

Committee of Visitors Report on the Molecular and Cellular Biosciences Division of the BIO Directorate

Executive Summary

The Division of Molecular and Cellular Biosciences (MCB) plays a critical role in the BIO directorate, the NSF, and the scientific community by identifying and supporting outstanding research and researchers, with the goal of understanding biological processes in cellular, subcellular, and molecular detail. The Committee of Visitors (COV) found that MCB has performed at an exemplary level in pursuit of its basic mission. In particular, MCB successfully has identified outstanding research and education initiatives for support over the three years under review (2002-2004), and in formulating research portfolios that appropriately address a broad range of NSF and national objectives. MCB is clearly concerned with nurturing of “high risk/high payoff” and emerging research areas, encouraging multidisciplinary research, developing young investigators, supporting research at undergraduate institutions, incorporating underrepresented groups in science, and improving the research enterprise across the United States. In addition to their direct impact, the results of MCB funded research have provided the basic biological knowledge and tools necessary for future efforts by other research enterprises and by industry. However, challenges remain.

The most important challenge facing MCB is continuing to improve the level of excellence achieved in support of scientific research and education. At present, only a small, and declining, percentage of proposals judged to be outstanding or highly meritorious can be supported by MCB. At the same time, and partially as a consequence of the low success rate, the number of proposals being submitted to MCB is steadily increasing. The confluence of these, and other trends discussed in the body of the COV report, threatens the ability of MCB to complete its mission, with consequent impairment of NSF and national priorities. The obvious, and only sustainable, solution is that additional resources are necessary both to support a greater number of highly meritorious research and education proposals and to expand MCB staff to meet the increased workload.

Nonetheless, within current budgetary restrictions, the COV identified major issues that require careful scrutiny by MCB staff and administration.

- (1) *Sustaining a high impact program with declining funds.* Unsolicited proposals by creative investigators are the wellspring of innovation in science. Solicited and/or targeted programs can be essential in cultivating particular research areas, such as the Microbial Observatories, or in meeting programmatic objectives, such as the Research Initiation Grants/Career Advancement Awards (RIG/CAA) initiatives. However, within an essentially fixed or declining budget, expansion of solicited and targeted programs necessarily negatively impacts the ability of MCB to support unsolicited proposals.
- (2) *Increased staff workload.* A hallmark of the MCB review process, and a primary mechanism for overall success, is the intense scrutiny of proposals by permanent and rotating Program Officers in developing research portfolios. The increased workload associated with larger numbers of submitted proposals coupled with inefficient workflow is in danger of overwhelming MCB staff, and ultimately will reduce the ability of Program Officers to achieve other important program objectives and will hinder recruitment of outstanding rotating Program Officers.
- (3) *Maintaining open lines of communication.* Effective communication between organizational levels is critical to the functioning of any entity, particularly during times when difficult decisions must be reached.

The main body of the COV Report begins by reviewing aspects of MCB performance identified in the provided template (sections A, B, and C). This section of the report is followed by discussion of other issues identified by the COV, including suggestions for improving the COV process itself.

Date of COV: August 8-10 2005
Division: MCB
Directorate: BIO
Number of actions reviewed by COV: Awards: 44 Declinations: 37 Other:
Total number of actions within Division during period being reviewed by COV: 3973 Awards: 788 Declinations: 3185 Other:
Manner in which reviewed actions were selected: Reviews were randomly sampled from the 127 pre-selected by the program officers (POs).

PART A. INTEGRITY AND EFFICIENCY OF THE DIVISION'S PROCESSES AND MANAGEMENT

Briefly discuss and provide comments for *each* relevant aspect of the division's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* division being reviewed and for those questions that are relevant to the division under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged. Please do not take time to answer questions if they do not apply to the division.

