

CORE QUESTIONS and REPORT TEMPLATE
for
FY 2018 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2018 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2018. 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/COV%20Policy%20and%20Procedures%2007091 S.pdf](https://inside.nsf.gov/tools/toolsdocuments/Inside%20NSF%20Documents/COV%20Policy%20and%20Procedures%2007091%20S.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, a resource for NSF staff preparing data for COVs is the Enterprise Information System (EIS) -Web COV module, which can be accessed by NSF staff only at <http://budg-eis-01/eisportal/default.aspx>. In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

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

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

MCB COV June 2018 Executive Summary

The most important take-home message from the MCB COV is that based on all of the materials provided, we can confidently say that the integrity and efficiency of MCB program processes and management during the FY2014- FY2017 period are excellent. Moreover, we believe that the quality and integrity of the merit review processes, program operations, and program-level technical and managerial matters related to proposal decisions are also excellent.

The COV is appreciative of the responsiveness of MCB to issues raised during the previous COV report as well as the high-quality self-study, which was thorough, well-written, and data-driven. We congratulate the entire MCB team, especially Theresa Good and Reyda Gonzalez-Nieves, for their commitment to recruiting, supporting, and nurturing staff at all levels of MCB, thus creating an engaging working environment populated by high-performing staff. The highly effective, inclusive, and supportive environment for staff is a strategic strength and has positive impacts on every aspect of MCB operations including the ability of Program Directors to engage with the community and in the evaluation of, and investment in, the most impactful science. The willingness by staff to embrace diversity and change will serve MCB well moving forward and should be seen as a model for effective management by other units within NSF. The team should be provided the necessary additional support and resources to maintain an adequate level of nimbleness and ensure maximum responsiveness and effectiveness to advance the NSF, BIO, and MCB missions, in addition to the needs of the nation.

The COV is inspired by the scientific leadership and scope of MCB which supports research to discover and understand the emergent properties of complex living systems across the molecular, subcellular, and cellular scales. MCB activities demonstrate a commitment to support and address the NSF strategic goals of transforming the frontiers of science and stimulating innovation/addressing societal needs. Evidence for this support is clear from the portfolio of investments, which wisely leverage and use a variety of available mechanisms: standard research awards, EAGER, CAREER, RAPID, RUI, RCN, INSPIRE/RAISE, Ideas Lab, engagement and co-funding with international organizations (BBSRC, BSF, EU through ERASynBIO), and engagement and co-funding Centers with other NSF programs (Frontiers of Physics Centers, IUCRC, STC). We commend MCB for strategic use of RCN to support research communities as well as education and mentoring communities. Moreover, Program Directors continue to engage the community and provide vital support for research conferences.

MCB is a leading, forward-leaning, resource for the community. MCB should serve as a role model for Division operations within NSF. Moving forward, it is critical to ensure continued success and impact by MCB. We identified a few opportunities to further strengthen and enhance MCB's processes and impact and we highlight several recommendations below. Other recommendations are detailed in the answers to the questions provided as a template. MCB is poised not only to serve the needs of the community, but also to help lead Foundation-wide strategic activities. More importantly, we anticipate that MCB will lead national-scale initiatives that naturally align with MCB's mission. Current MCB staff and processes provide a foundation for such activity. This strategic leadership, however, will require additional investment of staff and new resources to realize full benefit without compromising the existing excellence. The outcomes of these investments will help further raise the profile of NSF as a leader addressing national needs related to the progress of science, advancement of national health, prosperity, and welfare, and support of the national defense.

Specific Highlights and Opportunities:

1) Response to the last GOV

The 2014 GOV report contained several important suggestions regarding MCB management and processes. The current GOV is very impressed by MCB's response to these suggestions - they have made strategic changes that have successfully addressed the documented issues. They have advanced their portfolio of quantitative, predictive and theory-driven biology at the molecular and cellular level. Morale among administrative staff, a significant concern during the 2014 GOV, is now outstanding. There is significantly increased transparency and communication at the Division level and some improvement at the Directorate level. They have developed new methods for communicating scientific achievements and MCB activities. They have improved and better defined the use of EAGER Awards. We recognize that during the past four years there has been an unusual amount of turnover at all levels of MCB staff and expect increased stability moving forward.

