

# **Diversity Document**

## **Committee of Visitors for the Division of Biological Infrastructure Directorate for Biological Sciences National Science Foundation**

**June 16-18, 2004**

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 2004 Committee of Visitors for the Division of Biological Infrastructure (see attached list) was composed of nine members, including Cassandra Manuelito-Kerkvliet, who represented the BIO Advisory Committee. Five of the members were female, and two of the members are from an underrepresented minority. Members currently work in nine different states, including AR, CA, DE, IN, MD, MN, SD, and VA. Six were from academic institutions, one was from industry, and one was from a government agency.

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 prior to arriving at NSF and at the inception of the meeting. No conflict issues arose during the meeting.

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June 16-18, 2004**

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**CORE QUESTIONS and REPORT TEMPLATE  
for**

**FY 2004 NSF BIO/DBI COMMITTEE OF VISITOR (COV) REVIEWS**

NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions; and (2) comments on how the outputs and outcomes generated by awardees have contributed to the attainment of NSF's mission and strategic outcome goals.

Many of the Core Questions are derived from NSF performance goals and apply to the portfolio of activities represented in the division under review. The division under review may include several subactivities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the subactivities of the division, with the latter requiring more time but providing more detailed information.

The Division or Directorate may choose to add questions relevant to the activities under review. NSF staff should work with the COV members in advance of the meeting to provide them with the report template, organized background materials, and to identify questions/goals that apply to the division under review.

**Guidance to the COV:** The COV report should provide a balanced assessment of NSF's performance in two primary areas: (A) the integrity and efficiency of the **processes** related to proposal review; and (B) the quality of the **results** of NSF's investments in the form of outputs and outcomes that appear over time. The COV also explores the relationships between award decisions and division/NSF-wide goals in order to determine the likelihood that the portfolio will lead to the desired results in the future. Discussions leading to answers for Part A of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. *COV reports should not contain confidential material or specific information about declined proposals.* Discussions leading to answers for Part B of the Core Questions will involve study of non-confidential material such as results of NSF-funded projects. It is important to recognize that the reports generated by COVs are used in assessing agency progress in order to meet government-wide performance reporting requirements, and are made available to the public. Since material from COV reports is used in NSF performance reports, the COV report may be subject to an audit.

*We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions.*

**NSF BIO/DBI FY 2004 REPORT TEMPLATE FOR  
NSF COMMITTEES OF VISITORS (COVs)**

<b>Date of COV: June 16-18, 2004</b>
<b>Division: Biological Infrastructure</b>
<b>Directorate: Biological Sciences</b>
<b>Number of actions reviewed by COV: Awards: 65 Declinations: 87 Other:</b>
<b>Total number of actions within Division during period being reviewed by COV: Awards: 779 Declinations: 991 Other: 88 Total: 1858</b>
<b>Manner in which reviewed actions were selected:</b> The target for the COV jacket review was 7% of the total jackets in each cluster per year; thus proportionately jackets were pulled randomly from each program, and within each program, from awards and declines based on their relative numbers. In programs with small numbers, at least one award and one decline were pulled for the COV review.

**The following tables are referenced in the COV Report Template and are available on the DBI COV website.**

- Table A – Roster of all pulled Jackets
- Table B.1 – All FY01 Instrument Related Activities proposals
- Table B.2 – All FY02 Instrument Related Activities proposals
- Table B.3 – All FY03 Instrument Related Activities proposals
- Table B.4 – All FY01 Research Resources proposals
- Table B.5 – All FY02 Research Resources proposals
- Table B.6 – All FY03 Research Resources proposals
- Table B.7 – All FY01 Training proposals
- Table B.8 – All FY02 Training proposals
- Table B.9 – All FY03 Training proposals
- Table C.1 – All awards
- Table C.2 – Portfolio Balance
- Table D – Review process for all programs
- Table 1 – Percentage of reviews addressing both review criteria
- Table 2 – Intellectual Merit & Broader Impacts in panel summaries
- Table 3 – Dwell Time
- Table 4 – Average number of reviews (panel + mail) per proposal
- Table 5 – Number of reviewers by institution type
- Table 6 – DBI Panelists and reviewers from underrepresented groups
- Table 7 – Average award size and average award duration
- Table 8 – Geography of awards
- Table 9 – Institution type for awards
- Table 10.a – Awards to Minority Serving Institutions
- Table 10.b – Minority PI Funding Rates
- Graph 1.a – Average award size – requested vs. actual
- Graph 1.b – Average award duration – requested vs. actual
- Graph 2 – Award expenditure by institution type
- Map 1 – Reviewer geography
- Map 2 – Award geography

