

**FY 2020 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

Date of COV: December 15-17, 2020
Program/Cluster/Section:
Division: Division of Biological Infrastructure
Directorate: Biological Sciences
Number of actions reviewed: 384 Awards: 106 Declinations: 235 Other: 43
Total number of actions within Program/Cluster/Division during period under review: 4036 Awards: 1182 Declinations: 2711 Other: 143
<p>Manner in which reviewed actions were selected: The complete list of proposals from which samples were taken and other data were provided was obtained from the NSF Enterprise Data Warehouse (EDW), the official storehouse of NSF proposal information. Using EDW, all DBI actions with a DD-Concur date during the CoV period of review (October 1, 2016-September 30th, 2020) were identified. Supplements, increments, forward-funds, PI-transfers, IPA salary awards, and the NEON Operations proposal (not under the purview of this COV) were removed, leaving a set of 4036 proposals. The MS-Excel® =RAND() function was used to assign each proposal a random number, and then a subset of proposals from each program was selected based on the lowest random numbers received by the proposals in that program (i.e., randomized and stratified).</p> <p>Note: This CoV was delayed from July to December of 2020 due to the COVID-19 pandemic allowing FY2020 data to be included. Since the typical review timeframe for a CoV is four years, FY2016 data tables and sample proposals were provided independently of the self-study via the SharePoint site and eJacket CoV module, respectively because the previous DBI CoV only included proposal data through</p>

FY2015. In addition to the sample listed above, the CoV reviewed a set of 49 actions from FY 2016.

COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	Elizabeth Kellogg	Danforth Plant Science Center
COV Members:	Lois Pollack	Cornell University
	Greg Farber	NIH
	Heidy Sierra	UPR
	Thomas Daniel (BIO AC)	Univ. Washington
	Aaron Ellison	Harvard
	Talia S. Karim	University Colorado
	Luke Achenie	Virginia Tech
	Emily Jane McTavish	Univ CA-Merced
	Shirley Pomponi	Florida Atlantic University
	Holly Ewing	Bates College

OVERVIEW AND SYNTHESIS

DBI is to be congratulated for pulling together all the documents and support necessary for the 2020 CoV, despite all the challenges that the year had brought to everyone. The program officers and staff had done a remarkable job of assembling a huge amount of data, which made the job of the CoV possible. The panel was given access to a random set of proposals from the past five years. Program officers and staff were available at all times for questions and to provide any resources we needed. The effective use of Zoom made the meeting itself seamless. Holding the meeting over Zoom required a slightly shorter meeting than in previous years, which meant that the committee was not able to dig in as deeply as they would have preferred. Nonetheless, we feel that we have been able to provide a comprehensive view of the work of DBI.

We focused on proposals about which decisions were made (“DD concurred”) in the interval between 2016 and 2020, so the review covered a five-year window rather than the usual four years. While much of our time was spent evaluating the review process itself, we also spoke with DBI program officers, administrative staff, and program officers from other divisions in BIO.

We found many strong aspects of DBI, in particular the following pertaining to the first part of the charge (*Assess the quality and integrity of operations, including technical and managerial matters pertaining to proposal review and recommendations*):

- Documentation of decisions: We found the process for handling reviews and communicating with PIs to be well documented and complete. Internal mechanisms for justifying decisions within NSF are clear and offer a good electronic trail that permitted the committee to understand why and how decisions were made. CoV members were unanimous in their praise for the quality of the Review Analyses. One member observed that the RA was well enough documented that she felt as though she would have been able to have a cogent conversation with the PI without knowing anything more about the proposal and the reviews. In total, across all programs and review approaches, nearly every proposal had at least one high-quality review, and many had more than one. These reviews, in combination with the panel summary and the PO's review analysis, collectively led to what appear to be well justified and fair reviews of the merit of proposals.
- Communication within DBI: The groups we met with felt that communication within DBI was good, both among POs and between POs and administrative staff. The administrative staff appreciated the leadership in DBI and commented particularly on the use of a shared calendar. They also noted that the push towards using standardized documentation across DBI has made their job easier and has made it easier for staff to jump into projects in other clusters. This has been facilitated by the division director who really encourages collaboration and standardization (as opposed to cluster/PO "fiefdoms"). This is a notable and welcome improvement on concerns raised to the previous CoV. DBI should be congratulated on the fact that internal communication and cooperation no longer appears to be a problem.

The support staff appear to be well managed by the program support manager. All levels of staff - division secretary and program assistant, specialist, and

analyst - reported excellent supervision and organization of tasks. Relationships between program support staff and program officers are good, and it was noted that support staff play an important role in orientation of rotators to their jobs.

- Communication within BIO: Communication between DBI and other divisions in BIO also appears to have improved in the years since the last CoV. Some POs suggested that the shift to no-deadline submissions led to increases in co-reviewing, which in turn created more and better communication. The last CoV suggested that DBI POs might not be interacting as much as they should have been with other BIO divisions. Discussions this time, with DBI and other divisional staff, indicate that this issue has been resolved well.
- Functioning during the pandemic: The CoV is impressed with DBI's ability to function smoothly and effectively during the pandemic. One PO described BIO as having procedures in place that pre-adapted them to working entirely on-line, an observation that was consistent with what the CoV noted.
- Diversity on panels: While it is difficult to fully quantify the extent of improvement because many panelists do not respond to demographic questions, DBI has done an admirable job of diversifying their panels. More work needs to be done in this area but the progress is notable.
- Response to 2016 CoV: DBI has made a serious effort to respond to the previous CoV report. In particular, they have encouraged Program Officers to undertake formal training in project management, have successfully dealt with the previous concerns in the Centers cluster, and as mentioned above they have improved communications both within DBI and with the other divisions in BIO.

Pertaining to the second part of the charge (*Assess whether the portfolio of awards is appropriately balanced*):

- Development of new tools for managing the portfolio: The COV was impressed with the tremendous breadth of science that is funded and managed by DBI as it strives to serve all of BIO. In an effort to be sure that this is happening they have recently developed text-mining tools that allow them to determine whether particular awards fall within the purview of DEB, IOS, and/or MCB. This is a creative and efficient mechanism for determining whether DBI is meeting its goals. Should further development of these tools be planned, we would encourage periodic cross-checking of the algorithms and their outputs since all algorithms have built-in biases as to what they can or cannot find or do.
- Novel organizational structure: The organization of projects into a continuum of innovation-development-sustainability is a positive step toward funding projects across multiple stages of development. This concept was suggested by the 2016 CoV as a way to structure the programs, and the 2020 CoV is pleased to see it being implemented.

- DBI and BIO are to be commended for their strong support of biological infrastructure. The CoV encourages DBI to continue to promote the value of biological collections infrastructure - both physical and electronic - as a crucial *national* infrastructure and to seek cross-directorate support for infrastructure, as appropriate. One example would be to support the upgrade, integration, and maintenance of databases and cyberinfrastructure that support the natural sciences community. For example, this might include gene sequence data or georeferenced data that are interoperable across databases and that would enable users of GEO-supported databases/cyberinfrastructure to mine data from BIO-supported databases/cyberinfrastructure, and vice-versa.

Areas for development

Our overall observation is that DBI is in a strong position to fulfill its mission in BIO and NSF. With a goal of continual improvement and looking toward the future, we make the following suggestions, divided into the broad areas of proposal review and recommendations, portfolio content and balance, and management of programs.