A.1 Questions about the quality and effectiveness of the division's use of merit review procedures. Provide comments in the space below the question. Discuss areas of concern in the space provided.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE or NOT APPLICABLE
Is the review mechanism appropriate? (panels, ad hoc reviews, site visits)	Yes
Is the review process efficient and effective? <i>The electronic jackets have shifted too much of the clerical burden onto the program officers.</i>	Effective, Yes Efficient, No
Are reviews consistent with priorities and criteria stated in the division's solicitations, announcements, and guidelines?	Most of the time. Most often for criterion 1 but less often for criterion 2

<p>Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer’s recommendation?</p>	<p>In general, yes</p>
<p>Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? <i>Panel summaries are too terse and do not provide sufficient feedback to the PI, especially with regard to the perceived weaknesses. We like the idea of using scribes to write the summaries (i.e. a panel member who did not serve as either the primary or secondary reviewer.)</i></p>	<p>No</p>
<p>Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? <i>Much better than the panel summaries but the logic of some decisions is difficult to discern from the review analysis. The rationale for labeling proposals “high risk” should be documented.</i></p>	<p>Variable</p>
<p>Is the time to decision appropriate? <i>Still too long but understandable given the workload. Shorter turn-around would be greatly appreciated by the community and is especially important for new investigators.</i></p>	<p>No</p>

Comments on the quality and effectiveness of the division’s use of merit review procedures:

Recommendations:

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers. Provide comments in the space below the question. Discuss issues or concerns in the space provided.

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? <i>Criterion I always addressed; criterion II not always addressed.</i>	Not always
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? <i>See comment in section A1 on panel summaries.</i>	Yes
Have the <i>review analyses</i> (Form 7s) addressed whether the proposal contributes to both merit review criteria? <i>Level of detail varies.</i>	Yes

Comments on NSF's merit review system:

Recommendations:

NSF needs to be tracking success of training endeavors, which is a big part of criterion II.

A.3 Questions concerning the selection of reviewers. Provide comments in the space below the question. Discuss areas of concern in the space provided.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Did the division make use of an adequate number of reviewers for a balanced review?	Yes
Did the division make use of reviewers having appropriate expertise and/or qualifications? <i>Spot checked only; appears reasonable.</i>	Yes
Did the division make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? (Note: Data for underrepresented groups are not available). <i>Most of the COV was not convinced that geographical distribution of reviewers was nearly as critical as other criteria, primarily expertise, in selection.</i>	Yes
Did the division recognize and resolve conflicts of interest when appropriate?	Yes

Comments on selection of reviewers:

Recommendations:

A.4 Questions concerning the resulting portfolio of awards under review. Provide comments in the space below the question. Discuss areas of concern in the space provided.

<p align="center">RESULTING PORTFOLIO OF AWARDS</p>	<p align="center">APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</p>
<p>Overall quality of the research and/or education projects supported by the division. <i>Quality is high but the funding level leaves many excellent projects unfunded.</i></p>	<p>Yes</p>
<p>Are awards appropriate in size and duration for the scope of the projects?</p>	<p>Mostly.</p>
<p>Does the division portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • High Risk Proposals? <p><i>The COV struggled with the amorphous and essentially unspecified definition of “high risk”. Of the proposals we examined in this category, not all matched our expectations of high-risk/high-reward (i.e., cutting edge) proposals.</i></p>	<p>Unable to determine.</p>
<p>Does the division portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Multidisciplinary Proposals? <p><i>The term “multi-disciplinary” had two definitions in the Self Study, resulting in strongly divergent measures of MCB performance on this criterion. We would like to see more support for cross-directorate collaborations such as those now being fostered between Biological Physics, Condensed Matter and the Biomolecular Systems cluster.</i></p>	<p>Yes, but see comments.</p>
<p>Does the division portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Innovative Proposals? <p><i>As noted in the Self Study, defining “innovative” is difficult. Nonetheless, the level of innovation in the proposals examined satisfied us.</i></p>	<p>Yes</p>
<p>Does the division portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Funding for centers, groups and awards to individuals? <p><i>Insufficient information was provided. This information could surely be collected from the entire MCB program rather than presenting a subset of information.</i></p>	<p>Unable to determine.</p>

Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Awards to new investigators <i>MCB POs appear to make a strong effort to nurture and fund new investigators.</i>	Yes.
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Geographical distribution of Principal Investigators? 	Yes
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Institutional types? 	Yes
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Projects that integrate research and education? 	Yes
Does the division portfolio have an appropriate balance: <ul style="list-style-type: none"> • Across disciplines and subdisciplines of the activity and of emerging opportunities? 	Yes
Does the division portfolio have appropriate participation of underrepresented groups? <p><i>Success rates of minority applicants are falling while number of applications remains constant. Why? Please provide additional information. In addition, not all individuals identified as minority applicants may actually be from under represented groups. How is this status confirmed? Finally, we would like to be able to compare the award statistics to the pool of underrepresented groups holding research and faculty positions.</i></p>	Needs improvement.
Are the programs in the division relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.	Appropriate

Comments on the quality of the projects or the balance of the portfolio:

Recommendations:

We believe that the unsolicited proposals are a rich source of emerging opportunities.

