

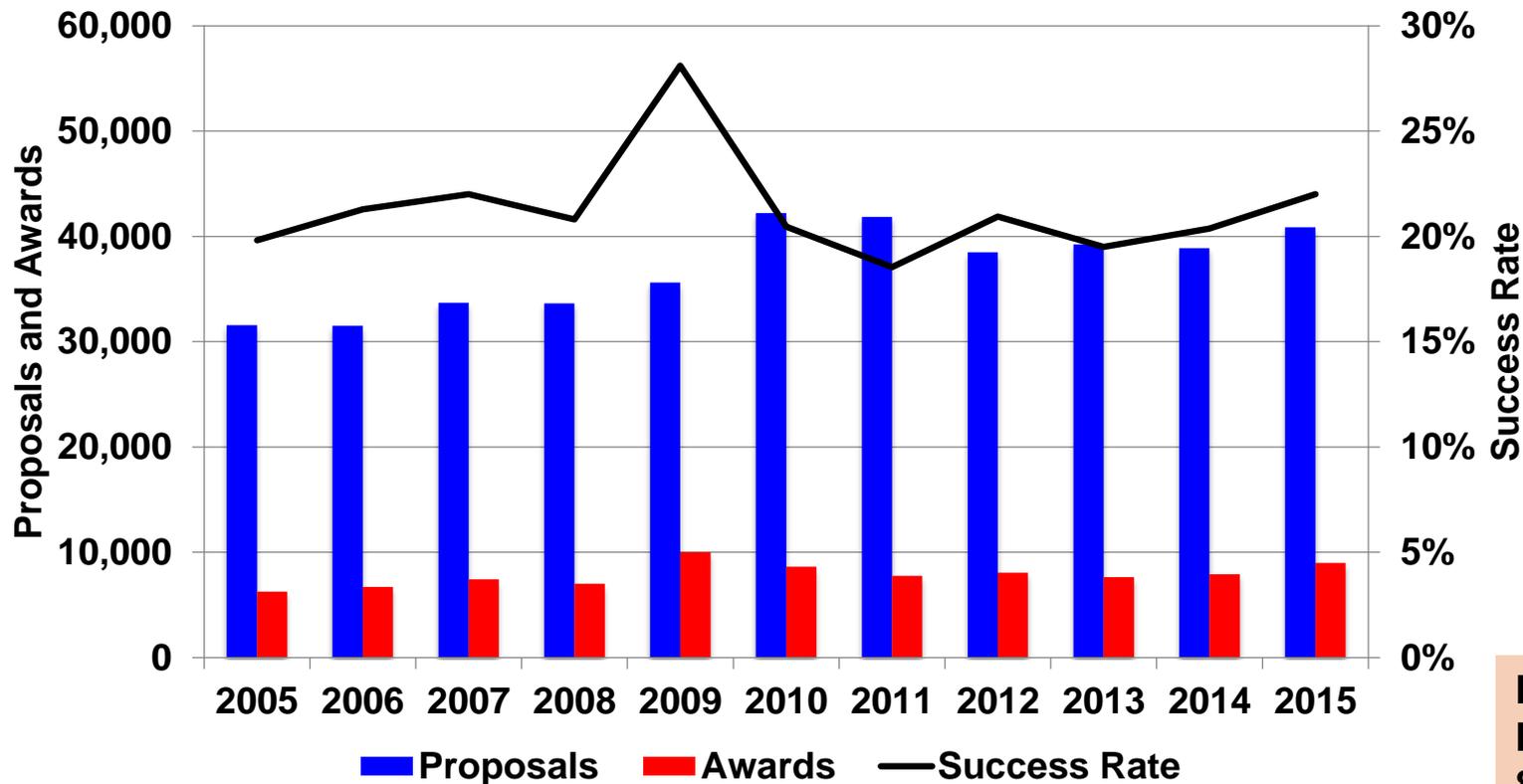


NSF's Merit Review Process

Briefing to AC-MPS
November 17, 2016

BASIC INFO

Research Proposals, Awards and Success Rate, by Fiscal Year

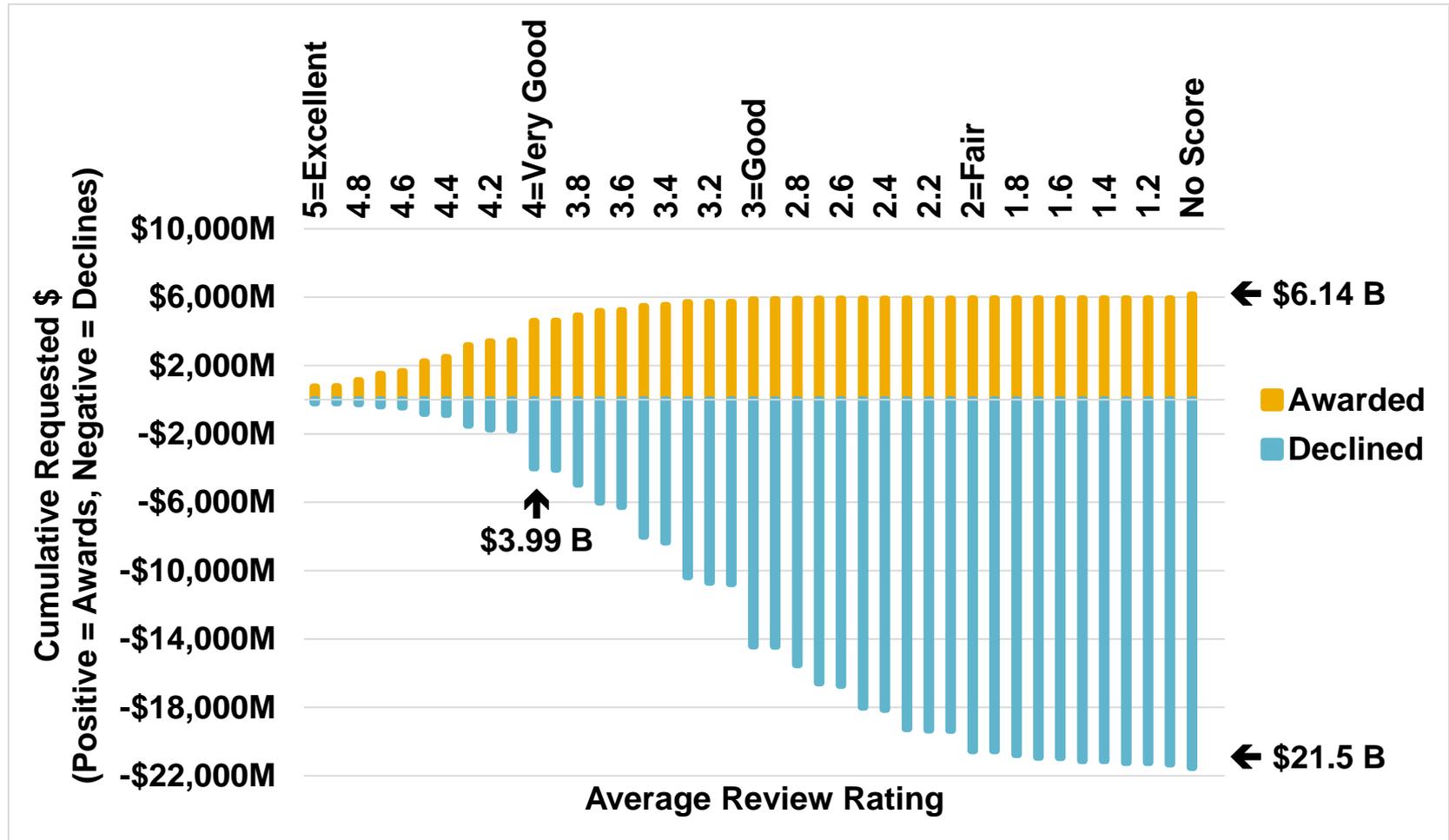


Preliminary
Proposals: 4200
80% IOS & DEB

Research proposals and awards. (Excludes: centers and facilities, equipment and instrumentation grants, conferences and symposia, Small Business Innovation Research grants, Small Grants for Exploratory Research (through FY 2009), and education and training grants)

* FY 2009 and FY 2010 include American Recovery and Reinvestment Act awards.

