

**CORE QUESTIONS and REPORT TEMPLATE  
for  
FY 2012 NSF COMMITTEE OF VISITOR (COV) REVIEWS**

**Guidance to NSF Staff:** This document includes the FY 2012 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2012. Specific guidance for NSF staff describing the COV review process is described in Subchapter 300-Committee of Visitors Reviews (NSF Manual 1, Section VIII) that can be obtained at <[www.inside.nsf.gov/od/oia/cov](http://www.inside.nsf.gov/od/oia/cov)>.

NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and (2) managerial matters pertaining to proposal decisions.

The program(s) under review may include several sub-activities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the sub-activities of the program, with the latter requiring more time but providing more detailed information.

The Division or Directorate may choose to add questions relevant to the activities under review. NSF staff should work with the COV members in advance of the meeting to provide them with the report template, organized background materials, and to identify questions/goals that apply to the program(s) under review.

Suggested sources of information for COVs to consider are provided for each item. As indicated, a resource for NSF staff preparing data for COVs is the Enterprise Information System (EIS) –Web COV module, which can be accessed by NSF staff only at <http://budg-eis-01/eisportal/default.aspx>. In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

For section IV addressing portfolio balance the program should provide the COV with a statement of the program's portfolio goals and ask specific questions about the program under review. Some suggestions regarding portfolio dimensions are given on the template. These suggestions will not be appropriate for all programs.

**Guidance to the COV:** The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the **processes** related to proposal review. Discussions leading to answers for Part A of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. **COV reports should not contain confidential material or specific information about declined proposals.** The reports generated by COVs are made available to the public.

*We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions. For past COV reports please see <http://www.nsf.gov/od/oia/activities/cov/covs.jsp>.*

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

The information below should be completed by program staff.

**Date of COV:** June 5-7, 2012

**Program/Cluster/Section:** All

**Division:** Division of Environmental Biology

**Directorate:** Directorate for Biological Sciences

**Number of actions reviewed:**

**Awards:** 32      **Declinations:** 119      **Other:** 0

**Total number of actions within Program/Cluster/Division during period under review:**

	All Proposal Actions	Competitive Proposal Actions
<b>Awards:</b>	3,347	1,420
<b>Declinations:</b>	6,194	6,039
<b>Other:</b>		

**Manner in which reviewed actions were selected:**

The list of proposals used in this study includes all competitive proposal actions managed by the Division during the study period. Competitive proposal actions include all research and education proposals which have gone through the merit review process resulting in award or decline decisions; this excludes supplements, continuing grant increments, and any proposals that were withdrawn or returned without review. The list includes both core disciplinary programs and more focused solicitations with special review criteria managed in DEB during the study period.

Generally, the Division reviews and manages proposals at the level of "Projects" where collaborating investigators from separate institutions are treated as one unit even though each institutional

Sponsored Research Office submitted a cover page and budget request generating an individual "Jacket". The 7459 competitive proposal actions covered by this Self-Study represent a total of 5595 projects.

The sample of 151 jackets provided to the COV was selected from the complete list of competitive proposal actions for qualitative analysis of merit review. To generate the sample, a sequential number was assigned to each competitive proposal considered during the study period in order of jacket ID number. A random number generator was used to select 150 jackets; these were checked for representative proportions of programs and outcomes and examples of all programs the Division. One additional random number was generated and the nearest neighbor used to capture an example of a program absent in the initial sample, yielding a total of 151 jackets. Where the sample lacked representative proportions with respect to program clusters and the proportion of awards versus declines, two new random numbers were generated to drop the nearest occurrence of the over-represented category and add a jacket from an under-represented category. Committee members will be able to access any of the 151 sample jackets via the COV web site in eJacket, excepting those that present a reported conflict of interest. Committee members should discontinue reading and alert DEB staff members about any proposals for which they find conflicts that were not captured by eJacket. Note: A total in excess of 151 jackets will appear in the eJacket module because the system automatically includes all jackets associated with collaborative proposals even though only one of the jackets was counted in the sample.

In addition, eJacket contains a list of all the awards made by the Division over the last three years. The COV can request to see any proposal on this list during the meeting, remaining cognizant of conflict of interest (COI) rules.

## Committee of Visitors Report June 26, 2012

### EXECUTIVE SUMMARY

The Division of Environmental Biology (**DEB**) continues to lead the U.S. scientific community in the evaluation and funding of innovative science in ecology and evolution. The merit review process is carefully implemented; the intellectual questions and societal impacts addressed by DEB-funded research continue to be novel and broad in scope; and the relationships among Program Officers (**POs**) within DEB and other Divisions (BIO and others) are productive, cordial, and provide opportunities to increase funding and promote interdisciplinary research. The Committee of Visitors (**COV**) commends DEB's administrative staff (the Program Support Manager, Operations Specialist, Division Secretary, Program Analysts, Program Specialist, and Program Assistants) for their dedication and work in facilitating the missions of the POs and DEB Directors during a period of unstable and low staffing.

In this report, the FY 2012 COV reviews the Division's activities from 2009-2011 and presents recommendations aimed to enhance DEB's strengths and contributions to the community it serves. These recommendations acknowledge, and some of them reflect, the constraints of flat funding, increasing proposal submissions, very low and declining funding rates (particularly for the Core Programs), and the escalating cost of scientific research. In our deliberations, we were also mindful that the BIO Directorate and DEB must develop novel mechanisms for stimulating new research and approaches, increasing the efficient use of funding while continuing to protect funds that might appear to be available for reduction or elimination, and promoting the research of young investigators as well as mid-career scientists in the face of intense competition for highly limited funds.