MCB has many ties to other directorates, which we see as a real strength. These interactions should be encouraged at all levels. For more, see section C.4.

A.5 Management of the division under review. Please comment on:**Management of the division:****(Comments below include both observations and recommendations)**

1. The Program Officers (POs) and MCB director/deputy director are devoted and clearly committed to the scientific community and to the mission of the NSF. The proposal review process is obviously labor-intensive, and despite competing demands on PO time, results in very intelligent, well-thought-out and fair decisions (as documented or detailed in the review analyses). Portfolios are well balanced and justified. The review process, from assignment of proposals to panels, to panelist selection and recruitment of ad hoc reviewers, appears to work well. We were impressed with the scientific expertise and dedication of the POs and applaud their hard work on behalf of all of us.
2. Challenges to MCB appear to be coming from a number of sides. This period of time under evaluation (2002-2004) may be particularly difficult, due to the multiple challenges of drops in congressional funding of NSF, limited staff numbers, increased number of proposal submissions, and sharp drops in funding success rates. All of these factors are taxing an already overworked group of dedicated POs who evidently care deeply about serving the scientific community.
3. In our several discussions with POs, reviews of the grant proposal evaluation process, and discussions with Biology Director Clutter and others, we have come to a number of conclusions.
 - a. The morale of program officers seems, to those of us who have interacted with NSF over the years, to be at a low level. While there are substantial issues of workload, the COV observed that the vitality of the program officers is being sapped by a weak communication of the overall strategic decision process between POs and senior management at the level of the Biology Directorate and above. The workload assigned to each PO is impossible to maintain long term, and some measures to improve efficiency must be adopted in order to maintain the standard of excellence in proposal review and program oversight. We are also concerned that the best POs will not be retained unless these issues are addressed.
 - b. It is not entirely clear how to reduce PO workload without either (1) increasing the number of POs or (2) streamlining the proposal review process. For instance, the current MyWork software requires each PO to enter all data associated with every proposal assigned to him/her manually; no data-entry tasks can be assigned to staff members. New software (grants.gov) is expected to replace the existing system in another year or so, but in the meantime, POs are left with a very difficult system. This is exacerbated by the sharp increase in the number of submitted proposals. Since POs (and NSF as a whole) are committed to a review process that requires many hours of personal oversight for each proposal, this process has placed an unreasonable demand on PO time and resources. The advantage of having rotators and a knowledgeable scientific staff that provides leadership in the support of the advancement of science will be lost if the POs are mired in clerical details.
 - c. Ironically, the PO's are resistant to modifying these labor-intensive review methods despite the evident drain on available resources. Neither POs nor the majority of the COV are enthusiastic about adopting NIH-style triage or ranking systems.

Nevertheless, we urge MCB to consider timesaving efficiency measures. Unless workload reduction is accomplished, the NSF should expect either an increased level of complaints from the scientific community about how grants are being handled or attrition of their best POs, or both. We strongly urge the NSF to take concerted actions to address these issues as quickly as possible.

- d. POs and the Division leadership are clearly aware of emerging research and education trends, and are keenly interested in fostering new research areas in their respective communities. It is important that the leadership of NSF recognizes and respects the expertise of their Pos and Division Directors and gives them the resources (financial and otherwise) they need to respond to the community needs and prioritize new research areas.
- e. The Cluster structural organization has provided a layer of obfuscation that makes it difficult for PIs to identify program managers and panels for submission of their proposals. This makes extra work for the POs.
- f. The website is not easily navigated. More effective keyword-based searches (not only for searching funded projects) would be a bonus.

