

# Response to Recommendations from the Committee of Visitors for the Division of Molecular and Cellular Biosciences June 11-13, 2008

## 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. The recommendations made by the COV are thoughtful and many of them are in line with changes that were already being implemented in the Division during FY2008. The Fall 2008 Division Retreat was devoted to discussion of several of the recommendations of the COV. The outcomes of the retreat are being implemented in FY2009.

The following is the BIO response to specific recommendations<sup>1</sup> made by the committee in its report.

## Recommendations and Responses

### ***Recommendation 1 Proposal Review.***

One area that the COV identified as needing improvement is the quality of reviews. The COV noted that many reviews were not substantive, especially in evaluation of broader impact. Too many of the reviews simply restated what the proposer wrote and discussed broader impact mainly in terms of intellectual merit.

The COV has two suggestions to help ad-hoc reviewers and panelists in the preparation of reviews: It believes that PDs should provide examples of substantive and not substantive reviews (for both intellectual merit and broader impact), and make these examples available for access by all reviewers (much like what was provided to the COV in the Self-Study Report). These reviews could be real or fabricated and should include explanations as to why the reviews are judged as excellent and informative or why they are not sufficiently substantive. The COV suggests a minimum of two sample reviews from each category, representing proposals judged as "excellent" and "good/fair". It also suggests that PDs contact new panelists (perhaps by phone conference) and explain the panel process and general past panel results, to help ensure that proposals entrusted to new panelists are not at any advantage or disadvantage.

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<sup>1</sup> The COV report discussed 12 recommendations in section C. The report also lists a set of recommendations in the executive summary. These two sets are largely, but not completely, overlapping. Additionally, there were some comments and recommendations made in section A. In this document, the Division has first responded to the recommendations in Section C and has added a section 'other recommendations' to discuss the recommendations that were made at other places in the report.

## **Response 1**

The Division agrees that the quality of reviews and panel summaries vary. The Division appreciates the suggestions to improve the quality of reviews and has begun to implement changes to improve these documents.

### **Panel summaries**

*In the Fall 2008 Division retreat, the Division agreed that a good panel summary:*

- *has clarity, logic, and a meaningful analysis;*
- *reflects the content of the panel discussion;*
- *justifies the basis for the overall panel rating;*
- *critically evaluates the strengths and weaknesses related to both review criteria (intellectual merit and broader impacts); and*
- *discusses outlying ad hoc reviews adequately.*

The Division staff discussed several ways in which both panel organization and panel operations could be modified to improve the quality of panel summaries. The Division agreed to continue and/or implement the following best practices with respect to the panel operations:

- The Division has developed information for all Program Directors on providing advance guidance to the panelists about the importance of panel summaries. To discuss this information, the program directors are being encouraged to have a teleconference for new panelists or to have individual calls with them before the panel meeting.
- The COV's recommendation of providing special guidance to new panelists will be incorporated into the Program Director training session about panel operations.
- During the Division Director's welcoming remarks to each panel at the beginning of their meeting, the importance of the panel summary in providing feedback to the PI is being emphasized.
- In the past few years, Science Assistants have been assigned to each panel to preview the summaries for completeness and clarity before they are finalized. The Division has intensified its efforts to provide appropriate guidance to the Science Assistants for this task.
- The Program Directors are emphasizing the importance of the panel summaries during the panel meetings and are providing information to the panelists about their responsibilities with respect to writing panel summaries, as follows:
  - The panel summary template has been revised to include brief pointers for writing a good panel summary.
  - The Division has generated a document for the panelists about how to write useful panel summaries.
  - The Program Directors will give feedback to the panelists early and often during the panel meeting.
- To help increase the transparency of the funding decision, Program Directors will be encouraged to use the 'PO Comment' mechanism to provide additional information to the PI if appropriate. For example, 'PO Comments' can be used to communicate elements of the panel discussion that were not reflected in the panel summary.

With respect to organizing panels, the MCB staff identified a variety of best practices during the Fall 2008 Division retreat. The Division staff will be encouraged to identify and implement the best practices that are most appropriate for their individual panels, beginning with the spring 2009 panels. Among the options available are:

- Extending the length of the panel meeting to allow sufficient time for writing the panel summaries

- Assign a third person (who is not reviewing the proposal) as a “scribe” to write the panel summary for that proposal. Scribes would be informed in advance, so they have an opportunity to read the proposal before the panel meeting
- Pair experienced panelists with new panelists when assigning proposals
- Provide periodic breaks during the panel meeting to write panel summaries
- Arrange the discussion schedule so that good panel summary writers are involved early in the panel meeting, so they can provide models of good summaries.

Change in the “panel culture” is likely to be gradual, but we believe that these processes will be effective in improving the quality of the panel summaries.

### **Reviews**

The Division agrees that some of the reviews are uncritical and of less value in panel discussions and in funding decisions. The solution proposed by COV is logical, but NSF policy does not allow posting of actual reviews. During the Fall 2008 Division retreat, the Division staff discussed ideas about how to achieve the goal of increasing the average quality of the reviews. Some of the options for reviewer training that will be implemented in the future are listed here:

- The Division will provide completely fabricated reviews to the panelists as examples of what is expected in their individual reviews.
- New panelists will be instructed personally about preparing individual reviews and panel operations through telephone calls. The program directors will provide feedback to panelists, particularly the new panelists, after they submit their first few reviews.
- The reviewer request letter template will be revised to increase the likelihood of generating a positive response and substantive reviews. The Division has begun to revise the reviewer request letters for various types of proposals (e.g. unsolicited research proposals, CAREER proposals, RUI proposals, etc.) and will use them consistently for all proposals in the Division.
- The program directors will strive to increase the reviewer pool, so that mail reviewers will not be overloaded with excessively high numbers of review requests.

