CORE QUESTIONS and REPORT TEMPLATE
for
FY 2022 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2022 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2022. Specific guidance for NSF staff describing the COV review process is described in the "COV Reviews" section of NSF's Administrative Policies and Procedures which can be obtained at: https://inside.nsf.gov/tools/toolsdocuments/Inside%20NSF%20Documents/Policy,%20Procedures,%20Roles%20and%20Responsibilities%20for%20COV%20Reviews%20and%20Program%20Portfolio%20Reviews.pdf[1].

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

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

The Division or Directorate may add questions relevant to the activities under review. Copies of the report template and the charge to the COV should be provided to OIA prior to forwarding to the COV. In order to provide COV members adequate time to read and consider the COV materials, including proposal jackets, COV members should be given access to the materials in the eJacket COV module approximately four weeks before the scheduled face-to-face meeting of the COV members. Before providing access to jackets, the Conflict of Interest and Confidentiality briefing for COV members should be conducted by webinar, during which, NSF staff should also summarize the scope of the program(s) under review and answer COV questions about the template.

Suggested sources of information for COVs to consider are provided for each item. As indicated, resources for NSF staff preparing data for COVs include the COV Dashboard in Enterprise Reporting (https://bi.nsf.gov/analytics/saw.dll?Dashboard&PortalPath=/shared/Enterprise%20Reporting/Pre-Built%20(Canned)%20Reports/COV%20Dashboard/COV%20Dashboard&Page=COV%20Landing%20Page) and Enterprise Information System (EIS) –Web COV module (accessed by NSF staff only at http://budg-eis-01/eisportal/default.aspx). In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

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

Guidance to the COV: The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the ***processes*** related to proposal review. Discussions leading to answers of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. ***COV***

[1] This document has three parts: (1) Policy, (2) Procedures, and (3) Roles & Responsibilities.

reports should not contain confidential material or specific information about declined proposals. The reports generated by COVs are made available to the public.

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

MCB COV May 2022 Executive Summary

The universal conclusion of the COV, based on the materials provided as well as discussions with NSF stakeholders, is that MCB is in excellent shape. The quality and effectiveness of the merit review, the criteria for selecting reviewers, the management of the processes and the composition of the portfolio are all outstanding. Under the leadership of DD Good, the MCB team (i.e. the leadership team, program directors, and staff) forms a cohesive and effective unit of high integrity and outstanding collective vision that supports each other and the scientific mission. The COV applauds MCB for its agility and ability to adjust and mitigate disruptions caused by major changes in their processes that included going to a no-deadline submission paradigm, the Covid pandemic, and the heightened awareness of the high cost of persistent racial and social inequities.

The COV very much appreciates the detailed, informative and well-written report, as well as the outstanding responsiveness of everyone at the NSF, especially DD Theresa Good and the staff (Rosetta Rhine and Casonya Johnson) to requests for additional information and data. The COV also wishes to acknowledge the ease of operating within the virtual space managed by Spencer Swansen, Tresa Proffitt and Olaf Corning. The COV felt they could be more effective if they were provided with clear information about the goals and outcomes of MCB and its impacts over both the short and long term. This would be best done with metrics and analytics rather than only nuggets and highlights.

The COV was impressed by the breath of the science and education activities supported by the four MCB clusters and its clear alignment with Strategic Goal 1 and Goal 2 of NSF to promote science and develop a highly educated, diverse STEM workforce. COV also recognized the numerous new activities and initiatives that MCB has started during the last 4 years and has high confidence that such interdisciplinary and cross-cutting endeavors will greatly benefit science and society. MCB is doing an excellent job supporting interdisciplinary research across scales to obtain a predictive, theory/model driven understanding of biological systems from atoms to organisms. This is accomplished through extensive participation in cross-disciplinary and cross-cutting initiatives within MCB, BIO, and across Directorates. MCB also should be commended on their active support of RCN and workshop funding to unite distinct disciplines and bring scientists together from those disciplines to allow the formation of inter-disciplinary projects that often represent the cutting-edge of science.

The COV was especially impressed by the swift and effective way MCB responded to the Covid-19 pandemic, with numerous approaches (including the swift use of RAPID and other methods) to mitigate the negative effects of the pandemic on the scientific enterprise. It will remain important to carefully monitor the fallout to ensure continuing success of the diverse groups of investigators supported by the MCB.

MCB did an excellent job of addressing issues raised during the previous COV in 2018. The COV recognized that some of the raised issues are beyond the immediate scope of the MCB to resolve and may require cultural shifts within the NSF.

Overall, the COV concludes that MCB is a premier agency that champions outstanding science that can serve as a template for other divisions and agencies in developing workforce. MCB appears to be highly responsive to scientific trends and excels at moving science into new and leading fields, while at the same time ensuring sustained curiosity driven basic research. We commend its success in balancing basic science and applied/translational science that empowers national scientific priorities. Basic research in the area of Molecular and Cellular Biology has played a crucial role in the nation's (and the world's) ability to address the recent pandemic and will be equally important to other societal threats. Moving forward, it is essential that MCB receive sustained funding and full support from NSF to enhance MCB processes, fund the best science and retain and promote its excellent staff. Other opportunities are outlined below under specific points and in

answers to the questions provided in the template. MCB is poised to raise the profile of NSF as a leader in addressing national scientific priorities in advancing our knowledge and understanding of life with critical impact on health, prosperity, and defense to the benefit of the nation and beyond.