**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.**

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

QUALITY, EFFECTIVENESS and IMPLEMENTATION OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) (list of programs and Table D)	Yes
Are reviews consistent with priorities and criteria stated in the division's solicitations, announcements, and guidelines? (program solicitations and Jackets)	Yes
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria? (Table 1)	Usually Yes
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? (Table 2)	Usually Yes
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? (Jacket Review)	Usually Yes
Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation?	Usually Yes

(Jacket Review)	
Have the <i>review analyses</i> (Form 7s) addressed whether the proposal contributes to both merit review criteria? (Jacket Review)	Nearly always yes
Is the documentation for recommendations complete, and does the program director provide sufficient information and justification for her/his recommendation? (Jacket Review)	Yes
Is the time to decision appropriate? (Table 3)	No
Is the review process efficient and effective?	Effective: Yes Efficient: Yes

**A I. Comments on the quality and effectiveness of the division's use of merit review procedures:**

- The time-to-decision (dwell time) appears to be increasing. The COV recognizes that increased attention to Criterion 2 has made the review process more time consuming, so a longer dwell time is not unexpected. Nevertheless, we feel that quick turn-around is critical to the ability of scientists to respond quickly to emerging challenges. In turn, this directly affects our nation's scientific competitiveness. It is critical for PIs to get feedback as quickly as possible, particularly when the success rate is low, so that PIs can revise and resubmit a proposal within a year of the original submission. Time delay is especially challenging also for first year training programs that begin with summer programs for students. Apparently increased decision time is related to increases in Program Director workload.
- On a positive note, it is laudable that a SGER proposal that needed immediate attention due to its relevance to national security was funded within weeks of its submission.

**Recommendations:**

- Consider how to expedite handling of proposals that involve decisions of multiple panels.
- Consideration should be given to improving the return rate of ad hoc reviews, e.g. by a solicitation for reviewers through a general mailing, and by more personal contacts between the program directors and reviewers for specific proposals.
- The time to decision could be decreased by continued improvements in Fastlane with respect to administrative functions, and by increasing the number of program directors.
- Consider an online system for PI feedback on the review process.

**A 2. Comments on NSF's merit review system:**

- The basic features of the system are solid. The emphasis on broader impacts of work distinguishes NSF from other granting agencies.
- Inconsistent use of broader impacts: sometimes lack of attention to broader impacts is used as justification for a decline, but it was not clear to some COV members that awarded proposals had scored high on this criterion. Other members recognized that a diversity of

projects are worthy of support and that all projects cannot do everything. We note that the shift in culture is still on going regarding application of the broader impacts criterion to the review process.

- Broader impacts criterion needs better definition. It is not transparent what role this criterion plays in review process. Applicants and reviewers don't agree on relevant broader impacts criteria; specification of these criteria should remove this discrepancy. The **program directors** indicated that they wanted the community to specify the relevant broader impacts criterion. In addition, they voiced concern that specifying criteria would then cause the applicants to address only those criteria.

**Recommendations:**

- Continue to emphasize to potential applicants that broader impacts must be addressed in any proposal and in progress reports. In program announcements, include examples of broader impacts relevant to this program with clear indication that examples are not exhaustive/prescriptive.
- In public relations documents and press releases, include some reference to broader impacts.
- We suggest that **program directors** specify what sort of broader impacts are relevant to a particular program. Proposal instructions need better incorporation of broader impacts criteria upon which proposal will be judged. Perhaps criterion two could be rewritten to indicate that the following criteria (as determined by the **program** director) are likely to be very important for evaluation of the proposal but the investigator is encouraged to describe other ways in which funding of the proposal will generate a broader impact. In this way, all proposals might be evaluated in a similar manner with the ability to recognize those proposals with strong or unique contributions to broader impacts.

**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? (Table 4)	Usually Yes
Did the division make use of reviewers having appropriate expertise and/or qualifications? (Jacket Review)	Yes, almost always
Did the division make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? (Map 1, Table 5 and Table 6)	Yes, see comments

Did the division recognize and resolve conflicts of interest when appropriate? (Jacket Review)	Yes
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**Comments on selection of reviewers:**

- Overall, the Division has done an admirable job of cultivating and engaging a diverse community of reviewers.
- Any conflicts of interest were resolved.
- The panel noted that it appears to be increasingly difficult to obtain ad hoc reviewers.
- One concern raised was that a small fraction of the reviewers appeared to provide little detailed evaluation of the proposal.
- Three reviews may not be enough, especially if one or more reviews are not comprehensive, or there is a wide variance among reviewer rankings.
- In addition, there is a continued need to increase the number of underrepresented minority panelists.

