CORE QUESTIONS and REPORT TEMPLATE
for
FY 2007 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2007 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2007. Specific guidance for NSF staff describing the COV review process is described in Subchapter 300-Committee of Visitors Reviews (NSF Manual 1, Section VIII) that can be obtained at <www.inside.nsf.gov/od/oia/cov>.

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 results 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 program(s) under review. The program(s) 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 program, 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 program(s) 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 that appear over time. The COV also explores the relationships between award decisions and program/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. 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. For past COV reports, please see http://www.nsf.gov/od/oia/activities/cov/covs.jsp.

FY 2007 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: 6/27-29/2007
Program/Cluster/Section: BIO/DBI
Division: DBI
Directorate: BIO
Number of actions reviewed: Awards: Declinations: Other:
Total number of actions within Program/Cluster/Division during period under review: Awards: Declinations: Other:
Manner in which reviewed actions were selected:

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

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

A.1 Questions about the quality and effectiveness of the program's use of merit review process.

Provide comments in the space below the question**.** Discuss areas of concern in the space provided.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE[1]
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: The review system used by most programs with a combination of ad hoc and panel reviews works well. The COV did not examine the procedures followed during site visits. The COV recommends continuing diligence to find methods to address the chronic problem of an inadequate return of appropriate *ad hoc* reviews.	YES

[1] If "Not Applicable" please explain why in the "Comments" section.

2. Are both merit review criteria addressed? a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses? Comments: Individual reviews tended to be weaker in evaluation of broader impacts than of intellectual merit of the proposals. The COV recommends continuing education of the community on the meaning of broader impacts through instructions to panelists, outreach programs, use of examples on the Web, etc. The PO review analyses were complete and appropriate, although in one sample ejacket (a COI of the PO in BDI), the PO review analysis was very short and lacking in substance. (The COV had problems accessing PO review analyses in some ejackets).	a) usually yes b) YES c) YES
3. Do the individual reviews provide the rationale for the reviewer ratings (E, VG, G, F, P)? Comments: Most individual reviews provided a rationale for the reviewer rating, but there are sometimes disparities between the ratings provided and the narrative.	Usually yes
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: Yes, although more justification would have been useful in several situations where the individual reviewer ratings and text were internally inconsistent or scores varied among reviewers. The COV recommends that in these situations of inconsistencies within or between reviews, the POs continue to work hard to ensure that the panel summaries are clear in the justification of the decision and that the PO clarify this justification to the PI if the panel summary is not clear. (Note: The COV could not access the emails or many of the diary notes of the sample ejackets.) The COV felt that the sample size of jackets was not sufficient to evaluate the panel summaries within small programs. Although the COV recognizes that for statistical analysis a stratified random sample of the entire Division may be desirable, for evaluations of ejackets the COV recommends a sampling procedure that results in a reasonable number of both awards and declines within each program within DBI.	Usually YES
5. Does the documentation in the jacket provide the rationale for the award/decline decision? (Note: Documentation in jacket usually includes context statement, individual	YES

reviews, panel summary (if applicable), site visit reports (if applicable), Program Officer analysis, and staff diary notes.) Comments:	
6. Does the documentation to the PI provide the rationale for the award/decline decision? (Note: Documentation to the PI usually includes the context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written or telephoned with diary note in jacket) of the basis for a declination.) Comments: (Note: The COV could not access the emails or many of the diary notes of the sample ejackets.) A PI should receive feedback that makes clear both the strengths and the weaknesses of the proposal. Most, but not all, jackets discussed both strengths and weaknesses of the proposal and were substantive enough to help the PI understand why a proposal was declined. The degree of explanation given varied between programs. In some cases, it appeared that the PIs and reviewers differed in interpretation of some of the criteria for the program (e.g., the meaning of "multi-disciplinary"). In other cases, it appeared that reviewers who were more accustomed to traditional research proposals were uncertain how to apply and/or were inconsistent in the application of the NSF criteria of intellectual merit and broader impacts to proposals for infrastructure or human resources. The COV recommends careful attention to the instructions given to panelists on how to evaluate infrastructure proposals as well as human resource proposals with respect to intellectual merit and broader impacts, and continued evaluations of the program announcements for clarity in these issues.	Usually YES
7. Is the time to decision appropriate? Note: NSF Annual Performance Goal –Time to Decision: For 70 percent of proposals, the Division Director concurrence has been completed within six months of deadline or target date, or receipt date, whichever is later. Once the Division Director has concurred, applicants may be informed that their proposals have been declined or recommended for funding. The 70 percent goal recognizes that for some programs or some individual proposals, the time to decision is appropriately greater than six months. Comments: The DBI self study reports that 56-66% of proposals each year were processed within 6 months. Although the COV recognizes the impact on dwell time of increasing PO workloads and slow NSF servers, the COV recommends examination of the steps limiting this process within each program and increased effort to meet the NSF annual performance goal on time to decision. Declines need to be completed in time for PIs to meet following program target dates for a number of reasons (synchronization of training grants with the academic year, field seasons, better service and relationships with the community, etc.).	Mostly Yes, but not yet at 70%

8. Additional comments on the quality and effectiveness of the program's use of merit review process:

The NSF system using both panel and ad hoc reviews remains the "gold standard" for scientific review. The COV believes that the merit review system is working well within the division and reflects the quality of the work of the program officers and the division leadership.

A.2 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[2]**
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: The review of multidisciplinary programs is particularly challenging because no single reviewer may be able to address all aspects of a project. The quality of individual reviews in general seemed high.	YES
2. Did the program use reviewers balanced with respect to characteristics such as geography, type of institution, and underrepresented groups? Note: Demographic data is self reported, with only about 25% of reviewers reporting this information. Comments: The reviewers were balanced with respect to geography and type of institution, although there are a low number of reviewers from non-Ph.D. granting schools. In the data provided during the COV meeting, the proportion of panelists from under-represented groups ranged from 10-22% each year. The COV recommends that DBI continue to work hard to choose panels each year with representation of underrepresented groups. For panelists, the COV recommends that DBI further encourage panelists to report this information voluntarily (e.g., give them a hard copy of the form at the meeting to voluntarily return). 3. Did the program recognize and resolve conflicts of interest when appropriate?	YES

[2] If "Not Applicable" please explain why in the "Comments" section.