*Highlights of our discussions with DEB staff and management and of deliberations are the following:*

**(1) New Program Initiation and Development:** There is widespread concern among POs in DEB (and other Divisions) that opportunities to increase research funding through new initiatives are instituted without sufficient input from POs to take advantage of their scientific knowledge and their awareness of the scientific community. Although DEB POs collectively participate in >70 individual working groups (as listed in the self-study prepared by DEB), they feel that their ultimate influence is weak and delayed, potentially due to the lack of direct contact with (and direct responses from) senior management in the BIO/OAD office. A more effective, direct, and transparent way to determine program priorities that fully engages the DEB scientific staff should be developed. This is especially important as NEON evolves because involvement of the DEB community in promoting and conducting continental-scale research will be critical to the success of NEON. Innovative and proactive steps are needed to engage a broad spectrum of scientists to capitalize on the unique research opportunities that NEON will provide. New programs and initiatives increase the administrative burden on DEB and reduce the ability of staff to support the research community. Without additional funding, these new initiatives may compromise support of the core programs that are the "heart and soul" of the Division.

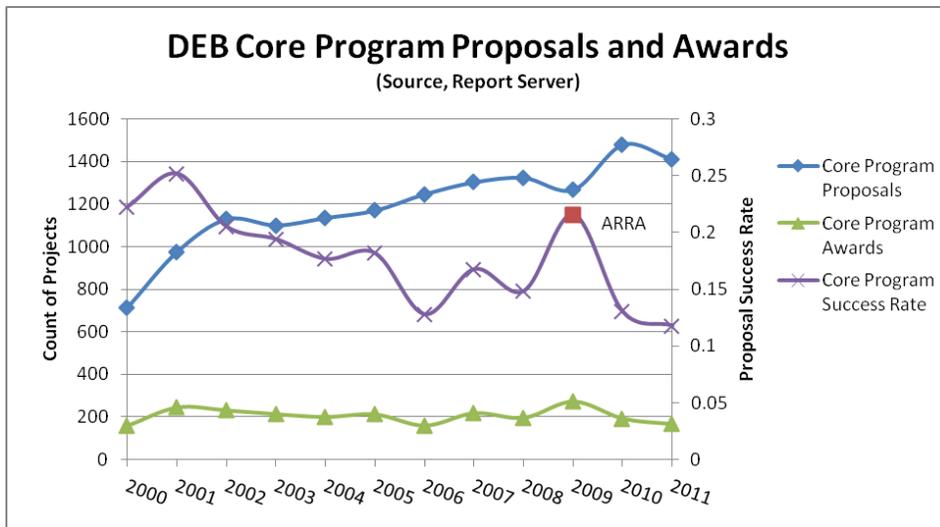
**(2) Innovations in the Review Process:** The DEB has been involved in several experiments to explore options for improving the proposal review process. In 2011, the

Division adopted a new proposal submission and review system that is expected to address concerns about administrative staff, PO, and reviewer community workload. The new system has some potential advantages (e.g., on average, there is less work required per proposal for the PI, the reviewers, and the POs), but panel-based activities will remain frequent. DEB may need to explore qualitatively new practices to complement the standard panel. For example, as video-conferencing technology improves, it may be possible to run small virtual panels (e.g., 5-7 people) with targeted goals.

**(3) Opportunities for Young Investigators:** Opportunities for young investigators to develop independent research programs representing the full spectrum of DEB disciplines have declined significantly with the termination of NCEAS. New postdoctoral opportunities that serve the DEB community are available through other synthesis centers, but these are constrained topically and few relative to the perceived need. The 2012 COV strongly supports the recommendations of past COVs (2009, 2006) to develop opportunities for postdoctoral funding in DEB, and across the BIO Directorate. Reallocation of funding within DEB and BIO could be used to support independent postdoctoral opportunities that would strengthen the next generation of scientists. Opportunities for coupling some of these opportunities with NEON and other interdisciplinary programs that address research challenges identified by the Foundation should be identified and promoted. In addition, DEB POs and Directors should be encouraged to explore partnerships with other federal agencies with shared research interests (e.g., U.S.G.S., U.S. Forest Service, National Park Service, U.S. Fish & Wildlife Service, the Smithsonian Institution, and USDA) to promote postdoctoral opportunities of agencies and DEB.

**(4) Prospects for International Collaboration:** Research within DEB is becoming more global. At the same time, recent management decisions above the Divisional level make funding of international research more difficult for DEB Program Officers. The creation of the Global Venture Fund added a level of bureaucracy that slows the funding process and limits opportunities for co-funding. In addition, the pending reorganization of OISE will reduce permanent staff and result in a loss of critical international expertise.

**(5) Constraints to Programmatic Improvement and to the Fulfillment of Scientific Capacity:** DEB has responded effectively and thoughtfully to recommendations of the 2009 COV that were within its control, particularly given the increase in the number of proposals submitted to the core programs and the decline in funding rates during the review period (as reported in the DEB self-study; see Figure below). However, many of the concerns raised by the 2009 COV relate to increasing proposal workloads, erosion of core programs from top-down initiatives, lack of stability in hiring of staff, limited opportunities for postdoctoral investigators to develop independent research, and reductions in funding that constrain travel budgets, which are not under DEB's control. This COV perceives the need for substantive two-way communication between the BIO leadership and DEB Program Officers as the BIO directorate and DEB grapple with pending challenges.



**(6) DEB Management:** During the review period, although there was more turnover in a key staff position (the Program Support Manager) than desired, the operations and mission of DEB were fulfilled due to the high level of dedication of the support staff and the POs.

**(7) Leveraging DEB Program Officer Knowledge:** The broad expertise, judgment, knowledge, and familiarity of DEB POs and Division Directors with the research and education communities in DEB and related fields (including Math, Geology, Geography, DBI, and IOS) are an invaluable human resource that is not fully utilized by BIO Senior Management when considering and developing initiatives. Senior Management in BIO should offer and promote informal opportunities to include DEB and other POs in discussions of how their expertise can be tapped to serve the communities of scientists that they support. Without routine dialogue among the DD, AD, and all DEB POs (both permanent POs and rotators), opportunities to maximize the positive impact of new initiatives and facilitating partnerships across the Division and between BIO Divisions will be missed.

