 29 of which were awarded. **Table 20.1** 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 is to offer the most creative investigators an extension to address opportunities in the same general research area, but not necessarily within the scope covered by the original/current proposal. Awards eligible for such an extension are generally three-year continuing grants. Special Creativity Extensions are usually initiated by the NSF program officer based on progress during the first two years of a three-year grant.

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 continuing grants. Special Creativity Extensions are normally initiated by the NSF Program Officer based on progress during the first two years of the grant.[63] In FY 2015, 13 Special Creativity Extensions were awarded.

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

Table 20.1 - Accomplishment-Based Renewals, by Directorate or Office

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

Source: NSF Enterprise Information System, 10/01/15. "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 21 – Merit Review Survey

In 2015, NSF conducted a survey of people who had submitted proposals to and/or reviewed for NSF during or after FY 2012. The survey yielded information on how the research community experiences the merit review system. The survey also included questions about researchers' experiences with some of the merit review pilots, notably, participation in the virtual panel pilot. In this appendix, we summarize some of the results.

21.1 Survey participants

34,835 individuals responded to the survey. Of these, approximately one quarter said that they had only submitted proposals (26%), one quarter said that they had only been reviewers (27%), and one half had been both (47%).

Respondents represented all of NSF's major research domains. 96.5% of the respondents indicated with which directorate their research was most closely aligned. Of these, 8% indicated EHR, 9% replied CISE, and 23% indicated MPS. The remaining directorates were each represented by between 14% and 18%.

88% of respondents answered a question that asked whether they were "soft-money"[64] researchers. Of these, 11% indicated that they were. The proportion of soft-money researchers was highest among researchers in the Geosciences (24%) and lowest in MPS (7%), SBE (7%), and ENG (8%).

90% of respondents answered a question that asked whether they worked in an institution of higher education. Of these, 87% indicated that they did. The proportion working in higher education was highest in SBE (94%) and lowest in EHR (80%), ENG (81%), and GEO (82%).

99% [26,977 of 27,260] of those who worked in higher education answered a question that asked whether they worked in a minority-serving institution. Of these, 9% indicated that they did. For all directorates except EHR, the proportion was between 8% and 10%. For EHR, the proportion was 20%.

98% of those who worked in higher education indicated whether or not they had tenure. Of these, 64% had tenure. 98% indicated their academic rank. Approximately 41% were full professors, 25% were associate professors, 20% were assistant professors, 4% were post-doctoral researchers, and 10% held a position other than professor or post-doctoral researcher.

Of the 4,110 respondents who indicated an employment sector outside higher education, the largest proportions worked either in the commercial sector (23%) or a non-profit research organization that was neither a Federally-Funded Research and Development Center nor a government agency (20%).

[64] Defined as, "your appointment requires that 75% or more of the annual salary for the research position you hold is funded by grant monies, rather than your employer."

85%, 81%, and 78% of respondents provided information about gender, race and ethnicity. Of those providing such information, 31% were women, 1% were American Indian or Alaskan Native, 3% were Black or African-American, 6% were Hispanic, 15% were Asian, and 81% were White. Fewer than 1% were Native Hawaiian or Other Pacific Islander.

21.2 Perspectives of Reviewers

Workload

Reviewers were asked to estimate how many reviews they had provided for NSF since the beginning of FY 2012. Researchers who identified with CISE, EHR, or ENG reported providing the most, on average, with between 40% and 42% reporting more than 10 reviews and between 20% and 21%, more than 20 reviews. Reviewers associated with SBE, GEO and MPS tended to report providing fewer reviews, on average. For these three directorates, the percentages of researchers providing more than 10 reviews were, respectively, 15%, 20%, and 27%, and the percentages providing more than 20 reviews were 9%, 8%, and 10%.[65]

When asked how many ad hoc reviews they were willing to provide per year, the average for reviewers associated with ENG was the highest at 7.7 while reviewers associated with SBE were the lowest, at 2.6. The NSF average was 3.7 with only ENG and EHR reviewers willing to undertake larger numbers.

When asked how many panel reviews they were willing to provide per year, the average for reviewers associated with ENG was the again the highest at 10.6. The NSF average was 6.9. Now four directorates had averages above the NSF average, ENG, EHR, BIO and CISE. MPS had the lowest average, 4.7.

Reviewers were asked whether, during the previous 12 months, they had declined to provide an ad hoc review or to participate in a panel when requested. 16% of the just over 24,000 respondents said that they had declined an invitation to provide an ad hoc review, 18% had declined to participate in a face-to-face panel and 10% had declined to participate in a virtual panel. For CISE, EHR, and ENG, over 25% had declined to participate in a face-to-face panel. The domain with the highest proportion of respondents who thought that they had declined to provide an ad hoc review was GEO (24%). The most commonly cited reasons for declining to review were lack of time and competing professional pressures (which are not orthogonal). Of the 4,468 reviewers who had declined to participate in a face-to-face panel, 51% of the 4,103 that responded on this topic cited either being unwilling to travel or being unable to travel as a factor that influenced their decision to a moderate or great extent. This is consistent with the idea that participation in face-to-face panels can have an impact on work-life balance.

[65] Respondents were only presented with this question if, on the first question in the survey, they had said that they had been a reviewer for NSF since the beginning of FY 2012. However, when presented with this question, 4% said that they had written no reviews for NSF since the start of FY 2012. Some of these may have served as panelists on panels where the participants were asked to discuss proposals and the ad hoc reviews those proposals had received, without writing separate reviews of their own.

In response to being asked to estimate the total amount of time it took to read the proposal, write and submit the reviewer's most recent review, the average[66] varied from a low of 2.7 hours for reviewers associated with EHR to 4.9 hours for GEO. The NSF average was 3.9 hours. If this is representative of the experiences of those who did not respond to the survey, then a very approximate estimate of the effort expended by the review community in writing reviews for NSF (excluding the time spent traveling to and participating in panels) can be obtained by multiplying the number of written reviews given in **Section IV.E** by 3.9 hours to obtain approximately 360 person-years.

89% of just under 24,100 responding reviewers reported doing some or all of their review preparation outside their normal working hours, indicating another potential impact of reviewing on work-life balance. However, many individuals voluntarily decide to do this. Just under 24,000 reviewers responded to a question asking whether their employers viewed reviewing proposals as within or outside the employee's scope of work. 17.5% were unsure but, of the remaining 19,800, 91% thought that their employer viewed serving as a reviewer as within the respondent's scope of work.

Two-thirds (64%) of 24,160 responding reviewers had reviewed for NSF both before and since the beginning of FY 2012. 32% of these estimate that the time they are able to devote to each review has decreased. Such a decrease is most common for GEO and BIO and least common for EHR.

Creativity and Interdisciplinarity

Among reviewers who had reviewed proposals both before and after the beginning of FY 2012, 80% thought that the degree of creativity and risk in proposals had either stayed the same or increased; only 20% thought that it had declined.

A little over 10,000 reviewers had reviewed both interdisciplinary and monodisciplinary proposals since the beginning of FY 2012. Among these, more than half, 54%, thought that the interdisciplinary proposals they reviewed had a greater potential to advance knowledge, 39% thought that the monodisciplinary proposals had greater potential, and the remaining 8% thought that there was no difference.

Review Criteria

Reviewers were asked what relative weights they gave to various factors when forming judgments about intellectual merit and broader impacts. They were asked to use a scale ranging from Very Low (0) to Very High (4). For intellectual merit, the factors, in order of the average relative weight reported (given in parentheses), were:

- Originality of the research question (3.4)

[66] The average was calculated by taking the number of responses in each category: < 0.5 hours, 0.5 – 1 hours, 1.1 – 2 hours, 2.1 – 3 hours, etc., and multiplying by 0.25, 0.75, 1.5, 2.5, etc., then dividing by the total number of responses. The final category was "over 10 hours." The numbers in this category were included in the averages by multiplying by 12 hours. This is somewhat arbitrary and probably conservative. If the multiplier were changed to 15 hours, the numbers cited in the text would change to 2.8 hours for EHR, 5.1 hours for GEO, 4.0 hours for NSF as a whole, and an additional 13 person-years.

- The project's potential to change our understanding of an important existing scientific or engineering concept (3.4)
- The appropriateness of the proposed methodology (3.3)
- The extent to which the research challenges current understanding (3.1)
- Qualifications of the principal investigator and any co-investigators to implement the research plan (3.0)
- The likelihood that the proposed project will be completed successfully (2.9)
- The extent to which the research may open a new field in science or engineering (2.8)
- Presence of a mechanism to assess the project's progress (2.1)
- The quality of the data management plan (1.6)
- Size of the budget (1.5)

For broader impacts, the factors, again in order of average relative weight given, were:

- The significance of the potential broader impacts (3.0)
- The clarity and detail with which the proposal explains its broader impacts (2.9)
- The project's potential contribution to broadening participation in research (2.7)
- Past record of the principal investigator and co-investigators (if any) (2.6)
- Integration of research and education within the project (2.5)
- Originality of the character of the broader impacts (2.5)
- Plans for disseminating the results of the proposed research (2.5)
- The project's potential contribution to enhancing local, regional or national infrastructure to support future research (2.3)
- The quality of the data management plan (1.5)
- Size of the budget (1.4)

The responses came from just under 23,500 individual reviewers.

Implicitly, the higher scores given to the leading factors under intellectual merit, compared to the leading factors under broader impacts, suggest that, on average, reviewers give a slightly greater weight to intellectual merit than to broader impacts while still giving considerable weight to the significance of the potential broader impacts. (The value 3 corresponds to a choice of "High" relative weight by the reviewer.)