Comments: It is clear that DBI program officers are extremely careful to check for COI of reviewers, panelists, and POs. Almost all (10/11) of the limited number of COIs within the sample proposals were resolved appropriately.	YES, almost always
4. Additional comments on reviewer selection: The COV commends DBI for the attention given to balance and diversity of reviewers and panelists. Continued attention to diversity is encouraged.	

A.3 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[3], OR DATA NOT AVAILABLE
1. Overall quality of the research and/or education projects supported by the program. Comments: Source: Jackets and program information	Appropriate
2. Does the program portfolio promote the integration of research and education? Comments: DBI not only addresses diversity in subject matter, but also successfully integrates research and education components in several existing programs (e.g., post-doc programs). The COV recommends that DBI think about new ways to integrate research and education through potentially jointly funded and jointly administered programs for research and education. For example, informatics tools used for research are also potentially useful as tools for teaching. The COV also recommends that procedures that specify the research areas of training programs such as post-docs become (a) more transparent to the community as well as the program officers and staff within NSF, and (b) remain flexible with an ability to target emerging areas that may require more encouragement to flourish. The COV also recommends better coordination of the various post-doc programs and areas among the different divisions of	YES

[3] If "Not Appropriate" please explain why in the "Comments" section.

BIO, with consideration of other postdoc alternatives available from non-NSF sources.	
3. Are awards appropriate in size and duration for the scope of the projects? Comments:	Generally appropriate
4. Does the program portfolio have an appropriate balance of: • Innovative/potentially transformational projects? Comments: This question appears more directed toward strictly research programs. The COV recognizes that DBI has both infrastructure and basic research programs. For DBI, this question places insufficient stress on the ENABLING of science, and begs the question of "what ALLOWS transformations?" Many infrastructure awards are not directly innovative or transformational but are ESSENTIAL because in many cases biological infrastructure (e.g., FSML) enables innovations or transformations that otherwise may not have occurred.	Appropriate
5. Does the program portfolio have an appropriate balance of: • Inter- and Multi- disciplinary projects? Comments: The COV commends DBI as one of the most interdisciplinary divisions. The division funds a number of infrastructure projects that are multidisciplinary, and the number of awards that are jointly funded by more than one program also reflects this emphasis. Funding of DBI programs has not kept pace with BIO in general, and has resulted in proportionately less funding for infra-structure, with rippling effects throughout BIO because of this.	YES

6. Does the program portfolio have an appropriate balance considering, for example, award size, single and multiple investigator awards, or other characteristics as appropriate for the program? Comments:	Appropriate
7. Does the program portfolio have an appropriate balance of: • Awards to new investigators? NOTE: A new investigator is an investigator who has not been a PI on a previously funded NSF grant. Comments: Appropriate, based on the data for DBI as a whole. No data were given to determine if there is an appropriate breakdown by program.	Appropriate
8. Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments:	YES
9. Does the program portfolio have an appropriate balance of: • Institutional types? Comments: Non-Ph.D.-granting institutions have only a small proportion of the total awards.	YES
10. Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity? Comments: Given the diversity of programs in DBI, the information provided at the division level does not allow us to make a well-based answer.	Not applicable?
11. Does the program portfolio have appropriate participation of underrepresented groups? Comments: Addressed later	YES
12. Is the program relevant to national priorities, agency mission, relevant	YES

fields and other constituent needs? Include citations of relevant external reports. Comments: Given the priorities set by the letters from OMB, NSF strategic plan, and BIO mission, the research resources and scientific training activities of DBI are critical, as demonstrated in the annual reports, PRA highlights, and list of DBI awards.	

13. Additional comments on the quality of the projects or the balance of the portfolio:

The COV believes that many of the strengths of DBI, including infrastructure support, societal impacts of human resource activities, the enabling role of resources for training, and the impact of training that extends to a much larger community than just the research community, are critical and have not been adequately highlighted by the above questions. These questions appear to be designed primarily for disciplinary research.

A.4 Management of the program under review. Please comment on:

1. Management of the program.
Comments:
Overall, the management of DBI is excellent. The COV also commends DBI's excellent administration of the competitive review and award processes. The COV was impressed with the quality and scientific diversity of the program staff. DBI has done a commendable job of being responsive to the needs of the scientific community while ensuring that the portfolio of projects supports the primary goals of the program, and allocating the division's modest budget appropriately. DBI is doing a good job in programmatic planning and structuring, however the COV suggests more transparency of the priority-setting process within DBI as well as BIO. DBI's programs are crosscutting across BIO and therefore the COV recommends that DBI strive to improve communication with program officers in the other BIO divisions through annual meetings with new program officers in other BIO divisions as well as through more informal means. Such communication can put an interdisciplinary division, such as DBI, squarely at the center of BIO activities rather than at the periphery. The COV also recommends that DBI consider developing a system of mentoring for program officers in the division. The COV also recommends that DBI continue to develop an effective strategy for creating a portfolio of programs that balances innovation and persistent infrastructure.

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

Comments:
DBI has been in the forefront of research and education for a number of years. Within the research

resources cluster of DBI, the COV has found that the DBI is fostering research that will advance the frontier of knowledge, emphasizing areas of greatest opportunity and potential benefit. After examining 135 representative jackets, the COV determined that the DBI is engaged in promoting transformational science and has been successful in supporting and advancing research at the frontiers of knowledge. The funded proposals represent a mix of high-risk, multidisciplinary and innovative thinking. The COV recommendation is to continue to think strategically about how to ascertain the emerging fields and balance the persistent infrastructure needs with innovation as they are related!

Within the training cluster, the funding of postdocs through the PDRF is seen as a successful means to train future researchers. The COV especially lauded the small setup grants available to previous PDRF holders. The COV recommends that the process of choosing postdoc research areas be made more transparent. A correlation between the need of quality postdocs in a field and their chances for funding upon accepting an assistant professorship should be fully addressed. Also, the transparency as to the choice of topics should be disseminated through out the Bio Directorate. DBI has been innovative in human resource development through their REU program directly funding the tribal college (**DBI-0353848** Roberto Gonzalez-Plaza, Northwest Indian College) rather than outreach from a major university.