Quality and integrity of operations, including technical and managerial matters pertaining to proposal review and recommendations:

1. Evaluate and strengthen use of the Broader Impacts criterion: The BI criterion remains a perennial source of confusion and inconsistency. Although NSF policy is that it should receive attention equal to that of intellectual merit in proposal reviews and funding decisions, we found that this policy often appears to be ignored. This is an issue that goes back at least to the 2013 CoV report, which suggested “*We recommend that DBI lead the development of a Directorate-wide process to assess the effectiveness and impact of the "broader impacts" criterion, with attention to how the community has responded to changes in the guideline language for this criterion. In particular, we think it is important to know how well projects broaden participation and integrate research and education.*” This point was reiterated in the 2016 report and we repeat it here. While individual POs, DBI leadership and NSF in general continue to emphasize the use of Broader Impacts and the related criterion of Broadening Participation in evaluating proposals, both external and internal reviewers are inconsistent in their attention to this criterion. Exceptions appear in several programs in the HR cluster and in CAREER awards. Because DBI has extensive experience in administering programs that explicitly aim to integrate research, education, and broadening participation, the Division is well placed to lead such an evaluation.
2. Evaluate and strengthen the quality of reviews: The CoV recommends that DBI work with other parts of BIO (or NSF) to analyze review quality and to develop methods to help ensure that reviews are consistently detailed and informative. The reviews that we saw were generally sufficient for evaluating the merit of the submitted proposals, with roughly one-third to one-half of reviews conducted by panelists or *ad hoc* reviewers from outside NSF being of high quality with extensive detail, making clear the justification for the ranking. However, the quality of the reviews was highly variable, with an appreciable fraction being non-substantive (either positive or negative), providing no real justification for the rankings. Internal reviews conducted

by NSF POs were also somewhat variable, though all jackets contained at least one extensive, high-quality review from a PO. This is a concern because the review process is at the heart of all of NSF's work. As the pressure on the reviewer community continues to increase, we worry that the merit review processes at NSF, which are already relying heavily on one or two thorough reviews per proposal, may become vulnerable. We recommend that a formal analysis of review quality be undertaken to identify patterns in variability in the quality of reviews solicited from scientists in the broader community. Consideration of possible reasons for the variability would be a useful part of any such analysis, along with possible suggestions for mitigating the problem.

In making this recommendation, we emphasize that all current decisions that we reviewed are well-supported and justified. We do not see an immediate problem with review quality or justification for funding decisions. However, the CoV has flagged this as a potential future concern if DBI finds itself struggling to find even one substantive review for each proposal.

Portfolio content and balance:

3. Assess the success of programs and emphasis areas: The breadth of the programs in DBI and frequent changes of emphasis make the structure of the Division hard to understand and we suspect hard to administer. The rationale for the inclusion of particular programs within clusters, their movement across clusters, and changes in the emphasis of particular programs (e.g. postdoctoral and REU) was unclear to the CoV. We recommend that DBI identify easily captured metrics of success for each program and emphasis area, and the outcomes be communicated effectively to the community. In addition, we recommend that such metrics be reported in regular assessments provided at clearly explained and justified intervals. For example, the computational emphasis area in the post-doc program was phased out in favor of the Rules of Life emphasis. It is unclear whether the computational area met its goals and whether it was effective or not. We emphasize the term "easily captured metrics" knowing that DBI staff are already stretched, so any metrics would ideally be available in data that are already provided in some form.

Connected to the question of program assessment is further documentation of how funding allocations are made to programs within cluster. Future Self Studies could explain the rationale for relative allocations and perhaps include NSF strategic planning documents in the summary information provided to the CoV early in their meeting.

4. Explore reasons for differential representation of types of institutions: The CoV agreed with and further underscores the self study's concern with the dramatic drop in the success rate of proposals from Minority Serving Institutions (MSI) in 2020. It was not clear from the available data whether the drop in 2020 is related to the absence of deadlines, a last-quarter COVID impact, or some other reason. We note that COVID has magnified pre-existing inequities in nearly all facets of life, and we suggest that being attentive to the long-term effects of such inequities will be important for the future of research at MSI and by PIs from demographics underrepresented in science. We recommend that DBI consider new outreach to MSI and new programs aimed at scientists in such institutions.

The CoV is pleased to see that all types of institutions are present in the portfolio, and institutions with larger numbers of research scientists have a larger representation, which is equitable in one respect. However, institutions with less research infrastructure are underrepresented relative to their proportion nationally, which likely reflects the need for institutional sponsored project offices and faculty time and reward structures for research. If NSF has a strategic goal to increase portfolio representation of institutions whose missions might be primarily educational (rather than research-focused) or those that are primarily minority-serving (MSI), new mechanisms may be needed for supporting the entire research cycle at such institutions. We note that any such initiative likely would lie outside of DBI, but because of its emphasis on developing infrastructure, DBI could lead the effort.

5. Take advantage of new online/virtual/hybrid learning and working skills to enhance broader participation and new opportunities. DBI should think about how to support both new opportunities and equitable access within its own programs and in operations across the division. On-line options for research and teaching are rapidly becoming more widespread and improved, and DBI is in a position to support these efforts. As the same time, the pandemic has enhanced pre-existing inequities in access to resources, and many of the most vulnerable students, professionals, and institutions have become even more vulnerable. Neither access to high-speed internet nor safe spaces in which to work remotely are uniformly distributed geographically, socioeconomically, or across individuals of different racial, ethnic, or gender identities. We see opportunities for DBI and its funded PIs to lead in addressing these challenges.

Program management:

6. Continue to be vigilant about communication within DBI, BIO and NSF: Communication within and outside DBI has clearly improved appreciably since the last CoV. However, it is such a critical area that we flag it here as an area that will need continual attention. As noted in the 2016 CoV report “[DBI] requires constant multi-way communication, and should involve stakeholders (i.e., the community of biological scientists and educators who do or should avail themselves of NSF’s programs) before critical decisions are made about the nature or timing of major programmatic activities. DBI in particular, and perhaps BIO in general, should regularly revisit this challenge, so as to identify hurdles to effective and timely communication, and devise tactics and strategies to overcome them.”
7. Enhance communication with PIs: While the CoV was universally impressed by the quality of the Review Analyses, we felt that the POs could do more to be sure that more of the rationale for the decision was communicated to the PIs. We found that the Panel Summary was often somewhat limited in conveying the rich information that was in the Review Analysis. POs could make more and more effective use of the option of Program Officer comments. Many PIs are not aware that calling the PO is an option and thus miss out on that valuable post-review conversation.

8. Consider moving the Post-doctoral Research Fellowship (PRFB) and Research Experience for Undergraduates (REU) programs to no-deadline submissions: The move to no-deadline submissions has been largely successful in much of BIO, but deadlines remain in place for the programs within the HR cluster. The CoV recommends considering whether no-deadline submissions might be appropriate here. For example, graduate students can complete theses any time of year. REUs and UBEs are also not time critical. A no deadline system could also increase diversity of REU sites. See additional comments under the HR cluster.
9. Continued attention to staffing levels: DBI (and probably BIO as a whole) needs to work to maintain staffing levels. This appears to be ongoing challenge. In particular, it does not appear that DBI has sufficient staff (either at the program level or at other levels) to appropriately manage the Centers Cluster, which includes a number of large and complex programs. If DBI does make additional hires, it might be useful to think about sharing those hires in a meaningful way with other BIO divisions. A program officer with a home in DBI who manages a separate grant portfolio in IOS (or any division) and participates in all IOS division meetings might help coordination between various parts of BIO. Shared administrative staff might also be worth considering.

Specific comments on the structure of the virtual CoV

We appreciate the enormous challenges of running a CoV with all participants logging in remotely, and the committee was impressed by the efforts of the NSF administrative team and Program Directors to manage the process smoothly and efficiently. The structure of the Zoom meetings and the accompanying break-out rooms went well. Nonetheless, there were aspects that could be improved if future CoVs are to be done remotely. While some of these appear below in the assessments made by reviewers of individual clusters, the CoV Chair will communicate a summary to DBI leadership in a separate document.

HUMAN RESOURCES CLUSTER

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, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) 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.