Although originality of the research and the potential to change understanding of an important existing concept are the highest rated factors, the appropriateness of the methodology also matters strongly to the reviewers. The qualifications of the project team are also given "High" relative weight, on average. The reviewers view the size of the requested budget and the quality of the data management plan as of low to medium significance for both intellectual merit and broader impacts. On average, the reviewers do not weight all of the potential broader impacts equally. In particular, contributions to broadening participation in science and engineering research are weighted more highly than the integration of research and education, the dissemination of the results of research, or contributions to enhancing research infrastructure.

Virtual Panels

In recent years, NSF has been piloting greater use of virtual panels. The survey provided reviewers with an opportunity to comment on their experiences. Over 4,200 reviewers said that they had participated in virtual panels. Of these, over 3,200 had participated in both virtual panels and face-to-face panels. They provided feedback on their perceptions of differences between the two types of panels. In particular, they were asked how their experiences in the two types of panels differed on five dimensions:

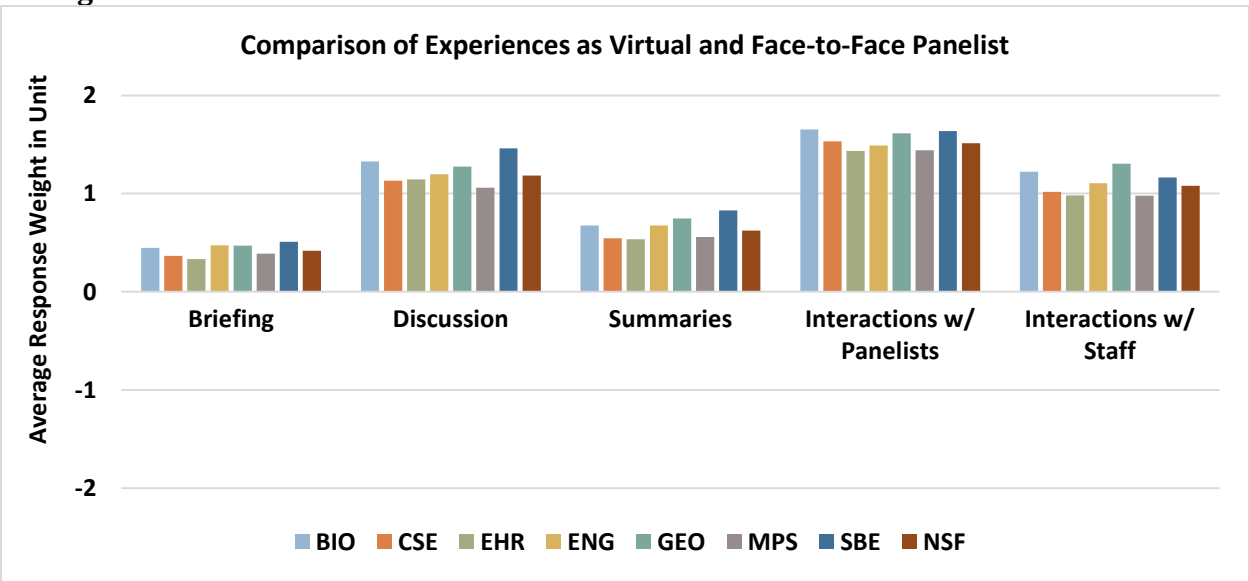
- Quality of panel briefing/training
- Quality of group discussions
- Quality of the panel summaries
- Quality of interpersonal interaction among panel members
- Quality of interaction with NSF staff

The respondents' assessments are summarized in **Figure 21.1**, which shows the averages of the quality ratings that the respondents provided along each dimension. The scale goes from -2 to 2 and corresponds to the following subjective ratings:

Value	Rating
2	Significantly better in face-to-face panels than virtual panels
1	Somewhat better in face-to-face panels than virtual panels
0	About the same in both types of panel
-1	Somewhat better in virtual panels than face-to-face panels
-2	Significantly better in virtual panels than face-to-face panels

Figure 21.1 shows the average for all respondents, labeled "NSF", and the averages for respondents grouped by the directorate with which their expertise is most closely affiliated.

Figure 21.1



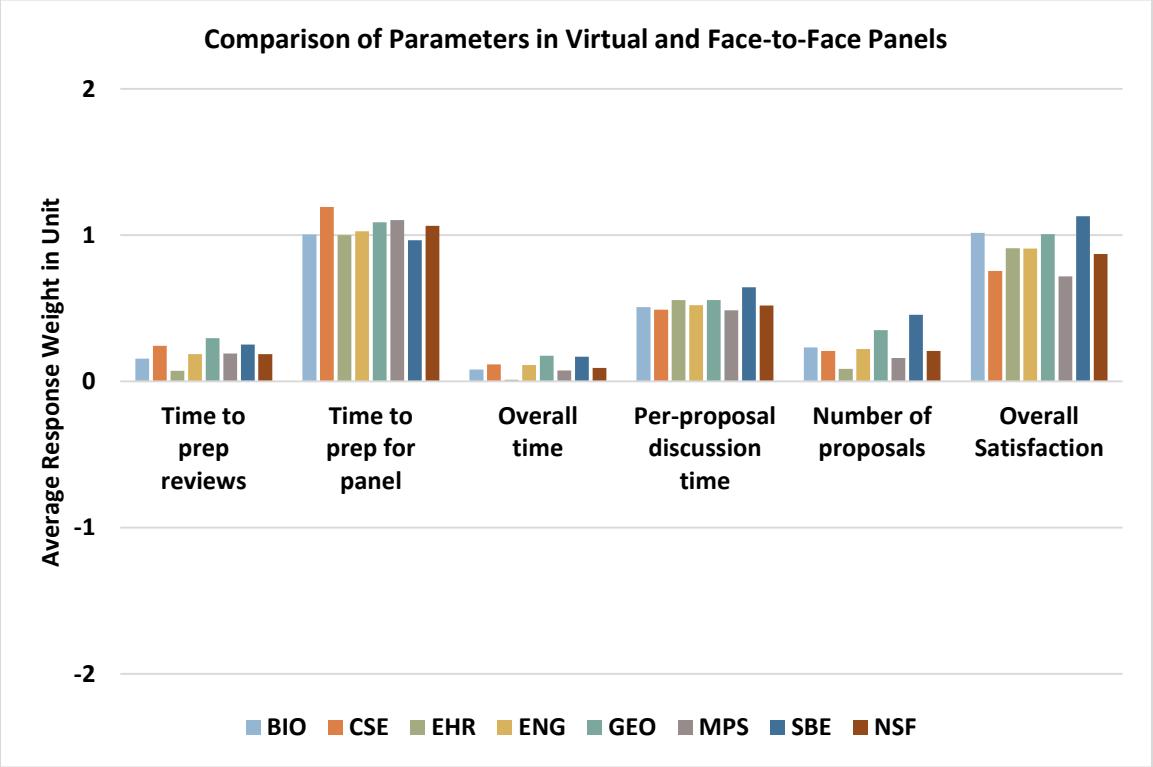
The respondents were asked to compare their estimates of five quantities associated with panel participation:

- Time spent on preparing reviews
- Time spent preparing for panel
- Overall time commitment
- Average amount of time spent discussing each proposal
- Number of proposals discussed by the panel

They were also asked about their overall satisfaction with the two types of panels. These comparisons are summarized in **Figure 21.2**. The scale again goes from -2 to 2 and corresponds to the following ratings:

Value	Rating
2	Significantly more in face-to-face panels than virtual panels
1	Somewhat more in face-to-face panels than virtual panels
0	About the same in both types of panel
-1	Somewhat more in virtual panels than face-to-face panels
-2	Significantly more in virtual panels than face-to-face panels

Figure 21.2



Despite the fact that they believed that more time was required to prepare for a face-to-face panel, in all research domains, reviewers were more satisfied with face-to-face panels than with virtual panels. They felt that the quality of the panel discussions of proposals and the

interactions between panelists were better in face-to-face panels. They also thought that face-to-face panels produced panel summaries that were of higher quality. However, of the over 4,200 reviewers that had participated in virtual panels, 33% had, at some point, declined to participate in a face-to-face panel with over half of them saying that this was because of research or teaching commitments. 36% of those who had declined to participate in a face-to-face panel cited work-life balance issues and 35% stated that they had been unable to travel. (Respondents could select more than one reason.)

Almost 4,000 of those who had participated in virtual panels responded to a question asking what NSF could do to improve the experience of serving on virtual panels. The three most common responses were: facilitate more interaction among co-panelists (56%); integrate virtual meeting technology and the FastLane Interactive Panel System so that there is no need to run two applications simultaneously (44%); and, reduce proposal volume (36%).

Preliminary Proposals

A number of programs request that applicants first submit preliminary proposals. Beginning in 2012, two divisions in the Directorate of Biological Sciences, the Division of Environmental Biology (DEB) and the Division of Integrative Organismal Systems (IOS), began requiring that applicants to the divisions' core research programs submit preliminary proposals. These account for the majority of preliminary proposals received by NSF since then. Other programs requiring preliminary proposals tend to be special funding opportunities rather than core programs. The survey first asked some questions of people who had reviewed any preliminary ("short-form") proposals. It then went on to ask additional questions of those who had reviewed preliminary proposals for DEB and IOS.

Just under 2,000 respondents answered a question that asked what weight they gave to each of six components of a typical preliminary proposal. For each component, the respondents chose from a five-point scale that ranged from 1 (Very Low) to 5 (Very High). In order of perceived importance, the reviewers provided the following average scores:

- Research questions to be addressed (e.g. hypotheses to be addressed or understanding to be sought, expected findings) = 4.6
- Statement of purpose (e.g. a statement of the objectives, aims, conceptual framework, or similar) = 4.5
- Statement of the specific intellectual merit of the proposed research = 4.3
- Description of the approach to be used for addressing the research questions = 4.2
- Background material (e.g. a review of relevant literature, a summary of the state of the field, a rationale for the proposed work, or similar) = 3.7
- Statement of the potential broader impacts of the proposed research = 3.5

When asked what they thought was the appropriate length for the project description of a preliminary proposal, three-quarters (73%) said five or fewer pages. Another 23% suggested values between six and ten pages.

