

**FY 2019 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

The table below should be completed by program staff.

Date of COV: June 12-14, 2019
Program/Cluster/Section: All DEB Programs
Division: Division of Environmental Biology
Directorate: Directorate for Biological Sciences
Number of actions reviewed: 590 Awards: 101 Declinations: 150 Other: 13 Withdraws; 8 Return without review; 135 Invites; 183 Non-invites
Total number of actions within Program/Cluster/Division during period under review: 12,112 Awards: 3,096 Declinations: 4,472 Other: 26 Withdraws; 179 Return without review; 1,129 Invites; 3,210 Non-invites
Manner in which reviewed actions were selected: <p>The full list of DEB proposal actions from FY2015 to FY2019 was downloaded from the NSF Enterprise Information System. Non-lead collaborative jackets were removed from consideration because they duplicate documentation of the lead jackets, leaving a pool of 10270 unique actions during the period. Five percent of the jackets were selected for the sample by numbering each jacket from 1 – 20, selecting a random number from 1 – 20 and taking every jacket with the matching number, producing a sample of 514 jackets.</p> <p>This sample was checked for inclusion of all DEB programs, proposal types, award types, and action types. In case of a full proposal the corresponding pre-proposal jacket was identified, and added if missing, to ensure a trail of continuity. The sample was also compared to the full proposal list for geographic, institutional, and PI demographic representation but no additional proposals were added in these categories.</p>

COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	Dr. Allen Moore	University of Georgia
COV Members:	Dr. James Bever	University of Kansas
	Dr. Nancy Cavallaro	USDA
	Dr. Timothy Collins	Florida International University
	Dr. Jason Cryan	North Carolina Museum of Natural Sciences
	Dr. Tamar Dayan	Tel Aviv University
	Dr. Michele Dudash	South Dakota State University
	Dr. Winsor Lowe	University of Montana
	Dr. Lucinda McDade	Rancho Santa Ana Botanic Garden
	Dr. Jill Miller	Amherst College
	Dr. Jon Seger	University of Utah
	Dr. Christina Staudhammer	University of Alabama
	Dr. Judy Stone	Colby College
	Dr. David Strayer	Cary Institute of Ecosystem Studies
	Dr. Jake Vander Zanden	University of Wisconsin-Madison

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

The 2019 committee of visitors for the Division of Environmental Biology met from 12 June to 14 June, reviewing material provided by DEB with respect to the four questions posed in the report template. In addition, we met with DEB staff, Program Officers, and BIO and DEB administration for separate discussion/question sessions. Finally, some general issues going forward were discussed, and are raised in the “other topics” section.

Based on this evidence, the overall consensus of the committee is that DEB is exceptionally well run, following NSF protocol appropriately and is respectful in its use of the peer-review process. It is clear that this is a positive and supportive working environment. Of particular note, the “best practices” working group was highlighted by several groups as having a positive impact. The Division is run transparently and collegially. Our comments and recommendations below are intended to provide our perspective on areas to consider further, but our overall evaluation is that DEB serves the community well.

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.

<p style="text-align: center;">QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS</p>	<p style="text-align: center;">YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE</p>
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments: The Committee of Visitors members addressing this issue reviewed over 100 jackets as well as the many supporting documents that were provided in each proposal's jacket. It is our assessment that, overall, DEB achieves high standards in the review process.</p> <p>Our review focused on full research proposals, but we also included those responding to special solicitations (e.g., GoLife) as well as EAGERs, RAPIDs and supplements. The proposals we examined were primarily reviewed by both ad hoc reviewers and panelists, followed by panel summary. However, the requests for EAGERs, RAPIDs and supplements of multiple sorts (e.g., REUs, research awards) were reviewed only by Program Officers (POs). The proposal jacket usually included explanation of why the proposal was handled in the way that it was, both in terms of process and outcome, but documentation was scarce in a few cases which is less than optimal. We did not review any proposal jackets that resulted in site visits.</p> <p>We noted that some proposals that underwent the full review process (i.e., ad hocs, panelists, panel, Program Officers) received only one or two ad hoc reviews; however, all had the minimum of three reviews (including reviews from panelists).</p>	<p style="text-align: center;">YES</p>

<p>Emerging issues: The pre-proposal process was discontinued during the interval covered by this review, as was the system of submission deadlines. Preliminary evidence suggests that these two changes are having the impact of reducing workloads and spreading the workload more evenly across the year. We urge that DEB continue to monitor the impact of these changes on the PI community as well as on the Division.</p>	
<p>2. Are both merit review criteria addressed:</p> <ul style="list-style-type: none"> a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses? <p>Comments: <u>Individual reviews:</u> Yes, both merit review criteria were almost always addressed in panel and ad hoc reviews. There was, however, a notable difference in terms of both the extent and quality of feedback for the two merit review criteria (intellectual merit and broader impacts). Compared to the intellectual merit criterion, feedback on broader impacts was more likely to be abbreviated, sometimes reduced to a brief statement (e.g., broader impacts seem adequate). Not infrequently, such a brief summary statement was followed by reiteration of the broader impact activities that were proposed by the PI(s) (e.g., Broader impacts are standard and include training of students and outreach to K-12 via class visits). Part of this may reflect the reviewer's perception of their role in evaluating the proposal's scientific merit versus the broader impacts. The discrepancy in feedback may also reflect a lack of expertise in, or understanding of, broader impacts among some DEB reviewers. In our discussions with Program Officers, they suggested that the scientific community is becoming more sophisticated with respect to the broader impacts criterion and thus proposal reviewers are increasingly likely to have the requisite expertise to assess the broader impacts of the proposals under review. Nevertheless, it may be worthwhile to consider including ad hoc reviewers or panelists with particular broader impacts expertise.</p> <p><u>Panel Summaries:</u> Intellectual merit was unfailingly addressed in panel summaries, and broader impacts were addressed more consistently, and in more depth, than in many individual reviews. It is, however, our impression that PIs of declined proposals receive more feedback – both constructive and critical – than those whose proposals are recommended for funding.</p> <p><u>Program Officer Review Analyses:</u> Review analyses consistently addressed both merit review criteria although, as noted elsewhere, there were inconsistencies noted in some jackets with regard to the inclusion of weaknesses identified in individual reviews and panel summaries that would provide additional context in funding decisions. Also, the 'real estate' devoted to broader impacts was often considerably less than that given over to intellectual merit.</p>	<p>YES</p>