2) Morale and quality of all of the MCB staff

The GOV cannot overemphasize how impressed we are with both the quality and morale of the MCB staff - both at the Program Director and the Administrative Staff levels. Morale was such a significant concern of the 2014 GOV that this GOV felt it necessary to address this issue because of the impact it can have on the quality of the program operations. MCB functions as a supportive and effective team. Theresa Good (who during this time has served as both ODD and Acting DD) and Reyda Gonzalez-Nieves (Operations Manager) are to be credited for creating a culture where all team members are respected and valued. There is an incredible sense of teamwork and pride in the work they all do. Much of the staff satisfaction is attributed to the team's ability to be inclusive in decision-making and communication. Administrative staff and program directors feel like they have excellent career and professional development opportunities. In our opinion, MCB should serve as the gold standard for how an NSF unit should function - it should serve as a role model and training ground for BIO and beyond.

Organizations with strong and effective leaders can become complacent and overly reliant on such individuals and therefore not do succession planning. It appears that MCB is mindful of this and that planning and strategies have been considered.

Recommendation: The GOV hopes that NSF will recognize the high-performing nature of the MCB team and allow them the flexibility to grow, promote, and retain their staff as needed to further enhance and expand their impact on the community.

3) Science

The science supported through MCB continues to be at the forefront of quantitative, predictive and theory-driven science in molecular and cellular biology. In fact, the GOV feels that maybe MCB undersells itself when providing evidence of its transformative accomplishments. In addition to focusing on formal achievements such as having Nobel Prize laureates within their portfolio, MCB could document the many emergent fields that were supported by MCB in their infancy or that arose from MCB investments. A quick glance at CAREER awards from the 1995-2005 period reveals many awardees who are now the leaders of exciting and novel areas in science, such as synthetic biology, single-molecule biophysics, bacterial communities and communication, and chemical genetics. Others are now, in addition to being stellar scientists, academic leaders in promoting inclusion and diversity. In addition MCB has funded activities resulting in transformative broader impacts such as the impressive iBIOLOGY videos that bring to the public advanced concepts in cell biology. The GOV reaffirms the outstanding quality of MCB's portfolio.

The GOV also feels that MCB's active role in co-funding grants with other areas (such as physics, math and CBET) has allowed MCB to broaden its impact and influence.

Recommendation: We encourage NSF to take advantage of the fact that MCB, with its emphasis on predictive and quantitative understanding of the atoms and molecules of life, is a natural place for integration of cross-disciplinary studies among Directorates and other agencies. MCB is uniquely positioned to act as a central hub for the Rules of Life initiative and to organize research activities across length scales (atoms, molecules, through to organisms). We further recommend that MCB consider a broader approach to define, highlight, and communicate their achievements.

4) Moving to "no-deadline" grant submissions

The COV recognizes that the move to a no-deadline process for grant proposals is a major change for MCB and has both potential benefits and drawbacks. We hope that a consistent policy across all of BIO will result in easier and more successful partnering with other Divisions within BIO without jeopardizing the successful ties already created with other Directorates such as PHYS and CBET. We see a benefit to the administrative staff by virtue of a more even distribution of the workload over the year; however, we are concerned that the constant arrival of proposals may hinder the ability to convene excellent review panels and may distract Program Directors from their ability to travel and interact with the community. The COV is concerned about a possible cap on the number of PI submissions and its effect on both the community and proposal administration.

Recommendation: We recommend that adequate resources and procedures be put in place to implement this change and evaluate its impact. We also recommend that the impact of the potential cap on annual submissions be well-vetted prior to implementation.