**Recommendations:**

- We suggest creating an online system to allow potential new reviewers to register and describe their interests.
- More effort should be spent in promoting the benefits to reviewers, e.g., except for being a panelist, there is no better way to learn how to write a good grant proposal.
- We also suggest maintaining a database that tracks requests for ad hoc reviews as well as the **program director's** appraisal of the utility of a submitted review.
- We encourage solicitation of reviews and panelists from underrepresented minority groups and non-PhD granting institution, including 2- and 4-year colleges and federal government laboratories.

**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.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the division.	Appropriate – very high!
Are awards appropriate in size and duration for the scope of the projects? (Table 7 and Graph 1)	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• High Risk Proposals? (Table C.2)</li> </ul>	Appropriate



Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• Multidisciplinary Proposals? (Table C.2)</li> </ul>	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• Innovative Proposals? (Table C.2)</li> </ul>	Not appropriate; seems low if correctly identified
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• Funding for centers, groups and awards to individuals? (Table C.2)</li> </ul>	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• Awards to new investigators? (Table C.2)</li> </ul>	Appropriate for this division (but low in comparison to others.)
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• Geographical distribution of Principal Investigators? (Table 8 and Map 2)</li> </ul>	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• Institutional types? (Table 9 and Graph 2)</li> </ul>	Making progress; need more effort in 2- & 4-year colleges
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> <li>• Projects that integrate research and education? (Jacket Review)</li> </ul>	Appropriate
Does the division portfolio have an appropriate balance: <ul style="list-style-type: none"> <li>• Across disciplines and subdisciplines of the activity and of emerging opportunities? (Jacket Review)</li> </ul>	Appropriate
Does the division portfolio have appropriate participation of underrepresented groups? (Table 10.a and 10.b)	Not appropriate, see recommendations.
Are the programs in the division relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. (background materials)	Appropriate

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

- Overall the distribution of awards is both impressive and well balanced, with the exception of a low proportion of innovative projects, projects in 2- and 4-year colleges, and participation from underrepresented groups.

- Though density of population may partially explain the clustering of awards on the east and west coasts, there continues to be a need for capacity building in low population states.
- Success rates for proposals from universities for underrepresented groups (HIS, HBCU, TCU) appear to be proportionately lower in some years than from other schools. This suggests a need for outreach and assistance especially in writing proposals.

**Recommendations:**

- DBI should encourage successful schools to engage in outreach activities such as providing workshops in grant writing at geographically close MSIs.
- Continue to emphasize integration of research and education at all levels: general community, K-12, and university students.
- Continue to put effort into solicitations to guide PIs to submit innovative proposals and proposals in areas in which the Program Director recognizes gaps.

**A. 5. Management of the division under review. Please comment on:**

**Management of the division:**

The DBI is blessed with an excellent group of program directors. We applaud Dr. Dilworth's effort in identifying and hiring the best possible people to fill program director positions. It is clear that the Division Director, Deputy Division Director, and program directors have mutual respect for and appreciation of each other. All show a strong commitment to the NSF mission and for seeing that the best science gets done in a cost-effective manner. The eclectic nature of DBI and its participation in numerous cross-cutting programs undoubtedly makes its management more complicated. In view of this, the high quality of management observed is noteworthy. Program directors indicate that they view interaction with principal investigators to produce award-worthy proposals as an important responsibility.

**Responsiveness of the division to emerging research and education trends:**

Reports by division director, program directors and the review of proposal jackets show that the division is responsive to new and emerging trends in research and education. It was encouraging to the COV to hear repeated reports by program directors and by the division director of their success in securing funding for new proposals that were innovative and did not fit any particular program guidelines. Because the duration of most grants is less than three years, because of SGERs, and because the program directors have some ability to encourage proposals in certain areas, the division is able to be quite responsive to emerging technologies. Postdoctoral awards also represent a clear mechanism by which the division responds to both education and research trends.

COV noted that many of the program directors had inadequate time to rewrite program descriptions, which is the major mechanism to solicit proposals in certain areas.

**Division planning and prioritization process (internal and external) that guided the development of the portfolio under review:**

The division director reported that she drew from NSF and directorate priorities and involved the program directors in planning and establishing priorities. The program directors, many of who are rotators, brought strength to this planning process because of their continued professional activity in science areas. The unique background of program directors (e.g. informatics) also impacted priorities. The director reported that the ideas of program review panels, senior staff input, the

number of students in graduate programs and market demands were factors in transitioning to specific doctoral fellowship programs. The COV saw the prioritization and process as fair and functional.