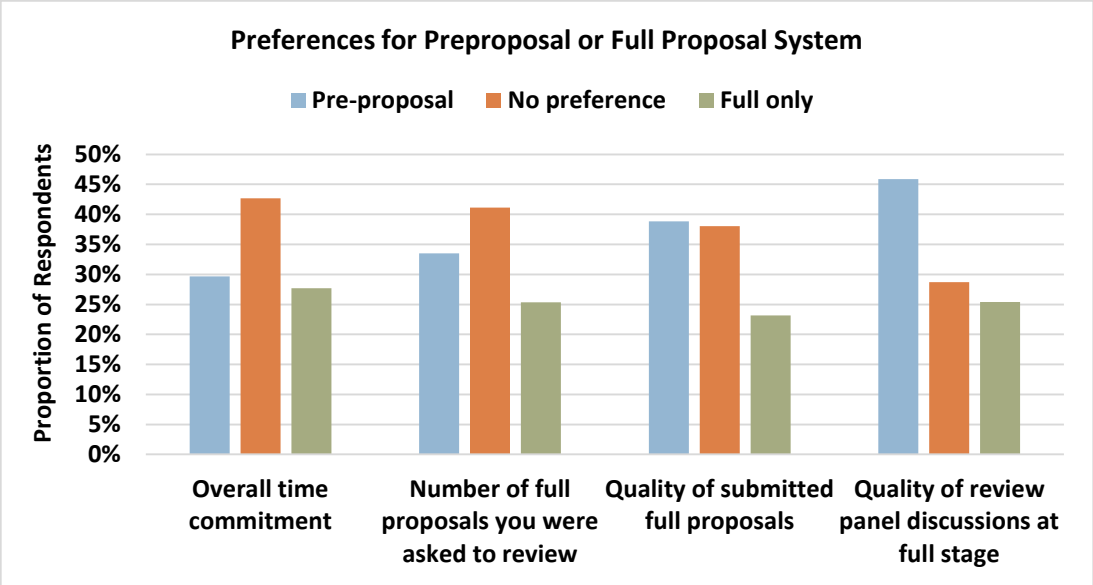
Three times as many people agreed as disagreed with the statement that the use of preliminary proposals increased the quality of the full proposals that they reviewed. 32% neither agreed nor disagreed.

644 reviewers indicated that they had reviewed proposals for DEB or IOS both before and after the switch to requiring the submission of preliminary proposals. They were asked which process they preferred, preliminary proposal followed by full proposal (the more recent approach) or full proposals only (the previous approach) along the following four dimensions.

- Overall time commitment as a reviewer
- Quality of review panel discussions at the full proposal stage
- Quality of submitted full proposals
- Number of full proposals you were asked to review

Just over 600 reviewers responded and their responses are summarized in **Figure 21.3**.

Figure 21.3



In all four areas more people preferred the new process than preferred the old. In the area of the amount of time commitment required, the difference was negligible and over 40% of respondents had no preference. However, in two important areas, the quality of the submitted full proposals and the quality of the panel discussions of full proposals, there was a clear preference for the process with preliminary proposals.

The "One-Plus" Pilot

The One-Plus pilot is described in **Section IV.F**. One of the interesting aspects of it is that it asks review panels to separately evaluate the long-term significance of a proposed project and whether the proposed project is likely to be executed successfully.

Since the "One-Plus" mechanism is a pilot conducted by a single program, Geography and Spatial Sciences (GSS), the number of respondents who had participated in it is relatively small. Approximately 250 respondents had served as reviewers in the pilot. When asked whether it was difficult to evaluate whether a proposed project would be executed successfully, just over half thought not, fewer than 20% though that it was difficult, and approximately 30% neither agreed nor disagreed that it was difficult. When asked whether it was difficult to evaluate the potential long-term significance of a proposed project, the respondents' opinions were more mixed.

Respondents were given three options: they could disagree that it was difficult, agree that it was difficult, or choose to neither agree nor disagree. Of the three, the most chosen of the three categories again corresponded to reviewers being confident that they could successfully evaluate the criterion; just under 50% disagreed that it was difficult to evaluate the potential long-term significance. However, 26% felt that it was difficult. When asked which of four actions might improve the experience of a One-Plus reviewer, 59% of the respondents chose "Provide specific guidance on the 'longer-term significance' criterion."

Just over 100 of those who had participated as reviewers during the pilot had also been reviewers before the pilot was introduced. They were asked how the following six parameters varied between the two approaches:

- Time you are able to devote to each review
- Thoroughness you provide to each review
- The effort it takes to review proposals
- Number of proposals you are asked to review
- Ease of overall review process
- Overall satisfaction

Between 78% and 87% of the respondents said that the two approaches were the same with respect to these parameters. One of the conclusions drawn from this is that the approach was not perceived as creating an undue burden on reviewers.

21.3 Perspectives of Principal Investigators

Factors Motivating Research Proposal Submission

Principal investigators (PIs) were asked the extent to which factors other than a desire to make contributions to science motivated them to submit proposals to any funding source. For each factor, the PI assigned a score ranging from 0 ("to no extent") to 3 ("to a great extent"). Approximately 23,500 PIs provided responses and the average scores provided to seven factors were:

- To enable me to involve students (graduate, undergraduate or high school) in research (2.5)
- Being able to continue to pay the stipends of students (graduate or undergraduate) who currently work with me (2.2)
- Contributing to my employing organization's research status/reputation (1.8)
- Building/maintaining a record of submitting proposals for academic tenure and/or promotion (1.7)
- Being able to continue to pay the salaries of individuals who currently work with me in a professional capacity (e.g. post-doctoral associates, technicians, lab managers) (1.6)
- To pay for the acquisition, development, maintenance, or operation of laboratory equipment and/or instrumentation (1.6)
- Securing funding to pay for my own salary (1.1)

Being able to involve students in research and pay their stipend were described as the most important factors, while securing salary for the PI was the least.

When asked to what extent 11 specific factors influenced their decision to submit proposals to NSF in recent years, approximately 23,200 PIs provided responses and the average scores provided were:

- NSF is the major source of funding for my area of research (2.2)
- Opportunities for funding collaborative research (1.9)
- Opportunities for funding inter-, cross-, or multidisciplinary research (1.7)
- Interesting and relevant new funding opportunities (1.6)
- Need to **obtain grants** for tenure and/or promotion (1.4)
- Need to build and maintain research facilities, centers or programs (1.3)
- Need to **submit proposals** for tenure and/or promotion (1.2)
- Better chance of funding at NSF than other agencies (1.0)
- Decreased funding available from other sources (1.0)
- Encouragement from NSF staff (0.8)
- The NSF budget in my area of research has increased (0.4)

PIs were asked first what they thought was the success rate for the program to which they submitted their most recent proposal and, later, what was the success rate at or below which they would no longer submit to a program.

Estimate of Program Success Rate

Success Rate	Proportion of PIs
Over 40%	1%
31% - 40%	1%
21% - 30%	8%
11% - 20%	28%
6% - 10%	34%
5% or less	17%
Not sure	9%

Rate at which Submission Discouraged

Success Rate	Proportion of PIs
≤ 40%	1%
≤ 30%	3%
≤ 20%	9%
≤ 10%	20%
≤ 5%	20%
Always	47%

Slightly more than half of PIs (52%) thought that the success rate was 10% or lower. In fact, for 2015, the success rate for research proposals was 22% and in all directorates it was 18% or more. While a few research programs have success rates below 10%, these attract far fewer than half the proposal submissions. Thus, the majority of PIs are too pessimistic in their estimates of program success rates.

When asked how the level of competition for research grants at NSF compared to that at other federal agencies, 52% of approximately 18,000 respondents thought that competition was more intense at NSF, 44% thought it was about the same, and only 4% thought that it was less intense.

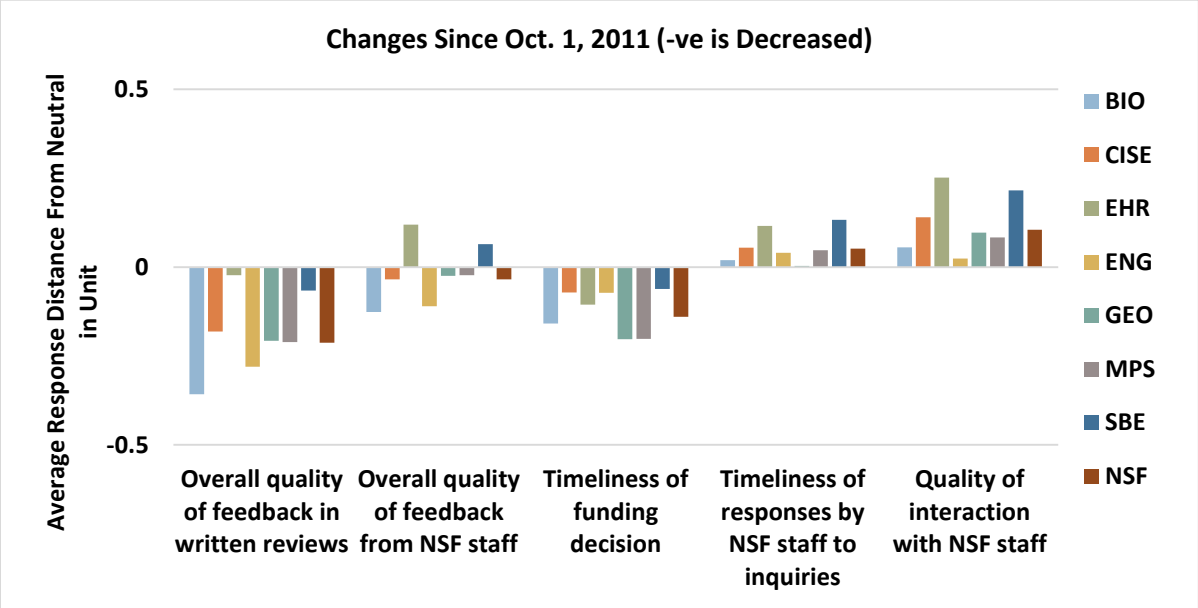
PIs who had submitted proposals both earlier than and more recently than the beginning of FY 2012 were asked how they thought several aspects of the review process had changed with time. These were:

- The overall quality of feedback in the written reviews of your proposals
- The overall quality of feedback from NSF staff about your proposals
- The timeliness of the decision to award or decline funding

- The timeliness of responses by NSF staff to your inquiries
- The quality of your interaction with NSF staff

The results are summarized in the **Figure 21.4**. Respondents chose values from a five-point scale, from +2 (the parameter had greatly increased with time) to -2 (the parameter had greatly decreased over time), with 0 corresponding to no change. **Figure 21.4** shows the averages of the values provided for each parameter for NSF as a whole and for each directorate.

Figure 21.4



While on average, the quality of feedback from NSF staff is viewed as having remained the same, there is a perception that, except among PIs associated with EHR and SBE, the quality of the feedback provided in written reviews has declined.

Success rates and award sizes are frequently raised as issues for the research community. With that in mind, one of the survey questions asked about hypothetical trade-offs between the sizes of award budgets, award durations, and success rates. The question was framed as follows: "For this question, assume that the NSF average annual award budget, award duration, and proposal success rate (the percentage of proposals that receive awards) are mutually dependent. For example, **increasing** the average annual award budget while keeping the average award duration **fixed** results in a **decreased** success rate. Given that constraint, to which of the following would you give the highest priority?

1. **Increase** the average annual award budget and **decrease** the average award duration to maintain a similar success rate;
2. **Decrease** the average annual award budget and **increase** the average award duration to maintain a similar success rate;
3. **Increase** the average annual award budget and **increase** the average award duration, accepting a lower success rate;
4. **Decrease** the average annual award budget and **decrease** the average award duration to increase the success rate;

5. Leave both the average annual award budget and average award duration at their current levels, maintaining a similar success rate."

Averaging across the research domains of the respondents, the two most preferred options were #4, increasing success rate by decreasing the mean award size and duration, 36%, and #5, leaving things as they are, 34%. The least favored option was #3, reducing the success rate in order to increase award size and duration. Only 8% preferred this. There was some variation between research domains; for example, 46% of biologists preferred option #4, only 26% preferred option #5 and only 5% voted for #3.

Just under 8,000 PIs indicated that at some point they had wished to submit a proposal to a program that had a limit on the number of proposals that an organization could submit. Among these, just over 7,800 answered a question that asked whether the organizational submission limit had had a negative impact on the PI's ability to submit a proposal to such a program. 58% indicated that it had.

Creativity and Interdisciplinarity

Among PIs who had submitted proposals both before and after the beginning of FY 2012, 92% thought that the degree of creativity and risk in their proposals had either stayed the same or increased; only 8% thought that it had declined. Most PIs (58%) thought that the degree of creativity and risk in their proposals had stayed about the same, but 34% though that it had increased over time, this was significantly higher than the proportion of reviewers who thought that they had seen an increase in creativity and risk in the proposals they reviewed (9%).

Of approximately 23,400 respondents, 55% said that they had submitted an interdisciplinary proposal since the beginning of FY 2012. For most of these, the respondent had been the PI on an interdisciplinary collaborative proposal but for one in nine, their interdisciplinary proposals had only been single-investigator projects. Of the 23,400 respondents, 27.5% had submitted both interdisciplinary and monodisciplinary proposals since the start of FY 2012. Those who submitted interdisciplinary proposals were equally likely to have done so as an unsolicited proposal as in response to a targeted solicitation that specifically asked for interdisciplinary proposals. (In response to a question that asked PIs to indicate whether they had [a] submitted one or more **unsolicited** interdisciplinary proposals to NSF and/or [b] submitted one or more interdisciplinary proposals to NSF **in response to targeted solicitations** that specifically requested interdisciplinary proposals, 58% indicated [a] and 57%, [b].)

Satisfaction with the Submission Process

Of approximately 23,100 PIs who responded, 57% said that they were somewhat or very satisfied with the quality of the information NSF provided during the proposal submission process, while 15% were somewhat dissatisfied or very dissatisfied. Similar proportions (58% and 15%, respectively) were satisfied or dissatisfied with their interactions with NSF staff. However only 34% were satisfied with the timeliness of the decision to award or decline funding, while 38% were dissatisfied.

A little over 19,100 PIs compared the effort required to prepare and submit a proposal to NSF with that required to submit proposals to other federal agencies. Those who found that an NSF

proposal required more work outnumber those who thought it required less work by more than 3 to 1. 37% found it more onerous and only 11% thought that submitting a proposal to NSF required less effort. 53% answered that nearly the same effort was required.

Workload

In response to being asked to estimate the total amount of time it took to prepare (write, format and submit) the PI's most recent proposal, the average[67] varied from a low of 80 hours for investigators associated with SBE to 91 hours for BIO. The NSF average was 84.5 hours. If this is also representative of the experiences of those who did not respond to the survey, then a very approximate estimate of the effort expended by the research community in writing proposals to NSF can be obtained by multiplying the number of research proposals given in **Section III.F** by 84.5 to obtain over 1,700 person-years.

Approximately 23,400 PIs answered a question about how frequently, on average, they submitted proposals to NSF. Of these, 76% submitted 1.5 or fewer proposals per year. Only 7% (1650 respondents) submitted more than 2.5 proposals per year.

Given the effort involved in preparing a proposal, it is unsurprising that PIs whose proposals have been declined tend to resubmit them to NSF. Of approximately 23,500 respondents, 61% said that after a proposal had been declined, they had submitted a revised version of that proposal to the same NSF program or division. 24% said that after a proposal had been declined, they had submitted a revised version of that proposal to another NSF program or division. 16% said that they had submitted very similar proposals simultaneously to NSF and other funding agencies and approximately 24% had not submitted proposals to federal agencies other than NSF.

Quality of the Review Process

The PIs were asked to indicate whether they agree or disagree with a number of statements related to their perception of the quality of the review process. They were asked to rate each statement on a four-point scale ranging from -2 (strongly disagree) to +2 (strongly agree). For each, statement, the respondent also had an option of indicating that the statement was not applicable. The number of respondents who found each statement applicable was between 17,600 and 22,400. The statements, the average of the researchers' responses, the percentage who agree and disagree, and the number of respondents who found each statement applicable are shown in **Table 21.1**.

The responses indicate considerable satisfaction with the review process. Three-quarters of the respondents believe that the review process treats proposers fairly. Almost two-thirds found that the reviews are technically sound, and just over two-thirds thought that the panel summaries were of high quality. However, only a little more than half thought that the individual written reviews are thorough.

[67] The average was calculated by taking the number of responses in each category: < 10 hours, 10 – 19 hours, 20 – 39 hours, etc., and multiplying by 5, 15, 30, etc., then dividing by the total number of responses. The final category was "over 120 hours." The numbers in this category were included in the averages by multiplying by 130 hours. This is somewhat arbitrary and probably conservative. If the multiplier were changed to 140 hours, the numbers cited in the text would change to 83 hours for SBE, 94 hours for BIO, 87 hours for NSF as a whole, and an additional 50 person-years.

Table 21.1

Statement	Average Response	% Agree	% Disagree	# Responses
Researchers submitting proposals were treated fairly	0.63	76%	24%	20231
Written reviews were thorough	0.09	55%	45%	22394
Written reviews were technically sound	0.27	63%	37%	22274
The panel summary or summaries were of high quality	0.45	69%	31%	20422
The information provided regarding the outcomes of the competition was of high quality	0.80	77%	23%	17611
The PO Comments I viewed in FastLane helped me understand the decision to decline or award my proposal	0.25	61%	39%	21912
The conversations (email, phone, face-to-face) I had with my program officer provided me with helpful feedback about my proposal	0.50	70%	30%	22257
The merit review process provided feedback that I can use to improve my future proposals	0.19	59%	41%	20800

Preliminary Proposals

21% of 23,272 PIs responding said that they had submitted a preliminary proposal to NSF. However, these were distributed unevenly depending on the research domain with which the PI was associated. 58% of PIs associated with biological sciences had submitted preliminary proposals. The next highest proportion was 20% for EHR PIs. GEO, ENG and CISE had proportions of between 14% and 16% while the proportion was less than 10% for MPS and SBE.

Just under 5,000 respondents answered a question that asked what weight they gave to each of five components when preparing a typical preliminary proposal. For each component, the respondents chose from a five-point scale that ranged from 1 (Very Low) to 5 (Very High). In order of perceived importance, the reviewers provided the following average scores:

- Research questions to be addressed (e.g. hypotheses to be addressed or understanding to be sought, expected findings) = 4.6
- Statement of purpose (e.g. a statement of the objectives, aims, conceptual framework, or similar) = 4.6
- Statement of the specific intellectual merit of the proposed research = 4.5
- Description of the approach to be used for addressing the research questions = 4.0
- Statement of the potential broader impacts of the proposed research = 3.9
- Background material (e.g. a review of relevant literature, a summary of the state of the field, a rationale for the proposed work, or similar) = 3.7

When asked what they thought was the appropriate length for the project description in preliminary proposals, 82% said between one and five pages. Another 17% suggested values between six and ten pages.