5) Review Processes

The COV was impressed with the overall review process. The committee did, however, discuss some specific issues. The first issue is related to how ad-hoc reviews are utilized. There is a sense that the ad-hoc reviews are not taken into consideration on the panels in a consistent way. Second, there was discussion around possible improvements to Fastlane forms for reviewers. The concern is that the boxes on the Fastlane forms do not guide reviewers to adequately address all the review criteria. The third topic discussed related to the use of non-academic (e.g., industry) reviewers and the opportunity that may be available for expertise from a different segment of the community that might provide useful perspectives during proposal evaluation.

Recommendation: MCB should consider establishing a more standard approach to the presentation of ad-hoc reviews during the panel discussion (even if in complete concurrence with the panelists), which is a practice that several program directors already follow. MCB should consider adjustments to the proposal evaluation form on Fastlane that would more directly address the review criteria to reduce inconsistencies among reviews. Finally, we recommend that MCB consider inviting more reviewers from outside of academia.

6) Strategic Considerations

MCB is effectively positioned as a nexus of research within NSF and across the federal Government. MCB staff are engaged actively in a number of Foundation-wide activities such as the Big Ideas initiative (e.g., Rules of Life). MCB should be commended for helping lead, or otherwise play a critical role, in a number of these activities. However, the amount of effort expended on these activities can compete for time needed for MCB's strategic thinking and planning, and could create a situation in which MCB is reacting to opportunities rather than proactively shaping the future. When combined with typical workloads and pending changes to eliminate proposal deadlines, the GOV is concerned that the MCB staff will not have time to be strategic with their interactions and resources.

This limitation may become even more impactful on initiatives that offer opportunities for MCB (and NSF) to help lead or engage in matters of national importance. To have NSF play a lead role in some of these national, or whole-of-government, activities can create opportunities to: 1) leverage resources from other parts of the federal government towards a common goal that is already aligned

with the MCB/NSF community; and 2) help elevate and amplify the excellent work done by the community funded by MCB and its staff.

Recommendation: We recommend that MCB receive additional resources for staffing and programmatic purposes to lead important initiatives effectively. Such an investment will promote the progress of molecular and cellular biosciences, and advance the national health, prosperity and welfare.

7) Rotators Versus Permanent Staff

The COV considered the merits and drawbacks of a rotator/permanent staff in the DD/DOD position and the appropriate ratio of rotator/permanent Program Directors. While the ultimate decision is made at a higher level, it is clear that successful leadership of a Division relies on finding a team of leaders who can work together effectively. The COV is confident that the current team will provide the type of leadership needed for such a vibrant and effective program.

Recommendation: We recommend evaluating the merits and drawbacks of various scenarios involving rotators and permanent staff in all MCB positions, including leadership. As part of that process, it would be wise to solicit input, and share perspectives, from all of the MCB and relevant BIO staff.

8) Broadening Participation / Diversity

MCB efforts to diversify the scientific community and broaden participation are excellent. We highlight that through targeted outreach, MCB is working proactively to expand the pool of applicants so that it better reflects national demographics. The COV was very impressed with the thoughtful, data-driven approach that MCB is taking on this important topic.

Recommendation: The COV discussed that some demographics of individuals are less resilient in the face of rejection. We suggest an exploration of tailored methods for outreach to PIs as follow-up to rejection to encourage discussion about ways to submit a more competitive proposal.

9) Workforce Development

MCB has established a good start in terms of graduate student preparedness for workforce entry. The six graduate student supplements in this area provide an initial cohort to establish best practices and opportunities to provide exposure to key skills and experiences needed to be successful. The quantitative and basic science skills that are foundational to the MCB portfolio also contribute to student preparedness. The recently released (May 29, 2018) NASEM report co-funded by NSF, Graduate Stem Education for the 21st Century, provides a series of recommendations for federal agency leadership in promoting the culture change needed to encourage that graduate education institutions focus on: 1) student education based on core competencies; 2) increasing diversity and inclusion; 3) making program data transparent for informed decision-making by prospective students; 4) broadening student exploration of career options.