**Discuss any concerns identified that are relevant to the management of the division:**

Some of the program directors noted that their workloads are so heavy that they are not able to spend adequate time with activities that are considered by the COV to be very productive.

**FastLane/ Electronic Jacket** appears to have resulted in putting extra clerical work into the hands of program directors. There is also the challenge of program directors maintaining enough energy for their primary job assignment while taking advantage of the rich environment of other activities, committees, and initiatives within NSF, including participation in cross-cutting initiatives. Essential activities need to include generating lines of communication with the scientific community, especially with smaller, non-Ph.D. granting institutions, or thinking about the "big picture" within their program area. They do an admirable job of this already, but there is a consensus that there are tremendous benefits by informing and educating the community in various aspects of working with the NSF. This includes awareness of funding opportunities, writing effective proposals, generating ideas for new proposals including education programs, and understanding the broader impact of such scientific and education activities. Such activities should result in greater diversification of the portfolio. One area that is clearly under subscribed is instrumentation proposals from 2- and 4-year colleges.

**Recommendations:**

We suggest:

- the Director be given the opportunity to achieve the optimal 60:40 ratio of permanent members: rotating members,
- the Division could consider ways to transfer some of the mechanical aspects of proposal handling away from program directors, to free more of their time for thinking about where science could be going in their program areas,
- two additional program directors be hired to alleviate the workload that appears to be exceptionally heavy on some program directors. The heavy workload appears to reduce the effectiveness of some program directors in carrying out the primary responsibilities to their core programs, and
- **FastLane/Electronic Jacket** system be optimized to allow easier delegation of tasks by the program directors.

**PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS**

NSF investments produce results that appear over time. The answers to the first three (People, Ideas and Tools) questions in this section are to be based on the COV's study of award results, which are direct and indirect accomplishments of projects supported by the division. These projects may be currently active or closed out during the previous three fiscal years. The COV review may also include consideration of significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when the investments were made. Incremental progress made on results reported in prior fiscal years may also be considered.

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current

set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

- To promote the progress of science.
- To advance national health, prosperity, and welfare.
- To secure the national defense.
- And for other purposes.

Excellence in managing NSF underpins all of the agency's activities. For the response to the Outcome Goal for Organizational Excellence, the COV should comment, where appropriate, on NSF providing an agile, innovative organization. Critical indicators in this area include (1) operation of a credible, efficient merit review system; (2) utilizing and sustaining broad access to new and emerging technologies for business application; (3) developing a diverse, capable, motivated staff that operates with efficiency and integrity; and (4) developing and using performance assessment tools and measures to provide an environment of continuous improvement in NSF's intellectual investments as well as its management effectiveness.

**B. Please provide comments on the activity as it relates to 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.**

The COV would like to commend the staff of DBI for the tremendous progress that is being made in reaching each of the three outcome goals listed below. We appreciate the effort that the division director and the program directors take to ensure that each program has a well-balanced portfolio in order to meet the strategic goals of NSF.

The COV reviewed approximately 70 jackets distributed across the three clusters. Through this sampling the committee noted many outstanding achievements that have affected progress towards NSF's mission. The COV is excited about the current set of awards and have great expectations regarding future outcomes.

The provided outcomes (nuggets) present evidence that progress is being made in reaching each of the three outcome goals. We recognize the important and unique contribution that individual grant stories can make towards illuminating the forward momentum of the NSF in each of these areas. It is clear from discussions with **program directors** that they are keenly aware of the importance of these goals and that they strive to identify proposals that will make progress in attaining these goals.

It would be useful, however, to gain a broader perspective on the relative success in attaining these outcome goals if various metrics were employed. Suggestions for these metrics are listed in the appendix. Due to the broad range of scientific endeavors that are funded by DBI, all metrics will not be equally applicable to all program areas. Nonetheless, by keeping track of such records, this information will provide a basis for assessing the progress of a program in attaining goals as well as provide a means of evaluating the relative contribution of each of the program areas to various goals. These metrics may also provide some insight into how evaluating how the "broader impacts" criterion is being employed to evaluate proposals and contributing to achieving the outcome goals. The value of incorporating metrics is vividly illustrated by the outcomes and impacts report for Minority Postdoctoral Research Fellowships. In this report, judicious application of a range of metrics is critical in firmly establishing the outstanding success of this program.