### **C.2 Broader Impact.**

Criterion II on the broader impact of a research proposal is not well-defined and is inconsistently interpreted by both applicants and reviewers. There are two general types of broader impact of research proposals: broad scientific impact and broad societal impact. Broad scientific impact refers to how the research will enable work on scientific problems beyond the scope of the specific research plan outlined in the proposal. This would include, for example, new methods of data analysis, widely disseminated databases, seminal ideas, or technological infrastructure. Expectations for what constitutes appropriate social impact are less clear, but would generally include training of diverse students as scientists, community outreach and education, and the development of public awareness of the value of science. The COV felt that both types of broader impact are important to the mission of MCB, and that a successful proposal would generally have excellence in Criterion I and excellence in at least one, but not necessarily both, of these areas of Criterion II. Reviewers should not require proposals to excel in both kinds of “broader impact.” Both proposers and reviewers appear to be confused about this point, and it is critical and urgent to better educate both groups regarding what NSF seeks in terms of broader impact. The COV suggests that NSF make available to proposers and reviewers examples of excellent broader impact summaries from their portfolio.

Concerns were raised in cases where Criterion II is a major component of the proposal

assessment. The COV believes that measurable outcomes of such “broader impacts” must be carefully defined and evaluated during and after the funded grant period. In the case of broader impact based on community outreach and/or training programs, it may be necessary to include as a panel member an expert who can specifically address such impact. The assessment of societal impact plans should be supported by appropriate preliminary results or by the progress report of a renewal proposal.

The NSF effectively fosters collaborations and supports shared facilities in order to promote the best possible research. Likewise, the agency can and should play a prominent role in helping PIs make connections that will allow them to achieve effective education and outreach, where appropriate. For example, MCB could provide contact information regarding NSF-funded educational programs with which MCB-funded investigators might establish connections to enhance their broader impact activities.

In addition to considering the potential broad impact of research grant proposals, NSF should particularly encourage proactive community outreach and/or public education for institutional type grants, such as MRI and training grants

## **Response 2**

The Division concurs with the COV’s concern about the lack of clear definition of measurable outcomes of broader impacts in most proposals received by the Division. In the Fall 2008 Division retreat, the scientific and administrative staff in the Division discussed the expectations from the PI and the reviewers about the broader impacts in the proposal.

The Division staff agreed that:

- The broader impacts in the MCB proposals should be integrated in the research proposed by the PI. The broader impacts activities should not be ‘outsourced’.
- The broader impacts activities should affect people other than the PI (and coPIs).
- The Division should not be prescriptive by specifying the type of activities favored by the Division. This will allow PIs to be creative in designing and proposing the broader impacts activities.
- The broader impacts activities should demonstrate the same level of rigor and accountability as the research activities.
- Criteria for determining whether the broader impacts activities are successful should be determined by the PI and then addressed in annual reports and in the Results from Prior Support in renewals and other subsequent proposal submissions.

To provide information to PIs, reviewers, and panelists, the following actions will be implemented.

- The Division will continue to provide the NSF document giving examples of various broader impacts activities to the panelists.
- The annual report reminders and award letters will be modified to alert the PIs that they need to include outcomes of broader impacts activities in the reports.
  - When evaluating reports, the program directors will compare the results with what was proposed in the original proposal.
- The instructions to the panelists will emphasize the diversity of broader impacts.
- The Directorate for Biological Sciences is planning to add to its website additional information about broader impacts and examples of funded projects with successful broader impacts activities.

During FY2009, the Division plans to systematically study the broader impacts activities in the Division's portfolio of awards. Salient conclusions of this study will be made available to the panelists once the study is completed.

The COV has recommended that 'MCB could provide contact information regarding NSF-funded educational programs with which MCB-funded investigators might establish connections to enhance their broader impact activities'. The Division agrees with this recommendation and will include this information in the Division web page. The COV recommendation about helping PIs to make connections could also be served by the newly introduced Research Coordination Networks – Undergraduate Biology Education (RCN-UBE) (<http://www.nsf.gov/pubs/2008/nsf08035/nsf08035.jsp>).

The COV recommendation about institutional-type grants is already being implemented by NSF through the presentations about these opportunities in the NSF outreach days, workshops and the QEM (Quality Education for Minorities) workshops for the specific NSF-wide programs like MRI.

### ***Recommendation 3 Enhancing Innovative/Transformative Research.***

The COV commends NSF for changing the terminology of "high risk" to "innovative/transformative" research. The COV believes that every proposal should address what, if anything, is innovative or transformative about the science and that reviewers should be asked to comment on this specific aspect of proposals. One mechanism for this would be to add this query to both the application form and the review template.

To further stimulate highly innovative/transformative project applications (other than SGERs), the COV suggests the use of a separate panel to review a collection of such proposals. This may encourage PIs to propose innovative/transformative research knowing that the panel will be evaluating only proposals in this category. Where the research is time-critical, the current mechanism of SGER review should be retained.

MCB should communicate to investigators, by whatever means are most effective (Dear Colleague letters; at meetings; on the web site), their strong interest in receiving such proposals, and they should publicize the fact that in recent years these proposals have, on average, achieved a higher rate of funding than less innovative proposals.