Recommendation: MCB should develop sustainable and scalable methods for career development to support core competencies, career exploration, and career-specific skills.

Part 2.

FY 2018 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

Date ofCOV: June 11-13, 2018

Program/Cluster/Section:

Division: Molecular and Cellular Biosciences (MCB)

Directorate: Biological Sciences

Number of actions reviewed: 261

Awards: 62

Declinations: 199

Other: 0

Total number of actions within Program/Cluster/Division during period under review: S,392

Awards: 1,211

Declinations: 4,040

Other: 141

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 274 proposals (261 projects) 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 274 proposals (including lead and non-lead collaborative proposals) 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

	Name	Affiliation
COV Chair:	Marqusee, Susan	University of California Berkeley
COV Members	Bender, Michael	NIH/NIGMS
	Booker, Squire	Pennsylvania State University
	Caceres, Carla	University of Illinois at Urbana-Champaign
	Campbell, Malcolm	Davidson College
	Ibba, Michael	Ohio State University
	Jackson-Hayes, Loretta	Rhodes College
	Koeppe II, Roger E	University of Arkansas
	Lee, Kelvin	University of Delaware
	Malik, Harmit S	Fred Hutchinson Cancer Research Center
	Maxon, Mary	Lawrence Berkeley National Laboratory
	McLean, Gail	Department of Energy
	Phizicky, Eric M	University of Rochester
	Sztul, Elizabeth	University of Alabama at Birmingham
Woodbury, Neal	Arizona State University	

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. (GPG Chapter 11.C.2.d.(i) 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 GPG Chapter 11.C.2.d.(i), 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.

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: The review methods are effective in selecting appropriate proposals for funding. Panels do an excellent job reviewing applications, especially considering the wide diversity of topics covered in each session. An additional positive is that generally all proposals are reviewed, and each receives a panel summary, which provides critical feedback for younger investigators.</p> <p>One area where further improvements might be achievable is to increase the impact of ad-hoc reviews. Based on a limited sampling of data, it appears that the impact of ad-hoc reviews is inconsistent during panels. While the ad-hoc reviews generally are aligned with panelists feedback, there is not complete alignment. In those cases, it is not clear how these differences of opinion are dealt with in panels and the post-panel analysis for funding. There may be an opportunity to improve uniformity among panels in how ad-hoc reviews are presented and considered. This issue may become more important as MCB moves away from proposal deadlines. If deemed necessary, NSF MCB might also consider having expert ad-hoc reviewers dial-in by phone for their reviews to be given more weight in the final analysis of a proposal.</p>	YES
<p>2. Are both merit review criteria addressed</p> <p style="padding-left: 20px;">a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses?</p> <p>Comments: a) In individual reviews? Individual reviews generally address both criteria, although some variability is observed in the substance of Broader Impacts</p>	YES

comments. Some updates to the Fastlane prompts to reviewers may improve consistency in this regard.

b) In panel summaries? In panel summaries, both criteria are always addressed, reflecting input by other panelists as well as the Program Director. In a few instances the extent of feedback to investigators was variable, although the key issues (positive or negative) were reflected.

c) In Program Officer review analyses? Program Officer review analyses are considerably more detailed than the panel summaries in addressing both review criteria, although some variation was noted depending on program officer and specific proposals.

<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Comments: The vast majority of reviewers provide substantive comments to explain their assessments.</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: Yes. Panel summaries are written by panelists, using a template to provide a summary of the panel discussion, including rationale for the panel consensus and overall panel rating. The panel summaries are reviewed both by other panelists and by MCB staff to ensure that comments are accurate and sufficiently detailed to understand the spirit of the discussion of any particular proposal. The use of a template to encourage panelists to detail strengths and weaknesses of a proposal helps to focus the review in a way that is most helpful to the PI. One gauge of success of this strategy is the degree to which panelists provide substantive comments. As detailed in the self-study report, only 1% of panel summaries lacked substantive comments in intellectual merit, while 13% lacked substantive comments in broader impacts.</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: Yes. All proposals in MCB must receive at least three reviews. The documentation in the jacket provides these individual reviews as well as the panel summary of the discussion of the proposal. In addition, the jacket provides a table of reviewers and documentation of any correspondence that the program director has with reviewers or with the applicant (PI). Importantly, there is a detailed narrative review analysis by the Program Director that summarizes the reviews and panel summary and addresses any discrepancies between reviews and the panel summary in addition to rationale as to why a proposal was funded or declined. If some of the additional information in the review analysis could be provided to the PI, it would help to ensure transparency in the funding decision. However, the GOV notes that some of this information might be provided in one-on-one conversations with the PI.</p>	<p>YES</p>