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

**Comments:**

The COV has found that the DBI is promoting the development of a diverse, competitive and globally engaged scientific workforce. An example of the commitment of NSF to the development of people can be found in the BIO Collaborative Research at Undergraduate Institutions (C-RUI) Program. Research projects supported through BIO C-RUI involve faculty members and undergraduate students across disciplinary or departmental boundaries, and if appropriate, institutional boundaries. NSF has awarded \$849,972 over four years to the University of the Pacific for the project entitled "C-RUI: Molecular Mechanisms of Mechanical Diversity in Spider Silks" (DBI-0112165). Due to its strength, flexibility and durability, spider silk is an attractive candidate as a biomaterial, with possible applications in medicine and protective clothing, for example. The goal of this C-RUI project is to increase the understanding of spider silks by correlating the mechanical properties of the silk filaments with the underlying secondary structure and sequence of silk proteins. This project, which connects the disciplines of chemistry, biology and materials science, is under the direction of three faculty members from two Universities: Dr. Anne M. Moore (University of the Pacific), a zoologist with considerable experience in studying spider silk; Dr. Barbara A. Lawrence (Eastern Illinois University), who has experience in physical biochemistry and NMR spectroscopy; and Dr. Craig Vierra (University of the Pacific), a molecular biologist. This project is a continuation of previous work funded by the NSF. The collaborative and interdisciplinary nature of this research area has provided an excellent educational experience for undergraduate students. In the previous granting period, over fifty undergraduates participated in the project, eighteen of which presented their work at regional symposia, four at national and international meetings, and eight were coauthors on publications. This research project is an example of how NSF is working to meeting the outcome goals of developing intellectual capital, integrating research and education, and promoting partnerships in science.

In the area of development of people, the COV recognizes that it continues to be a challenge to DBI to increase the number of proposals from Minority Serving Institutions (MSIs). The funding of projects, such as the above C-RUI, at MSIs would provide considerable help with the goal of increasing the diversity of the scientific workforce. The COV commends the outreach efforts by DBI program directors; such outreach should help faculty members at MSIs learn of the opportunities and make the connections necessary to become involved in these type of collaborative research projects.

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

**Comments:**

The COV has determined that DBI is achieving its strategic goals and objectives in the IDEAS cluster. A sampling of approximately 23 jackets in the IDEAS cluster was reviewed representing past and currently funded projects. From this review, the COV determined that the division runs a credible, efficient merit review system. The mix of high-risk, multidisciplinary, innovative and new investigator projects demonstrates how a well-balanced portfolio is important in developing "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."

Below is an example of a project that the COV feels is representative of the kinds of projects being funded by DBI that demonstrates that they are accomplishing their strategic outcome goals.

The CRUI project 0330840 entitled "A multidisciplinary test of mutualistic benefits fungal endophytes provide their host plants" is an outstanding example of a project that addresses an exciting research question through collaboration between a small undergraduate school with a large university. The PIs will examine the role of fungal endophytes on host plant defenses under the adverse conditions of insect herbivory and drought conditions. The PIs include a molecular biologist, a botanist, an analytical chemist and a mathematician from Hope College with a molecular biologist at a large institution, Univ. Kentucky. At least 10 undergraduates will be involved in this research including two minority students for a community college. The multidisciplinary approach to this question is novel in its use of diverse approaches. This tripartite relationship of grasses infected with fungal endophytes eaten by insects provides an excellent system to address fundamental questions of fungus-plant-predator interactions, vertical and horizontal transmission of the endophyte, and the abiotic factor of drought. Many fundamental questions will be addressed using field and molecular approaches. We suspect that just writing the proposal has been stimulating to the numerous PIs.

**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:**

The COV found a strong effort by the Division to support the balanced building of the scientific infrastructure in all areas of concern to the Directorate for Biological Sciences. There was the appropriate emphasis by the Program Directors and review panels on assuring that the facilities and tools are broadly accessible with particular emphasis on educational aspects. We particularly commend the strong support of instrument development, which is consistent to the NSF's mission of developing innovative ideas, an area in which there has been particular success. We note the very rapid support of proposals under the SGER program of an "Atomic force microscopy system with single molecular fluorescence capabilities" (PI: Lyubchenko, #0100828) which was funded within three months, and the very timely funding of "Fluorescent detection of anthrax" (PI: Price, #0204004), for which the award date was *one month* from the time of submission (submission date, 2 November 2001; award start date, 1 December 2001).

There is good expectation that current awards will continue to support the biological sciences infrastructure at a very high level, relative to the limited amount of money available. An excellent example of a highly innovative "tool" proposal is the IDBR project 0242561 entitled "Electrochemical/optical nanoprobes for high-resolution chemical analysis at neuronal microenvironment," a research project which incorporates training of graduate and undergraduate students in an interdisciplinary environment with international connections. The PI is Shigeru Amemiya, a new Assistant Professor in the Department of Chemistry at the University of Pittsburgh. As this is his first grant, these funds are helpful in the set up and development of the research program of a young faculty member. At least two undergraduate and two graduate students plus post-doctoral fellows participate in this project, including underrepresented minorities. They will use cutting-edge etching and electrophoretic painting techniques to develop electrochemical and optical 100 nm nanoprobes. These probes will be used in electrophysiology experiments to detect the chemical signal transmission and electrical response within the neuronal subcellular spaces including the synaptic cleft. The panel summary stated that this proposal was considered a high-risk/high-impact, but the strong

interdisciplinary component and the continued demonstration of commitment to the participation of under-represented groups reinforce the strength of this submission.