To meet the growing demand of undergraduate outreach a better balance between innovations vs. long term needs is required. The COV recommends that DBI continue to think strategically about how to move forward with human resources as well as research resources. For example, some of the training programs could be structured in such a way that home institutions undertake part if not all, of the investment of an REU site that has demonstrated success over the long-term. Solicitations for proposals could state that renewals on their third round must demonstrate that funding has been lined up to continue the award before the proposal runs out.

The COV recommendation is to continue to thinking about how new ideas are generated and disseminated – both on human resources and research sides.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio. (JOHN AND ANN)
Comments:

COV A4.3

One measure of the strength of the program planning and prioritization within the DBI portfolio is the portfolio itself. DBI has a diverse and appropriate portfolio of programs supporting research and human resource development. The division has shown itself to be capable of making sensible changes to that portfolio over time, and several of the programs that were the topic of this review (the period 2004-2006) have already been modified or abandoned and several new programs have been added.

Additionally, the COV interviewed program officers both within DBI and other divisions within the BIO directorate on a wide range of topics, including several that related to the planning and prioritization processes. Within the division the program officers were well aware of the range of programs available and of the rationale behind decisions that led to changes in the portfolio. For example, we discussed the process that led to the extension of a program for bioinformatics post docs, while discontinuing a similar program for microbial biologists, which included soliciting feedback from BIO-wide working groups. The DBI program officers were also well aware of the relationship of DBI programs to related foundation-wide efforts.

The situation was somewhat different for program officers from other divisions within BIO. First, there was extremely strong agreement that the resources and enhancements to resources provided through DBI play a critical role in enabling biological research in all BIO divisions and that DBI is the best place to locate these programs. Specifically cited were collections and databases used by systematists, the Protein Databank, the American Type Culture Collection, the Arabidopsis genome database, the field station and marine labs, and living stock collections of mutant organisms. Additionally, they cited the important role DBI programs have played in multi-user instrumentation and in instrument development. However, there was a strong sense that they perceived a trend of increasing separation between DBI and other BIO divisions, including decreases in co-funding of proposals and interactions in general. They cited a number of factors including an increasingly tight funding environment, loss of some programs that had been the focus of interactions, and increasing workloads that have reduced the opportunities for flexible collaboration and co-funding between divisions in recent years. They also discussed the decision-making process for bioinformatics post-docs. They agreed that their input had been solicited, and that the ultimate decision was appropriate ("bioinformatics is a pressing need"), but were disappointed in the transparency of the process, as they had no idea as to who was making the ultimate decision and what role their input played. They also felt that they were less informed, in general, about the programs available through DBI than they had been in the past, again citing the increased workloads experienced in recent years as the cause.

One topic that came up with both groups was the suspension or loss of some instrumentation programs. The suspension of the Multi-User Equipment program has left some important gaps in the resources available to purchase shared equipment costing between $60-100K, especially for small to medium-sized groups of investigators at large universities. Program officers from outside DBI specifically cited loss of instrumentation programs that had previously been co-funded between divisions as a contributing factor to the perceived decrease in interactions with DBI. Both groups indicated a desire to see the return of some of these instrument programs, perhaps in a modified or more targeted form.

The COV would like to see DBI return to a more central role in its interactions with other divisions within BIO. Although a better funding environment is a solution we all would prefer, we focus here on activities that do not specifically require new funds. Several activities were suggested by program officers from one of the other BIO divisions. These included increasing solicitation of suggestions for reviewers & panelists from appropriate divisions within BIO, along with input on reviews of proposals. Another suggestion was to have the DBI director make a brief presentation at meetings of the other divisions detailing DBI programs, especially those with opportunities for co-funding. Ideally such a visit would be scheduled for a time shortly after new rotators arrive at NSF. The COV endorses these suggestions.

Strong support for many of the programs from other
Have a diverse and appropriate portfolio
Contact with stakeholders
Increased transparency desirable
Outreach and Inreach – need for being able to fund equipment in mid-range was often desired
More collaboration with other divisions would be helpful

- Suggestions for reviewers & panelists
- Input on reviews of proposals
- Development of new instrumentation
- Meeting with new rotators from other divisions

Interaction with user community is appropriate

4. Responsiveness of the program to previous COV comments and recommendations.
Comments:

In its 2004 review of the DBI, the COV made 18 recommendations and also noted that 10 recommendations of the 2001 COV remained valid. The DBI has adequately addressed the majority of these recommendations as noted in the Division's reports ("Response to the 2004 COV Recommendations" and "2007 Self-study") and through its current policies and practices.

Many of the 2004 COV's recommendations were concerned with the mechanics of proposal processing within the NSF system. Specific suggestions were offered to expedite the handling of applications or improve the FastLane online system. From our review, we conclude that the Program Officers have worked conscientiously over the past several years to reduce the "dwell time" for proposals, in spite of a marked increase in the number of proposals and what is still often cumbersome computer network at the NSF. In addition, we found that the Program Officers felt that the DBI Director is providing sufficient oversight to ensure that efficient proposal processing is priority throughout the DBI.

A number of the previous recommendations addressed the need to recruit well-qualified reviewers and panelists. As noted in our COV report, this task remains a challenge for DBI Program Officers. Several of the POs whom we met with are using a variety of strategies to try to increase the return rate of *ad hoc* reviews and recruit qualified panelists. However, these commendable actions are not often met with improved outcomes in current times when so many proposals are submitted and so few are funded. This challenge of finding reviewers is not limited to the DBI, or to NSF, so the recommendation that Program Officers explore new ways to recruit a diverse pool of reviewers and panelists remains valid. Improved communication and networking among colleagues within BIO, NSF, and outside the agency and novel outreach strategies are needed to identify individuals who might serve as potential reviewers. In addition, there is a continual need to train newly appointed reviewers and panelists so they better understand the review criteria, especially the broader impact criteria. Newly appointed Program Officers also need mentoring from seasoned POs to learn how to recruit the best qualified reviewers for their program as efficiently as possible. Documenting the most successful recruiting and training strategies being used by DBI POs would be helpful to provide in future reports to the COV.