<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: RCN-UBE and REU-site proposals use panel reviews, which the CoV feels are appropriate.</p> <p>PRFB proposals encompass a vast range of science. We note in particular that the "Rules of Life" or "Biological Collections" categories are so broad as to challenge the expertise range of a finite panel.</p> <p>(3) It was not clear to this subset of the COV whether reviews from IOS/DEB/MCB were part of the process. This would be true for postdoc proposals that have foci in each sub area.</p> <p>(4) Many "Rules of Life" proposals had significant computational/mathematical foci. Were panels well balanced in this regard? The information we had was unclear.</p>	<p style="text-align: center;">Yes</p>

<p>2. Are both merit review criteria addressed</p> <p>a) In individual reviews? For the most part. There were perhaps a few individual reviews where that may not have been clear.</p> <p>b) In panel summaries? Yes</p> <p>c) In Program Officer review analyses? Yes.</p> <p>Comments:</p> <p>We feel that the two merit review criteria (Intellectual Merit and Broader Impacts) were addressed in all reviews, though the weight applied to each in making award/decline decisions appeared to be highly variable.</p> <p>When there were additional review criteria, the individual reviews did not always address them, but the additional criteria were reliably addressed by the panel reviews and the program summary.</p> <p>For Postdoc programs, Career Development Plans and Mentoring Plans may be as important as IM and BI. Mentoring is particularly important for broadening participating in biological science careers.</p>	<p>Yes</p>
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<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Comments: For the majority of proposals we analyzed, and in all the HR cluster's programs, the reviews were generally quite thoughtful and informative, giving applicants a sense of strengths and weaknesses of the proposal.</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: (No additional comments)</p>	<p>Yes</p>

<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]</p> <p>Comments: This was a feature of the analysis we found both helpful and informative. There was clear rationale developed for funding decisions. The information provided in the PO review analysis was especially helpful in outlining the decision making process.</p> <p>In all the HR cluster programs we reviewed, the panel summaries, the individual reviews and the review analysis did indeed provide the rationale for award decisions. We do note that the review analysis was generally much more comprehensively articulated for funded proposals than for declines.</p>	<p>Yes</p>
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<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>[Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]</p> <p>Comments: The combination of panel summaries and individual reviews provided sufficient feedback, often quite specific.</p>	<p>Yes</p>
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<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>No additional comments.</p>	
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II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>This was not the easiest question to evaluate. Expertise and qualifications of panelists needed to be inferred from departmental affiliations or institutions. But it would be unreasonable to ask POs or DBI overall to provide details on how panelists were selected.</p> <p>In discussion, POs noted that all reviews were done by panelists. This provides equal weight to reviews (reviewers "in the room" get more attention than ad-hocs not present) and that panelists were selected because of expertise and qualifications, as well as diversity (ethnicity, geography, institution size, Carnegie type, and MSI/population served).</p>	Yes
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p> <p>No irregularities noticed.</p>	Yes
<p>3. Additional comments on reviewer selection:</p> <p>To our reading, the panels represent both breadth and diversity in a range of disciplines.</p> <p>We note that there has been an improvement in the breadth of and diversity of reviewers since the last CoV. This particularly notable in the recent years with the RCN UBEs and REU Sites reviewers. We hope this trend continues in future years.</p>	Yes

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:

Overall, the DBI HR programs are managed well. There has been a large increase in post-doc submissions, but the collaborative environment across the administrative staff has made that manageable. The Admin staff we talked to noted a few pressure points, including the switch to no-deadline (in programs other than HR-related ones), non-intuitive IT systems for paying post-docs holding PRFs; and the big jump in FY2020 in PRF proposals (35%) after four years of essentially no change.

The 3 platforms for submission (research.gov, grants.gov, fastlane) creates some tension with evaluating submissions for compliance, and it's not always clear if what POs ask for in terms of compliance checks are actually used by POs (or whether it's just "nice to know").

One positive the Admin staff mentioned was that the push towards using standardized documentation across DBI has made their job easier and also made it easier for staff to jump into projects in other clusters. This has been facilitated by the division director who really encourages collaboration and standardization (as opposed to cluster/PO "fiefdoms")

Some consideration should be given to the question of whether the deadline model for this sub section of the Bio Directorate remains the right model. It would be worth thinking about no deadline. For example, graduate students can complete theses any time of year. REUs and UBEs are also not time critical. A no deadline system might increase diversity of thinking about REU sites.

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

Comments:

As we mention below, the shift to more integrative efforts (Rules of Life, computational skills in the Bio workforce development) reflects a good response to emerging trends and priorities in the life sciences.

The overwhelming importance of quantitative and computational skills for the workforce in biological sciences will remain a key issue, one that DBI can take a lead on with regards to future REU, UBE, and Postdoc programs. Strengthening a data literate workforce (#NSF10BigIdeas) is absolutely critical. The programs fostered so far go a good way

towards this goal. (REU efforts have been particularly good in this regard). Even more effort in this space seems warranted – computational and data analytic efforts can be a key component integrated into all programs.

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

Comments:

We would like to understand better how the balance of effort (financial, staffing, etc.) is determined within the HR cluster. We do know that recommendations are made for allocations between broad categories, but we do not have a clear understanding of the basis for those recommendations. It would be helpful for future self-studies to explain the rationale for relative allocations.

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

Comments:

Several of the concerns raised in the previous COV regarding the HR component of DBI have been nicely addressed in the intervening time.

One concern was how DBI aligned with national priorities. Here, DBI has done a good job through (a) aligning postdoc support with the "Rules of Life" initiative, (b) supporting a more diverse work force via the postdoc program and (c) weaving increased quantitative foci in all HR related programs from the REU sites, to the RCN-UBEs, to the Rules of Life efforts. Additionally, BIO POs generally seem to be aware of the need to address discipline-specific infrastructure needs in collaboration with DBI.

There was a prior concern with the structure of sample data sets that were addressed by staff and leadership of DBI.

DBI has done an admirable job in diversifying their panels.

The 2016 CoV had question about post-doc mentors and mentoring institutions. In response, DBI said they would provide spreadsheet of mentors and institutions to 2020 COV. We couldn't find it. But POs pointed out the importance of mentoring plans and institutions. For next COV (2023/2024), more documentation on this in the self-study would be helpful.

The 2016 CoV has asked DBI to take a lead in assessing the effectiveness of Broader Impacts. This request really has multiple dimensions. Is the evaluation of BI applied consistently? (For example, in a proposal with strong IM is BI down-weighted?). Second, to what extent are the BI aspects working? How is this assessed? As noted elsewhere in this document, this issue remains to be addressed.

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: We note that the postdoc support provided by DBI takes some stress off of the other divisions. The track 1 postdocs (those that broaden participation) are especially valuable, as are the postdocs bringing/developing strong quantitative foci.</p> <p>We would like to better understand how the balance of effort (financial etc.) is determined within the HR component. We do know that recommendations are made for allocations between broad categories, but we do not have a clear understanding of the basis for those recommendations. Future self studies could explain the rationale for relative allocations and perhaps include NSF strategic planning documents in the summary information provided to the CoV at the start.</p>	<p>Yes (qualified)</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments: The size and duration of postdoctoral fellowships both seem reasonable. The CoV suggests discussing the implications of high variation in the cost of living between different locations.</p> <p>The REU-sites, INCLUDES, and RCN-UBE programs appear reasonable. Cost of living may be a factor for REU-site programs.</p>	

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

Comments:

Yes, the majority of programs in the HR cluster are innovative and potentially transformative. The postdoc program in particular has a high success rate of PIs moving on to permanent positions.

The committee expressed concern that programs/projects that require extensive attention to logistics and management (e.g., REU Sites) provide less space in the proposal (and hence less attention) for the science and therefore might be less innovative or transformative. In these cases, reviewers, panelists, and review analysis also tend to focus more on logistics, management, and "Broader Impacts" than the "Intellectual Merit" (science topics) of the proposals.

The pivot to online and virtual learning in 2020 has demonstrated that alternative models for how HR cluster projects (e.g., REU Sites, RCN UBE) are structured should be explored. The classic summer program model of an REU site fits some students better than others.

The committee notes that there will still always be a role for hands-on aspects that can only be provided when school is not in session, and the financial support for REU students can broaden participation by taking a burden off of the need to earn money by holding a separate job in the summer. Having a partially or wholly on-site (as opposed to virtual) program where people can gather in person can level the playing field, particularly for students who may not have a reliable internet connection at home or for whom home is not safe.

On the other hand, having an online summer program or the option for year-round mentoring is likely to attract a different set of students from those currently served by the summer programs. For example, a student who works part-time throughout the academic year is usually not in a position to take 10 weeks off from her job in the summer; even if her stipend is covered by REU program her job is likely to disappear over the summer.

The CoV recommends that DBI re-think the classic summer program model of an REU Site. Changes might influence both the structure and budget of a given Site, could offer year-round mentoring in some cases, and might be offered online. By considering several models, DBI might help to broaden participation in these programs. Support for all these innovations could be facilitated with a move to no-deadline applications.