<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Comments: The COV applauds DEB’s efforts to fund the best possible research by securing substantive and constructive reviews from the community. The COV noted the challenges in obtaining ad hoc reviews, and we laud the effectiveness of the Program Officers in procuring sufficient ad hoc reviews.</p> <p>The COV’s review indicated that individual reviews varied in the extent to which their comments were substantive, ranging from detailed and specific to superficial. This variation was present for both panelist and ad hoc reviews, but some members of the COV had a sense that reviews from panelists tended to be shorter and less specific than those from ad hoc reviewers. This may be related to the sheer number of proposals that panelists are required to review coupled with anticipation of proposal discussion at the panel meeting. Nevertheless, the vast majority of reviews do contain substantive comments to explain the assessment (see II. 1).</p> <p>Given unpredictability in the community of reviewers, the number of ad hoc reviews differed widely across the proposals. For those proposals in our sample that were co-reviewed by different panels, the range of ad-hoc reviews varied from zero to nine. The range was also high for proposals not co-reviewed (one to six in our sample). To the extent that the number of reviews is associated with substantial feedback, we encourage DEB to continue their commitment to obtaining and incorporating specialist ad hoc reviews into the proposal review process.</p> <p>Recommendation: Emphasize to reviewers the importance of evaluative, as opposed to descriptive, language when composing reviews so that reviewer feedback is most helpful in the assessment of proposals.</p> <p>Emerging issues: Given the recent change to the no deadline system for proposal submissions, the COV suggests that the Program Officers and DEB leadership continue to monitor the ad hoc review process so that any change at the community level in the ways that ad hoc reviewers respond to requests for review will be detected fairly early. We note that, if panels are indeed smaller as predicted under the no deadline system, then ad hoc reviews will be of increased importance both to ensure sufficient numbers of reviews and obtain relevant expertise.</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: In general, panel summaries moved beyond individual reviews and provided synthetic feedback as well as the rationale for the recommendation regarding competitiveness and priority for funding. Key insights from both ad hoc and panel reviews were usually incorporated. The strengths and weaknesses of broader impacts were more consistently developed in the panel summary than they were in individual reviews. It appears that the new workflow</p>	<p>YES</p>

<p>for preparation of Panel Summaries initiated as a response to the previous COV has helped develop higher-quality panel summaries overall.</p> <p>Emerging issues: One impression garnered by the COV was that proposals assessed to be non-competitive often received more substantive and detailed input that those judged to be worthy of funding. We believe that funded PIs can also benefit a great deal from constructive input that may emerge from the review process. More detailed language on the merits of a strong proposal may also help reinforce the distinction between different panel recommendations.</p> <p>Examination of our sample of proposal jackets yielded the observation that ad hoc reviews were less likely to be reflected in panel summaries. An internal DEB analysis based on data from 2016 fall panels across all four clusters reinforced this impression. The study showed that panelist ratings are stronger predictors of funding recommendations than are ad hoc ratings. This result may not be entirely surprising given that panelists rank a large number of proposals and thus develop more context for their reviews than ad hoc reviewers. Slightly more concerning was our appraisal that panel summaries more often discounted themes raised by ad hoc reviewers than by panel members. This may become a more significant issue if the 'no deadline review process' results in smaller panels that will naturally have a more limited range of expertise. This will increase the importance of ad hoc reviews.</p> <p>Recommendation: DEB should monitor this issue closely and consider devising a mechanism to ensure that ad hoc reviews are fully and fairly incorporated into the panel summary. One possibility would be to designate one panelist as the "ad hoc proxy" (see section II), with the role of representing the viewpoints expressed in the ad hoc reviews.</p>	
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>Comments: The documentation included in each jacket establishes a 'story' for a submitted proposal, ultimately leading to the funding decision. Each chapter in this story (individual reviews, Panel Summary, Review Analysis, Context Statement, etc.) provides more information in this narrative, with the evident goal of this documentation to provide transparency and disclosure in the proposal review and funding process.</p> <p>In the majority of jackets examined by the COV, the rationale for the award/decline decision was appropriately evident and transparently explained in the included documentation. However, we noted several jackets in which there seemed to be some degree of disconnect between the Panel Summary and Review Analysis. For example, in some cases the individual reviews and Panel Summary recorded significant weaknesses or deficiencies in the proposal whereas the Review Analysis did not reflect those critiques and funding was awarded. In other cases that were reviewed by the COV, the individual reviews and Panel Summary were exceedingly positive, identifying no significant weaknesses, and yet the proposal was not awarded funding and the rationale for that decision was not adequately explained in the Review Analysis.</p>	<p>YES</p>

We emphasize that this disparity between proposal rating and award decision was observed in a minority of jackets examined. And even in those cases, the documentation included partial (but incomplete) rationale for the funding decision. For example, the Review Analyses (not provided to investigators) include rationale for how/why 'outlier' individual reviews were discounted (e.g., a rating of "E" for a proposal that was ultimately declined for funding or a rating of "F" or lower for a proposal that was ultimately awarded funding). The Context Statements (provided to investigators) report some statistics regarding the numbers of proposals considered by the respective panels, the funding priority recommendations assigned to those proposals, and the intended number of awards to be recommended.