<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: Generally, yes. The documentation to the PI includes a context statement, individual reviews, the panel summary, and in some instances, a PO comment. This information typically explains how well a proposal was received by a panel, but sometimes does not reflect why a proposal was declined or funded. In some instances, the decision to fund or decline might relate to portfolio balance, demographics and geography and that may not be apparent to the PI.</p>	<p>YES</p>
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>In general, the review process is effective and is characterized by checks and balances at each stage. The positive impact of the review process for declined new investigators (i.e. any first time applicants to NSF) could be enhanced by providing information on resources to assist with resubmissions such as grant writing workshops, mentoring programs and other appropriate mechanisms.</p> <p>One suggestion to ensure that substantive comments address all five review criteria is to provide reviewers additional guidance with the review process either through Fastlane prompts or via an MCB template that addresses best practices on addressing all of the review criteria.</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.

<p>SELECTION OF REVIEWERS</p>	<p>YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE</p>
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments: In many ways, MCB excels in balancing the demographics of the panelists to match the diversity of Pis submitting proposals. We were particularly pleased to see the percentages of submissions from women, URM and EPSCoR states aligned very well with the composition of panelists.</p> <p>There is some room for improvement on panelist representation. The fractions of panelists from MSIs and PUIs were lower than the fractions of proposals coming from these institutions. We recommend that MCB explore ways to achieve a panel composition that more closely aligns with submissions.</p> <p>In some areas, industry is arguably ahead of academia both technically and conceptually. Including representatives from industry and national labs in the review process might add a helpful dimension currently lacking by relying almost entirely on academic participants.</p>	<p>YES</p>
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments: We commend the NSF on their implementation of COi policies. We feel that all levels of the review process, NSF employees and panelists under their charge respect the letter and the spirit of the COi requirements.</p> <p>3. Additional comments on reviewer selection:</p> <p>MCB is commended for persevering when finding reviewers in cases where 10+ invitations are needed to identify qualified and willing individuals.</p>	<p>YES</p>

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

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

Comments:

- The COV is highly impressed with the dedicated staff team and the dramatic improvement in staff morale and job satisfaction over the past several years. The MCB responses to the challenges can be a model for the NSF. A number of positive changes have been implemented over the past four years to ensure that the workplace environment is rewarding, pleasant, and effective in support of a professional and productive team of MCB staff members. Efforts to improve transparency and the outlook and morale of senior and supporting staff members were taken seriously. The leadership of a new Operations Manager, Reyda Gonzalez-Nieves, is noted as having been very effective over the past two years. Staff retention rates and morale have improved significantly.
- The COV recognizes the value and importance of both permanent and rotating Program Directors. Questions were raised about the merits and drawbacks of the balance between permanent and rotator staff at various levels. There is a recognized importance of maintaining a continuity of strategic goals for the overall portfolio.
- The COV recognizes and emphasizes that support staff members perform valuable service as an effective team for the MCB. The Operations Manager is commended for effective recruiting, judicious hiring and building staff morale. The staff members expressed high levels of satisfaction with the work environment, performance plans and career opportunities for advancement. The support staff members value being included in the interview process for selections of their colleagues and supervisor; the procedures have worked well and should be continued. Effective mechanisms for recognizing, rewarding, and retaining high-performing staff members at all levels should be pursued. Additional staff are needed to address new challenges and opportunities while maintaining excellence.
- MCB leaders and the COV recognize that uncertainties and challenges will be associated with the change of schedule for receiving proposals with no deadlines. A general recommendation is for effective implementation and evaluation of new procedures with appropriate flexibility and transparency for the scientific community.
- The 2014 COV report noted a restricted budget for Program Director travel to engage the scientific community (subject to OMB guidelines). The COV recognizes the importance of PD travel and encourages support for the travel budget. The Webinar programs offer additional and commendable opportunities for outreach to encourage participation, innovation and proposal submission.
- The available budget is managed effectively. Additional funding would enable MCB to address new strategic research objectives (see below).