<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments:</p> <p>This was an especially strong feature of the HR portfolio of DBI. A majority of REU, RCN-UBE and postdoc awards featured multidisciplinary efforts. Many of these included (as mentioned elsewhere here) statistical, computational, data analytics aspects of biological sciences research.</p> <p>Multidisciplinary efforts (melding DEB, IOS, MCB) are inherently strong. The committee saw less evidence of multi-directorate efforts. Many or most of these may have been outside our purview for this review. For cases that cross directorates, the funding model is unclear which then raises programmatic challenges.</p>	<p>Yes</p>
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments:</p> <p>Some geographical areas are still lacking in representation as noted in the 2020 self-study, but it was clear from some of the Review Analysis comments (e.g., REU Sites) that efforts are being made to rectify this issue in specific programs.</p> <p>Additional data provided by the DDD and PO illustrated that even though the institutions awarded the relatively small number of RCNs or RCN-UBEs are not geographically representative or widespread, the network "reach" - distribution and links to co-PIs, other senior personnel, post-docs and grad students – is very broad.</p> <p>As the previous COV noted, the percentage of HR-cluster awards to EPSCoR-state institutions/PIs is smaller than the percentage of EPSCoR states. However, the overall percent of awards to EPSCoR and non-EPSCoR states are roughly equivalent for all of the HR cluster. The percent of REU Site and RCN/RCN-UBE awards to institutions based in EPSCoR states exceeded those awards to non-EPSCoR states during the analysis period. More post-doc fellowships went to non-EPSCoR states than to EPSCoR states.</p> <p>The CoV finds these numbers impressive.</p>	<p>Yes</p>

<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>We note that several recent awards have gone to PIs based at community colleges, which is especially important for the programs focusing on undergraduate biology education and broadening participation.</p> <p>One concern was the reduction in proposals awarded to MSIs (the self-study flagged this on p. 29 and asked for COV reflection on it). In all years prior to 2020, the award rate to MSIs was on par with the overall success rate in the cluster). In 2020 the success rate for MSIs was substantially lower than the overall rate in the cluster). At the same time, however, the total number of proposals increased, dominated by a significant number of postdoctoral applications and awards.</p>	<p>Yes</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: By definition most of the awards in the HR cluster are to postdocs who are at early career stages. It is not clear to us whether REU sites are best efforts for early career researchers (in fact, the self-study or the 2016 COV) notes that they are not). That said, RCN-UBEs and the INCLUDES program are clearly supporting early career researchers.</p>	<p>Yes</p>
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments: This is, indeed, the core of the HR mission. We believe it is carried out well.</p>	<p>Yes</p>
	<p>Yes</p>

<p>9. Does the program portfolio have appropriate participation of underrepresented groups¹?</p> <p>Comments: This was a concern raised in the prior COV review and has been addressed in the intervening time. We understand that program officers have made (and will continue to make) significant efforts to broaden participation in panels. Moreover including "Broadening Participation" as an additional aspect of Broader Impacts is also helping to address DEI issues. Indeed, awards for INCLUDES programs seriously weighted leadership participation from minority serving institutions as part of the decision process.</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: The key elements of the HR cluster for DBI are clearly relevant to national and agency priorities. Indeed this is a particular strength of this division. These include fostering a diverse and vibrant workforce [references 1-4] that extends from early career scientists in high school (via outreach efforts) and undergraduate programs (via REU, REU site, INCLUDES, RCN-UBE) and track 1 postdoctoral fellowships. Additionally, NSF BIO-DBI through its funding of postdocs in the "Rules of Life" effort, and through undergraduate educational efforts that involve the INCLUDES program and those that foster highly interdisciplinary efforts which include computing, statistics and other mathematical and physical sciences plays directly into the 10 Big Ideas foci of NSF [5] and together address central issues of workforce development in STEM domains [6,7]. PDFs of the sources we reviewed are all in the Sharepoint HR folder.</p> <p><u>[1] National Science Foundation Strategic Plan</u> (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf18045)</p> <p><u>[2] Promising Practices for Addressing the Underrepresentation of Women in Science, Engineering, and Medicine: Opening Doors (2020)</u> National Academies Press</p> <p><u>[3] The Impacts of Racism and Bias on Black People Pursuing Careers in Science, Engineering, and Medicine: Proceedings of a Workshop (2020)</u></p>	<p><u>Yes</u></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>[4] Vision and Change in Undergraduate Biology Education: Unpacking a movement and sharing lessons learned. Planning Meeting July 2017. https://live-visionandchange.pantheonsite.io/wp-content/uploads/2018/09/VandC-2018-finrr.pdf</p> <p>[5] https://www.nsf.gov/news/special_reports/big_ideas/</p> <p>[6] Work force development (Biological Collections) https://www.nationalacademies.org/our-work/biological-collections-their-past-present-and-future-contributions-and-options-for-sustaining-them</p> <p>[7] National Academies of Sciences, Engineering, and Medicine. 2017. Building America's Skilled Technical Workforce. Washington, DC: The National Academies Press. https://doi.org/10.17226/23472.</p>	
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>We are generally pleased with the quality of the projects for all programs within the HR cluster.</p> <p>In terms of number of awards, the balance of the portfolio appears to be equally balanced between undergraduate focused awards (e.g. REU, RCN, INCLUDES) and postdoctoral fellowships. The fiscal balance is slightly skewed towards undergraduate awards, dominated by support of REU sites. Over the four years reported, 262 (about \$38M) postdoctoral fellowships were awarded. This balance seems reasonable to us.</p>	

OTHER TOPICS

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

The CoV suggests that DBI consider whether the post-doctoral fellowship competition should be shifted to “no deadline.” The committee noted that Ph.D. students finish at many different times during the year and removal of the deadline might could capture a broader and more diverse set of post-doctoral fellows. Such as shift might also improve quantitative skills/training in the workforce.

Similarly are fixed deadlines for undergraduate biological science education proposals as relevant in today's environment with live online aspects becoming so prevalent?

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.

We spent some time mining data on awards and award rates in light of geographic distribution, support of EPSCoR states, diversity and career stage. To our reading of the data, the overall pattern of support in the HR cluster is in line with NSF goals of broadening participation.

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

This will come up in other clusters as well, but attention to how Broader Impacts are assessed and considered in award decisions would benefit from NSF-wide clarity.

4. Please provide comments on any other issues the COV feels are relevant.
No additional comments.

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

This was our first. More small breaks are needed in the schedule. It would have been helpful to have read many of the documents in the summary data folder before the meeting (especially the previous CoV document and response, in addition to the 2020 self-study).

RESEARCH RESOURCES

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, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) 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.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments:</p> <p>The panel process used to evaluate most proposals (MRI, Instrumentation, IIBR, ICB, Field Stations, Digitization, Biological Research Collections, and Advances in Bioinformatics) seems sound with generally good documentation of the review process. For the non-panel decisions, those having to do with EAGER, RCN, and SABI, there were either internal ad hoc reviews (in the case of EAGER) or external ones (for the RCN and SABI).</p> <p>In all jackets examined across all programs, the documentation provided was sufficient to trace what had happened in the review and decision-making process. In complex cases spanning PO transitions and unusual needs for review the combination of materials took quite a bit of examination, but needed details and documents were all present. In nearly all cases, the review analysis alone was sufficient to illuminate the connection between reviews and the ultimate decision, and we commend the practice of writing extensive review analyses.</p>	YES

<p>In general, across all programs, the largest issues were inconsistency in the quality of the reviews. This issue was primarily with the reviews obtained from people external to NSF, both panelists and ad hoc reviewers, and we detail more of our concerns below. We also note that among ABI proposals, not many proposals were co-reviewed with other panels. However, we understand that co-review has increased since the move to no-deadline submissions, and that is positive and appropriate for many DBI programs.</p> <p>We note that there was no longer a summary available about which programs had pre-proposals or how the shaping of the portfolio mix occurred. This information would have been a useful addition to the self-study to enable the CoV to interpret the review process.</p> <p>It was not clear to this subset of the CoV whether reviews from IOS/DEB/MCB were part of the process.</p>	
<p>2. Are both merit review criteria addressed</p> <p>d) In individual reviews?</p> <p>e) In panel summaries?</p> <p>f) In Program Officer review analyses?</p> <p>Comments:</p> <p>Intellectual Merit (IM) and Broader Impacts (BI) were addressed in individual reviews, panel summaries, and PO review analyses in all programs examined. However, the majority of reviews did not speak individually to the sub-criteria that are part of the prompt for review of IM and BI. The PO analysis tended to be more detailed and more informative in both merit review criteria than the other reviews. This could be attributed to the fact that the PO in general has more time and resources (broader knowledge of programmatic elements) as compared to panelists, though panelists also varied greatly in the quality of their reviews (see below). In the Field Station and SABI proposals, it was not clear that the standard merit review criteria were appropriate since buildings and sustaining infrastructure are important but not obviously creative or transformative, something we find acceptable. CAREER award panel summaries and review analyses were light on solicitation-specific criteria.</p>	<p>YES</p>

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?