Recommendation: In cases where the ultimate funding decision does not align with the recommendation in the Panel Summary, the COV suggests that it is essential that the Review Analysis contain sufficient explanation of this disparity.

<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>Comments: In general, yes. In the majority of jackets examined, the discussions of proposals and the ratings/recommendations recorded in the Panel Summaries were suggestive of the ultimate funding decisions. Further rationale was observed in some of the correspondence between Program Officers and investigators and in some of the documents preserved in the Diary Notes. However, as noted elsewhere, we detected opacity in some jackets in the correlation between a panel's rating of a given proposal and the ultimate funding decision on that proposal (in one example examined, a rating of "non-competitive" was recommended for a proposal that was ultimately funded). We expect that this reflects the necessity for some flexibility in funding decisions at the Program Officer level such that other factors (i.e., division budgets, program portfolio diversity, EPSCoR eligibility, etc.) can be considered.</p>	<p>YES</p>
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>The COV devoted considerable time and attention to the topic of ad hoc reviews. Of particular concern was some evidence from examined jackets that the content of ad hoc reviews may not have been consistently considered and/or noted in Panel Summaries; some variance was noted in the incorporation of <i>ad hoc</i> review comments in the panel summaries and review analyses. Discussions between the COV and Program Officers indicated that the identification, solicitation, and deliverables-tracking of ad hoc reviewers require a significant investment of time and effort by the Program Officers. If this exercise requires such significant resource investment, then the results of this process should be treated with consistent importance throughout the panel discussions, panel summaries, and review analyses. This topic is also discussed in other sections of this COV report.</p>	<p>NOT APPLICABLE</p>

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: The DEB Self Study indicates that the Program Officers use a variety of approaches to identify appropriate panelists and <i>ad hoc</i> reviewers for a given proposal. It appears that the number of review requests has declined during this review period, perhaps because the pre-proposal process did not require <i>ad hoc</i> reviews. DEB requires at least 3 reviews per proposal and the overall average for proposals in the panel review process has consistently been 6 during this review period.</p> <p>Overall the process of <i>ad hoc</i> selection and panel participation is, in our view, very effective. We are impressed by the consistency with which high quality reviews from scientists with expertise relevant to each proposal are sought and obtained by Program Officers. This is true for both the panelists and <i>ad hoc</i> reviewers. Our qualitative review of proposal jackets suggested that <i>ad hoc</i> reviews tended to be more detailed and thorough than panel reviews. Following up on this, we looked specifically at whether the <i>ad hoc</i> reviews contributed to funding decisions and were represented in the panel summaries. While our qualitative assessment was that <i>ad hoc</i> reviewer comments were incorporated into panel summaries, a quantitative internal analysis conducted by DEB with data from fall 2016 concluded that <i>ad hoc</i> reviews tend not to be an integral part of the final panel. Considering the significant effort on the part of Program Officers and the science community to generate high quality <i>ad hoc</i> reviews, this is of concern.</p> <p>While we very much appreciate the effort to quantitatively evaluate the value of the <i>ad hoc</i> reviews, we think that the data collected could be more effectively used to answer the key question of the extent to which <i>ad hoc</i> reviews contribute to DEB funding decisions rather than panel recommendations. We have reason to think that there will be differences between panel recommendations and DEB funding decisions because Program Officers identified that they occasionally overrule a panel recommendation when they think that <i>ad hoc</i> reviews were not adequately considered in their deliberations. Also, we are concerned that the poorer fit of the <i>ad hoc</i> relationship with panel recommendations is due to the greater variability or lower number of <i>ad hocs</i> included in the individual averages. Therefore, it would be worthwhile to examine the extent to which the <i>ad hoc</i> reviews contribute to DEB funding decisions (rather than panel recommendations) after accounting for the effect of average panelist ranks. Is the fit of the <i>ad hoc</i> average influenced by the number of <i>ad hoc</i> reviews of that proposal; that is, are panels influenced by the number of <i>ad hoc</i> reviews?</p>	<p>YES</p>

<p>We conclude that the current approach to identifying and soliciting relevant expert reviews has been effective and we commend the Program Officers for their work in identifying and soliciting these reviews. Ensuring that the input from the <i>ad hoc</i> reviews flows into the panel summary and the funding decision is something that deserves additional attention.</p> <p>Emerging issues: We observed that the number of <i>ad hoc</i> reviews varies considerably from proposal to proposal. This is in part due to co-reviews, which results in multiple panelist’s reviews. The variation is only a problem when the number of ad hoc reviews is low (in some cases only one). In these cases, we could see from the correspondence that the Program Officer had secured a promise from an <i>ad hoc</i> reviewer that failed to deliver. Efforts to increase the return rate of ad hoc reviews could improve panel function.</p> <p>We are very aware of the time-consuming nature of the solicitation of ad hoc reviews on the Program Officers. An internal DEB analysis suggested three possible responses: “the use of post-hoc reviewers, who would only be requested after panel for proposals that need additional input, or an increase to the number of panelists assigned per proposal, and a concomitant reduction in ad hoc reviews, or a pre-panel triage system based on ad-hoc reviews.” We are not in favor of the last suggestion given the higher variance in the fit of <i>ad hoc</i> reviews to panel recommendations, but we think that the first two options merit consideration. We suggest another possibility, to assign a panel member to be the “Ad hoc proxy” who would represent the perspectives of the ad hoc reviewers in the panel discussion.</p> <p>Recommendation: We recommend that DEB invest in a system that would send automated reminder emails to ad hoc reviewers. Journals use this approach and overburdened reviewers have grown to rely on these reminders to structure their work time. This same approach could increase rates of reviewer follow-through and thereby decrease variance in ad hoc reviewer number</p> <p>Recommendation: We recommend that DEB consider assigning a panelist to act as an ‘ad hoc proxy’, whose role would be to represent and advocate on behalf of the ad hoc reviewer(s) comments during the panel discussion. This would not entail reading the full proposal and reviewing it as well; the proxy would simply read the reviews and make sure the points are discussed and concur with the panel summary. This could be one strategy for improving incorporation of ad hoc reviews into the panel discussion, panel summary, and ultimately the funding decision</p>	
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments: The COV found that DEB is effective at identifying conflicts of interest. NSF has clear conflict of interest (COI) rules and procedures, and the DEB processes for identifying and addressing COIs are clearly communicated to DEB reviewers and panelists from the outset of the review process.</p>	<p>YES</p>