Cumulative Requested Amounts for Awarded and Declined Proposals by Average Reviewer Rating, FY2015



Median and Mean Annualized Award Amounts for Research Grants, (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
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

 Largest
 Smallest
 MPS

Success Rates by Directorate

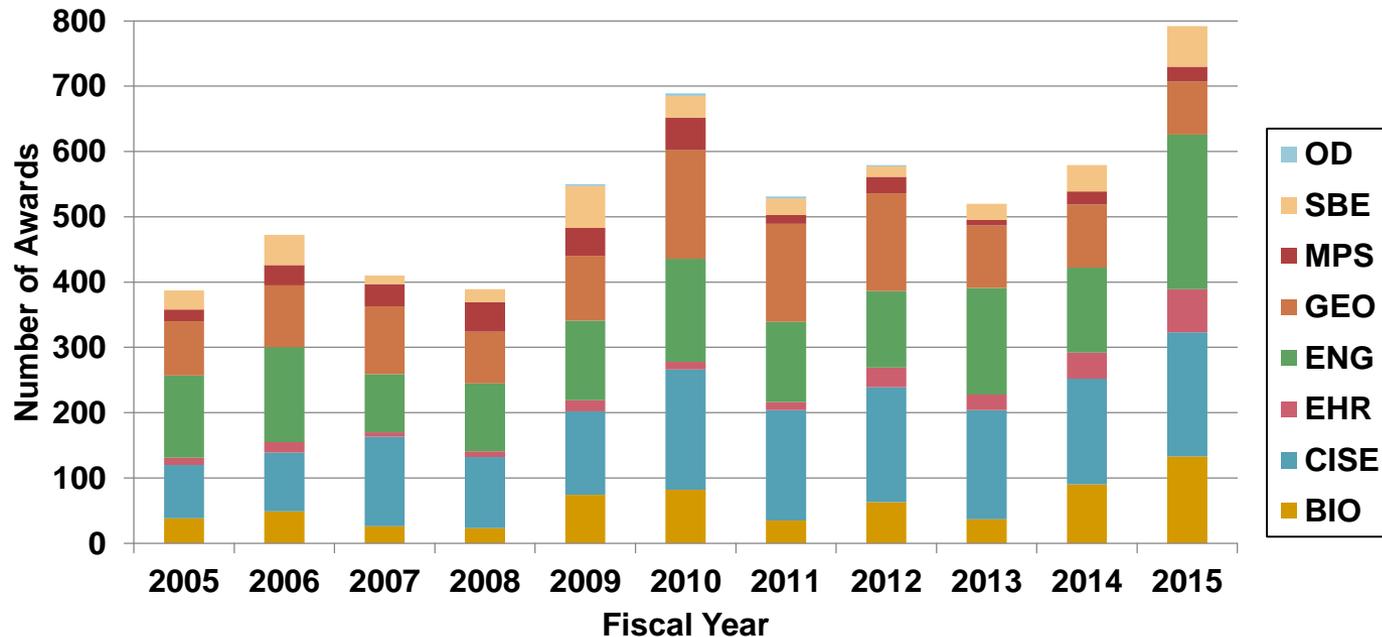
RESEARCH GRANTS: # PROPOSALS, # AWARDS & SUCCESS RATE, BY DIRECTORATE

	FY2015 Proposals	FY2015 Awards	Success Rate FY15	FY 2015 – FY 2004 R&RA (real \$)
BIO	4300	1030	24%****	+1%
CISE	7621	1589	21%	+24%
ENG	9332	1851	20%	+30%*
GEO	5299	1239	23%	+0.7%**
MPS	8061	2050	25%	+1.6%
SBE	2990	639	21%	+15%***

* SBIR/STTR excluded; ** OPP included; *** SRS / NCSES excluded

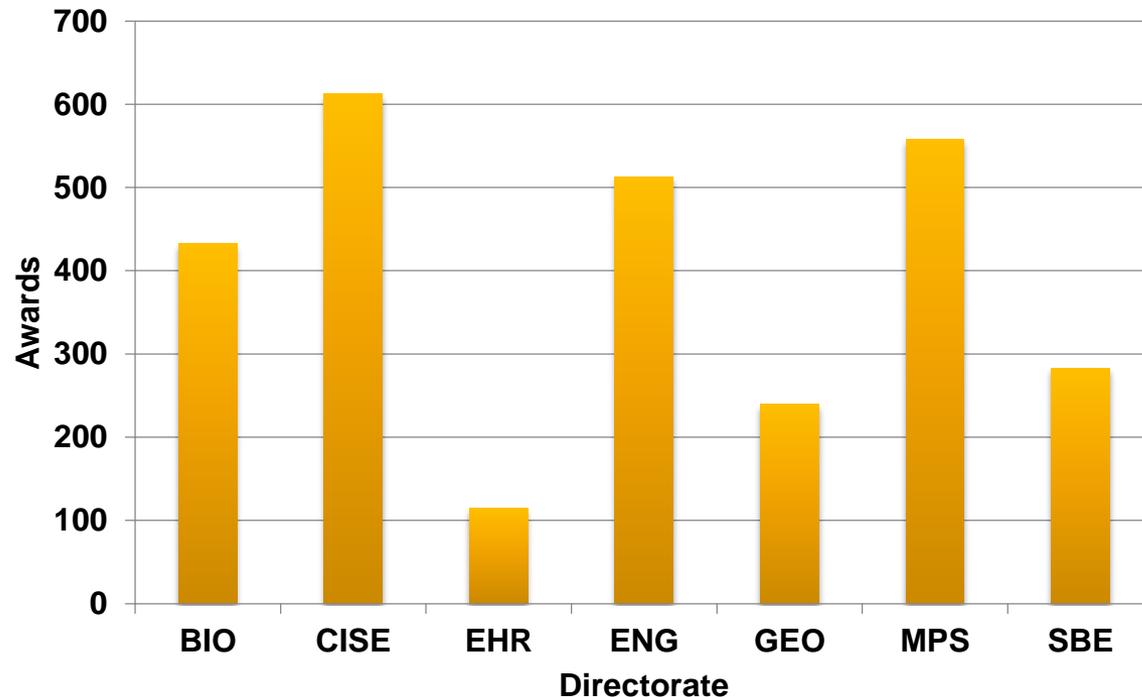
**** Does not account for preliminary proposal pilot in DEB & IOS

SGER, EAGER and RAPID Awards, by Directorate or Office



EAGERS & RAPIDS	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

FY 2015 Research Awards Co-funded by Divisions



1,125 co-funded research awards – approx. 12.5% of FY 2015 research awards.

