

**REPORT OF THE 2012 COMMITTEE OF VISITORS**  
**Research and Education Programs**  
**Division of Ocean Sciences (OCE)**  
**Years 2009-2011**

**INTRODUCTION**

The Committee of Visitors (COV) for the Biological Oceanography (BO), Chemical Oceanography (CO), Integrated Ocean Drilling (IOPD, grants program only), Marine Geology & Geophysics (MGG), Ocean Education (OE), Ocean Technology (OTIC) and Physical Oceanography (PO) programs reviewed proposal e-jackets, analyzed program data, and spoke with Program Officers (POs) and administrators on June 4-5, 2012 at NSF headquarters.

The 2012 COV members were: Dr. Robert Duce, Chair (Texas A&M University), Dr. Kelly Benoit-Bird (Oregon State University), Dr. Paula Bontempi (National Aeronautics and Space Administration), Dr. Margaret Delaney (University of California, Santa Cruz and AC/GEO Member), Dr. Steven Gaines (University of California, Santa Barbara and AC/GEO Member), Dr. Scott Harper (Office of Naval research), Dr. Brandon Jones, Environmental Protection Agency), Dr. Joseph Ortiz (Kent State University), Dr. Lisa White (San Francisco State University) and Dr. Rebecca Woodgate (University of Washington).

The charge to the COV was to review actions taken by these seven programs during the last three fiscal years (2009-2011) and to evaluate the products and contributions supported and overseen by the programs over that period. For the review of program actions, the COV was asked to examine the integrity and efficiency of the processes used to solicit, review, recommend, and document proposal evaluations, including the effectiveness of the program's use of NSF's two merit review criteria, and the relationship between decisions and program goals. The Committee was provided with a template meant to organize and specify the types of questions the Committee consider as it reviewed the programs. The template included requests to comment on management of the programs, including responsiveness of the programs to emerging research and education opportunities, the planning and prioritization process that guided the development of the programs' research portfolio and the responsiveness of the programs to previous COV comments and recommendations. The Committee was also invited to make additional comments on broader issues such as areas in need of improvement or gaps within program areas, agency-wide issues that should be addressed to help improve program performance, and ways to improve the COV review process, format and report template.

**FY 2012 REPORT TEMPLATE FOR  
NSF COMMITTEES OF VISITORS (COVs)**

<b>Date of COV:</b> June 4-5, 2012
<b>Program/Cluster/Section:</b> BO, CO and PO Programs in the Ocean Section, MGG and IODP science programs in the Marine Geosciences section, Ocean Education and Ocean Technology programs in the Integrative Programs Section
<b>Division:</b> Ocean Sciences (OCE)
<b>Directorate:</b> Geosciences (GEO)
<b>Number of actions reviewed:</b> 206 Projects (313 proposals)  <b>Awards:</b> 53 Projects + 47 RAPID Proposals  <b>Declinations:</b> 106 Projects  <b>Other:</b>
<b>Total number of actions within Program/Cluster/Division during period under review:</b>  <b>Awards:</b> 1141 Proposals  <b>Declinations:</b> 2702 Proposals  <b>Other:</b>
<b>Manner in which reviewed actions were selected:</b>  The NSF Budget Office provided OCE with a spreadsheet with Program Element, Proposal ID, mail reviewer average score and panel average score, and overall average of the proposals for FY 09-11. The number of proposals per program to be reviewed was prorated based on the total number submitted per program, with the exception of the Ocean Education and Ocean Technology programs (which, if prorated, would be limited to 1-4 proposals). Proposals were randomly selected from each of the following categories: award-low rating, decline-high rating, award-high rating, decline-low rating, and some in the middle. All RAPID proposals related to the Deep Horizon Oil Spill, Mississippi River Flooding, and Japan Earthquake/Tsunami were also included. Proposals submitted in response to the CAMEO call were not included for analysis because the program was cancelled prior to funding decisions.

**INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES  
AND MANAGEMENT**

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

**Note that throughout this review the word "Program" will refer to a combination of the BO, CO and PO programs in the Ocean Section, MGG and IODP science programs in the Marine Geosciences section, and Ocean Education and Ocean Technology programs in the Integrative Programs Section. The use of the word "program" will often be for one of the parts of the Program indicated above. OCE tracks inter-disciplinary or multi-disciplinary proposals and projects as those that were reviewed by a multi-disciplinary review process as explained in the report below. We use "IM" to represent NSF review Criteria I, Intellectual Merit, and "BI" to represent NSF review Criteria II, Broader Impact.**

**NSF staff responded to a number of requests from the COV for data, graphs and tables to help the COV in its evaluations. The COV considered all of these very useful graphs and tables in the development of their report. Many of the graphs and tables are used in different sections of the template below.**

**I. Questions about the quality and effectiveness of the Program's use of merit review process.** Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

<b>QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS</b>	<b>YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE</b>
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments:</p> <p>The 2012 COV found that the review methods, which included mail and panel reviews, were used appropriately during the review process, and that the jackets provided balanced reviews. We found that other federal agencies often appropriately participated in or observed panel reviews if those agencies were potential sources of funds. In some cases where the outcome seemed very clear (e.g., very high ranking or a set of rankings that made a proposal non-competitive), the proposal did not go to a panel. This was appropriate in those cases.</p> <p>The COV was impressed with the care and thoroughness with which the Program Officers evaluated both the external proposal reviews and the panel deliberations. The professionalism of these individuals provides the COV with</p>	<p>Yes</p>

<p>great confidence that the funding decisions made are done with the utmost care, drawing on extensive advice. However, vital to these funding decisions is that members of the oceanographic community take a similar level of responsibility by responding promptly to requests to review and when they agree to review a proposal, providing thorough and extensive proposal reviews.</p> <p>As an example of the review process, in one program, on average, the program requested input from 21 individuals per proposal, including both the reviewers and panelists. A small program unable to call its own panel utilized other standing panels to provide additional input. Across the program, each proposal had, on average, 4 mail reviewers and 12 panelists available to provide comment. Conflicted individuals were clearly identified and excluded from input during the proposal review process, either at the mail review or panel stage. Ad hoc reviews conducted for RAPID proposals clearly indicated the basis under which the proposals were evaluated. Multi-disciplinary proposals were evaluated by a panel formed from members of disciplinary panels.</p> <p>While generally the panel summaries did an admirable job of bringing together the mail reviews, in a few cases the panel summaries appeared quite short and did not seem to summarize the individual reviewer's key points.</p> <p><b>Recommendation 1. The COV recommends that all panels be provided with consistent instructions with regard to two specific issues: 1) identifying and evaluating transformative and high risk proposals at the onset of the panel process, and 2) effectively evaluating multi-disciplinary proposals both in the context of the discipline and the division.</b></p>	
<p>2. Are both merit review criteria addressed</p> <p>a) In individual reviews?</p> <p>b) In panel summaries?</p> <p>c) In Program Officer review analyses?</p> <p>Comments:</p> <p>The 2012 COV observed that both review criteria were typically addressed well in individual reviews. Although in some cases the broader impacts (BI - Criterion II) section was not clearly identified in the proposal, reviewers typically developed the "connections". In most cases the panel and program decision was dominated by issues related to intellectual merit (IM - Criterion I). In spite of this heavier weighting, almost all reviewers provided substantive comments on the BI criterion.</p> <p>Both review criteria were usually addressed thoroughly in panel summaries, although some of the panel summaries were short and light on details. Both review criteria were always addressed very thoroughly in Program Officer review analyses. Program Officers did an excellent job of calibrating the comments about the BI criterion to the program, as the community still often misunderstands this relatively new requirement. However, the definition of appropriate topics/activities to include in BI still seems a bit mystifying to</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p>

proponents, mail reviewers, and to a large extent panel members. Program Officers typically take a much more balanced view, taking into account the type of proposal, the experience of the PI, and the relative ranking of BI in regard to the overall pool of proposals. This was particularly important in cases where the review input covered a wide range of opinions.

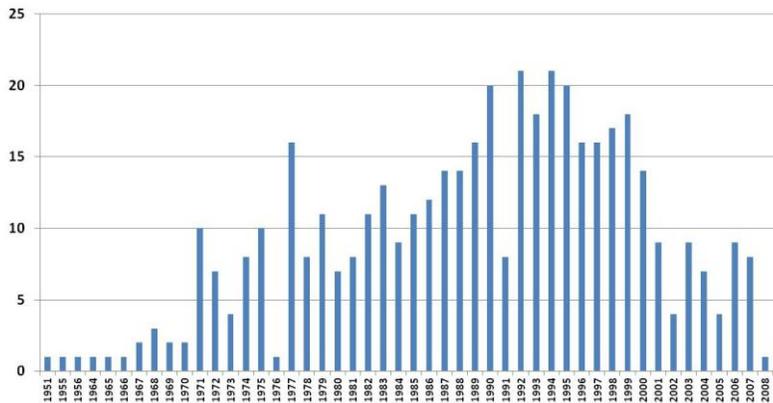
**Recommendation 2. The COV recommends that the importance of addressing BI should continue to be explained to reviewers and PIs. More focused guidance on how to assess projects under BI should be given to all reviewers/panelists.**

<p>3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals?</p> <p>Comments:</p> <p>The 2012 COV found that individual reviewers do provide substantive comments to explain their assessment of the proposals. There were generally only a few curt responses from reviewers, but having the Program Officers' analyses helps mitigate those instances. In a few cases, the reviews were not sufficiently substantive to support the (generally high) ranking. The panel and Program Officers did a good job of identifying review scores that were poorly matched to review comments and ensuring that the proposal was evaluated on substantive comments and not on such anomalous scores.</p> <p>Panels did an excellent job of reviewing the reviews for quality and depth, rather than just rating. They evaluated and clearly summarized each review and evaluated on what it was based. In particular, in cases where ratings did not reflect the reviewer's comments or the comments showed that the rating was based on something other than the merit of the proposal itself, the panel provided a careful analysis of the comments. They also effectively weighted reviews by their relevance and focus, rather than just their length (e.g., just because it is long, doesn't mean that a review is substantive).</p>	<p>Yes</p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p> <p>The 2012 COV found that panel summaries were generally well organized and clearly discussed the rationale for the decision indicated. Where there was disagreement between the panel and the individual reviews, the panel generally clearly articulated the rationale for their assessment. While usually quite substantive, some panel reports were a bit brief, rather light in detail and did not seem to summarize the key points of the individual reviews. Occasionally there was just one line written on IM.</p> <p>In some cases, the panel was more favorable or more critical of the proposal than the mail reviewers, and this difference of opinion and the reasons for it were generally captured in the panel summary. In a few cases, the panel members and the mail reviewers had wide ranging views, not reaching consensus, and this was documented.</p> <p>The panels generally did an excellent job of combining mail reviews of proposals with concerns raised during previous submissions of proposals. Proposals were tracked well, and the process of resubmission generally effectively utilized peer review to strengthen proposals.</p> <p>Occasionally there was a Panel Summary that simply concurred with the mail reviews. This was appropriate for very low or very high scoring proposals.</p>	<p>Yes</p>

**Recommendation 3. The COV recommends that when there is a spread in scores on the mail and panel reviews, it would be helpful if the Panel Summary detailed the key points that went into determining the final score, so as to provide more thorough feedback to the PI.**

The COV notes the following information regarding panelists. The PhD-age for panelists ranged from 3 to 69 years with an average between 18 and 20 years (see Figure 1). The proportion of women panelists was significantly lower than male panelists, ranging by program from ~17 to ~32%, with the smallest proportion in MGG and the largest proportion in CO (see Figure 2). The vast majority of panelists were US citizens (391/456), with permanent residents (42/456) as the second largest category (see Figure 3). Nearly all panelists were affiliated with universities (227/ 244), with roughly equal numbers from private industry (8/244) or government (9/224) (see Figure 4). Panelists within BO, CO and PO came from a broader range of sub-disciplines than those in MGG or REU (see Figures 5 through 9). While the categories reported for REU are for a much broader disciplinary scope than for the other programs, there do not appear to be reviewers from CO or PO included in the REU panels unless these are incorporated in the “undergraduate education” category. Additional information on this result would be helpful (see Figure 9).

**2009-2011 Year Panelist’s PHD Received**



**Figure 1**

## 2009-2011 Panel Gender Diversity

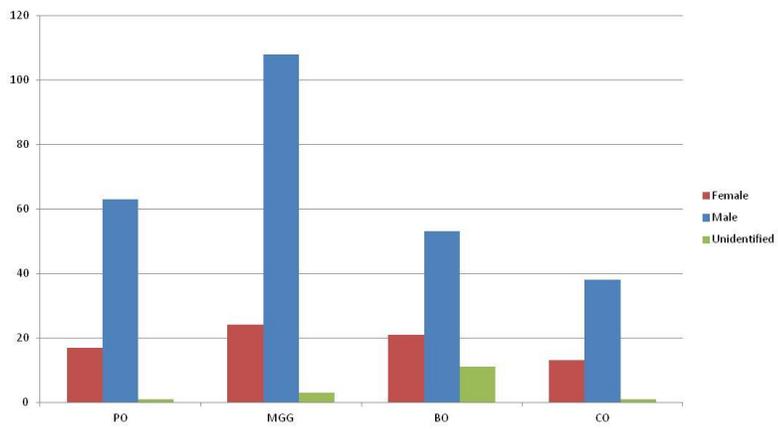


Figure 2

## 2009-2011 Count of Panelist Citizenship

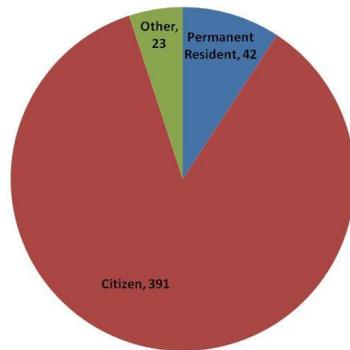
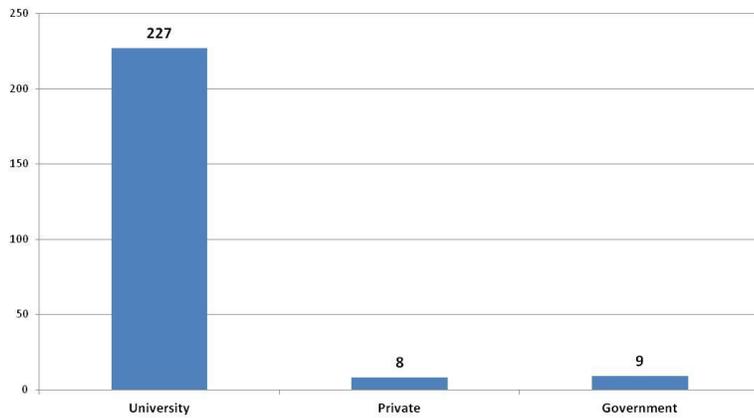


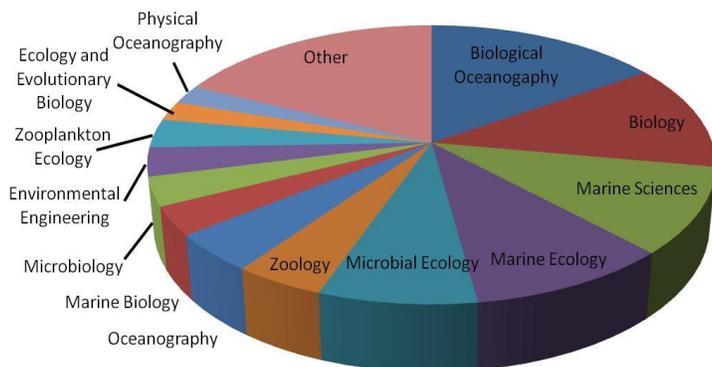
Figure 3

## 2009-2011 Panelist Federal Status



**Figure 4**

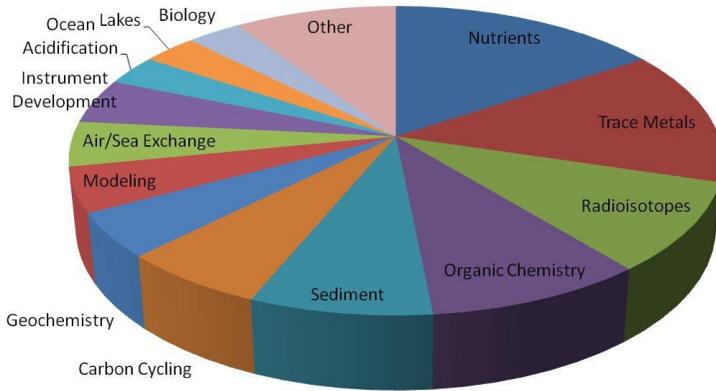
## Biological Oceanography Panelist Sub-Disciplines



Disciplines in Other with one Panelists ID = Coastal Oceanography, Molecular Biology, Chemical Ecology, Civil and Environmental Engineering, Mechanical Engineering, Aquatic Ecology, Environmental Sciences, Geology and Geophysics, Geomicrobiology, Evolutionary Ecology, Applied Mathematics Marine Chemistry, Biomechanics and ecophysiology, Evolution and Ecology, Larval Ecology

**Figure 5**

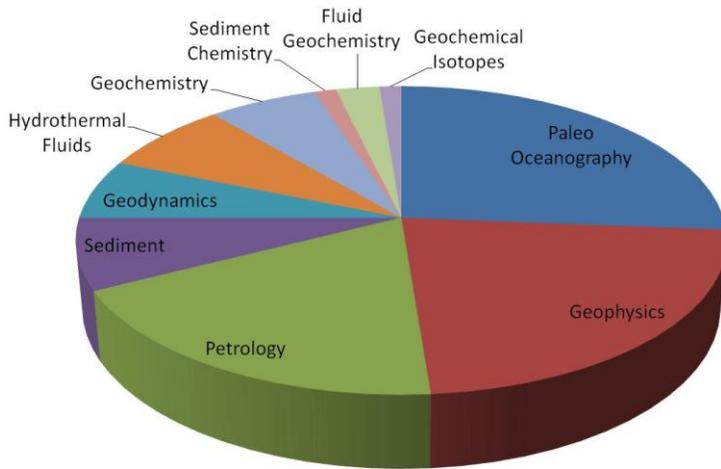
**Chemical Oceanography Panelist Sub-Disciplines**