Comments:

We judge the reviews to have been sufficient for fairly evaluating the merit of the submitted proposals. However, we recommend that a formal analysis of review quality be undertaken for the purpose of identifying patterns of variation in the quality of reviews solicited by NSF of scientists in the broader community. Consideration of possible reasons for the variability would be a useful part of any such analysis.

In our informal, semi-quantitative analysis of the review quality across all programs, we found the quality of the reviews was highly variable. One third to half of the individual reviews conducted by panelists or *ad hoc* reviewers from outside NSF were of high quality with extensive detail making clear the justification for the ranking. Such reviews were generally easy to connect conceptually to panel summaries and PO review analyses. In approximately a quarter to a third of cases, the reviews were so limited as to provide no real justification for the rankings, and the remaining quarter to third of reviews were somewhere in between these two levels having some rationale for the rankings but no extensive analysis of the proposed work. Among the insufficient reviews, reviewers fell into two general categories: those who awarded high rankings (E, V) without justification and those who awarded lower rankings (G,F,P) with vague, blanket criticism. The internal reviews of EAGERs conducted by NSF POs were also somewhat variable, though all contained at least one extensive, high-quality review from a PO.

In total, across all programs and review approaches, nearly every proposal had at least one high-quality review, and many had more than one. These reviews, in combination with the panel summary and the PO's review analysis, collectively led to what appear to be well justified and fair reviews of the merit of proposals.

We are concerned, however, that as people have become busier and as the number of proposals, manuscripts, programs, and dossiers people are asked to review has increased, the merit review processes at NSF may become vulnerable as the process has already become reliant on the most thorough reviews. Some of this reliance may be mitigated within DBI by the extensive use of reviews by panelists where there is an opportunity for discussion of the proposal in person, but because the reviews go back to PIs without editing, it would be most helpful for the text of individual reviews to be thorough. We also note that the move to no deadlines has resulted in smaller panels, so it may be that the extent to which panel conversation can substitute for written reviews will decrease. This seems especially likely should the outcome of a panel be a request for an external *post hoc* review to obtain a more complete

MIXED BY
REVIEWER
RATHER
THAN BY
PROGRAM

<p>analysis from a subject-matter expert; any such reviews would have to be thorough to be of use in the decision-making process.</p> <p>Should an analysis of review quality be undertaken more broadly across NSF, we would suggest that it consider, among other things, the cases in which insufficient reviews provide either high or low rankings. We observed some tendency toward the insufficient reviews with high rankings being those assigned in cases where the PIs on the grant proposal were from high-profile institutions, whereas lower rankings most often occurred in cases where the PIs were in less prominent institutions. Reviews should be analyzed for possible implicit bias.</p>	
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments: For programs reviewed by a panel, the panel summaries generally provided a clear description of strengths and weaknesses in IM and BI. In cases with at least one high quality review of a proposal, the panel summary was almost always complete and clear about the rationale for the decision. However, the connection between the reviews and summary was not always clear and may depend in part on whether the thorough review came from the person who also wrote the panel summary. In cases, where there were no high quality reviews of a proposal, the panel summary also lacked depth, and the PO's review analysis became crucial in understanding the rationale behind recommendations.</p> <p>For solicitations with program-specific review criteria (e.g. CAREER, Field Sites) the panel consensus on strengths and weaknesses with respect to the program-specific review criteria was not consistently communicated.</p>	<p>YES</p>
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]</p> <p>Across programs the eJacket documentation generally provided clear rationale for the award/decline decisions. In particular, the Review Analyses were comprehensive and detailed. They filled gaps between individual reviews and the panel summary, and connected the award/decline decisions to broader program priorities.</p> <p>The CoV felt that an edited version of the Review Analysis would be very useful to the PI. Making sure that PO comments to the PI include the</p>	<p>YES</p>

<p>relevant information and finding a way to draw PI attention to this information would be helpful. This information was particularly important in programs without panel discussion (EAGER, RCN, SABI).</p>	
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<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>[Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]</p> <p>Comments: The documentation provided to the PI generally provided rationale for the award/decline decisions, especially in programs with external reviews and panel discussions (ABI, CAREER, MRI, and others) where the panel consensus was decisive. In programs without panel review (EAGER, RCN, SABI) the documentation to the PI was less comprehensive, and it is not clear how thoroughly it captured the full rationale for award/decline decisions. However, there was often additional information in the Review Analysis about the weighting of different considerations which were not always shared with PIs and could provide valuable constructive criticism.</p> <p>Even though PIs generally know that many factors contribute to a funding decision, generally only the peer reviews are shared with the PI. The CoV notes that the POs use the Review Analysis to discuss funding decisions if the PI calls the PO; the comments are not provided in writing to the PI. Making sure the PO comments include any details relevant to the PI — for example highlighting where weak BI can be a deciding factor-- is an opportunity for further transparency.</p>	<p>Mixed</p>
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<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <ul style="list-style-type: none"> • The merit review process is clearly most successful and consistent when both internal and external reviewers are able to provide thoughtful reviews that justify rankings and statements. Additional mechanisms for improving the quality of the reviews would likely be helpful to the process. • In some cases the panel summary or individual reviews, contained questions – like "panel wondered if funding for X is in scope" or "is personnel Y necessary". It was not clear what weight those comments were given, or if those came into later budget discussions between POs and PIs. • More discussion of results of prior support, as well as increased co-review could help to maximize the utility of funded projects to the community. • Issues of equity and inclusion are variably addressed by POs; some are clearly sensitive to issues of discrimination and can point it out in reviews and in unjustified statements. While it is clear that NSF and the POs in this division are attentive to issues of representation and portfolio balance, further training of POs—both permanent and rotators—in recognition of bias in reviews, program summaries, and recruitment of proposals from different kinds of institutions would likely improve the review process. 	
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II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>Although eJacket did not provide explicit information, implicitly it appeared the programs generally invited reviewers with the requisite expertise, background and knowledge of the community. These inferences are based on departmental and college affiliations of the reviewers as well as</p>	

<p>the depth of the reviews. For example, for computational research, the backgrounds of the reviewers were in computer science, statistics, bioinformatics and machine learning. The RR cluster CoV felt there were too few <i>ad hoc</i> reviewers; although there may have been good reasons for this, more <i>ad hoc</i> reviewers could have strengthened the domain expertise.</p>	
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p> <p>All review analyses included a statement about how COIs were handled in panels, and in jackets where a COI was discovered by a reviewer in the process of the review, that review was clearly marked as one that could not be released (and had clearly not been completed). Individual CoV panelists have also found appropriate handling when serving on DBI panels. Also, the eJacket has a module called “Conflicts of Interest” that allows the members of the CoV to list a COI as appropriate. With regard to the CoV itself, a review of COI was conducted before commencing deliberations.</p>	
<p>3. Additional comments on reviewer selection:</p> <p>A number of questions were pondered by the CoV for the RR cluster. Do <i>ad hoc</i> reviews tend to get under-weighted in panel discussions? Since <i>ad hoc</i> reviewers do not have live interactions with the onsite review panel, they are not calibrated against other proposals. Perhaps a knowledge of review scores from <i>ad hoc</i> reviewers could be useful for properly weighting <i>ad hoc</i> scores and panelist scores.</p> <p>In the meeting with POs, it became clear that there was a foundation-wide database of reviewers. However, the RR cluster CoV did not have access to the database. As such it was not clear the granularity of the reviewer expertise and history to which POs making review requests have access.</p> <p>Adequate representation on review panels from underserved minorities is hard to quantify. For example, based on data the CoV was given, only about half of the reviewers responded to the question about minority status. While some identified as members of under-represented groups, it is unclear how these numbers can be extrapolated to the set of reviewers as whole.</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:

Based on the DBI organizational chart, the structure seems reasonable for management of processes. POs appear to have good working relationships, but the clusters vary a great deal in the proportion of POs who are permanent vs rotators. Management of BIO's large and complex awards may be placing a greater burden on POs and support staff.