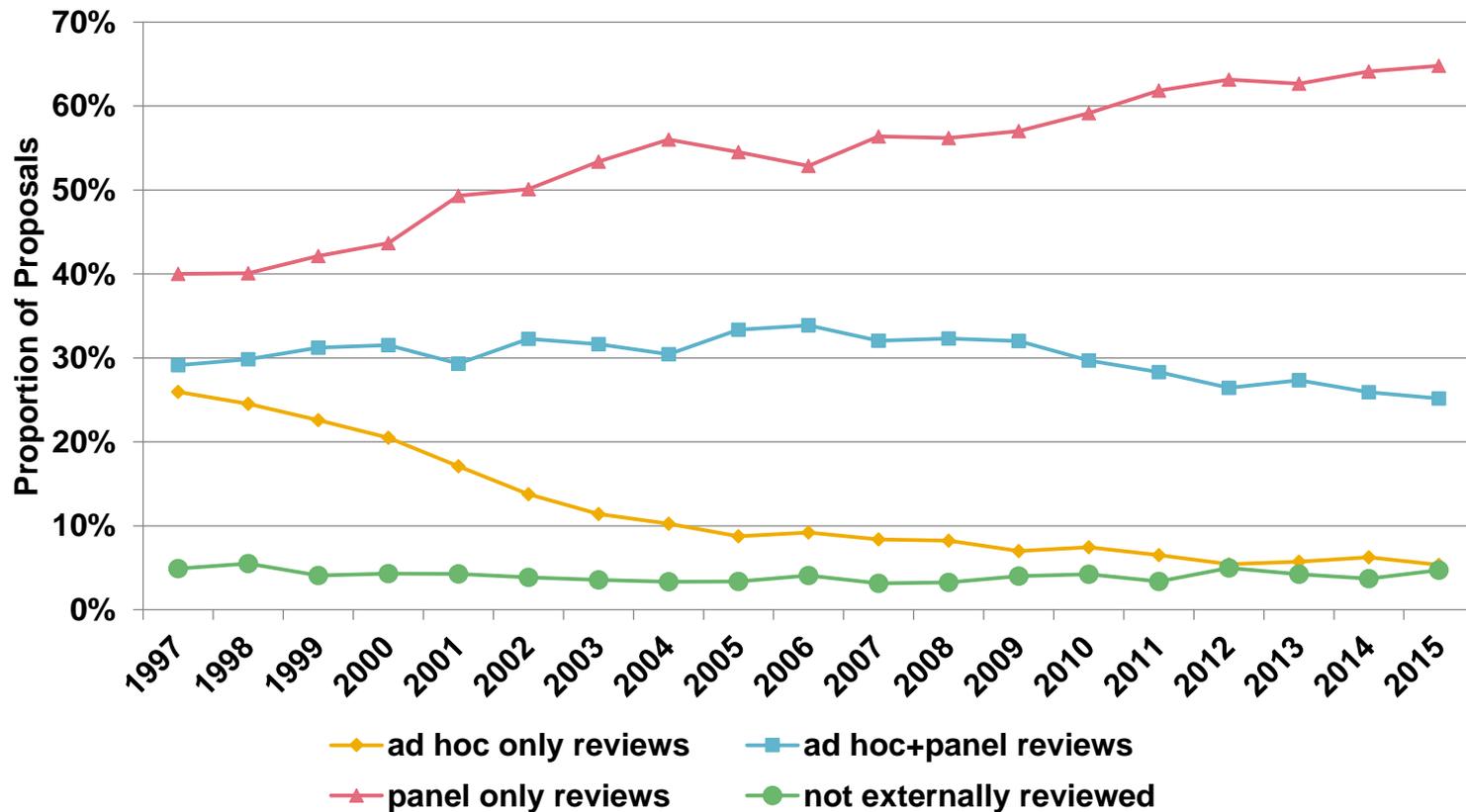
437 of these awards are co-funded wholly within a directorate.

Average number of contributing divisions is 2.4

REVIEW PROCESS

Review Methods & Reviews/Proposal

	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



REVIEWERS

Numbers of reviewers: FY 2015 c.f. FY 2001

	Total Reviewers	Ad hoc Reviewers	Panelists	Not a previous reviewer	Proposals
FY2001	50,683	44,726	10,052	~9,000	30,829
FY2015	35,462	24,290	13,810	7,406	47,282

Reviewer effort:
355 - 375 person-years

PI effort preparing research proposals:
1700 - 1800 person-years

Survey: Workload

	Mininum	NSF Average	Maximum
Review a Proposal	2.7 hours (EHR)	3.9 hours	4.9 hours (GEO)
Prepare a Full Proposal	80 hours (SBE)	84.5 hours	91 hours (BIO)

89% of just under 24,100 responding reviewers reported doing some or all of their review preparation outside their normal working hours

**76% of approx. 23,400 responding PIs submitted 1.5 or fewer proposals/year
7% submitted more than 2.5 proposals/year**

Merit Review Pilots (FY 2012 – FY 2015)

Pilot	Nature of pilot	Units participating
Virtual Panels	Expanded use of review panels in which all panelists participate electronically from distributed locations (e.g., 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
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	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
Umbrella-Amendment Solicitation	A flexible solicitation mechanism that accommodates both overarching, long-term goals and the ability to be responsive to changing community requirements. Used to implement a community-developed infrastructure.	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. Ad hoc reviews are 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

Merit Review Pilot: Impact of Eliminating Program Deadlines [Division of Earth Sciences]

Proposals received by EAR/IF before and after transition to no deadlines

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

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

	2013	2014	4/9/2015 to 4/9/2016
Geobiology & Geochemistry	203	214	83
Sed. Geol. & Paleobiology	214	217	119
Geomorphology	157	137	68
Hydrologic Sciences	261	237	97

Merit Review Survey (Fall 2015)

Respondents: 34,835 (26% PIs only; 27% reviewers only; 47% both)

11% soft money researchers [88% answered]

90% worked in higher education [87% answered]

64% tenured

41% full prof., 25% associate prof., 20% asst. prof.