<p>COV members felt that effectively addressing COIs is part of the culture of DEB. While it would be impossible to identify every COI immediately, multiple systems are in place to detect and address COIs throughout the proposal review process. The addition of the Collaborators and Other Affiliations (COA) spreadsheet document for each individual who submits a biosketch as part of a proposal is an excellent example of how DEB has continually improved how they address COIs. This COA document is used in the selection of ad-hoc reviewers and panelists. In addition to relying on the COA, Program Officers use the proposal itself and bibliographic websites to identify potential reviewer COIs. In the rare case that ad-hoc reviews are provided and there is a reviewer-identified COI, the reviews are not taken into consideration and the COI is documented in the Review Analysis.</p> <p>For review panels, both NSF and panelists identify statutory and appearance COIs in advance of the panel. Panelists are denied access to proposals for which there are COIs. Panelists and Program Officers leave the panel room during panel discussion and do not participate in the evaluation process for COIs.</p> <p>In sum, we commend DEB for their processes to identify and resolve COIs.</p>	
<p>3. Additional comments on reviewer selection:</p> <p>Comments: The program is keenly aware of the importance of a diverse portfolio of ad hoc reviewers, panelists, and institutions in the merit review process. To further examine the reviewer selection process, we requested additional data on gender, minority status and institution type to generate a finer representation of the data, which is discussed below.</p> <p>First, in terms of gender representation in reviewer selection, males are overrepresented in the ad hoc panel pool. However, this appears indicative of the gender representation at our academic institutions. There is less of a difference in the panelist pool between males and females. Interestingly, there is a considerable number of individuals who choose to not self-report.</p> <p>Examining panel selection for both ad hoc and panelist inclusiveness of minority status is particularly challenging owing to the large number of individuals that choose to not self-report individually or in regard to their academic institutions.</p> <p>When we examined institution type in terms of <i>ad hoc</i> and panelist participation, there appears to be a similar level of participation in each institution type.</p> <p>Given our analyses, our impression is that DEB is doing a fine job assuring that diverse representation of ad hoc reviewers and panelists are present to the point possible owing to their distribution across institutions.</p> <p>Emerging issues: Attention to engaging underrepresented PIs, co-PIs and institutions remains an ongoing challenge, which will require constant diligence. The use of remote participation in hybrid panels is one approach that is proving helpful for individuals where travel to NSF is not readily possible.</p>	<p>NOT APPLICABLE</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 COV concluded that DEB is extremely well-managed based on the written materials provided and discussions with people at all levels within program administration. In particular, the DEB excels in areas of self-assessment and best practices, collegiality and transparency, and process documentation and standardization. These areas of strength create what appears to be a strong sense of community and common purpose, built on a foundation of rigorous application and documentation of process (e.g., panel logistics, proposal management, correspondence with reviewers and PIs). The Best Practices Working Group has been a great asset in maintaining the high standards of program management, identifying innovations to improve processes and human dynamics, and adapting to changing conditions within the Division, Foundation, and scientific community.

The strength of the “process-based” management approach within DEB came across clearly to the COV. Specific benefits of documenting and standardizing procedures extend throughout the Division, including proposal tracking, facilitating co-funding, and reviewer selection. However, one area that stood out was training of support staff and rotators. People appreciate the well-established and thorough training procedures instituted by the Division, as well as the legacy of mentorship, professional development, and accessibility established at this initial training stage.

Emerging and Ongoing Issues: The Division’s record of excellent management, self-assessment, and collegiality will be valuable in responding to future challenges stemming from the elimination of deadlines, including panel logistics (e.g., scheduling, room reservation) and maintaining efficiency despite the irregular timing of proposal submissions.

Recommendation: The COV recommends that the DEB receive resources and support to reduce delays in filling vacant support staff positions, and to centralize the desk and office space of all Division personnel. The COV feels that these issues are critical to maintain the management and human resource strengths of the Division.

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

Comments: The DEB is drawing on diverse sources to stay abreast of new research priorities and opportunities, including aligning existing programs with national research priorities, merging related and interconnected programs for greater efficiency, and creating new programs in emerging areas. The COV was particularly impressed by the Division’s commitment to breaking down traditional boundaries among disciplines (i.e., clusters) to create new research and education opportunities. This commitment led to the creation of the new “Bridging Ecology and Evolution (BEE)” track, and the addition of an Evolutionary Processes Program Officer to the LTER working group. The division is also active in outreach to the scientific community to solicit ideas for new research areas, including encouraging informal interactions between POs and researchers at scientific meetings,

convening workshops and working groups, and monitoring NSF-level initiatives for those that align with the core goals of the division.