DBI functions within BIO and NSF and the Division Director and POs have noted quite reasonably that implementing some COV recommendations is difficult because some areas remain outside its direct purview. While we understand these structural constraints, we look forward to DBI's responses to COV recommendations to any BIO Directorate or NSF issues since their analysis might lead to alternative and creative solutions that could be applied across the directorate or agency.

5. Additional comments on program management:

PART B. RESULTS OF NSF INVESTMENTS

The NSF mission is to:

- promote the progress of science;
- advance national health, prosperity, and welfare; and
- secure the national defense.

To fulfill this mission, NSF has identified four strategic outcome goals: Discovery, Learning, Research Infrastructure, and Stewardship. The COV should look carefully at and comment on (1) noteworthy achievements based on NSF awards; (2) ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcome goals; and (3) expectations for future performance based on the current set of awards.

NSF investments produce results that appear over time. Consequently, the COV review may 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.

To assist the COV, NSF staff will provide award "highlights" as well as information about the program and its award portfolio as it relates to the three outcome goals of Discovery, Learning, and Research Infrastructure. The COV is not asked to review accomplishments under Stewardship, as that goal is represented by several annual performance goals and measures that are monitored by internal working groups that report to NSF senior management.

Please provide comments on the activity as it relates to NSF's Strategic Outcome Goals. Provide examples of outcomes ("highlights") as appropriate. Examples should reference the NSF award number, the Principal Investigator(s) names, and their institutions.

B.1 OUTCOME GOAL for Discovery: "*Foster research that will advance the frontier of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformational science and engineering."*

The COV has found that the DBI is fostering research that will advance the frontier of knowledge, emphasizing areas of greatest opportunity and potential benefit. After examining 135 representative jackets, the COV determined that the DBI is engaged in promoting transformational science and has been successful in supporting and advancing research at the frontiers of knowledge through a rigorous merit review system. The funded proposals represent a mix of high-risk, multidisciplinary and innovative thinking.

We point to two of several examples which were made available to the COV in the E-Jacket. The first on "single molecule fluorescence" reflects transformative science in biophysics. The NSF DBI initiated funding in this area in the eighties, which in the COV's opinion was forward-thinking and preceded that of DoE and the NIH. Utilizing single photon methodology researchers can follow a single molecule at the active site of a protein or a short piece of DNA undergoing transcription. These experiments are transforming our fundamental understanding of enzyme catalysis and other

important events in biological systems. This forward thinking investment by the DBI is impacting *all* aspects of biological/biophysics research --- from the lab to the classroom.

Another award, made in 2006, a grant to Fagan (DBI0548366, University of Maryland, College Park) for the establishment of a "stoichioproteomic" database is worthy of mention. In prior years, Fagan and his coworkers noted the correlation between the whole-organism nitrogen content of N-rich and N-poor species and the standardized N-content of the side chains of their proteins. Initially, such investigations demonstrated that protein atomic compositions of bacteria and yeast correlated with the nutrient availability in their ecological niche. Preliminary data in the proposal indicate that also in animals and plants protein amino acid residue stoichiometry is a diagnostic signature of the niche environment and trophic factors. Nutrient influence on amino acid composition may prove to be a new parameter that impacts fundamental analyses of phylogenetic relationships between organisms and plays a role in the evolution of protein structure and function.

Such projects reflect DBI's leadership in the area of Discovery as well as its critical role in contributing to NSF's overall missions.

Expectations for future performance based on the current set of awards: Continued contributions to NSF's cyberinfrastructure priority area will require both responsiveness to emerging ways of structuring data and knowledge as well as coordination between DBI and other NSF-wide programs. A continuing challenge, also related to B.3., is that of maintaining existing infrastructure while supporting emergent databases. A balance between these will be critical for synthesis, discovery and legacy. It does not appear obvious to the COV that DBI has the human and financial resources to respond to this important and difficult need.

B.2 OUTCOME GOAL for Learning: "*Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens."*

Comments:

The DBI has several mechanisms to cultivate a world-class, broadly inclusive science and engineering workforce, and to expand the scientific literacy of all citizens. DBI has a diverse portfolio of training programs including the REU, UMEB, cRUI and PDRF. NSF continues to be the primary source of support for REU-type programs in the country, typically the only support available for inclusion of students from outside of one's institution.

The **REU program** at DBI has been highly successful in funding programs for underrepresented minorities. A typical REU site gets more than 100 on-line applications for about 10 available slots. Many sites still experience difficulties in successfully enticing underrepresented minority students, as these students report getting multiple offers for summer research internships.

DBI has funded three programs that specifically enable Native Americans to perform research. **DBI-0353848 (**Roberto Gonzalez-Plaza, Northwest Indian College) is the first REU program from a tribal college in the Bio Directorate. **DBI-0353642** (Anthony Sena, Northern New Mexico Community College at Espanola) has REU students with both Native American and Hispanic backgrounds. **DBI-0244221 (**Diana Anderson, Northern Arizona University) is an REU program that trains American Indian students from 3 tribal colleges (Dine College, Southwestern Indian Polytechnic Institute, and Crownpoint Institute of Technology) and has had its first graduate go on to graduate school in biology. In cultivating other underrepresented minorities, in **DBI-0243754 (**Jonathan Arnold, University of Georgia), all 40 participants come from underrepresented minorities with 5 peer-reviewed publications arising from their contributions. **DBI-0244179 (**Paul Bosland, New Mexico State University) is a unique site because it provides research experience to 1st generation college students who are children or grandchildren of migrant farm workers.

UMEB is designed to increase the representation of all groups in the broadly defined area of environmental biology. UMEB Program is unique for having both a focus on the type of groups targeted and its narrowly focused area of biology. These characteristics make the program unique among programs at NSF and those at other agencies. DBI-0405380 (Michael Hadfield, University of Hawaii) is a UMEB program that targets Native Hawaiians from Micronesia and Polynesia. Students learn molecular biology techniques and apply them to problems/questions in terrestrial or marine ecosystems in Hawaii.