Specific Highlights and Opportunities:

1. Merit Review

Overall, the COV was impressed by the conduct of the merit review process within MCB which was seen as thoughtful and robust. Written reviews, panel summaries and the Program Officer's summary reports provide strong support for funding decisions. The committee did discuss the concern that although the reviews of intellectual merit were almost universally extensive and thorough, reviews of broader impacts were often less in-depth. In addition, the need to ensure ad hoc reviews were given suitable weight in the review process was seen as an important goal. The Program Officers were thought to be using internal review with care and forethought. However, they were noted to be lacking the data to assess the success and impact of the projects funded through this mechanism

Recommendations: The COV suggests MCB provide clarity to reviewers on what constitutes a thorough and impactful review of a proposal's broader impacts. New BI Rubrics under development (https://aris.marine.rutgers.edu/wizard/rubric.php) should be incorporated into reviews. MCB should also develop longitudinal metrics to track the impact and success of projects funded through the internal review process.

2. Quality of Science

There was a consensus on the high quality of science funded by MCB. The COV felt that there was a good balance of awards across the disciplines and sub-disciplines. There was strong support for the innovative nature of the core projects, some addressing out of the box ideas with high risk. Such projects funded by NSF led to groundbreaking and transformative ideas in the past. The notable increase in collaboration (via joint funding or solicitation of special programs) between MCB and other BIO divisions and other Directorates is commendable and seems to increase the visibility of MCB programs to the wider scientific community. The science-driven international partnerships (two new ones added) demonstrate effectiveness of MCB in creating new opportunities to expand the scientific research enterprise without additional funding.

Recommendations: The COV expressed concerns that the cost for running a research operation has increased over the years (higher salaries, including graduate students and postdocs, lab supply, instrument time, etc.), which is not well reflected in increased budgets of the awards. MCB should explore whether an increase in grant size should be leveraged against a lower funding rate. The COV would recommend a more transparent mechanism (for the wider community) for evaluating and assessing high risk awards like RAPID and EAGER and other internally reviewed awards. It may be helpful to clearly define what MCB means by "theory-driven" research as the phrase may vary in meaning by different disciplines and has been changing over time.

3. Effects of Switching to a No-Deadline Submissions

The transition to no-deadline submission of investigator-initiated grant proposals, which roughly coincided with the beginning of the pandemic, came with a substantial drop-off of submissions. It is unclear at this time what the explanation(s) for this are and whether this is a concern. While overall, this shift was seen as a positive change, the new 'grant cycle' creates some logistical hurdles such as setting up panels and securing ad hoc reviewers with the appropriate expertise and the potential for 'better' and 'worse' submissions times.

Recommendations: The COV strongly suggests following submission trends over the next few years carefully. Especially important will be to uncover what has happened to people who did not submit new proposals (but had been previously funded by MCB). The COV recommends making sure all potential PIs are aware of the general cycle of panels, so that no specific group has an unfair advantage in terms of when to submit and to caution people away from times of the year where longer delays from submission to funding actions are likely to occur. The COV also recommends continuing evaluation of the ideal number of ad-hoc reviewers and panel logistics.

4. Effects of Covid-19

The COV found that MCB's response to the pandemic -- which included grant extensions, supplements and funding post-bac opportunities -- was thoughtful and effective.

Recommendations: The COV urges MCB to continue gathering data about disproportionate effects, and continuing to respond with targeted interventions (whose effectiveness is regularly assessed). In particular, MCB needs to develop explicit, consistent and persistent plans for dealing with gaps in productivity by applicants associated with pandemic shutdowns. Guidance must be provided to ad hoc reviewers and panelists. Some of the interventions, like the REPS program, seem worth retaining for the long-term.

5. Broadening Diversity and Inclusion

The COV recognizes that while MCB has made an effort to diversify its staff, more work is needed to ensure that program officers and directors reflect the growing research community. The same is true for the composition of review panelists. Only 15% of review panelists identified as having minority status and only 35% identified as female. MCB program staff engage in outreach activities to encourage broader participation, and they continue to use data (where possible) to drive its efforts, but assessment of those efforts is needed to measure their success.

Recommendation: MCB should continue to improve diversity among its program directors and panelists to reflect the MCB applicant community.

6. Rotators Versus Permanent Staff

The COV noted the apparent shift away from rotators and more towards permanent program directors.

Recommendation: We encourage MCB to evaluate and articulate a sustainable plan for management of their program directors that will provide the needed stability, scientific expertise, and diverse outside perspectives.

7. Distinctions in Workforce Development

In recent years, the need to address workforce development has escalated as a priority for the federal government. The COV recognizes the important contribution that MCB makes to establish the foundation for the nation's science and engineering enterprise. MCB continues to invest in workforce development through a broad scope of projects and development of scientific expertise that fuel new innovations and discovery. Beyond the exemplary impact on scientific discovery, the MCB portfolio identifies multiple points of engagement for building the scientific capabilities needed to develop the biotechnology workforce, including opportunities for community engagement, undergraduate and graduate-level research, RET/REU programs, and numerous interagency collaborations. The COV commends MCBs approach to develop synergies across BIO clusters and the newly established TIP directorate.

