

Committee of Visitors Report
Review of the Division of Environmental Biology
June 21-23, 2006

Committee of Visitors:

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Introduction

The Division of Environmental Biology (DEB) appointed a Committee of Visitors (COV) to conduct a review of DEB for the fiscal years 2003, 2004, and 2005. The charge to the Committee was:

The 2006 DEB COV is charged to provide an assessment of the Division in two primary areas (1) assessments of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions; and (2) the degree to which the outputs and outcomes generated by awardees are contributing to the attainment of NSF's mission, strategic goals, and annual performance goals. The time period covered for this assessment is fiscal years 2003, 2004, and 2005.

In addition, the COV was asked to address a set of questions specific to DEB-activities. These were:

- 1) Has DEB sufficiently supported integrative research within and beyond environmental biology?
- 2) Success rate has been dropping within DEB and BIO. This is largely due to an increased number of proposals being submitted to each panel cycle, combined with flat or declining budgets. So far, DEB has made no changes to the submission and review process (other than increasing efficiency to maintain timeliness of the decision). Should changes be considered?
- 3) The programs within DEB have the flexibility to devote program funds to workshops that identify research frontiers or initiatives. Do you feel that DEB programs should be more proactive or have a more consistent plan for funding such workshops within the communities they serve?
- 4) Please comment on the proposed data sharing policy that was developed within DEB and being considered for adoption as a BIO-wide requirement on all proposals?

The twelve-member COV conducted its review 21-23 June, 2006 at NSF. Dr. Michael Mares, representing the Advisory Committee for the Biology Directorate (BIO), participated in the meeting and provided insights on NSF and BIO policy, history, programs, and current concerns. The COV used the self study document for analysis and supplemented the data provided in that document by reviewing the 120 proposal jackets (including both awards and declines) supplied by DEB. The COV conducted both qualitative and quantitative assessments of the jackets. The COV met with DEB program officers and staff. The COV also met with allied program officers and staff from other areas that often co-fund projects with DEB.

The COV thanks Acting Director, Dr. Penelope Firth, and Acting Deputy Director, Dr. Alan Tessier, for their assistance and commitment to the COV review. The COV also thanks the many DEB staff who contributed to the review and helped at the meeting. The COV is particularly grateful to Division Secretary, Althea Ball, who organized travel and pre-meeting arrangements and Science Assistant, Angela Early, who responded to many requests for additional information and helped us throughout our three days at NSF. Finally, the COV recognizes the important work of the DEB Science Assistants who put together the self study document. Their efforts were instrumental in allowing the COV to spend more time discussing strategic issues and less time collecting information.

The results of our review are contained in the answers provided to questions in the report template. In addition, we present summary recommendations at the end of the report along with answers to the four specific questions posed to the COV by DEB.

DEB funded research is critical to advancing knowledge about the environment as DEB is the primary source for fundamental research in ecosystem studies, ecology, population biology, and systematics. Without this source of funding the nation will not be able to cope with an ever increasing and daunting set of challenges related to the environment, including global climate change. Current DEB sponsored research is of the highest quality, and the most critical concern of the COV is that DEB does not have sufficient resources to fund all the high quality research presented to it by the scientific community. Success rates in many programs have fallen below 10%. The COV finds that DEB is a well managed program constrained by resources and consequently falling short of its potential. This is not how NSF and the Nation should be supporting the environmental sciences at this critical stage of rapid global environmental change.

Actions taken in response to previous COV recommendations (2003 report)

DEB responded positively to a number of points made in the prior COV review. Specifically, a very helpful self study was undertaken; there was an effort toward and improvement in getting more ad hoc reviews; the evaluation by reviewers, panelists, and program personnel of Criteria 2 improved; genomics studies were increased both within DEB and through DEB collaborations with other programs; and a general commitment has developed toward increasing the number of permanent program officer positions to 50% (although actual filling of positions is incomplete). We note lack of progress on some recommendations including enhancing postdoctoral training opportunities, increasing participation of under-represented groups, increasing RUI submissions, increasing Career awards, increasing award duration, strengthening post-project evaluation, enhancing mechanisms for communicating with young investigators, providing strategic planning outlines and processes to the COV.

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE ¹
<p>1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits)</p> <p>Comments: The COV recognizes a need to continue to improve the return rate of the ad hoc reviews. Low returns in some cases may be reflective of poorly targeted review requests, or more likely, an overly burdened review community. In order to encourage PIs to become more active in the NSF review process, the COV suggests NSF consider listing PIs previous service to NSF on their CV or directly on the proposal cover sheet.</p>	Yes
<p>2. Is the review process efficient and effective?</p> <p>Comments: The review process is effective. We highly commend DEB on the transition to electronic jackets, which makes evaluation and review processes more effective in particular given high proposal pressure. Program Officers are very effective at dealing with an enormous number of proposals requiring numerous ad hoc reviews, panel reviews, and funding decisions. However, the efficiency of the process could be improved if the number of proposals/reviews could be reduced.</p>	Yes

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

<p>Suggestions are made below toward reducing the number of proposals and load on reviewers.</p>	
<p>3. Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation?</p> <p>Comments: The section dealing with broader impacts is difficult to assess quantitatively. COV feels there is a need to develop more objective methods of assessing the broader impacts of a research proposal. Perhaps a more detailed description of how these are evaluated would be helpful. The DEB self-study also identified this as an area in need of improvement.</p>	<p>Yes</p>
<p>4. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation?</p> <p>Comments:</p> <p>In most cases yes, although the fact that highly fundable proposals have to be rejected means that the criteria for rejection must of necessity not be strong for certain proposals. This is a direct result of there being insufficient funds to support all or even most of the high quality proposals that are submitted to DEB. In cases where the panel recommendation varies significantly from the ad hoc reviews, the panel summaries should more clearly address the divergent reviews. The DEB self-study recognized that criterion 2 was not addressed in all summaries, although there was improvement from 2003 to 2005 in this assessment.</p>	<p>Yes</p>
<p>5. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation?</p> <p>Comments: Overall, the information was good and the quality of this information improved over time. COV is concerned that low funding rates for otherwise fundable proposals may lead to the appearance of unfairness in the review process given that some fine proposals that would otherwise be funded if there were sufficient funds available must be denied.</p>	<p>Yes</p>
<p>6. Is the time to decision appropriate?</p> <p>Comments: COV notes that the time required to notify PIs about unsuccessful proposals might be made shorter. Is it possible to notify</p>	<p>Yes</p>