The support staff appear to be well managed by the program support manager. The division secretary and program assistant, specialist, and analyst all reported excellent supervision and organization of tasks. Relationships between program support staff and program officers are good, and it was noted that support staff play an important role in orientation of rotators to their jobs. Support staff reported that program officers vary a great deal in how promptly they respond to support staff requests. While it is recognized that program officers are busy, support staff see timely responses as a matter of respect.

There is a sense that the support staff are overwhelmed at times, but they are responding to the challenge. Good staff retention shows a certain level of satisfaction with management. The staff believes the transition to virtual work has been an overall good thing that could improve program management and organization of panels and reviews. A brief discussion of how COVID-19 has impacted performance and the work-arounds DBI has devised would speak to the adaptability of DBI to unforeseen events.

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

Comments:

Program officers from other divisions within BIO report having had the ability to develop collaborative relationships with program officers in DBI to address and co-fund some emerging areas (e.g., the Brain initiative). However, the ability to coordinate Mid-Scale Infrastructure and to provide support for consolidating and upgrading collections of genome sequences as part of the national research infrastructure were flagged as upcoming areas of concern.

It is not clear to what extent DBI is a conceptualizer of new programs as opposed to the research community it serves. There was some discussion with the DD, DDD, and POs about transitioning support from NSF to other sources of funding to sustain the infrastructure.

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

Comments:

BIO works with the other directorates and the NSF director to address particular national priorities. This is a complex process that involves many stakeholders. A DBI program may align with national priorities or a new program may be launched, such as NeuroNex. Typically, a single division does not address national priorities alone.

Given the importance of the Review Analysis and portfolio balancing to meeting larger strategic objectives at NSF, the culture around Review Analysis is crucial. The maintenance or evolution of culture is not discussed in the self-study, but it appears that there are internal mechanisms for this that center around PO conversations and the retrospective analyses that are done after panels. As new POs enter the division, whether as permanent staff or rotators, discussion of objectives, norms, and considerations behind the balancing of portfolios are essential. We understand that for rotators, the application process itself begins this reflection as candidates are asked to comment on the role and importance of both IM and BI review criteria. Further consideration of the ways in which management relies on cultures of practice may be important in meeting future goals about portfolio composition with respect to equity and inclusion.

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

Comments:

DBI has been quite responsive with regard to communications. Specifically it has initiated “Human Resource Cluster Meetings”, “Research Resource Cluster Meetings”, and “DBInfo blog”, for effective communication within both the DBI and the scientific community it serves. DBI should strive to assess the utility of the initiatives.

The suggestion of better emphasizing and reviewing Broader Impacts seems to have been well executed, but there is still room for improvement by both the PIs and the reviewers.

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

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE,
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	OR DATA NOT AVAILABLE
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?</p> <p>Comments:</p> <p>The cluster and division portfolio is large and diverse, and the data in the self-study do not clearly indicate the range of submissions and awards by discipline or sub-discipline within each program. The range of proposals to which we had access, a random subset of the whole, was not sufficient to assess disciplinary balance. From the data we had available, there was no obvious imbalance. Indeed, given the breadth of research served by DBI, balance may be quite difficult to assess for DBI as a whole.</p>	DATA NOT AVAILABLE
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments:</p> <p>Awards were typically for the amount requested by the PI, and the CoV assumes that the PIs were the best judges of the match between the project requirements and the size and duration. Among the reviewed proposals, budgets were rarely cut, and POs provided thorough justification when asking for revised budgets.</p> <p>The CoV noted that "Advancing Digitization of Biodiversity Collections" is a key source of graduate and undergraduate student support within DBI and provides HR development within biodiversity and collections. These proposals (and therefore awards) tend to have relatively small budgets, and expanding funding in this area could support national priorities related to collections, as well as supporting student training and research.</p>	APPROPRIATE
<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments:</p> <p>As a proxy indicator for the "Innovative early stage and basic research proposals," the DBI self-study highlighted submissions to the IIBR program (now "Innovation") that represents 13% (=90/658) of the awards in the Research Resources cluster. There are other innovative submissions (e.g., Development proposals in the MRI Program; the</p>	APPROPRIATE

<p>PRFB research proposals), but such determinations are somewhat subjective.</p> <p>In the RR cluster, 46 EAGERS & RAPID's were awarded (~7% of the awards for the cluster), but we do not have a sense of the extent to which these might be considered "innovative" or "potentially transformative."</p>	
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments: Yes. Based on Table 8 of the DBI self-study, support for most of the inter- or multi-disciplinary projects comes from within BIO, with the next highest being EHR, CSE, GEO, and MPS, in that order.</p>	<p>APPROPRIATE</p>
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments: The geographic representation of awards is similar to that of the proposals submitted. The unusually low success rate in some states identified in the self-study suggests that there may be a need for more mentoring or other ways of engaging PIs from those states.</p> <p>For programs within the Research Resources cluster, funding rates in EPSCOR states were generally lower than those of non-EPSCOR states. We recommend that DBI consider carefully what is driving this result.</p>	<p>APPROPRIATE</p>
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments :</p> <p>In general, it appears that all types of institutions are present in the portfolio and that institutions with larger numbers of research scientists have a larger representation in the portfolio. This is perhaps "appropriate" representation, but to the extent that diversification is a portfolio objective, we note that institutions with less research infrastructure are underrepresented in the portfolio relative to their representation nationally. This is to be expected given the need for institutional sponsored project offices and faculty time and reward structures for research. To the extent that there is any strategic initiative within NSF to increase portfolio representation of institutions</p>	<p>APPROPRIATE, but see comments</p>

<p>whose missions might be primarily educational (rather than research-focused) or those that are primarily minority-serving (MSI), there may be a need to consider new mechanisms for supporting the entire research cycle at such institutions. Any such initiative likely would lie outside of DBI, but given the dramatic drop in the success rate of proposals from MSI in 2020 in both Research Resources and Human Resources, it is worth asking whether either new outreach to institutions or new programs aimed at scientists in such institutions would be helpful. It is not clear at this point whether the drop in 2020 is related to the absence of deadlines, a last-quarter COVID impact, or some other reason. We note that COVID has magnified pre-existing inequities in nearly all facets of life, and we suggest that being attentive to the long-term effects of such inequities will be important for the future of research at MSI and by PIs from demographics underrepresented in science.</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: It is clear that CAREER proposals and other submissions from new investigators are represented among the awards. Appendix 1 of the self-study shows that while relatively few awards are made in Research Resources to those who have received their PhD in the last five years, the representation of PIs with PhDs in the last decade is strong and is better than representation on the "older" end of the PhD-year distribution. We think this balance is appropriate.</p>	<p>APPROPRIATE</p>
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments: Yes, CAREER awards explicitly do this, and awards across the other programs reviewed often include educational objectives as part of their broader impacts.</p>	<p>APPROPRIATE</p>

<p>Integration of research and education is already built into proposal review. Under Broader Impacts, principal investigators are explicitly required to address integration of research and education. Funded proposals are chosen partly on the basis of how synergies between intellectual merits and broader impact are carefully managed.</p>	
<p>9. Does the program portfolio have appropriate participation of underrepresented groups²?</p> <p>Comments: Progress has been made, but URM's are still underrepresented nationally, and as long as that is true, that is insufficient participation.</p> <p>However, specifically within DBI, we do not have an accurate measure of underrepresented groups' participation. Perhaps, in the call for proposals, DBI and the BIO directorate could make a good case for why the question about minority status is useful for helping NSF/DBI reach its programmatic targets.</p>	<p>NOT APPROPRIATE/ DATA NOT AVAILABLE</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: In the pdf document "M-20-29_OMB and OSTP Memo_National Science Priorities" from the EXECUTIVE OFFICE OF THE PRESIDENT, national priorities in the areas of Artificial Intelligence, Machine Learning, and the leveraging of data to extract knowledge are consistent with DBI's portfolio in infrastructure offerings, for example, software that is bio-domain specific. In addition, the DBI portfolio has direct impact on Biomedicine/Biotechnology, Infectious Disease Modeling, and Prediction and Forecasting, to name a few. As such, the DBI is responsive to national priorities.</p>	<p>APPROPRIATE</p>
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>Comments: The quality of projects and balance of the portfolio are both appropriate. Regarding the development of new programs or the reorganization of existing programs, the CoV felt that DBI could be</p>	<p>APPROPRIATE, but see comments</p>