Recommendations: The COV strongly encourages MCB to pursue additional efforts to bridge workforce development initiatives to other areas of the NSF that can leverage the MCB portfolio to develop opportunities for expanding workforce readiness programming (e.g., Advance Technology Education, TIP). In addition, the COV suggests MCB consider strategies to engage and expand the impact zone for career pathways through incentivizing supplements for researchers (INTERN, NSF 18-102/21-013, REPS: 21-085). In addition, we suggest increasing participation of 2-year institutions and other federal agencies, such as the Manufacturing Innovation Institutes, who can benefit tremendously from the products of MCB's portfolio (continue investment in Future Manufacturing (NSF 20-552, NSF 21-564)). As NSF expands its programmatic capabilities, it is critical for MCB to establish and maintain connections across the institute to build workforce capacity, entrepreneurship, and career development pathways.

8. Thematic Selection and Balance Between Distinct Clusters

MCB is subdivided into four different clusters: Cellular Dynamics and Function; Genetic Mechanisms; Molecular Biophysics; Systems and Synthetic Biology. Operationally, these seem to be functioning in an equitable manner, with roughly equal numbers of submissions and funding rates. Is it possible that part of the reason for the drop-off in submissions over the past several years is a consequence of the program's failure to highlight some newly emerging areas in their portfolio?

Recommendations: Going forward, MCB should make sure to maintain an appropriate balance of single-investigator, curiosity-driven research and larger thematically driven science.

9. Responses to Prior COV

The COV was extremely impressed with MCB's response to the 2018 COV recommendations. We saw clear evidence of positive change on the noted recommendations. Particularly noteworthy were the decision to fill the DD appointment with a permanent NSF employee, which has brought stability and a productive environment to the whole unit, and the extensive partnering between units in MCB, BIO and related Directorates. Noteworthy ongoing concerns are the evaluation and assessment of broader impacts during the review process and the long-term effects of the transition to no-deadlines for investigator-initiated grant proposals.

Recommendation: The COV recommends that MCB focus on the actual impact of broader impacts and less on the development of new and "transformative" programs. One partial solution might be to explicitly ask for an extended retrospective accounting of broader impacts activities from any PI that has received previous funding (beyond the cursory coverage in the Prior Funding section), with a more minor role for future activities (building/improving on what they have already established). While assessment plans for BI are increasingly being included, funds to pay for this work and expectations for reporting back on results should become routine parts of new submissions.

10. Communication with Stakeholders

To recruit the best scientists to apply to MCB and to support the goals of reaching the best new investigators, many with identities underrepresented in science, MCB has developed a variety of outreach activities. The Virtual Office Hours, the MCB Blog, the HBCU Webinars, scientific meeting attendance and in-person participation in Outreach events are all able to provide insight into NSF science and processes. The effort that goes into these activities is commendable.

Recommendation: The efforts to reach PIs new to NSF through various outreach activities should be continued, including trying new ways, such as those experimental methods mentioned to the COV (direct emails to

potential PIs). The PDs need to continue efforts to communicate with declined PIs (PO Comments, direct emails) to encourage conversations with a PD, which is a first-step to successful resubmissions.

FY 2022 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Table 1 - Summary Information

Summary Information
Date of COV: May 25- 27, 2022
Program/Cluster/Section:
Division: Molecular and Cellular Biosciences (MCB)
Directorate: Biological Sciences (BIO)
Number of actions reviewed: 174 **Awards: 45** **Declinations: 129** **Other: 0**
Total number of actions within Program/Cluster/Division during period under review: 3282 **Awards: 1,189** **Declinations: 2,019** **Other: 74 (withdrawn, returned without review)**
Manner in which reviewed actions were selected: A stratified random sampling method was used to select a set of externally reviewed proposals, to aid the COV in analyzing MCB's merit review process. For quantitative measures (such as the percentage of review analyses addressing both review criteria), the sample of 174 proposals is predicted to provide a 5% margin of error. The number of proposals in the sample set was determined by the number of proposals received, awarded, and declined in each fiscal year. The set of proposals for the Jacket Sample was determined in Microsoft Excel by random selection. The 174 proposals (the number is slightly higher as when collaborative proposals were randomly selected, both the lead and non-lead proposals were then included in the Jacket Sample) were balanced between awards and declines from all four clusters, over four fiscal years. All proposals in the Jacket Sample were reviewed externally. A list of these proposals, as well as a list of all the proposals reviewed by the Division over the last four years, can be found as an Excel document in the documents list of the eCOV module. The COV has complete access to the Jacket Sample and can request access to any of the remaining proposals on the complete list during the meeting.

COV Membership

Table 2 - COV Membership

Role	Name	Affiliation
COV Chair:	Sztul, Elizabeth	University of Alabama at Birmingham
Co-Chair:	Bruschweiler, Rafael	The Ohio State University
BIO AC Rep:	McClung, Robertson	Dartmouth College
COV Members:	Briggs, Steve	University of California, San Diego
	Garcia-Moreno, Bertrand	Johns Hopkins University
	Gilroy, Simon	University of Wisconsin-Madison
	Gimm, J. Aura	Department of Energy
	Hermann, Greg	Lewis and Clark College
	Horwitz, Rick	Allen Institute
	Lynch, Michael	Arizona State University
	Marqusee, Susan	University of California, Berkeley
	Nemhauser, Jennifer	University of Washington
	Peterson, Martha	University of Kentucky
	Rampulla, David	National Institutes of Health
	Renoe, Susan	University of Missouri-Columbia
	Riggs, Blake	San Francisco State University
	Tubon, Thomas	BioMADE Manufacturing Innovation Institute

MERIT REVIEW CRITERIA

An understanding of NSF's merit review criteria is important in order to answer some of the questions on the template. Reproduced below is the information provided to proposers in the Grant Proposal Guide about the merit review criteria and the principles associated with them. Also included is a description of some examples of broader impacts, provided by the National Science Board.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.

- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities. These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d, prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit**: The Intellectual Merit criterion encompasses the potential to advance knowledge; and

- **Broader Impacts**: The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to:
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

3. Examples of Broader Impacts

The National Science Board described some examples of broader impacts of research, beyond the intrinsic importance of advancing knowledge.[2] "These outcomes include (but are not limited to) increased participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education at all levels; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a globally competitive STEM workforce; increased partnerships between academia, industry, and others; increased national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Investigators may include appropriate outcomes not covered by these examples."

[2] NSB-MR-11-22

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**.**

Table 3 - Quality and Effectiveness of the Merit Review Process

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: The combination of the inputs from the review panels, ad hoc reviewers and, where appropriate, site visits, produced thoughtful and well-reasoned reviews of projects. There is an increased reliance on ad hoc reviewers due to the move to no deadlines and the associated need for broader panels. Ad hoc reviewers are essential to fill holes in panel expertise and it is important that their impact be monitored. The ultimate discussion of the strengths and weaknesses of each grant proposal is inevitably driven by the grant panel members and it is important that the expert opinion of the ad hoc reviewers be an integral element in these decisions. MCB has a clear commitment to transparency in the processes behind review and award decisions. Inevitably, the least transparent part of this process is for proposals such as EAGERs that only receive internal review. The >$100K threshold to require external review is appropriate. Internal review allows the program to be nimble with the funding of projects requiring rapid response or in supporting high-risk/high-reward projects that can be challenging to review in traditional external review panels. To promote transparency in this internal review process, it will be important to establish a metric to track the effectiveness and impact of these internal decisions relative to those made through the external review process. Suggestions: 1. Develop a process for evaluating the impact of the ad hoc reviewers on the review process. 2. Develop an assessment measure for the impact of internally reviewed projects. **Data Source: Enterprise Reporting, COV Dashboard, Question 6**	YES

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
2. Are both merit review criteria addressed a) In individual reviews? Yes, for nearly 100% of cases reflecting a strong template for the review and guidance for the reviewers b) In panel summaries? Yes, for nearly 100% of cases reflecting a strong template for the review and good oversight by NSF staff c) In Program Officer review analyses? These analyses are quite extensive covering both aspects of merit review adequately. Suggestions: Maintain current level of excellence, no changes suggested. **Data Source: Jackets**	YES

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: The written reviews are mostly extensive and thoughtful, but there is a wide range in the extent of the specifics and the level of detail. Developing means to assess the kind of review that has the most impact will be important, as it will allow the development of a template or guidance to inform reviewers and program personnel to help increase the impact of reviews, especially from reviewers with less experience of the grant review panel process. There is a notable difference between the depth of the reviews for intellectual merit and reviews for broader impacts. Many reviewers provide little to no substantive comments on the broader impacts, and most comments focus on the lack of evaluation and assessment. More guidance to reviewers about how to review broader impacts and direction from the program officers to revise reviews that do not provide substantive comment would be helpful. A thorough review of broader impacts in the panel will reinforce the relevance of this criterion. Suggestions: 1. Encourage reviewers to provide substantive comments regardless of proposal ranking. 2. Provide training and resources for program officers and proposal reviewers (e.g. https://aris.marine.rutgers.edu/wizard/index.php) on writing substantive comments for broader impacts. **Data Source: Jackets**	YES

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: Panel summaries are extensive and effective in describing the panel discussion that leads to the funding decision. The MCB program officers have been doing a great job on oversight for these. Of the two review criteria, intellectual merit often appears to drive a panel's proposal ratings more than broader impact. It will be beneficial to ensure that program staff spend time balancing the relative weight of both of these elements within the panel summary. Suggestions: Maintain current level of excellence, no changes suggested. **Data Source: Jackets**	YES
5. Does the documentation in the jacket provide the rationale for the award/decline decision? [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.] Comments: The Jackets provide an extensive and clear set of documentation to justify the award/decline decision. The program director summary in particular is a key narrative to follow the rationale for funding decisions. Suggestions: Maintain current level of excellence, no changes suggested. **Data Source: Jackets**	YES

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
6. Does the documentation to the PI provide the rationale for the award/decline decision? [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.] Comments: The existing documentation provides highly appropriate feedback to the PIs about funding decisions. In addition, the POs make themselves available to the PIs to discuss these decisions in detail. Developing strategies to promote these opportunities for direct feedback and discussion with the POs would help to further strengthen this element of the proposal review process. Suggestions: Maintain current level of excellence, no changes suggested. **Data Source: Jackets**	YES
7. Additional comments on the quality and effectiveness of the program's use of merit review process: The review process is working well. The review is conducted with rigor and decisions are well justified and documented. From the available documentation, the feedback to the PIs also seems constructive and informative. One area that the program may wish to explore is how to ensure the review process is accessible to all potential reviewers. For example, by providing guidance to proposers about appropriate use of color in a proposal to accommodate color-blind readers. In addition, the program could consider how well the review process is tracking modern approaches to data presentation. Much data in cell biology is dynamic and often presented as videos and simulations. Models are also often dynamic in nature. Could these trends in data visualization be incorporated into a proposal/review process without opening a loophole in the proposal system where PI's could side-step the proposal page limit or inadvertently favor highly resourced institutions over others? This is a challenging problem to address but may become increasingly relevant as modern cell and molecular research techniques generate increasingly dynamic outputs.	YES