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

Comments:

- MCB's leadership in the scientific community is well demonstrated through its identification and response to emerging research opportunities. There is tremendous value in the flexibility afforded the Program Directors to identify and support new research opportunities as it enables MCB to be at the forefront – and in many ways help define the frontiers - of science. The information provided in the post panel reports illustrates well the breadth and agility of MCB in exploring and addressing new scientific and strategic areas. An example of this leadership is MCB's contributions to the Rules of Life, one of NSF's ten Big Ideas for future investment.
- While highly attentive to research opportunities, the responsiveness to emerging education opportunities was less evident in the documentation provided to the COV. One of the more visible responses to an educational opportunity is the Graduate Student Supplement initiative. Assessment of this relatively new effort is still underway and will be central to determining its effectiveness and any need for modification. In general, the annual report provides numerous examples of excellent educational and outreach activities, but new emerging opportunities in education/outreach were not specifically highlighted. MGB may wish to note Emerging Areas for education as well as for science in its Post-Panel reports.
- MCB uses EAGER and RAPID funding mechanisms to foster new scientific directions and address emerging research areas, particularly in regard to high risk/high impact research. The GOV found the distinction between EAGER and core research awards is not always clear. This issue may be in part due to the definition of "potentially transformative" being subjective as noted by the 2014 GOV.
- MCB is commended for its initiative in supporting new research opportunities through its core programs. This commitment is illustrated by MGB funding high risk research through mechanisms such as support of one aim of a proposal as a "proof of concept" effort. The availability of discretionary funds is recognized as an important tool in fostering these funding decisions.
- MCB's overall portfolio displays a combination of cross-cutting, multidisciplinary efforts and smaller single discipline focused efforts. Each of these approaches brings unique value and enables the program to foster a range of scientific questions, from risky targeted efforts to collaborative multi-PI projects that may involve multiple areas within MCB as well as across Directorates. This diversity in approach is a clear strength of MGB, allowing it to respond at appropriate levels to new research opportunities. Support for both multidisciplinary and single discipline efforts is important.

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

Comments:

- MCB should be commended for the productive collaborations with other Divisions and Directorates, as can be seen by the co-funded individual grants, workshops, center-scale activities. Rules of Life will offer additional opportunities for collaboration at the cutting edge, with MGB having a key role. Within the division, there now seems to be clear communication among the clusters regarding portfolio balance.
- The 2014 GOV raised concerns about career training provided for NSF-funded graduate

students and postdocs. In response, MCB now participates in Improving Graduate Student Preparedness for Entering the Workforce, Opportunities for Supplemental Support (NSF 16-067). This program is advertised in the core solicitation and at panels. This is a good start, and the COV recommends continuing openness to additional opportunities for career development for NSF trainees who wish to enter careers outside of academia.

- Going forward, it is unclear how the change to "no deadline" will influence program planning, prioritization and co-funding opportunities. The composition of the panels is a vital step in maintaining portfolio balance and it is essential that representative panels be maintained with the change to no deadline.

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

Comments:

The MCB staff have been highly responsive to the 2014 COV comments. A detailed response document and updated statements were provided.