In response to being asked to estimate the total amount of time it took to prepare (write, format, and submit) the PI's most recent preliminary proposal, the average varied from a low of 40 hours for investigators associated with SBE to a high of 64 hours for BIO. The NSF average was 54 hours.

Table 21.2.

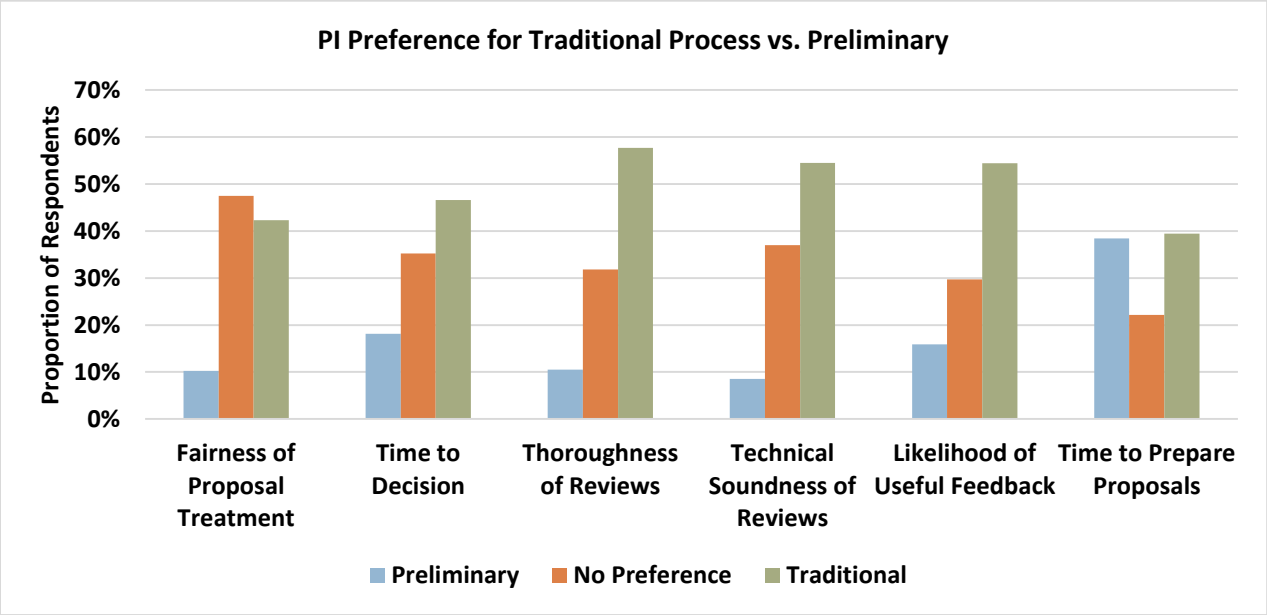
Statement	Average Response	% Agree	% Disagree	# Responses
Researchers submitting preliminary proposals were treated fairly	0.53	74%	26%	3978
Written reviews of preliminary proposals were thorough	-0.07	49%	51%	4431
Written reviews of preliminary proposals were technically sound	0.39	67%	33%	2500
Written reviews of invited full proposals were thorough	0.39	69%	31%	2572
Written reviews of invited full proposals were technically sound	0.43	70%	30%	2486
The panel summary or summaries were of high quality	0.25	61%	39%	4461
The information provided regarding the outcomes of the competition was of high quality	0.27	63%	37%	3986
The PO Comments I viewed in FastLane helped me understand the decision to decline or award my proposal	0.68	74%	26%	3256
The conversations (email, phone, face-to-face) I had with my program officer provided me with helpful feedback about my proposal	0.07	55%	45%	4347
The merit review process provided feedback that I can use to improve my future proposals	0.09	56%	44%	4193
Overall, I am satisfied with NSF's use of preliminary proposals	0.08	56%	44%	4560

The PIs were asked to indicate whether they agreed or disagreed with a number of statements related to their perception of the quality of the review process for preliminary proposals. They were asked to rate each statement on a four-point scale ranging from -2 (strongly disagree) to +2 (strongly agree). For each statement, the respondent also had an option of indicating that the statement was not applicable. The number of respondents who found the statement applicable was between approximately 2,500 and 4,500. (Some of the statements were only displayed to PIs who had submitted a preliminary proposal and then been invited to submit a full proposal.) The statements, the average of the reviewers' responses, the percentage who agree and disagree, and the number of respondents who found each statement applicable are shown in **Table 21.2**.

It is interesting to compare the responses summarized in **Table 21.2**, which focuses on the use of preliminary proposals, with responses to a similar set of questions about the review of proposals in general, summarized in **Table 21.1**. Three-quarters of the preliminary proposal PI respondents believe that the review process treats proposers fairly. This is similar to the result for the same question asked of all PIs (**Table 21.1** above). However, the degree of enthusiasm for this statement is a little softer in the case of preliminary proposals. The average of the responses is lower, 0.53 compared to the 0.63 seen in **Table 21.1**. In part, this is because the proportion of preliminary proposal PI respondents who strongly agreed with the statement is lower (12%) than for the earlier question of all PIs (18%). Two-thirds of those who responded found that the reviews of preliminary proposals are technically sound, although the number of people who

responded about this statement was anomalously low. It was discovered during investigation of this that the survey logic led to only those PIs who had been invited to submit full proposals being asked the question of whether they thought that the reviews of their preliminary proposals were technically sound. It is likely that this introduced a positive bias in the responses. 61% of respondents thought that the panel summaries of preliminary proposals were of high quality. This is noticeably lower than the 69% seen in **Table 21.1** when PIs of all proposals were asked what they thought of panel summaries. Moreover, slightly less than one half of respondents thought that the individual written reviews of preliminary proposals were thorough. Respondents were much more positive about the review of full proposals that they had been invited to submit after their preliminary proposals had been favorably reviewed; 69% and 70% thought that written reviews of invited full proposals were thorough and technically sound, respectively. It is worth noting that a significant fraction of those submitting preliminary proposals are likely to have been submitting preliminary proposals to the biological science divisions IOS or DEB. A panel typically reviews such preliminary proposals whereas the invited full proposals in these divisions are reviewed by both ad hoc reviewers and a panel.

Figure 21.5



Approximately 1,540 PIs said that they had submitted proposals to DEB or IOS both before and after the switch to requiring the submission of preliminary proposals. They were asked which process they preferred, preliminary proposal followed by full proposal (the more recent approach) or full proposals only (the "traditional" approach) along the following six dimensions.

- Fairness with which proposals are treated
- Time to receipt of decision about decline or award
- Thoroughness of reviews received
- Technical soundness of reviews
- Likelihood that reviews contain feedback that I can use to improve my future proposals
- Time spent writing proposals

Between 1,524 and 1,531 PIs responded and their responses are summarized in **Figure 21.5**.

In terms of the time to decision, thoroughness of the reviews, technical soundness of reviews and the likelihood that the review process would produce useful feedback to the PI, the earlier full-proposal-only process was preferred to the more recent preliminary proposal process by a significant margin, although roughly one-third of respondents had no preference. Along the dimension of perceived fairness of the review process, 47% of respondents saw no notable difference between the two methods. However, among the 53% who did see a difference, more than four out of five thought that the former process was fairer than the more recently used process.

The "One-Plus" Pilot

The One-Plus pilot is described in **Section IV.F**. It asks review panels to separately evaluate the long-term significance of a proposed project and whether the proposed project is likely to be executed successfully. Some PIs of declined proposals may be given an opportunity to revise and resubmit between the annual proposal deadlines when the review panel found the project likely to result in a significant impact, if the project plan could be implemented successfully.

Since the "One-Plus" mechanism is a pilot conducted by a single program, Geography and Spatial Sciences (GSS), the number of respondents who had participated in it is relatively small. Approximately 210 respondents were aware that they had submitted proposals during the pilot. (Over 500 more were unsure.) Among 207 respondents, 17% had received awards in the first round, 56% had been declined in the first round and not invited to revise and resubmit the proposal, and 27% had had proposals declined in the first round but were invited to resubmit a proposal in the second round.

The PIs were asked to indicate whether they agreed or disagreed with a number of statements related to their perception of the quality of the "One-Plus" review process. They were asked to rate each statement on a four-point scale ranging from -2 (strongly disagree) to +2 (strongly agree). For each statement, the respondent also had an option of indicating that the statement was not applicable. The number of respondents who found the statement applicable was between 56 and 168. (Some of the statements were only displayed to PIs who had been declined and then invited to submit a proposal to the second round. Some were only displayed to PIs who had submitted proposals both before and after the start of the pilot.) The statements, the average of the reviewers' responses, the percentage who agree and disagree, and the number of respondents who found each statement applicable are shown in **Table 21.3**.