85% / 81% / 78% provided gender / race / ethnicity

31% Women

6% Hispanic

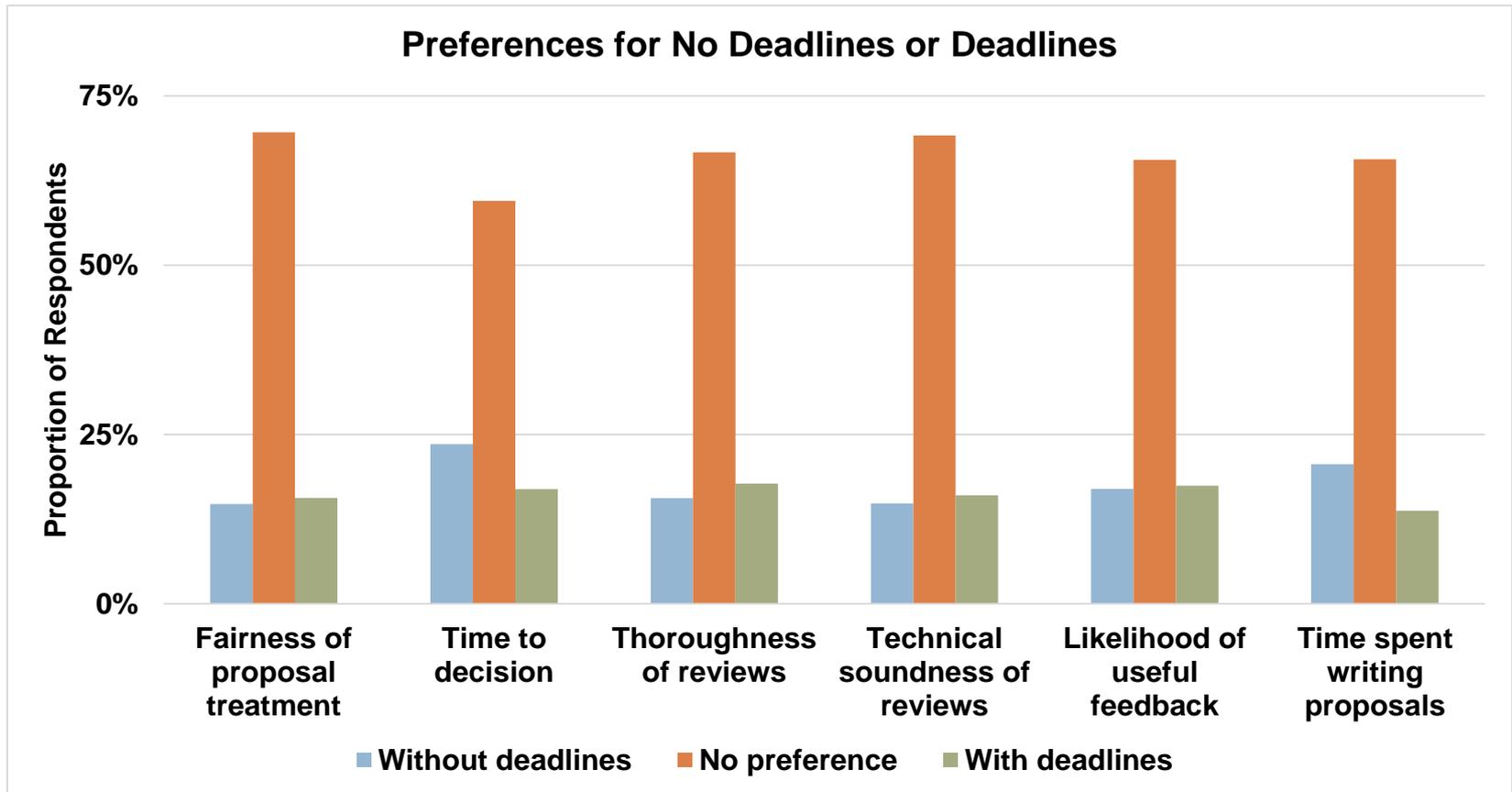
81% White

15% Asian

3% Black/African-American

1% American Indian/Alaska Native

Survey: Deadlines vs. No Deadlines



Having no deadlines is not a problem for PIs (n = 2549 – 2569)

Virtual Panels

Increase the use of virtual panels in place of face-to-face (F2F) panels.

POTENTIAL IMPACTS:

Broadens participation in reviewer pool; decreases reviewer time commitment; increases flexibility in panel implementation; cost savings

After several years of small experiments, began pilot in FY 2012

- Impacts depend on size of virtual panels used and size of panels being replaced
- Technology and social science support smaller virtual panels
- Recommendation was to use small virtual panels (6 or fewer panelists)

FY2011: Virtual = 1% of paneled proposals

FY2015: Virtual = 12% of paneled proposals
(24% of proposal panels)

Virtual Panels: Potential Impacts

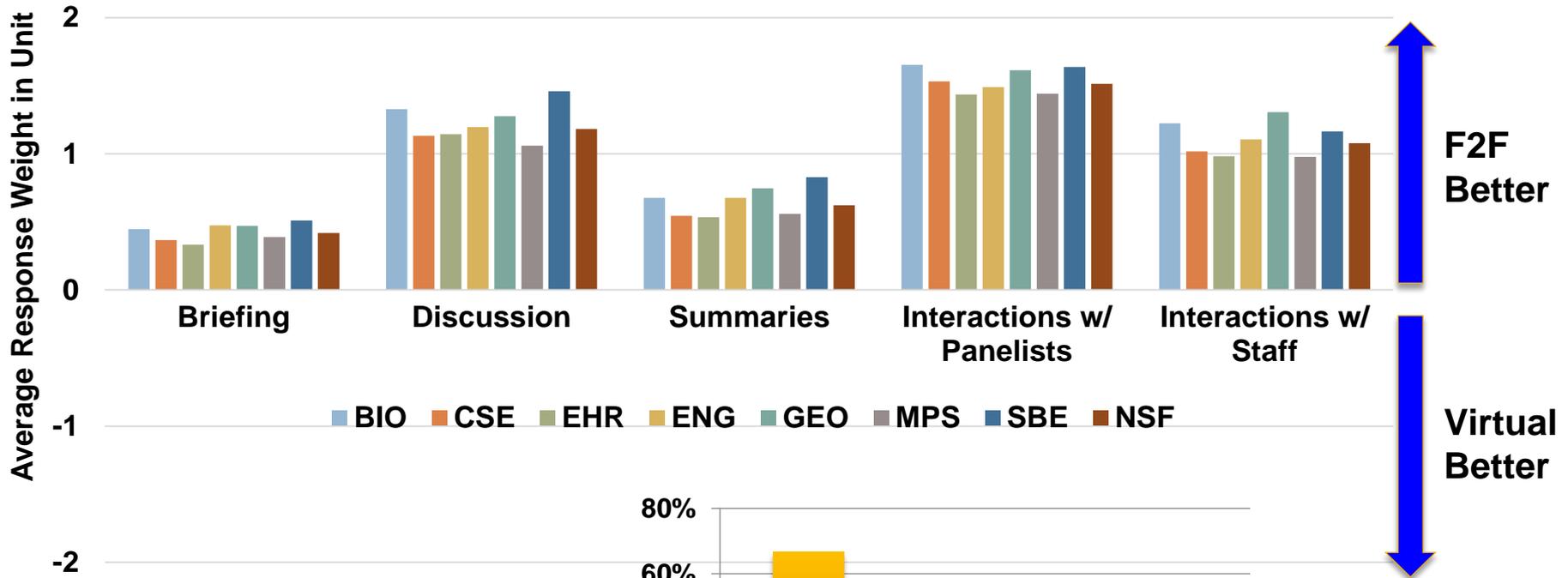
- Broadens participation in reviewer pool
 - Yes. See increased participation by women
- Decreases reviewer time commitment
 - Yes. Reviewers appreciate not losing time to travel.
- Increases flexibility in panel implementation
 - Yes. Some panels are being scheduled with one-day breaks; smaller, shorter panels are being used.
- Cost savings
 - Yes. Panel cost per proposal has declined.

Also seeing:

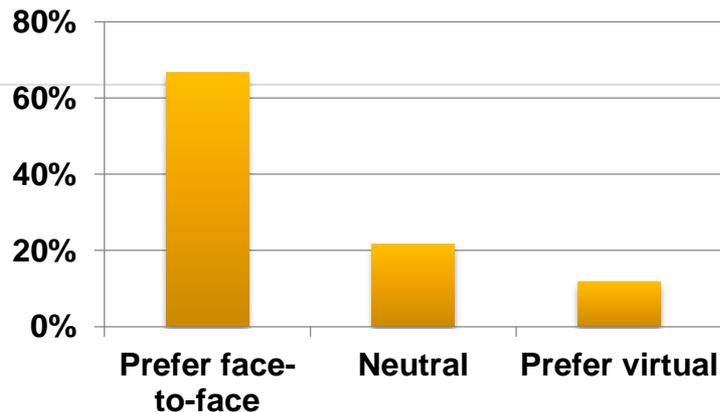
- Reduction in opportunity to network
- Some panelists are more distracted by teaching and admin work
- Technology glitches – for example, bandwidth problems over poor wifi connections