² 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.

more transparent with regard to how new programs are developed and how funding levels are determined.	
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Another issue of concern is that principal investigators (PIs) tend to "follow the money", and as result, PIs need continually to adapt their research portfolio to respond to changes in programs. The CoV wonders if this is a good thing for the national research enterprise as a whole.	
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OTHER TOPICS

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

Based on the demographic data the reviewers provided, it was difficult to determine panel diversity. The CoV assumes that the PO's assemble panels with balanced representation of active researchers: early-, mid-, and late-career, pronoun preference, white and non-white, and from subfields that represent the range of those funded by the program.

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.

Based on discussions with the DD, DDD, PD's and PO's, it is clear that the program administrators are working diligently to meet program goals.

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

Consistent review of Broader Impacts. While we recognize that reviewers are instructed about BI review, the CoV wonders whether there are additional things that could be done to improve the consistency of BI review. Clear guidance about how BI will be evaluated, how it might be included in proposals, as well as inclusion of specific questions about BI on the review form could improve consistency both in inclusion in proposals and in review. Provision of clear guidance on how Broader Impacts will be evaluated in each program and the relative weighting of BI and IM should be made clear to the PI and reviewers.

Expansion of software development, cyberinfrastructure, and data integration across directorates should also be addressed. Across the sciences, software development and database development are increasingly important to support basic research. Within BIO this is likely to expand the role of DBI, and a comprehensive strategy for funding and maintaining these types of resources needs to be developed across DBI, BIO, and NSF.

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

The CoV notes that DBI has already begun to respond to recommendations from the NASEM study on biological collections, sponsored by DBI. Recent changes in DBI align with recommendations in the report that are targeted towards NSF and other funding agencies:

- DBI has maintained and will continue to maintain its support for collections through the new “Capacity: Biological Collections” programmatic area of the Capacity solicitation (NSF 21-501) and the “Sustaining” Solicitation (21-503). This includes the digitization efforts previously supported for the last 11 years through the ADBC program.
- DBI and BIO will continue to work with the community, the BIO AC, and other stakeholders to optimize efforts in training and in integrating/accessing data.
- DBI will continue to discuss across BIO and other elements of NSF the innovative use of collections such as those supported through the collections track of the PRFB program.

DBI and BIO are to be commended for their strong support of biological infrastructure. The CoV encourages DBI to continue to promote the value of biological collections infrastructure—both physical and electronic—as a crucial *national* infrastructure and to seek cross-directorate support for infrastructure, as appropriate. One example would be to support and maintain upgrading and integrating databases and cyberinfrastructure that support the natural sciences community. For example, this might include gene sequence data or georeferenced data that are interoperable across databases and that would enable users of GEO-supported databases/cyberinfrastructure to mine data from BIO-supported databases/cyberinfrastructure, and vice-versa.

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

Meetings with the DD, DDD, PD's, and program staff were very helpful—particularly in providing more detailed guidance during the CoV review process.

Three 6-hour days are not long enough, particularly for reviewing all the eJackets in the time allotted. CoV members should be encouraged to review the eJackets prior to the meeting. A rubric (similar to the spreadsheet that was prepared by one of the 2020 CoV members) with the CoV report topics would be very helpful; this rubric could be expanded to enable the committee members to provide more detailed input.

Specific guidance on the eJacket entries that should be closely evaluated, as well as a description of the data those "fields" contain, would streamline the process. This was perhaps the most challenging aspect of the CoV review process—especially doing this analysis on day 1.

CENTERS CLUSTER

**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, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) 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.

<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:</p> <p>Different Program Announcements use different review methods. The method chosen is appropriate in all cases.</p> <p>The Biological Integration Institutes used a panel review.</p> <p>The Mid-Scale Research Infrastructure – 1 used a two stage review. Program staff first reviewed pre-proposals. Panel review was used for those applications invited to submit a full proposal.</p> <p>For invited proposals (first step in review process), the Next Generation Networks for Neuroscience used a panel review which proved essential given the breadth of individual proposals. In many cases consensus was reached among reviewers with more diverse opinions before the discussion.</p>	<p>Yes</p>

<p>The Developing a National Infrastructure for Neuroscience program used panel review combined with reverse site visits as appropriate.</p> <p>It does not appear that the Centers Cluster uses ad hoc review, which is appropriate for awards which are often very large.</p>	
<p>3. Are both merit review criteria addressed</p> <p>g) In individual reviews?</p> <p>h) In panel summaries?</p> <p>i) In Program Officer review analyses?</p> <p>Comments:</p> <p>Both merit review criteria are addressed in the individual reviews, in panel summaries, and in the PO review analysis for all programs.</p> <p>The Intellectual Merit criterion is solidly addressed in all documents for all programs.</p> <p>As has always been true, there is heterogeneity in the information provided by reviewers in the Broader Impacts sections of their reviews.</p> <p>In the BII program, evaluation of Broader Impact was thoughtful and detailed in some of the reviews for each jacket sampled.</p> <p>In the Neuronex program, considerations of Broader Impact appear to have been thoughtfully considered by some reviewers but not by others in the jackets sampled.</p> <p>In the Mid-scale Research Infrastructures program, which were mostly internally reviewed, a direct appraisal of the Broader Impacts is provided in the RA document.</p> <p>In these cases, for the jackets sampled, the panel summaries offer solid assessments of the Broader Impacts.</p> <p>In general, the breakdown of all review criteria in terms of strengths and weaknesses is crisply presented in the Review Analyses.</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:</p> <p>In general, reviewers for all programs do provide substantive comments that explain how they reached their overall evaluation of each application. The Review Analysis document usually provides all the information that is needed for any program staff member to explain to the PI how a decision is made. The documents provided to the PI also have a great deal of that information. This was true for reviews in each of the three programs.</p> <p>The request for strengths and weaknesses often helps to focus the review. In a few cases where individual reviews don't provide substantive explanation of the evaluation, they seem to be balanced by a larger number of reviewers participating in the panel.</p>	<p>Yes</p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p> <p>Panel summaries provide a filtered perspective on the detailed information given in the Review Analysis and therefore encourage follow up phone calls with the PO to discuss.</p> <p>Panel summaries and decisions appear to be consistent by program announcement for declined and awarded proposals.</p>	<p>Yes</p>
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]</p> <p>Comments:</p> <p>For panel reviews, it was easy to follow the information flow from the individual reviews to the panel summary and then on to the PI. Since the Mid-Scale Research Infrastructure program used a two stage review, it was initially harder for the CoV to understand exactly what information was provided to PIs who were not invited to submit a full proposal. NSF staff explained where that information was located in the jacket, and it</p>	<p>Yes</p>

<p>appears that the rationale for not inviting a submission was provided to the PIs.</p> <p>The Review Analysis thoroughly documents the process, and is (correctly) for internal use. The depth of information provided allows those who were not present during the review to understand the discussion and decision.</p>	
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<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>[Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]</p> <p>Comments:</p> <p>The documentation in the jacket does provide the rationale for award/decline decisions, though as noted above, not all of the information is transmitted to the PI (such as the RA). The documentation is sufficient to ensure that a follow up phone call to the PO (should the PI have questions or concerns) can be answered.</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 program appears cognizant of some (infrequent) reviews that are motivated more by the reputation of the PI, than by the quality of the proposal (as evaluated by the majority of other reviewers). These issues were uncommon (one CoV member noted 2 instances out of the many reviews examined) and were overshadowed by the high quality of many of the other reviews in the sampled proposals. This balanced approach to handling these situations is very appropriate.</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:</p> <p>Yes, in this sample set only a small number of reviews were prefaced by a statement that the proposal is outside of the reviewers' area of expertise. Generally the reviewers in all panels are highly qualified.</p>	Yes
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p> <p>NSF has an extensive system for identifying conflicts of interest. All panelists and ad hoc reviewers are made aware of the definitions of a conflict through a process outlined in the Self Study (p.10). Any conflicts are noted in the Table of Reviewers. Management of conflict of interest was noted in the review analysis.</p>	Yes
<p>3. Additional comments on reviewer selection:</p> <p>For those programs employing panels, we commend the diversity represented.</p> <p>One general concern, not related to this suite of proposals: could panel service be tracked for all reviewers across the agency to ensure that no single reviewer receives too many requests? It would be helpful to publicly share/post guidelines or expectations for service, especially with junior faculty. Including a question about the number of panels the potential reviewer participated during the last two years could help in that aspect.</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 applications from the Centers cluster provided to the CoV came mainly from four program announcements: Biology Integration Institutes (BII), Developing a National Research Infrastructure for Neuroscience (initial version of NeuroNex), Mid-Scale Research Infrastructure, and Next Generation Networks for Neuroscience (current version of NeuroNex).

