Division of Molecular and Cellular Biosciences
Directorate for Biological Sciences
National Science Foundation

Response to the report by
Committee of Visitors (FY2008-10)

Introduction

The Directorate for the Biological Sciences (BIO) and Division of Molecular and Cellular Biosciences (MCB) appreciate the hard work and efforts of the Committee of Visitors (COV) in assessing the processes in MCB and outcomes of MCB investments. They thank the COV for insightful comments and constructive recommendations in the COV report. The Division appreciates the committee's recognition of the critical role that MCB plays in identifying and supporting outstanding research and educational activities, encouraging multidisciplinary research, supporting new investigators, fostering research at undergraduate institutions, and broadening participation of underrepresented groups in science.

After receiving the COV report, the Division held a series of discussions to develop an implementation strategy. The recommendations made by the COV are thoughtful and many of them are already being implemented by the Division within months from the COV meeting. Most notably, the Division published a solicitation implementing many of the COV recommendations, such as providing additional time for resubmission, changes in proposal cycle times, clear framing of Division priorities, and requesting information in the annual reports for tracking trainees supported by the grants.

This document contains the BIO response to specific recommendations[1] made by the committee in its report.

[1] The COV report has discussed major recommendations in executive summary. The report also lists a set of recommendations throughout the report. These two sets are largely, but not completely, overlapping. In this document, the Division has first responded to the recommendations in executive summary and has added a section 'other recommendations' to discuss the additional recommendations that were made at other places in the report.

Specific Issues Raised by COV

Scientific Recommendations

Scientific Focus: *The COV was impressed with the scientific accomplishments and vision of MCB in expanding into new areas while maintaining a solid core. It is commendable that MCB has used innovative methods (e.g. Ideas Lab, Sandpit and Big Pitch) to explore and expand their research portfolio into new and emerging areas (e.g. Synthetic Biology and Systems Biology) including funding high-risk, high pay-off science. The panel did, however, express some concern about MCB potentially diluting its efforts rather than focusing on its uniqueness and strategic initiatives. The COV recognized MCB's role in catalyzing new and signature areas of inquiry that are transformative and focused, yet inclusive. An example of this is "Model Organisms", an MCB signature focus area that is inclusive across all life forms and develops a research community and associated resources.*

Response:
The Division agrees with the COV's concern and concurs with the recommendation to sharpen its scientific focus. This will be a major topic of discussion in the 2011 retreat of the Division, and an effort will be made in during the forthcoming year to obtain stakeholder input on this matter. Once finalized, the Division solicitation will be revised to communicate the Division focus and priorities to the scientific community. In addition, an outreach plan will be developed to communicate the Division's 'brand'.

Biology at the Interface*: The COV was very encouraged by the interdisciplinary funding activities initiated between MCB and other divisions including Physics, Chemistry, Math, Computer Science, and Engineering. The COV commends these collaborations and activities and recommends that MCB continue to expand on these areas in the future.*

Response:
The Division will continue to develop interactions with other directorates. In addition to MCB-Physics panel that has been organized for the last several years, the Division is considering co-organizing joint panels with other Divisions in the Directorate for Mathematics and Physical Sciences and in the Directorate for Engineering. These joint panels will allow the Division to properly review and foster activities at the interface of MCB with engineering and physical sciences. Examples of such potential areas include chemical biology, systems analysis, and synthetic biology.

Balance of Small vs. Large Project Funding*: The COV recognizes the importance of MCB's funding of a diverse portfolio containing single investigator grants (with large and small budgets), as well as large multi-investigator grants. MCB is encouraged to continually re-examine this mix to ensure an appropriate balance is maintained. It is also important to maintain a balance between hypothesis-driven and discovery-based, large-scale biology research.*

Response:
The Division agrees with the COV recommendation. Through a series of discussions, the Division has formulated guidance for portfolio analysis of the balance between large and small grants or between hypothesis-driven and discovery-based research. For the purpose of portfolio analysis, the Division defines a large grant is the one that has average annual size of at least two times the median annual size of the awards in the previous fiscal year. For example, the median size of awards for FY2010 was $190,000 and thus all grants with annual size of $380,000 or higher will be considered as large grants.

Distinction between hypothesis-based and discovery-driven research was discussed extensively by the Division. For portfolio analysis, the Division will use the following definitions as guidelines. Hypothesis-driven research is guided by testable predictions. Discovery-driven research contains a targeted collection of data by is not necessarily guided by functional prediction (no predictive intent). Once the data are collected, hypotheses are expected to emerge from the data analysis.