The **cRUI** program encourages multidisciplinary research at undergraduate institutions. It supports the training of undergraduate students in highly integrated research projects that span biology and at least one other discipline. cRUI has stringent requirements of cross-disciplinarity, as well as a focus on primarily undergraduate institutions. cRUI was discontinued after FY2005. DBI-0442269 (John Long, Vassar College) is an award for studying the origins of articulated vertebrae by using "real animal robots" and virtual animal robots that can be used to simulate the evolution of centra. This award promotes linkages between two researcher institutions with strengths in robots and computational modeling. Two year fellowships provide students cross-disciplinary expertise in often uncorrelated fields.

PDRF provides postdoctoral research fellowships to minority doctoral scientists to assist in their preparation for positions of scientific leadership in academia, industry, and government. In 2005, NSF awarded $100,000 over two years to the University of California Davis for "Project: Exploring the role(s) of small RNAs in plant-virus interactions" (**DBI-0512081**). The project director, Dr. Jagger Harvey, will work in the laboratories of Dr. David Baulcombe, director of the Sainsbury laboratory at

John Innes Center in Norwich, UK and Dr. Hans Herren, at the Centre of Insect Physiology and Ecology in Nairobi, Kenya. This study addresses several key questions concerning the natural interplay between the genetic defense mechanisms of organisms and the genomes of the invading entities to which they mount a defense. The project will expand our understanding of plant disease resistance, and may provide us with a new source of pathogen-derived resistance (PDR), which has saved numerous farming industries to date including papaya in Hawaii and tomato in the Dominican Republic.

Expectations for future performance based on the current set of awards:
National Academy of Sciences Bio 2010 calls for significant restructuring of undergraduate education programs in biology. All education programs at NSF including those supported by DBI need to have the flexibility and resources to be responsive. DBI is uniquely positioned to contribute to the call because it currently supports technologies that support this type of reform. During CRUI's tenure it was most attuned to the Bio 2010, however the program did not receive many applications. This is believed to be due to the fact that few investigators were equipped to think creatively along these directions. Development and support of the required individuals will require nurturing by a program with the attributes of CRUI in specifically supporting integration of quantitative science with education. Because innovative ideas are not forthcoming in this direction, NSF will need to rethink the human capital needs in this scientific area.

B.3 OUTCOME GOAL for Research Infrastructure: "*Build the nation's research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure and experimental tools.*"

As represented in the name of the division, a primary mission of DBI is to support the development and maintenance of a range of infrastructures that are critical to the operation of the larger biological enterprise. Major areas include 1) the development of advanced instrumentation, 2) development and, to some degree, support of databases that are enabling to particular areas of biology, and 3) the development and maintenance of enabling resources such as biological collections and facilities such as biological field stations and marine laboratories.

First, DBI's critical investment in advanced instrumentation is illustrated by two awards that support a collaborative project for development of a new time-resolved single photon imager optimized for ultrahigh sensitivity fluorescence spectroscopy and microscopy. This instrument will allow improved imaging and spectroscopy of single molecules, molecular complexes and macromolecules in living cells and tissues (0552096 O. Siegmund University of California-Berkeley and 0552099 S. Weiss University of California Los Angeles).

Second, with respect to databases, DBI continues to play a critical role in developing vibrant and viable components of cyberinfrastructure that support biological research in a variety of areas. These "community" databases make accessible information that is critical to the pursuit of important questions in molecular biology, organismal ecology, paleontology and biodiversity research. They vary widely in size, level of maturity and amount of DBI support, but each plays an important role in its particular community. The importance of this infrastructure is illustrated by several specific examples.

DBI has consistently been a leader in supporting the formation of a series of federated databases. This support is long-standing, going back some eleven years when an award was made to explore a data model for dealing with biodiversity collections. This led to the development of the DiGIR software and associated community that itself has driven the subsequent development of a number of successful federated database resources in different areas, including mammals (MANIS – 0108161 B. Stein University of California at Berkeley), birds (ORNIS – 0345448 M. Farmer University of Kansas) and reptiles (HerpNet – 0132303 L. Trueb University of Kansas). Similar databases have been funded in the areas of proteomics and genomics.

Other DBI-funded, ongoing database efforts include support for the Protein Data Bank (PDB – 0312718 H. Berman Rutgers University) which serves as the US component of the international repository for three-dimensional structural information for biological macromolecules and the Arabidopsis Information Resource (TAIR – 0417062 S. Rhee Carnegie Institute of Washington Plant Biology). Both of these databases have come to be seen as fundamental pillars underlying the research efforts in their respective large communities.

Biological and living collections continue to play a similarly essential role for their respective research communities. The challenges for stock centers include the need to be dynamic in response to the community while providing basic services. Under the current climate of funding, there are similar needs for collections in other communities that may be going unmet.

Third, is the development of enabling infrastructure at biological field stations and marine laboratories, which has a direct impact by making possible, such developments as the innovative real-time networked animal tracking system in a tropical rainforest (0201317 M. Wikelski Princeton U). Much of the most important work for enabling biological discovery at field stations is less glamorous. Even such seemingly mundane activities as upgrading a sewage system, a road system, or expanding a dormitory (0330442 M. Williams University of California –Santa Barbara), expanding a laboratory or providing microscopes (0434256 A.O.D Willows at the University of Washington Friday Harbor Laboratory) can have significant impacts on discovery because researchers can't study what they can't access or see. Importantly, such enhancements of biological field stations should also be appreciated as wise long-term investments for the NSF because of their impact on student training, as well as scientific discovery.

Future performance depends on DBI's continued support of a diversity of infrastructural needs

PART C. OTHER TOPICS

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

There was a general sense that the overall Division is operating well and there are few obvious gaps. However, the COV did identify some areas that the Division should give some thought to. With the exception of the first item, these are not in any particular prioritized order.

Most importantly, the recent loss of Gerald Selzer, particularly in the critical area of instrumentation development represents a key position where experience and background knowledge are very important to its functioning. The Division needs to gives careful thought as to who will be filling this key position.