Recommendations:

1. *Reduce the workload associated with proposal review.* This could potentially be accomplished by:
 - a. *Modifications to the software system*, enabling POs to delegate data entry to other staff and to enable efficient generation of reports to track NSF progress. The new grants.gov technology under development should be reviewed critically to ensure that it is designed with lessons learned from the MyWork shortcomings in mind. If NSF plans to continue to use the MyWork software for internal proposal management, resources should be allocated to modify the software and bring it in line with PO needs. This is likely to require hiring an additional programmer or database administrator for upgrades to the system. This investment in the software infrastructure will benefit POs of all clusters within MCB and potentially across NSF. A small investment in the software infrastructure will improve PO efficiency and effectiveness, and advance NSF objectives. It will also improve PO morale.
 - b. *Increasing the number of permanent POs.* Although rotator POs bring fresh insights and energy to NSF, the permanent POs have the experience and institutional memory that is necessary to advance the NSF agenda most effectively. Although the POs had different opinions as to what the ratio of permanent POs to rotating POs should be, a ratio of at least one permanent PO to one rotator seems to be necessary to achieve the desired balance.
2. *Increase the quality and effectiveness of communication at all levels*, especially between POs and senior management of MCB, as well as with senior management of the Foundation. This is essential for maintaining good morale, especially when the workload is as demanding as it is at present, and when budget reductions necessitate painful decisions (and subsequent explanations to struggling PIs). This will also enable POs to contribute their insights and perspective stemming from close interaction with the scientific community to NSF management, to help guide the overall direction of the NSF, and provide input to the decision-making and prioritization processes.
3. *Ensure that POs are involved in ongoing conversations with NSF senior management* about priorities and decisions made at the highest levels. This will help reduce the apparent

disconnect among POs who feel that their ideas and concerns are not given sufficient attention by NSF management (see also (2), above).

4. *Revise the NSF website for greater accessibility and transparency to the scientific community*, which would enable PIs to identify appropriate programs (perhaps by keyword-based searches). While NSF management and POs assert that they can handle proposals (re-directing them as necessary), we believe many PIs would prefer to have access to more information, both to enable them to develop the most effective proposals and to determine where to send the proposal for the greatest success rate. This would also help to decrease PO workload and increase PI satisfaction.

Part B. NSF's Strategic Outcome Goals.

Provide examples of outcomes (nuggets) as appropriate. Examples should reference the NSF award number, the Principal Investigator(s) names, and their institutions.

B.1 OUTCOME GOAL for PEOPLE: Developing “a diverse, competitive and globally engaged workforce of scientists, engineers, technologists and well-prepared citizens.”

a. Narrative discussion:

It is clear that NSF continues to have a major impact on the scientific workforce by directly and indirectly funding undergraduate and postgraduate training. Although the exact number of graduate and postdoctoral trainees on NSF funded projects is not known, this number (as determined from grant budgets) appears to be quite significant. The number of undergraduate (Research Experience for Undergraduates, REU) trainees in NSF funded projects is also quite large and anecdotal information indicates that this program has been successful. The training of undergraduates in laboratories is of particular importance to the overall goals of the NSF as they constitute an important component of the pipeline to the Ph.D. They also contribute to developing a scientifically literate workforce.

Recommendation:

The fact that exact numbers of trainees are not available is of concern to the COV as this information is particularly relevant for securing additional funding for this agency. Tracking the success of the REU program should be considered to determine the effectiveness of this program and the impact of particular NSF mentors on their trainees. This information may be useful when budgets do not allow the funding of all REU supplements.

This recommendation is similar to that suggested by the 2002 COV. In that report, specific recommendations were made for tracking the development (success) of the training programs which included documenting publications of trainees arising from NSF funded research, tracking awards and prizes arising from student research, and tracking career paths upon completion of training.

b. Noteworthy proposals that specifically address the development and training goals:

i. From the Nugget list:

Crowding may make proteins fold: an undergraduate project leads to a seminal discovery.

Nugget ID: 1374

NSF Award Number: 0212939

Award Title: Protein Biophysics in Cells

PI Name: Gary Pielak

Institution Name: University of North Carolina at Chapel Hill

Collaborative Research projects provide cutting edge research opportunities at minority-serving institutions.

Nugget ID: 1642

NSF Award Number: 0215924

Award Title: C-RUI Collaborative Project: Intracellular and Structural Analysis of Roles of a Cytokine Precursor in Aminoacyl-tRNA Synthetase Complexes

PI Name: Cindy Wolfe

Institution Name: Tougaloo College

NSF Award Number: 0215940

Award Title: C-RUI Collaborative Project: Intracellular and Structural Analysis of Roles of a Cytokine Precursor in Aminoacyl-tRNA Synthetase Complexes

PI Name: Mark Olson

Institution Name: University of Mississippi Medical Center

NSF Award Number: 0114666

Award Title: Arabidopsis 2010: Collaborative Project on the Functional Genomics of Arabidopsis beta-Glucosidase and beta-Galactosidase Gene Families

PI Name: Jonathan Poulton

Institution Name: University of Iowa

Learning biology by studying heat-loving microbes at a Microbial Observatory in Yellowstone National Park.