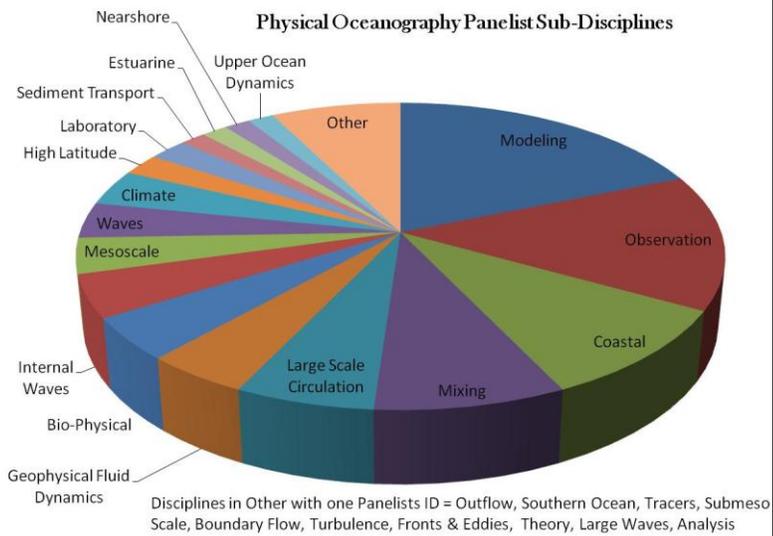
Disciplines in Other with one Panelists ID = Microbial Ecology, Photochemistry, Calcium Carbon Cycling, Biogeochemistry, Analytical Chemistry, Sediment Geochemistry

**Figure 6**

**Marine Geology and Geophysics Panelist Sub-Disciplines**

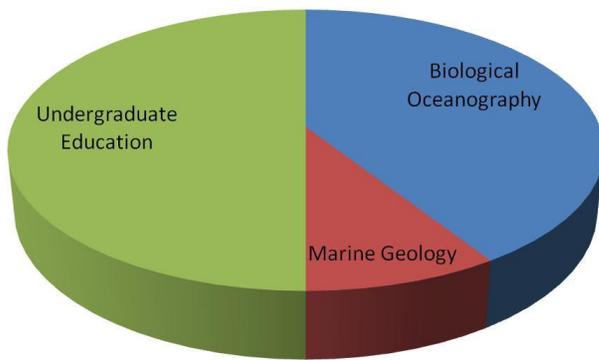


**Figure 7**



**Figure 8**

**REU Panelist Sub-Disciplines**



**Figure 9**

<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>(Note: Documentation in jacket usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), Program Officer review analysis, and staff diary notes.)</p> <p>Comments:</p> <p>The 2012 COV found that the award documentation was generally thorough, complete, and explained at an appropriate level of detail. The documentation offered clear explanations of the mail reviews and the individual and summary panel reviews. It described how the Program Officer used this information to reach a decision. It clarified how the Program Officer was evaluating a risky, but potentially very rewarding proposal in the context of overall program goals to arrive at a positive funding decision. Similarly, the documentation explained decisions not to fund based on overall context and program goals, especially when mail reviews had a more positive view of the proposal than did the panel or when all views covered a wide range of opinion. In particular, the Program Officer review analyses almost always provided a clear summary of all of the components of the review process and clearly laid out the connections between the various review components.</p> <p>The rationale for the award/decline decision was generally clearly articulated to the PI based on the materials in the eJacket. In a few cases with divergent opinions between the individual reviewers and the panel, the program could have provided additional insight regarding their decision.</p>	<p>Yes</p>
<p>6. Does the documentation to PI provide the rationale for the award/decline decision?</p> <p>(Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the Program Officer (written or telephoned with diary note in jacket) of the basis for a declination.)</p> <p>Comments:</p> <p>The 2012 COV found that the documentation provided to PIs was extremely thorough and provided clear rationale for award/decline decisions in essentially all proposals. This included comments relating to resubmissions, including encouraging resubmission for promising proposals, and clarifying issues where a proposal had been submitted several times without significant improvement in rankings. Complete information was provided in the context of both of the NSF review criteria. Documentation to the PI was also clear in the case of a proposal that had been submitted several times without increasing enthusiasm, indicating to the PI that the proposal should not be resubmitted.</p> <p>Program Officers also seem to make great efforts to work with panels and PIs to obtain all of the necessary information for funding decisions (e.g., points of clarification, rebuttals to comments) as appropriate. This is commendable. One</p>	<p>Yes</p>

<p>bit of evidence that the process is working is that there have been no requested decision appeals in 5 years (remarkable for an agency and Program of this size).</p>	
<p>7. Additional comments on the quality and effectiveness of the Program's use of merit review process:</p> <p>The 2012 COV found that Program Officers dealing with a matrix of a variety of proposal types and emphasis, including high risk, high reward science in awards, appear to exercise appropriate decision-making authority in funding decisions. For example, we observed cases where Program Officer decisions differed from mail reviews or panel reviews/summaries; Program Officers generally gave very clear explanations of how and why they reached their decisions in the context of programmatic goals in these cases.</p> <p>The response to the 2006-2009 COV suggested that BI was not weighted as strongly in award recommendations during the previous review period. There was a clear increase in both the level of evaluation and use of BI in the current review period.</p> <p>When the panels/Program Officers integrated the reviewers' comments on issues (e.g., reviewers 1, 2, 3 found this point important; reviewers 4, 5, 6 all felt such and such was missing), this was particularly helpful. Less helpful were those panel/Program Officer reports where the reviews were repeated without analysis. Overall the COV was impressed with the amount of thought that had been put into understanding the reviews by the Program Officers.</p> <p>We found that the Program has done a very good job requesting input from qualified reviewers, managing conflicts to prevent the potential for bias, and communicating the rationale for decisions on proposals to the project PIs. Analysis of the provided graphs indicates that effective efforts are made to balance input from new career researchers with established researchers (see Figure 1), as well as researchers from different geographic regions and classes of institutions and (see Figures 10 and 11).</p> <p>When proposals were resubmissions, funding decisions were often based on whether the proposal effectively addressed previous comments, rather than just current reviews. Because of this additional information, panel rankings were sometimes different from those of reviewers. This is an effective use of the peer-review process, as funded proposals were often greatly improved over previous incarnations.</p> <p>In the case of RAPID proposals, awards generally seemed well justified on the basis of timeliness, urgency, and Program Officer evaluation of the two criteria.</p> <p>As an example of innovative funding, in at least one case with promising reviews, but concerns raised by the panel, the Program Officer negotiated a reduced budget pilot study on a topic deemed to be a priority to the Program. Proposals were split funded with other programs when possible and appropriate; if differences of opinion between programs were too great, projects were also funded without split funding if appropriate.</p>	

### Geographic Distribution of Reviewers FY 2009-2011

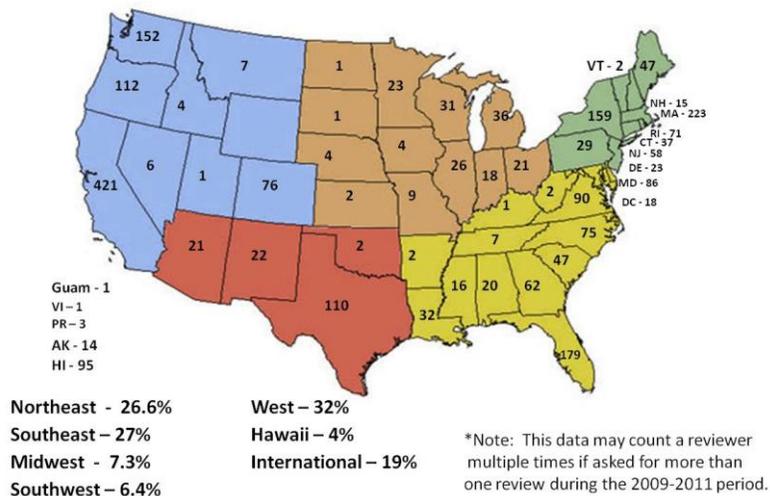


Figure 10

### Reviewer Composition Institution Type\*

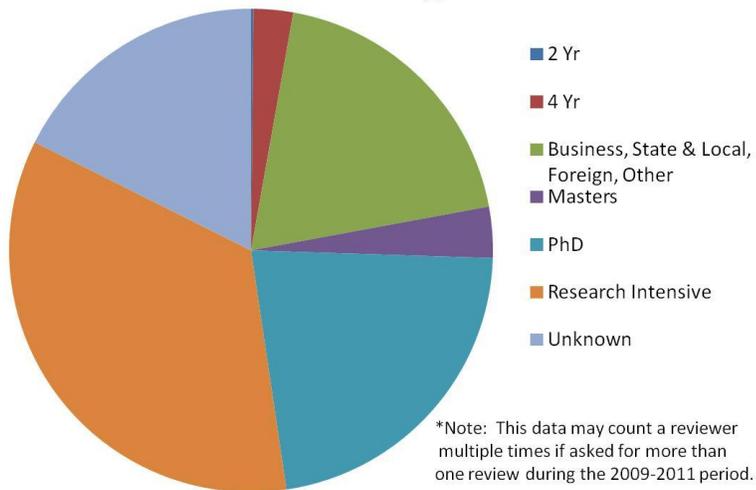
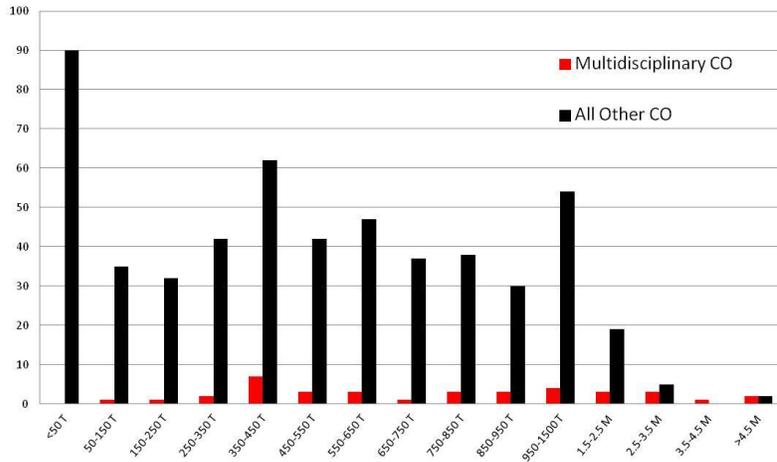


Figure 11

For the review of multi-disciplinary proposals, the Program convenes a multi-disciplinary panel by taking members from relevant disciplinary panels to review these proposals. Multi-disciplinary proposals appear to have somewhat larger budget requests than proposals reviewed by single disciplines, perhaps due to the greater complexity and/or number of researchers involved (see Figures 12 through 15). These proposals also appear (and perhaps appropriately so given the broader range of subject matter addressed) to often receive reviews with a dichotomy of opinion. Excluding results from RAPID proposals and the large single discipline GEOTRACES projects, Multi-disciplinary proposals in CO, PO, and MGG had success rates that were -3%, -2% and -0.5% relative to single discipline reviewed proposals, while in BO the success rate was +3% for multi-disciplinary proposals relative to single disciplinary proposals (see Figure 16). There is thus no systematic decrease in funding rate across programs within OCE. The modest decreases seen in CO, PO, and MGG could result from a combination of the budget size and complexity of these proposals relative to single discipline proposals. We discuss historic trends in the success rate and the impact of RAPID awards and GEOTRACES awards on multi-disciplinary vs. single program success rates further in section III.4 (below).

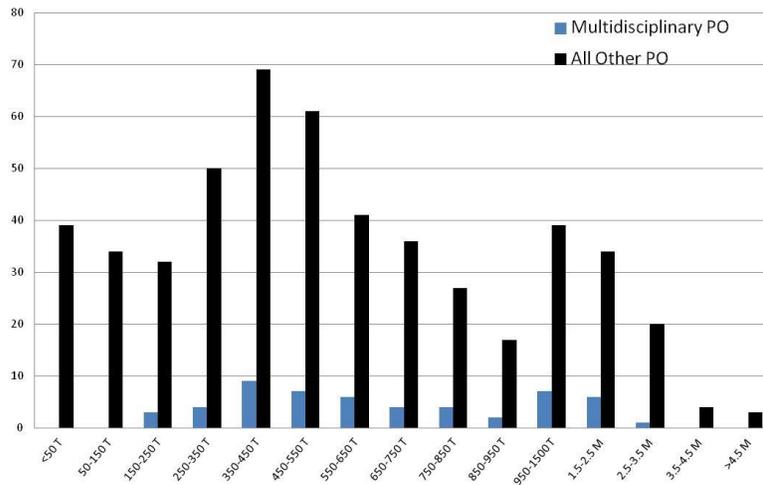
The COV notes the following information regarding reviews and reviewers. The return rate for mail reviews ranged from ~50 to ~70% by program in 2011, and was flat or slightly increasing from 2002 to 2011 for MGG, BO, and CO, but decreased for PO, OTIC, and ODP (see Figure 17). The plurality of reviews is from reviewers from departments within universities, with nearly an equal proportion (49% vs. 42%) from oceanographic institutions. The remainder comes from government (4%) or international sources (5%) (see Figure 18). A plurality of reviews is from RI and PhD institutions (34.7% vs. 22%). An equal percentage could not be identified (22%), while 19.3% come from sources other than MS or undergraduate or community colleges (see Figure 19). The geographic distribution of reviewers and panelists is similar to that of awards (see Figures 11, 20, and 21).

**Multidisciplinary CO Proposal vs All Other CO Requests**



**Figure 12**

**Multidisciplinary PO Proposal vs All Other PO Requests**



**Figure 13**

Multidisciplinary BO Proposal vs All Other BO Requests

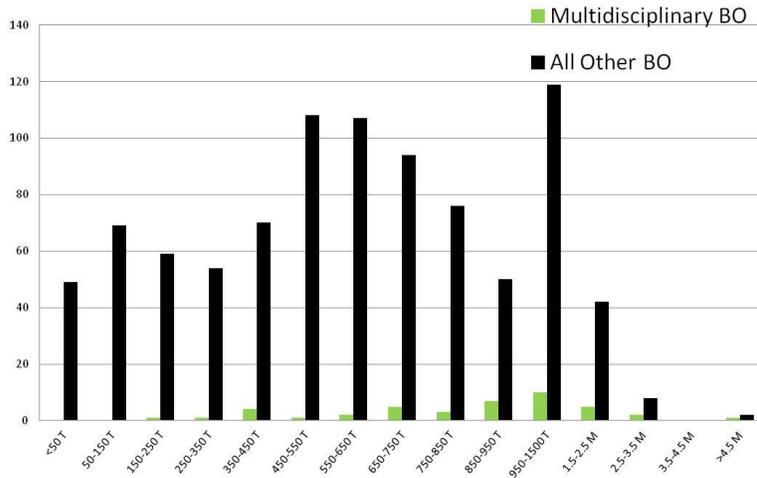


Figure 14

Multidisciplinary MGG Proposal vs All Other MGG Requests

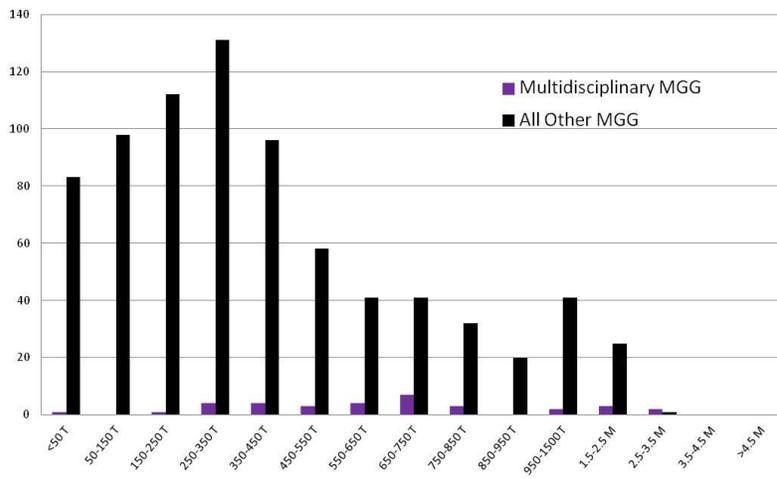
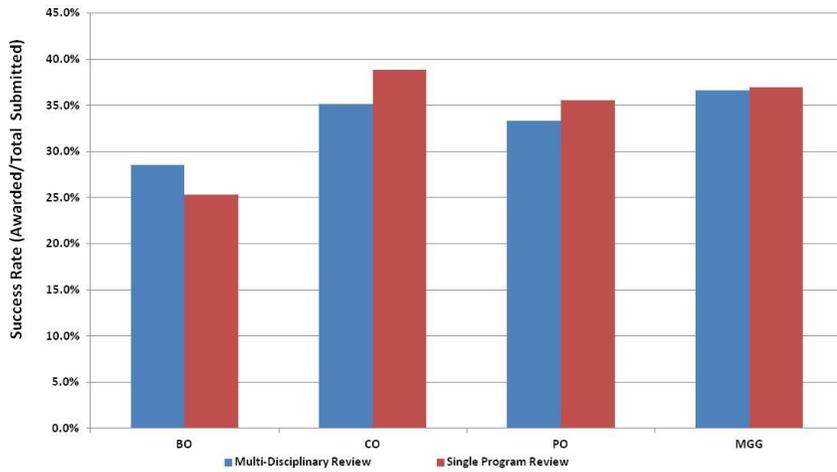