Several issues relating to personnel were identified by the COV. First, it appears as if there is no formal mechanism in place to orient new program officers (rotators or otherwise) within the larger BIO directorate. Such an orientation would maximize the kind of understanding of the larger directorate that will facilitate better and more frequent interaction among program directors in the different BIO divisions. The COV had a difficult time getting an exact fix on the number of rotators versus permanent program directors that currently within the Division but felt it was reasonable. This is a ratio that needs to be kept track of as personnel move into and out of the Division.

The COV recognizes that the Division has paid close attention to the proposal dwell time and is rapidly approaching the NSF target of having 70% of the proposals processed by six months. The COV was also of the opinion that some level of streamlining of procedures and implementing Division-wide standard operating procedures (SOPs) might function to cut the current dwell time down allowing the Division to reach, or even exceed, the NSF-wide goal. The general framework for handling and processing of proposals within DBI functions is at a high level of efficiency given the heavy workload that program director's face. However, there did seem to be some level of variation among the different programs that could be impeding the efficient handling of proposals across the Division. To address that, the COV felt that some consideration should be given to evaluating the current methods used within the Division for the processing and handling of proposals with the intent of establishing, to the extent advisable, a clear framework for employing best business practices. For example, the Division should develop a set of consistent guidelines and protocols for contacting ad hoc reviewers and should give some thought to developing procedures or incentives for improving the ad hoc return rate. Were the latter accomplished, it would have the net effect of improving the efficiency by which program officers get the ad hoc-ing done and, in theory at least, free up a fair amount of their time.

Another area where the COV was concerned about variation across programs was in the way different programs handle carryover issues on proposals that are still under consideration. The COV recognizes there is a considerable amount of variability among the DBI programs and does not want to be in a position of recommending putting a collection of different shaped pegs all into square holes. However, a review of how the different programs handle carryover with the goal of establishing, as practical, a set of best practices would be worth carrying out.

The COV was favorably impressed with the operation of the postdoctoral programs and supportive of NSF's effort in this arena. There was, however, a lack of clarity as to the process by which topics for the targeted postdoctoral programs (e.g., microbial biology, bioinformatics) were both decided upon on the one hand and slated for renewal or discontinuation on the other. Again, the COV is not calling for wholesale change but rather recommends that the leadership of the Division review the processes by which these decisions get made to ensure they are sufficiently transparent so that others know the basis for the decisions that get made.

The COV was concerned to learn that one consequence of the loss of the Multi-user Equipment (MUE) program was to eliminate access to NSF funding for equipment costing less than $100K from Ph.D.-granting institutions. This was seen by committee members and program officers alike as a real loss, and one that threatens the nation's research infrastructure as smaller groups within universities that might want to purchase a $50-75K instrument can no longer access such funds through NSF. The COV feels that this issue needs to be examined by both the Division and the Directorate with the idea of possibly identifying a substitute source of funding for these instrument needs. A second area of concern related to instrumentation involves the current approach of allowing

only two to three proposals from any given university per year in the MRI Program. This is seen as limiting and effectively serves to remove highly competitive proposals from the potential pool for funding.

Finally, the COV had concerns about the ability of the Division to maintain a balance between its support of persistent (long-term) infrastructure and new, more innovation projects. This topic will be addressed more fully in **Section X.Y**.

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

No additional comments

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

The COV commends DBI personnel on the amount of time spent with the user community in all aspects of outreach, administration, professional development and post-award management as well as keeping current emerging frontiers in their respective disciplines. However, a combination of increased grant applications from the user community coupled with static resources appears to have resulted in heavy workloads which could impact the efficacy and global leadership of NSF overall. If NSF does not address workload issues across the entire agency the system may not only lose competitiveness but eventually become unworkable.

While the reasons for increased applications to NSF for funding are being examined by an NSF-wide review, the Impact of Proposal and Award Management Mechanisms (IPAMM) committee, there does not appear to be a systematic and systemic mechanism to assess how the agency can adapt to meet these rapidly growing demands. Such an assessment would allow not only DBI, but all other programs to meet NSF's strategic goals in a timely and appropriate manner. Related to this is the need to enhance NSF's competitiveness in the global arena by allocating increased resources toward high-risk and innovative programs. Additionally, it is critical that NSF's own cyberinfrastructure and information technology systems continue to be high-speed, secure and adaptable.

Ultimately, NSF must be strategic in promoting and achieving 1) cohesion within and among programs, 2) accountability of PIs for data synthesis and dissemination and 3) NSF-wide collaboration which requires allocating resources to improved and effective workloads. NSF could consider progressing toward a Knowledge Management System (KMS) that utilizes the extensive and unique tacit knowledge

(i.e., knowledge that people carry in their minds and the experience that comes from adjusting knowledge based on doing) held in NSF's human capital as well as explicit and rapidly growing scientific data. A Knowledge Management System refers to a structure for managing knowledge (versus data) in networks of people, infrastructure and information. This includes supporting the creation, capture, storage, linking and dissemination of data and information which are integrated across scales and disciplines. It can lead to increased efficiency and ultimately discovery because it allows emergent and novel patterns (relationships, correlations, etc.) to be identified, improves the continuity of information (i.e., legacy) and allows the dissemination and adaptation of knowledge as a recursive process across broad user groups.

NSF has enormous potential to develop Knowledge Management Systems across its programs but this requires a commitment to understanding and adapting workloads such that individual programs have the time and resources to assess and capitalize on the relationships between both research and education efforts. This can subsequently be done across programs to create an overview of the synergies between programs within NSF such that its investments are optimized not only in direct products but, as importantly, gives rise to a whole greater than the sum of its parts.

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

No comments

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

The COV thanks the DBI division director, Machi Dilworth, the deputy division director, Judy Skog, the program officers, and the staff for outstanding support during the COV. Their desire to serve the best interests of their community and the BIO directorate was evident throughout. The diverse portfolio of programs in the research resources cluster and the human resources cluster of DBI makes this a challenging division not only to administer, but also to review. The COV appreciated the diversity of perspectives allowed by a COV committee of this size (N=11). The ability to meet with both the DBI program officers as well as with program officers from other BIO Divisions was extremely useful and we recommend continuation of these two meetings with the DBI COV.