Ongoing and Emerging Issues: Dimensions of Biodiversity, a program prioritizing conceptual integration, will benefit from expansion to other cooperating countries, thereby increasing the pool of potential projects (and proposals) and allowing for more emphasis on the scientific goals of the program.

Recommendations: Continued assessment of “boundary breaking” efforts (e.g., BEE, LTER oversight), as well as identification of specific goals and timelines for judging the success of these efforts, is needed.

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

Comments: DEB is a well-organized division and the transparency and open communication at all levels allows for interactive and adaptive management that lends itself well to program planning and prioritization to guide portfolio development. The division includes “clusters” in Ecosystem Science, Evolutionary Processes, Population and Community Ecology, and Systematics and Biodiversity Science, as well as groups to manage cross cutting programs: LTREB, OPUS, DoB, DDIG, LTER, EEID, CNH, GoLIFE

These cross-cutting programs and groups are essential for breaking down scientific silos. It is unclear from the self-study document if the cross-cutting working groups are cross-cluster, or if there are also cross-division groups or membership. It may be useful to include membership from other divisions.

Emerging and on-going issues: Prioritization and portfolio management is mainly via these working groups, considering guidance on national research priorities from government and the National Academies of Science, but includes input from the research community via panels, professional society meetings, workshops, outreach to universities and other events. The COV considers that it would be useful to provide opportunities to obtain input from international and non-traditional groups and stakeholders such as educators, NGOs, private industry and others who use the science for decision making. The DEB blog and other social media can be a platform for communicating these opportunities, as well as open calls and web-based “listening sessions”. DEB could use these mechanisms to get feedback on needs that can be met through the broader impacts effort of funded research projects, as well as what types of “broader impacts” are most appreciated. Some input from NSF’s SBIR and Education programs could also be useful, as well as such interagency programs as the US Global Change Research Program and its working groups, INFEWS, Plant biotic Interactions, and others.

Criteria listed in the self-study for achieving good portfolio balance are appropriate and well applied. Ecosystem type and geographic diversity could also be considered. DEB should continue to explore ways to include input on needs and successes of the portfolio from more international and non-traditional communities. The switch to no-deadlines may have an impact on the balance of applicants and eventually on the portfolio.

Cross-disciplinary and transdisciplinary research and emerging issues is well served by the increasing openness of DEB to co-review and co-funding.

Recommendation: Continue efforts to break down scientific silos and barriers through input from across divisions and cross-directorate and interagency programs and through flexibility with co-review and co-funding and inclusion of other divisions in either formal or informal working groups

Recommendation: The COV notes that co-funded grants are managed only within one division, reducing the information obtained and bragging rights of the division that is not managing the co-funded grant. We recommend that DEB work with other divisions to make sure co-funded projects that are not managed by DEB are tracked and shared annually with the co-funded program, and to see results from these projects.

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

Comments: The COV appreciates the efforts DEB has made to respond to all of the recommendations from 2015. The responses have been creative and appropriate and mostly effective. In some areas there has been good effort, but that effort and creativity in addressing these issues should continue. Alternatively, because some of the recommendations concerned issues associated with the pre-proposals and these have now been discontinued, there is no need to comment on the response except to say that it was appropriate for the process. Also note that the requested external assessment of the pre-proposal process was done, and results were useful in understanding the effects of this now-discontinued process.

The prior recommendations about panel summaries were well received and led to a new best practice about early intervention in and instructions about panel summaries. The introduction of an expanded checklist was also very responsive. While the 2019 COV's impression is that panel summaries have improved over the last 4 years, this does continue to be an issue with panel summaries that appear to be insufficient at conveying the reasons why the proposal was put into the category where it fell. Generally, we have found many good examples, but we encourage efforts to find new ways to continue to improve panel summaries.

With respect to PO staffing recommendations from 2015, it appears that DEB has been able to successfully fill vacancies and about half of the Program Officers as rotators willing to stay multiple years. Similarly, regarding the recommendation about outreach to the scientific community, the issue of travel funds for outreach activities and for POs to keep up with the science through workshops and meetings seems to have become less of a problem as travel funds are less restricted than at the time of the previous COV. We applaud these efforts.

We encourage nurturing communities created by special programs when those programs end. The committee appreciates the examples of programs where this happened: GoLife, DoB, and Macrosystems Biology now supported within the core. We commend these developments and recommend DEB continue to seek creative solutions to this issue.

DEBrief blog has grown and increased over the last several years in terms of hits and posts and appears to be well-advertised.

We applaud these efforts and their continuation with expanded outreach into the international, NGO and private worlds.

Recommendation: Encourage scientific community to use workshops to identify emerging areas, especially at the interfaces among disciplines, and to use creative approaches such as Ideas Labs to solve recalcitrant problems and generate novel programs.

Recommendation: Identify opportunities to facilitate interactions at disciplinary boundaries of core and special programs. The committee appreciates the efforts over the last 4 years in emphasizing and achieving more co-reviews of proposals and co-funding as well as participation in interdisciplinary programs and creation of new tracks such as BEE and Rules of Life. However, there continues to be concern about the handling and openness of dealing with proposals and ideas that cross the traditional or newly established boundaries via participation in cross directorate programs and in co-review and co-funding.

Recommendation: There should be continued efforts to facilitate interactions at the many disciplinary boundaries and that DEB make an effort to seek out issues or projects that are good science but fall between the cracks. Some of these may be appropriate for EAGER projects.