Survey: Virtual Panel Pilot

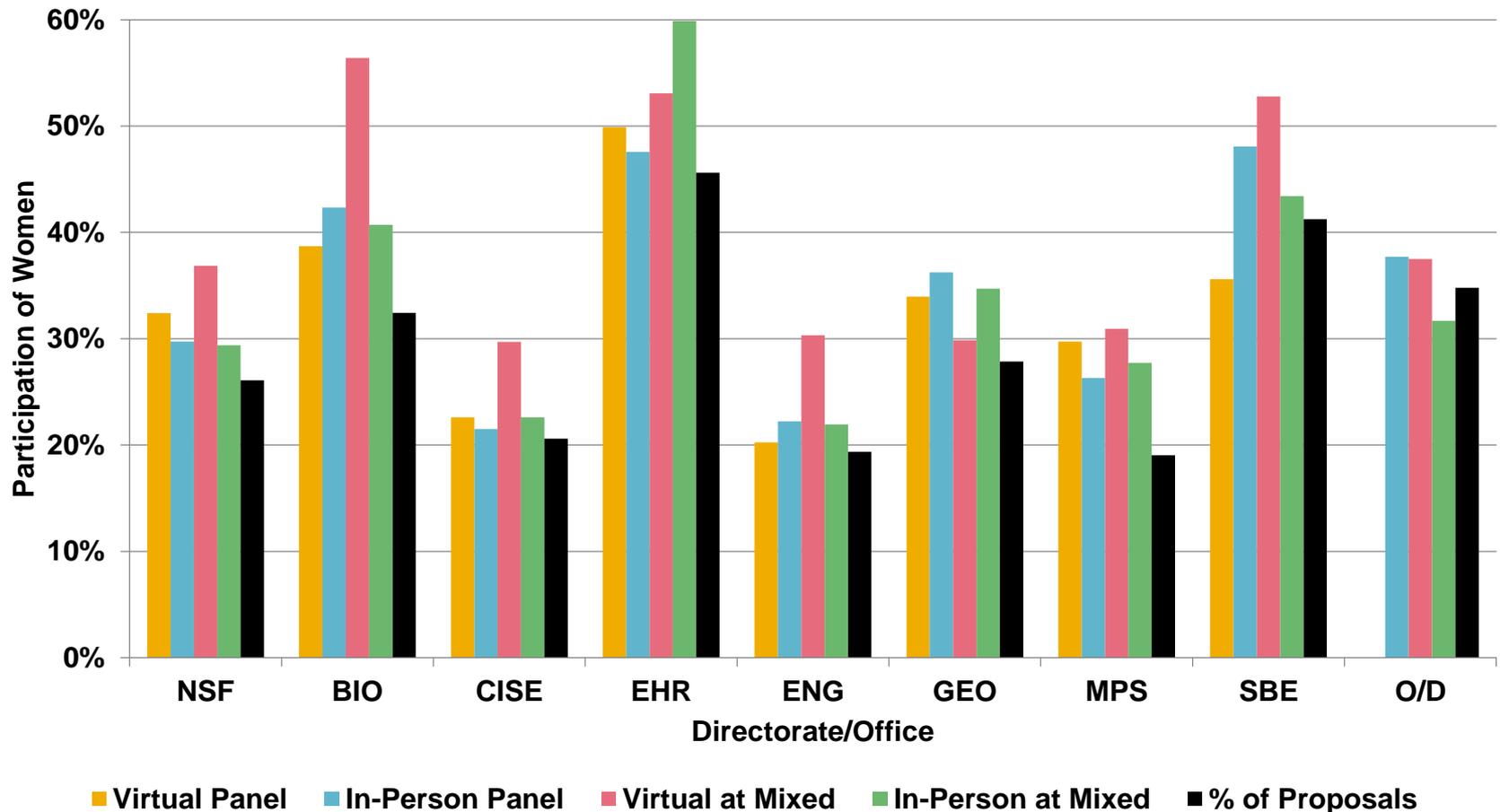
Comparison of Experiences as Virtual and Face-to-Face Panelist



Overall Satisfaction:
 67% prefer F2F
 (n = 3180)



Participation of Female Reviewers in Virtual, In-Person, and Mixed Panels during FY 2015



Merit Review Pilot: College of Reviewers (COR) [Perception, Action and Cognition Program]

Membership: ~100

Process:

- Semi-annual review cycle
- 3 ad hoc reviews per proposal – COR enhances return rate
- Decline those without at least one E or 2 VGs
- Panel review for the remainder – better discussions

Assessment:

- **Panelists:** better discussions, better review quality
- **COR members:** all but one willing to continue
- **COV:** “seemed to provide a means of calibration for evaluating the proposals and therefore increased level of consistency in the reviews across proposals,” “should be continued “

Asynchronous Reviewer Discussion

Reviewers are assigned to a proposal. Each submits an independent written review. Reviewer can then see the other written reviews and begin a discussion of the merits of the proposal with the other reviewers on a secure bulletin board.

At the end of the discussion period, the scribe prepares a summary.

Asynchronous discussions amongst reviewers can be used in different ways:

- Augmenting an ad hoc review
- As a different form of panel discussion
- As a precursor to a regular panel

POTENTIAL IMPACTS:

- Adds opportunity for ad hoc reviewers to reconcile contrasting views.
- Helps identify proposals needing more or less discussion during panel.
- Provides a more thorough review.

Asynchronous Reviewer Discussion: Results so far...

FY 2013: Piloted by ~9 panels using SharePoint

- 7 used asynchronous discussion, then virtual panel;
- 2 used asynchronous discussion, then in-person panel
- Program officers and panelists liked the concept, found it made the panels more efficient, hated the technology.

FY 2015: Using Interactive Panel System in place of SharePoint

- Program officer and panelists found the technology straightforward to use
- There were comments on each proposal but little discussion between panelists until the panel met

E-voting for Straw Panel Polls

- **Context:** NSF review panels group proposals into different categories of merit based on the panel discussion. Some employ a ‘straw-poll’ of panelists to get a sense of where the panel is inclined to situate a proposal.
- **Pilot:** Use a web-based voting tool for panel ‘straw-polls.’