The efficiency of the COV was lowered because of technical problems with access to documents on the NSF server. Access to documents was intermittent and slow, and it was impossible to access parts of the ejackets. This direct experience with the NSF servers did allow the COV to experience some of the inefficiencies in the work environment of the program officers and staff. Minor changes that would help the COV include more consistent

file names for similar documents among programs and across years, and small file sizes to facilitate downloading documents at home institutions and at NSF. The COV found that the standard template was biased toward evaluation of core research programs and it was difficult to use that framework to address the more unique aspects of DBI relating to support of infrastructure as well as the human resources cluster of programs.

Additional data requested during the COV during the review for the division included (a) a list of staff by status (permanent, rotator), (b) data on both the number of proposals as well as the number of awards by state, (c) data on the number of proposals and funding rates by type of institution, (d) data on the number of proposals and funding rates of new investigators, (e) data on the number of awards with joint funding between programs, (f) more internal "leading edge" documentation beyond that initially provided, and (g) a complete list of living stock supported during the review period. Because of the diversity of programs within DBI, the COV requested during the review several documents that provided information by program as well as for the division as a whole, including (a) the annual budgets of the programs, (b) the average annual award size and duration, (c) diversity information (with and without diversity-targeted programs), (d) the number of proposals and proportion funded. The COV recommends that this additional information be routinely provided to the COV. Additional data may need to be provided as the report template evolves. Because of the number of programs within DBI, the COV also recommends a sampling procedure of ejackets for the COV that results in a reasonable number of both awards and declines within each program within DBI.

PART D. PROGRAM LEVEL QUESTIONS

DBI would like your advice about several questions related specifically to the program.
Venn Diagram—Preamble **(JOHN AND ALEX)** (or to go in A.4. Section 3)

D.1 Are there ways that DBI can uniquely contribute to BIO's broadening participation efforts by making our portfolio as inclusive as possible to represent the face of America today? (ERIK)

Overall, the COV gives DBI high marks for working to make the face of its portfolio represent the face of America today. We advise continuing efforts on capacity building at minority serving institutions, and to continue other efforts aimed at nurturing the careers of scientist-scholars at all stages of their careers. Specifically we advise continued investment in postdoctoral fellowships in critical scientific areas, including initial faculty startups, continued efforts to build capacity at minority serving institutions. Consideration should be given across the Foundation on whether the human resource programs are demographically sound; i.e., there is a balance of support throughout an individual's scientific career.

We note an opportunity that is perhaps unique to DBI: DBI has a unique role in nurturing cyberinfrastructure for biology education and research in the United States. (By cyberinfrastructure we mean the databases, access protocols (e.g., graphic user interfaces), human capital, hardware, software and searchability of these frameworks for research and education. Concomitant with these challenges is the growing complexity of databases and the absolute need for sophisticated curatorial staff that manage them. This optimizes discovery by capitalizing on both implicit (e.g., human expertise) and explicit (e.g., data) knowledge). At the same time cyberinfrastructure for biology education and research has a unique role in solving an enormous problem in the biology workforce--

-the lack of workers trained simultaneously in biology, quantitative physical science, mathematics, and computation. This need is the subject of the National Academy of Sciences study BIO 2010, and an enormous opportunity for enabling broad participation by under-represented minorities. While career opportunities are limited for biologists without such integrated training, there is a shortage of computational biologists and relatively abundant opportunities for experimental and observational scientists who can effectively utilize quantitative methods. Advances in tools for data searching and analysis, visualization, simulation, and integration of multiple computational modes within portals have created the potential for augmenting creative multidisciplinary biology education approaches with cutting edge cyberenvironments. These cyberenvironments should provide the capability to utilize research computational and visualization tools for education, and disseminate rich educational environments tuned to the needs of 21st century biology to previously under-represented groups. This can enable the face of the 21st century biology workforce of tomorrow to represent the face of America today. An excellent and so far unique prototype for such an effort is in the biology curriculum at the University of California at Merced, the newest research university in the United States. UC-Merced has just finished its third year of operation for undergraduates. It serves a student population with a large fraction of under-represented minorities, most of whom are the first generation in their families to attend an institution of higher learning. In this context, approximately 1/3 of its entire undergraduate population is majoring in a rigorous biology curriculum that mandates biophysics with calculus, and computational biology, as well as traditional cell, molecular, and systems and integrative biology.

D.2 How can DBI best approach the issue of long term maintenance and operation of the long-lived infrastructural resources we help to develop, including biological resources, instrumentation, databases, and software?

The COV identified a number of instances where there exists a tension within clusters and individual programs caused by mixing support for long-term infrastructure (such as biological databases and living collections) with support that is shorter in duration (e.g., post-docs). Long-term infrastructure poses special challenges. Panels considering both long-term infrastructure and more traditional research often experience tensions between the "intellectual merit" and "broader impact" criteria. A database critical to the research of hundreds of researchers may or may not be innovative, but provides a tremendous service that enables innovative research. Criteria such as number of users, currency of data, and statistics reflecting use of data (such as number of publications using data from the database) are appropriate for long-term infrastructure, but these criteria would be inappropriate when applied to a "normal" NSF proposal where the quality of the research itself, rather than the research it enables in the short term, is paramount.

Additionally, the most suitable forms of award management may differ. For "normal" NSF proposals, competition between researchers is both desirable and necessary. However, for long-term infrastructure projects it is generally much more productive to promote cooperation and joint development.

In summary, the problem is an undesirable competition between the need to support innovative development of new technologies for creating infrastructure, and the need to maintain and continually enhance ongoing infrastructure for science (for example PDB or the TAIR). At present these needs compete with each other during the review process, with both types of projects being reviewed by the same panel, and the reviewer judgments being resolved by the program director.

DBI recognizes this problem, but deals with it reactively (by reacting to situations raised in the submission and review process) rather than proactively (by creating a strategic plan for balancing the need for evolvable long-term infrastructure with the need for innovations in infrastructure creation).