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**.**

Table 4 - Selection of Reviewers

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? The approach to obtaining appropriate panel and external ad-hoc reviewers is well-designed and well-executed, but there remains some uncertainty as to how specific ad-hoc reviewers are eventually procured. There is concern that with the move to no-deadline submissions, the panels may increasingly lack proposal-specific expertise and thus ad-hoc reviews might become more important in the review process. Yet, a spot check of jackets suggests that just 1 ad-hoc review is quite common and some have no ad hocs, even though fairly large numbers are being invited. Perhaps some consideration should be given to define the optimal number of ad hocs. It might be useful to monitor the fraction of reviewer invitees that accept in various demographic / geographic / scientific / etc. categories, and whether there might be methods to improve the pool of ad hoc reviewers. This is likely an NSF-wide issue, and it is unclear what incentive can be provided for outside reviewers. There is a large pool of potential reviewers in industry. It may be useful to cultivate connections so that these potential reviewers are visible to those who are making reviewer selections. Although we are confident that the program officers are making use of the scientific expertise reflected in the reviews, it is sometimes difficult to evaluate the quality of the integration of such information into the overall decision-making process, i.e., how the issues of intellectual merit and broader impact are balanced against other factors such as geography, level of career development, DEI, etc. **Data Source: Jackets**	YES

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
2. Did the program recognize and resolve conflicts of interest when appropriate? MCB seems to be doing an excellent job of identifying COIs. **Data Source: Jackets**	YES
3. Additional comments on reviewer selection:	

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

Table 5 - Management of the Program Under Review

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

Comments:
The COV was very impressed with the overall management of the Division. The culture of the program is positive and collaborative, which has clearly contributed to its success during the period under review. The post-panel reports make it clear that MCB is actively engaged in exploring the cutting-edge of each panel/program's area. The emphasis on finding areas for connection with other divisions and directorates is also a strength; Program Directors within BIO and across directorates expressed that their partnerships with MCB were strong and a positive aspect of their portfolio. There was a robust response by MCB to COVID-19 through grant extensions, supplements, and funding post-bac opportunities.

Shift to no-deadline submissions and virtual panels
A major change since the last COV report, was the transition to no-deadline submissions of investigator-initiated grant proposals. This transition, which roughly coincided with the beginning of the pandemic, came with a substantial drop-off of submissions. It is unclear at this time what the explanation(s) for this are and whether this is a concern; the COV strongly suggests following this trend carefully. The program needs to consider what has happened to people who did not submit new proposals (but were previously funded by MCB). Assuming that there will be some disproportionate impacts on productivity metrics among submitters going forward, MCB staff need to be aware of vicious cycles that might emerge from disruption of the research enterprise by COVID-19, for example driving mothers of young children (as one example demographic) out of research. In information MCB presents to reviewers and during panel reviews we suggest providing education on this issue and discussing how to consider productivity in the context of COVID-19, similar to how reviewers are educated on how to consider productivity from RUI faculty. Staff report that the transition to no deadline created a more reasonable distribution of workload, which may prevent burnout and staff turnover.

It will be important to continue to assess the impact of the lack of deadlines in the long term. In the short term, conflated with the pandemic, the data argue that representation of the various demographics has not changed. However, we should be hesitant to declare the issue resolved.
The demographics of who submitted and were funded seem to have not changed with "no deadline" but the data are incomplete so it remains unclear. One big issue in tracking the demographics of submissions and success (awards) versus declinations is poor self-reporting. What sort of remedies can be considered? Education might be one. Could it be explained at the information point that such data are requested because NSF has the goal of broadening participation of various demographic groups but its ability to assess the success (or lack thereof) of its initiatives is compromised by the weakness of the data resulting from ~ 30% lack of responses. We recommend that demographic data not be associated with individuals but rather be used in aggregate form and this be clearly communicated in pre- and post-award questionnaires.

There are recent calls for changing collection of demographic data in regard to gender and sexual orientation of applicants/awardees (https://www.scientificamerican.com/article/nonbinary-scientists-want-funding-agencies-to-change-how-they-collect-gender-data/; https://www.science.org/content/article/how-many-scientists-are-lgbtq-federal-survey-delays-frustrate-researchers). Even if there are not top-down changes in data collection practices, it would be a significant step for MCB to adopt the suggestion of using 'Men' and 'Women' in place of 'Males' and 'Females' in all communications, and of including additional non-binary choices wherever possible.

One consequence of the move to no deadlines has been a split of proposal evaluation into multiple times throughout the year. The funding rate from review panels does not appear to significantly change throughout the year. It will be important to monitor this and to communicate this clearly with the MCB

research community so that we do not create a situation in which individual investigators feel they can gain (or lose) advantage depending on when they submit. Similarly, it should be communicated that panels meet fall through spring and that proposals submitted between May through July will likely not be reviewed until the fall. We suggest a compromise of letting the community know that there are typically three panels each year with the approximate timing for each panel. Perhaps input from the community also might be used to rationalize any particular model of submissions.

A similar concern emerges from the potential for mixed in-person and virtual panels, where we want to avoid a situation where individual investigators try to game the system, attempting to time their application to try to attain in-person versus virtual review. While the move to on-line panels seems to have been quite smooth and likely increases the potential for diversity of panel participants, there are also costs to consider. For example, survey data and discussions with PDs strongly suggest that mixed virtual and in-person panels were less successful than fully virtual panels. If MCB moves to a model with a mix of in-person and virtual panels, MCB will need to assess the effect of in-person relative to online on the outcomes.