Figure 15

### Success Rate of Single Program Reviewed and Multi-Disciplinary Reviewed Projects Taken to Panel 2009-2011



\*The graph does not include RAPID or Geotrace data

Figure 16

### Mail Review Return Rate by Program

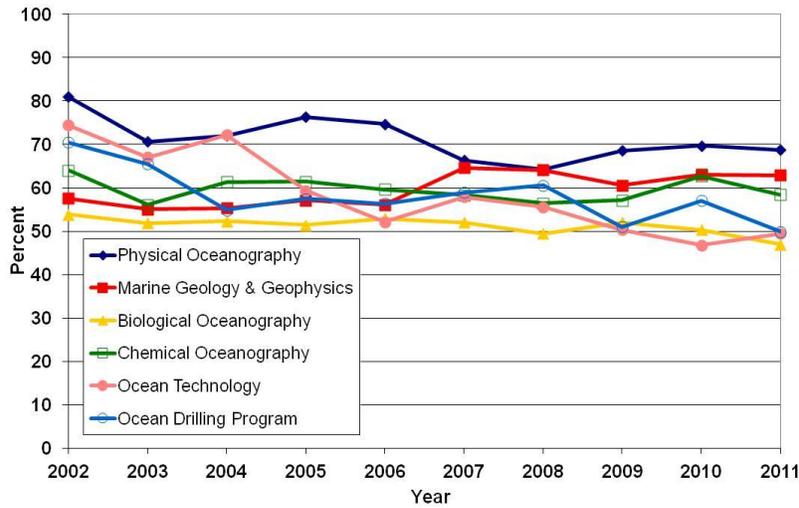


Figure 17

### Reviewer Composition Department

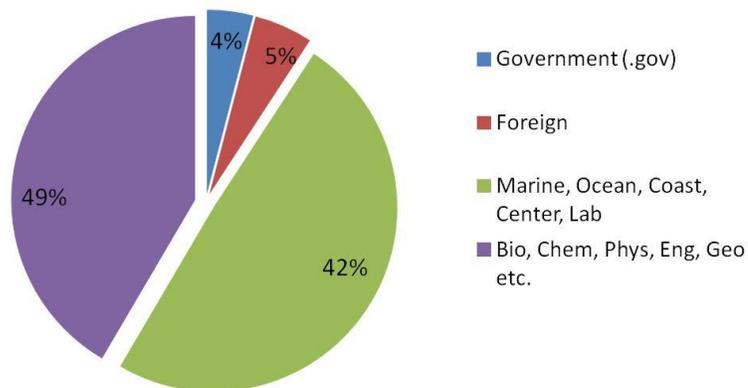


Figure 18

### Reviewer Composition Institution Type\*

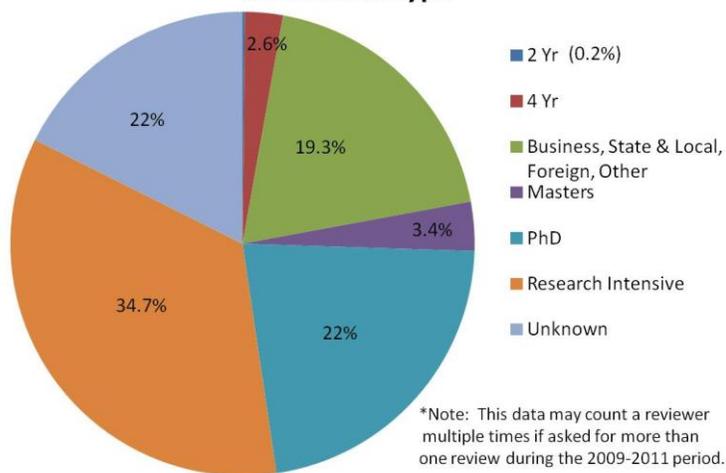
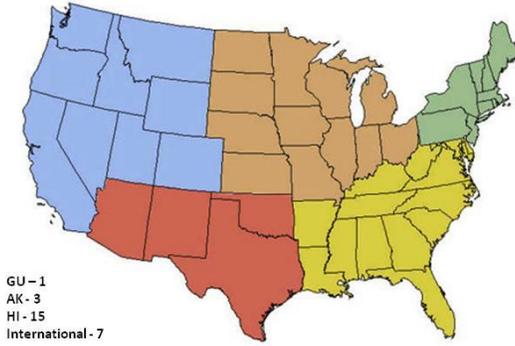


Figure 19

**Geographic Distribution of Panelists FY 2009-2011**



Northeast - 106	West - 110
Southeast - 114	Guam - 1
Midwest - 25	International - 7
Southwest - 28	

**Figure 20**

**Geographic Distribution of Proposal Awards FY 2009-2011**



Northeast - 370	West - 366
Southeast - 268	Puerto Rico - 2
Midwest - 56	International - 7
Southwest - 62	

**Figure 21**

**II. Questions concerning the selection of reviewers.** Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Did the Program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>The 2012 COV found that reviewers were selected from a broad range of relevant areas of expertise, geographic regions, institutions, and from various stages of their career. A very small fraction of reviewers had expertise that was sufficiently outside the key areas of the proposed research that superficial reviews resulted. The return rate for most proposals was, however, reasonable enough to ensure that proposals were evaluated over an appropriate mix of expertise.</p> <p>Proposals that included both modeling and observational components received reviews from modelers and from observational scientists, and the Program Officer documentation noted the expertise areas of different reviewers relative to their rankings.</p> <p>OTIC proposals address two issues: engineering and science. The reviewers in this area seemed to represent both of these needs well, although this is challenging when the number of substantive reviews for this sort of cross-field evaluation is near the minimum number of reviews (3). Note that this is not, in any of the files examined, a case of an inappropriate number of original mail reviewers requested, but the low rate of return observed for these proposals led to combinations that occasionally may not have covered both sides of the problem effectively.</p> <p><b>Recommendation 4. The COV recommends that, while reviewer expertise seems to be sufficient to comment on how proposals address IM, NSF should seek to expand the range of reviewer expertise (where it makes sense) to add perspective to how proposals address BI. Additionally, the use of reviewers from sibling Agencies may also increase the perspective on BI since agencies continually respond to inquiries regarding programmatic outputs, outcomes and return on investment of research dollars</b></p>	<p>Yes</p>
<p>2. Did the Program recognize and resolve conflicts of interest when appropriate?</p>	<p>Yes</p>

<p>Comments:</p> <p>The 2012 COV found that programs identified and addressed all potential conflicts. When conflicts of interest were recognized, they were treated appropriately and documented in the file, along with how they were handled. The written record built confidence in this regard. Individual reviews were requested from a sufficient number of potential reviewers to provide adequate input after conflicts were excluded. No examples of unresolved conflicts of interest were found in the subset of proposals reviewed by the COV.</p> <p>During the COV review Program Officers commented that reviews provided by reviewers who had conflicts of interest were not used at all in the review process. This appears to be in contradiction to the COV's understanding of comments in the standard letter requesting proposal review, which states that even in the case of conflicts of interest, NSF "would like to have your review unless you believe that you cannot be objective".</p> <p><b>Recommendation 5. The COV recommends that the Program review the wording on the letters requesting reviews, to clarify that reviews from those with conflicts of interest will not be used, and to request that in cases of suspected conflicts of interest, the reviewer contact the Program Officer in a timely manner for clarification, to avoid wasting reviewer effort.</b></p>	
<p>Additional comments on reviewer selection:</p> <p>The 2012 COV notes that reviewers are primarily from R1 and PhD institutions.</p> <p>Since the U.S. is producing more PhDs than there are tier 1 academic jobs, many highly qualified PhDs are now at smaller institutions. Two-year institutions and community colleges often have high quality PhD-level faculty who could review proposals. We note that female review numbers are still low, and we would like to see an increase in these numbers, as well as younger PhDs, in the review process without in either case overburdening the reviewers.</p> <p><b>Recommendation 6. The COV recommends that OCE should make a concerted effort to tap other, underrepresented, reviewer pools.</b></p> <p>We note that in Figures 18 and 19 shown earlier no data are given on the race/ethnicity makeup of reviewers (we understand that those data are voluntary).</p> <p><b>Recommendation 7. The COV recommends that NSF look into the feasibility of submitting an Information Collection Request to OMB (Office of Management and Budget) to begin to collect additional appropriate reviewer information to better identify areas of improvement in panel and reviewer makeup.</b></p>	

**III. Questions concerning the management of the Program under review.** Please comment on the following:

#### MANAGEMENT OF THE PROGRAM UNDER REVIEW

##### 1. Management of the Program.

Comments:

The 2012 COV found that overall the Program is well managed. The panel summary process coupled with the Program Officers' analyses and staff diaries sets up an effective control system. Within each individual program, from the information provided to the COV, the Program Officers coordinate effectively among themselves to maintain an efficient review process that reflects the views of the community, achieves program balance, and incorporates alternative points-of-view. In particular, the use of IPAs as Program Officers is very effective, and a robust rotator program provides fresh ideas and perspective into the programs and gives the community additional insight into the Foundation's review and funding process. Regarding support of multi-disciplinary science within OCE, the Program Officers work together effectively to jointly support proposals when appropriate, and the statistics demonstrate success rates for multi-disciplinary proposals that are generally similar, or only modestly lower, than proposals submitted to individual programs. Overall, OCE has adequately managed the portfolio, balancing program needs against funding constraints and has attempted to increase participation by women, underrepresented groups and new PIs.

Special programs are also well managed by the cadre of OCE Program Officers, and the Program participates in these wider NSF programs to the benefit of the OCE community. In terms of the management of the RAPID program, the awards appeared to be well justified on the basis of timeliness and urgency, and the Program Officers' evaluations of the two criteria were sound. The awards involved multi-disciplinary funding when appropriate, including funds from outside OCE, and in a few cases also supported risky, potentially transformative science.

##### 2. Responsiveness of the Program to emerging research and education opportunities.

Comments:

The 2012 COV found that the Program is very responsive to cutting edge research and education needs. Program Officers balanced risk and potential reward in making decisions, and they appeared in touch with trends and developments in the field. In addition, through the involvement of teachers, undergraduate students, and citizen scientists, broader members of the community are increasingly involved and benefiting from research in these programs. RAPID funding indicates that the Program is responsive to emerging opportunities that require quick responses.

There is a perception in some communities (BO in particular) that NSF rarely funds risky research. Risk aversion was common in mail reviews in some program areas, but there was no evidence of a strong bias against risky proposals in subsequent funding recommendations by panels or decisions

by Program Officers. This suggests effective guidance by Program Officers during the panel review process. There would be value in broadening this discussion about the appropriate ways of evaluating risk to the broader community who provide proposal reviews. OCE could stimulate this discussion among reviewers through its newsletter and public meetings and better align reviewer evaluation of risk with Program efforts to encourage transformative research.

We note that a lower success rate of high risk science can be seen in CO compared with PO, BO, and MGG (Figures 22 and 23), and a trend toward submitting less and funding less high risk science overall from 2009 to 2011 (same graphs).

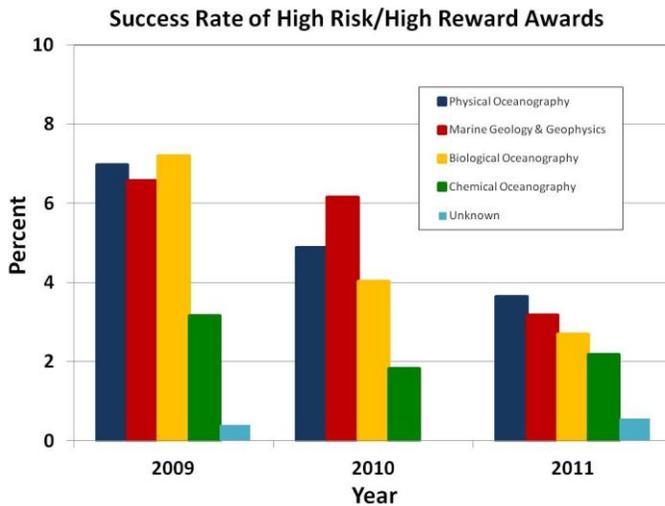


Figure 22

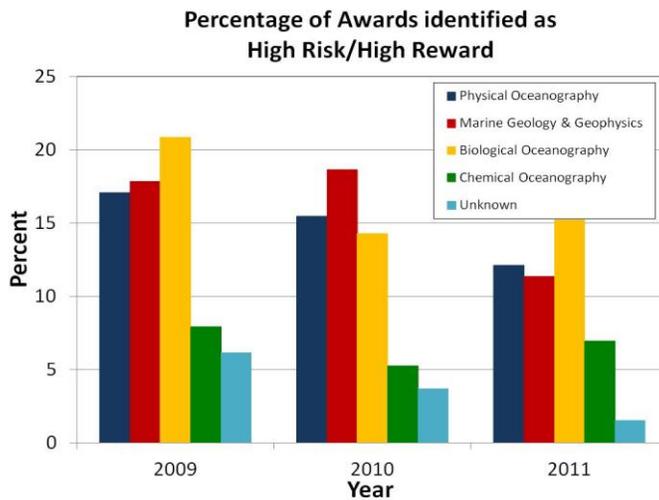


Figure 23

During discussions with Program Officers on expanding education and outreach within OCE projects and investing in human resources, questions were raised about the relative weight of IM and BI in the review process, including how best to encourage more systematic applications of BI elements into the proposed research plans. The COV understands that agency-wide, BI will be revisited and similar questions may be raised and addressed as part of the process.

**Recommendation 8. The COV considered especially the REU program, and the COV recommends that, while research and education are naturally integrated in OCE REU programs, all REU proposals be held to the same standard of educational and societal relevance. In addition and specific to REU efforts, the COV recommends programs encourage greater emphasis on projects focusing on training students to be more than academic researchers and include options better suited to non-academic geoscience careers.**

We note that Figure 24 suggests a wide geographical distribution of REU programs, but somewhat biased to the east coast. It is somewhat surprising that there are so few OCE REU awards for the interior U.S. Table 1 shows that there has been a gradual increase from 2009 to 2011 in the number of active REU sites as well as in the numbers and percentages of females and underrepresented minorities participating in these programs, with the underrepresented minorities accounting for 37% in 2011. This table also indicates the very high percentage of females who participated, 63% in 2011.

## OCE REU Sites in 2009-2011

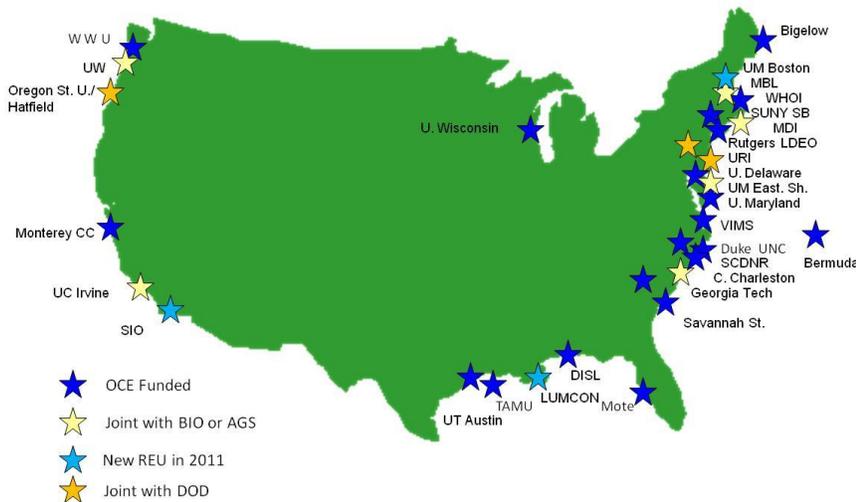


Figure 24

## OCE REU Sites 2009-2011

	2009	2010	2011
<b>Active Sites</b>	19	23	26
<b>Survey Responses</b>	19	19*	26
<b>Applications</b>	2253	3194	3339
<b>Positions</b>	201	229	252
<b>Selectivity</b>	9%	7%	8%
<b>Female</b>	118	144	159
<b>% Female</b>	59%	63%	63%
<b>Male</b>	83	85	93
<b>% Male</b>	41%	37%	37%
<b>Underrepresented</b>	59	81	91
<b>% Underrepresented</b>	29%	35%	36%
<b>Additional students**</b>	***	60	57

\*Data supplemented with annual report data to equal 23

\*\* Students supported with other sources of funding who participated in REU program.

\*\*\* Data not requested

**Table 1**

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:

The 2012 COV found that it appears that Program planning and prioritization is thorough, although admittedly it did not have extensive data on which to base this. We did note that during the review process many of the strongest proposals emerge in the core funding area as a result of interaction among Program Officers.

4. Responsiveness of Program to previous COV comments and recommendations.

Comments:

In general the 2012 COV believes that the responsiveness of the Program to the previous COV's comments and recommendations was very good, particularly in the following three areas recommended during the 2006-2009 COV: (1) In the decision making process, the rationale and justification for awards and declines was clear in the portfolio of documents; (2) BI was appropriately

used in combination with IM to evaluate the strength of the awards; and (3) Greater diversity in the reviewers of the EHR proposals was also noted during analysis of the jackets.

The comments below on the responsiveness to the 2006-2009 COV are arranged using the numbering system in the previous COV report and the NSF response document.

A.1.3: The Program is now providing input on the number of reviewers. However, the information in the Review Analysis is in some cases ambiguous, as some symbols used are not clearly defined. For example, use of "R" to mean "reviewer" and "review provided", and use of the numbers 1, 2, 3 in the panelist field. Individual reviewers who gave no ranking or multiple rankings could be denoted "E/VG", etc., or "OM" for omitted ranking.

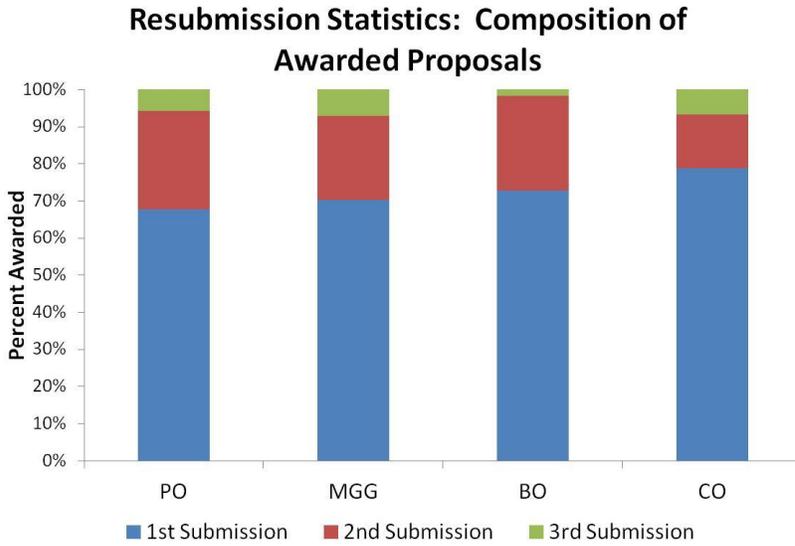
**Recommendation 9. The COV recommends ensuring that the reporting procedures are standardized and that all symbols used are clearly defined.**

A.1.4. The previous COV commented that the panel summaries did not convey the decision making process. The Program explained that the panel summaries indicate the panel discussions, but that the programs make decisions. This is strictly correct, but perhaps does not get at the question the 2009 COV may have poorly phrased. If the 2009 COV meant to comment that the Program at some times did not convey the basis of the decision, then in response, the Program did an effective job at conveying the rationale for the decision in nearly all cases that were evaluated by the present COV. Conveying the rationale for the decision was straightforward in all cases where the individual reviews and panel summaries were in agreement. Additional scrutiny should be provided on a case-by-case basis in situations where the individual reviews and/or panel have divergent perspectives regarding a project.