The Division will add data columns on large grants and discovery-based grants in the analysis of cluster portfolios that is performed after each panel cycle. The Division will also monitor the balance between the funds invested by the Division in these types of grants in the future.

Grant Administration:

***Panel Reviews**: The COV found the Review Analyses to be extremely valuable documentation about the grant reviews and funding decisions. The COV recommends that a version (or portion) of these Review Analysis reports be rapidly communicated to PIs, especially in cases where panel summaries are positive and funding decisions are negative. This would help PIs understand how to amend for resubmission before the next proposal deadline.*

Response:
The Division agrees that the review analyses contain thoughtful rationale for funding decision.
In the past, the Division asked program directors to provide a PO comment to the PI if
the panel summary and reviews did not provide sufficient rationale for panel rating, or
the panel summary and rating were inconsistent with the program decision.
The Division will continue this practice, and we will undertake the following actions to increase the transparency of decision-making to the PIs.

The context statement provided to the PIs will be revised to include a clearer description of the decision process at NSF.

A PO comment with additional details about how a program director is expected to balance the portfolio of proposed awards will be provided to the PIs where portfolio balance is the reason for declination.

***Ad Hoc Reviews**: The COV noted that the "return" on ad hoc reviews was low. There was also a serious concern for confidentiality of the grants sent to ad hocs who decline to review. It is recommended that only the title and project summary be sent to ad hocs as a pre-inquiry, along the lines of journal request to review. The ad hocs should also be required to formally acknowledge that the information is confidential before being allowed to download the grant. The COV noted that NSF grantees should be encouraged to serve the NSF by providing Ad hoc reviews or service on grant panels.*

Response:
This comment and other related comments in the report contain three elements of concern.

Confidentiality
The NSF and the Division agrees that the confidentiality of the proposal content is of utmost importance. Some safeguards are emphasized in the communication with the ad hoc reviewers and panelists.to ensure that the ideas in research proposals are not used by the reviewers for their own benefit.
For example, when a reviewer accesses a proposal, s/he agrees to the NSF policies (see below).

Your Obligation To Keep Proposals Confidential
The Foundation receives proposals in confidence and protects the confidentiality of their contents. For this reason, you must not copy, quote from, or otherwise use or disclose to anyone, including your graduate students or post-doctoral or research associates, any material from any proposal you are asked to review. Unauthorized disclosure of confidential information could subject you to administrative sanctions. If you believe a colleague can make a substantial contribution to the review, please obtain permission from the NSF Program officer before disclosing either the contents of the proposal or the name of any applicant or principal investigator. When you have completed your review, please be certain to destroy the proposal.

- When the panelists are appointed to a panel in MCB, they are provided with instructions about confidentiality and conflicts. Panelists sign a statement agreeing to the NSF's strict policies regarding confidentiality.

Return rate

A review record in each eJacket documents all individuals that have had access to a proposal. The Division realizes that despite the NSF's efforts to ensure the confidentiality of the proposal content, there are times when a reviewer could deliberately or unintentionally use the information in a proposal for his/her benefit. One way to address this problem is to reduce the number of individuals who receive access to a proposal. This can be achieved by taking measures to increase the probability that ad hoc reviewers will review proposals that are provided to them. The Division has implemented the following measures to achieve this goal.

- The Division has begun to use panel-only review if a fairly small number of topics are covered in a panel and at least two or more panelists have some degree of expertise in evaluating each proposal. This approach has eliminated the need to obtain ad hoc reviews for most proposals in these panels. During spring 2011 season, four out of 11 panels used panel-only review.
- Some program directors have started using a multi-stage approach in requesting reviewers. Using this approach, program directors first request reviews from only 3 reviewers. The reviewers are encouraged (coaxed with reminders, if needed) to let the program know if they plan to review the proposals. If less than two reviewers agree to review a proposal, additional 2-3 review requests are sent out in the second stage. This approach minimizes the number of ad hoc reviewers that are sent review requests and who can access to proposals. Carefully worded reminders are effective in receiving acceptances from the reviewers.
- To encourage the PIs to review proposals from NSF, the congratulatory letter sent to the PIs will be modified to include the expectation that awardees will be expected to serve as reviewers for at least two proposals every year.

Review quality

We agree with the COV that the quality of reviews is important for both the program directors and the PIs. MCB plans to make the following changes to improve the quality of the reviews.