The COV recommends that DBI seriously consider creating a new cluster for long-term infrastructure and pursue an intensive process incorporating internal meetings, and workshops involving experts on the management of other programs that fund long-term resources (both inside NSF and outside). Goals for the organizational process would be:

- To develop and refine goal and mission statements for the cluster
- To identify which elements of existing programs should be moved to new programs within the cluster
- To identify the best models for management of long-term infrastructure that will facilitate its collaborative development and efficient operation, including criteria and processes for adding, relocating, or discontinuing specific resources.

Appendix A provides a "straw man" example of how such a cluster might be operated.

We would note that it is possible towards a collaborative approach a program in which individual investigators could compete for using existing infrastructure as a testbed for development of new innovations. For example, existing supported databases could be used as testbeds for developing new methods for genomic analysis. The new methods developed would ultimately be incorporated into such database/portal.

D.3 What are the anticipated infrastructural needs (both human resources and research resources) for the biological sciences based on your view of where the science is moving in the next decade?

One trend in science that we can anticipate is that overall research projects will become more complicated and that team approaches will become more common than they are at present. This transformation is already starting nationally and is just making some inroads at the NIH. This has implications for balancing the mix between small and large projects with attention to how these may change in favor of the larger projects/programs. These large programs will have a common factor, participants will not all be housed at a central University or laboratory. This trend could place significant stress on existing infrastructures, most notably the communications/computer infrastructure or simply the "cyberinfrastructure." Having said this, the Foundation is going to have face issues relative to the cost of maintaining such an infrastructure by itself or forcing the grantee institutions to recognize their share in this investment. The grantee share could simply be of the form that they pick up the cost of maintaining the infrastructure after some subtle time frame. For example, the issues of long-term infrastructure and maintenance addressed in section D.2 will arise in an equally critical way if ignored.

A corollary to these issues is the Foundation's need to exploit the power of the next generation of computers and apply that power to biological problems. For example, within the research domain, the development of quantum mechanical/molecular mechanics (QM/MM) models for large protein DNA complexes or multi-protein complexes is simply out of the realm of possibility with existing supercomputers. Is that still going to be the case with the new hardware? Is exiting software scaleable to these larger problems? The Foundation can take the lead in on such issues through new programs within the biology directorate.

Finally, to address these complexities of the future we need the human resources, i.e. graduate students, post doctoral fellows, and new faculty that are ready to tackle these exciting opportunities. Hence, we need to start working on the development of these programs now.

Appendix A: A Straw-Man Vision for Long-Term Infrastructure

This is a "straw-man" description of one way that a long-term infrastructure cluster might be structured and administered. It draws extremely heavily on the model used for Long-Term Ecological Research projects, although we recognize that this is not the only possible, model.

The goal of the Long-Term Infrastructure (LTI) cluster is to provide efficient support for and efficient management of widely-used resources that provide enabling infrastructure that is critical for discovery in biological science.

The Long-Term Infrastructure cluster would include the following elements:

- Living Stock Collections
- Established biological databases (those that already have a substantial user community)
- Major software tools

They are characterized by:

- A major "service" component – they curate and distribute resources used by a wide community of researchers and educators.
- The need for continuous, long-term support without which the resource might be irrevocably lost

Funding should be for a 6-year period, with a mid-term site review in year 3 of each award cycle and, might be a Cooperative Agreement rather than a continuing grant. Projects would be arranged into "cohorts" spaced two years apart. This means that every other year would be devoted to either renewal proposals for one cohort, or mid-term reviews for another cohort, in continuous rotation.

Renewals would be handled as a pass-fail process, rather than a competitive ranking of existing and new projects. Criteria for a renewal decision would be predicated on:

- A compelling vision for the goals and mission of the project and how the project will lead to the advancement of discovery science
- Metrics for the continued value of the resource, such as the number of requests, number of users, number of publications that resulted from use of the resource.
- The quality of plans for enhancement of the resource
- The quality of the leadership and administration of the project
- Participation in collaborative efforts with other LTI projects in the development of shared infrastructure or tools
- Optionally: Success in, and plans for education and outreach activities
- Optionally: Success at leveraging NSF support to attract resources from other funding sources

If a project is found deficient in any area the panel could recommend:

- Immediate discontinuation of the project
- Funding for a 2-year "probation" period during which deficiencies must be remedied, followed by a new proposal for 4 years to be sent to the next panel.
- Funding for a 2-year "shutdown" period. Optionally a competition for a replacement home for the resource could be held the following year, with a one-year overlap between old and new homes for the resource.

When new resources become available it may be possible to add new infrastructure projects to the LTI portfolio. The competition would be limited to projects/resources that have already established a track record, so that the metrics used for renewals can be applied. Optionally, following the model in the Field Stations and Marine Laboratory Program, wherein as a first step a planning workshop is funded to support development of

a detailed plan, LTI could support workshops and planning efforts aimed at developing detailed assessments of the probable impact of new infrastructure.

Provision should also be made for sunsetting programs as well as individual projects on the basis of “mission accomplished” as well as for inadequate performance, perhaps during a decadal review of the LTI cluster.

SIGNATURE BLOCK:

For the DBI 2007 COV
Dr. Ann K. Sakai
Chair

Date

Dr. Lilian Alessa

Dr. Daphne Rainey

Dr. Paul Ellis

Dr. Caroline L. Schauer

Dr. Alexander N. Glazer

Dr. James Siedow

Dr. Chavonda Jacobs-Young

Dr. Eric Jakobsson

Dr. John Porter

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.

Dr. Barbara Wakimoto
Designated Representative, BIO Advisory Committee

Date

DIVERSITY DOCUMENT

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

June 29, 2007

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 2007 Committee of Visitors for the Division of Biological Infrastructure was composed of 11 members, including Dr. Barbara Wakimoto, who represented the BIO Advisory Committee Six of the members are female, and three members are from an underrepresented minority. Members currently work in eight different states, including California, Washington, Alaska, Illinois, Virginia, Pennsylvania, North Carolina and the District of Columbia. Nine members are from academic institutions, one is from a national lab, and one is 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.

James P. Collins
Assistant Director
Biological Sciences