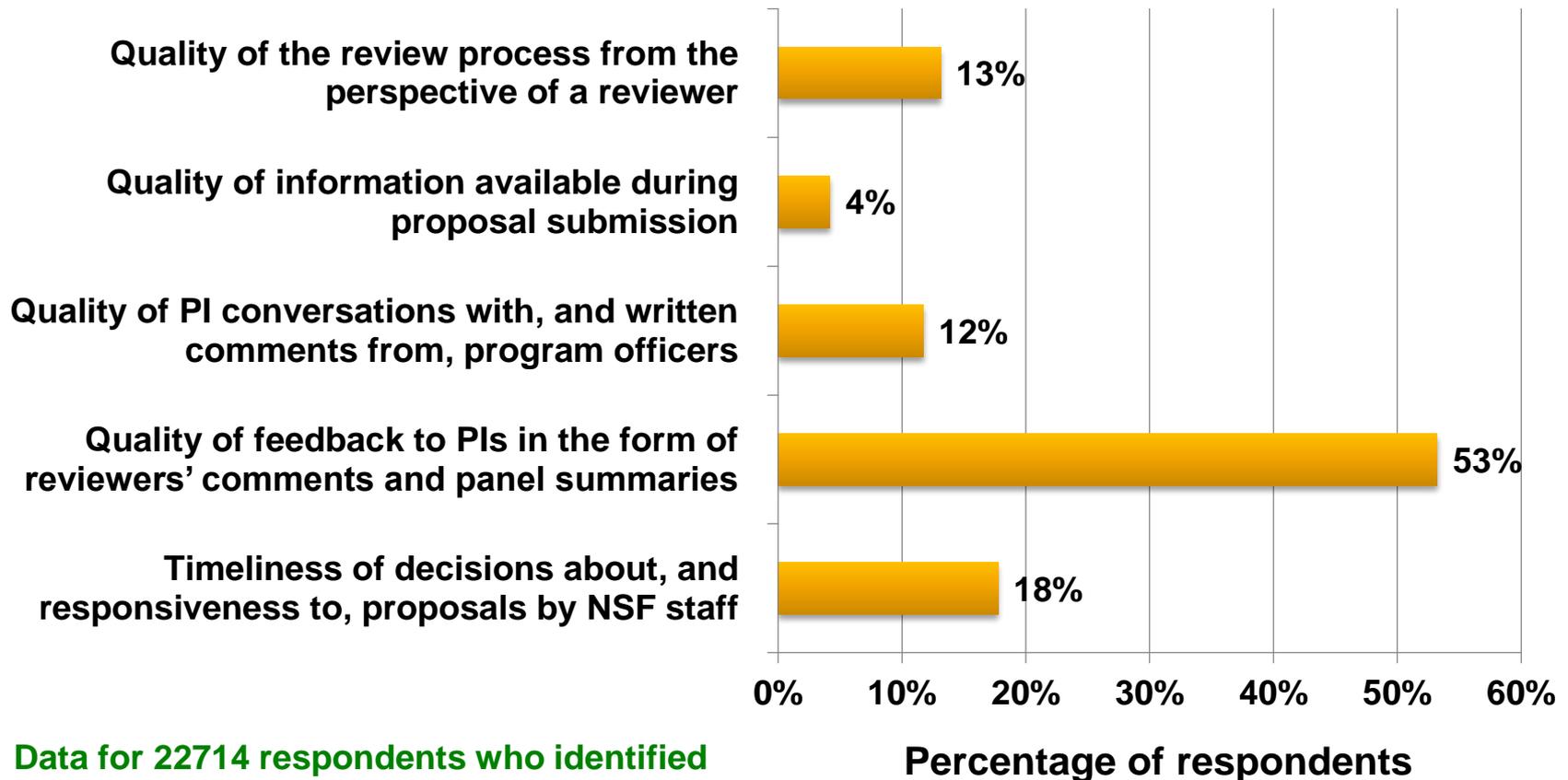
POTENTIAL IMPACTS:

Reduce time required; increase accuracy of poll (no manual recording); reduce peer pressure

Implemented by AST (Division of Astronomical Sciences):

- **Technology:** Google Form & BlueJeans
- **Found:** Impacts were as expected; saves 1 – 2 min / proposal
- **Adoption was easy; panelists and staff were positive**

Q: Improving which one of the following factors in the merit review process will have the most significant effect in fostering the progress of science?



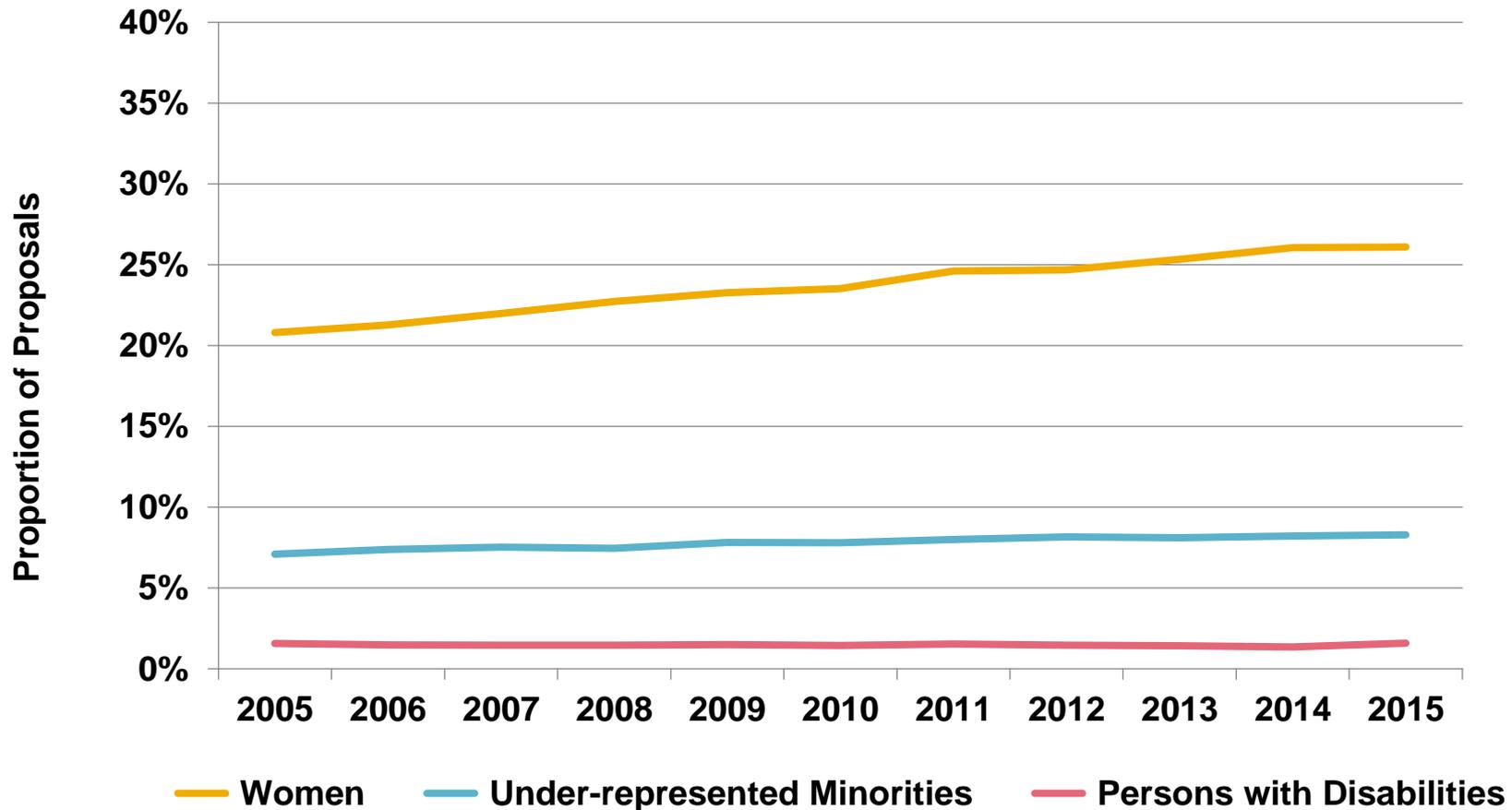
Data for 22714 respondents who identified themselves as PIs. Of these, 14,678 also served as reviewers.