Management of the BII program involves program staff from across BIO and panel reviews were used.

Management of the NeuroNex program involves program staff from DBI and IOS in BIO as well as, more recently, participation from the Canadian Institutes of Health Research, the Deutsche Forschungsgemeinschaft, the Fonds de Recherche du Quebec, and the Medical Research Council in the UK.

The Mid-scale Research Infrastructure program involves program staff from many NSF Directorates. Participation varies a bit between the two solicitations. Pre-proposals are submitted and internally reviewed by NSF staff. Feedback from this initial review determines whether a full application is invited. The reasons for invitation or decline of full proposals were well documented in the jackets. In a number of cases, highly meritorious pre-proposals were not invited to submit full applications. The jackets do document that program balance issues were critical in determining which applications would be invited to submit a full application.

Science advisors convene meetings of relevant program staff to help coordinate these complex programs. However, these coordination meetings take real time and effort. It does not appear that DBI has sufficient staff (either at the program level or at other levels) to appropriately manage the Centers Cluster. With additional staff, periodic coordination meetings at the start of a new solicitation could be more likely to occur.

Program staff in BIO outside of DBI said that they had frequent positive interactions with DBI staff and that they relied on DBI staff to offer advice on the management of large programs that are not administered by DBI.

Other awards are managed in the Centers Cluster, but these three programs represent most of the applications that are managed here. Many awards in this cluster are managed as cooperative agreements, which can be more complex to administer than other awards.

The professional administrative staff feel valued and are aware of opportunities for advancing both horizontally or vertically. This engagement ensures continuity of knowledge about the Centers programs.

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

Comments:

DBI faces the formidable challenge of balancing emerging areas with foundational areas upon which advances are based. The comments made by in the 2016 COV report continue to be true in 2020. In many cases, the programs managed by the Centers Cluster are planned outside of DBI (or BIO) which makes it difficult to comment on responsiveness to emerging opportunities.

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

Comments:

See response to question #2.

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

Comments:

The programs being managed by the Centers Cluster have dramatically changed since the 2016 CoV report. As a result, the comments made by the previous CoV do not have much direct relevance today.

However, the previous comments related to how DBI integrates management of their programs with other parts of NSF are still relevant. Additional staff are necessary to solve this problem. If DBI does make additional hires, it might be useful to think about sharing those hires in a meaningful way with other BIO divisions. A program officer with a home in DBI who manages a separate grant portfolio in IOS (or any division) and participates in all IOS division meetings might really improve coordination between various parts of BIO. Shared administrative staff might also be worth considering.

It is worth examining the impact of the relaxation of deadlines on the communication between divisions. This change occurred since the last CoV.

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: We gleaned this information from Table 8 of the self study, which reports co-funding from other divisions. It appears that both DEB (by virtue of number of awards) and IOS (by virtue of sum of amount) are strong partners, according to this metric. MCB does exhibit partnership but co-funds fewer awards and at a smaller amount.</p> <p>As for Centers-specific awards, this trend is consistent with the selection of jackets we reviewed.</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>Comments: The awards in this cluster are appropriate in size and duration.</p> <p>The new framework in the Centers Cluster of dividing research resources into an initial innovation phase (generally with low budgets) followed by a building capacity stage to allow the resource to scale for the community and finishing with a long term sustaining phase is very thoughtful and interesting. As BIO gets more experience with that framework, there will be questions about whether DBI should be the home for the sustaining phase of resources that do not necessarily begin in DBI. There will also be difficult conversations about when a resource is no longer worth additional resources to keep it in the sustaining phase. Such decisions really are difficult since the current and future value of resources may be hard to measure accurately.</p>	<p style="text-align: center;">Yes</p>

<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments:</p> <p>NeuroNex is a good example of a program where the whole is greater than the sum of the parts. This Centers program really does have the possibility of being transformative for that research community.</p>	<p>Yes</p>
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments:</p> <p>The Centers Cluster portfolio is almost entirely filled with inter- and multi-disciplinary projects as viewed by the subdisciplines of science that are part of the applications.</p> <p>The Self Study document provides information about co-funding as a measure of whether multiple areas of science are involved, and that table also suggests that DBI receives extensive co-funding from the other BIO divisions as well as from other NSF directorates.</p>	<p>Yes</p>
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments:</p> <p>Data in the Self Study document were not broken out by cluster. In most cases, the number of awards in each state seems to follow the proportion of applications received from that state, i.e., the success rate is similar across all states. Exceptions occur in states where the overall number of applications is small, such that adding or subtracting a single award makes a significant difference in the success rate.</p>	<p>Yes</p>
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments :</p> <p>Data in the self study document were not broken out by cluster. However, the data provided about the awards and the proposal pressure from different sorts of institutions (Ph.D., masters, bachelors, community colleges, NA, and academic unknown) show that the</p>	<p>Yes</p>

<p>percentage of awards is very similar to the percentage of proposals even when those groups of institutions are further broken down into private, public, and other categories.</p> <p>Information was also provided about the success rates of minority serving institutions (MSIs) in the various clusters. The success rates for MSIs were similar to or higher than non-MSI institutions in fiscal year 2017, 2018, and 2019. That was not true in the Human Resources or Research Resources clusters in 2020. The numbers of applications did not change in those clusters in 2020, so DBI will have to closely monitor this success rate in 2021 to see whether 2020 was an anomaly.</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:</p> <p>Proposals submitted to the Centers cluster are unlikely to have early-career investigators (for example Assistant Professors) as PIs. These early-career faculty should be focusing on establishing themselves as individual investigators, which may, of course, include participation in (but not leadership of) a large center proposal.</p> <p>Specific information was not provided about the number of new or early-career investigators who lead awards in the Center cluster. The CoV hopes that there are not many examples where this has happened. The information provided about the median year when a PI received a degree suggests that centers awardees are much more senior than those receiving awards from the Human Resources or Research Resources cluster.</p>	<p>Yes</p>
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments:</p>	<p>Yes</p>

<p>The Biology Integration Institutes had a lot of good examples of projects where integrating research and education was an important part of the application.</p>	
<p>9. Does the program portfolio have appropriate participation of underrepresented groups³?</p> <p>Comments:</p> <p>While the success rate of underrepresented groups in 2020 in the Centers Cluster was similar to the percentage for all applicants, the total number of applications submitted by members of underrepresented racial or ethnic groups is very low. This lack of participation represents a real concern, and DBI should try to understand why potential PIs who are members of underrepresented racial or ethnic groups are not applying to the cluster.</p> <p>The success rate for women in the Centers Cluster in 2020 is above the overall success rate.</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:</p> <p>None.</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.

No comments.

³ 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.

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.

No comments.

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

No comments.

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

No comments.

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

The virtual COV process is necessary because of the pandemic. We could have used a little more time on the first day to review the material provided. Hopefully, the next COV meeting will be in person and the agenda for the meeting will be more similar to previous meetings. In hindsight, starting the conversations with program staff should have begun later in the second day rather than at the start of the day.

Overall, the material provided to the COV was very helpful. The Zoom calls were managed excellently. There were no technical issues that caused concern.