Balance of effort and support

In a related issue, the self-study provided application and funding rates for CAREER and RUI submissions. The funding rate for CAREERS was much lower than for general proposals. The lower proposal funding rate is associated with a longer grant time frame and overall higher budget, providing a model for MCB to consider in its core grant programs. The success rate for RUIs was very high. Therefore, it would seem that the goal now needs to be to increase submissions. One might expect that simply disseminating success rates might help, although it would raise the mentorship/advising burden on NSF staff. Possibly, successful RUI awardees could act as peer mentors if this becomes an issue.

There has been a large shift in work from proposals in core program, about 50% less now than in 2018, to management of 10 more solicitations, and 8 DCLs. Incorporation of this workload and its unique challenges needs to be considered as sustainable going forward.

Personnel

The COV was very impressed with the MCB staff – they are clearly committed to the mission and the program. We applaud the decision to hire a permanent NSF staff member as DD, it is clear that Theresa Good is well respected and appreciated by her team. The administrative staff are dedicated, well-qualified, and an asset to the program. The self-study documents linear progression of assistant to specialists, which demonstrates opportunities for education and growth within the administration. This is a reflection of a supportive and positive working environment.

The COV was concerned about the apparent shift away from rotators and more towards permanent program directors. We encourage MCB to evaluate and articulate a sustainable plan for management.

MANAGEMENT OF THE PROGRAM UNDER REVIEW

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

Comments:
MCBs emphasis on identifying emerging research opportunities is strong. MCB has developed workshops to get community input on emerging research areas and MCB has extensive involvement in cross-divisional initiatives, programs, and institutes that are focused on frontiers in fields supported by MCB. The COV is concerned about how PDs keep up with emerging areas in a mostly virtual world. One of the mechanisms by which MCB responds to emerging opportunities is through RAPID and EAGER grants, which were extensively used in FY20 to address COVID-19. The COV suggests that MCB remain aware of and address any major differences in the demographic distribution of funded projects when comparing in-house versus panel review.

The COV feels that MCB should invest energy and time in evaluating/assessing emerging education opportunities. This is an active area of research and activities, and the COV did not see evidence that MCB is taking advantage of these studies and expertise. The discussion of this in the self-study did not strongly illuminate the process of how emerging educational opportunities are identified and what responses have resulted. One exception to this was the new Postbaccalaureate program (REPS), which seems both popular and a great area for consistent investment in the long term.

MANAGEMENT OF THE PROGRAM UNDER REVIEW

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

Comments:

The COV noted that MCB uses several different methods to guide the development of the portfolio. Detailed post-panel reviews, as routinely conducted at MCB, provide important information about research trends and funding priorities also for future panels. It may also be useful to reach to journal editors to share their observations, although short-term trends should not dominate the majority of fundamental research sponsored through MCB.

The COV was not clear about mechanisms that guide the evolution of the portfolio and how decisions are made about the balance of each area in terms of clusters and funds. Going forward, it will be important to develop a strategy that includes PDs attending conferences balanced with MCB-generated workshops.

As commented above, the program planning appears to be well-aligned with the community's "growth edges" and national priorities. Defending support for fundamental research can be challenging. MCB should continue to take advantage of strategic partnerships, and shifts in the focus of some subfields, yet be sensitive to drifting too far away from the core mission of fundamental research.

The work with HBCUs is also seeming to gain some traction. It would be worthwhile to articulate more specific goals for that program, beyond increased grant submission. For example, building partnerships or exchanges with other universities, expanding into MSIs and Tribal Colleges/Universities, etc. One strategic consideration for future work could be how NSF can help build capacity for grant submission and management, as many of these colleges and universities lack the critical infrastructure in these areas. Depending on how the current outreach activities are structured, it might be useful to change the emphasis from delivering to gathering information.

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

Comments:

The COV was impressed with the MCBs response to the previous COV and we saw clear evidence for positive change on most of the noted recommendations.

- The decision to move the DD to a permanent position makes sense and appears to be a positive change. This provides stability and institutional memory to the division. The stability and satisfaction of the staff is likely a direct reflection of this. The move to no-deadline was handled thoughtfully and without major issues. PDs and staff appear to see this as a net positive for the division.
- MCB has partnered effectively with other divisions in BIO and other directorates. MCB has effectively positioned itself as a central hub in the Rules of Life initiative and organized research activity across different length scales. It is noted that several of the current Physics Frontier Centers are aligned with MCB goals.
- There was a noted increase in morale and quality of staff continues to be very high. The staff are dedicated to the mission and feel well-supported and mentored with opportunities to grow. The COV got the impression that MCB is a model unit at the NSF in terms of staff, mentoring, training, and growth. The COV feels that MCB needs more staff and is concerned with the level of staffing and ability to be resilient in response to further staffing stresses.
- The efforts around communicating MCB-sponsored achievements were strong, and should continue to be an area for exploration—perhaps even asking for PIs to add MCB and NSF in hashtags for social media posts on research, education and outreach activities. This would also help MCB staff keep better tabs on activities to re-post or highlight with more extended coverage.