## 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.

**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>The review process for the various kinds of proposals received by DEB is appropriate. The quality and depth of both the <i>ad hoc</i> and the panel reviews are high. The ultimate decision to award a grant or to decline a proposal was generally well substantiated. Reviewers effectively evaluate the specific details proposed as well as the motivating, big-picture questions. As the number of submissions has increased, the workload of the reviewing community and the number of Conflicts of Interest has also increased, both of which limit the PO's ability to obtain an appropriate number of reviewers on all proposals (a minimum of three, with the aim of including three ad hoc reviews for the proposals that are evaluated by most panels).</p> <p>There appears to be considerable discussion of proposals at panels, and there is evidence that this informs and influences programmatic decisions. The high quality and experience of panelists is therefore imperative. This is particularly critical for the new pre-proposal process in DEB; the process includes drastic winnowing of the pre-proposals (only 15-20% of pre-proposals will be identified as meriting an invitation to submit a full proposal). The evaluation of pre-proposals is conducted by panel members in the absence of external reviews.</p> <p>An increase in the number of panels creates a challenge for all staff in DEB. Travel funds, both for panelists to attend meetings at NSF, and for rotating POs to travel home, to academic conferences, and to other institutions, are critical for the basic functioning of the NSF Directorates. This funding stream needs to be protected if NSF is to carry out its basic mission effectively.</p> <p>Because DEB has switched to a single submission and evaluation cycle per year, some of our comments regarding the 2009-2011 review period may no longer apply. Particular attention should be paid to the fate of new investigators in the pre-proposal process. How resubmissions of full proposals that are not funded are treated is of particular concern given that the interval between successive submissions is so long.</p> <p>The COV strongly encourages DEB leadership and POs to consider ways to restructure panels or to investigate the use of virtual meetings to reduce the costs of panel meetings. However, the existing technology for effective virtual conferences is not adequate, and does not allow for caucusing of smaller groups of panelists, widely acknowledged as one of the most important panel activities. For now, virtual meetings should be investigated for very small panels addressing specialized topics. Alternative panel and proposal evaluation formats could also be explored.</p>	<p>Yes</p>
<p>2. Are both merit review criteria addressed</p>	<p>Yes</p>

- a) In individual reviews? Yes, with qualifications as described below.
- b) In panel summaries? Yes, with qualifications as described below.
- c) In Program Officer review analyses? Yes.

Both criteria are routinely addressed in individual reviews, panel summaries and PO review analyses. The COV recognizes and appreciates the need for all proposals to be evaluated for both criteria.

For purposes of funding decisions, the intellectual merit of submitted proposals appears to be treated by POs as the primary criterion by which proposals are judged, with the proposed broader impacts being secondary but still needing to be met adequately to earn an award.

By contrast, based on the COV's reading of available jackets, many reviewers appear to believe that every proposal must be exceptionally strong in both its intellectual merit and its broader impacts to be ranked highly. This view is in contrast to the spirit of the December 2011 National Science Board report, which advised that Broader Impacts may be fulfilled in the *aggregate*, at the Program or Divisional levels. This new (or renewed) flexibility should be incorporated into both the review and the award processes.

In addition, the NSB report provided a very broad definition of Broader Impacts, which "...may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project."

The COV appreciates, therefore, that the NSB accepts great latitude in any individual award's broader impacts as long as the targeted needs are met at the programmatic and divisional levels. While POs are mindful that the increasing level of competition has generated increased scrutiny of the broader impacts proposed in every submission, it should be made clear to reviewers and panelists that each Program has the flexibility to fund *any* proposal that has exceptional intellectual merit even if its broader impacts are not exceptional. The COV believes that clarifying this distinction will reduce the confusion that we perceive to exist among colleagues and will help to streamline panel discussions.

The COV suggests that the instructions to the reviewers should be updated to reflect the spirit of the NSB recommendations and to reduce the potential for confusion. Moreover, it would be helpful to provide greater clarity regarding what qualifies as "good" vs. "exceptional" broader impacts. Currently, there is no community consensus as to how to evaluate broader impacts in the proposal or how to evaluate the success of previously proposed broader impacts.

There are a number of different ways to generate consistency and transparency in the evaluation of the Broader Impacts. These include at least three possibilities:

- 1) Ask reviewers to restrict their use of the categorical scores to their evaluation of intellectual merit and then to provide comments only (no score) on the broader impacts.

<p>2) Instruct reviewers and panelists how to weight the two categories (intellectual merit vs. broader impacts).</p> <p>3) Ask reviewers to provide two separate scores, one for intellectual merit and the other for broader impacts.</p> <p>Finally, it would be useful to have a mechanism for mining annual reports to assess how broader impacts were fulfilled. A summary of these impacts could potentially be used to leverage more funds for particular programs.</p> <p>Special consideration regarding DDIGS: While recognizing that the development of broader impacts is an important component of DDIG proposals, the COV suggests that this aspect of the DDIG proposals is receiving undue scrutiny and criticism by advisory panels. The COV identified DDIG panel summaries and review analyses that indicated the proposal had been declined on the basis of criticisms of broader impacts. DEB should ensure that the DDIG advisory panels are well briefed about role of broader impacts in DDIG evaluation. DEB POs asked the COV for input on the imposition of indirect costs to DDIGs. The COV recommends that DEB cap the amount of direct costs and let the IDC float depending on the requirements of the institution.</p>	
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<p>3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals?</p> <p>Yes, in the vast majority of cases.</p> <p>An examination of 161 of the proposal jackets made available to the members of the Committee revealed that the ad hoc reviewers provided substantive comments in support of their assessments. In many cases, reviews summarized the justification for and scientific approach of the proposal and noted both strengths and weaknesses in its conceptualization, theoretical contexts, methods, research designs, and broader impacts. Notably, such detailed evaluations were provided for proposals declined as well as for those awarded. The committee was impressed by the diligence of reviewers. Furthermore, the Review Analyses provided by the PO in attendance detailed how outliers and any potential conflicts of interest were dealt with, and were evidence of careful assessment of the significance and interpretation of the substance of individual reviews.</p> <p>Panelists might be offered examples of high-quality panel summaries at the outset of each panel. Similarly, it might be helpful to provide <i>ad hoc</i> reviewers with redacted models of exemplary reviews, including examples of both negative and positive reviews, at the same time that they are given access to the proposal they are requested to review.</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>Yes, in the vast majority of cases.</p> <p>Consensus appeared to be reached in all cases examined. Where individual</p>	<p>Yes</p>