### **Response 3**

From January 2008, NSF has modified the Intellectual Merit review criterion to include the following: 'To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts?' This change should address the COV recommendation that the reviewers should be asked to comment on the potential of a proposed project to be transformative.

The Division disagrees with the COV recommendation that a separate panel be used to review transformative projects.

- The transformative projects that were included as examples and in the statistics provided in the self-study were identified by the panels. Thus MCB believes that the current panels are capable of identifying transformative projects.

- A separate panel would require prior identification of potentially transformative projects by either the PIs or the program directors. As described in the IPAMM report (provided to the COV), approximately 30% of PIs believe that 50% or more of their proposals contain potentially transformative research concepts. If PIs were asked to pre-identify potentially transformative projects, they would identify large numbers of proposals which would require multiple dedicated panels. Identification of transformative proposals by the program directors before peer review would not be a prudent option.

The Division agrees with the recommendation that MCB should emphasize their willingness to consider and fund potentially transformative projects. The recently revised Division description on the web includes this information. In addition, outreach presentations by the Division staff emphasize MCB's willingness to receive and fund potentially transformative research.

#### ***Recommendation 4 Support for Early Career Stage Investigators.***

One of the key missions of MCB is to foster new scientific initiatives. In this regard, MCB makes an important and valuable impact by supporting early career investigators by nurturing the creation of new laboratories involved in high quality basic research. Support of early career investigators has seeded important new areas of science, and helped in the development of new techniques and basic fundamental research that have provided the groundwork for some of the top research laboratories in the nation.

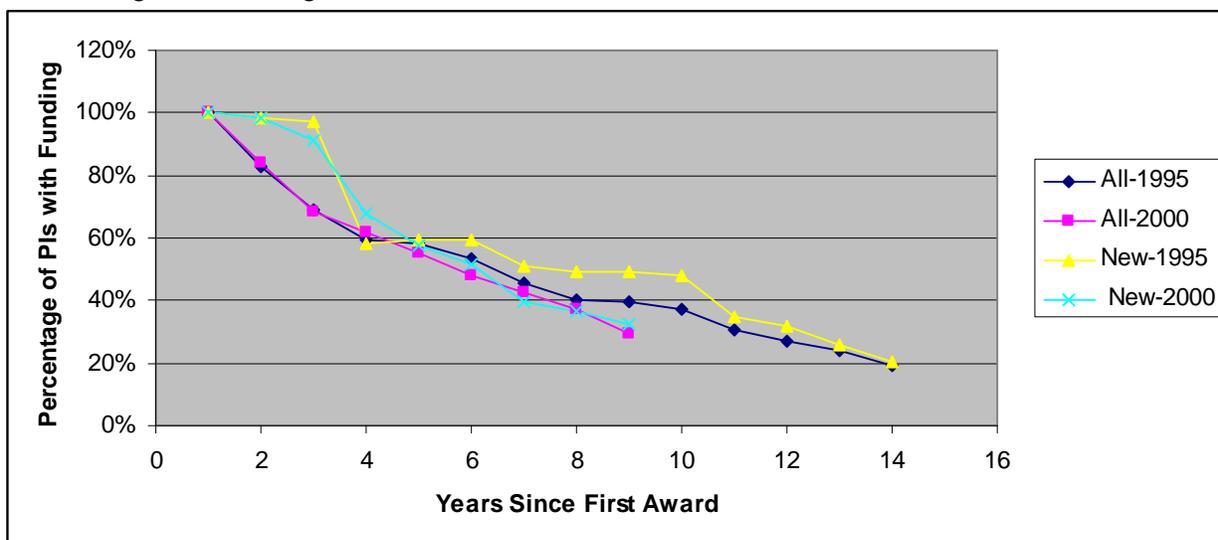
Historically (including the period 2005-2007), MCB has done an outstanding job in supporting PIs early in their careers by devoting a substantial portion of their portfolio to the first awards granted to these individuals. While the funding rates for early stage investigators obtaining their first awards appear to be good relative to other priorities, it is critical that support of early stage researchers continue to be a major component of the MCB portfolio, and that the success of this early stage research support by NSF be made known to the scientific community.

Concerns were raised that many early career stage PIs who are doing good work still fail to succeed in attracting subsequent NSF funding. Approximately 60% of new investigators, which includes a large proportion of early career investigators, failed to obtain subsequent NSF funding. However, the COV recognized that an unknown number of these investigators obtained funding from other sources. To optimize success rates of these burgeoning laboratories and projects, the COV suggests that funding for early career investigators should generally be for three years, with an option for supplementary funding at 50% of the annual award rate for the 4<sup>th</sup> year, to provide a bridge for PIs who are close to, but not quite ready, to apply for renewals.

#### **Response 4**

The Division appreciates the COV's comment that 'MCB has done an outstanding job in supporting PIs early in their careers'. MCB program directors emphasize support for early career investigators in their portfolios and include this information in their outreach visits. Given the prevailing view about the difficulties facing early career investigators (which are based largely on NIH funding rates), additional efforts can be made to provide statistical data on NSF funding rates and portfolio representation of early career investigators during outreach visits. The Division also appreciates the COV's concern about the ability of early career investigators to sustain their funding. The Program Directors pay close attention to the fate of renewal proposals, and factor this into the development of a balanced award portfolio.