<p>investigators as soon as the panel has made a decision, at least for those rejected proposals that have no probability of being funded in that particular funding cycle? COV is also concerned that the % of proposals for which decisions were in the range of 6-9 months from review to decision has been increasing every year and was > 20% in FY05.</p>	
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review procedures:</p> <p>In order to enhance the efficiency of the review process and reduce the overall burden on the review community, the COV suggests that the DEB consider developing a preliminary 'triage' panel to determine which proposals go out for review. Proposal to be examined by a triage panel would be selected by program officers. The triage panel would rank each proposal "review" or "do not review" by the panel. "Do not reviews" would be rejected and the PIs informed forthwith. Proposals marked "review" would go through the review process.</p> <p>DEB should continue to allow program officers the discretion to make strategic/opportunistic awards (e.g., SGER) without ad hoc or panel reviews.</p>	

A.2 Questions concerning the implementation of the NSF Merit Review Criteria (intellectual merit and broader impacts) by reviewers and program officers.

Provide comments in the space below the question. Discuss issues or concerns in the space provided.

<p>IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA</p>	<p>YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE²</p>
<p>1. Have the individual reviews (either mail or panel) addressed both merit review criteria?</p> <p>Comments: The discussion of broader impacts was often perfunctory. However, the quality of the reviews on this criterion has been improving over time.</p>	<p>Yes</p>

² In "Not Applicable" please explain why in the "Comments" section.

<p>2. Have the panel summaries addressed both merit review criteria?</p> <p>Comments: Again, comments on criterion 2 are improving but still reflect a lack of understanding of evaluation criteria.</p>	<p>Yes</p>
<p>3. Have the <i>review analyses</i> (Form 7s) addressed both merit review criteria?</p> <p>Comments: We reviewed close to 50 jackets and noted no cases where the forms were not filled out.</p>	<p>Yes</p>
<p>4. Additional comments with respect to implementation of NSF's merit review criteria:</p> <p>DEB should be more proactive and aggressive in encouraging the community of investigators to actively seek minority postdocs, predocs, and undergraduates. NSF is good at offering carrots to help promote change in the scientific culture but more needs to be done to achieve the goal of expanding participation.</p>	

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

<p>SELECTION OF REVIEWERS</p>	<p>YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE³</p>
<p>1. Did the program make use of an adequate number of reviewers?</p> <p>Comments:</p>	<p>Yes</p>
<p>2. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments: Our review of jackets (over 30) support the self-study findings</p>	<p>Yes</p>

³ If “Not Applicable” please explain why in the “Comments” section.

that DEB is getting an adequate number of reviewers with appropriate expertise and qualifications, and reasonable geographic and institutional balance.	
3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? ⁴ Comments: See response to A.3 question 2 above.	Yes
4. Did the program recognize and resolve conflicts of interest when appropriate? Comments: DEB is very effective at informing the community about conflict of interest rules and resolving conflicts during the ad hoc review and panel process.	Yes
5. Additional comments on reviewer selection: See A-1-7 (above). If such does not already exist, COV recommends DEB establish a database for potential new reviewers. A form could be posted on the web that would permit potential reviewers to sign up listing areas of expertise, etc. Only those who had not reviewed for NSF before would be listed. Also, the COV suggests DEB consider establishing a committee of subject specialists that could suggest reviewers. This would be a virtual panel that would function electronically and participants would be recognized as NSF panelists. The goal of this suggestion is to ease the burden on Program Officers of finding appropriate reviewers and to also help expand the reviewer community based on the knowledge of this proposed panel. Finally, an automated electronic reminder should be sent to reviewers when reviews are due.	

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 APPROPRIATE⁵, OR DATA NOT
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⁴ Please note that less than 35 percent of reviewers report their demographics last fiscal year, so the data may be limited.

⁵ If “Not Appropriate” please explain why in the “Comments” section.

	AVAILABLE
<p>1. Overall quality of the research and/or education projects supported by the program.</p>	Appropriate
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments: Awards are appropriate given the severe funding restraints in DEB. The limited budget and high number of fundable proposals limits both the size and number of awards. COV asks that DEB be cognizant that the costs of additional required activities such as data management, outreach, and other matters may detract from scientific activities without concomitant increases in the size of awards to cover possible extra costs associated with carrying out data management activities and broader impacts of the research.</p>	Appropriate
<p>3. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Innovative/high-risk projects?⁶ <p>Comments: The COV strongly supports the concept of SGER grants and would encourage that larger SGER awards be given. In the future, the DEB Self Study should examine the effectiveness and innovation of SGER grants as far as new ideas realized, ability to react to sudden scientific needs, etc. Examples of major successes would be useful. The numerous SGERs devoted to understanding the impacts of Hurricane Katrina are excellent examples of responding rapidly to a need.</p>	Appropriate
<p>4. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Multidisciplinary projects? 	Appropriate
<p>5. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Funding for centers, groups and awards to individuals? <p>Comments: Is the trend toward multiple PIs increasing the diversity of</p>	Appropriate

⁶ For examples and concepts of high risk and innovation, please see Appendix III, p. 66 of the Report of the Advisory Committee for GPRA Performance Assessment, available at <www.nsf.gov/about/performance/acgpa/reports.jsp>.