While the COV was extremely pleased with the response to the previous COV, there were a few areas that are still in progress:

- The COV feels that there are still issues around increasing diversity in reviewers and in grantees and thus this is an area of on-going concern. Perhaps a formal program for postdocs to sit-in on panels could help in this area, with a preference for postdocs from demographics that might not be applying to MCB (e.g., trainees from areas outside Biology, people with identities marginalized in STEM). This approach is already often informally done for Assistant Professors, but reaching back a bit earlier could further enhance the benefit. Perhaps also recording short videos where people role-play an investigator with an unfunded grant speaking to a program officer might be helpful for encouraging conversations.
- Another area highlighted as an on-going concern is the place of broader impacts in assessment. This seems to be an evergreen area of challenge, and a source of concern in the community as well. One area to consider is that while assessment has been added as core aspect of proposing a new broader impacts-related program, results from assessments rarely appear in applications. It is also the case that many reviewers seem to want new programs with each grant, which also works against the inclusion of assessments. One, at least partial, solution might be to explicitly ask for a retrospective accounting of broader impacts activities from any PI that has received previous funding, with a more minor role for future activities (building/improving on what they have already established). An approach that looks for “proof in the pudding” rather than the shiny new thing would likely result in more meaningful reviews. This should naturally extend to mentorship plans for grads and postdocs as well, where these are required. Some guidelines for how PDs discuss the weighting and evaluation of IM and BI and the beginning of panels might be very helpful as well.
- The COV recognizes the difficulty and efforts associated with procuring Ad Hoc reviews and their necessity depending upon panel composition. The COV did not see evidence of significant change towards standardizing the Ad Hoc reviewer's participation.

MANAGEMENT OF THE PROGRAM UNDER REVIEW
- The COV felt that NSF still needs to work on better communicating their accomplishments the general public and the general scientific community. One suggestion would be to ask PIs to acknowledge MCB funding in social media posts.

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

Table 6 - Resulting Portfolio of Awards

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity? Comments: The COV members felt there was a good balance of awards across the disciplines and sub-disciplines. There was some discussion on how to better and more quantitatively measure the balance of awards only based on funding rates provided in the self-study. Such numbers would also provide potentially useful insight on what sub-disciplines are becoming more popular over time to indicate trends in research clusters. Additionally, this could provide input on how sub-disciplines could be merged and new sub-disciplines created along with formal procedures for such creation. Recommendations: The current cluster categories are broad and do not reveal the real composition of the portfolio and the subdisciplines that comprise them. It might be beneficial to present major subdisciplines and trends within the clusters to appeal to an increased number of scientists. **Data Source: Enterprise Reporting, COV Dashboard, Question 8**	YES

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
2. Are awards appropriate in size and duration for the scope of the projects? Comments: The duration of the awards appeared appropriate and well justified for the proposals, with a mean duration of an award in 2021 being 3.64 years. The self-study showed that budgets were adjusted when clearly out of range. NSF has a history of spending in line with the project in the biological sciences, but there are no clear criteria listed for the reduction or increases in the initially requested budget. Recommendations: The panel expressed a concern that the cost of a research operation has substantially increased over the years (higher salaries, including graduate students and postdocs, lab supply, instrument time, etc.), which is not reflected in budgets of the majority of awards. MCB should explore the cost/benefit parameters of increasing grant budgets versus reduced funding rate. **Data Source: Enterprise Reporting, COV Dashboard, Question 4**	YES
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? Comments: There was strong support for the innovative nature of the Core Projects with it being noted that these projects were addressing out of the box ideas carrying some risk. Such MCB-funded projects have led to groundbreaking and transformative ideas in the past (along with high-profile prizes) and there is high level of expectation that currently funded projects will be as transformative. Questions were raised surrounding the measure of success especially of EAGER awards, which are reviewed internally. Specifically, what are the metrics of success and what is the quality of these proposals? Do these investigators follow up with Core Projects and other funding mechanisms with MCB? MCB has a good portfolio of high-profile awards as listed in the self-study. Recommendations: There should be a transparent mechanism for evaluating and funding high risk awards like the EAGER and other internally reviewed awards. Additionally, there should be tracking of the success/failure of those awards. **Data Source: Jackets**	YES

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
4. Does the program portfolio include inter- and multi-disciplinary projects? Comments: There are clear strengths in the inter- and multi-disciplinary projects, with all MCB clusters supporting collaborative efforts between investigators from other agencies internationally and the Science and Technology Centers (STC) which are viewed as hubs of inter-disciplinary projects. It was noted that a reasonable fraction of the applications are of a collaborative nature representing a good balance. The creation of two new international partnerships, as well as the current international programs was viewed as extremely positive. There was some confusion on the panel about the use of the term "theory". Recommendations: It was suggested that MCB define "theory" more broadly as encompassing theory, computation, modeling, and AI. **Data Source: If co-funding is a desired proxy for measuring inter- and multi-disciplinary projects, the Co-Funding from Contributing Orgs and Co-Funding Contributed to Recipient Orgs reports can be obtained using Enterprise Reporting, COV Dashboard, Question 7**	YES
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: The awards were well-balanced geographically, showing similar percentages of funded proposals across the country. It was noted in the self-study that there are states (EPSCoR) that historically are under-represented with respect to NSF proposal submissions and awards. The self-study did highlight good new efforts to address this issue including virtual office hours, outreach efforts to HBCUs and other funding opportunities and connections with scientific societies. Recommendations: The virtual webinars and funding solicitations to HBCUs were viewed as positive and would recommend expanding to MSIs and HSIs to broaden participation. **Data Source: Enterprise Reporting, COV Dashboard, Question 2**	