<p>reviews or scores were at variance, the final recommendation was explained. Pains were taken to examine the substance of the reviews in the panel summary, not just the summary rankings (E, V, G, F, P). The panel summaries are clear about weaknesses and strengths, whether a project was declined or awarded. In some cases, what might be added to a project to improve it, either in execution or resubmission, was stated. The COV generally found the summary of the reviews by the Core Program panels to be fair and clear. Panels summarized reactions to both intellectual merit and broader impacts. In only a very few cases did we find the panel summaries to contain vague statements.</p> <p>Comparing panel summaries to the more detailed Review Analyses demonstrated care in reaching panel consensus.</p>	
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<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>Reviews and review analyses effectively cover the prospective positive contributions and the intellectual or methodological weaknesses of each proposal. From the perspective of the COV, the combined information contained in the reviews, the panel summary, and the review analysis gave a clear understanding of how the decision on each proposal was made.</p> <p>Is the quality of the context statement acceptable?</p> <p>For the most part, the context statements were acceptable, and if read appropriately by the PI, should be clear as to how the DEB makes funding decisions. A brief explanation of how the relative importance of Intellectual Merit vs. Broader Impacts were considered by the program when making the funding decisions would be helpful.</p>	<p>Yes</p>
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<p>6. Does the documentation to PI provide the rationale for the award/decline decision?</p> <p>Naturally, panel summaries are variable in their scope and in their usefulness to the PI. Those panel summaries that carefully identify (sometimes with enumeration) the recognized strengths and weaknesses of the proposal, and that clearly distinguish between the conclusions of the panel and the criticisms of external reviewers are probably most useful.</p> <p>To assist in the construction of complete, consistent, and helpful panel summaries, the following field could be added:</p> <p>"Panel assessment and comments on <i>ad hoc</i> reviews": Adding this (or a similarly worded) section would encourage the panel to emphasize important reviews (both positive and negative), and to let the PI know that inappropriate or erroneous review statements or comments in a review were ignored by the panel and did not affect their decision.</p>	<p>Yes</p>
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7. Additional comments on the quality and effectiveness of the program's use of merit review process: None provided.	

**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>After sampling the jackets of the 151 randomly chosen proposals for the 2009-2011 review period, the COV was impressed by the care with which reviewers were matched to proposals, and by the high quality of most of the reviews. The sample included proposals from the diversity of clusters and competitions, including proposals that received joint review. The reviewers usually had the appropriate expertise (based on the nature of their comments), though we had no data on their specific qualifications.</p> <p>For DDIG proposal reviews, it appeared that reviewers were sometimes evaluating research that was outside of their area of expertise, and DDIG reviews were sometimes terse relative to reviews submitted for other competitions.</p> <p>The previous COV report commented on the lack of a reviewer database in which areas of expertise can be identified. This COV supports establishing such a database because of the importance of getting new reviewers into the pool and engaging new investigators. Nonetheless, the program officers do a very good job of finding appropriate reviewers.</p> <p>The COV suggests that Program Officers ensure the continuity of reviewers throughout the new proposal submission process.</p>	<p>Yes</p>
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>The DEB program staff and its review processes continue to maintain the high NSF standards that avoid conflicts of interest (COI) and even the perception of COI.</p> <p>A growing issue is the reduction of the reviewer pool because of the increasing number of conflicts of interest that accompany the growing number of</p>	<p>Yes</p>

<p>collaborative activities. Some of the COI criteria may be too stringent, particularly in situations where colleagues have participated in a paper written by multiple authors, of whom they may only have interacted significantly with one or two. Examples of these include (but are not limited to) workshops or society working groups that lead to a published report. It could help to modify criteria such that substantive collaborative relationships could be distinguished from those in name only. PIs would need to make that distinction.</p> <p>As the number of multi-investigator research projects and activities continues to grow, identifying well-qualified reviewers who are not in conflict with any of the PIs will likely be increasingly difficult.</p>	
<p>Additional comments on reviewer selection: None provided.</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.

Overall, DEB is a nimble and efficiently managed program. Over the reporting period (2009-2011) there has been a structural realignment of programs in DEB to more effectively address research areas of common interest. These realignments included combining Population Biology with Community Ecology into the Population and Community Ecology (PCE) cluster and defining two focus areas within Evolutionary Processes (EP; Evolutionary Ecology and Evolutionary Genetics). Internal review and community input were used to refocus the directions of the SBBI cluster, which was renamed Systematics and Biodiversity Sciences (SBS) and comprises two programs. DEB is understaffed and vacancies must be filled. Nevertheless, the current DEB staff work effectively with the POs and leadership team. The new annual submission process created some additional administrative burden on staff this year (2012). It will be incumbent on the 2015 COV to evaluate how this system has affected workflow and load on the support staff. It remains to be seen whether this change reduces workload (as anticipated).

DEB has participated in several experiments to explore new ways to review and evaluate proposals (graded/ungraded, pre-proposals etc) that have been put forward as ways to develop greater efficiency. DEB POs also took a leadership role in exploring how an "Ideas Lab" could lead to the development of a new initiative to establish tools for Assembling, Visualizing and Analyzing the Tree of Life (AVAToL) The Ideas Lab included broad community involvement and led to the successful development and funding of three large-scale projects. The Ideas Lab type of activity could also be a successful mechanism to develop other new initiatives in DEB that can more effectively utilize the Emerging Frontiers programs, particularly those that will support NEON and Sustainability initiatives in BIO.