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

<p style="text-align: center;">RESULTING PORTFOLIO OF AWARDS</p>	<p style="text-align: center;">APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</p>
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?</p> <p>Comments: Yes, DEB’s program structure has continued to evolve in response to the growth of new research areas, and to increasingly interdisciplinary approaches toward many specific research problems. Programs have become broader internally, and increasingly able to co-fund projects that span programs, divisions and even directorates. Perhaps most frequently mentioned were “eco-evolutionary” projects, but there were many others. Thus, we commend DEB for skillfully maintaining administrative structures and a division-wide culture that appear to work very well for the scientific community that it serves.</p> <p>The proposal-classification metrics analyzed in the self-study support our assessment as expressed in the previous paragraph, and also demonstrate impressive levels of PI-reported project interdisciplinarity. However, these classifications are all relatively coarse-grained, and they are conceptually oriented. The BIO classification form captures data on many other dimensions of disciplinarity, and at finer levels of resolution with respect to many of these dimensions such as study systems, locations, research approaches, and the like.</p> <p>Recommendation: The next DEB COV might benefit from an analysis of the BIO classification form, which is a rich data set and could reveal the presence (or suggest an absence) of subtler biases in the characteristics that affect a proposal’s chance of being funded.</p>	<p style="text-align: center;">APPROPRIATE</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments: Overall, the trend is for grants awarded to conform to the grant amount requested. The self-study as well as the Program Officers (POs) explained the process by which award sums are granted. The requested budgets are scrutinized closely to look for inconsistencies, lack of budget justification, and non-conformity with the DEB policies. If required, the PIs readjust the budget in discussion with the POs. On the other hand, supplemental grants may increase the total grant amount to very slightly above the original request.</p> <p>We noted a few grant final funding levels that were significantly lower than those requested. The Program Officers explained that they provided limited</p>	<p style="text-align: center;">APPROPRIATE</p>

<p>support in one of two cases: a) early-career pre-tenure scientists whose careers are dependent upon NSF funding but who did not quite make the cut; b) proposals that seemed high-risk yet innovative and promising, and required a period of time to produce preliminary results.</p> <p>In both cases the funding policy seems thoughtful and in conformity of overall program goals – concern for young scientists and supporting innovation.</p> <p>In 2013, the DEB Core solicitation added a designation for Small Grants (currently up to \$200,000), to help pre-proposal reviewers adjust their expectations for the scope of a project relative to the expense in absence of a project budget. Although pre-proposals are no longer solicited, the designation is ongoing. Funding rates of this program are high relative to total funding rates. A small grants program may be an opportunity to support smaller-scale research of early-career investigators, innovative high-risk projects, and perhaps also researchers from primarily educational institutions, in conformity with DEB goals.</p> <p>The 2015 COV supported the Small Grants track: “This track will not be equally useful for all investigators and all types of science, but it provides a mechanism for broadening the portfolio of awards while maintaining high quality science.” This remains a valid and important goal.</p> <p>Recommendation: All budget cuts above 10% should be justified in writing to the contracts and grants office of the submitting institution as well as to the PI. By making the rationale explicit, the hope is that submitted budgets will become realistic.</p> <p>Recommendation: NSF should provide clear, transparent, and consistent guidelines on what can and what cannot be funded (specific items mentioned were computers, second month summer salaries, and funds for foreign institutions). This would be best communicated in FAQ, DEBrief, or other media beyond traditional NSF publications.</p>	
<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments: The portfolio includes innovative and transformative work. Without going into a formal analysis of innovation, which is beyond the scope of our study, it is difficult to address the more important questions of what fraction of funded work is innovative or transformative and whether the portfolio contains <u>enough</u> of this work. It is our impression that proposal reviews and panel discussions tend to be conservative and may be reluctant to fund proposals that are risky or innovative. It was clear from our discussions with Program Officers that they are aware of this problem and are actively seeking out innovative proposals. We note with approval that DEB currently employs several mechanisms to encourage the funding of risky or innovative work that might not be funded through the normal review process, including EAGER awards, instructing panels specifically to consider high risk-high reward research, asking panels to identify the “most exciting proposal” independent of ranking, in addition to any proposals recommended</p>	<p>APPROPRIATE</p>

<p>for funding. In addition, during the period in which pre-proposals were required, Program Officers sometimes overruled panel recommendations in cases where they saw potential for innovation and invited full proposals in cases where the panel recommended “Do Not Invite”. The Program Officers told us that this resulted in some highly rated full proposals.</p> <p>It seems likely that the conservatism of the review process will pose a continuing challenge for funding innovative and transformative research.</p> <p>Recommendation: DEB should continue current programs and activities to encourage funding of innovative or transformative research and be alert to additional opportunities to encourage funding of innovative work.</p> <p>Recommendation: DEB should consider doing an analysis of past funded work similar to that done by Wu et al. to identify innovative research and explore what factors if any (e.g., career stage of investigator, size of research group, whether proposal was funded through EAGER, special programs, or core programs, etc.) were most likely to be associated with innovative research.</p>	
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments: Several lines of evidence show that the portfolio includes many inter- and multi-disciplinary projects. First, several special programs during the study period encouraged or required inter- or multi-disciplinary research (e.g., CNH, Rules of Life, EEID, Dimensions of Biodiversity). In addition, many proposals funded by the DEB core programs received co-review and/or co-funding from another program, either another program within DEB or a program outside of DEB. Such co-review or co-funding seems to us to be concrete evidence of inter- or multidisciplinary, in that the proposed work was viewed as including elements from at least two programs. Finally, PIs self-reported interdisciplinarity in about 1/3 of proposals submitted to DEB, as well as ~1/3 of funded proposals. It is interesting to note that the similar percentage of interdisciplinarity in submitted and funded proposals suggests that DEB core programs neither select for nor against interdisciplinarity.</p> <p>In conversations with the COV, Program Officers from both DEB and other programs expressed enthusiasm for co-review and co-funding of inter- and multidisciplinary proposals, which they regarded as potentially setting up new connections among researchers from different fields, transforming established research fields, or establishing new research fields. It was clear from these conversations that Program Officers from DEB and other programs were routinely thinking about supporting inter- and multidisciplinary projects and welcomed proposals that crossed program boundaries.</p> <p>No matter how NSF and DEB set up the boundaries of individual programs, there will always be a need to support research that crosses those boundaries. While it is apparent that DEB staff wish to encourage dialogue about biological research that does not clearly have a programmatic home, there is no clear pathway for such discussion. DEB should explore the possibility of a formal procedure for researchers to find appropriate programs</p>	<p>APPROPRIATE</p>