## **PART C. DIVISION LEVEL QUESTIONS**

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

In the DBI-COV Report of 2000, there were 21 Recommendations of the COV. The majority of these Recommendations have been addressed by DBI and NSF. In particular, there is now a greater level of participation in the review process (ad hoc reviews, panels, COVs) by underrepresented minority groups. However, the current COV notes that some of the previous Recommendations are still valid.

*Recommendation 3 - The Division should consider increasing the number of permanent program directors such that there is an approximate equal balance between rotators and permanent program directors.*

*Recommendation 5 - Additional permanent staff should be hired to enhance the speed and efficiency of the merit review process.*

The ratio of permanent program directors to rotators has increased in recent years. There is room for improvement, e.g., to decrease the training load on the permanent staff. Additionally, the workload for all program directors is very high. Although this is a group of highly motivated, talented and effective people, the volume of work must affect the efficiency of the process and the time that can be spent on "higher level" activities, such as consideration of future program needs and goals.

*Recommendation 6- An effort should be made to update and MAINTAIN the database of potential ad-hoc reviewers especially with regard to current e-mail addresses. Having an up-to-date database would facilitate the use of electronic communication between the program directors and reviewers thus improving the return rate of ad-hoc reviews. NSF must commit additional resources to this effort.*

Although some information is available concerning previous reviewers, other information appears to be scattered or available only as personal knowledge. A more standard database might facilitate the review process.

*Recommendation 7 - NSF must commit more resources to the continued improvement of FASTLANE to make sure it is stable, effective, and able to reliably handle high levels of traffic if the agency is going to require electronic submission of all proposals and reviews.*

*Recommendation 8 - NSF should consider consulting outside electronic commerce experts (editors of electronic journals, commercial vendors who use the WWW extensively, etc.) to help with the continued improvement of Fastlane.*

The COV recognizes that significant improvement in Fastlane has occurred in recent years. Future improvements should address both the process and the reliability of the system. The use of Fastlane/**Electronic Jacket**, additionally, has resulted in a shifting of some responsibilities from administrative assistants to program directors. The nature of these new duties should be examined, to see if they could be facilitated by additions or improvements in the software.

*Recommendation 10 - All parts of the proposal process, from the envisioning of a proposal, the writing of it, the reviewing and decisions must give stronger focus on Criterion 2. For example, it could be stated that a proposal that fails to properly address Criterion 2 will not be funded; review forms could have a separate section for commenting on Criterion 2.*

The scientific community now has a much better appreciation of the importance of Criterion 2 to the NSF. However, the specific nature of Criterion 2 and its implementation are not always clear to the community. For example, some program descriptions still need to be evaluated with respect to Criterion 2. This issue is also addressed elsewhere in this report.

*Recommendation 14 - While the programs directors are dedicated to increasing minority participation and participation of small institutions and those in EPSCoR in DBI, more needs to be done. An institutionalized commitment to broadening participation in DBI programs needs to be developed so that more individuals at smaller institutions and institutions that serve minority students can be involved. Program directors need to be proactive in outreach to this clientele so that these scientists and their students can benefit from these programs.*

*Recommendation 19 - DBI should increase funding for the REU and CRUI programs and encourage proposals from HBCU/HSI/TCU and from community colleges that will reach underrepresented groups of students.*

There has been some progress with inclusion of Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs) and Tribal Colleges and Universities (TCUs). The success rate for proposals from these institutions is comparable to averages across DBI. The total level of grants awarded to these groups, however, is still quite low. The COV has heard some examples of successful outreach to these groups, and would encourage continuation of this effort. Additionally, outreach to EPSCoR states is encouraged. The allocation of funding specifically targeted for EPSCoR states is a positive move by NSF.

**C. 2. What are the most pressing infrastructural needs in the biological sciences research community? Do the current programs serve the needs of the community? Are there other infrastructural needs crossing disciplinary or organizational boundaries that we should address?**

Because Biological Research Collections lumps together support for databases and collections, and databases are taking ever more resources, the support for collections may be reduced without being noticed. We recommend that the support for databases and collections should be considered, or at least tracked, separately.