During the COV's meeting with DEB support staff, career/professional development was raised as an issue that needs to be addressed NSF-wide. Staff members expressed to the COV that pathways for career development are not always clear or available, which has led some administrative staff to leave NSF for career advancement. Mechanisms to promote employment stability and staff mentorship should be explored by DEB, BIO, or NSF-wide; efforts to provide mentors for staff are underway in DEB. Administrative staff also expressed that they would welcome more open communication from management (from either DEB or BIO managers) about the progress being made towards filling positions that have become vacant.

2. Responsiveness of the program to emerging research and education opportunities.

DEB has taken a leadership role in a number of initiatives that have broad effects on both the research and educational interests of the community it serves and the Foundation as a whole. DEB POs are seen by other Divisions as key partners in the development and implementation of new research initiatives that address important 'grand challenges' of the Foundation and in funding proposals that are 'at the boundaries' of specific programs. The Emerging Frontiers program has

provided the opportunity to explore new funding initiatives; however, concerns were expressed by the DEB scientists about their lack of inclusion in the development of new initiatives and/or changes in processes (e.g., the new system of pre-proposals) that are promoted by Senior Management in BIO.

The portfolio of programs and initiatives that originate outside of DEB and that are supported by the Division seems to have grown without concomitant increases in funding. DEB cannot continue to support the core programs that are the “heart and soul” of the Division and also respond appropriately to new initiatives. A more effective and transparent way to determine program priorities should be developed. Of particular concern is the risk that research funding to the core programs may be reduced (or fail to grow, further decreasing the funding rate) to support emerging opportunities that are not initiated by DEB. While some incubator programs have been successfully incorporated (with their funding) into the core programs (e.g. Assembling the Tree of Life (AToL), BioMaPS) and/or have led to new initiatives (e.g., Water and Watersheds led to to Coupled Natural-Human Systems), others have not.

With NEON coming on-line as a platform to support continental-scale science, the challenge of identifying funding sources that will support this new research potential within DEB and BIO without gutting the core programs must be considered thoughtfully. This provides an important opportunity for discussions between DEB (POs and Directors), other Divisions within BIO, and the BIO/OAD. The MacroSystems Biology program was developed to promote regional- to continental-scale science as a precursor to the establishment of NEON. The Ideas Lab format that was successfully used to develop the priorities for the AVAToL initiative may be an appropriate tool for including the ecological and other research communities in the development of exciting, transformational initiatives that will utilize the NEON platform. NEON provides an opportunity for developing novel research collaborations across and within NSF Directorates that should not be squandered.

DEB POs have been strong and effective advocates for proposals in other cross-disciplinary funding venues (e.g., SEES, Dimensions of Biodiversity). This activity is commended and should continue to be promoted.

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

NSF Program Officers are the primary point of contact and interface between the Foundation and the scientific community. They provide a direct conduit between investigators, reviewers, and panelists. DEB has an excellent culture for co-funding that should be commended and encouraged. Yet, a major challenge that DEB faces in program planning and prioritization is that much of its budget is dominated by initiatives that do not originate from the Program Officers in DEB. "Top down" initiatives do not always reflect the needs of the scientific community, are perceived as poorly defined, and may drain or deflect resources from core programs, particularly given that the cost of research is increasing while core funding is not. Whenever possible, DEB program officers should use top-down initiatives as opportunities to design funding competitions that meet program needs and serve the broad DEB community.

The COV was impressed with the extent to which DEB successfully co-reviews and co-funds proposals with other units, including international proposals. There seems to be a strong positive culture of leveraging resources through co-funding that continues to improve. Co-funding is challenging because the review cycles of the different units are not synchronized, but the officers in all of the Divisions are aware of these constraints.

#### 4. Responsiveness of program to previous COV comments and recommendations.

DEB responded appropriately to many of the recommendations from the 2009 report. For example, DEB's proposed staffing plans have included requests for additional support staff, and the Division is perpetually working to manage workflows to increase overall staff efficiency. To address confusion in the scientific community over "broader impacts", DEB has added wording and details to the description of broader impacts, and DEB has an Einstein Fellow (since 2011) who is looking into the possible assessment of educational outcomes. To facilitate international collaborations, DEB has used The Research Coordination Networks (RCN) mechanism, the Dimensions in Biodiversity program, and The Ecology and Evolution of Infectious Diseases (EEID) program. DEB has brought a recommendation to BIO/OAD to increase the funding of post-doctoral positions. In response to earlier concerns about funding for microbial and metagenomic research, much new research in these areas has been funded through the Dimensions in Biodiversity program. DEB has continued to support cross-disciplinary research in many ways, including: co-reviews among the core programs, the Research Coordination Networks (RCN), the Dimensions in Biodiversity program, Assembling, Visualizing, and Analyzing the Tree of Life (AVAToL), Coupled Natural and Human Systems (CNH), as well as Research at the Interface of the Biological, Mathematical, and Physical Sciences (BioMaPS) program, as well as support of 43 workshops for FY2009-FY2011. These are examples of the kinds of responses that DEB has been able to make within the constraints of its budget and its mandate. The full details of DEB's responses are contained in the document file B3.COV 2009 ([Continuing Progress on Recommendations by the 2009 DEB COV](#)). However, many of the most important concerns that were raised in several previous COV reports are not under DEB's control. These are:

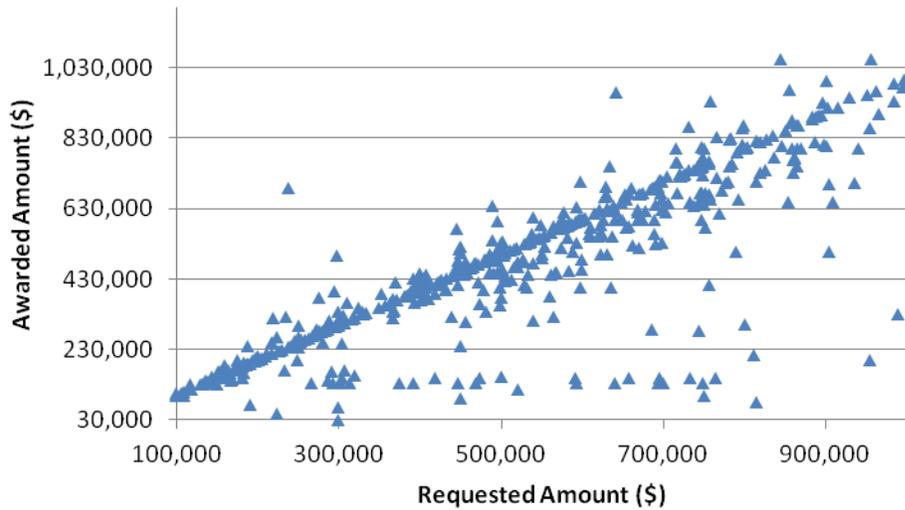
- Increasing proposal workloads for staff, program officers, *ad hoc* reviewers, and panelists.
- Potential erosion of resources for core programs from the funding of top-down initiatives.
- Lack of stability in the hiring and retention of staff.
- Scarcity of funding opportunities for post-doctoral investigators to develop independent research.
- Threats to travel budgets that are essential for successfully recruiting panelists and temporary rotators.

The COV appreciates that DEB recognizes these chronic needs and has tried to address them. Perhaps some relief will arrive if proposal loads diminish in the future with the new pre-proposal system. Nevertheless, these problems will persist unless additional resources flow to DEB.

**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>As reported in the self-study (Page 30), the Program Officers review the portfolio of potentially fundable projects (based on panel recommendations) before funding decisions are made to ensure an adequate breadth of relevant disciplines and areas of inquiry.</p> <p>The substructure of DEB facilitates coverage of the range of disciplines and sub disciplines represented by the scientific community. The COV is impressed with the Division’s ability to balance the stability of cluster and program management with the need to be responsive to the changing needs of the community. For example, this responsiveness is reflected in the recent restructuring of Evolutionary Processes and Population and Community Ecology programs, and the SBS Cluster.</p> <p>While the COV did not perform a quantitative assessment of awards within individual programs, the committee’s perusal of proposal titles and award titles did not suggest any evident bias favoring proposals on some topics at the expense of investment in others.</p>	<p style="text-align: center;">Yes</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>DEB Programs attempt to fully fund highly competitive projects with well-justified budgets; however, resource limitations necessitate cutting requested budgets of many proposals (See figure below).</p>	<p style="text-align: center;">They appear to be appropriate.</p>

**Requested vs. Actual Award Size (FY09 - FY11) For  
Project Requests Between \$100K and \$1M**  
(Source, EIS and Report Server)



The duration of awards appears to be appropriate for the scope of work proposed. The COV suggests that an analysis of the frequency and length of no-cost extensions be conducted to provide additional insight into whether the duration of awards is appropriate. The COV notes that the duration of awards has increased over the recent past and that this is indicative of DEB responsiveness to the research needs of the community.

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

Yes

While “innovative” and “transformative” are difficult to define and highly subjective terms, DEB is clearly funding exciting and cutting-edge research. COV inspection of a sample of jackets identified numerous reviews and panel summaries that described the proposed research as innovative and transformative. The COV notes that many excellent and potentially transformative proposals go unfunded due to budget constraints.

DEB has several mechanisms in place to ensure that innovative and potentially transformative proposals are submitted, evaluated, and funded. Panelists identify particularly exciting proposals, EAGERs fund high-risk research, RCNs provide a venue for synthesis and cross-disciplinary interactions that can lead to future transformative projects, and DEB Program Officers manage several of the centers supported by BIO. In addition, the self-study describes a pilot program, the “Individual Decision Fund”, to support individual/independent funding decisions by Program Officers. Analysis of the success of this program in fostering risky or innovative projects should be forthcoming.

The COV is impressed by the judicious, limited, and careful support of research

<p>proposals that are not peer-reviewed, representing no more than ~1% of the DEB budget.</p>	
<p>4. Does the program portfolio include inter- and multi- disciplinary projects?</p> <p>DEB program officers have long been active in seeking co-reviews and co-funding, and current POs from other directorates report that this practice continues and is mutually valued. Non-DEB program officers praised their DEB counterparts for their collegiality and collaborative nature. The net result is that science that spans disciplines is supported and financial resources are leveraged. DEB co-reviews approximately 10% of the proposals that go to its panels.</p> <p>In addition, DEB participates in programs that are inherently interdisciplinary such as Dynamics of Coupled Natural and Human Systems and Research Coordination Networks.</p>	<p>Yes</p>
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Cursory analysis of data provided in DEB’s self-study suggests that submissions per state correlate with state population size and that success rates do not appear to vary in a systematic manner among states or regions. Success rate among EPSCoR states roughly parallels that for all proposals.</p>	<p>Yes</p>
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>The data provided in the self-study, or that can be gleaned from jackets, permit only partial answers to this question given that the population of different types of institutions throughout the U.S. is unknown. The self-study does allow comparison of the relative proportions of proposals submitted by different types of institutions, and the funding rates by institution type. About 60% of submitted proposals are from research-intensive Ph.D. institutions, yielding 64 – 69% of the awards, and representing 66 – 71% of the funding allocated. Non-research-intensive Ph.D. institutions account for ~22% of proposals, receiving 15-19% of all DEB awards, and accounting for 15% of the expenditures. M.Sc. institutions account for ~7% of proposals, 4-6% of awards, and 3.2 – 5% of funding. This limited data set suggests a slightly higher likelihood of proposal success and a slightly larger award size for PIs based at research-intensive institutions, which is not surprising.</p> <p>Interestingly, the distribution of reviewers among types of institutions deviates significantly from proposal activity and success. Only 33% of reviews come from scientists at research-intensive institutions, whereas 28% are from non-research intensive Ph.D. granting institutions. The COV was curious about whether this pattern is consistent across the Foundation.</p>	<p>A qualified Yes</p>

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

It continues to be a challenge for new investigators to obtain NSF funding, particularly as independent PIs. Data from DEB's self-study indicate that funding rates for new investigators (8%, for proposals in which they are sole PIs) is low relative to that of prior investigators (17%). Over the last three years, the number of awards, and the probability of funding, has declined for investigators at every level of experience (See table below, prepared by the DEB Self-Study).