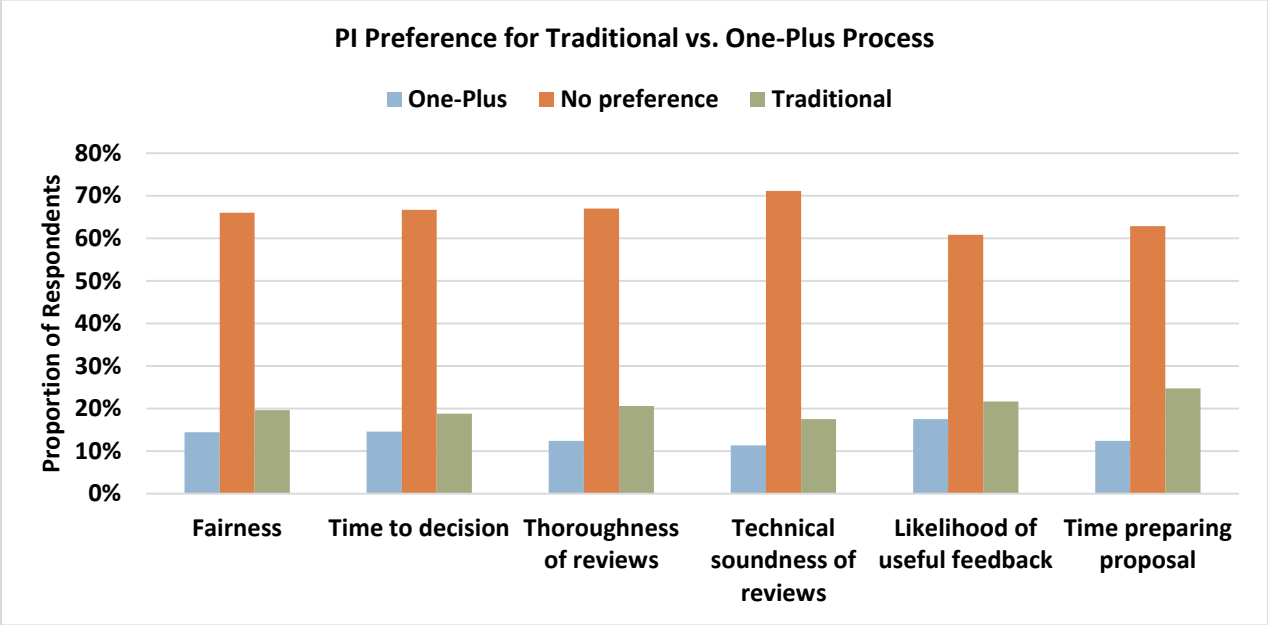
Table 21.3

Statement	Average Response	% Agree	% Disagree	# Responses
A. Researchers submitting proposals in the One-Plus process were treated fairly	0.65	80%	20%	132
B. Written reviews of initial round One-Plus proposals were thorough	0.42	67%	33%	159
C. Written reviews of initial round One-Plus proposals were technically sound	0.42	69%	31%	153
D. Written reviews of invited second round One-Plus proposals were thorough	0.77	80%	20%	35
E. Written reviews of invited second round One-Plus proposals were technically sound	0.74	80%	20%	35
F. The panel summary or summaries were of high quality	0.36	64%	36%	168
G. The information provided regarding the outcomes of the competition was of high quality	0.46	69%	31%	163
H. The PO Comments I viewed in FastLane helped me understand the decision to decline or award my proposal	0.63	77%	23%	156
I. The conversations (email, phone, face-to-face) I had with my program officer provided me with helpful feedback about my proposal	0.93	83%	17%	123
J. The merit review process provided feedback that I can use to improve my future proposals	0.56	73%	27%	168
K. The use of the One-Plus process decreased the time I spent preparing proposals in a single calendar year	-0.42	36%	64%	64
L. The use of the One-Plus process decreased the time between first submitting my idea and receiving a decision about whether or not it would be funded	-0.23	43%	57%	56
M. Overall, my satisfaction with the new One-Plus process is greater than my satisfaction with the old process	-0.26	40%	60%	68

80% of 132 respondents believed that the "One-Plus" review process treats proposers fairly. This is a little higher than the result for the same question asked of all PIs (**Table 21.1** above). However, only about two-thirds of those who said that they had participated in the "One-Plus" review process gave an opinion about the fairness of the process. The other one-third selected the "Not Applicable" response for this question. Approximately two-thirds of PIs who responded believe that the written reviews are thorough and technically sound and that the panel summaries are of high quality.

Of the 104 PIs who said that they had submitted proposals to GSS under both the "One-Plus" process and the former, more traditional merit review process, approximately two-thirds gave an opinion of which of the two processes they preferred. Among these, 40% preferred "One-Plus" and 60% preferred the old approach. It is unclear whether this is motivated by the inherent nature of the "One-Plus" process or by the fact that the old process had semi-annual proposal deadlines whereas the "One-Plus" has only an annual primary deadline.

Figure 21.6



In addition to indicating their overall satisfaction with "One-Plus", PIs who had submitted proposals under both the "One-Plus" approach and the older approach were asked which process they preferred, along the following six dimensions.

- Fairness with which proposals are treated
- Time to receipt of decision about decline or award
- Thoroughness of reviews
- Technical soundness of reviews
- Likelihood that reviews contain feedback that I can use to improve my future proposals
- Time spent writing proposals

Between 96 and 97 PIs responded and their responses are summarized in **Figure 21.6**.

Along each dimension, between 61% and 71% of the respondents had no preference for one method over the other. Amongst the remainder, there was a slight preference for the older approach rather than the "One-Plus" approach.

The "Mechanism Design" Pilot

The Mechanism Design pilot is described in **Section IV.F**. PIs who submit proposals must review seven of the competing proposals so reviewers are also PIs.

Since the Mechanism Design pilot has only been conducted once, by a single program, Sensors and Sensing Systems, the number of respondents who had participated in it is relatively small. Approximately 40 respondents had participated in the pilot. Of these, approximately 20 had previously submitted proposals to the Sensors and Sensing Systems program.

The PIs were asked to indicate whether they agreed or disagreed with a number of statements related to their perception of the quality of the Mechanism Design review process. They were asked to rate each statement on a four-point scale ranging from -2 (strongly disagree) to +2 (strongly agree). For each statement, the respondent also had an option of indicating that the statement was not applicable. The number of respondents who found the statement applicable was between 19 and 39. (The last statement was only displayed to PIs who had submitted proposals both before and after the start of the pilot.) The statements, the average of the reviewers' responses, the percentage who agree and disagree, and the number of respondents who found each statement applicable are shown in **Table 21.4**.

Table 21.4

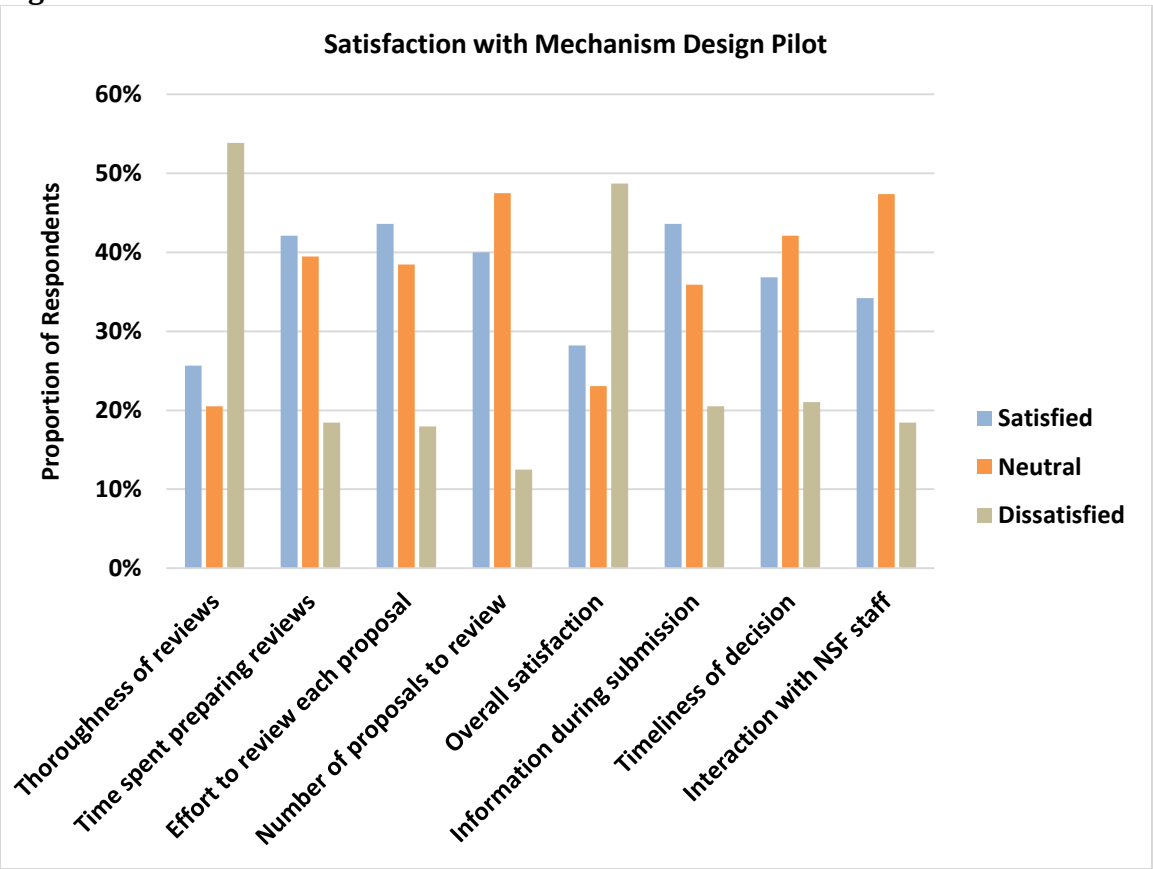
Statement	Average Response	% Agree	% Disagree	# Responses
A. Researchers submitting proposals in the "Mechanism Design" process were treated fairly	0.39	74%	26%	38
B. Written reviews from peer reviewers were thorough	-0.33	41%	59%	39
C. Written reviews from peer reviewers were technically sound	-0.08	53%	47%	38
D. The information regarding the outcomes of the competition was of high quality	-0.16	50%	50%	38
E. The PO Comments I viewed in FastLane helped me understand the decision to decline or award my proposal	0.13	61%	39%	31
F. The conversations (email, phone, face-to-face) I had with my program officer provided me with helpful feedback about my proposal	0.32	68%	32%	25
G. The merit review process provided feedback that I could use to improve my future proposals	0.00	55%	45%	38
H. Overall, my satisfaction, **as a proposer**, with the new Mechanism Design process is greater than my satisfaction with the old process	-0.32	42%	58%	19

Since the pilot only ran once in one program, the number of PIs responding is small. Once again, approximately three-quarters of respondents felt that the process was conducted fairly but fewer than half thought that the written reviews that they received were thorough. Only 19 of the respondents were able to compare the mechanism design pilot to the normal panel review process used by Sensors and Sensing Systems. Among these, more than half were more satisfied with the traditional process than the Mechanism Design process.