Examples of COV Comments

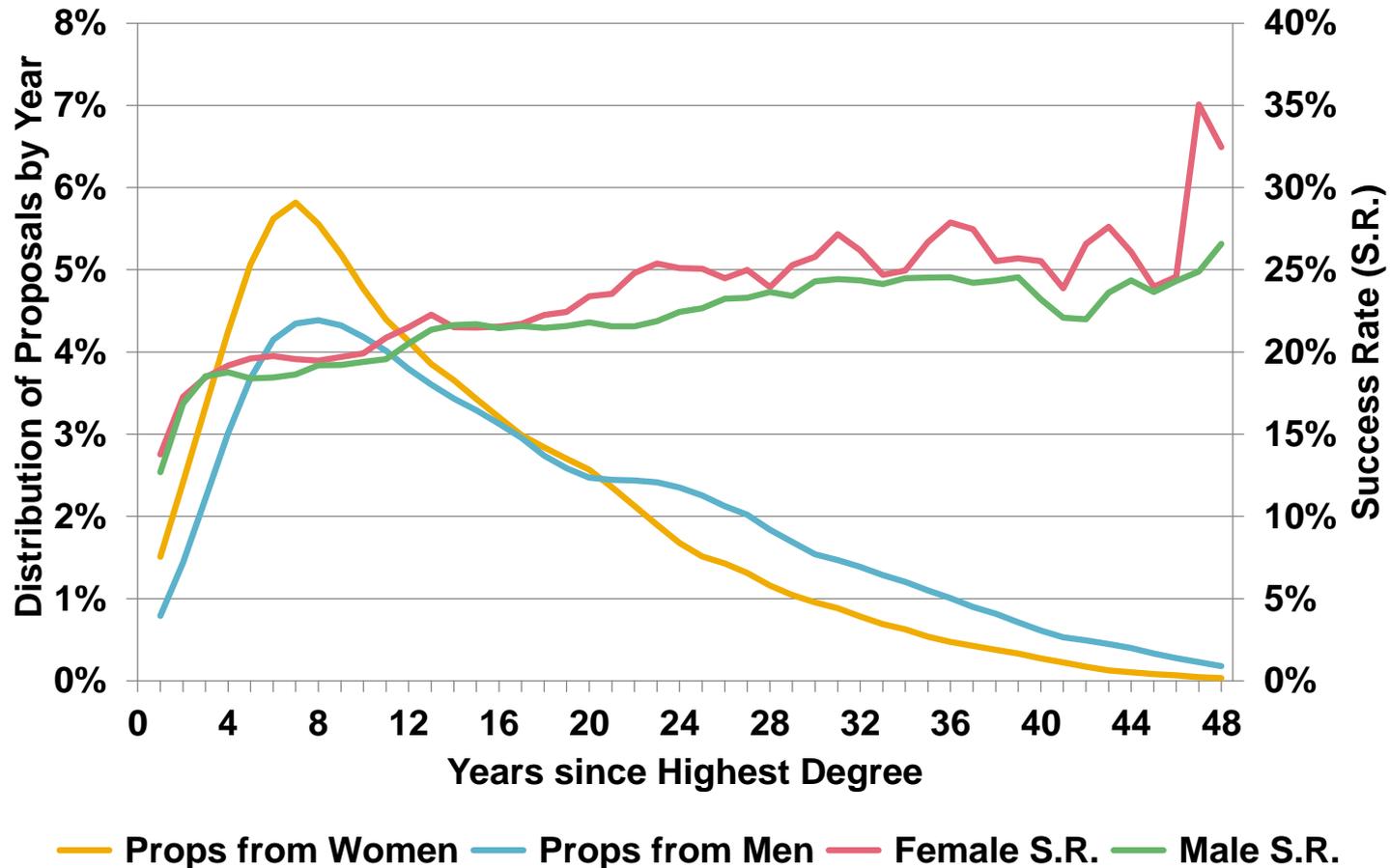
- **The COV's review of random eJackets revealed significant variability in the quality of the reviews. ... we often observed that ad hoc reviews were higher quality (in terms of substantive content or feedback provided) than those of panelists.**
- **[S]ome of the assessments were superficial and left the impression that the proposal either was not read carefully or the reviewer was not an expert in the field. A common example of a superficial assessment is summarizing the goals and objectives of the proposal without any meaningful critique.**
- **Reviews were hit or miss depending on the individual providing the review. Some reviews were not substantive, not showing how the proposal could be funded, while other reviews were detailed, insightful and extremely helpful.**
- **Most reviewers fully grasp the need to 1) clearly substantiate their comments, 2) write their review in an unbiased and professional manner, and 3) assign ratings that are commensurate with their comments ... However, there are some reviewers ... that appear to either need "coaching" or a reminder of these standard practices.**
- **The quality of individual reviews varies substantially.**
- **[T]he level of detail contained in individual reviews varied considerably, and the reviewers' use of the rating scale did not always conform to the content of their reviews. Thus, POs should explore the possibility of providing reviewers with further information about the preferred level of detail, perhaps by providing a redacted set of "ideal reviews" to serve as models, and to clarify how the rating scale should be used.**
- **There continues to be confusion among PIs and reviewers as to what constitutes broader impact.**
- **NSF and CISE have made substantial efforts to improve the understanding of the "broader impacts" criterion by PIs and reviewers, but the reviews in eJacket show that there is still great variability in its interpretation. We recommend that CISE continue its efforts to help reviewers and PIs understand what qualifies as broader impact.**
- **While the comments were substantive overall, the level of comments on the Broader Impacts could be improved for most of the proposals evaluated.**

DEMOGRAPHICS

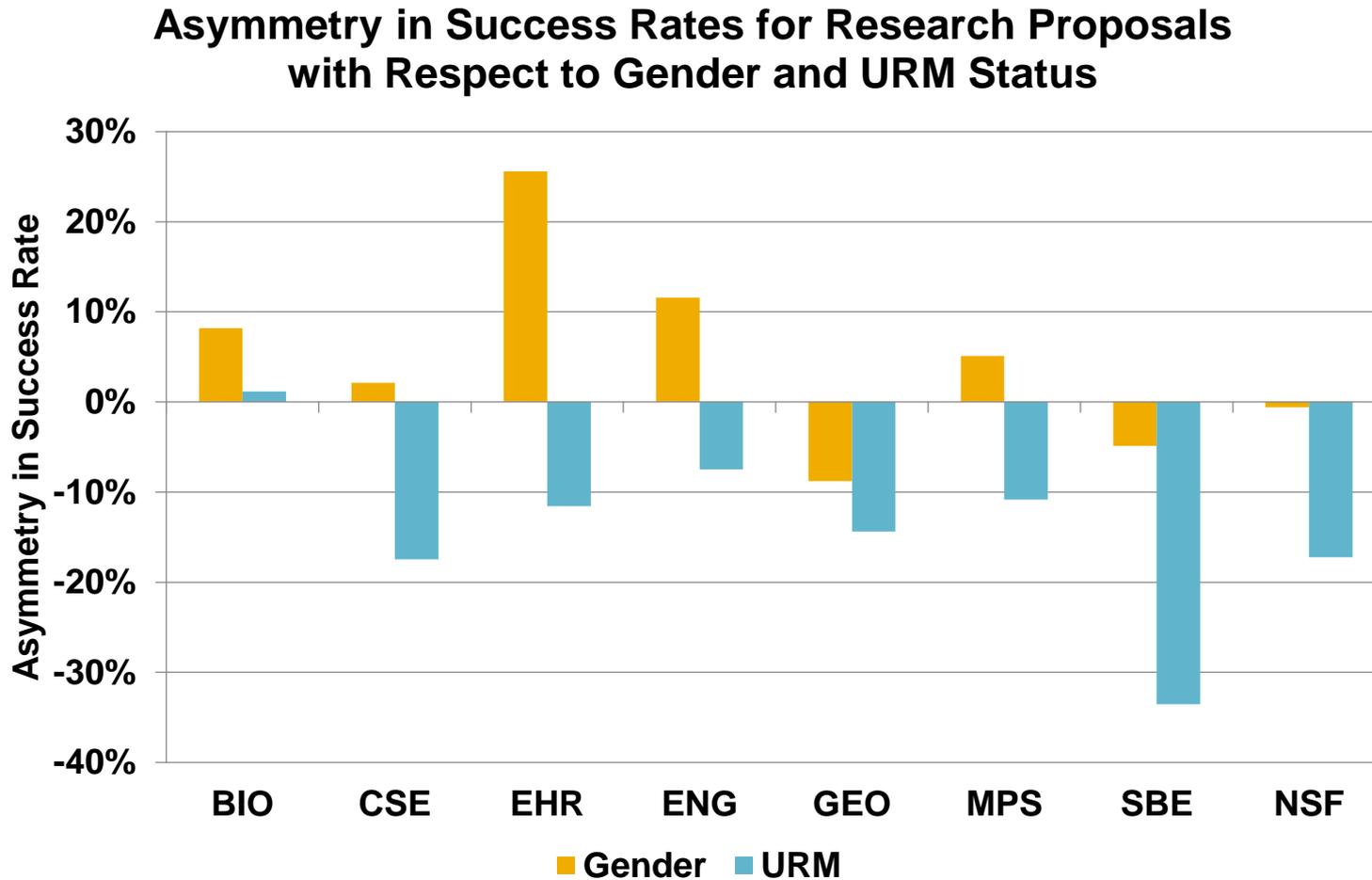
Proportions of Competitive Proposals from various Demographic Groups