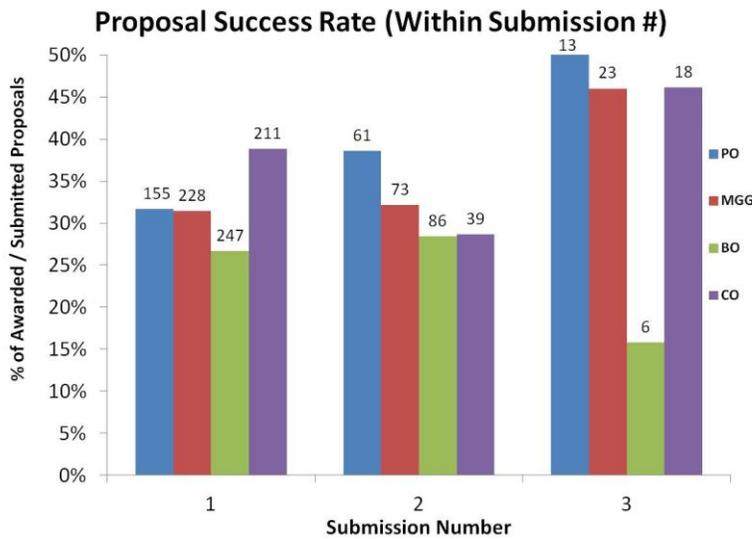
Panel summaries in the more recent files that were studied did seem to follow a somewhat more consistent format. There was greater variability in the Review Analysis documents provided by the Program Officers. This may be due to personal preference, differences between programs, or between the standard proposals and the RAPID proposals. Standardizing the format is indeed helpful. It is particularly useful to see the rankings for all individual reviews, rather than just an average and min-max.

A.1.6. The previous COV requested that PIs receive copies of the review analysis. The Program responded that these are for internal use. A more effective request would be to specify which aspects of the review analysis were deemed most beneficial to the PI. Specifically, the COV could request that additional insight be provided regarding which comments were of most importance for the PIs to address in future revisions. This is particularly important when there is divergent guidance provided by the individual reviews and the panel summary. The COV recognizes that it is important for the Program to provide freedom for the PIs to pursue various lines of inquiry and that following the suggestions from the Program will not guarantee funding on a future submission.

**Resubmissions** – How many times can a proposal be submitted? Or a better way to ask this is what is the submission history for awarded and declined projects? This is an issue that has concerned the present COV, and we were provided some data to address this issue. Many of the BO jackets reviewed by the COV were resubmissions, but according to Figure 25, the proportion of 2<sup>nd</sup> (~20-25%) and 3<sup>rd</sup> submissions (~5-10%) does not appear to vary greatly by program. The success rate on resubmission generally increased for PO, CO and MGG, but not for BO (Figure 26).



**Figure 25**

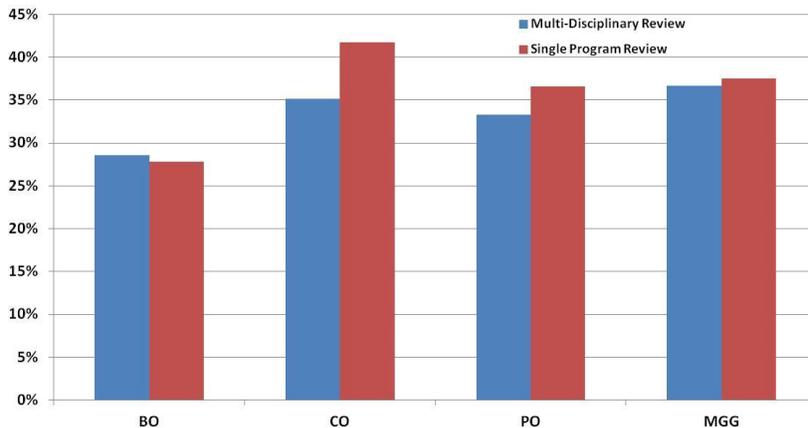


**Figure 26**

**Multi-disciplinary projects** – The 2006-2009 COV expressed concern regarding the success rates of multi-disciplinary projects. In response, the Program noted that multi-disciplinary project success rates had increased from 24 to 33% from 2006 to 2008, and that the Program was committed to funding these awards while recognizing that their success rate was lower than single disciplinary awards by ~6-9%. While specific information about the time history of success for multi-disciplinary

awards is not provided, Figure 16 shows that the success rate of multi-disciplinary awards relative to single program awards ranged from approximately -3% to +3% when GEOTRACES and RAPID awards were not considered. If RAPID awards (which are not reviewed in the same way) are added, then the differences in success rates between multi-discipline and single discipline proposals by program was still relatively small at: +1% for BO, -7% in CO, -3% in PO, and -1% in MGG (Figure 27). Adding GEOTRACES awards (a large single discipline initiative) to CO increased the deficit in CO to approximately -10%. Discussions with OCE Program Officers regarding the difference in CO indicated that about half of the apparent difference in multi-disciplinary vs. single disciplinary success rates for CO was due to the combined effects of GEOTRACES and RAPID awards, which together accounted for ~5-6% of the 10% difference. When viewed in this way, there is relatively little difference between the success rate of the multi-disciplinary proposals vs. those having single program review, and no systematic difference across programs. Based on Figure 27, the lowest success rate for multi-disciplinary proposals was ~28% in BO, but the success rate of both multi- and single reviewed proposals was essentially equal. In all other programs the multi-disciplinary proposal success rate was 33% or greater. The overall success rate across OCE was also similar to the average multi-disciplinary success rate for non-OCE programs.

Success rate of single program reviewed and multi-disciplinary reviewed projects taken to panel 2009-2011



\*The graphs include RAPID awards but does not include GEOTRACES in CO  
 \*\*RAPID Award numbers are only found in Single Program Review

Figure 27

Overall, the data presented in Figures 16 and 27 suggest that the discrepancy in multi-disciplinary projects relative to single discipline projects noted by the 2006-2009 COV has largely disappeared.

The COV commends OCE on their process of convening a multi-disciplinary panel from existing disciplinary panels to review multi-disciplinary proposals.

**Recommendation 10. The COV recommends that the Program make the process of convening a special panel for multi-disciplinary proposals more generally known to the community.**

Correlation between funding action and proposal rankings. The Program has provided detailed data to demonstrate the relationship between proposal rankings and funding outcome (see Figures 28 to

32). As expected, in general proposals with higher rankings are more likely to be funded than those with lower rankings. The distribution of proposal rankings and success varies somewhat by discipline, panel and funding pressure (awardable funds vs. number of proposed projects).

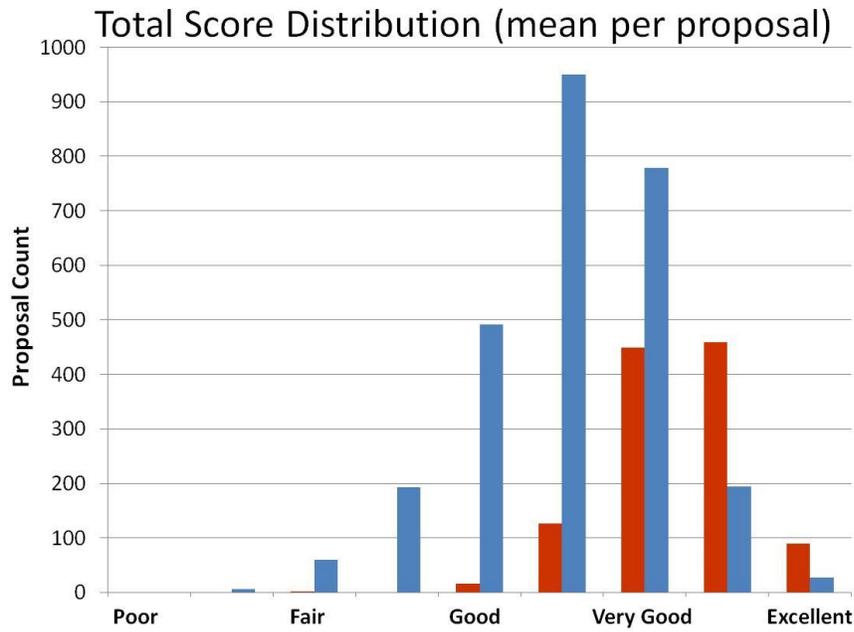


Figure 28

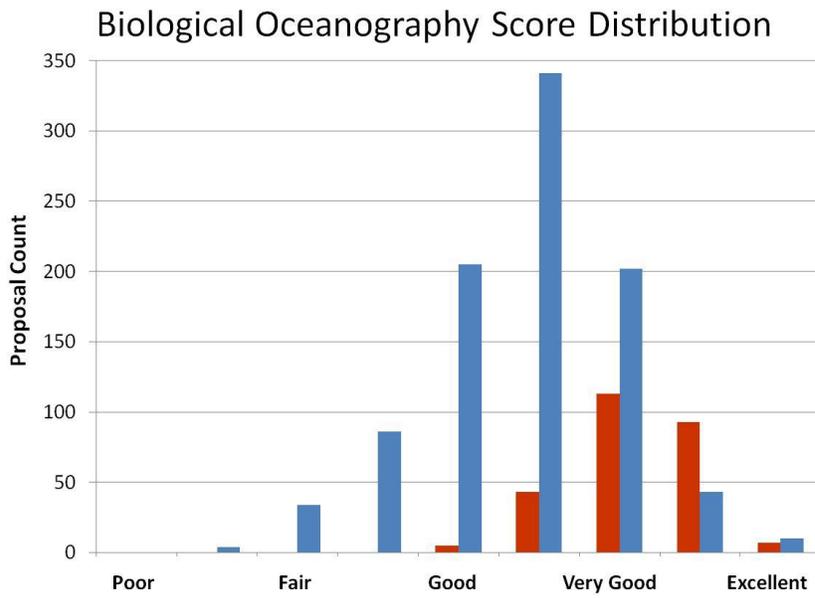


Figure 29

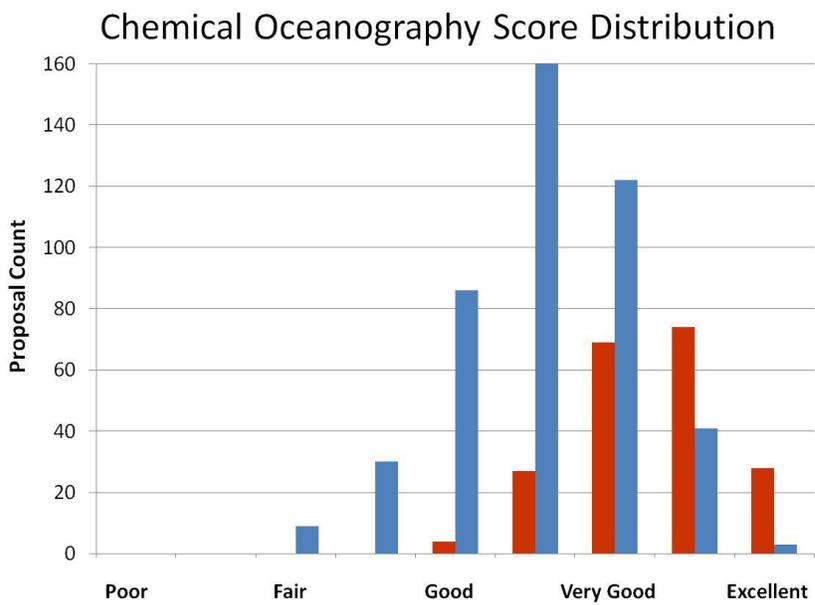


Figure 30

### Physical Oceanography Score Distribution

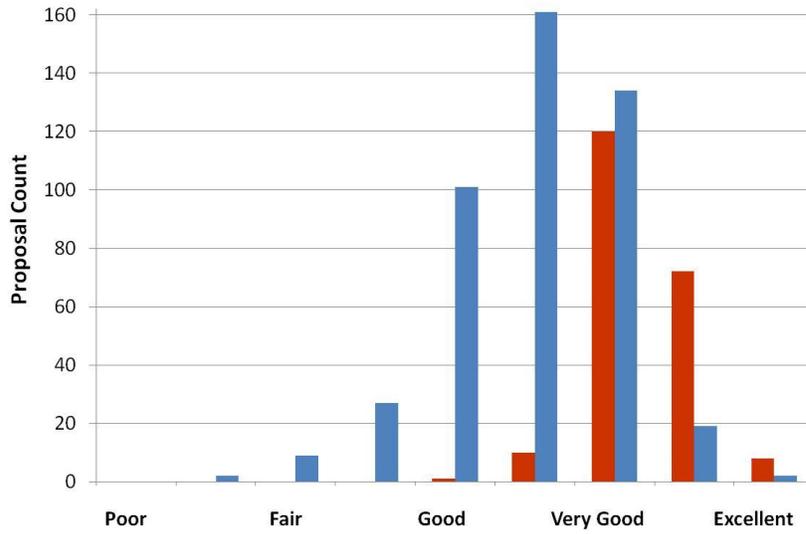


Figure 31

### Marine Geology and Geophysics Score Distribution

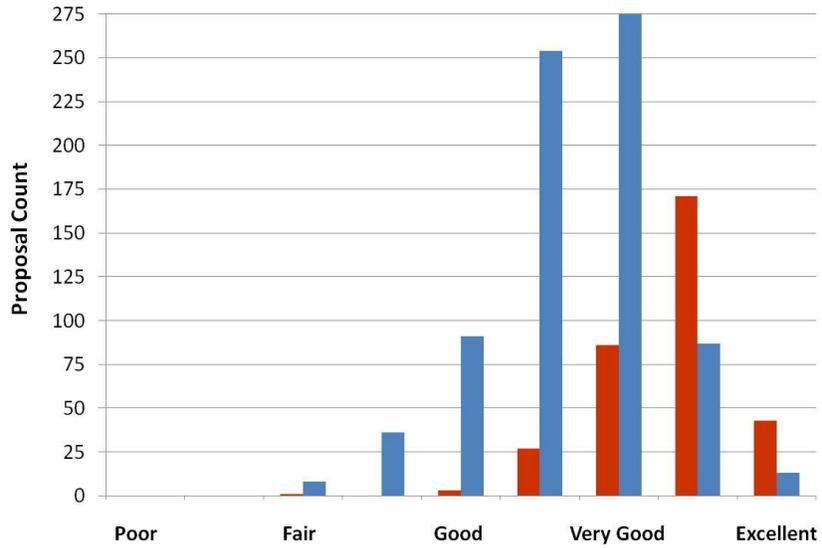
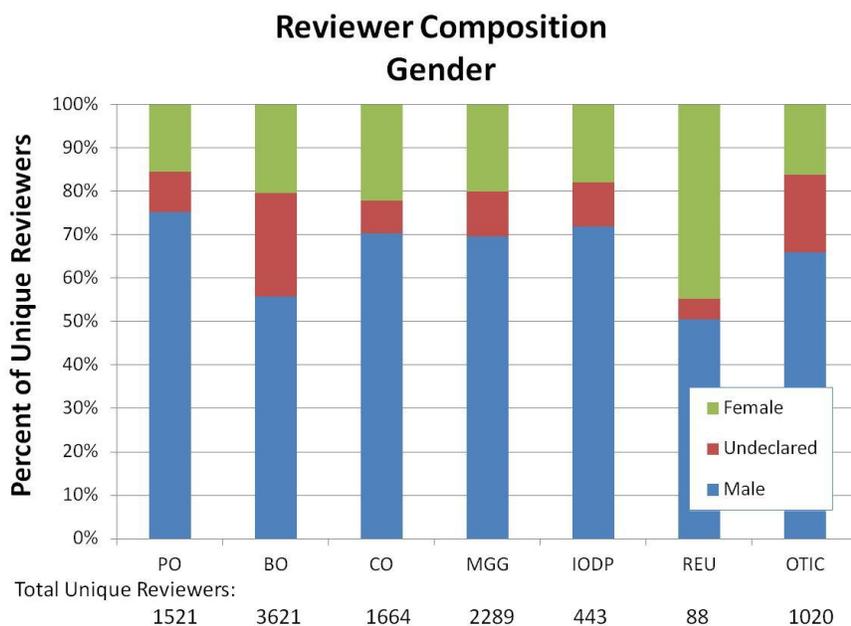


Figure 32

2.2. Representation of women and minorities as reviewers and panelists. The percentage of women reviewers is similar across programs, ranging from ~15-22%, with the exception of REU, where the number of women reviewers is ~45% (see Figure 33). The smallest percentages were found in OTIC, PO, and IODP. It is unclear how these percentages relate to the distribution of women in these areas from the data that are provided, but the lower percentages may be proportional to their participation in OTIC and PO. The relatively small percentage of women reviewers in IODP seems somewhat surprising. The distribution of women on panels was similar to that of the individual reviewers, or perhaps somewhat lower. Information about the number of minorities who served as individual reviewers or on review panels is lacking.

**Recommendation 11. The COV recommends that the Program track this information on women on panels and continue to encourage participation by women and minorities in the review process.**



**Figure 33**

A.3.7. Balance of awards to new investigators. See discussion in section IV-7.

A.4.3 Small number of proposals with equipment in their budgets. The Program argued this was a function of incomplete sampling. Aggregate statistics were not provided for us to address this question effectively.

B.3. Lab vs. Field equipment. NSF has provided no data for us to address this. This is still an area that needs to be addressed.

C.3 Recommendation that AC/GEO address the balance between core, targeted, and intermediate size programs. If we take shared projects and multi-disciplinary projects as relevant to this question,

then CO and MGG fund the smallest number of shared projects, but the success rate for shared projects is low in CO and MGG (see Figure 34). The average award size in MGG is in general lower than all other program areas with the exception of Ocean Education, and IODP (see Figures 35 and 36). In contrast the average award size in CO is generally comparable to that of BO and PO and usually somewhat larger than MGG. However, MGG makes a greater number of awards per year than CO or other programs, with the exception of BO, particularly since 2007 (see Figure 37).

**Improve the COV process** – The COV process has run smoothly and improvements seem to have been made. The 2012 COV particularly applauds having access to the eJackets prior to the site visit as a means of preparing for the site visit. The 2012 COV also commend NSF for their extensive graphing of statistics for this COV. The graphs and tables, many of which are included in this report, give valuable quantitative insight into the proposal review process.