<p>individuals receiving NSF funding or the diversity of institutions represented? This is an important question but not one we could easily assess with the information available.</p>	
<p>6. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Awards to new investigators? 	<p>Appropriate</p>
<p>7. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Geographical distribution of Principal Investigators? 	<p>Appropriate</p>
<p>8. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Institutional types? <p>Comments: Four-year colleges function as important links in the pipeline leading to graduate school. DEB should consider additional outreach to these institutions to encourage more proposal submissions. The number of awards to 4-year Institutions and the number of RUI awards was fairly stable (albeit low) over the period 2003-2005. Data provided to the COV do not permit an analysis of trends in the number of submissions from these types of institutions.</p>	<p>Appropriate</p> <p>See recommendations for actions and improvement in C.1</p>
<p>9. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> • Projects that integrate research and education? 	<p>Appropriate</p>
<p>10. Does the program portfolio have an appropriate balance:</p> <ul style="list-style-type: none"> • Across disciplines and subdisciplines of the activity and of emerging opportunities? 	<p>Appropriate</p>
<p>11. Does the program portfolio have appropriate participation of underrepresented groups?</p> <p>Comments: Based on an analysis of relative success rates, DEB appears to be unbiased in its activities in terms of funding awards</p>	<p>Not Appropriate</p> <p>See recommendations for actions and improvements in</p>

<p>submitted by various underrepresented groups (e.g. minorities, women, undergraduate institutions). However, there has been no significant change in minority participation (number of awards submitted). The COV believes even more effort is required to correct the situation. Increasing participation is a challenge. COV encourages DEB to develop a Division strategy to deal with this. Ongoing outreach programs are not succeeding. COV recommends DEB encourage partnerships between minority scientists and non-minority scientists. Examples of such strategies might include grant supplements for the addition of PI-driven minority postdocs, predocs and undergraduates to existing NSF grants. These same trends apply to women and also require more action by DEB.</p>	<p>sections B.1 and C.1</p>
<p>12. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.</p> <p>Comments: DEB has been sensitive to national priorities by encouraging high quality fundamental science, strengthening the scientific and educational infrastructure of science (LTER research and education programs), helping inform the public about science, responding to global challenges that require scientific research for a solution (Emerging Infectious Diseases), identifying and supporting research of high priority and quality, internationalizing scientific activities (supporting field research and collaborations across the globe), understanding complex systems (Coupled Human and Natural Systems), and supporting environmental initiatives. Additionally, NSF (and DEB) has moved toward electronic records gaining efficiency and easing the work of proposal submission and review. DEB has also worked to identify priority areas for funding core research through efforts such as holding the Frontier workshops. These workshops are a very forward- looking activity to ensure DEB remains 'ahead of the curve'. One of the key recommendations of the COV is to extract future directions from the Annual Reports and Frontier Workshops and include summaries of these as part of the DEB self-study.</p>	<p>Appropriate</p>
<p>13. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>COV congratulates program officers and others involved in the review process for maintaining a wide array of high quality research that cuts across disciplines. This is an enormous challenge and is being met successfully, especially in the face of staff shortages, increasing numbers of proposals, and declining funds (in constant dollars). The digitization efforts have resulted in a more dynamic and efficient organization. The self-study provided invaluable information in answering the questions in this section.</p>	

See Sections B.1 and C.1 for issues to be addressed with a strategic plan and benchmarks regarding the consistently low proposal submission rate from underrepresented groups and primarily undergraduate institutions.

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

1. Management of the program.

Comments: Program is well managed. COV recommends DEB work to reach the 50% level of permanent program officers versus rotators in order to increase the efficiency of the review process and reduce the workload on program officers. Efforts should be made to name a permanent director and to add additional program officers. The increasingly integrative nature of science has increased the complexity of the review process and time demands on program officers.

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

Comments: DEB is a catalyst division and its clusters produce research at the intellectual core of environmental biology. Program officers are responsive to changes in scientific disciplines and respond accordingly. SGER grants are especially flexible as a mechanism to deal with rapid change. Other DEB research programs have played a lead role in some of NSF's most crosscutting and exciting initiatives (e.g., ATOL, NCEAS, NESCent, LTERs—including their expansion into oceanography—NEON, LTREBS, the various EF programs, the mathematical biology initiative for undergraduates, the Coupled Natural and Human Systems biocomplexity program, etc.). DEB gathers data on the geographic distribution of awards and proposals and the types of institutions that are funded. Program officers are cognizant of the influence of NSF activities on educational institutions and great efforts are made to be inclusive across the educational spectrum. In terms of educational opportunities, the COV is interested in DEB exploring group-specific postdoctoral opportunities.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments: DEB projects are driven by the quality of the research. However, program officers are aware of the changing needs of science in the broader community. A fresh perspective on emerging trends is provided by the rotator system of program officers who lend their expertise to DEB for 1-2 year periods before returning to their own active research programs. COV encourages program officers to continue to work toward supporting both interdisciplinary areas and core areas of science, an especially challenging task given restricted funding. DEB has been a veritable incubator for new ideas. However, as the funding rate has continued to fall the COV is extremely concerned that there will be fewer

exciting projects to incubate in order to provide the great new ideas and programs of the future. If core funding continues to weaken, the potential for the research community to respond creatively to new initiatives may also decline.

4. Additional comments on program management:

PART B. RESULTS 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 program. 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.

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

Comments: DEB has continued or initiated support of investigators and students at all stages of their academic careers. DEB frequently makes awards that benefit K-12 students and their teachers by exposing teachers to primary research (Schoolyard LTER, RET) and involve students directly (RAHSS). DEB also makes awards for training undergraduate students (REU, RUI), in support of research by graduate students (DDIG), young investigators (CAREER awards), and established scientists at primarily undergraduate institutions (ROA). Additionally, DEB has initiated a new program, OPUS, which provides support for mid-to-late career scientists.

A source of concern to this COV is that there has been no increase in the rate of submission of proposals by underrepresented groups including minorities and women (see section C3). This indicates that DEB should be more proactive in addressing this deficit. However, the COV also reiterates the observation of the 2003 COV that it is difficult to assess whether representation of these groups is sufficient because no benchmarks have been set. It would be useful for DEB to examine national levels of representation of different groups in the population, identify points in the leaky pipeline where representational deficits are being created, and to design programs that target these groups.