- Letters sent to the reviewers will be modified to encourage them to describe both the strengths and weaknesses of the proposal relating to each of the two review criteria
- MCB will provide guidance on its website for reviewers and panelists. The information will include information such as: examples of substantive reviews and panel summaries (which will be fabricated

de novo to avoid breach of confidentiality), examples of panel summaries, review process timeline, panel review procedures

***Review Feedback Timing and Proposal Deadlines**: The COV panel noted that there was an improvement in turnaround time on funding decisions since the last COV, with 90% of the review of applications completed within 6 months. Nevertheless, for unfunded grants, this turnaround precludes PIs from meeting the next submission deadline. We recommend that MCB find a solution to this problem. This may include an earlier release of reviews or an extension of deadlines for resubmissions. The COV also recommends that the proposal submission deadlines be pushed forward a month, possible to Feb/Mar and Aug/Sept, so that grant submission and processing does conflict with university and school holiday closings as they relate to family care issues.*

The Division agrees with this recommendation and has implemented it in its recent solicitation. The Division changed its cycle length to eight months, thus providing at least two months for PIs of declined proposals to revise their proposals.

***Internally Reviewed Proposals**: With the substantial increase in size of EAGER grants, we recommend that a minimum of two PDs review and approve the requests, in addition to sign-off by the DD.*

The Division disagrees with the COV's recommendations. To maintain the ability of a program director to take chances on highly risky, but potentially high impact proposals. In MCB's experience with panels, data has shown that the more reviewers involved in a decision, the more risk averse the group becomes. In any case, at least one program director and the Division Director is involved in the recommendation of EAGER proposals for award. During 2008-10, many of the funded EAGER proposals were reviewed by at least two program directors. Thus the Division strongly believes that it is essential to keep flexibility in the review of EAGER proposals.

Improving Educational/Societal Mission

***Underrepresented Scientists:** The COV noted an increase in funding of minority scientists since the last COV. We would like to see a continued improvement in this direction. We also noted that RIG/CAA awards have been discontinued and are concerned about what funding mechanisms will replace these.*

The Division agrees with the COV and will continue to monitor the progress in increasing diversity in the Division's award portfolio. The Division is currently studying the impacts of termination of RIG program and is actively engaged in the Directorate-wide discussion in innovative programs to increase diversity.

***Tracking of Trainees:** The previous COV recommended that NSF implement a tracking system for trainees, and this has not been implemented. The current COV concurs with this request.*

The Division agrees with the COV recommendation and has included additional reporting requirements in its solicitation to obtain tracking information.

***Broader Impacts:** The COV had ample discussion about Broader Impacts and expressed opinions that two types of broader participation should be recognized more fully: 1) PIs who participate in existing mechanisms to train/educate/mentor students in their research labs or for activities within their institution, and 2) PIs who create new vehicles to train and educate students. Both are valuable and valid. We recommend metrics of success be included in the annual progress reports. We also note that the NSF Highlights were effective and*

that both scientific merit and broader impacts should be included in them. The panel also discussed that NSF might consider setting aside specific funding for grants for which the Broader Impacts was significant and a more compelling component compared to the Intellectual Merit.

US Congress has included specific language in the "America Competes Act," NSF's authorization bill for 2011. The NSF Director is preparing an implementation plan to present to Congressional committees. Also, the National Science Board is currently reevaluating the broader impacts criterion. Therefore, the Division awaits the outcomes of these deliberations and postpones discussion of this COV recommendation until NSF-wide decisions are made.

Division-specific questions

1. What <u>new opportunities</u> in molecular and cellular biosciences should the Division address? *In addition to the emerging areas identified by the previous Committee of Visitors in 2008 that include systems biology, metagenomics, synthetic biology, protein disorder, epigenetics, the COV identified potential new areas of research/education for MCB consideration:*
Within Biology
Phenomics: Genomes-to-Phenomes
Real-time Biology: Dynamic responses of molecules, cells, populations and systems

Interdisciplinary
Computational and Predictive Biology (with Mathematics and Computer Science)
Bio-inspired design of materials, processes, and machines (with Engineering)

Response to Societal Needs
Biology for Sustainability (e.g. Clean energy, oil spills)

Infrastructure
High-throughput phenotyping facilities
Real-time super high-resolution imaging
Cyber-enabled use of instrumentation

Broader Impacts/Education
Priming the stalled pipeline: A path from PhD to professor
Enlist professional assessment of broader impacts (e.g. quantitative metrics).