Nugget ID: 1691

NSF Award Number: 0237167

Award Title: RUI-Microbial Observatories: A Longitudinal Molecular Diversity and Chemical Survey of Red Layer Microbial Communities in Yellowstone National Park

PI Name: Sarah Boomer

Institution Name: Western Oregon University

ii. Additional proposals involving projects with undergraduate training components:

NSF Award Number: 0233854

Award Title: RCN: Networking Tools for NMR Research on Biological Solids

PI Name: Ruth Stark

Institution Name: CUNY College of Staten Island

NSF Award Number: MCB-0346688

Award Title: RUI: Student Research in T Cell Xeno-Recognition

PI Name: Peter Eden

Institution Name: Marywood University

NSF Award Number: MCB-0346688

Award Title: RUI: The Biochemistry of Template Switching

PI Name: Angel Islas

Institution Name: Santa Clara University

Bringing Structural Biology Research into Classroom

NSF Award Number: 0237297

Award Title: PECASE: Probing protein surfaces using multiple solvent crystal structures

PI Name: Carla Mattos

Institution Name: North Carolina State University

NSF Award Number: MCB-0414328

Award Title: RUI: Investigating DNA Deformation Induced by Cation Binding Using Computational Analysis of X-ray Crystal Structures

PI Name: Lori Isom

Institution Name: University of Central Arkansas

B.2 OUTCOME GOAL for IDEAS: Enabling “discovery across the frontier of science and engineering, connected to learning, innovation, and service to society.”

a. Narrative discussion.

The Program Officers go to great lengths to fund science of the very highest quality whether their programs are focused on traditional single investigator or large multi-investigator awards. By cutting across the spectrum of contemporary biology, the projects serve society by extending the frontiers of knowledge on a broad front. The major shortcoming in this area lies in the inability of the Program officers to do more because of the severe shortage of funds. With a more appropriate budget, the Division would be able to build a greater bank of scientific knowledge, thereby meeting the future needs of industry and ensuring our nation’s competitive edge in the long term. Discoveries and advances made in several areas of biology are evident from the accomplishments in the projects identified below (section b).

The COV was impressed by the diversity of ways in which scientific discoveries are disseminated, ranging from publication in high-profile journals to the support of teaching state-of-the-art methods in the classroom to issuing press releases. In this way, the MCB Division is making a serious attempt to educate both scientists outside the sphere of biology and the American public about biology—a growing challenge as the questions of evolution and genetically engineered crops occupy center stage in today’s media. A stronger effort

should be made to issue timely press releases on the most exciting discoveries reported with NSF support.

Recommendation:

It is the opinion of the committee that the MCB Division is doing the best it can under financially trying times to serve the nation in enabling discovery across the frontiers of science and in related arenas connected to learning, innovation and service to society. In so doing, the Division attempts to balance its science portfolio with a diversity of single PI projects and large multi-investigator awards. The Committee recommends that the Division continue to scrutinize the productivity of large grants awarded as they are made at the expense of funding single investigator projects with proven track records.

b. Noteworthy proposals that address the ideas goal particularly well. (Please note that this is an area where we could have done a better job if supplied with the jackets ahead of the meeting).

Novel Exceptions to the Canonical Genetic Code in a Methanogenic Archaeon
NSF Award Number: 0114797
Award Title: Exceptions to the Canonical Genetic Code in a Methanogenic Archaeon
PI Name: Joseph Krzycki
Institution Name: Ohio State University Research Foundation

NSF Award Number: 0237728
Award Title: Microbial Observatories: Collaborative Research Linking Microbial
Discovery to Biogeochemical Processes: An Oligotrophic Oceanic Microbial
Observatory
PI Name: Craig Carlson
Institution Name: University of California-Santa Barbara
PE Code: 1089

Spider venom may yield environmentally friendly pesticides
NSF Award Number: 9983243
Award Title: Structure-Function Studies of Novel Insecticidal Toxins
PI Name: Glenn King
Institution Name: University of Connecticut Health Center
PE Code: 1166

The Fourth Chromosome: A Mover and Shaker After All!
NSF Award Number: 9977990
Award Title: The Origin of New Genes
PI Name: Manyuan Long
Institution Name: University of Chicago

B.3 OUTCOME GOAL for TOOLS: Providing “broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation.”