The 2003 COV also urged DEB to consider new mechanisms to provide postdoctoral opportunities, to forge innovative links between research and education, and to allow researchers to “retool” to pursue investigations in new directions. It is clear from the response to the 2003 COV that the ability of DEB to offer such opportunities was controlled by the BIO directorate, with targeted funding (e.g., bioinformatics and microbiology) being controlled directorate-wide. This limits opportunities for DEB to offer postdoctoral fellowships in broader topic areas, and potentially stifles creativity and independent thinking by postdoctoral researchers. A lack of funding for junior researchers, including postdocs, was a problem identified by the "National Science Board, Science and Engineering Indicators 2006" (Vol. 1, Figure O-43).

These reservations aside, the COV commends the DEB for its support of projects that lead to the development of a diverse, competitive, and globally engaged workforce of scientists, engineers, technologists, and well-prepared citizens. The following are outstanding examples of this support.

An RET supplement to a DEB funded project ([0343447](#)) included over 120 K-12 teachers and students. The project involved a multidisciplinary research team of mycologists, plant ecologists, and entomologists who were assembled to survey and inventory tree canopy biodiversity in the Great Smoky Mountains National Park. This collaborative effort allowed disciplinary experts to serve as mentors to K-12 teachers and community college faculty, allowing them to bring their personal scientific research experiences back to their classrooms. In this regard, one teacher created a two-tiered website enabling visitors to use this medium to experience tree canopy research and to facilitate parallel field research in their own outdoor labs, thereby fostering development of the next generation of researchers.

An RAHSS supplement to LTER DEB-0334762 involved minority high school students directly in research by creating teams that included one or more graduate students, a teacher from a nearby school district, and high school students. In this way, the students and teachers gained first-hand experience in studies of biotic interactions of the Short-Grass Steppe ecosystem across a broad range of climatic, geologic, topographic and chronological conditions.

DEB award 9602229 supported development of a training program that involves both graduate and undergraduate students, a large portion of whom belong to underrepresented groups, in both

academic and cultural activities that are integrated into the learning process. A large number of the students were international, increasing the cultural diversity even more. The educational and research programs focused on theoretical and empirical approaches to the advance understanding of evolution at scales ranging from that of individual genes to that of organisms and populations. The program provided students with a level of understanding of evolutionary biology and of applied mathematics sufficient to permit them to work at the forefront of modern quantitative biology. The experience gained from this award was used by the PI to help found a summer program at Los Alamos National Laboratory that specially encourages the involvement of minority students

A DEB CAREER award (9983879) involved at least thirteen senior investigators, five post-doctoral researchers, nineteen graduate students and fourteen undergraduate researchers in a study of ant-fungus symbiosis. The project is exemplary of cross-disciplinary research and education incorporating microbial ecology, systematics, agricultural evolution, biogeography, symbiology and behavioral ecology. A television program, Nova featured the fungus-growing ants in a series about evolution. Several classes about fungus growing ants have been taught at primary schools and high schools and a web-based taxonomic ant key was developed for use by K-12 students and teachers.

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

Comments: DEB is to be commended for its initiative both in creating new programs and restructuring existing programs in ways that are likely to lead to significant innovation, learning and service to society. A good example of this is the new Population and Evolutionary Processes (PEP) program that came from an integration of Population Biology and Ecology, recognizing that this interdisciplinary area is central to many breakthroughs in both population biology and evolution, and that it merited additional support. A new program, OPUS recognizes that progress is often made by synthesizing existing empirical data and encourages mid to late career scientists to undertake such syntheses. Existing programs such as DDIG, the Schoolyard LTER project and directorate-wide REU, ROA, RAHSS, and RET supplements are also excellent at engaging large numbers of undergraduates, teachers and school children in ecology, evolutionary biology and systematics. A new DEB program PEET trains new taxonomists and promotes the translation of existing expertise to develop new tools to facilitate discovery of poorly known taxonomic groups of organisms. Hence, this program involves direct training and promotes learning by providing new tools. One program, UMEB (Undergraduate Mentoring in Environmental Biology), was broadened from DEB to become directorate-wide because of its success at engaging undergraduates in learning in environmental biology.

Specific examples of NSF-funded projects highlight some outstanding examples of each of the three areas (learning, innovation and service to society):

An excellent example of promotion of learning comes from an RET supplement (DEB 0227669) where the PI trained a K-8 science teacher from an Ohio school to conduct tests of water quality, allowing her to assess the suitability of these methods for 5th to 8th grade classes. The teacher was then able to use these tests during science classes in her school.

Some of the best examples of innovation and service to society come from increasing our understanding of the role of biodiversity in maintaining critical ecosystem services. For example, under "LTREB: Sustainability of Soil Fertility in Model Tropical Ecosystems" (DEB 9975235)

investigators Donald Stone and Gary Hartshorn researched the link between forest harvesting regimes and soil fertility. They were able to identify how long it took for depleted soil nutrients to recover after harvesting of tropical forests. The budgets of carbon storage and exchange in tropical forests are also vital to understanding global warming, and this work links forest growth to soil fertility and human harvesting for timber. A second study (DEB-0344019) led by investigators at the University of Wisconsin-Madison focused on discovering the role of genetics in the degree of attack by insect pests and herbivores of aspen trees in the U.S. As insect herbivores feed, they induced chemical changes in plants and alter inputs of organic matter to the soil. These impacts in turn influenced basic ecological properties that influenced forest health, and the capacity of forests to take up carbon from the atmosphere, a critical ecosystem service. Both of these studies relate to economic gains (from forestry), provision of ecosystem services that are critical to human welfare (elemental recycling, atmospheric gas fluxes) and ultimately to global warming.