The COV's recommendations to optimize the funding rates of beginning investigators is based on the observation that only ~40% of these investigators sustain funding beyond three years, which led to an assumption that these investigators are at a greater disadvantage in continuing their research support from NSF than PIs in general. However, the data presented to the COV in the self-study did not account for the possibility that some of these PIs did not submit renewal applications to NSF. Further, the data in the self-study focused only on beginning investigators, and did not compare trends for this group to trends for all PIs. To determine if the COV's concerns that this group of investigators was at a greater disadvantage were valid, MCB collected additional data with the help of the Division of Information Systems. The data presented in the figure below show that approximately 60% of beginning MCB PIs who submit a subsequent proposal to NSF sustain funding beyond the first three years, and that they are as successful in continuing their NSF funding as all PIs supported by MCB. The initial difference in the slopes is due to the fact that a larger fraction of new PIs (as compared to all PIs) were funded for three or more years (many of the new PIs receive CAREER grants, which have a five year duration). From 4-8 years after the first grant, both cohorts showed similar success in maintaining NSF funding.



**Continuation of funding for all MCB PIs and new MCB PIs from 1995 and 2000** The graph displays funding information on new PIs who received their first NSF award in either 1995 or 2000, excluding those who did not submit a subsequent proposal. The cohort dropped from 90 to 69 in 1995 and from 96 to 68 in 2000. As a control, the graph also displays funding data for all PIs who received an award in either 1995 or 2000, regardless of whether they were new or not. PIs who did not submit a subsequent proposal were excluded from this analysis as well. Both sets of data include PIs only (not coPIs). The data extends only until 2009.

Thus, the Division believes that the Program Directors are currently doing everything they can to optimize the success of beginning investigators. The COV's recommendation to provide an additional year of funding at 50% of the annual amount as a supplement is problematic, as it is not allowed under current NSF policy, which states that 'in unusual circumstances, small amounts of supplemental funding and up to six months of additional support may be requested to assure adequate completion of the original scope of work.' However, the Division does not believe that it is necessary to implement this recommendation in any case. The Program Directors already have the capacity within existing policy to either supplement a current award or provide bridge funding through a new award when a renewal proposal is declined, and they exercise these options judiciously when necessary. The COV's recommendation to limit award durations to three years for early career investigators is not feasible, as a significant number of beginning PIs supported by MCB are CAREER awardees and thus receive 5-year funding as a

requirement of that program. Furthermore, MCB does not believe that setting a limit on award duration is advisable in general. The Division focuses instead on providing enabling grants whose duration and award size corresponds with the scope of the project, irrespective of whether the PI is a beginning investigator or an experienced one.

***Recommendation 5 Portfolio Enhancement.***

MCB should also promote new and innovative science by the best researchers in the nation. These researchers have already demonstrated their abilities and have sufficient infrastructure in place to complete challenging projects. Eminent researchers should be actively recruited by MCB to apply for NSF grants, particularly for support of transformative and innovative ideas in basic biological research that cannot be funded by other agencies. This would ensure that investments in transformative and innovative research projects are made with a high likelihood of success, and actively involve researchers who are not currently contributing to the legacy of the NSF.

**Response 5**

The Division disagrees with this recommendation for several reasons. First, the Division receives, reviews, and supports unsolicited proposals from anyone that is eligible to apply to NSF. Specifically inviting particular individuals to apply to MCB because of their status in the community is inappropriate, as it could raise an unreasonable expectation about the likelihood of funding, and create a perception of unfairness for the rest of the scientific community. The Division also strongly believes that transformative innovative research is conducted by diverse types of PIs including beginning investigators as well as prominent researchers. Finally, this recommendation is predicated on an assumption that MCB does not currently support many eminent scientists. In reality, without any targeted 'outreach' to prominent researchers, the Division's portfolio already has a significant number of prominent researchers. Among the 2005-2007 awardees of the Division (total number 808), 11% are considered prominent researchers (equivalent to members of the National Academy of Sciences) by the MCB program directors.

***Recommendation 6 Support for Discovery-Based Research.***

The COV concurs that, in addition to hypothesis-driven research, discovery-based research provides substantial benefit to the scientific community and often leads to the emergence of new fields of study and baseline data for hypothesis-driven investigations. The COV commends current efforts to balance PD portfolios with both innovative/transformative proposals as well as discovery-based research, which are often intertwined. The COV applauds MCB for recognizing the value of discovery-based research and hopes that PDs will not only continue to emphasize the importance of such studies during panel review, but also will include panelists equipped to evaluate proposals that have a discovery-based component or emphasis. The COV further suggests that MCB enhance its efforts to: (i) inform the community that NSF welcomes innovative discovery-based research and, (ii) help the applicant-PI to identify the most suitable panel for his/her proposal. Because discovery-based proposals must be evaluated using review criteria that differ significantly from those used in reviewing hypothesis-driven proposals, the COV recommends that specific guidance be provided (e.g., in the review instructions) to panel members and ad-hoc reviewers to ensure appropriate and consistent reviews for discovery-based research proposals.

**Response 6**

The Division agrees with the recommendation and will implement the following actions:

- The web-based descriptions of the Division and its clusters will be modified to inform the community about Division's willingness to receive and support discovery-based research and about the cluster most appropriate for their research.
- The instructions to the panelists will be modified to ensure that discovery-based research is reviewed consistently, and to emphasize that discovery-based research is a valuable part of the MCB portfolio.