**Award Jackets to New Investigators (Source, EIS)**

	2009		2010		2011	
	# Award Jackets	Funding Rate	# Award Jackets	Funding Rate	# Award Jackets	Funding Rate
New Investigator (PI)	130	21%	107	12%	59	8%
Prior Investigator (PI)	421	30%	390	20%	313	17%
New Investigator (PI or CO-PI)	282	25%	265	17%	192	14%
All Investigators	551	27%	497	17%	372	14%

If CAREER proposals were 20% smaller and placed less emphasis on broader impacts, more young investigators could be funded at a critical point in their developing careers.

Apparently yes, but difficult to assess.

8. Does the program portfolio include projects that integrate research and education?

The COV is satisfied with the integration of research and education in the core programs and in multi-disciplinary and co-reviewed awards. Moreover, DEB makes excellent use of the several types of awards that target education as a major component (e.g., RUI awards, and REU, RET, ROA, and RAHSS supplements).

Although DDIGs and CAREER awards have the ability to integrate education into research activities if mandated, the COV recommends that to maximize the scientific development of these young investigators, DEB should consider relaxing the requirement that doctoral candidates and young investigators dedicate significant time to broader impact activities that focus on education.

Yes

9. Does the program portfolio have appropriate participation of underrepresented groups?

Based on the self-study, funding rates of minority and under-represented groups are comparable to the aggregated funding rates of all groups. Small sample sizes (and low absolute funding rates) contribute to high variance in the reported funding rates among minority groups. Based on the COV's discussion with DEB

Yes

<p>program officers and directors, DEB understands that diversifying the population of researchers is a high priority for NSF and for the Division.</p>	
<p>10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p>The programs of the DEB are relevant to all of these arenas.</p> <p>DEB excels in promoting the progress of science within its disciplinary scope, as well as at the interface of other areas in biology, natural and social sciences, and engineering. In the area of health, prosperity, and welfare, several initiatives and activities stand out in the portfolio of DEB and its interactions with other Directorates:</p> <ul style="list-style-type: none"> <li>• The ecology and evolution of emerging infectious diseases</li> <li>• The mechanisms that govern sustainability and biodiversity</li> <li>• Evolutionary, organismal, ecosystem, landscape and continental responses to changing climates and other environmental drivers.</li> </ul> <p>In addition, interdisciplinary research that includes the social sciences informs decision-making and resource management. Contributions to the national defense include understanding the role of processes affecting water and energy security. Hence, the portfolio and activities of DEB contribute substantively to achieving the mission of the agency.</p> <p>DEB also contributes to national priorities. Fundamental scientific discoveries about environmental biology advance the competitiveness of US industry and business through understanding the renewable resource base of the nation and identifying opportunities to reduce damage and impairment of that base. National priorities are also served by maintaining US leadership in the growing global community of science. In particular, achieving resource sustainability requires knowledge of economic, social, and environmental structures and processes, and the relationships among them. The research and education supported by DEB are crucial to advance not only basic environmental research and promote scientific literacy, but to train and employ an educated workforce prepared for the knowledge based economy of the 21<sup>st</sup> century.</p> <p>Continental-scale research is an emerging area of emphasis in the portfolio of DEB. The Dimensions of Biodiversity and MacroSystems Biology program are two such recent additions to the research portfolio of DEB. Research that illuminates the Tree of Life, particularly with the new efforts in visualization, may be another area appropriate for addressing continental-scale questions. The development and maintenance of natural history collections and expertise in systematics is a crucial, globally significant activity that DEB has supported.</p> <p>DEB responds very well to the needs of its constituencies. Recent publications that articulate and explore constituent interests include reviews and commentaries on: the need and significance of synthesis (Carpenter et al. 2009); systematics and biodiversity and the importance of species exploration (Wheeler</p>	<p>Yes</p>

<p>et al. 2012; Maddison et al 2012); the significance and interpretation of phylogenetic pattern and process (Daly et al. 2012); advancing the understanding of emerging infectious disease (Borer et al. 2012); and probing microbial processes and their relationship to global changes (American Association of Microbiology 2011). These publications are available in the COV eJacket.</p>	
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>The Assembling the Tree of Life Initiative (AToL), which began in Emerging Frontiers and in FY2010 was moved to DEB, has advanced our understanding of the processes as well as the pattern of evolution of all life on Earth. It is one of the most successful NSF initiatives in systematics. The COV recommends that AToL continue to be well-supported.</p>	

## OTHER TOPICS

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

Despite limited funding, DEB has met program goals successfully by taking advantage of funding initiatives that complement its core mission. DEB is involved in several cross-Directorate programs, and should confidently take a leadership role in developing initiatives within the BIO Directorate that cross Divisional boundaries to support new funding for NEON and Sustainability initiatives. Means to coordinate these activities need to be developed in collaboration with the BIO/OAD.

Interdisciplinary activities or broad-scale research programs can be powerfully enhanced by providing mechanisms for investigators at any career stage to gain new training and expertise that will enhance their existing skills. Such programs would serve at least two goals: (1) to promote individual talent at key career stages (e.g., postdoctoral fellowships; mid-career investigators) or of under-represented groups (women and minorities), (2) to foster interdisciplinary research by individuals rather than requiring the assembly and coordination of large teams.

2. 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.