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

<p align="center">RESULTING PORTFOLIO OF AWARDS</p>	<p align="center">APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</p>
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?</p> <p>Comments: Yes. The program portfolio is well balanced in terms of disciplines and sub-disciplines as evidenced by the cluster post-panel reports, the annual reports, and a sampling of the funded awards. Within each cluster, the submissions and the awards cover the breadth of scientific areas relevant to the field and also including investments in emerging topics of importance to the scientific community. The emphasis on projects that are quantitative, predictive, or theory-driven, which comprise approximately 70% of funded awards, helps keep science moving forward and also creates new opportunities to collaborate with other disciplines.</p>	<p align="center">YES</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments: Yes, most awards seem to be appropriate in size and duration in relation to the scope of work and there is a broad range of both size and duration which reflects the diverse array of types of projects funded. Research-driven proposals generally have a longer duration (4-5 year) and other proposals (e.g. EAGER) are shorter as required by those programs. The fraction of projects with budget reductions remained approximately equal over the four years in the study period.</p>	<p align="center">YES</p>
<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments: The portfolio contains many projects that are innovative and/or potentially transformative and this is consistent with the history of MCB funding. One demonstration of MCB's transformative investments is that five Nobel laureates from the 2014-2017 period were MCB-funded researchers. Another demonstration is that many former CAREER awardees of MCB have pioneered new frontiers of science such as (but not limited to): synthetic biology, single-molecule biochemistry/cell biology, social interactions and signaling between bacteria, genome editing. MCB awardees have also made critical contributions to training and outreach. Other measures of MCB's transformative contributions appear in the broader impacts of the projects they fund, in terms of training and broad scientific outreach, exemplified by the very popular !Biology science video series.</p> <p>We encourage MCB to continue to use metric-based procedures and their</p>	<p align="center">YES</p>

<p>experience to identify other projects with transformative potential. MCB has a number of funding mechanisms to rapidly approve funding of projects (with review by two Program Directors and the Deputy Division Director) including the EAGER and INSPIRE programs. It is imperative that MCB Program Directors continue to actively engage the community in emerging topics of interest, a task that may get increasingly more challenging with the transition to "no deadline" submissions.</p>	
<p>4. Does the program portfolio include Inter- and multi-disciplinary projects?</p> <p>Comments: Yes. With its focus on theory-driven molecular mechanisms and emphasis on broad principles, MCB is ideally and perhaps uniquely placed within the BIO directorate of NSF to collaborate with studies that venture from the molecular to the organismal. MCB has generally done an excellent job of fostering and investing in inter-and multi-disciplinary projects. The GOV is impressed by the amount of co-funding of MCB across NSF Directorates to answer questions that otherwise could not be answered by investigators in a single discipline. This impression was reinforced by the very positive feedback we received from Program Directors and Division Directors from other Directorates (e.g., Phys, Math, CBET).</p>	YES
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments: Overall, the geographic distribution of awards is appropriate. However, the success rate varies significantly, albeit with some of these results based on a low number of applications. Of particular concern was the persistent low success rate from some states.</p> <p>MCB is encouraged to investigate this discrepancy and to develop means to address any issues.</p>	YES
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments: See comments in point IV.9 below.</p>	YES
<p>7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators?</p> <p><i>NOTE: A new investigator is an individual who has not served as the PI or Go-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning awards, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within ten years of receiving his or her last degree at the time of the award.</i></p> <p>Comments: Yes. MCB has an appropriate balance of awards for new, beginning, and early investigators, although their success rate is slightly lower than for all awards.</p>	YES