### ***C.7 Transition of Successful Focus Programs.***

MCB does an excellent job soliciting proposals for special projects, such as MO/MIP, that nurture emerging fields and support innovative and transformative science. However, the COV is concerned that some successful solicited programs are not easily "mainstreamed" because they do not fit into core portfolios for various reasons, including, but not limited to (i) a discovery-based, rather than hypothesis-driven emphasis; (ii) experimental work that requires resources larger than the standard budget; (iii) the absence of a PD or panel members with the appropriate expertise. Moreover, "taxon-neutral" funding can disadvantage the study of emerging and new model systems that have yet to develop the tools available in classic systems, such as genetics, biochemistry, and genomics.

The COV recommends that MCB develop specific transition plans for such initiatives that do not easily transfer into its core programs. If the choice of the transition plan is to "mainstream" a successful focus program, four key elements should be considered: (i) provide core programs with sufficient funds that are specifically designated for the subject of the transferred focused program (e.g., in the case of MO/MIP, for microbial biology); (ii) enlist PDs with expertise in the focused program area; (iii) include specialists from the focused area on review panels; (iv) alert the community of the evolution of these programs by disseminating letters of solicitation for proposals in the focused area and by helping PIs to identify the appropriate cluster for their proposals.

With regard to the MO/MIP program, the COV was very impressed by its exemplary success, where advances have been made that broadly impact the life sciences (genomics, molecular biology, structural biology, biogeochemistry, biophysics, cell biology, computational biology, community ecology, biotechnology). The MO/MIP program put NSF at the forefront of science linking several levels of organization, from the genome and cell to complex communities that influence planetary mechanisms and global climate change, and spawned novel fields of study (e.g., metagenomics and community profiling). In addition to scientific merit, many MO/MIP projects have exceptionally strong broader impacts, particularly in community outreach, international collaborations, and minority science education.

Given this success, we are very concerned that MCB is considering "phasing out" MO/MIP as an independent program. The COV recommends that a concrete plan be developed that specifically addresses how MO/MIP will be incorporated into core programs without jeopardizing the science. We suggest that this plan should include the four key elements above to ensure not only the survival but also the enhancement of fields currently supported by MO/MIP.

### **Response 7**

The Division appreciates the COV's recognition of the high quality of the research funded through the MO/MIP program. The Directorate and Division have recognized the general problem of mainstreaming past focus areas into the core programs. Therefore, the Directorate has been developing plans proactively to allow the smooth transition of two focused programs: MO/MIP and Arabidopsis 2010. Both programs represent research areas that are spread throughout all four divisions in the Directorate. These plans already incorporate the

recommendations made by COV. Specifically, the budgets of core programs that absorb a disproportionate number of proposals from MO/MIP or Arabidopsis 2010 will be augmented, emphasis will be placed on recruiting Program Directors with appropriate expertise in microbial and plant biology, and the community will be kept informed through Dear Colleague communications. Within MCB, there has historically been a critical mass of Program Directors with expertise in, and appreciation of, microbial and plant biology; this will be maintained during recruitment of rotating Program Directors. In addition, during the Fall 2008 Division retreat, the staff identified several additional ways to facilitate the integration of focused programs into the core, including:

- Revision of cluster descriptions expanding the boundaries to incorporate the research areas included in these focused programs;
- Inclusion of panelists with expertise in the relevant areas in the transitioning program in the core panels; and
- Active outreach by the Program Directors in informing the PIs funded through the transitioning programs about the MCB clusters and their portfolios.

#### ***Recommendation 8 Tracking of trainees.***

A specific recommendation by the previous COV was to improve tracking of the research training activities of NSF-funded projects. In particular, there has been a historical lack of tracking of REU undergraduate trainees. As mentioned in the response to this recommendation, "...the NSF report system does not deposit information submitted by the PIs in a searchable database." The response also mentions that "NSF is currently developing a new reporting system to evaluate the impacts of training. However, this system is not yet fully functional." A report of total number of trainees per year was provided by the MCB, but this report was not deemed sufficiently detailed to allow for an in-depth analysis of participant gender and ethnicity or the impact of their training (continuation in the Ph.D./scientific pipeline). The COV recommends that the NSF find a means of tracking their former trainees by a procedure that is designed to be of low burden to PI and trainee. One possibility is that the NSF could annually ask PIs for email addresses of all current trainees and to feed this information into an address list for an annual survey of the trainees in which they are asked simply to reply to confirm or change their current email address and job/student status. This process could be programmed to run automatically to periodically update an NSF-or MCB-maintained database. The request of a limited response should increase compliance because it requires little time of the responder and keeps email addresses updated. A bounce of an email from this mailing could trigger an email request to the PI for an update in contact information for the trainee, if available. The MCB could occasionally use this maintained list of email addresses of former trainees to gather more detailed information relevant to its mission.

#### **Response 8**

MCB agrees with the COV that tracking of training is an important outcome indicator that should be captured. This is an issue that is important to the NSF as a whole, and is being addressed at that level. To date, budgetary limitations had prevented NSF from aggressively changing the reporting system to allow mining of this information. However, a new reporting system is currently being developed that will potentially address the problem. In addition, in response to the America Competes Act, NSF is developing new policies related to the final report, which will require the PI to prepare a public report on the outcomes of the award. Meanwhile, the Division plans to invest efforts in obtaining representative statistics for assessing the effectiveness of training activities in the grants as a part of its study of the broader impacts portfolio presented in its awards.