The 19 respondents who had submitted proposals to Sensors and Sensing Systems both before and during the mechanism design pilot were asked which process they preferred along the same six dimensions as considered in the "One-Plus" case. The number of respondents is too small to provide statistically robust results and so the responses are not plotted. Along all of the dimensions, at least 8 of the respondents had no preference, 8 or fewer preferred the traditional approach and 3 preferred the mechanism design approach.

The PIs were asked whether they were satisfied or dissatisfied with a number of aspects of the Mechanism Design review process. The results are shown in **Figure 21.7**.

Figure 21.7



The Impact of Proposal Deadlines

Many NSF programs have deadlines or target dates for the submission of proposals. Some NSF programs do not have submission deadlines or target dates; instead, proposals can be submitted for review at any time.

Approximately 2,800 respondents said that they had submitted proposals to programs without submission deadlines. Amongst other things, they were asked to say whether they were satisfied or dissatisfied with the timeliness of the decision to award or decline funding. 44% were satisfied, 30% were neither satisfied nor dissatisfied, and 26% were dissatisfied. It is interesting to compare this with the response to the same question by all PI respondents, regardless of the nature of the program to which they were submitting. In that case, there was a lower level of satisfaction with the timeliness of decisions, 34% were satisfied, 28% were neither satisfied nor dissatisfied, and 38% were dissatisfied.

Another type of comparison that can be made between PIs who submitted proposals to programs without submission deadlines and the general population of PI respondents is the distribution of

time that PIs spent preparing a single proposal. **Figure 21.8** plots the distribution for all PIs who responded, regardless of the type of program to which they were submitting proposals (approximately 23,000 respondents, blue) and the distribution for PIs submitting to programs without deadlines (approximately 2,800 respondents, red).

Figure 21.8

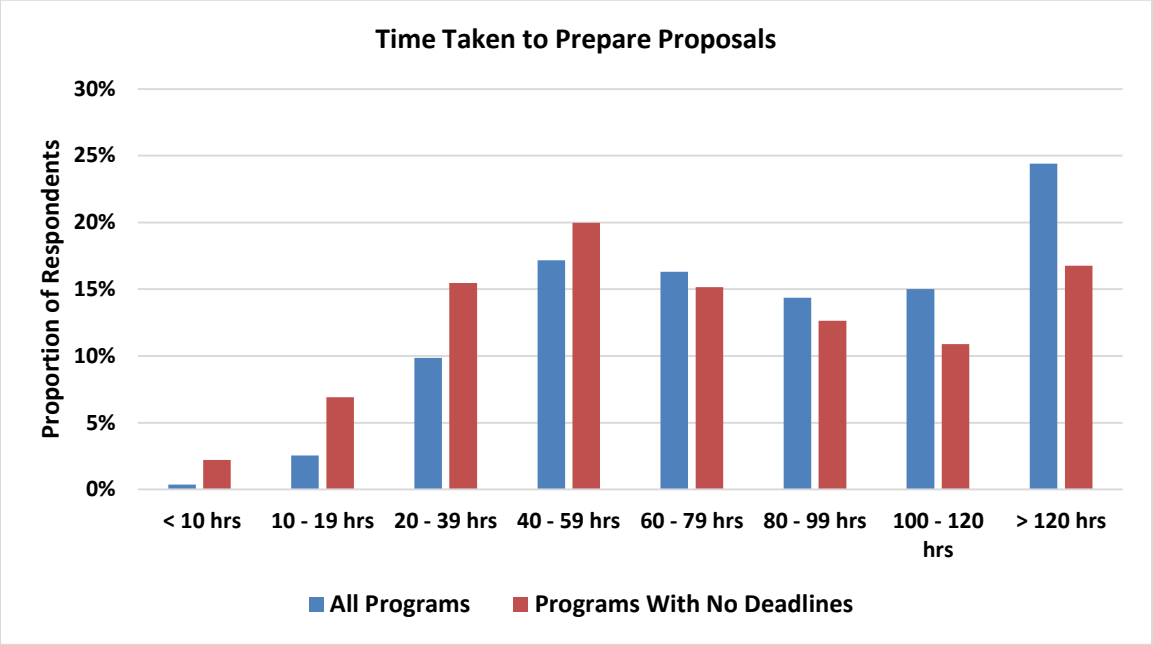


Figure 21.8 suggests that, in general PIs submitting proposals to programs without deadlines require less time to prepare each proposal than PIs submitting to programs with deadlines. However, this result does not include any attempt to normalize for domain of research, whether the proposing team is disciplinary or interdisciplinary, or other factors that might affect preparation time. For example, some cross-directorate solicitations have proposal deadlines, complex proposal formatting requirements, and call for interdisciplinary project teams.

PIs submitting to programs with no deadlines were asked to indicate whether they agreed or disagreed with a number of statements related to their perception of the quality of the review process. They were asked to rate each statement on a four-point scale ranging from -2 (strongly disagree) to +2 (strongly agree). For each statement, the respondent also had an option of indicating that the statement was not applicable. The number of respondents who found the statements applicable was between 2,224 and 1,867. (Some were only displayed to PIs who had submitted proposals both to programs with deadlines and programs without deadlines.) The statements, the average of the reviewers' responses, the percentage who agree and disagree, and the number of respondents who found each statement applicable are shown in **Table 21.5**.

Among PIs submitting proposals to programs without deadlines, there was more satisfaction with the fairness of their treatment and the quality of the reviews than was the case for PIs submitting to all programs. Approximately as many people agreed as disagreed with the statement that not having submission deadlines decreased the time that they spent preparing proposals in a calendar year. Two-thirds of respondents did not agree that not having deadlines reduced the time to

decision. This could be because they thought that whether or not a program had deadlines made little difference to the time to decision or because they thought that it increased the time to decision. The former seems more likely, given that approximately three-quarters of respondents were satisfied or neutral about the timeliness of decisions.

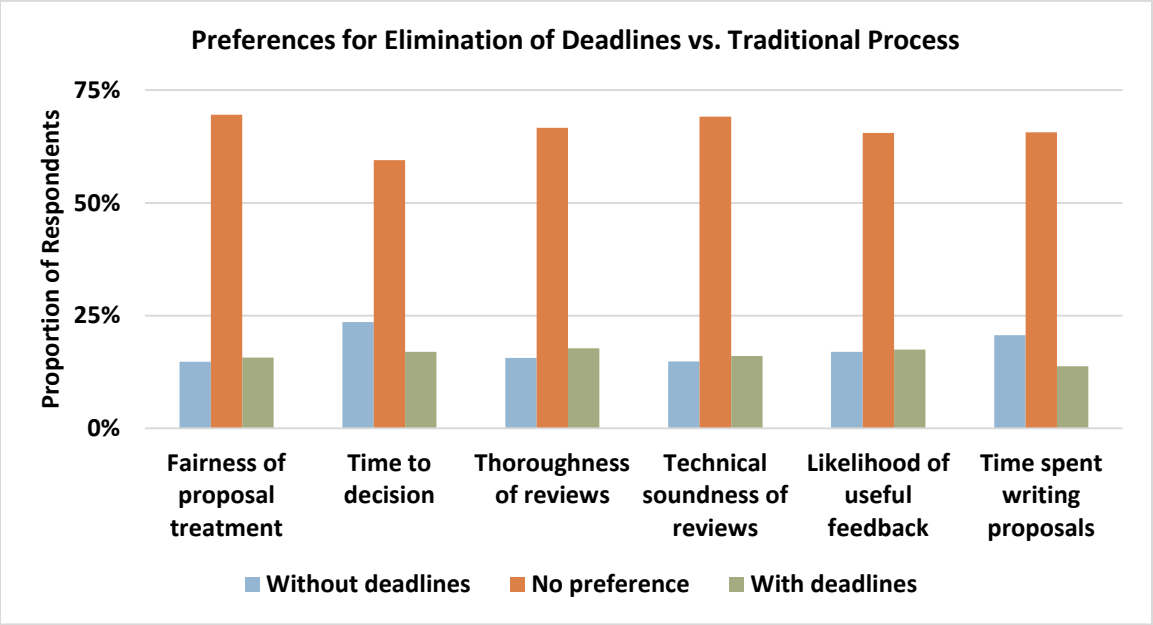
Table 21.5

Statement	Average Response	% Agree	% Disagree	# Responses
A. Researchers submitting proposals were treated fairly	0.78	82%	18%	2205
B. Written reviews were thorough	0.35	66%	34%	2224
C. Written reviews from were technically sound	0.44	70%	30%	2209
D. The panel summary or summaries (if applicable) were of high quality	0.41	67%	33%	2151
E. The information regarding the outcomes of the competition was of high quality	0.60	75%	25%	2101
F. The PO comments I viewed in FastLane helped me understand the decision to decline or award my proposal	0.99	83%	17%	2218
G. The conversations (email, phone, face-to-face) I had with my program officer provided me with helpful feedback about my proposal	0.36	67%	33%	1867
H. The merit review process with no submission deadlines provided feedback that I could use to improve my future proposals	0.64	76%	24%	2224
I. Not having submission deadlines decreased the time I spent preparing proposals in a calendar year	0.11	53%	47%	2039
J. Not having submission deadlines decreased the time between submitting my proposal and receiving a decision about whether or not it would be funded	-0.39	34%	66%	2193
K. Overall, my satisfaction with a merit review process **without** submission deadlines is greater than my satisfaction with a merit review process **with** submission deadlines	0.09	51%	49%	2094

Approximately 2,550 PIs who had submitted proposals to both programs without deadlines and programs with deadlines were provided with the opportunity to indicate which they preferred. The results are shown in **Figure 21.9**.