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments : MCB has an excellent track record of awards to distinct types of institutions across the nation. Substantial efforts are invested into receiving proposals from other types of institutions, specifically from PUI and MSI. In general, the number of proposals from PUI and MSI is low; however, the funding rates for RUI proposals are higher than average. In contrast, the funding rate of proposals from MSI is lower than average. One question that emerged: Are non-R1-universities being appropriately guided and supported so they can be competitive in the NSF system? Currently, the success rate for RUI's suggests that the NSF is considering the impact of funding when making funding decisions. However, some institutions might not be in a position to apply for NSF-sponsored research and might benefit from investments in infrastructure that would allow such submissions. Suggestions: It would be beneficial to better define the "appropriate balance" between institutions, so it would be easier to work towards the goal of achieving that optimal balance. **Data Source: Enterprise Reporting, COV Dashboard, Question 3**	

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? 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. Comments: New and early-career investigators are well-represented, but have a lower funding rate compared to all others and that is independent of the funding rates in any given year (true in 2021 when the funding rates were much higher than in 2018). The COV appreciates the new activities aimed at reaching out to investigators to encourage conversations with a PD, which is a first-step to successful resubmissions, such as the Virtual Office Hours and more use of PO Comments for declined PIs. Some of these activities are especially useful for early career faculty. The increased use of "PO Comment" is positive, but evaluation data would be needed to determine how well this helps new PIs to secure funding. Suggestion: The phrase "appropriate balance" seems too vague. It would be beneficial if MCB specified its goals what is the appropriate balance and implements steps towards reaching it. **Data Source: Information on new PIs available via Enterprise Reporting, COV Dashboard, Question 6**	

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
8. Does the program portfolio include projects that integrate research and education? Comments: The research and education components of funded proposals are well integrated. This is especially true in CAREER and RUI awards. The focus on Broader Impacts in all proposals ensures a high level of integration. Broadening Participation and Developing Workforce themes are found in the Broader Impacts sections at high levels in awarded proposals, and these two categories include at least some educational activities. Funding is being directed towards RETs, BIORETs, REUs and RAHSS which fund professional development pathways critical for developing the talent pipeline. Suggestions: Effort should be invested in following up on the outcomes of the Broader Impact activities in funded grants. Metrics such as numbers of people engaged, products created, and other metrics of BI effectiveness could be used to measure success. This data could be used to highlight the importance of integrating research and education and serve as exemplary template for promoting Broader Impact activities. **Data Source: Jackets**	

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
9. Does the program portfolio have appropriate participation of underrepresented groups[3]? Comments: Awards are made to women and minority applicants at a rate comparable to the overall funding rate and likely higher than the distribution of this populations at universities in general. To maintain quality and to increase overall numbers in this population it is important to continue to work to increase submissions from these groups and to help them understand how the funding system works. This population will be helped by outreach activities such as VOH, PO Comments, etc. Suggestions: Specific programming with HBCU's could be expanded to other institutions that serve diverse populations. The type of cohort building exercises that are being done with CAREER awardees would likely be effective with URM faculty. It is important to start focusing on outcomes and intentionality of engagement in activities related to DEIA. NSF needs specific strategies that lead to tangible outcomes and deliverables to further document that the NSF's efforts on this front are paying off. **Data Source: Enterprise Reporting, COV Dashboard, Question 5**	

[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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: The science supported by MCB overlaps very well with stated national priorities and agency goals. All indications are that MCB is selecting relevant proposals for funding. They participate in specific collaborative solicitations and have established strong collaborative funding practices with other parts of NSF to fund the science that emerges between established research areas. There are excellent examples of this in the portfolio, for example, in the areas of quantum biology and manufacturing. Having said this, it is important to recognize that the central mission of MCB is to promote fundamental research, curiosity-based exploration of new knowledge. There is a line, a balance, between the need to fund research that is relevant to national priorities and the imperative to fund fundamental research. https://www.nsf.gov/nsb/publications/2020/nsb202015.pdf **Data Source: Jackets**	
11. Additional comments on the quality of the projects or the balance of the portfolio:	

OTHER TOPICS

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

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.

    - It would be helpful if the NSF provided and defined clear criteria for evaluating success for different types of grants.

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

    - The COVs might be better used if they were less focused on procedural features and more on impact and goals of any specific Division.

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

   - Developing processes for longitudinal tracking of the success of a grant beyond the end of the funding period and relating that back to the anticipated impact of the original proposal would provide MCB with an important method to assess the effectiveness and long-term impact of funding decisions.

5. NSF would appreciate your comments on how to improve the COV review process, format and report template.
   - The terms “balanced” and “appropriate” were not well defined in the self-study, making it difficult for the COV to give evaluative feedback. Descriptions of explicit goals in developing the grant portfolio, outreach, etc., would enable the COV to give external feedback on how MCB is progressing to achieve these goals.

   - Having the COV in a virtual format worked but was more difficult than in person due to difference in time zones.

   - The online format for hosting the COV worked well, but should consider addressing additional accessibility tools to ensure full participation of persons with disabilities.

   - Would there be an advantage to utilizing COV as a science advisory and not just to evaluate procedural approaches?

   - It might be beneficial for the COV to be provided with some analysis of trends in the biological sciences and how MCB’s portfolio fits within this larger field. This would help the COV to give feedback on goals for the next four years.

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SIGNATURE BLOCK:

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For the Molecular and Cellular Biosciences Committee of Visitors
Professor Elizabeth Sztul
COV Chair
May 27, 2022