MCB cannot implement the COV recommendation to ask the PIs about the trainee information. The Paperwork Reduction Act contains specific standards that must be met before agencies can collect information from the public, to prevent imposing an undue burden on them. The COV's recommendation involves surveying both the PIs for contact information on all trainees, and then surveying the trainees on their status. Although the burden on the trainees may be minimal, the burden on the PIs to provide accurate contact information could be significant. Additionally, this activity will add substantially to the workload to the Division's staff. Finally, this activity would unnecessarily duplicate the work of NSF's Division of Scientific Resources and Surveys, which conducts regular surveys to examine the status of the scientific workforce in the US.

### **C.9 New Scientific Opportunities.**

The COV is impressed with the breadth of research areas supported by MCB. It recommends, in addition, that the following emerging research areas be given serious consideration as having the potential for producing innovative, transformative knowledge and technology.

- Systems/network biology
- Metagenomics
- Synthetic biology at the molecular/cellular level
- Protein disorder and RNA structural plasticity in the control of biological functions
- Microbial mediated processes from cellular to community to global scales
- Epigenetics in eukaryotes, archaea, and bacteria
- Exploiting unusual or novel model systems
- Molecular processes in a crowded cellular environment
- Continuing the emphasis on developing cutting-edge technology (e.g., subcellular imaging)

The COV also commends MCB for fostering the study of intrinsically unfolded proteins. MCB is now poised to support studies of the roles of intrinsically disordered proteins in systems/network biology.

### **Response 9**

The Division thanks the COV for recognizing its success in supporting the leading edges in the molecular and cellular biosciences, and appreciates that the COV provided its view of the emerging areas of science. All of these areas are already represented in the cluster portfolios in the Division; MCB will continue to emphasize these areas in its award portfolio. The Division will also track the proposals and awards in these areas in the future years to monitor the potential increase in the number of proposals in these areas.

In the Fall 2008 Division retreat, the staff discussed the potential leading edges for emphasizing in the future MCB investments. The Division agreed that the development and exploitation of new technologies to facilitate research focused on understanding the molecular underpinnings of complex biological systems should be a priority for the division. The staff recognized the following two types of technologies of particular importance for the community supported by the Division.

- Specific molecular tools to understand the living cell
- New technologies that support visualization and tracking of biological processes from the function of macromolecular machines to function of cellular systems

In addition, the staff identified the following research areas for the future emphasis in the Division.

- Underlying principles of molecular networks in biology
- Discovering the role of molecular and cellular dynamics in life processes
- Understanding molecular and cellular basis of life through synthetic biology

To communicate the Division's emphasis on the above areas, the Division will revise the cluster descriptions to highlight the newly identified emerging areas of research

#### ***C.10 Mechanisms the Division Should Use to Identify Priority Areas in MCB.***

In addition to the current methods, which the COV agrees have been very effective, it encourages PDs attending, supporting, and organizing workshops on new and transformative ideas. Likewise, they should be encouraged to continue attending cutting edge meetings (such as Gordon Conferences), and the Directorate should ensure that the PDs have sufficient time for such activities.

#### **Response 10**

The Division agrees with this recommendation and will implement it in the future years by continuing to support the travel of Program Directors to conferences and workshops and by encouraging the Program Directors to facilitate organization of workshops in the emerging areas.

#### ***C.11 Effective Approaches for Fostering Interdisciplinary and Integrative Research in MCB.***

To encourage applications for these types of projects, PDs may find it helpful to be more proactive by identifying potential collaborative investigators within their portfolio and encouraging them to develop interdisciplinary areas. One useful way of bringing together diverse individuals together is to fund workshops that foster interdisciplinary research interactions.

The COV also feels that an important component is the training of more scientists whose knowledge bridges multiple areas of research. While the IGERT program is one good model of training, the COV recommends that MCB invest in a new postdoctoral program, where top postdoctoral scientists who have identified mentors in at least two different research domains would be eligible to apply.

#### **Response 11**

MCB agrees with the recommendation to support interdisciplinary workshops. The Division will encourage the Program Directors to facilitate organization of workshops in the interdisciplinary frontiers. In addition, the Program Directors will be encouraged to organize meetings of PIs that are supported by MCB in emerging areas of research.

MCB appreciates the idea of interdisciplinary post-doctoral fellows, but cannot implement it in the Division. Post-doctoral fellowships in biological sciences are administered through the Division of Biological Infrastructure as part of a BIO-wide activity. BIO has recently constituted a working group to determine if there are new opportunities for post-doctoral fellowships that would enrich the biological sciences broadly. This COV recommendation will be communicated to that working group.

#### ***C.12 Improving the COV Review Process, Format and Report Template.***

The COV recommends that the chair of the COV be chosen from a recent COV. COV members who are local but who live more than one hour from Ballston, should be reimbursed for staying in the Ballston area because of the lengthy agenda. The COV suggests that, in the future, materials be made available as far in advance of the meeting as possible and that more guidance be provided about which documents to read before the meeting. The COV suggests that a few key documents be provided several weeks in advance: the previous COV report and responses, the self-study report, the IPAMM report, the charge to the committee, and the membership list. Also, suggestions on the most critical aspects of the e-Jackets to evaluate should be provided.

It is also suggested that future COVs include members from the previous committee who are available to consult with the chair prior to the meeting. The chair should also be given other recent COV reports prior to the meeting.

### **Response 1**

The Division agrees with the recommendation that the chair of the COV be chosen from a recent COV and will attempt to implement it in the next COV. The Division also agrees with the suggestion that the membership of future COVs include some representatives from past COVs, which was in fact the case for the current COV. Key information about the COV members (expertise, previous service, etc.) will be communicated to the COV in advance. However, MCB cannot implement the COV's recommendation with respect to providing full per diem reimbursement for local COV members, because the per diem rules are beyond the control of the Division and Directorate.