The COV noted that Dear Colleague letters were not reaching many members of the community. Dissemination could be improved by repeated and broader distribution to listservs (e.g., ECOLOG, EvolDir, Pal-Poll) and current and former DEB PIs.

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

Venture funds have been used by the Directorate to encourage Division/Cluster funding in particular areas. These funds create an additional burden for POs by requiring the preparation and evaluation of internal proposals and creating a delay in fund deployment. The current shift of OISE to a Venture

Fund model will change the importance of long-term relationships that have been built between POs of the Research Directorates and OISE, and may discourage program officers from participating.

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

The COV sees an opportunity for DEB to take a greater leadership role in the development of the research designed to ensure a more sustainable environment. Humans depend on the sustainability of natural biological processes, inter-specific interactions, ecosystem processes, wild habitats and unmanipulated systems. DEB can and should be providing key intellectual leadership for NSF research related to sustainability.

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

The following steps by DEB would be helpful to future COVs.

- Consider recruiting a former COV member to be the COV Chair.
- Provide more guidance to the Chair regarding preparation for the meeting.
- Prepare a template letter (that the Chair could modify), outlining the charge of the COV and allocating assignments (reading of jackets and supporting documents) to COV members, which would be sent to the COV members 6-8 weeks prior to the meeting.
- Offer the initial conversation between the COV, the Deputy Director, and the Division Director in a virtual setting (e.g., a webinar) four weeks before the COV.
- Encourage the Chair to instruct COV members to prepare for the meeting by:
  - a) Becoming familiar with the ejacket webpage.
  - b) Evaluating a specified number of jackets for completeness, quality of reviews and review analysis, treatment of the two review criteria, quality of the context statement, and scope of research.
  - c) Reading a specified number of the available reports so that each document has been read by at least three COV members and some documents have been read by all COV members (at the discretion of the Chair).
- Include a session during the COV's visit during which COV members meet with support staff as did the FY2012 COV.
- Provide a GoogleDoc-type mechanism that allows simultaneous document-editing by multiple people during the COV meeting.

6. The division would appreciate the comments of the COV on DEB-relevant opportunities and challenges in the following areas:

a. Continental Scale Science

MacroSystems Biology has served as a mechanism to encourage research projects from the DEB community that address regional- to continental-scale questions. This is an important initiative, as the larger, multi-investigator proposals in this area cannot be funded adequately through existing programs. Moreover, MacroSystems Biology research represents a strong bridge between DEB

clusters and NEON. We recommend that MacroSystems Biology be continued or folded (with funding) into DEB at the end of its initial five years, especially given the needed coordination between DEB research and NEON. We also encourage DEB to consider additional ways to provide incentives for generating new approaches for regional to continental-scale research. Perhaps an Ideas Lab could focus on a priority research topic that is emerging from the community.

Given that NEON is now in the implementation phase, it is critical that DEB strives to engage the community of scientists to foster excellent science that effectively use of these new observatories.

b. Integration of research across areas of biology

There have been numerous, successful new initiatives at NSF designed explicitly to foster interdisciplinary research extending beyond biology (e.g., to geosciences, social sciences, etc.). Given the diversity of levels of organization within biology, the COV supports efforts to develop research that spans multiple biological levels of organization within BIO as well, and we encourage the development of formal programs that specifically target such projects. These integrative areas can be as “interdisciplinary” as those that link biologists with other areas of natural or social science. Accordingly, the materials in the “leading edge” documents contain compelling ideas about research areas that integrate multiple areas of biology (e.g., genes to ecosystems; from genotype to phenotype; consequences of changes in climate and land cover).

c. Young investigators

There are several areas in which the COV has identified concerns regarding young investigators.

Pre-tenure PIs. With the new proposal process, there is concern that new investigators (i.e., those seeking their first NSF award) may be disadvantaged in two ways. First, the annual cycle extends the time period between submissions. Second, the pre-proposal format may favor more established scientists who have greater experience at conveying their ideas effectively in four pages. We encourage DEB to track funding rates for pre-tenure vs. tenured faculty members as the program moves forward and to ascertain whether there are any unexpected consequences for junior faculty with regard to funding rates.

Postdoctoral scientists. We strongly support the development of independent NSF postdoctoral fellowship positions. Nationwide, there are currently very few opportunities for postdoctoral funding, particularly for independently designed research, and this contribution toward maintaining scientific capacity by supporting young scientists would be beneficial to science.

Past international postdoctoral programs (such as the NATO/NSF active in the early 1980s) provided unique opportunities for US scholars to work and to live in foreign countries. The benefits of reconstituting such programs to exchange young scholars are innumerable.

Postdoctoral fellowships provide a significant opportunity to establish an independent research program and to begin their faculty careers with the skills and maturity needed to submit promising research proposals. Currently, although there are postdoctoral fellowships available (e.g., the Bioinformatics postdoctoral competition), they are limited in number and scope.

Graduate students. When the COV evaluated proposal jackets for DDIGs, we noted two issues.

(1) The broader impacts component of graduate student proposals was often criticized. While all NSF proposals are required to *address* the two criteria for merit review, the COV questions whether PhD students—who are in the early stages of their scientific development and are under increasing time constraints due to reductions in campus-level funding—should be *funded* based on the broader

impacts of their proposals. We suggest that DEB re-visit the instructions to reviewers and panelists regarding how the broader impacts criterion is applied to DDIGs.

(2) The reviews and panel summary statements on the DDIG proposals, especially those that were declined, were less detailed and often less informative than reviews and summaries for other kinds of proposals. A DDIG submission is often a young scientist's first experience with the review system, and it occurs at a vulnerable career stage. We encourage attention to whether the amount and quality of feedback to graduate students can be enhanced, though we recognize this may largely be due to time/panel constraints.

**SIGNATURE BLOCK:**

A handwritten signature in black ink, reading "Susan J. Mazer". The signature is written in a cursive style with a large, looping flourish at the end.

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For the FY 2012 COV  
Susan J. Mazer  
Chair



## DEB C O V

JUNE 5-7, 2012

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