Service to society also extends to understanding important diseases. For example DEB-funded research from a PEP award led to the discovery that Chagas disease was transmitted from mothers to infants over six times more often than was previously reported. This demonstrated that mother-to-offspring transmission is an important problem that needs to be considered in control of the disease. The project is structured such that the findings will feed directly into measurable public health benefits.

On average DEB produces over 30 "nuggets" per year that convey scientific findings to a broad cross-section of society. Based on a survey of funded DEB projects it is clear that this large body of research has contributed greatly to advancing progress in ecological, evolutionary and systematics science. There are clear direct benefits to human health, prosperity and welfare, as well aiding national defense through links to food, other biotic resources, and diseases. There are also innumerable indirect benefits to priority areas from DEB-funded research. The new programs created, changes to existing programs and use of program officer controlled SGER grants to investigate unexpected research opportunities all attest to DEB's poise and potency in being agile in promoting learning, innovation and serving society.

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: DEB funded research has contributed numerous tools that have made major contributions to meeting this NSF outcome goal. Of particular note, DEB has been the home or incubator for several major infrastructure and facility initiatives that have had a major role in enabling and fostering work within the ecological and evolutionary biology communities. The LTER network in particular serves as a major component of the nation's infrastructure for conducting ecological research and is one of the few cross-site research platforms available to the community. LTER has also served as an important model in the planning and development of NEON, which is intended to serve as ecological infrastructure, promoting transformational research at regional to continental scales. NCEAS is a DEB-initiated facility that is a highly effective means for encouraging data sharing, integration, and analysis. Indeed, NCEAS has proven so successful that a number of initiatives both within and outside NSF are now adopting its model. NCEAS has now matured to the point where it has been moved for management outside of the division. Based largely on the NCEAS model for encouraging collaborative research, DEB played a key role in the establishment of the new National Evolutionary Synthesis Center (NESCent). Again, although initiated by DEB, this center is now managed outside of the division.

DEB research has also generated a large number of tools that are proving to have broad applicability and relevance to the scientific community. For instance, Ecological Metadata Language (EML) is a recently developed tool for ecological data sharing that has been co-developed by NCEAS and LTER researchers among many others. This metadata specification provides a means for describing heterogeneous data relevant to the ecological discipline, thereby making these data easier to share across projects. LTER researchers have also been involved in the development of an innovative web-harvesting tool for assembling climate and hydrology records (ClimDB and HydroDB) held by various agencies. This automated data harvesting effort draws from all LTER sites, thereby facilitating a variety of research activities and syntheses.

DEB has also played an important role in the development of MorphoBank, an online workspace for systematics research. MorphoBank is designed to aid systematists in building phylogenetic trees based on morphological data, and is designed to serve as a repository for morphological data comparable to the role that GenBank serves for molecular data. Understanding evolution at the molecular level is of increasing interest, and DEB researchers have also been involved in developing new statistical tools for the analysis of natural selection at molecular levels. These methods are being used to estimate the age, distribution and correlated evolution of changes in DNA, and are being applied to a variety of data sets including viral sequences such as HIV-1 sequences. In addition, a number of molecular tools are being applied for the first time to ecological problems, thereby facilitating their broader adoption by the scientific community.

Emerging infectious diseases is a major societal issue, and several DEB-funded projects are developing useful approaches and tools for better understanding the distribution of such diseases. Chronic Wasting Disease (CWD), for instance, is a major problem for deer and elk populations, and a DEB funded project has developed a reliable, non-lethal method for detecting CWD in mule deer populations, which significantly improves the ability to monitor the prevalence of the disease and consequently to manage it.

While most DEB projects are not specifically focused on tools development, a number of projects have been successful in developing tools and approaches that are applicable well-beyond the individual research project. In addition, DEB has played a major role in the development of key facilities and infrastructure (e.g. LTER, NCEAS, and NESCent as noted above), and has proven to be an incubator for fertile new directions. These facilities and infrastructure represent significant contributions to the three subject areas—ecology, evolution and systematics—by providing tools that are available for broader adoption and use by the research community. This section ends by highlighting some of the outstanding DEB-funded projects that have developed general tools.

Chronic Wasting Disease (Hobbs DEB- 0091961)

The project has developed a reliable, non-lethal method for detecting CWD in mule deer that significantly improves the ability to monitor prevalence of the disease over time and space. Environmental transmission of an infectious disease has been unambiguously demonstrated for the first time. Population models, combined with experimental results at organismal and molecular levels, reveal a potent disease that will be difficult to eradicate.

Assessing Tropical Forest from Space (Clark DEB-0129038)

David Clark and his collaborators, with support from the NSF and the US Department of Energy, are working to combine inventory plot data with new high resolution IKONOS satellite imagery to provide reliable estimates of forest mortality and dynamics. It is estimated that this new high resolution remote sensing tool will allow ecologists to measure forest canopy status at scales 1000 times greater than done now for the same investment of time and money. Using this methodology, Clark, et al. (2004: *Ecology Letters* 7: 52, and *Science* 303: 435) were able to estimate mortality rates for

tropical forest trees, thereby significantly increasing our knowledge of tropical tree demography. Regular collection of similar data from this site and others can be used to determine if canopy tree mortality is increasing, decreasing or is stable in the face of climate change.

Automated morphological measurements (Houle DEB-0129219)

FINDWING was designed for fitting geometrical models to images of fly wings, but as Houle, et al. (2003) point out, with little modification the same approach can be applied to other (primarily) 2-dimensional objects such as leaves, feathers or protective scales. Thus, FINDWING represents a prototype of a general tool for rapid shape analyses that could be widely useful in biology. FINDWING gives us a preview of the kind of small but powerful generalized computer applications that will be deployed within the distributed grid architecture of the developing cyberinfrastructure for evolutionary biology.

Data harvesting tools (Harmon, Waide, Hollibaugh DEB- 0236154, 9632921, 9982133)

This is the first automatic data harvesting protocol across LTER and other related sites. It will greatly facilitate research synthesis. At this time, all 24 LTER sites contribute to ClimDB, and four LTER and ten USFS sites contribute to HydroDB. This prototype system is now the model for other systems addressing synthesis of even more complex information relevant to scientists and land managers.