With respect to the various materials that are provided to the COV, MCB will make every effort to provide the background materials as far in advance as possible, as was done with this COV. The Division will also provide guidelines about the importance of these materials in writing the report. The reports of other COVs are publicly available on the web; the Division will make sure that this information is provided to the next COV.

To address these recommendations and others described in the COV report about the improvements in the COV process, the Directorate will develop a handbook for the future COV chairs (and members) about preparing for the COV meeting.

## Response to Other Recommendations and Comments

The COV report contains several recommendations and comments in addition to the ones that are included in section C, which was expected to contain all COV recommendations. These additional comments are listed here along with the Division's responses.

### Page 2

**10. Maintaining Open Lines of Communication.** Effective communication between organizational levels is critical to the continued success of MCB. Although communication between PDs and MCB upper-level administrators has recently improved, communication continues to be problematic at other levels.

### Response

The Directorate has adopted many practices recently to increase communication between the Assistant Director and Division staff.

- In the past year, the AD has begun to meet on a quarterly basis with the Divisions in their regular staff meetings;
- The AD and the OAD staff in his office are open to communication by e-mail, informal visits, and formal scheduled visits. The Division staff have used all of these methods to communicate scientific and administrative issues to the AD in the past.
- In the past year, the AD has given NSF-wide and BIO-wide presentations to communicate future scientific priorities in BIO as well as vision for the BIO's future.
- There are BIO-wide social events, such as receptions and open-houses, when the AD and staff in the AD office are available to meet with the Division staff on an informal basis.
- New lines of communication have been established between the Administrative staff in the Divisions and the Office of the AD through the Administrative Functions Study pilot.

### Page 2

**11. Administrative Staff.** The COV felt that there were significant morale problems among support staff, who feel that their talents were not being fully utilized by the scientific and supervisory staff. The COV urges MCB to address these problems to enhance productivity at all levels.

### Response

When the leadership of the Division changed at the beginning of FY2008, it recognized that improving the morale in the Division was essential for improving the Division's performance. Therefore, many measures were undertaken and will be continued in the future.

*Challenging and satisfying tasks-* Many routine tasks may lead to the administrative staff feeling that their talents are not being used, yet these tasks must be completed for seamless function of the Division. The Division has begun to undertake analytical projects about the performance of clusters (e.g. portfolio analyses, broader impacts analyses, etc.); these projects provide challenging opportunities to the administrative staff for expanding their skill sets. The Division has also begun to provide organizational and leadership opportunities to the staff. In the future, the leadership will continue to ensure that these opportunities are available to all staff fairly and equitably.

*Training opportunities-* The Division will continue to encourage administrative and scientific staff to participate in the professional development opportunities such as training courses, travel to meetings, and details in other positions. During FY2008, all administrative staff members took advantage of these opportunities.

*Recognition of special activities-* Throughout FY2008, administrative and scientific staff were recognized on numerous occasions for the special acts that demonstrated their commitment to the function of the Division through certificates of appreciation, special act or incentive awards, and time-off awards.

*Social events and team activities-* To build team spirit in the Division, many strategies were used, including social events, retreats, etc.

In the Fall 2008 Division retreat, the administrative staff led the discussion on improving communication and other topics. With a substantial turnover of the visiting Program Directors in the Division, effective communication among staff was considered the most challenging issue. The Division agreed to implement the following actions to improve staff communication and productivity:

- Develop a timeline for each cycle. This will help everyone to understand the workflow, and how each person's work impacts the overall flow.
- Develop a single-page sheet of 'who does what'.
- Have regular cluster meetings to improve communication and clarify expectations among the staff in each cluster.

*Page 3 (Question A1.1: Are the review methods (for example, panel, ad hoc, site visits) appropriate?)*

**Comments:** Panels meeting less frequently should be evaluated to see if two per year is more appropriate.

### **Response**

From FY2008, there are two target dates for all disciplinary panels managed in the Division.

*Page 3*

*Question A1.2: Are both merit review criteria addressed (a) In individual reviews? (b) In panel summaries? (c) In Program Officer review analyses?*

**Comments:** Level of detail varied and transposition from proposal to review to panel summary to PD summary was not always accurate.

### **Response**

The source of information and the purpose of reviews, panel summaries, and review analysis by program director are different.

- Review represents critique of the proposal by an individual.
- Panel summary elucidates the summary of the discussion in the panel meeting, giving the basis of the panel rating. It is not meant to be the summary of the reviews.
- Program director's review analysis synthesizes all of the input, examines the reviews for consistency and fairness, identifies which issues are most critical, and provides justification for program recommendation.

*Page 4*

*Question A1.6: Does the documentation to PI provide the rationale for the award/decline decision?*

**Comments:** When the PD makes a decision that is not consistent with the reviews/panel summary, it is not clear how this is communicated to the PI.

### **Response**

When the rationale for decision is not clear from the panel summary and rating in reference to the context statement, the program director generally adds a PO comment, which is available to the PI along with the reviews, panel summary and context statement. This practice will be continued in the future.

*Page 5*

*Question A2.1. Did the program make use of reviewers having appropriate expertise and/or qualifications?*

**Comments:** The COV was concerned that some international reviewers were used when experts in this country might have been available. Differences in the review process in foreign countries could affect the outcome. This could be improved by providing more explicit instructions and examples to all reviewers, particularly foreign reviewers.