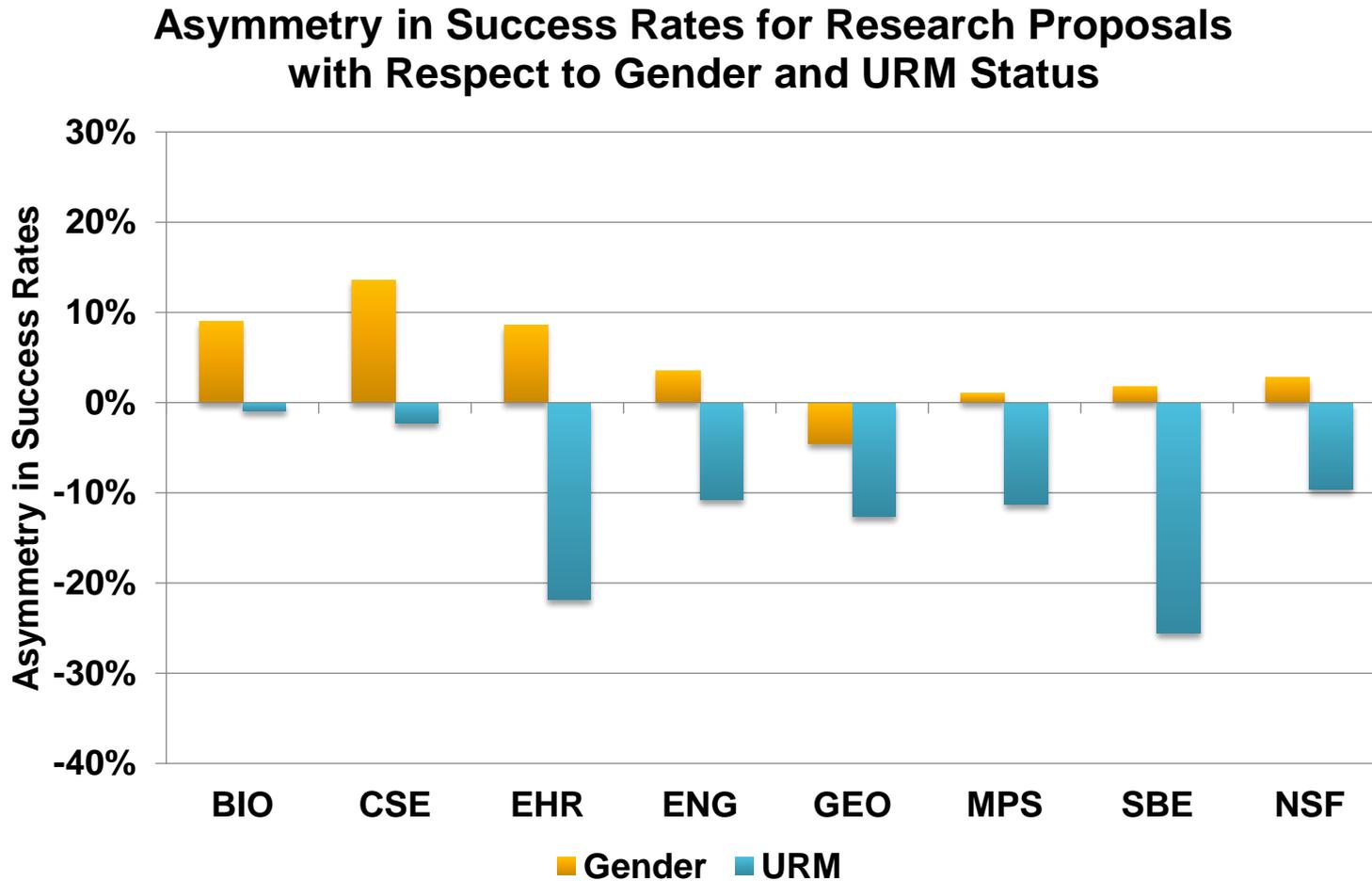
Research Proposals and Success Rates, FY 2012 – FY 2015, by Years Since Highest Degree and by Gender



Asymmetry in Directorate Success Rates for FY 2010 – FY 2014, by Gender and URM Status



Asymmetry in Directorate Success Rates for FY 2015, by Gender and URM Status



FY 2011 – FY 2012 Comparison of Reviewer Ratings from and for Different Genders

Comparison of ratings of and by women and men in Physics

Women give higher ratings to women!

	Mean	F_PI_F_REV	F_PI_M_REV	M_PI_F_REV	M_PI_M_REV
F_PI_F_REV	4.167		0.000579	0.00376	0.00306
F_PI_M_REV	3.834			0.414	0.115
M_PI_F_REV	3.888				0.638
M_PI_M_REV	3.908				

Perspectives

Creativity and Risk in Proposals Change before/after FY2012

	Reviewer	PI
Increased	9%	34%
About the Same	70%	58%
Decreased	20%	8%

Greater Potential to Advance Knowledge (Reviewer)

Interdisciplinary	54%
Disciplinary	39%
No Difference	8%

Types of Proposals Submitted (PI)

Interdisciplinary	55%
Disciplinary	72%
Disciplinary and Interdisciplinary	27%

Pessimism

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
$\leq 40\%$	1%
$\leq 30\%$	3%
$\leq 20\%$	9%
$\leq 10\%$	20%
$\leq 5\%$	20%
Always	47%

Reviewer: Intellectual Merit

Reviewers were asked what relative weights they gave to various factors when forming judgments about intellectual merit using a scale ranging from Very Low (0) to Very High (4)

	Average
Originality of the research question	3.4
Project's potential to change our understanding of an important existing scientific or engineering concept	3.4
Appropriateness of the proposed methodology	3.3
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
Likelihood that the proposed project will be completed successfully	2.9
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
Quality of the data management plan	1.6
Size of the budget	1.5

Reviewer: Broader Impacts

Reviewers were asked what relative weights they gave to various factors when forming judgments about broader impacts using a scale ranging from Very Low (0) to Very High (4)

	Average
Significance of the potential broader impacts	3.0
Clarity and detail with which the proposal explains its broader impacts	2.9
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
Project's potential contribution to enhancing local, regional or national infrastructure to support future research	2.3
Quality of the data management plan	1.5
Size of the budget	1.4

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Questions?

Steve Meacham - smeacham@nsf.gov