Mapping of linked databases (Fautin and others, DEB- 0003970, 9521819, 9978106)

The mapping tool, NEON, which is available to everyone via a website, is a powerful tool for analyzing linked databases of systematic, biogeographical, and environmental information. The tool will make it possible in the future to examine all manner of distributional and geophysical data to make predictions about a wide range of species. The researchers exemplified and developed their approach by jointly analyzing the data for anemones and associated anemonefish, which hitherto had been maintained in separate databases. All of this depends on sound taxonomic underpinnings, made possible by investment in systematic biology.

Ecological Consequences of Sociological Factors (Liu DEB-9702684)

Dr. Liu's work illustrates the development and implementation of a general modeling approach that synthesizes across a variety of data sets (GIS, remote sensing, survey data). Results can guide policy related to development of human society and management of regional biodiversity. It provides insight into the ways human societies interact with their environment, and is an excellent example of tools for interdisciplinary work at the interface of the ecological and social sciences.

Ecological Metadata Language (Waide DEB-9634135)

Ecological Metadata Language (EML) is a structured, modular computer software tool that is poised to become the global standard for documenting and exchanging ecologically relevant data among collaborating research and education groups. EML was developed through the efforts of many contributors, including the Knowledge Network for Biocomplexity project (KNB), NCEAS, LTER, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), and the Joseph W. Jones Ecological Research Center.

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

Comments:

DEB undertook an internal reorganization that improved communication within the division and placed proposals and research areas into more logical units. DEB is now completely electronic throughout its proposal submission, review process and panel deliberations. This has greatly increased the efficiency of the division from its paper-based days. It was the first business unit within NSF to make many of these steps.

The increase in multi-disciplinary research connects DEB’s core research with other fields, and thus effectively leverages limited DEB funding against other resources within NSF and other federal agencies, and against state and private sources.

DEB was the first unit within NSF to conduct a self study for a COV evaluation. This is an effective means to improve the quality of feedback from the COV process.

PART C. OTHER TOPICS

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

A survey of the representative sample of proposals funded per program area, as well as the submissions, suggests equivalent funding rates and sufficient breadth in the type of research supported and in number of submissions per program area. COV encourages continued attention to the breadth of intellectual and heuristic facets of environmental biology, keeping up to date their relation to emerging environmental national and international problems.

Gaps and areas for improvement include:

- Low number of proposals from undergraduate and masters institutions
- Low number of proposals submitted by women or minority PIs
- Low number of proposals submitted by EPSCOR states/territories
- Funding for Post-docs – problem for the pipeline
- Funding for mid-career scientists, especially for re-tooling.

Encouraging partnerships between primarily undergraduate and research institutions is one approach that can lead to greater number of submissions for the RUI funding component of each DEB cluster. Small grants to support such inter-institutional dialogue can allow for faculty to develop research partnership proposals, or for research institutions to access the educational outreach activities in undergraduate/masters institutions that would enhance the “broader impacts” component of the latter’s research proposal. At the same time, these partnerships may provide the research institutions with natural outlets for recruiting minority students and for educational outreach to enrich the “broader impacts” components of their funded ecological research projects.

The continued low number of proposals submitted or funded from EPSCOR states and territories, even though DEB program staff seek out co-funding from EPSCOR staff, suggests that a strategy needs to be developed to address this issue. Encouraging partnerships, especially through small grants to fund research dialogues between non-EPSCOR institutions with EPSCOR-based faculty, would begin to address this issue.

This COV and two previous COVs identified the need for funding postdoctoral fellowships and mid-career awards. Such awards enable investigators to pursue new research directions. No initiatives have developed in the postdoctoral area, either to allow post-docs to obtain teaching experience or to increase research activity that is needed to obtain a permanent tenure-track position. Mid-career awards permit scientists to re-tool to meet the rapid change in the technological needs of current ecological problems. Given that the need for mid-career awards may be especially acute at undergraduate institutions or in relatively isolated universities, we continue to recommend very strongly that DEB consider meeting these two needs simultaneously by establishing a postdoctoral fellowship program to enable both research and teaching at primarily undergraduate institutions. Such a program would link post-docs interested

in a career in undergraduate teaching and research with mid-career scientists who might benefit and welcome the infusion of new ideas and expertise. The post-doc would potentially bring experience with the latest technologies and new ideas, whereas the mid-career scientist could serve as a teaching and research mentor.

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.

The COV sees strategic and innovative funding allocation patterns (in view of no increase in overall funding) as the crucial issue to address problems alluded to in the above questions. (See comments on lack of proposals received from undergraduate and masters institutions, from women, from underrepresented groups, and from EPSCOR states/territories, found in Section A and under C1 and C3.)

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

The COV applauds the equal success rates for minority and women applicants relative to the general pool of applicants. However, the number of applications from these under-represented groups was very low. While the COV recognizes that there are many reasons for the "leaky pipeline", we believe that NSF can develop short- and long-term strategies that would be effective in increasing representation of minorities and women. In the long-term, DEB should incorporate studies of why women and minorities are not more proportionately represented, and seek to identify actions that it might take within its purview to positively affect this issue.

In the short-term, the COV believes that the best chance of DEB effecting positive change might be for it to provide incentives for established researchers to recruit undergraduate students, graduate students and post-docs from the ranks of under-represented groups. For example, the COV believes that a program parallel to that for the REU program could be used as an incentive for successful PIs to recruit postdoctoral associates from under-represented groups.

Current emphasis on visits to Minority Serving Institutions (MSI) needs better structuring. Lack of increase of proposals from such institutions during the past six years suggests that current practices are not effective. Visits or workshops structured around the strengths and weaknesses of such institutions may result in a greater recruitment of underrepresented scientists. MSI often are undergraduate institutions. Increased participation of faculty from MSI institutions in research will also result in an increased number of undergraduate minorities participating in research.