<p>The COV encourages MCB to be proactive in communicating with young investigators (especially women and URM) to encourage resubmissions after being declined.</p>	
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments: Yes. MCB has done an excellent job of integrating research with education through multiple funding mechanisms that include CAREER awards, RUIs, REUs, RETs, and RAHSSs. Equally important is the emphasis of MCB on Broader Impacts that include educational components that positively integrate research and education.</p>	<p>YES</p>
<p>9. Does the program portfolio have appropriate participation of underrepresented groups³?</p> <p>Comments: The response to this question depends on one's perspective on "appropriate".</p> <p>In general, the success rate of grants from under-represented groups is close to the average success rate across MCB. This includes PIs who are women, URMIs or from PUIs. One exception is the success rate of PIs from MSIs (especially from minority PIs), which is lower than the average. However, the NSF self-study identified that the total number of applications from women and minority PIs is lower than ideal. MCB is actively working to address this problem by targeted outreach activities.</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: MCB has done an excellent job of addressing national priorities as measured by its responsiveness to national priorities including the National Bioeconomy Blueprint, the BRAIN Initiative, the National Microbiome Initiative, STEM education, and Data Reliability. MCB's participation in whole-of-government activities (and Foundation initiatives such as Rules of Life) may create opportunities to: 1) leverage resources from other parts of the federal government towards a common goal that is already aligned with the MCB community; and 2) help elevate and amplify the excellent work done by the community funded by MCB as well as by the MCB staff. However, the amount of effort expended on these activities can compete for time needed for MCB's strategic thinking and planning, and could create a situation in which MCB is responding to opportunities rather than shaping the future strategically. With additional resources, for both programmatic and staffing</p>	<p>YES</p>

³ NSF docs 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>purposes, MCB can develop and lead new strategic opportunities for the Foundation and across the federal government, including some emerging opportunities:</p> <ul style="list-style-type: none"> - National Academies reports on Microbiomes of the Built Environment (2017), Future Products of Biotechnology (2017), Genes Drives on the Horizon (2016), Industrialization of Biology (2015), among many others. - Efforts relevant to MCB and of interest to other federal agencies including Cyberbiosecurity (e.g. Murch, Front Bioeng Biotech 2018), the new Safeguarding the Bioeconomy effort (FBI) and Manufacturing USA (led by NIST and including DOD and DOE). - The recently released NASEM report co-funded by NSF, <u>Graduate Stem Education for the 21st Century</u> (2018), is aligned with MCB efforts and provides recommendations for federal agency leadership in promoting the culture change needed to better prepare students for the workplace. <p>Additional resources for staffing and programmatic activities would enable MCB leadership in new and important ways to promote the progress of molecular and cellular biosciences, and to advance the national health, prosperity and welfare.</p>	
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>n/a</p>	

OTHER TOPICS

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

n/a

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.

n/a

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

To accommodate gender-fluid people, an underrepresented and growing group of scientists, NSF could provide additional gender identity options (representative info available at <https://registrar.ucsc.edu/gender-identity/index.html>) along with "M" or "F" for gender selection.

See also comments about rotators versus permanent staff.

Increased transparency around decision-making at all levels.

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

The GOV would like to reiterate the strength of the program and people in MCB.

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

Many of the GOV members were new to the process. As a result, there was a preference to have more direction and preparation in advance of the meeting. We further suggest that there be some overlap in GOV members for the future to ensure some 'institutional memory' of prior concerns and discussion.

The GOV felt that having GOV members-only time prior to starting on the first day would have been helpful as a way to orient the GOV on what to expect. That meeting may only need to be 15-20 minutes long.

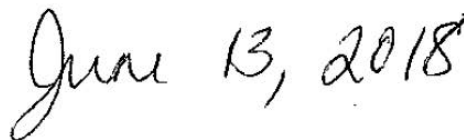
The GOV also would have appreciated any guidance on the Division's perspective on the meaning of "appropriate" which is used in multiple places on this template.

We believe that participation on the GOV from individuals from a prior NSF Program Director, other Federal agencies, a prior GOV member, and a significant fraction of NSF-funded members, is important.

The GOV would appreciate an opportunity for a conversation with the NSF Director at the conclusion of the process.

The Committee of Visitors is part of a Federal advisory committee. The function of Federal advisory committees is advisory only. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the Advisory Committee, and do not necessarily reflect the views of the National Science Foundation.

SIGNATURE BLOCK:



For the FY 2018 NSF Committee of Visitors for Molecular and Cellular Biosciences
Susan Marqusee
Chair