In all but one dimension, 66% or more of the respondents had no preference. In four of these the proportion of PI respondents who preferred programs without deadlines was similar to the proportion that preferred programs with deadlines, approximately 1 in 6 or fewer. In the fifth, the 'Time spent writing proposals', 21% of respondents preferred programs without deadlines, 14% preferred programs with deadlines and 66% had no preference. In one dimension, "Time to decision", the proportion with no preference was lower, 59%, although still relatively large, and again programs without deadlines were preferred over programs with deadlines by 24% to 17%.

Figure 21.9



It seems that the use of programs without deadlines significantly decreases the workload of NSF staff and reviewers (see **Section IV.F**) without being perceived negatively by the community of researchers submitting proposals to NSF.

21.4 Data Management Plans and Areas for Improvement

All survey respondents were provided an opportunity to provide input on the impact of NSF's requirement that data management plans be included in proposals and to identity what aspect of the merit review process it would be most useful to improve.

Data Management Plans

Respondents were asked whether they agreed or disagreed with the following statement, "The requirement for a data management plan in proposals has increased the likelihood that I will contribute annotated data to a long-term archive." Just over 31,000 people responded. 59% disagreed, 21% agreed and 19% neither agreed nor disagreed.

Areas for Potential Improvements in the Merit Review Process

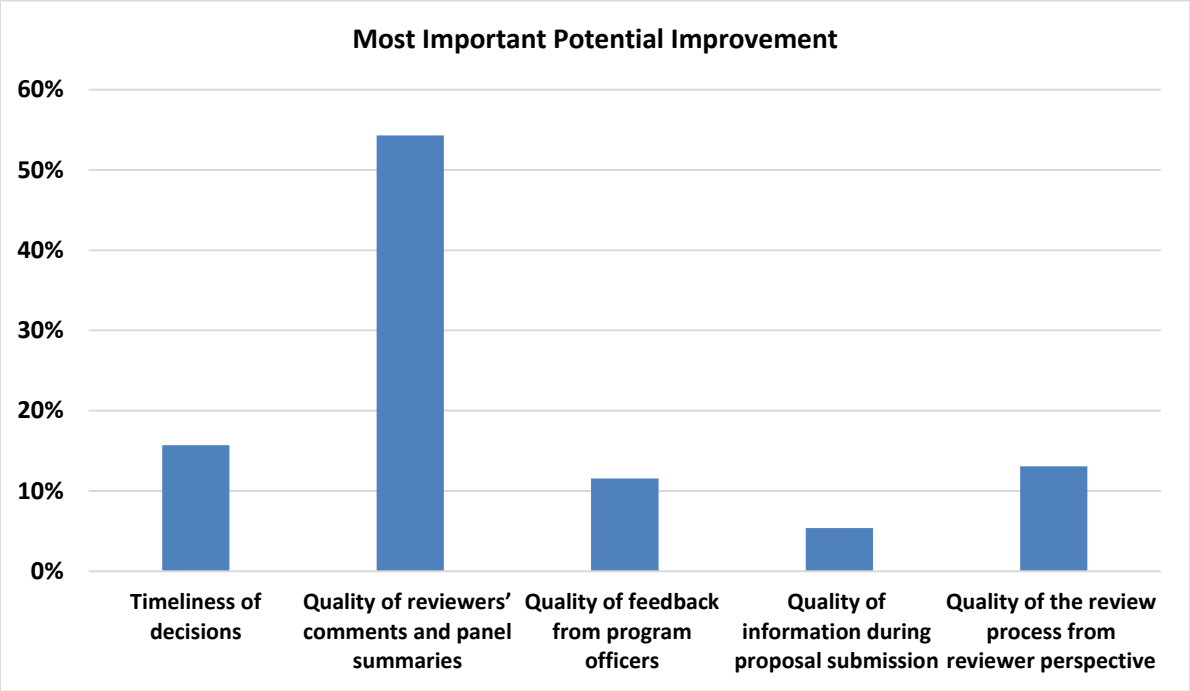
After answering questions about their experiences as PIs, reviewers, or both, respondents were asked the following question:

"In your opinion, improving which **one** of the following factors in that process will have the most significant effect in fostering the progress of science? Select one.

- Timeliness of decisions about, and responsiveness to, proposals by NSF staff;
- Quality of feedback to PIs in the form of reviewers' comments and panel summaries;
- Quality of PI conversations with, and written comments from, program officers;
- Quality of information available during proposal submission;
- Quality of the review process from the perspective of a reviewer."

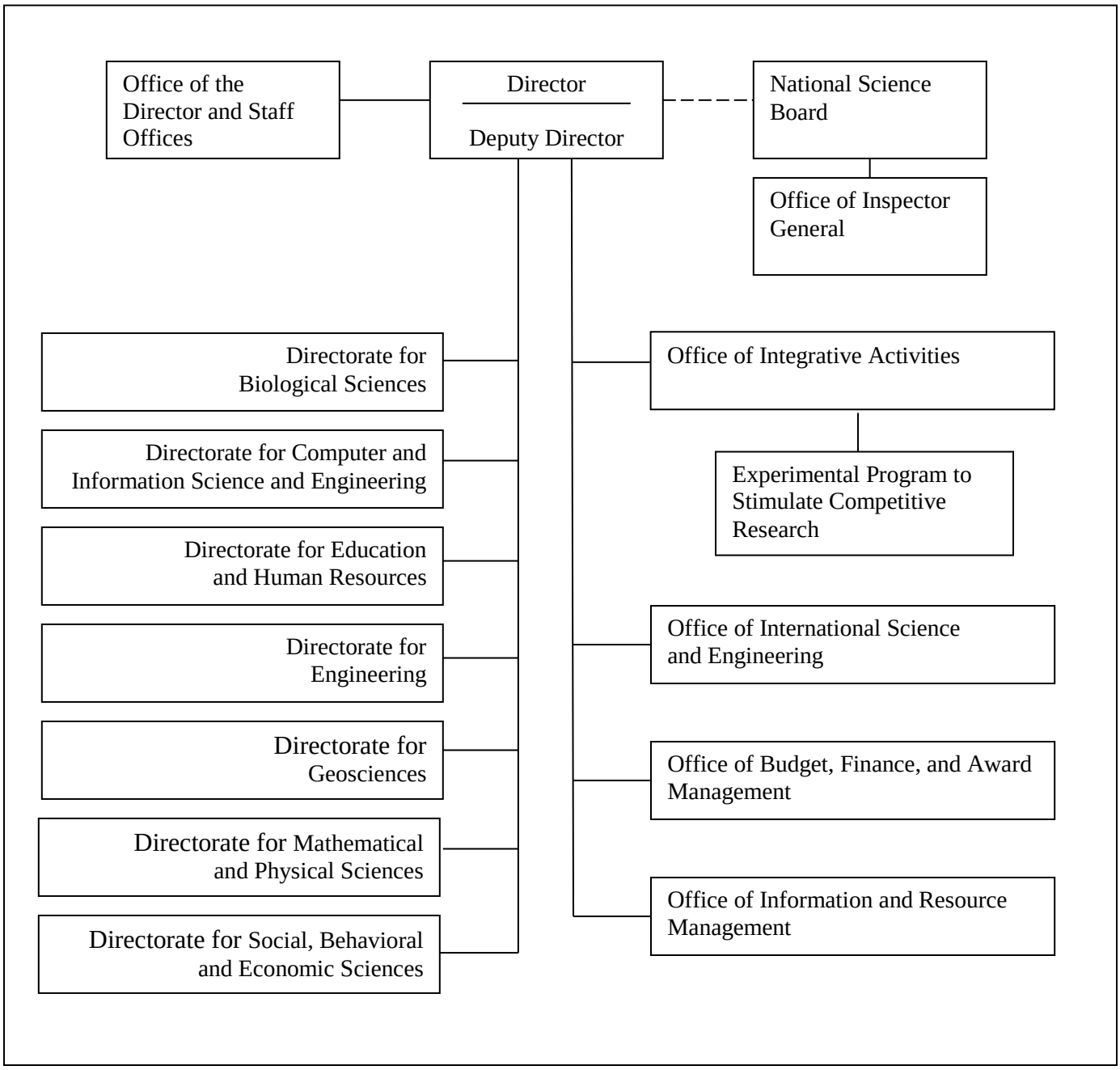
A little under 31,000 people responded. The results are plotted in **Figure 21.10**.

Figure 21.10



Among the five possible improvements, there was a clear preference for one. More than half of the respondents said that improving the quality of the feedback in reviewers' comments and panel summaries would be the most significant improvement.

Appendix 22 - National Science Foundation Organization Chart*



* The figure shows the organizational structure in place at the end of FY 2015. 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

Acronym	Definition
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 12th 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