## 2009-2011 Percentage of Shared Awards vs Total Awards

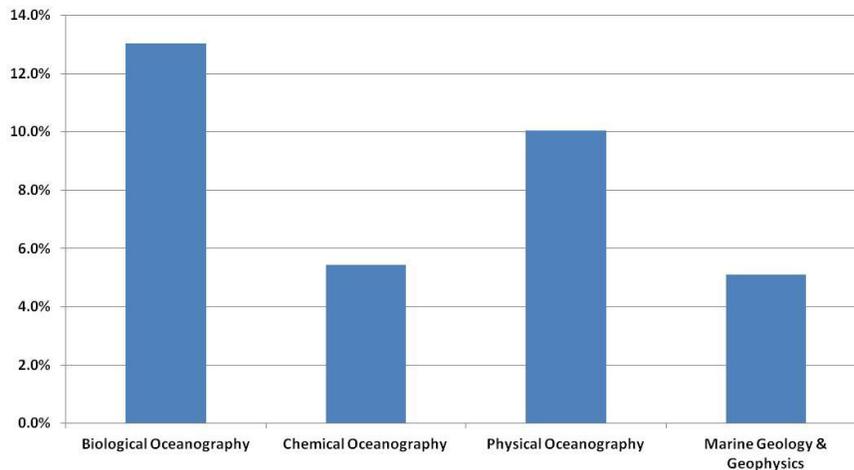


Figure 34

### OCE Mean Annual Award Size

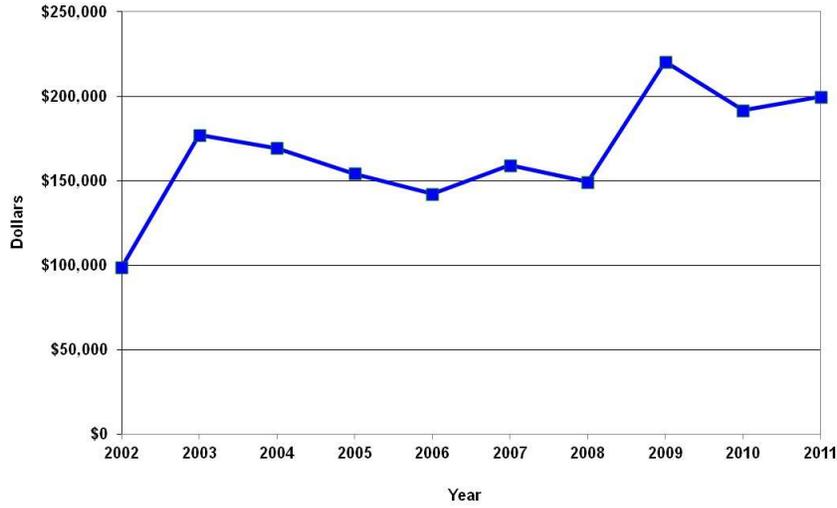


Figure 35

### OCE Annual Award Size by Program

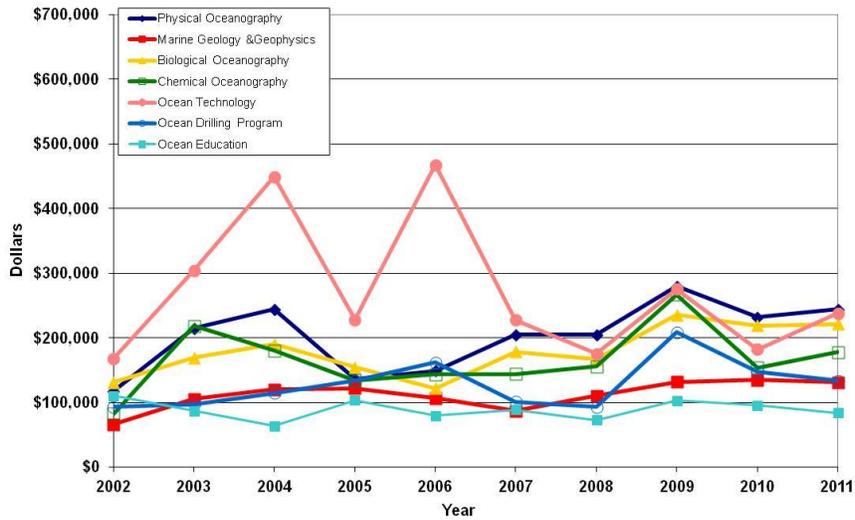


Figure 36

## Annual Number of New Awards

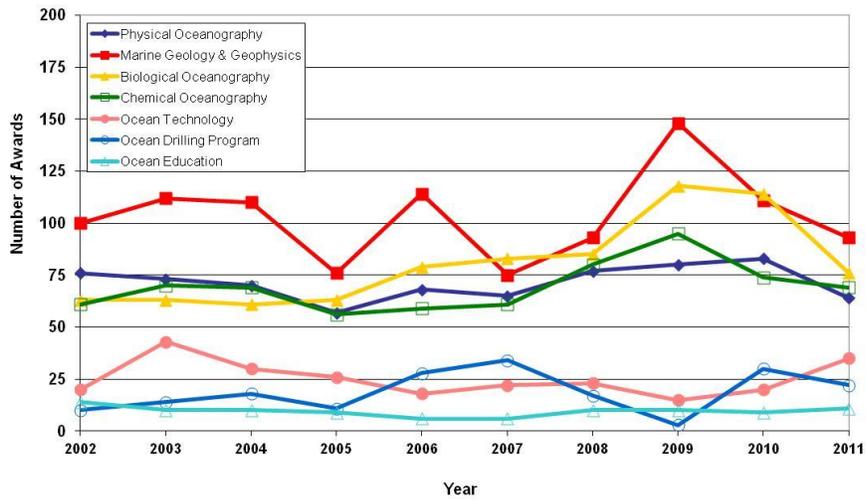


Figure 37

**IV. Questions about Portfolio.** Please answer the following about the portfolio of awards made by the program/s under review.

<p style="text-align: center;"><b>RESULTING PORTFOLIO OF AWARDS</b></p>	<p style="text-align: center;"><b>APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</b></p>
<p>1. Does the Program portfolio have an appropriate balance of awards across disciplines and sub disciplines of the activity?</p> <p>Comments:</p> <p>The 2012 COV found that in general an appropriate balance of awards was made across disciplines. We note that the Program should carefully consider proposal pressure and priorities to balance the funds available within specific sub programs.</p>	<p>Appropriate</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments:</p> <p>The 2012 COV found that in general awards are appropriate in size and duration. Scientists now have to scramble harder than ever to keep sufficient levels of funding. Program Officers are clearly working hard to keep the community afloat and are aware of the many funding pressures facing the community. It is frustrating to see review comments wanting either (a) a much more detailed work plan with more things in it for the money OR (b) a more limited research scope definition, without really much scientific rationale. Program Officers seem to manage these contradictory bits of advice well in working with PIs.</p> <p>Since the start of the ICER period, funding has increased in real dollars from ~\$310 million to ~\$360 million, although this represents essentially constant funding when adjusted for inflation relative to 1970 (see Figure 38).</p> <p>We note that the budgets available for PO, BO, CO, and Ocean Education have increased in size since 2001. Funding for MGG, OTIC and IODP have been flat or decreasing in size (see Figure 39). Proposal requests in terms of dollars have been variable, but not increasing in all cases except for BO (see Figure 40). As a result, IODP, OTIC, and Ocean Education have seen very large fluctuations in budget amounts versus requests (10 to 130%), while budget requests have been relatively constant at 20-30% for all other programs (see Figure 41). Overall success rate has oscillated between ~25 and 43% overall (see Figure 42). The number of new awards has been relatively constant, although with different mean values by program (see Figure 43). Award size has increased slightly for most programs (see Figure 44). It increased dramatically for OTIC in 2003, 2004, and 2006, and then decreased.</p>	<p>Appropriate</p>

to values similar to other programs.

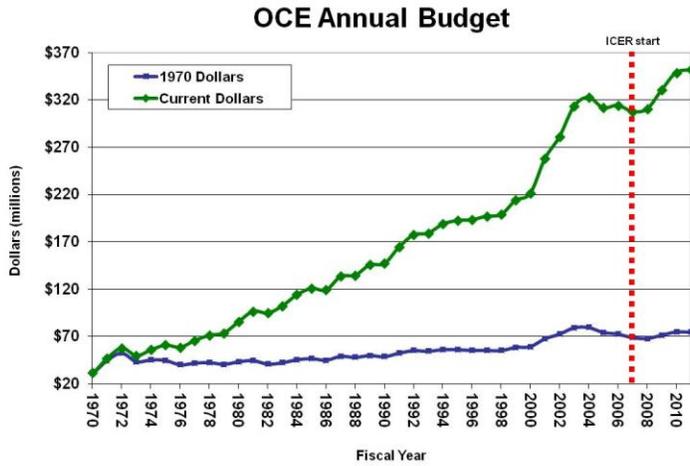


Figure 38

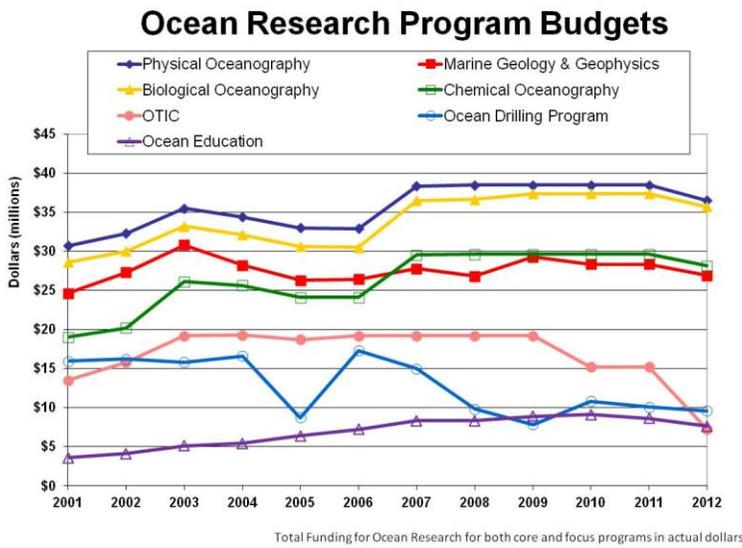
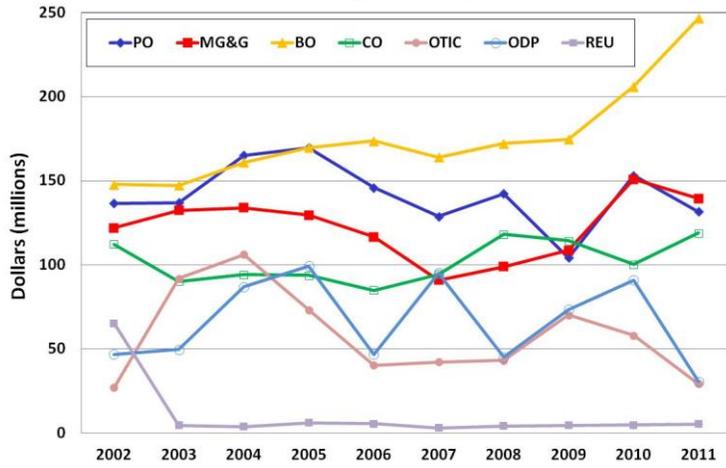


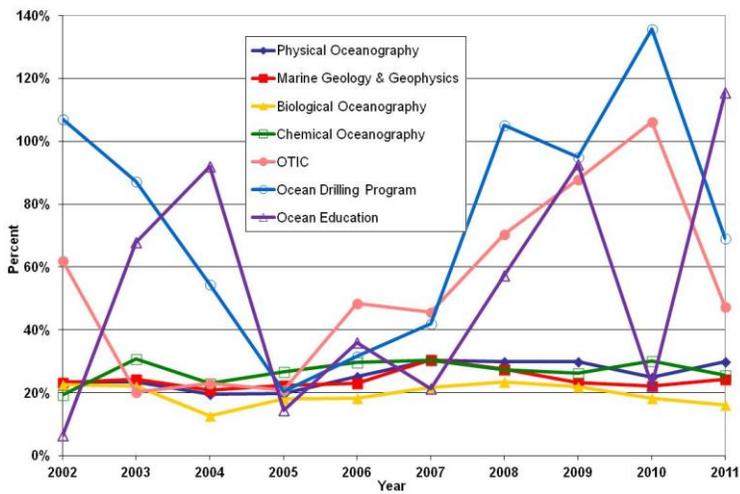
Figure 39

**Ocean Research Program Requested Dollars**



**Figure 40**

**Ocean Research Program Budget vs Request**



**Figure 41**

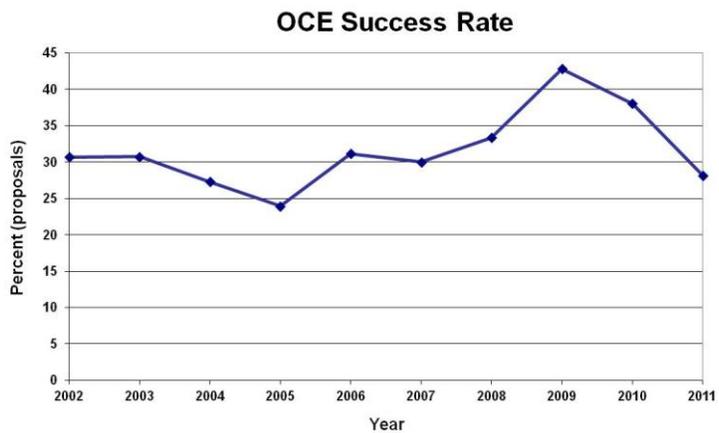


Figure 42

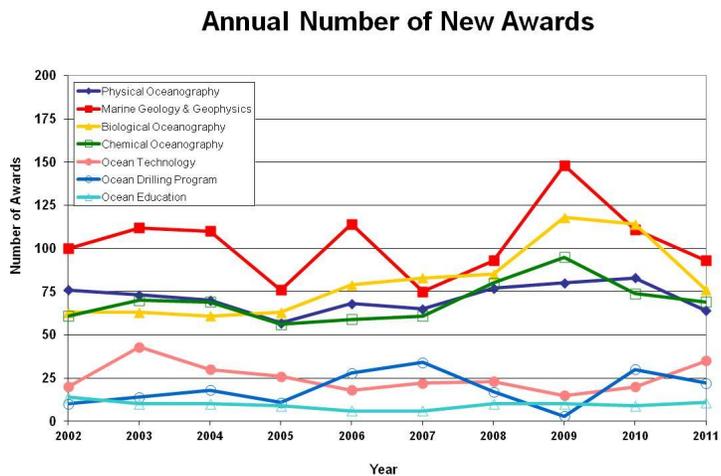


Figure 43

### OCE Annual Award Size by Program

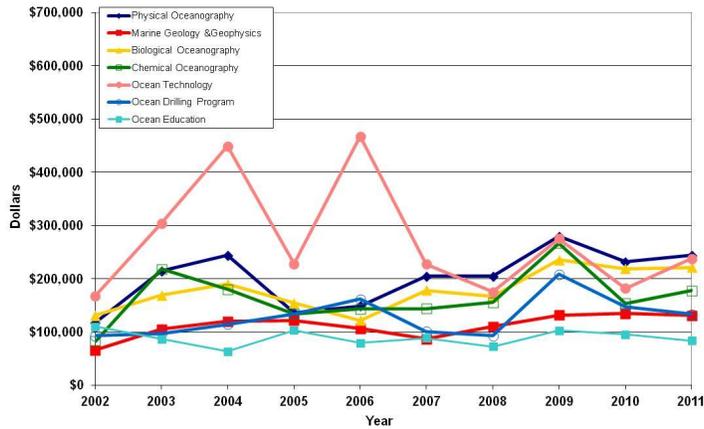


Figure 44

The fraction of awards with revised duration varied from less than 15% in BO to nearly 30% in IODP. Only a small fraction of the revisions (~2-7%) resulted in a longer project duration to meet the originally requested project scope. It is likely that the majority of projects with reduced duration were also revised downward in scope to reflect the shorter duration (see Figure 45). The trends by program observed in terms of project duration are correlated with the observed budget revisions. Programs that had greater reductions in duration also had generally greater reductions in budget (see Figure 46).

We also note that the overall mean award duration in OCE has apparently declined from ~3.5 years from 2002-2008 to about 2.5 years in 2011 (see Figure 47). However this decrease is not so obvious in the award duration graph for individual programs (see Figure 48). In 2011 the duration of awards in CO, MGG, Ocean Education, and ODP (2.0-2.5 years) was considerably lower than those in PO, BO, and Ocean Education (2.5-3.0 years).