The COV notes that a representative number of women were applying for and receiving DIGs, but that the total number of women applying for regular research grants dropped dramatically after the pre-doctoral career stage. Parental leave issues were frequently mentioned as a reason that women are lost to the system early in their careers. We

believe that the agency can develop policies for those funded solely on NSF grants that parallel those found in many universities with regards to parental leave.

The COV believes that Criterion 2 (Broader Impacts) is an important component of the research effort. This is a relatively new criterion considered in reviews and the COV believes that a review of how PIs address Criterion 2 and how it affects funding could benefit NSF and be used to direct prospective PIs towards “best practices.” This is not necessary for Criterion 1 (Intellectual Merit) for several reasons. Briefly, Criterion 1 has a much longer history, and the core elements of Criterion 1 are, in fact, a common part of every aspect of the scientific process. PIs have to address Criterion 1 critically in some fashion, in all interactions with peers. They are typically only confronted with Criterion 2 in NSF proposals. Directing PIs towards “best practices” will both make for better proposals and better implementation of Criterion 2. (See additional suggestions for improvement under other C section questions and under section A, for ways to address the above problems.)

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

As briefly noted above, current parental leave practices for NSF-supported projects need to be considered and examined since the lack of parental leave can hinder participation of women as PI’s in projects. In addition, this reinforces the impression of early-career scientists, both male and female, undergraduate and graduate students, that academia is not a family-friendly environment.

It was explained to the COV that a future concern of DEB may be a focus on the science underlying “ecosystem services.” It is not clear how current funding patterns are geared towards a better understanding of maintaining ecosystem services in the future. The COV encourages DEB to review and evaluate its program practices (or programs with which it frequently is involved in its support of interdisciplinary research) in this context. Some programs, e.g., Ecosystem Science, obviously have relevant components. Other programs that are not explicitly oriented towards understanding ecosystem services like the PEET program provide basic information on the natural history of algae, fungi, protists, and insects that are important bioprocessors of nutrients, oxygen and carbon. Thus, incorporating a broad component of program elements will be important in developing initiatives in ecosystem services.

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

The COV notes that the 2003 COV made significant suggestions to DEB regarding the review process and DEB seems to have followed nearly all of them, which greatly improved the efficiency of the 2006 COV review process. It is essential for DEB to keep conducting its self-study, and we recommend DEB also include in the future:

- A table of awards by gender, per program category

- The geographic distribution of RUI awards to help the COV understand how to increase their proportion of total proposal submissions
- Information on EPSCOR funding and other programs contributing to funding of DEB proposals, and in the areas where funding is awarded
- Percentage change in number of proposals by women and minorities.
- See Recommendations for additional related comments.

COV commends DEB for including two members from the previous COV. This allows for continuity and efficiency in the review process. DEB is encouraged to continue this practice.

Summary Recommendations: The first three recommendations arise from concerns associated with the effects on DEB programs of relatively flat funding and increasing submissions; additional recommendations focus on concerns about participation of underrepresented groups and the COV process. Please note additional details supporting these recommendations as well as specific suggestions for improvement are found throughout the COV report.

Recommendation for maintaining a balanced portfolio: If current trends continue (i.e. low success rates), the COV recommends that DEB create a task force including members of the scientific community and NSF staff. The charge to this task force would be to determine whether changes in management of the DEB portfolio are needed to maintain both the core DEB science and capacity of the DEB scientific community.

Justification: The two main pressures leading to this recommendation are 1) relatively flat funding levels and increasing submissions that are reducing success rate, and 2) the difficulty inherent in meeting the need for interdisciplinary initiatives that address complex environmental problems while sustaining continued excellence in core research areas that ultimately provide the capacity for these larger efforts.

DEB research is inherently broad. The complex problems addressed in these areas do not respect disciplinary boundaries and thereby have sparked important new interdisciplinary efforts. DEB is essentially the sole source of funding for fundamental science in ecology, evolutionary biology, and systematics. The commitment to supporting a broad portfolio of intellectual opportunities must be maintained, but this requires a tough balance of funding traditional disciplinary topics and cross-cutting initiatives.

The pressures identified should not be allowed to diminish the ability of DEB to accomplish its mission or to reduce the quality of the review system by overtaxing program officers as well as the reviewer community. DEB asked us to consider possible changes in the traditional approach to program management and review (Specific Question 2 from DEB). We considered several options such as a: pre-proposals, establishing a triage panel (see recommendations in section A), increasing the number of panel only review competitions, and seeking assistance in reviewer selection (see recommendations in section A). However, we judge this matter is so important that a separate group should be charged to evaluate possibilities and recommend approaches.

Recommendations for Criterion 2: Clarify for the scientific community the scope, expectations, and possible costs appropriate in proposals for addressing broader impacts. Begin a larger DEB level effort to determine how advances in environmental biology are meeting NSF-wide goals for broader impacts and how effectively these impacts are being communicated to the public.

Justification: The scientific community has embraced NSF's goal of increasing broader impacts from research. With each year both proposals and the review process are more effectively addressing Criteria 2. However, there is still confusion by proposal writers about meeting the merit standard for Criteria 2 and this confusion is perhaps exacerbated by declining proposal success rates. In addition, DEB appears to be much more proactive in establishing links between science and its importance to society. Nevertheless, the COV sees the value for increased emphasis on conveying the impacts and significance of environmental biology to non-scientists.

Recommendation: Fully staff program positions and increase permanent staff to 50% as currently targeted; increase size of DEB program staff to: adequately support cross-cutting initiatives, incorporate rapidly developing scientific opportunities, and increase analysis of the outcomes of NSF-supported research.

Justification: Between 2003 and 2005, the number of proposals submitted to DEB increased by more than 20%. There is no evidence that this trend will reverse anytime soon. Coupled with increasingly complex reviews (due to the increasingly integrative nature of ecology, evolution, and systematics), this acute increase in submittals has resulted in greatly increased demands on the time and performance of program officers. These demands cannot be sustained at the current staffing levels. Additionally, program officers expressed frustration that they have little time to document and comprehensively assess the long-term outcomes of research funded by DEB.