**Response**

The Division disagrees with the panel's concern about the use of international reviewers. The community of science is international and the expertise for evaluating proposals is available all over the world. To alleviate the differences in the review standards in different cultures, information is provided to all reviewers and the reviews are available to the panel, which can comment on any inconsistencies in the reviews. The program director examines all reviews for consistency and fairness.

When requesting ad hoc reviews, the program directors consider many factors, such as the reviewer history in responding to review requests, COIs, and the other review requests pending with the reviewer. Consequently, some reviewers are not used for a given proposal. This limitation, combined with the NSF's goal of expanding our reviewer pool, requires that the program director use qualified reviewers from all over the world.

*Page 7*

*Question A3.4. Does the program portfolio have an appropriate balance of innovative/potentially transformative projects?*

**Comments:** The COV noticed a decrease in the number of awards given to research projects considered "innovative/transformative".

**Response**

MCB agrees with the COV's observation and will investigate the reasons to ensure that this single point does not represent a trend. One trivial explanation for the smaller number of high risk high impact projects in FY2006 could be due to errors and/or omissions when coding proposals that are considered high-risk high impact by the panel. In the future, the Division will be diligent in coding proposals accurately.

*Page 7*

*Question A3.7. Does the program portfolio have an appropriate balance of awards to new investigators?*

**Comments:** NSF is to be commended for being an incubator for new investigators and new areas of research. However, the COV notes in Table 25 of the Self-Study report that the funding rate was lower for new investigators than for "all investigator types". It recommends that the "new" investigator category should be redefined as early career investigators and that NSF should proactively support this group of investigators.

**Response**

The Division cannot redefine the new investigator category as recommended by the COV. This category is defined by NSF and the data are collected in the NSF Enterprise Information System based on this definition.

*Page 8*

*Question A3.9*

*Does the program portfolio have an appropriate balance of institutional types?*

**Comments:** The COV notes that the proportion of awards to Baccalaureate/Master's level colleges is decreasing and hopes that this is not a trend, since these funds support good research and good educational opportunities.

The COV also commends the outreach of MCB to Native-serving Institutions

Response

The Division will monitor the award portfolios in the subsequent years and will take action if the proportion of awards to PUIs continues to decrease.

*Page 8*

*Question A3.11*

*Does the program portfolio have appropriate participation of underrepresented groups?*

**Comments:** The COV noted that in 2007, the Cellular cluster received more applications and funded a far lower percentage of RIG-CAA awards than the other clusters. The COV recommends that the PD determine if a trend is developing (poor reviews, poor grantsmanship, etc) and report these findings to the next COV.

Response

The Division will continue to monitor the RIG CAA proposals and awards in all clusters in the future years. The decreases in funding rates will be evaluated carefully to determine their causes.

*Page 9*

*Question A4.1*

*Management of the program*

**Comments:** The COV heard from staff and scientific officers that communications within MCB and BIO have improved since the last COV report, but the workload continues to increase for both PDs and administrative staff. Much of this problem has arisen from shifting responsibilities for managing electronic resources from administrative staff to PDs. Both groups felt that this is not the best use of their time.

The staff identified persistent limitations in computer program capabilities and low priorities of addressing them as adding significantly to their workload. The priorities for fixing these problems were perceived as being low due to budget limitations. There also appears to be significant morale problems among the support staff, including the feeling that there is a lack of respect from the scientific and managerial staff for their talents and dedication to the MCB mission, and that their input into decisions that affect their working lives is not valued. Staff should be allowed to participate in training opportunities to enhance their job effectiveness and career development. We recommend that an independent evaluator be brought in to evaluate the issues and suggest reforms.

Although initially skeptical, the COV supports the idea that the Division Director (DD) be a

rotating scientist. This recommendation is based on the expectation that the Deputy Division Director (DDD) position be held by a permanent employee to ensure administrative continuity and retention of "institutional memory". Concerns were raised about whether a 3-year tenure for the DD is sufficient to implement substantive programs. While the COV is cognizant of the limitations of the IPA mechanism, the DD position should ideally have the option of a second 3-year term. The COV also suggests that different Divisions should not be on the same cycle for the rotation of DD or change of DDD.

The ratio of rotator to permanent PD during the period reviewed was considered inappropriately high. The COV agrees with the current DD and DDD that a ratio of at least 1:1 is optimal so that each rotator is paired with a permanent PD. Staffing should be at full levels at all times, and every effort should be made to eliminate gaps between outgoing and incoming rotators. These measures should significantly decrease the workloads of individual PDs. The COV was pleased to learn that the measures described here are now being implemented and commends the efforts of the current DD and DDD to develop a cache of potential future PDs.

Formal training/mentoring should also be established to get rotators up to speed as soon as possible. A standard operating procedure for each position should be established as a baseline to guide new rotators.

### **Response**

*Workload-* The Division agrees that the workload on the staff was heavy during the evaluation period. In FY2008, the new leadership of the Division aggressively recruited both administrative and scientific staff. In FY2009, the Division is expected to be staffed fully.

*Staff morale-* Response described earlier

*Rotator to permanent ratio-* The Division agrees that 1:1 ratio of permanent to rotators is ideal for maintaining a balance between institutional memory and infusion of new ideas. Three new permanent Program Directors have recently been hired in MCB, and a new recruitment for additional permanent Program Directors will be done during FY2009.

*Formal training/mentoring-* In FY2008, the division discussed, developed, and implemented a comprehensive modular staff training plan. It contains the information suggested by the COV. The Division will continue to improve training activities based on rotator feedback and use it with the future groups of rotators.