The long-term maintenance of databases is a global issue that is addressed under C4.

**C. 3. DBI's education/training programs have specific target populations and goals. Are they the appropriate targets and goals? Should we choose specific topics education/training programs e.g. REU sites or postdoctoral programs? Are there any opportunities we are missing or communities we are not serving?**

The COV found that the target populations and goals of the DBI education/training programs are appropriate. The REU, CRUI and UMEB programs are serving a vital need in the undergraduate community. The three postdoctoral research programs were recently reviewed by a separate COV and found to be highly effective.



**C. 4. Please give us some advice on the following two major questions facing the biological databases today: (1) How should crucial data collections, particularly long-lived data collections, be sustained? and (2) Should a comprehensive 'data plan' be a part of every NSF proposal that would generate significant data sets?**

The larger community has recognized that one of the critical challenges to twenty-first century biology will be to understand the patterns and processes hidden in vast quantities of biological data. The long-term maintenance of databases has become an important and growing responsibility of NSF's Division of Biological Infrastructure. Greater amounts of support are needed for this "new work" of managing and integrating data. System maintenance, better integration, and the development of new data-related capabilities are all on-going costs. We recognize that different economic models for long-term data management will be most appropriate for different subject areas, including investigator databases, institutionally supported databases, federations of community databases, and global repositories. We also recognize that both science and information technology change rapidly and consequently best practices will change almost as rapidly. Maintaining consensus about best practices, therefore, will also require on-going review, exploration, and dissemination.

We recommend that DBI facilitate (at least within the Biological Directorate) the specification of appropriate economic models for long-term management of biological databases. A variety of mechanisms could be used to develop and promote these guidelines, including workshops, contracted studies and white papers, and ultimately, the establishment of data management requirements as criteria for project awards.

**C. 5. With respect to management issues, is there the appropriate balance and distribution of professional staff given the range of programs and activities undertaken in the division?**

The division is commended for its leadership and professional staff. The COV expressed concern regarding the ratio of NSF regular employees to rotators, the added time needed by program directors to input data in Fastlane and the multiple program assignments of program directors.

The COV compliments NSF for contracting to have an external firm conduct a study of its business practices and human resources. The COV also recommends careful review of the division's need for regular fulltime employees as the division maintains existing programs and responds to new and emerging trends.

**C. 6. What can DBI do to better inform the community about available funding opportunities in DBI?**

In addition to publication on the NSF web site, the following actions could also be taken:

- send URL to past reviewers, panel members and applicants
- send URL to administrators and faculty at Minority Serving Institutions
- announce at national meetings of professional societies
- announce at NSF workshops
- include in newsletters of professional societies, such as the National Association of Biology Teachers
- include in Community of Science (COS) service
- post on the Web site "University Faculty Voice of the nation's Historic Black Colleges and Universities": [www.facultyvoice.com](http://www.facultyvoice.com)

## **PART D. OTHER TOPICS**

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

Several programs directors stated that program announcements require updating. It is possible that out-of-date announcements may detrimentally affect the ability of the Foundation to support emerging issues. In addition, out of date announcements may create a disconnect between the applicants and ad hoc reviewers who base their proposals/critiques on the announcements, versus the panel members who are being directed by the **program directors**. As mentioned previously, the program directors should have adequate time to keep announcements timely.

### **D. 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.**

None.

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

Some program directors stated that the same or essentially the same proposals are submitted to different divisions and directorates of NSF. Because each proposal must be treated individually, the workload of program directors and staff is increased and may cause confusion. Actions should be taken to prevent this practice.

NSF needs more money! DBI is unable to fund all of the worthy proposals due to funding limitations. In addition, increasing the number of **program directors** would result in a more manageable workload for the **directors**. This statement is not meant as a criticism of the amount of money that DBI receives relative to other divisions, but rather an acknowledgement that the current funding level of NSF severely limits attaining the stated goals of the agency.

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

The COV was impressed with the strength and valuable work of the DBI and its unique function relative to the discipline-based divisions of BIO.

It is important that there be adequate flexibility beyond the historical budget allocations in order to allow the Division Directors to maintain the balance of the portfolio and to allocate funds to new and emerging trends.

The COV would like to thank the DBI division director, deputy division director, and the program directors for their help during the review process. Their openness was greatly appreciated and the information they provided was invaluable. We also thank the DBI staff for their considerable efforts in assembling the vast array of materials used to inform the COV, both prior to and especially during the site visit.

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

Having a template was extremely valuable. It provided guidance but still allowed flexibility. The Yes/No and Appropriate/Not Appropriate format of parts A and B of the report were somewhat constraining.