<p>for cross-disciplinary biological research that falls through programmatic cracks.</p> <p>Recommendation: DEB should continue to support inter- and multidisciplinary research through co-review, co-funding, and establishment of special programs</p>	
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments: There is substantial evidence of continued efforts of DEB to maintain a balanced portfolio across the United States. Statistics give evidence that each of the 50 states and territories receive funding roughly in proportion to the number of grants that they receive. While some smaller states show less than expected numbers of awards (in proportion to their submissions), these numbers are quite volatile due to the small number of awards submitted annually. DEB has also documented support to EPSCoR states, showing funding and full proposal invite rates on par with the program as a whole. DEB has made efforts to obtain co-funding from EPSCoR to enable these rates of funding.</p> <p>Recommendation: As NSF continues its transition to a "no deadline" environment, it should monitor the participation of scientists across the geographic diversity of the US to ensure equitable success in NSF-sponsored science.</p>	<p>APPROPRIATE</p>
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments: Once proposals have been received at DEB, it appears that decisions are made relatively evenly across submissions from different kinds of institutions. That is, invite rates for pre-proposals and funding rates for full proposals were similar across all different kinds of institutions for which adequate sample sizes were available.</p> <p>An important question that is not addressed by the data that are available to us is whether researchers from all different kinds of institutions are submitting proposals in proportion to their potential to contribute to the national research effort. For instance, it seems likely that researchers at institutions where sponsored research programs are small or nonexistent, or which do not have a strong history of NSF funding, may be underrepresented at the level of proposal submissions, even if their proposals fare as well as average at DEB.</p> <p>Recommendation: We recommend that DEB continue to track success rates of proposals from different kinds of institutions, continue procedures that help to balance awards across types of institutions, and consider providing training and support for institutions that do not have a strong history of NSF funding. We were pleased to hear about the efforts of DEB and BIO to support the Excellence in Research webinars being used to improve grant-writing skills at minority-serving institutions, as well as</p>	<p>APPROPRIATE</p>

<p>the common practice of including at least one panelist on each panel from a minority-serving institution, which should serve these goals.</p>	
<p>7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators?</p> <p>NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award.</p> <p>Comments: The self-study addresses the issue of early-career investigators, defined as within 7 years of award of last degree: “DEB is keenly aware of the concern in the community for young investigators and scientists striving to get tenure or its equivalent at their institutions. We share that concern, and Program Officers take this into account during deliberations after panel when they must prioritize which of the competitive proposals (at panel) should be awarded.”</p> <p>In addition, it appears that the DEB Program Officers also grant smaller sums for these early career scientists to help them get their research off the ground (see Question 2). We also assume that the Small Grants designation may be particularly useful for young scientists. In fact, the 2015 COV particularly cautions “that DEB remain mindful that the program not be associated exclusively with RUI, small schools, or <u>beginning investigators</u>”.</p> <p>The Program Officers seemed genuinely concerned and mindful of the success of young investigators in granting awards. That said, the funding success of young investigators is still on average somewhat lower than DEB averages. The self-study suggests that this reflects lack of experience in writing grant proposals. This appears to be a valid explanation. However, some concern was raised that the cancellation of the DDIGs program might exacerbate this problem. DDIGs were a means for PhD students to begin to develop skills for writing NSF level grant proposals. This suggests the need to continue monitoring the success of young investigators and to provide additional support if required.</p> <p>The Program Officers outlined different actions taken to encourage scientists to submit grant proposals, in particular scientists from underrepresented communities. We have no metrics for the success of these efforts, nor can we analyze the demographics of the new investigators, so it is impossible to tell whether this is a community that should be of particular concern. An analysis of the success of new investigators reveals success rates that are somewhat lower than the DEB means. However, this category includes also early-career investigators at an unspecified percentage, so we do not know whether they drive the trend. Presumably, a significant percentage of new investigators are also early-career, although the phrasing of the question suggests that this is not necessarily the case.</p>	<p>APPROPRIATE</p>