Comments:

MCB shares support for a variety of resources for the biological community, including Living Collections and various databases (e.g. the Arabidopsis genome site (TAIR). Most of these activities are maintained in other Directorates, but MCB-supported research is critical to populate these resources.

We took note also of the tools brought to our attention by the self-study document:

1) Important methods developed for the study of microorganisms grew from work by Dr. Stephen Giovannoni (Oregon State University), developing high-throughput approaches to culture methods. Most (>99.9%) extant microorganisms are not at present cultivable and are thus totally unappreciated by present knowledge.

Title: High throughput cultivation of novel and diverse microorganisms
NSF Award Number: 9977930

2) Some are unglamorous but critical, such as funding Kenneth Keegstra of Michigan State to provide UDP-Xylose to researchers working on cell wall biosynthesis, as well as to organize and support email and face-to-face meetings.

NSF Award Number: 0090281

Award Title: RCN: Plant Cell Wall Biosynthesis Research Network

PI Name: Kenneth Keegstra

3) Important new methods in NMR analysis that should provide much more rapid structure determination are supported by

NSF Award Number: 0075773

Award Title: Reduced Dimensionality NMR Spectroscopy for Structural Genomics

PI Name: Thomas Szyperski

Institution Name: SUNY at Buffalo

4) Additional important methods are needed for the study of membrane proteins, which have consistently been refractory analysis. Such general methods are under development in the laboratory of Stephen Boxer.

NSF Award Number: 0110400

Award Title: Mechanism and Macromolecular Organization in Photosynthetic Reaction Centers and Membranes

PI Name: Steven Boxer

Institution Name: Stanford University

5) The important Arabidopsis 2010 program has been supported to provide a complete accounting of the functions of all genes in the organism by a fixed date. This project continues to rapidly expand the understanding of these genes.

NSF Award Number: 0209754

Award Title: Arabidopsis 2010: Genomics Approaches to Finding Transcriptional Networks

PI Name: Philip Benfey

Institution Name: Duke University

6) Further work to improve understanding of membrane proteins will provide computer-based models of protein-protein interfaces.

NSF Award Number: 9808902

Award Title: Theoretical Studies of Membrane Proteins

PI Name: Barry Honig

Institution Name: Columbia University

B.4 OUTCOME GOAL for ORGANIZATIONAL EXCELLENCE: Providing “an agile, innovative organization that fulfills its mission through leadership in state-of-the-art business practices.”

The COV agrees with NSF that “excellence in managing NSF underpins all of the agency’s activities.” The COV recognizes that NSF has a monumental responsibility for stewardship of the national scientific enterprise, and that there is a natural tension between stability vs. agility, and reliability vs. innovation. The following sections noted areas of considerable success as well as issues of concern to the Division and the COV. Note that during the review of MCB, the COV attempted to determine which organizational procedures were within their purview to modify and which were dictated by agency-wide constraints. However, we were not always certain about the chain of command.

(1) Operation of a credible, efficient merit review system

The overall assessment was that the merit review system is highly credible if measured by the finding that all applications that result in awards are worthy. However, from the point of view of an applicant whose proposal is rated “Excellent/Outstanding” but not funded, the process may be perceived as inadequate. The COV recognizes that when funding levels are extremely low, many worthy applications must be declined despite their recognized value. From our random sampling of the correspondence contained in the sample of jackets available to us, we were impressed with the care that program officers took to explain difficult decisions to applicants. Unfortunately, because so many proposals must be declined, the resubmission rate is higher for subsequent panels, and in effect it becomes harder and harder to discriminate among applications in the top tier because it is being populated by superb grant applications that were not funded in the previous round.

Judging from the increase in the number of proposals and the lack of increase in staffing levels, it might appear that the efficiency of the merit review system has improved within NSF. However, there have been some inefficiencies introduced by the way proposals are delegated unilaterally to the Program Officers through the MyWork system (as detailed in section A). The COV concluded that the major credit for processing so many more grants goes to the diligence and dedication of program officers who regard their obligations to shepherding grants as their highest priority. However, this is not a sustainable system and there is every indication that the number of proposals being submitted will continue to increase annually. We urge the Division to self-evaluate their process so that they can become more efficient and make the best use of their talented scientists.