Recommendation: Establish programs, initiatives, and partnerships specifically targeted to increase participation in environmental biology by (1) minorities, (2) women, and (3) faculty and students from predominantly undergraduate institutions.

Justification: The self-study data indicate that the proposal review and award system is functioning well and that there is not a bias in funding success of these groups. However, there has been little progress in increasing participation of these groups, despite recommendations by previous COV panels and existing NSF supported programs over many years. Clearly, existing efforts are not yet accomplishing the transformative changes that are needed. Therefore, the COV strongly recommends taking a fresh look and trying some new strategies with greater flexibility (see report for more detailed suggestions).

Recommendation: Evaluate the COV template to reduce number of questions, eliminate redundancy, and add a brief analysis of strengths, weakness, opportunities and impediments to the self-study.

Justification: The self-study included with the documents for the COV was extremely helpful. It provided the data needed for the COV to determine the credibility and fairness of the review process, which is an essential part of the COV role. The COV was then able to spend more time on particular issues, and was

not forced to conduct data analysis of program management. However, the COV felt that it could be even more effective if it had more time to focus on broader issues, and to concentrate discussion on specific questions of interest to DEB. That is why we encourage adding a brief analysis of DEB strategy in the self-study for the next review.

Questions Specific to DEB

Q1. Has DEB sufficiently supported integrative research within and beyond environmental Biology? DEB and a number of the program personnel have been the incubators and leaders for many exciting integrative initiatives (e.g. expanding genomic analysis across a broad array of phyla, ecology of infectious and emerging diseases, Assembling the Tree of Life, Emerging Frontiers, FIBRE, the new synthesis center for evolution, the undergraduate initiative in mathematical and biological science, NCEAS, the expansion LTER to marine sites). In addition, DEB is also a strong partner in jointly funded initiatives with other agencies and provides funding stability to these partnerships (for example the integrative team formed by the Ecology Cluster that included USDA, NOAA, and EPA to examine invasive species). The COV found that there is strong collaboration and camaraderie among program directors and panels both within and outside DEB. Both NSF personnel and the scientific community are very excited about these integrative efforts, but these also require significant time to accomplish. COV agrees that integrative science is the path for advancement and NSF must continue as a world leader. However, the COV observes that additional resources will be needed to sustain and support these initiatives. Hence, there is a need to increase staffing and to provide incentives to support integrative science.

Q2. Success rate has been dropping within DEB and BIO. This is largely due to an increased number of proposals being submitted to each panel cycle, combined with flat or declining budgets. So far, DEB has made no changes to the submission and review process (other than increasing efficiency to maintain timeliness of the decision). Should changes be considered? We believe changes must be considered as outlined in our Recommendations above. We discussed a number of remedies and options. These include: a) allowing success rate to continue to decline (i.e. do nothing), b) seriously restrict funding of any new initiatives, c) reduce proposal size or duration to increase number of proposals that can be funded, d) reduce submissions allowed per individual, e) limit number of awards per individual, f) restrict allowable budget in certain areas (e.g. salary recovery), g) add a pre-proposal process to reduce the number of full proposals that must be reviewed. Each of these options poses difficulties, but if current trends continue, some action will be necessary. The COV did not have the information, time, or range of expertise to recommend specific actions. However, this issue is so significant many of our recommendations arise from our discussions and concerns related to the low and declining success rates and intense pressure on program managers and reviewers. Finally, it should be recognized that while all possible changes may involve undesirable consequences, the business as usual option also has costs. We were concerned in our discussion with DEB program

officers that there might be resistance to change because of well-meaning concerns about undesirable consequences. Nevertheless, the COV feels a hard-nosed look at this problem is warranted.

Q3. The programs within DEB have the flexibility to devote program funds to workshops that identify research frontiers or initiatives. Do you feel that DEB programs should be more proactive or have a more consistent plan for funding such workshops within the communities they serve? The current mix of approaches seems good and we do not recommend increasing the number of DEB-driven workshops. DEB should primarily respond to community initiatives for workshops and for identifying new initiatives.

Q4. Please comment on the proposed data sharing policy that was developed within DEB and being considered for adoption as a BIO-wide requirement on all proposals? There is broad agreement that providing better access to data and enhancing data management is desirable. The COV also agrees that including a description of data management in proposals is important. DEB sponsored programs have been a model for this type of effort (e.g. LTER). DEB sponsored research has also been at the forefront in the creation of data management and statistical tools that are widely shared. However, the timetable outlined in the draft letter may need to be reconsidered given the lack of clarity on overall needs, costs, and technical difficulties. Also, there is likely to be confusion about the amount of information needed and the effect of adding this requirement to proposals given current constraints on proposal length and other information normally included. The COV was concerned that making data sharing and management truly successful will require additional funding and it is possible that the actual cost will be substantial. Infrastructure will be needed to support broad access and to integrate data systems. The COV also feels the scientific community needs preparation and an opportunity for input before requirements are implemented. Hence, possible approaches include: starting this as a “soft initiative” of encouraging data sharing and asking researchers to describe data management methods in proposals (as indicated in the letter), establishing pilot data management and data sharing programs, conducting workshops to examine the variety of special needs for data management that fall within the broad spectrum of science supported by DEB.

DIVERSITY DOCUMENT

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

March 28, 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 2006 Committee of Visitors for the Division of Environmental Biology was composed of 12 members, including one who represented the BIO Advisory Committee. Five of the members are female, and four members are from an underrepresented minority. Members currently work in 11 different states and/or territories, including Connecticut, Pennsylvania, Massachusetts, New Hampshire, California, Oklahoma, Virginia (2), New York, Puerto Rico, Texas, and Maryland. Nine members are from academic institutions, none are from industry, one is from a non-government organization (NGO), and two are 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 Collins
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Biological Sciences