### Revised Duration

2009-2011

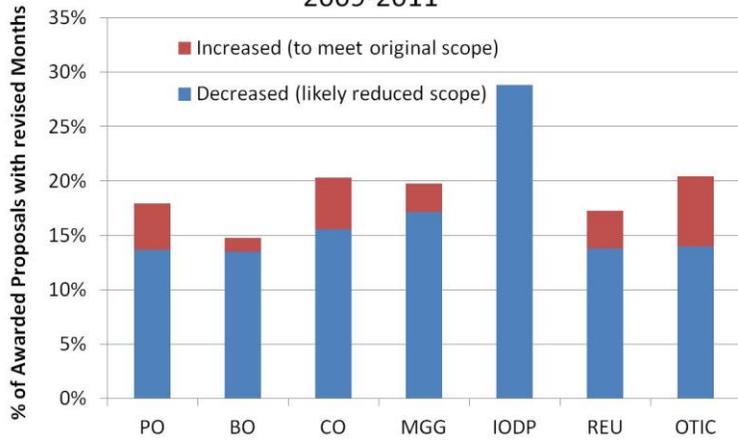


Figure 45

### Revised Budget

2009-2011

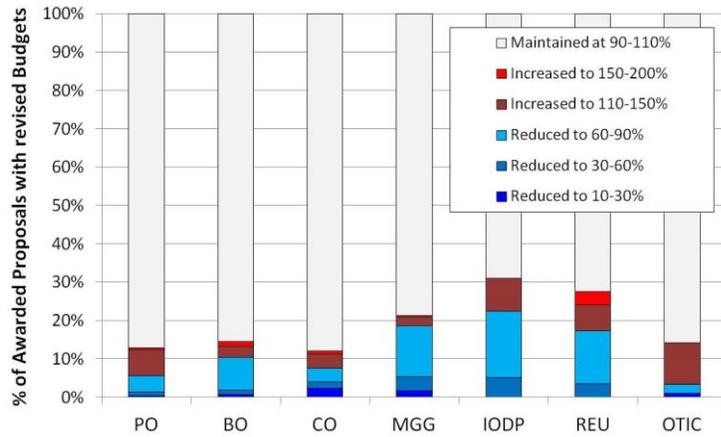


Figure 46

### OCE Average Award Duration Including No Cost Extensions

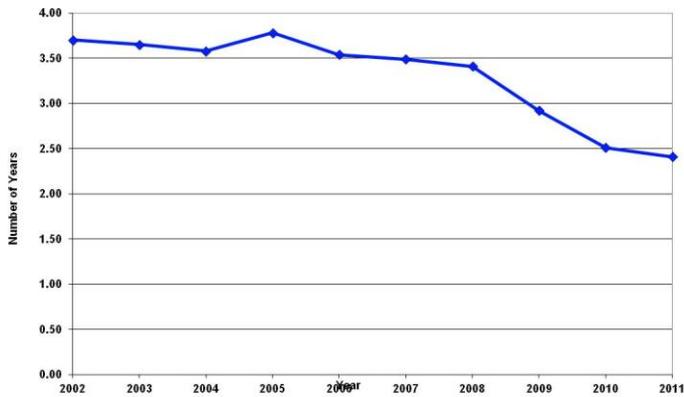


Figure 47

### Mean Award Duration by Program - revised

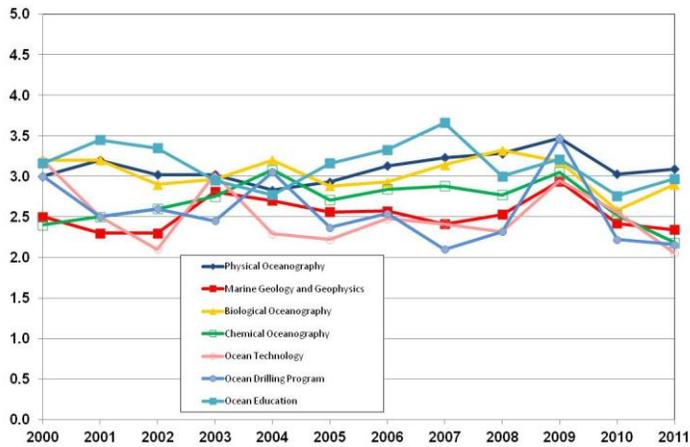
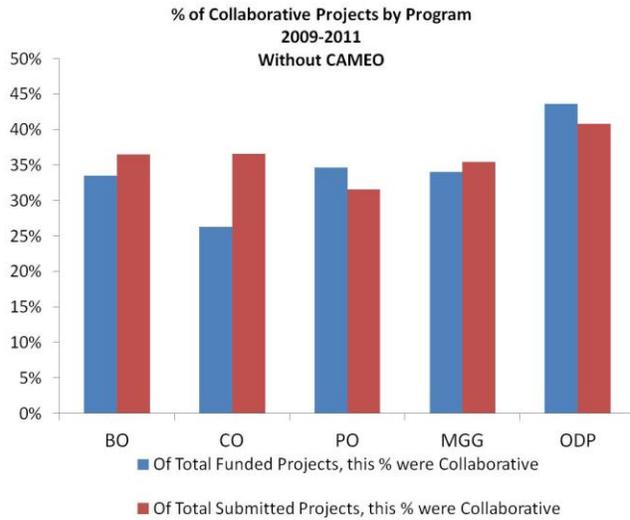


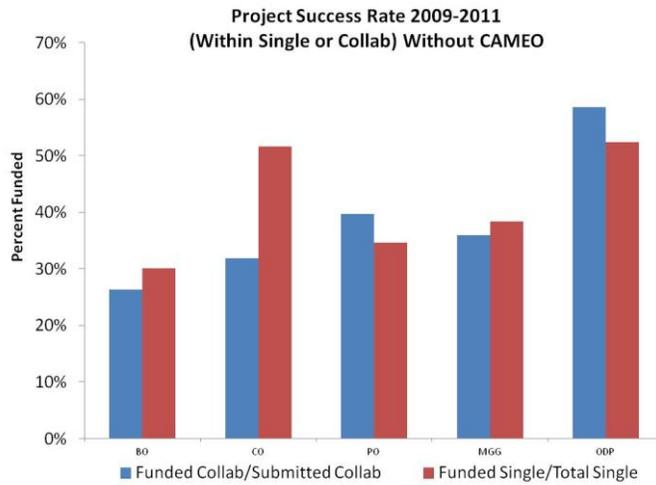
Figure 48

PO and ODP tended to fund collaborative projects at a rate slight greater than their representation in the submitted projects, while MGG, BO, and CO in particular, tended to fund collaborative projects at rates lower than they were submitted (see Figure 49). This trend was also true when comparing collaborative projects with single projects. ODP and PO tended to fund a

greater fraction of collaborative projects relative to single projects, while MGG, BO, and in particular, CO tended to fund a larger fraction of single projects relative to collaborative projects (see Figure 50). It is beyond the scope of the analysis available to us to see how statistically significant any of these differences are.



**Figure 49**



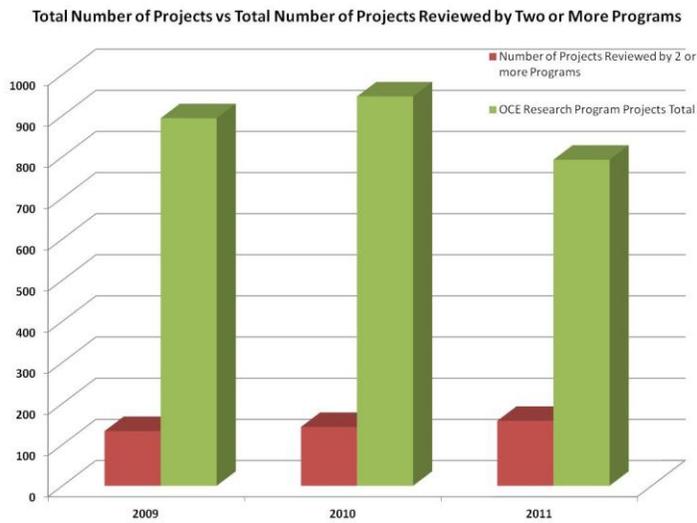
**Figure 50**

The majority of projects were funded by a single program, although the number of projects reviewed by more than one program did increase slightly from 2009 to 2011 (see Figure 51).

Of the multi-disciplinary proposals reviewed, a plurality was from non-OCE programs. The next greatest fraction had BO as lead, followed by CO, and then PO or MGG, which accounted together for about the same fraction as the CO component (see Figure 52).

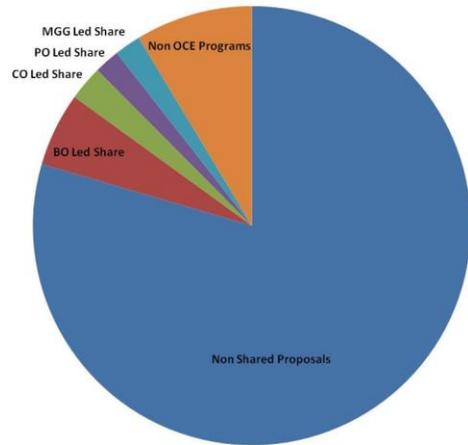
Following is additional information on proposal funding, processing time, and other data on proposals, rankings, and PIs obtained from the graphs:

The number of proposals handled by Program Officers as a function of program has generally decreased in MGG, was relatively constant in PO and CO, but increased in BO, and varied greatly in IODP from 2002 to 2011 (see Figure 53).



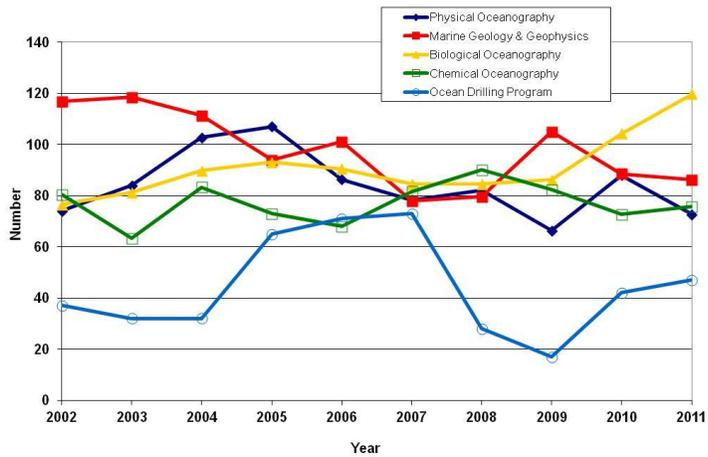
**Figure 51**

**Program Lead in Multidisciplinary Review  
by two or more programs 2009-2011**



**Figure 52**

**Number of Core Program Proposals Handled per  
Program Manager**



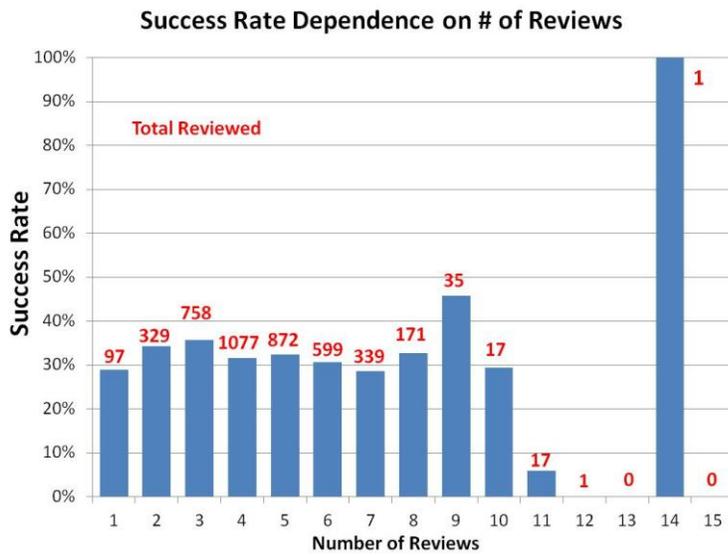
**Figure 53**

The percentage of proposals processed within 6 months decreased from nearly 90% in 2002 to 65% in 2006, before increasing back to 85% in 2011. Note that the percentage of proposals processed within 6 months in OCE was greater than that for GEO as a whole, although GEO also increased its processing time from 2009 to 2011.

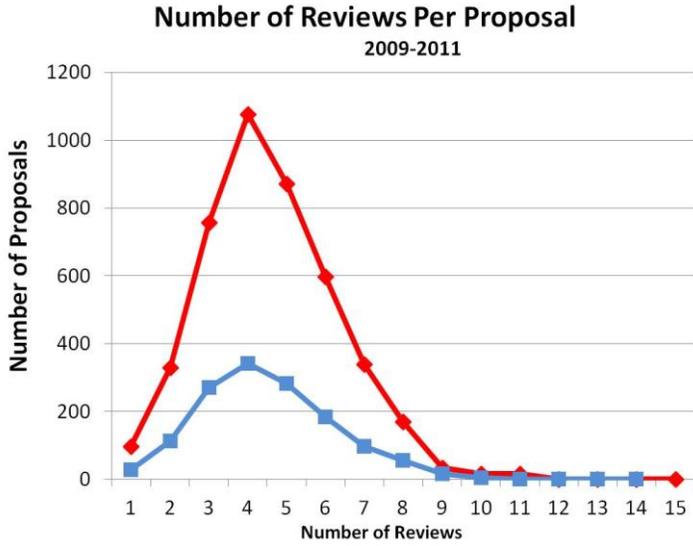
The number of reviewers per proposals did not appear to impact the success rate greatly (see Figure 54), averaging about 30% for projects with 1 to 10 reviewers. The histogram of the number of reviewers for both funded awards and submitted projects peaked at 4 reviewers (see Figure 55). Some projects with greater numbers of reviewers varied in their success rate due to small sample size (see Figure 54).

In general proposals with higher rankings were more likely to be awarded. The majority of proposals funded had rankings of E or V, with a considerably fewer rankings of G, F, or P. In contrast the majority of declined projects had rankings of V or G, with similar numbers of E and F, but relatively few P rankings (see Figure 56).

The panels ranked the projects more critically than the mail reviewers for both awarded and declined proposals. This may be a function of additional feedback they receive from other panelists, or due to comparisons between a greater number of proposals than the mail reviews (see Figure 57).

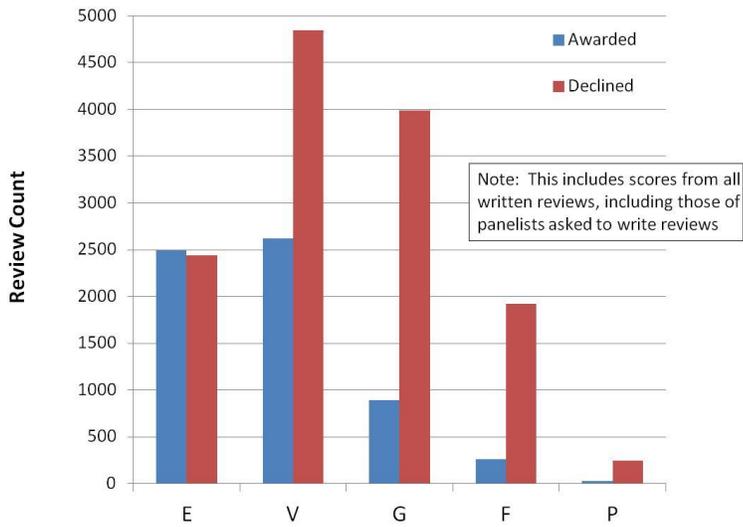


**Figure 54**



**Figure 55**

### Total Score Distribution (Review Count)



**Figure 56**

## Written Review Scores: Mail vs Panelist

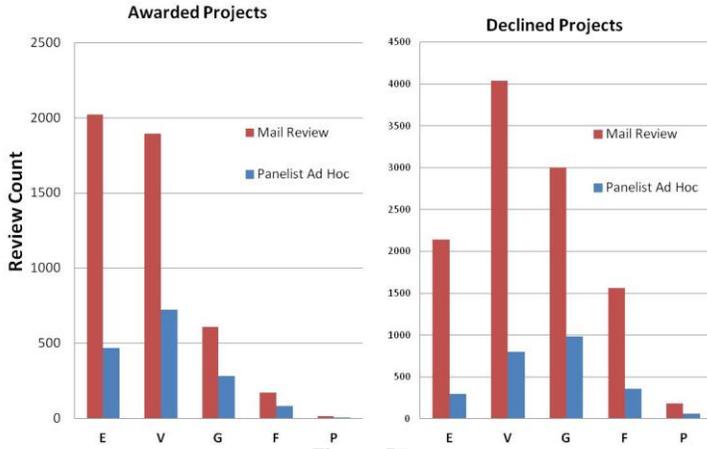


Figure 57

Although the data are considerably noisy, the maximum number of PIs with awards appeared to peak at 15 years post-PhD, while the number of PIs with declines reached a maximum at 10 years, before declining. The fall off in awards as a function of PhD age appears to be slower than the fall off of declines as a function of PhD age (see Figure 58).

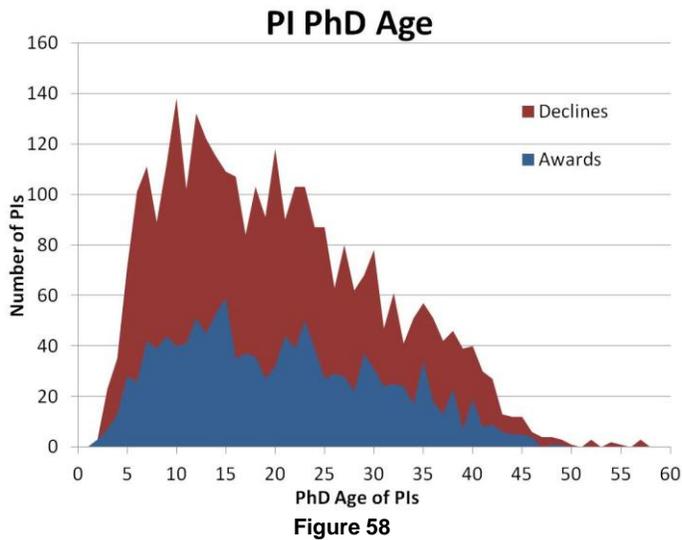


Figure 58

Based on the data provided, PI citizenship status did not affect funded success rate (see Figure 59).

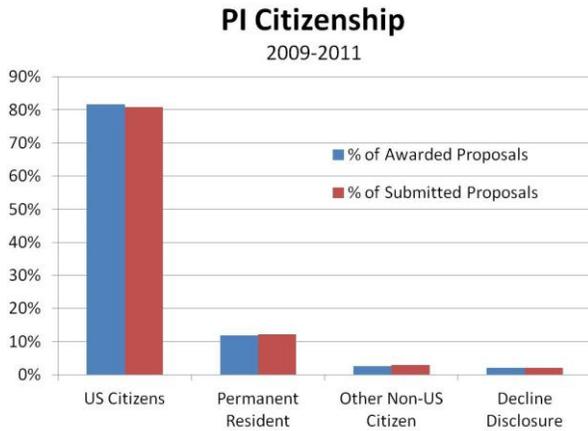


Figure 59

3. Does the Program portfolio include awards for projects that are innovative or potentially transformative?

Appropriate

Comments:

The 2012 COV found that the portfolio does include awards for projects that are innovative and potentially transformative. Program Officers explicitly acknowledged risky, potentially transformative projects, dealt with the range of opinions such proposals can generate, and worked to give awards in appropriate instances. However, we found that the fraction of awards that are identified as High-Risk/High-Reward (HR-HR) varies greatly by discipline, and has in general decreased from 2009 to 2011 (see Figure 23). The success rate in general for HR-HR proposals has also decreased from 2009 to 2011 and is now generally below 3%, dramatically below the general proposal funding success rate (see Figure 22). The current success rates for HR/HR proposals for different disciplines were similarly small, ranging from approximately 2% (CO) to just below 4% (PO). The HR-HR award variability may be partly driven by a lack of a consistent HR-HR definition across programs, as suggested during the site visit.