The Division appreciates the recommendations and will consider these areas of emphasis in its discussions on "branding."

2. How can the Division encourage interdisciplinary and integrative research in the cellular and molecular biosciences?
Comments: MCB should continue to promote interdisciplinary research and training among biology and the other disciplines including chemistry, math, computer science, physics, and engineering. More inter-directorate panels and program directors with associated budgets to create think tanks and working environments that inspire new innovative fertile ground should be implemented.

MCB agrees with the COV recommendation and has already begun exploring additional interdirectorate panels. BIO-MaPS funds were available in FY2011 for co-funded proposals, thus eliminating need to have separate funds for interdirectorate panels.

3. How can the Division assess the quality and impacts of science supported by the Division?
Comments: The evidence indicating that a new research area seeded by NSF funding is having a significant impact in science can be measured by a number of metrics including: 1) workshops and conference sessions at national and international meetings; 2) new investigators drawn to the field; 3) the number of grant applications in this research area; 4) the number of publications, citations and review articles; and 5) patents and industries' activity related to the field.

The Division agrees with the COV suggestions and will use the metrics in the future assessments of the Division activities and their impacts.

4. How do we, as an organization that supports fundamental molecular and cellular research, promote issue-inspired science, such as research that addresses societal needs?
Comments: Because MCB's mission encompasses organismal responses to changes in their natural environment, its research portfolio should be especially attuned to and responsive to global and societal issues related to these changes. In addition to the RAPID mechanism, we are suggesting that supplements to existing research that specifically address the issue could also be funded.

The Division plans to discuss and revise its portfolio of supplement opportunities and will consider the COV suggestion as a part of this discussion

Other Recommendations[2]

A.1

Ad hocs and Panel Memory: *The COV acknowledged that Ad Hocs are valuable because they bring in experts that may not necessarily be on the panel. Ad hocs can potentially serve a role for panel "memory" and should be enlisted by PDs to re-review re-submissions of revised grants, as panel memberships change every panel.*

The Division agrees with this recommendation. The program directors already use this strategy in reviewing resubmitted proposals and will continue to use it in the future.

Recommendation to enhance review of Broader Impacts:
We recommend that more substantive comments might be obtained from reviewers if a separate score is recorded for Broader Impact

The reviewer letter will be modified to obtain more substantive comments on the broader impacts. However, we will still depend on reviewers to integrate both intellectual merit and broader impacts in their overall evaluation of a proposal.

Consideration for Broader Impact funding:
The panel discussed that NSF might set aside specific funding for grants for which the Broader Impacts was significant and a more compelling component compared to the Intellectual Merit.

The MCB solicitation will encourage PIs to include budget items for supporting broader impacts activities.

Recommendation:
The "Scribe" function was implemented in the fiscal years of this review process and was looked upon positively by the COV. The panel noted however that low priority proposal panel summaries were not very substantive and informative for the PI. The High Priority proposals had more constructive feedback. The panel summaries for low priority proposals need to be crafted to provide better guidance for the PIs. Perhaps a summarized version of the review analysis could be sent back to the PI because they are were exceptional and gave excellent insight for the funding decision judgment. Scribes should be instructed on these points to improve panel summaries to be more prescriptive.

The Division agrees with the COV recommendation and will encourage panelists and program analysts to provide constructive feedback on proposals regardless of panel ratings. The recommendation to include parts of review analysis was discussed above.

Standardization of Review Analysis*: In assessing the programs use of merit review- the Self Study was truly an essential and exceptional document for the COV. In the individual e-jackets, the Review Analysis was a truly essential document to assess the rationale for the award decision. It is the one place that all the information is summarized and the rationale for the funding decision is made. We did however find a wide discrepancy in the format of the Review Analysis used by PDs and the level of details summarized therein. We feel it would be helpful to tighten up the format for the Review Analysis report to enable NSF DD and CoV members to more readily compare between panel decisions and funding outcomes.*

[2] Many recommendations in the body of the COV report were incorporated in the major recommendations in the executive summary. They are not included here.

The Division agrees with the COV suggestion to have a template for review analysis. It will incorporate parts of the suggested review analysis template in its revision of the Division template provided to the program directors.

Recommendations for future COVs documents:
1. Organization of e-jacket list: Organizing excel list of e-Jacket list into Grant types (e.g. CAREER, ARRA, etc) would be helpful.