The committee was surprised to find a single PO managing two separate programs.

(2) Progress in utilizing and sustaining broad access to new and emerging technologies for business application

The NSF is making an effort to move towards electronic handling of and dissemination of materials within the scientific community. It has pioneered electronic grant submission processes with FASTLANE, and modified that system in response to comments from the scientific community. Other federal agencies have watched its development closely, and are considering similar efforts. However, the COV had concerns about how the agency designs and revises software to meet the needs of the users, both internal and external. For example, the process of assigning grants efficiently does not allow an applicant to identify with a specific scientific program area, but requires one-to-one correspondence with cluster names. This translates to an increased workload for the POs because administrative personnel do not have the knowledge to assign a proposal to a program.

These problems suggest inattention to or incomplete knowledge of the needs of end-users. It is essential to arrange representative groups to do beta-testing and gather feedback before implementation and release of new software. It would be ideal to respond in a timely way and change the process. It is the impression that the eJacket system suffers from several of these problems and has not been changed despite staff criticism.

Although the NSF is a PC-based organization, the scientific and educational community is not PC-centric, and the proportion of people operating in a Linux, UNIX, or Macintosh environment (about half, or higher in some fields) is much greater than the population at large. Therefore, we recommend that as NSF prepares materials for dissemination, it provide its staff with support to determine whether information that is placed on websites is viewable on several platforms and with multiple versions of available software.

(3) Development of a diverse, capable, motivated staff that operates with efficiency and integrity

It appears that the rise in the number of proposals is now swamping the program officers, which may affect the ability to retain these valuable members of the scientific community. The COV is concerned that this workload is compromising PO opportunities for continuing education and public outreach, as well as their ability to initiate new programs, and promote visibility of their successes in funding cutting edge research.

4) Development and use of performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

The COV does not have comprehensive knowledge of all of the tools that NSF uses to conduct performance assessment. The panel review process provides feedback semi-annually to the program on the list of awardees from prior funding cycles, and thus the portfolio receives expert feedback. The Division conducts three-year reviews via the COV process. The COV hopes that when significant changes are made in the management structure of MCB (such as changing to a "cluster" organization), a review of the outcome will be planned and some criteria for success will be monitored annually so that all stakeholders may provide input.

PART C. OTHER TOPICS

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

It is clear that there is a strong commitment to funding the highest quality science throughout MCB. Program officers appreciate the division director's leadership and willingness to strive for consensus whenever possible. As the budget situation worsens, communication will become more important than ever. It is also clear that everyone in MCB is committed to the high quality review process for which NSF is known. However, with the increasing number of grant submissions, decreasing number of awards and no increase in staff, we feel the workload requires re-evaluating the entire process (see section A5 and B4).

The Cluster system needs to be more transparent to the community. The Clusters could still be the organizing unit but the community would appreciate the ability to request a program within a cluster when submitting their proposals. This would have the additional benefit of reducing the initial PO workload.

The COV struggled with the relationship between the MCB and the EF divisions. The Microbial Observatories program is a good example of the potential problems that can arise with this model. MO is a self-contained, highly successful program. Intellectually, MO belongs in EF but the program has thrived under the MCB umbrella which has nurtured and championed the program and has a vested interest in its success. We strongly urge that MCB maintain strong involvement with this program regardless of where it is administratively housed.

C.2 Please provide comments as appropriate on the division's performance in meeting division-specific goals and objectives that are not covered by the above questions.

We feel this is adequately covered in previous sections.

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

Biology has been the leading science of the latter half of the 20th century and will most likely continue to be so during the 21st century. As such, MCB, given the nature of the science it supports, plays a pivotal role both within the BIO directorate and within the agency, in linking to different levels of biological organization and different disciplines. There are already vibrant examples of MCB reaching out to Physics, Chemistry and Computer Science. The NSF director should use MCB to help integrate the sciences across the agency.

Are there plans to assess the compliance with and effectiveness of Criterion II? All proposals should be required to document their training and outreach activities. We understand that the data currently being collected in Final Reports is in narrative form and thus cannot be queried in order to determine how many undergraduates, graduates and postdoctoral fellows are being trained by NSF. We strongly urge that the NSF invest in the software required to access this information.