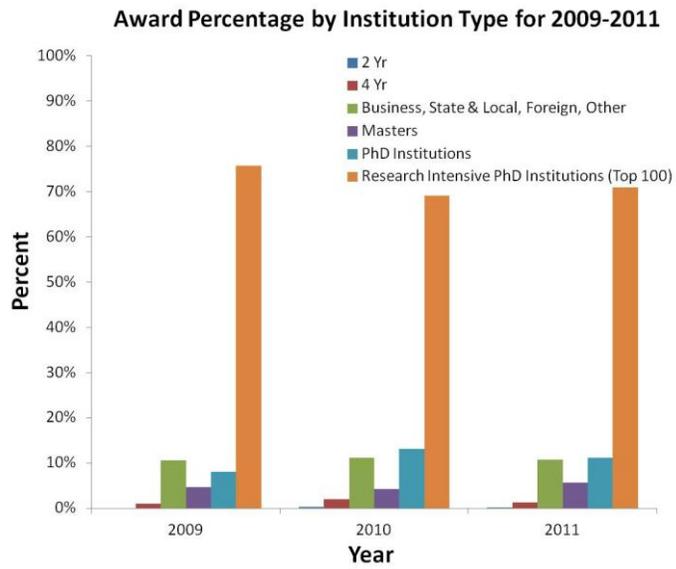
In some areas many proposals that evoked reviews that suggested the work could potentially be transformative were declined because of concerns raised by reviewers about methodological or other constraints.

**Recommendation 12. The COV recommends that more clear HR-HR criteria be developed at the programmatic level. Sets of criteria can then be used to identify programmatic overlaps in an effort to generate some consistency in HR-HR definition across OCE. A future COV can then assess this issue with accurate and coherent data.**

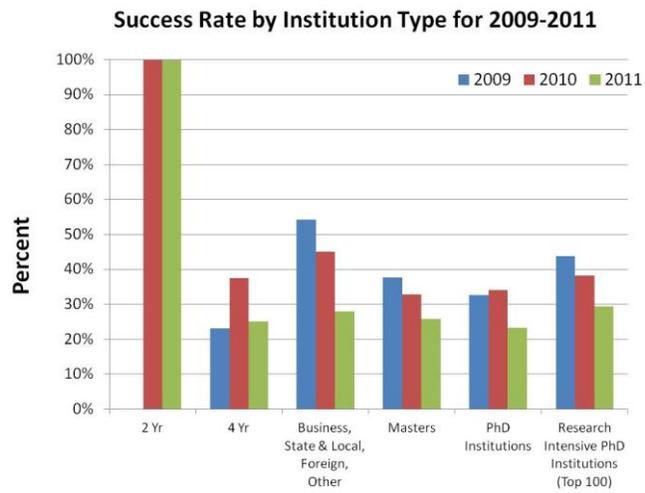
**Comment [RD1] :** This recommendation is new.

<p><b>Recommendation 13. The COV recommends that NSF provide guidance (perhaps in the OCE news letter or town hall meetings) to the community, reviewers and panelists regarding strategies to properly assess the risks inherent in HR-HR projects relative to programmatic objectives during the review process.</b></p> <p>It was noted that REU projects usually have a strong biological focus. Projects are needed that train students for real life as a technical professional, which means 1) individualizing the research experience, and 2) broadening participation from other disciplines. More diverse expertise in the submission pool and on review panels could help expand the technical and experiential focus. Although the science approaches incorporated in REUs are of necessity not cutting edge, the research experiences transform the lives of the student participants.</p> <p>A large fraction of the RAPID awards dealt with the Gulf Oil Spill. These were consistently valuable in assessing the spill's impact. OCE received an extremely large number of inquiries (almost 500) in this area. The Program Officers effectively assessed the relevance and strength of these inquiries and rapidly responded to them. Ultimately, about 11% of the inquiries were funded. We commend the Program Officers for their exemplary response to this unexpected and nearly unprecedented event.</p>	
<p>4. Does the Program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments:</p> <p>The 2012 COV found that the portfolio includes inter- and multi-disciplinary projects. E-Jackets document the collaboration between programs, including with some outside OCE. This serves the Program well.</p> <p>Much of the earlier decrease in the success rate of multi-disciplinary proposals relative to single discipline proposals noted by the 2006-2009 COV appears to now be gone, as pointed out earlier</p> <p>In the case of REU projects, by nature most of the OCE REUs are quite inter- and multi-disciplinary. The portfolio contained projects recommended for funding that made good use of field-based data collection, application of technology, and analysis of the Earth, atmosphere, and ocean interactive systems. Many proposals in other sub-disciplines naturally cross research and discipline boundaries. This trend is often acknowledged during the review process.</p>	<p>Appropriate</p>

<p>5. Does the Program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments:</p> <p>The 2012 COV found that the Program portfolio appears to have an appropriate geographical distribution. Like the 2006-2009 COV, we have some concern about what “appropriate” means here. It was noted that most awards were made to PIs in the Northeast (370), West (366), and Southeast (268), and that the relative proportions of awards matched that of reviewers (67) and panelists (78). Relatively few awards are made to PIs in the Southwest (62) and Midwest (56 (see Figure 21). These trends generally follow population distributions, and the lower number of awards in the Southwest and Midwest is perhaps not surprising considering that most of the ocean-oriented research programs are located on or near the coasts. But we did not have any information about the number of PIs funded geographically compared with the population of potential PIs geographically.</p>	<p>Appropriate</p>
<p>6. Does the Program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments:</p> <p>The 2012 COV found that overall awards were made to a range of comprehensive, teaching-centered universities and to Research Intensive (RI) institutions (see Figures 60 and 61). A good balance of public vs. private institutions was also noted among those proposals recommended for funding. However, the vast majority of project awards are made to RI institutions, with very few awards made to 2 year and 4 year institutions that are not designated as MS or PhD institutions. While the number of proposals from these types of institutions was quite different, the success rate by institution type was remarkably consistent, after accounting for variance due to small sample sizes.</p> <p><b>Recommendation 14. The COV recommends that there should be an effort to encourage more proposals from 2-year colleges, community colleges, and tribal colleges.</b></p>	<p>Largely appropriate</p>



**Figure 60**



**Institution Type**  
**Figure 61**

7. Does the Program portfolio have an appropriate balance of awards to new investigators?

Appropriate

NOTE: A new investigator is an investigator who has not been a PI on a previously funded NSF grant.

Comments:

The 2012 COV found that, while the success rate for new PIs was slightly lower than for other demographic groups, OCE appears to be providing adequate support for new PIs based on trends observed in the data. From 2002 to 2010, the success rate for new PIs increased from ~20% to ~30%, before dropping in 2011 to ~18%, at a time when decreases in success rate were experienced across all demographic groups (see Figure 62). Trends within individual disciplines were similar to the OCE-wide trend (see Figures 63, 64, and 65). The percentage of awards to new PIs went from ~ 15% in 2002 to ~ 10% in 2011. The percentage in 2010 increased to 18% in response to increased available funding (see Figure 66). These percentages are similar to those reported by the 2009 COV.

When considered as a function of PhD age, the success rate exhibited almost no trend. Assuming that a low PhD age is a good indicator of new PIs, this suggests that new PIs are at not significantly disadvantaged or advantaged by the current system. Discussions with Program Officers during the site visit indicated that OCE is implementing new programs and procedures designed to further encourage the success of new PIs.

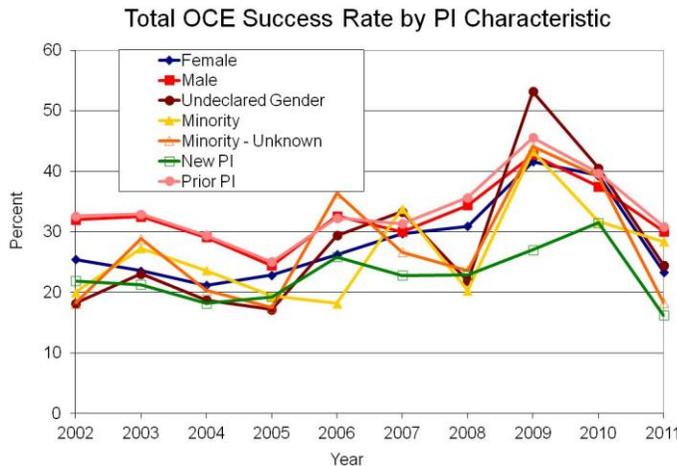


Figure 62

### Success Rate by PI Characteristic

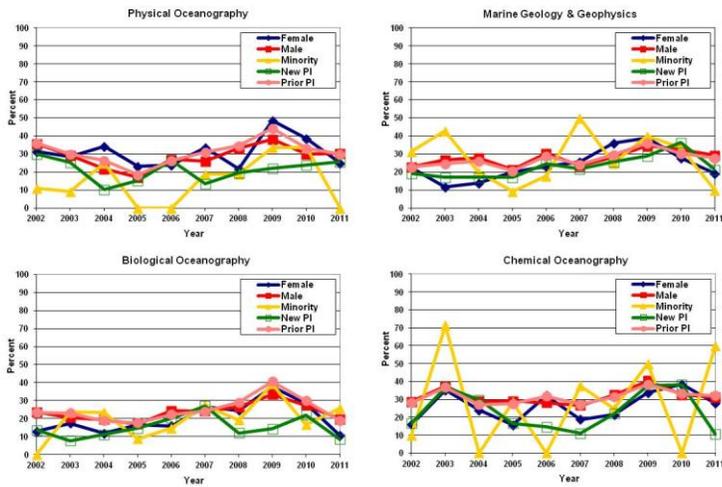


Figure 63

### Success Rate by Program

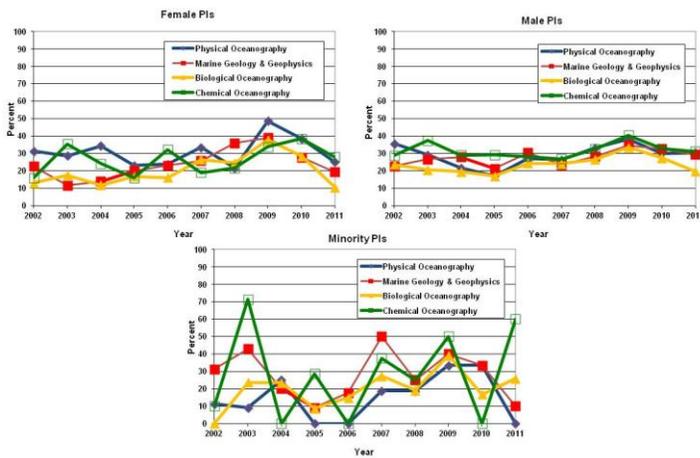
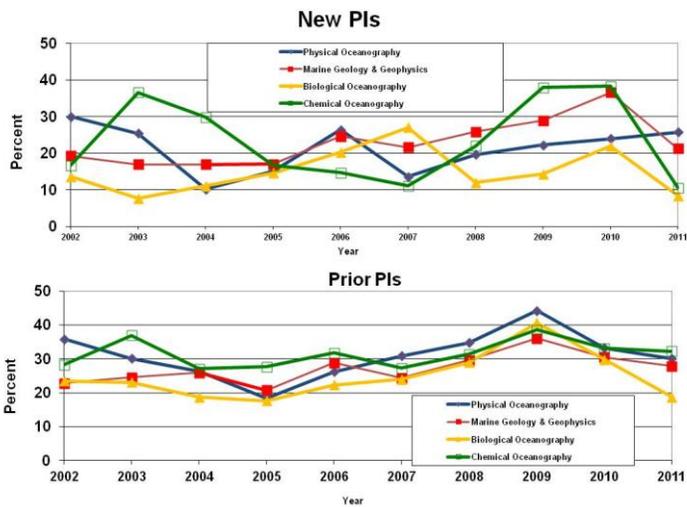


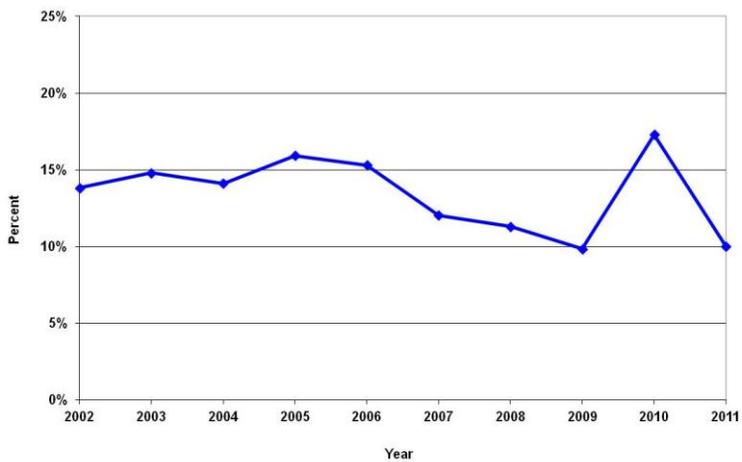
Figure 64

**Success Rate by Program**



**Figure 65**

**OCE Percentage of Awards to New PIs**



**Figure 66**

<p>8. Does the Program portfolio include projects that integrate research and education?</p> <p>Comments:</p> <p>The 2012 COV found that the Program does include many projects that integrate research and education. In most projects education is integrated in the sense of the experience of graduate students, post-docs, and undergraduates in these research projects. In addition, faculty discuss the outcomes in their classes.</p> <p>REU projects, by design, integrate education and research throughout the ocean science disciplines by making good use of field-based data collection, application of technology, and analysis of the Earth, atmosphere, and ocean interactive systems.</p> <p>Reviewers in some program areas analyzed by the COV questioned whether or not ample diversity of individuals was included across OCE.</p> <p>While success at recruiting underrepresented populations to the ocean sciences is noted within some individual programs and in the REU program on average, retaining underrepresented minorities in ocean sciences beyond the primarily undergraduate training programs continues to be a challenge.</p>	<p>Appropriate</p>
<p>9. Does the Program portfolio have appropriate participation of underrepresented groups?</p> <p>Comments:</p> <p>The COV knows that under-representation of women and minorities is persistent in the geosciences in general and ocean sciences in particular. We recognize that this is not an issue that OCE can solve on its own. However, the 2012 COV has significant concerns regarding the number of proposals from and participation by individuals from underrepresented groups within the Program. While the Program has treated these proposals fairly, and has worked to increase participation by underrepresented groups, the numbers of PIs from these groups are still extremely low relative to their proportion within the general population. Considerable progress is still required in this area, which has been raised as a concern in previous COVs. There has been little change in the participation of PIs from underrepresented groups within the OCE community, including the representation of women in the senior researcher ranks.</p> <p>While the number of awards to underrepresented groups remains relatively small, this is due almost entirely to a low number of submissions. Success rates for proposals submitted by PIs who were members of URM groups are generally relatively consistent with success rates for other groups (see Figures 62 through 65 and 67). The low number of awards to underrepresented groups is not going to be resolved without a significant increase in participation by individuals in these groups. In the case of education programs, with the exception of REU and other summer internship programs housed at an HBCU or an MSI, the portfolio did not show evidence of significant numbers of</p>	<p>Not appropriate</p>

minorities being served by EHR/OCE-funded projects. One notable exception was the high rate of female reviewers for the REU program relative to other areas of the OCE portfolio. It would be beneficial to the Program to seek to understand why women compose such a large fraction of the reviewers (and potentially PIs) within the REU program as opposed to other programs within the portfolio. While all programs do appear to be making the effort to reach out to underrepresented groups, other strategies should be encouraged.

**Recommendation 15. The COV recommends that OCE take a leadership role to address these issues in its own programs and in NSF as a whole.**

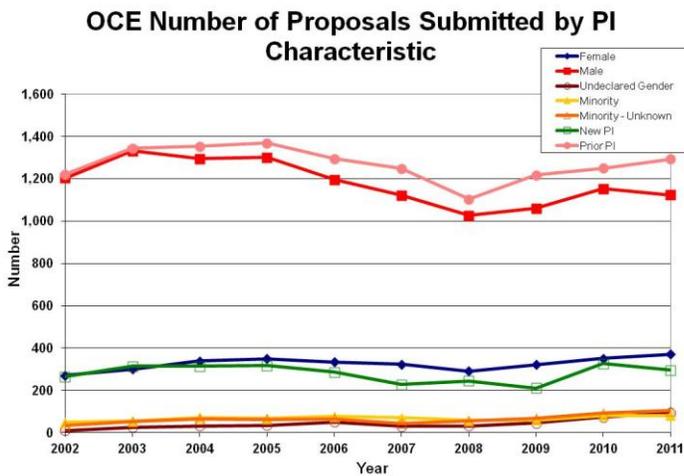


Figure 67

10. Is the Program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.

Comments:

The 2012 COV found that the Program is relevant to national priorities, agency mission, relevant fields, and other constituent needs. Congress and our citizenry are our main constituents, and they need to have information on the outcomes and impacts of our research.

Awards made by the Program support workforce training, understanding global climate change, systems interactions, and natural hazards resiliency, among others.

Relevant recent external reports related to question 10 include:

National Research Council, "A Review of the Ocean Research Priorities Plan and Implementation Strategy", National Academies Press, 148 pages (2007).

Appropriate

National Research Council, "Scientific Ocean Drilling: Accomplishments and Challenges", National Academies Press, 146 pages (2011).

National Research Council, "Approaches for Ecosystem Services Valuation for the Gulf of Mexico after the Deepwater Horizon Oil Spill: Interim Report", National Academies Press, 150 Pages (2011).

National Research Council, "Assessing Requirements for Sustained Ocean Color Research and Operations", National Academies Press, 100 pages (2011).

National Research Council, "Critical Infrastructure for Ocean Research and Societal Needs in 2030", National Academies Press, 88 pages (2011).

National Research Council, "Tsunami Warning and Preparedness: An Assessment of the U.S. Tsunami Program and the Nation's Preparedness Efforts", National Academies Press, 296 pages (2011).

National Research Council, "Assessment of Sea-Turtle Status and Trends: Integrating Demography and Abundance", National Academies Press, 174 pages (2010).

National Research Council, "Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean", National Academies Press, 175 pages (2010).

National Research Council, "Ecosystem Concepts for Sustainable Bivalve Mariculture", National Academies Press, 190 pages (2010).

National Research Council, "Realizing the Energy Potential of Methane Hydrate for the United States", National Academies Press, 204 pages (2010).

National Research Council, "Science at Sea: Meeting the Future Oceanographic Goals with a Robust Academic Research Fleet", National Academies Press, 120 pages (2009).

National Research Council, "Tackling Marine Debris in the 21<sup>st</sup> Century", National Academies Press, 218 pages (2009).

National Research Council, "Increasing Capacity for Stewardship of Oceans and Coasts: A Priority for the 21<sup>st</sup> Century", National Academies Press, 156 pages (2008).

UNOLS Fleet Improvement Committee, "The UNOLS Academic Research Fleet: Continued Access to the Sea (2009)", UNOLS Fleet Improvement Plan 99 pp (2009).