<p>Recommendation: Monitor trends in the success rate of early-career investigators following the discontinuation of the DDIGs program and develop tools for additional support if required.</p>	
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments: Yes, abundantly. In fact, it would be difficult to find a project that does <i>not</i> integrate education with research, in the form of real, hands-on research apprenticeship opportunities for young scientists (high-school students through postdocs). These are the best imaginable training experiences, and they bring incalculable benefit to the nation and, indeed, the world.</p> <p>In addition, DEB funds many special programs focused specifically on education, such as REUs (both as supplements to research grants and as stand-alone programs), NRTs and CAREER research grants, which also have highly beneficial, long-lasting effects on their participants.</p> <p>Until recently, the DDIG program provided a uniquely effective and valuable form of training in the art of proposal writing, for very large numbers of graduate students, including many outside the programs mentioned above, and whose advisors did not have NSF research grants. Proposal writing is arguably <i>the</i> core scientific skill. DDIGs provided motivation for thousands of young scientists-in-training, from all backgrounds and at all kinds of institutions, to learn it. Bringing the program back, in some form, would be very highly beneficial to science education, and could contribute to many seemingly unrelated goals such as increasing the numbers of women and historically underrepresented minorities who choose to enter scientific careers, and their post-Ph.D. rates of success in obtaining research funding.</p> <p>We were somewhat surprised to see low rates of co-funding with EHR, which would seem to be a natural partner for projects that combine research and education. For example, many Broader Impacts activities now include education, and it seems reasonable to the COV that support of such educational activities, and especially the formal evaluation of such activities, could be co-reviewed and co-funded by DEB and EHR.</p>	<p>APPROPRIATE</p>
<p>9. Does the program portfolio have appropriate participation of underrepresented groups¹?</p> <p>Comments: Female and underrepresented minority PIs and Co-PIs are funded at roughly the same rate as the entire population, evidencing the effort that DEB has made at equitable funding. The last COV reported that the representation of females and minorities—in terms of total numbers submitting proposals— was significantly lower than that of the population.</p>	<p>APPROPRIATE</p>

¹ NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

<p>According to NCSES (https://nces.nsf.gov/pubs/nsf19304/data), 37% of science, engineering, and health doctorate holders employed full time in universities and 4-year colleges are female, and 30% are from under-represented groups; however, the previous COV reported that about 28% of proposals were submitted by females. NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.</p> <p>The data supplied in the Self-Study show that while women and minorities are still represented at a lower rate than expected, those numbers are increasing at an impressive rate.</p> <p>NSF has a number of new programs to encourage involvement of women and minorities, for example the INCLUDES program (for Underrepresented groups in Engineering and Science) and ADVANCE (women in STEM) programs. The goals of these programs are to advance toward a diverse, innovative, and well-prepared STEM workforce, and to increase the participation and advancement of women in academic STEM careers.</p> <p>Recommendation: As NSF continues its transition to a "no deadline" environment, it should monitor the participation of women and under-represented groups and monitor the success of these programs, to ensure the continued improvement of women and minorities achieving success in NSF-sponsored science.</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>Comments: Certainly, the DEB program and the research it supports is relevant to national priorities, agency mission, relevant fields and other constituent needs. We cite several examples where DEB-funded work advances national priorities as identified in OSTP/OMB annual memos to agency heads. Global climate change was identified as a national priority by OSTP/OMB and was addressed by many proposals funded by DEB during the study period. According to the Self-Study document, 194 new DEB awards investigated climate change. Likewise, OSTP/OMB identified understanding microbiomes as a national priority, and DEB made 54 new awards during the study period on microbiome research.</p> <p>OSTP/OMB memos also identified several overarching activities as national priorities, including improving public access to data, interagency and international cooperation, STEM education, development of Grand Challenges, support of high risk-high reward research, and support of innovative, early-stage research. We saw evidence that DEB has made important progress on all of these national priorities. DEB's requirement for data sharing advances the OSTP/OMB priority, as well as the OPEN Government Data Act. Several DEB programs involve interagency or international cooperation, including the Ecology and Evolution of Infectious</p>	<p>APPROPRIATE</p>

<p>Diseases and Dimensions of Biodiversity. EEID also clearly addresses a rapidly developing scientific area of great national and international importance. Most of the jackets that we examined included Broader Impacts activities that involved STEM education at one or more levels (K-12, undergraduate, graduate, public education). DEB participated in NSF's Grand Challenges program ("10 Big Ideas"; e.g., Understanding the Rules of Life). Finally, as we noted in our response to question 3, DEB has unquestionably been supporting innovative, early-stage research, and has several programs (RAPID, EAGER) and procedures in place to encourage the support of such research.</p> <p>DEB has several procedures to ensure that they continue to support cutting-edge research that addresses national priorities. In addition to following guidance from the Executive Branch (OSTP, OMB, National Science Board), DEB participates in sessions at meetings of leading scientific societies, and seeks advice from reports from those societies, the National Academy of Sciences, and other groups, and holds regular strategic planning workshops.</p> <p>More generally, the COV was impressed by the quality and breadth of research that we saw in the jackets that we examined, and by the procedures in place at DEB to ensure that the highest quality research is efficiently supported. There is no doubt that the research supported by DEB contributes to the NSF mission "<i>to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.</i>"</p>	
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>None.</p>	

OTHER TOPICS

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

Recommendation: The division should develop language other than "not competitive" for awards that won't be considered further for funding (perhaps "not considered further for funding"). Although this is not within NSF control, outside bodies such as tenure committees and university administrators will use these as descriptors rather than categories as they are intended.

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.

None.

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

The committee discussed EAGER awards at length, and there was some concern that without peer review there could be a level of arbitrariness in what is and is not funded. We recognize this is an agency-wide program, and that PO are given wide latitude in decision-making with regard to EAGER grants.

Recommendation: Criteria used to fund EAGER and RAPID awards should be made clear for each program. The rationale for every decision should be fully documented, including how other reviews (e.g., other PO) were used. The review analysis should indicate number and names of people consulted. We recommend a minimum of 3.

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

We examined the trend in award size and number without the DDIGs since this program was eliminated in 2017. We found that the trend in average annual of funds allocated per award increased during this review period and the average duration was approximately 3 years. This trend reflects the increase in cost of conducting science and was also noted in the last COV review.

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

The pinch-point is the writing of the final document. Consideration should be given to a best-practice for finalizing edits, wordsmithing, formatting, etc. One suggestion was (for the next COV) to provide a stipend to the chair to fine-tune the document after the meeting.

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