The COV sees postdoctoral training as an efficient manner in which to meet many Agency goals. The Bio directorate currently funds 30-40 postdocs a year at a relatively low cost, similar, for instance, to the cost of a single FIBR award. The COV recommends that serious consideration be given to expansion of postdoctoral fellowship programs.

Program Officers are increasingly burdened with clerical work that used to be undertaken by clerical staff. This appears to be a direct result of the move from paper to electronic media, and the fact that only one person is able to make changes to an individual file. While we recognize the difficulties inherent in allowing multi-user access to electronic records, allowing limited access by clerical staff for specific functions would shift some of the clerical burdens off the POs, allowing them to focus their limited time on work that requires their expertise and that only they can do.

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

With flat budgets, there is clearly a conflict between sustaining programs that handle unsolicited proposals and the cross-directorate programs now housed in the virtual Emerging Frontiers division. It is clear from our analysis that there are plenty of exciting “emerging frontier-like” projects within each cluster. Faced with a decision on where to direct the dollars, we feel strongly that initiation of new programs at the expense of the existing programs should only be undertaken if the budget climate improves.

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

First and foremost, the materials must be made available to the committee members well in advance of the COV meeting. Most of us had no or limited access to materials until the face-to-face meeting began at NSF, which impacted our ability to supply the most thoughtful answers, especially with respect to Part B of the report template. We would have appreciated receiving the charge to the committee and access to the web site at least two weeks ahead of the meeting. With this access, a deeper understanding of NSF processes and results would have been possible at the time of writing the report. An opportunity to hold a conference call to discuss the format of the meeting and the nature of the documents would also be helpful. We appreciate the enormous amount of work by staff to amass all the data required for the COV review. We would have all benefited from more time to familiarize ourselves with the COV database and to absorb all the information in the self-study and other documents. We also would have appreciated having printers available in the meeting room.

We find the report template to be repetitive and constraining. Many of the questions were confusing. We did like the ejackets and found them easy to use. Better database search functionality would facilitate analysis of NSF’s success at achieving key aims and objectives.

PART D. DIVISION LEVEL QUESTIONS

D.1 Please comment on actions taken by the Division in response to the last COV's recommendations.

Many of the issues raised by the last COV have not been addressed, although we recognize that some of these cannot be fixed in the current budget climate. Time to decision, duration and amount of awards have not changed significantly. We appreciate that budget cuts have not been passed along to PIs (i.e. budgets have not gone down for those few grants that are being awarded).

The most important change is the addition of new permanent program officers.

Some progress on Criterion II has been made in that almost all proposals and reviews now address both criteria.

The previous COV pointed out the need to track numbers of people being trained by NSF as we have also pointed out above (see B1). Given that the "People" is one of the three strategic outcome goals, we cannot emphasize too strongly how important it is to be collecting this information in a manner that can be queried.

SIGNATURE BLOCK:

For the MCB COV
Joanne Chory
Chair

Date

Gina MacDonald

Clifton A. Poodry

Bob Buchanan

Kimmen Sjolander

Jerry Guyden

Elizabeth Raleigh

Steven Theg

Renato Aguilera

Madeline Shea

Mark Young

Arthur G. Palmer, III

David Butler

As the designated representative to this COV and on behalf of the BIO Advisory Committee, I submit this report to the Assistant Director of the Directorate for Biological Sciences.

Mary Lou Guerinot
Designated Representative of the BIO Advisory Committee

Date

DIVERSITY DOCUMENT

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

August 8-10, 2005

This document describes the diversity, independence, and balance represented by members of the COV, and the resolution of real or apparent conflicts of interest.

The 2005 Committee of Visitors for the Division of Molecular and Cellular Biosciences (see attached list) was composed of fourteen members, including Dr. Mary Lou Guerinot, who represented the BIO Advisory Committee. Six of the members are female, three members are from an underrepresented minority, and one member had a disability. Members currently work in nine different states, including California, Iowa, Maryland, Massachusetts, Montana, New Hampshire, New York, Texas, and Virginia. Eleven members are from academic institutions; one is from industry, and one from government.

All files presented to the committee were first scrutinized for possible conflicts with committee members. All conflicts were identified so that committee members would be aware of which files they could not review. Committee members were advised about confidentiality and conflicts of interest both prior to arriving at NSF and at the inception of the meeting. Conflicts issues during the meeting were considered and adjudicated by the division conflicts official.

Mary E. Clutter
Assistant Director
Biological Sciences