National Science Foundation, Strategic Plan for Fiscal Years 2011-2016 "Empowering the Nation Through Discovery and Innovation".

The International Ocean Discovery Program, "Illuminating Earth's Past, Present, and Future: Exploring the Earth Under the Sea, Science Plan for 2013-2023, 84 pp (2011).

National Science Foundation, GEO Vision, "Strategic Framework for Education & Diversity, Facilities, International Activities, and Data & Informatics in the Geosciences" 38pp (2009).

11. Additional comments on the quality of the projects or the balance of the portfolio:

The 2012 COV found that the scientific balance of the OCE portfolio is driven by the proposal pressure/proposals submitted. While the number of new proposals submitted to each program varied (see Figure 68), for the period examined the success rate was approximately equal across the four core programs (PO, BO, CO, and MG&G (see Figure 69). For proposals reviewed by multiple programs (multi-disciplinary), the number of proposals submitted is lower than the overall number of proposals reviewed by single programs, although their success rate is not systematically lower across all disciplines. With regard to balance of the portfolio, the COV wonders whether multi-disciplinary proposals are encouraged given their small number, or are perceived by the community to be as encouraged for submission as disciplinary proposals. Data were not available to assess this. It is clear from this COV that the review process for multi-disciplinary proposals is appropriate and consistent based on the science proposed, and that the multi-disciplinary proposals are reviewed together in a single panel using on-site core program panelists.

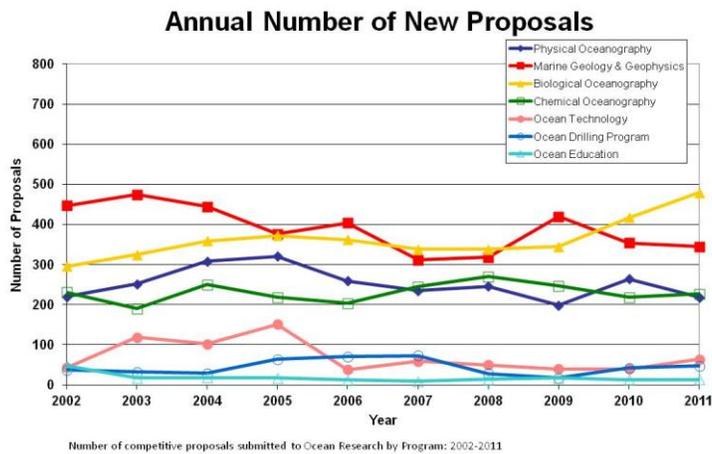
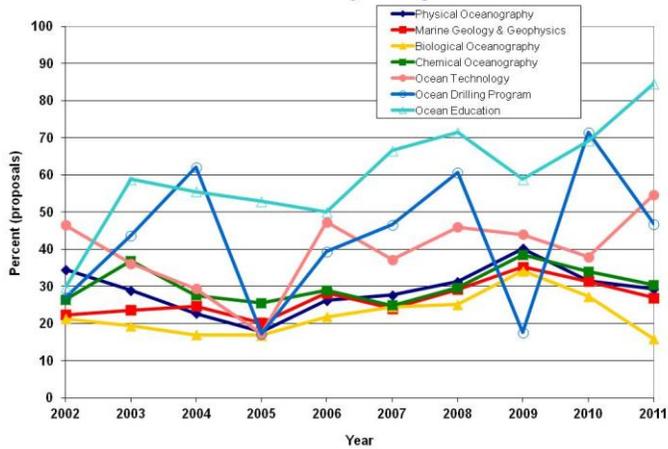


Figure 68

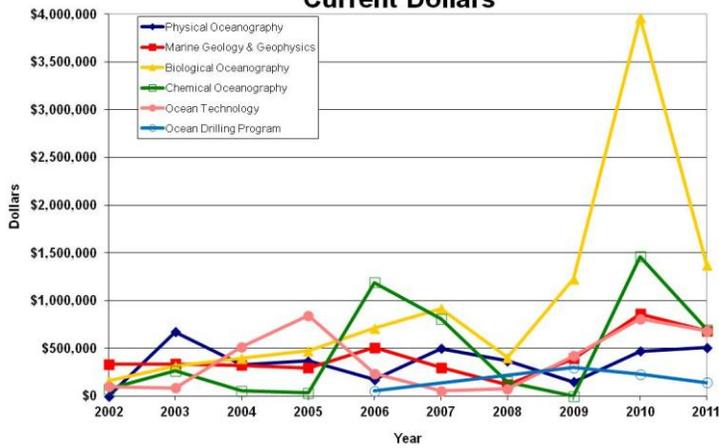
**OCE Success Rate by Program for 2002-2011**



**Figure 69**

Overall, the investment in RAPIDs (see Figure 70) seems an appropriate balance between responsiveness versus community input.

**SGER, EAGER, RAPID Award Amounts in Current Dollars**



**Figure 70**

## OTHER TOPICS

1. Please assess the timeliness, effort level and effectiveness of OCE's RAPID response to recent natural and man-made disasters, i.e. Katrina/Rita Hurricanes, Haitian earthquake, Deep Water Horizon oil spill, Japan earthquake and tsunami.

The 2012 COV found that, consistent with expectations of the RAPID program, the OCE awards were timely and supportive of a range of biological, chemical, geological, and physical explorations of recent disasters. The Program Officers are to be commended for their efficiency in getting these awards processed quickly. With the exception of the Haitian earthquake, the RAPID response times were very effective, with an average of 3 months and most responses under two months (see Figure 71). Results from the research awards are likely to benefit both the research community and the public in those regional areas most affected.

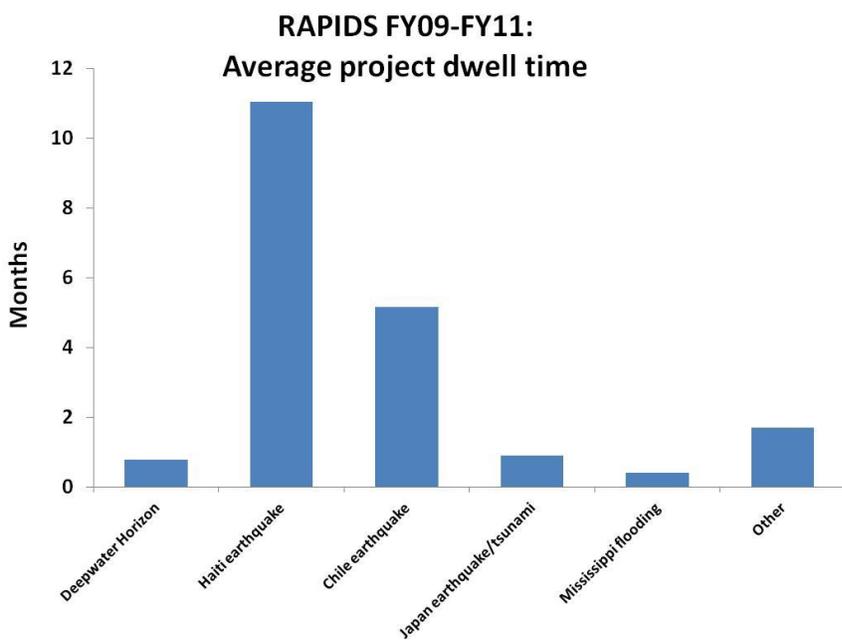


Figure 71

2. Please comment on any Program areas in need of improvement or gaps (if any) within Program areas.

It has been noted that at the Ocean Sciences meeting this year in Salt Lake City it was impressive just how diverse the attendants - particularly the students - seemed to be compared with a number of years ago. There are reports that suggest this as well in terms of the increase in diversity in Science, Technology, Engineering, and Mathematics (STEM) at the entry level. Ocean Sciences is attracting diversity at the entry level, but the key issue seems to be institutionalization of these new

potential PIs into the permanent workforce. The diversity (of reviewers and panel members, institutions, and PIs) remains a major issue. See additional discussion of this topic in Section IV-9.

In the education area, new and supplemental REU awards largely met the goals of targeting student participants and developing meaningful research activities in a range of field and lab settings. Fewer of these types of partnerships were noted in the eJackets for the other OCE programs, however.

**Recommendation 16. The COV recommends that OCE should consider expanding the size of the REU program with the goal of reaching more students and to continue progress at increasing the diversity of the OCE community given the past effectiveness of the REU program.**

3. Please provide comments as appropriate on the Program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

Considerable effort is spent balancing the resources available for core science as opposed to infrastructure needs. This approach, which is appropriate for an organization focused on basic research, makes NSF relatively unique among the Federal Science funding administrations. The biggest challenge to the long-term effectiveness of this approach appears to be budgetary pressures, which place limits on the ability to fund science, develop infrastructure, and develop the next generation of OCE scientists.

While the COV was not asked to specifically comment on the process by which the overall Program balance or priorities are determined, significant issues such as the relative percentage of Program funds that are spent on research infrastructure, facilities, and technology development do play some role in the proposal review process. This is particularly true as the relative proportion of Program funds used for these expenses continue to increase. The Program leadership has shown due diligence in trying to manage the increase in operation and maintenance costs, and to the extent possible, the COV believes the individual programs continue to review proposals in a manner that emphasizes the best science. The COV would like to see this emphasis on the scientific content (both in Intellectual Merit and Broader Impacts) continue to be the primary metric by which the programs assess proposal quality. There is a need to achieve an equilibrium between research funding and the funding of the tools necessary to carry out that research, and the COV encourages the Program to continue to carefully consider that equilibrium in a manner that benefits the science overall.

4. Please identify agency-wide issues that should be addressed by NSF to help improve the Program's performance.

One observation made after evaluating the 2006-2009 COV was that Broader Impacts was not particularly well integrated into the review process. It now appears that this is no longer the case. Both the Broader Impacts and Intellectual Merit of the projects seemed to be considered at all levels of the review process. This is a healthy development. NSF is also developing effective strategies to showcase principal results through NSF highlights and the OCE newsletter. At present, these efforts appear to focus largely in the area of IM. The COV feels that this strategy would be effective with respect to BI as well.

**Recommendation 17. The COV recommends that OCE and NSF seek to showcase the impact that both IM and BI are having on the research conducted by NSF PIs.**

Innovative approaches to increasing diversity and broadening the talent pool should remain central to the mission of the agency's programs and, subject to consistent measures of success, across directorates.

In the education area REU Site and Supplement projects can be key to diversity efforts. Many sites are located in geographic regions where access to underrepresented populations presents excellent recruiting opportunities. Program performance could also improve by encouraging greater partnerships with Federal Agencies, as these are likely to have societal and cross-disciplinary appeal.

5. Please provide comments on any other issues the COV feels are relevant.

The COV was impressed by the level of cooperation demonstrated by Program Officers when developing a funding decision regarding both single program and jointly funded projects. Multiple Program Officers often provide feedback to funding decisions within single program projects. RAPID proposals are often evaluated by multiple Program Officers prior to funding.

6. NSF would appreciate your comments on how to improve the COV review process, format and report template.

NSF has recently implemented new proposal requirements regarding the need for data management plans and Post-doctoral mentoring plans. The 2012 COV has not evaluated the impact of these on the proposal review process or on their role to help NSF meet Program objectives due to lack of data.

**Recommendation 18. The COV recommends that NSF begin the process of collecting data necessary to evaluate the effectiveness of these new requirements.**

Another potential improvement in the COV process would be to incorporate short presentations from each of the programs (BO, CO, PO, MGG, OTIC and OE) on the first day of the COV review panel. These short "contextual briefs" would provide information on intangibles not easily captured in the summary graphs to give the COV the critical background regarding each of the individual OCE programs, including breadth, goals, management style, and a brief introduction of the personnel involved in the program. This session, which should be no more than an hour total (less than 10 minutes per program), would give the COV a broader perspective and be useful when following up with the Program Officers to pursue individual questions and topic areas.

The current review process, including the accessibility to relevant files in the eJacket and the report template design, is a significant improvement over COV experiences by several COV members from 6 to 16 years ago, when the COV electronic files had yet to be organized into eJackets. The COV greatly appreciated access to these eJackets ahead of the on-site meeting. The program also provided graphs of program data, including many requested by the committee prior to the meeting. This access to the eJackets and the program data allowed the committee to synthesize much of this information before the COV site visit at NSF. This enabled the COV to focus on additional questions when they met. Program Officers commented to committee members that the COV quickly got to difficult questions the Program Officers ask themselves and each other, a positive development for both sides. With this increased time to understand the data summarized in the graphs, the COV found several cases where we would have liked to do more detailed analysis of the underlying data.

**Recommendation 19. The COV recommends that for future COVs these graphs be linked to the data used to generate them in a way that would allow statistical analysis by the committee.**

During the 2012 COV, many members read proposals from outside their primary area of expertise. One key element of the COV review is comparing the review process across individual programs in OCE, which is difficult when disciplinary boundaries are maintained in the review. We found that, unlike reviewing a proposal, the same level of technical expertise was not required for reviewing an eJacket, given the specific focus of the COV on the nature of the NSF review process. The process of reviewing an eJacket was also substantially faster and easier than reviewing a proposal. One approach to achieving the goal of reviewers gaining context across programs would be for each proposal to be read by two committee members, one within the discipline and one external to the discipline.

**Recommendation 20. The COV recommends that individual members of the next COV read jackets from more than one program.**

The COV noted that many of the NSF staff who participated with us in discussions were individuals whom we had not met previously. Although everyone did introduce himself or herself quickly at the beginning of the two-day review, names can quickly be forgotten.

**Recommendation 21. The COV recommends that NSF staff wear nametags and OCE program identification during the COV review to help COV members get to know them better.**

In the introductory letter (6th Feb 2012, from Timothy Killeen) the charge was to provide external expert judgments in 2 areas: a) matters pertaining to proposal decisions, and b) the degree to which outcomes have contributed to NSF's missions, goals, etc. The charge in the template (and finally clarified during the meeting) was to address only the first of these issues. We understand this redefined charge is new for this COV.

There appeared to us to be some anomalous template questions (perhaps related to the earlier dual charge?) or those for which data were insufficient. For example, we felt that questions about the relevance to national priorities were beyond our scope, and questions about portfolio balance in sub disciplines were beyond the information we received.

**Recommendation 22. The COV recommends that the Program check through documentation provided to ensure:**

- a) the charge to the COV is consistent;**
- b) the questions in the template are consistent with the charge,**
- c) sufficient data are provided to address the charge.**
- d) all graphs and tables provided to the COV include detailed descriptive captions or footnotes.**

Although the choice of the eJackets for COV review was explained prior to the COV meeting, some stressing of the factors used in making the choices would, we think, have been helpful; specifically, that the eJackets reviewed by the COV contained a higher proportion of anomalous proposals than the entire set of proposals submitted to the Program. This results from the method of proposal choice (The eJackets reviewed were chosen from 5 groups of submitted proposals - award-low rating, decline-high rating, award-high rating, decline-low rating, and some in the middle. While the number of submitted proposals in each category varied substantially, the number of eJackets selected for the COV did not). To be clear, we are not criticizing the method of selecting jackets to review – we are just seeking more clarity (before the COV) in how representative the selection is of the entire proposal pool. One way to address this might be to provide a histogram of the relative

proportions of all proposals in each of these categories within the entire portfolio to provide more complete information on the distribution of proposals in the portfolio.

**SIGNATURE BLOCK:**



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For the FY 2012 NSF Committee of Visitors  
Robert A. Duce  
Chair

Amendment to the report:

Two figures and a brief discussion of proposal success rate both with and without UNOLS ship time requests were inadvertently left out of the main report above. This additional information is as follows:

Figures 72 and 73 show proposal success rate both with and without UNOLS ship time requests, by program and OCE overall, over the past decade. While there is some variability by program over time, overall OCE funding rates for proposals without requests for UNOLS ship time varied from ~24% to ~43% while those with ship time requests also varied from ~24% to ~43%. Thus the overall success rate of proposals does not appear to be related to requests for ship time.

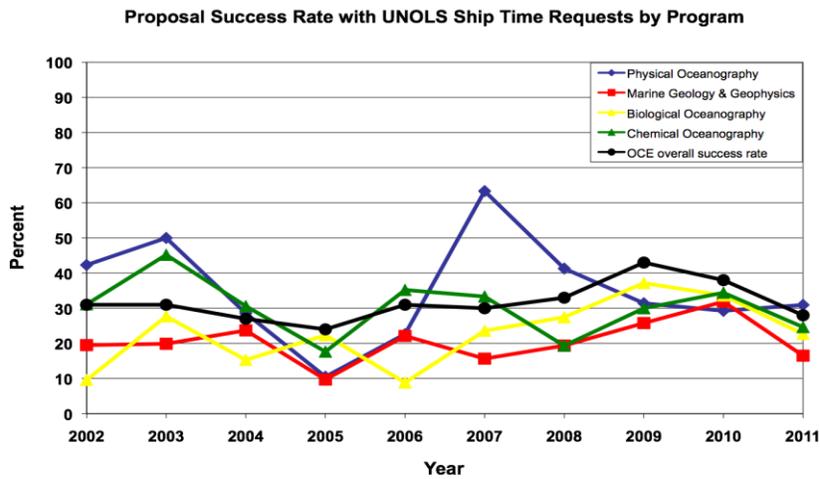


Figure 72

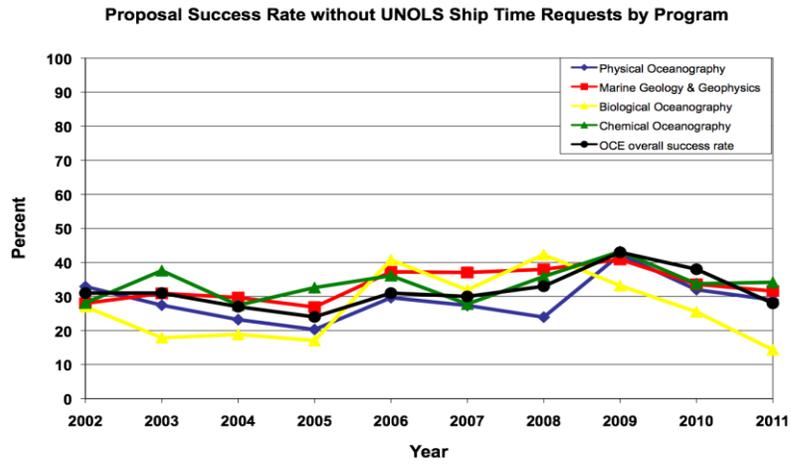


Figure 73