We attempted to provide a broad perspective on the programs although obtaining that perspective was difficult in our short time here. The amount of information we needed to assimilate and process in 2 1/2 days was overwhelming, but we appreciated that the time commitment was kept to this compact period. We wouldn't want the meeting to be any longer. Time spent talking with Program Directors was particularly valuable. The ideal format would be to interview the Program Directors initially, then work on the report but finally interview them again once the questions and issues had been identified. Learning what numerous acronyms stand for was especially an issue.

It would have been very useful to have the laptops networked. That would facilitate the group-writing process and communication.

It might have been useful to be alerted to the most important background documents that would be useful to read prior to arrival at NSF for the COV meeting. These would include the prior COV report.

The large amount of raw data as provided in Table C.2 made it difficult to evaluate the Division's performance against criteria of appropriateness, balance, and the needs of the larger community (A.4). Instead of color coding, if the data were presented with an extra column to indicate codes for high-risk, innovative, etc. proposals, this would allow the spreadsheet to be sorted and resorted to get a sense of the proportion of each category relative to the whole portfolio. Additional graphs showing recent performance in the broader context of previous years would have been very helpful. That said, all of our requests for additional data were responded to quickly.

It would be helpful to understand how budgeting priorities were established. Although we are given the relative funding for each division, it is not clear how funding was portioned within the division and why funding allocations were set at the current levels. This information is critical for the COV to comment on this aspect of the process.

## APPENDIX for Section B: List of Outcome Metrics

The following suggestions are not meant to be exhaustive nor final but only a starting point for discussion. In addition, this type of data has the potential to be manipulated to give the appearance of substantive progress in the absence of such. Program managers will play a vital role in verifying that a particular set of metrics is being meaningfully employed and modifying and/or removing those that provide little insight.

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

Collecting the following information on the final project report and maintaining a searchable data base of the information will be useful in assessing progress and outcomes:

- Number of K-12 students trained.
- Number of undergraduates trained.
- Number of graduate students trained.
- Number of postdocs trained.
- Number of minorities trained.
- Number of women trained.
- Number of individuals with disabilities trained.
- Number of non-scientists educated as a result of outreach activities.
- Number of international collaborations initiated.
- Number of partnerships initiated with non-degree granting institutions.

For K-12 and undergraduate students:

- How many students have gone on to enter a graduate program?
- How many students have gone on to successfully complete a graduate program?
- How many students have gone on to enter a science-related career?

For graduate students:

- How many students have gone on to a postdoctoral position?

For postdocs:

- How many postdocs have gone on to faculty positions?
- How many postdocs have gone on to other science professional positions?

The following information collected from the **program directors** and added to the data base will be useful in assessing the progress in reaching this outcome goal:

- Number of 2-year colleges awarded funding.
- Number of 4-year colleges awarded funding.

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

Collecting the following information on the final project report and maintaining a searchable data base of the information will be useful in assessing progress and outcomes:

- Number of papers published.
- Number of times papers cited.
- Number of invited presentations.
- Number of outreach activities organized.
- Number of people attending outreach activities.
- Number of articles written for popular consumption (e.g. Scientific American, etc.).
- Number of patents generated.

The following information collected from the **program director** and added to the data base will be useful in assessing the progress in reaching this outcome goal:

Percent of innovative/high risk projects that successfully achieve their primary stated goal.

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

Collecting the following information on the final project report and maintaining a searchable data base of the information will be useful in assessing progress and outcomes:

Number of people that use equipment.

Number of minorities that use equipment.

Number of people with disabilities that use equipment.

Number of undergraduates that use equipment.

Number of K-12 students that use equipment.

Number of papers that resulted from use of the equipment.

An interesting way to use some of these numbers would be see if certain types of equipment have a higher impact than others and also to compare the relative cost-efficiency of equipment.

The following information collected from the **program director** and added to the data base will be useful in assessing the progress in reaching this outcome goal:

Number of 2-year colleges awarded funding.

Number of 4-year colleges awarded funding.

**SIGNATURE BLOCK:**

\_\_\_\_\_  
For the DBI FY2004 COV  
Susan Wick  
Chair

\_\_\_\_\_  
Date

\_\_\_\_\_  
Mary E. Benjamin

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Stanley Blum

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Joseph Ogas

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John Burris

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Emil M. (Buddy) Orozco, Jr.

\_\_\_\_\_  
Carol Lushbough

\_\_\_\_\_  
Amy Rossman

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.

\_\_\_\_\_  
Cassandra Manuelito-Kerkvliet  
Designated Representative of the BIO Advisory Committee

\_\_\_\_\_  
Date