2. Funding Decisions: Identify list of proposals where PD funding decisions deviate from panel recommendations.

3. Renewal Applications: It would be nice to have statistics on renewal application funding frequencies.

4. Reviewer Stats: Since NSF collects so much information on reviewers, would it be possible to obtain statistics on the reviews as a function of gender, PUI vs. research PI, under-represented minority, etc -- return frequency, score, etc.

The Division agrees with the recommendation and will incorporate these suggestions in the next COV preparation.

A.2

Lack of sufficient demographic data. The small fraction of reviewers returning demographic information is troubling. Perhaps MCB could provide a brief statement to reviewers, reminding reviewers of the NSF's congressional mandate to support scientific research across the entire country. Therefore, while submission of demographic information is voluntary, it is very helpful to the NSF in insuring the fulfillment of its congressional mandate.

The revised review request letter will contain the importance of demographic data.

Question about gender bias in reviewer selection. It is difficult to determine with the given information whether reviewers are balanced across all proposer demographic groups. For example, ideally, the distribution of male and female reviewers should be overall the same for proposals written by males as for proposals written by females. Examination of a small sample of jackets suggests that this may be the case, but the sample is too small to determine with certainty. It would be helpful to have some data about this.

Please continue to improve diversity of reviewer pool. There is a need to continue to be vigilant to improve representation of women and minorities in the reviewer pool. We also note particularly low representation of reviewers from Master's institutions.

The Division will continue to improve the reviewer diversity and provide the recommended data to the next COV.

A.3

According to Table 21 of the Self-Study, roughly 25% of overall proposals and supplement requests were granted annually during the review period. This reflects a fairly high success rate for applicants, especially compared to most divisions of NIH. Notably, virtually all supplement requests were awarded. Proposals require a detailed description of the way in which teaching is integral to the proposed research project. While this encourages investigators to create a teaching plan, it also can force them to extend themselves in ways that may not be most beneficial to the project and/or mentoring goals. The CoV noted that both the simple exposure of students to research experiences, and more elaborate efforts in community outreach, could be appropriate mechanisms of incorporating education into research projects.

Also, the number of RUI proposals was markedly lower in FY2010 compared to the previous two years (45 vs. 70+), yet the same number of awards was granted. It will be worth following these numbers in future years to determine whether this is a temporary aberration or whether there are issues with access, program guidance, etc.

The Division agrees with COV's concern about declined RUI proposals and will monitor them in the future. The Division also plans to organize a specific outreach event for RUI and MSI PIs and potential PIs from undergraduate institutions and MSIs.

As detailed in Fig. 8 of the Self-study, the geographical distribution of awards for the past three years has been relatively constant and it is fairly broad. However, it should be noted, that some states like North Dakota and West Virginia did not receive any awards during that period. Overall, it appears that the most populous states receive the higher number of awards (CA, NY and TX).

COV encourages PDs to visit states/universities with low representation to encourage proposal submissions.

The Division concurs with this recommendation. In summer 2011, with the help of a summer intern, the Division undertook analysis of the future outreach sites based on proposal submission and award rates from minority PIs from different states. Based on this analysis, the Division has identified several potential opportunities for the future outreach.

While at the current COV meeting, we were informed that the RIG-CAA program is going to be phased out in 2012. We were also notified that the program would be replaced with a "better" program and that there is a working group working on this issue. A recommendation was provided to the Division Directors and PDs that stakeholders from the minority research community be invited to such working groups. It may also be a good idea to invite Program Directors from the NIGMS MORE Division (Drs. Zlotnik, Rivera-Rentas, and Drew for example) to participate in such discussions and provide input as they have experience with targeted grant mechanisms (SCORE SC-1, SC-2, and SC-3).

The Division appreciates the recommendation and will implement it by establishing interactions with NIH MORE for exchanging information and experiences in the broadening participation efforts at two agencies. MCB has already obtained input from stakeholders in a workshop organized by the Minority Affairs Committee of ASBMB.

A.4

Recommendations:
(1) NSF should focus on getting PARs functions incorporated into the eJacket environment or find a way for PARs to communicate with eJacket.

(2) MCB and the BIO directorate should continue its excellent progress in improving the morale and working environment of its administrative staff and PDs. There has been remarkable progress on this front.

(3) MCB should continue to evaluate workload of PDs and administrative staff. The 2011 COV was impressed by the relatively small number of staff, and their exceptional accomplishments.

(4) MCB should investigate if there is salary disparity for the administrative staff in MCB and in other directorates.

The Division appreciates the COV's comments and will incorporate its suggestions in future management decisions.