

COMMITTEE OF VISITORS (CoV)
REVIEW OF THE DIVISION OF INTEGRATIVE ORGANISMAL BIOLOGY (IOB)
DIRECTORATE FOR BIOLOGICAL SCIENCES
NATIONAL SCIENCE FOUNDATION

June 8 – 10, 2005

INTRODUCTION AND PREAMBLE

The current COV panel convened June 8-10, 2005 and was charged to provide a balanced appraisal of the Integrative Organismal Biology (IOB) Division performance in two primary areas: (A) the integrity and efficiency of the **processes** related to proposal review; and (B) the quality of the **results** of NSF's investments in the form of outputs and outcomes that appear over time.

The committee consisted of Joe Chappell (Chair), University of Kentucky, Lexington, KY; Dick McCombie (BIO AC Representative), Cold Spring Harbor Laboratory, Cold Spring Harbor, NY; Mark Brodl, Trinity University, San Antonio, TX; Jim Dykens, Migenix, Inc., San Diego, CA; Ruth Lehmann, New York University Medical Center, New York, NY; Carlos Martinez del Rio, University of Wyoming, Laramie, WY; Steve Scofield, USDA-ARS, West Lafayette, IN; Sonya Sobrian, Howard University, Washington, D.C.; and Cheryl Wilga, University of Rhode Island, Kingston, RI; representing a wide range of technical expertise, individuals from public and private institutions, federal organizations and private enterprise; persons familiar with NSF missions and operations, and those persons without prior funding support or service to the agency.

The COV took its charge seriously with the intent of providing persuasive and cogent assessments and recommendations to an already well-recognized unit within the Biological Science Directorate.

In evaluating the IOB Division, the COV review included: an in-depth assessment of the panel review system; interviews with Division Director, Deputy Division Director, Program Directors within IOB and other division Program Directors; and detailed review of 54 awarded and 54 declined grant applications chosen at random. Review of each application included affirmation of the review process and procedure, with special emphasis on how the applicant and review process addressed the scientific merit and the potential broader impacts of each application. The COV review was greatly facilitated by the self-study report provided by IOB. The self-study report was recognized for its wealth of information and the care in crafting a factual, rather than an evaluative, document.

In summary, the COV panel found IOB innovative in its new organizational configuration, which is designed to support emerging and creative trends within the greater research and education community. During this period of transition and with considerable financial constraints, IOB must continue to demonstrate flexibility in adjusting and moving programs within and between the IOB clusters. IOB was also recognized for its very open and responsive management style during this period.

The 2005 COV recommends the IOB Division consider the following:

1. Better tools for tracking the Division's ability to support outstanding science and education are needed. These assessment tools should be designed to better document the outcomes of NSF support, and should not be designed or used as an assessment of any grant application, PI or support. An array of quantitative and qualitative measures are necessary to better capture and capitalize on the successes achieved in meeting the scientific merit and broader impact goals

defined within the vision of NSF missions. These include adding new mechanisms for award recipients to input numbers of students trained – undergraduate, graduate and post-graduate students and associates, numbers of publications, citation indices, numbers of citations/publication, lists of websites developed and hits/website, requests for strains and tools developed (primarily for repositories), invention disclosures, and numbers of patent applications and issued patents. Especially important is better documenting those persons from under-represented groups in the science enterprise. A means for identifying the number of students going onto science careers/involvement in science also needs to be included. Awardees should also be asked to indicate, simply yes or no, their involvement in K-12 outreach efforts. PIs should also be asked to report the total funding used for equipment purchase in their final reports.

2. The new Cluster organization needs additional terms and identifiers for sake of clarity to the scientific community and within the Biological Sciences Directorate. Terms associated with traditional disciplines should not to be avoided, because these will make each cluster's intention more transparent to all persons involved.
3. The IOB division currently operates with a greater percentage of rotating Program Directors, more than other divisions within the Biological Sciences Directorate, and is handling a very significant work load in terms of grant applications received and reviewed. The COV panel strongly recommends increasing the number of permanent program directors to assist in maintaining continuity, institutional memory, and interface with a broad scientific community. We also recommend that the permanent and experienced rotators institute a formalized mentoring program for incoming PDs and develop an evolving operational manual that addresses daily matters. The DD and DDD should also be encouraged to continue their mentoring sessions with new PDS, but perhaps on a less frequent basis. The reliance on rotating PDs is essential to the vitality of the IOB program, its ability to recognize new and emerging ideas, and keeping it responsive to the educational and scientific community.
4. The IOB division is recognized for its strong commitment to its support staff and its efforts to enfranchise the staff in the changing responsibilities within the division. However, for the sake of efficiency and effectiveness, IOB needs to enhance training and education opportunities for the staff and to more clearly define expectations and responsibilities to the staff and those they serve.

**REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

Date of COV: June 8-10, 2005
Division: Integrative Organismal Biology
Directorate: Biological Sciences
Number of actions reviewed by COV¹: Awards: 127 Declinations: 127 Other: 93
Total number of actions within division during period being reviewed by COV²: Awards: 1041 Declinations: 3395 Other:
Manner in which reviewed actions were selected: In addition to those actions selected in the self-study report, Scientific Assistants were asked to pull random jackets amongst all programs with equal numbers for each year (2002, 2003, 2004) and equal numbers of awarded and declinations.

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

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

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Is the review mechanism appropriate? (panels, ad hoc reviews, site visits)	Yes
Is the review process efficient and effective?	Yes

¹ To be provided by NSF staff.

² To be provided by NSF staff.

Are reviews consistent with priorities and criteria stated in the division's solicitations, announcements, and guidelines?	Yes
Do the individual reviews (either mail or panel) provide sufficient information for the principal investigator(s) to understand the basis for the reviewer's recommendation?	Yes
Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation?	Yes
Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation?	Yes
Is the time to decision appropriate?	Yes

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

The various types of review mechanisms maximize the flexibility and effectiveness of the merit review process. The discussion of a proposal by the Panel is considered extremely important to the process, as is the ability to re-evaluate the proposals after all reviews have been completed. The quality, the amount of information and inclusiveness of the Panel Discussions are continually being reviewed in order to provide maximal information to the Principal Investigator.

While most of the review mechanisms were considered appropriate for the different types of proposals, there was some concern about one of the mechanisms, i.e., mail review, used to review proposals from active panel members.

The review process was generally viewed as both effective and efficient. The use of both panel and mail reviews was seen as a successful strategy to insure that the necessary expertise is brought to bear on a particular proposal.

Two criteria are used in evaluating proposals. They are: 1. What is the intellectual merit of the proposed activity, and 2. What are the broader impacts of the proposed activity. A description of what is to be evaluated under each criterion is clearly presented to reviewers.

To evaluate the next 4 questions, the COV reviewed over 100 jackets, both awards and declines, from 2002, 2003, and 2004. The findings of this independent assessment, in general, are consistent with the findings presented in the self-study.

While there has been an improvement in the use of both criteria, the rigor with which criterion 1 is applied is far more strenuous than that for criterion 2. Moreover, criterion 2 was not consistently addressed by all *ad hoc* reviewers.

In general, both individual reviews and panel summaries provide adequate information to support the basis for the reviewers' recommendations. Weaknesses are clearly delineated in an effort provide sufficient feedback to investigators for revisions. This documentation for the subset of

proposals reviewed by the COV was generally complete. With respect to Awards, less attention was given to weaknesses. However, sufficient justification was provided for all recommendations.

The NSF is meeting its goal (i.e., 6-months) of informing investigators of funding decisions during the last 3 years; approximately 80% are processed within this time. Unfortunately, the data presented in the self-study was not specific for IOB.

Recommendations:

The alternate panel review mechanism was deemed appropriate for the proposals of active panelists. However, there were concerns about the use of only mail review for this category of proposal. This concern centered on the lack of panel a (reviewer) discussion, which was deemed an important and integral part of the review process. If the mail review mechanism is used, the recommendation is to initiate a conference call after mail reviews have been received.

The COV recommends that the NSF continue to stress the importance of review criterion 2 to both investigators and reviewers. This might involve disseminating information about the kinds of activities that could be included under this criterion, and making a concerted effort to change the existing culture of the scientific community, which tends to give exclusive importance to criterion 1. We would also suggest that measures be developed to assess the impact of this criterion on NSF's outcome goals for People, Ideas, and Tools.

With respect to the time to making appropriate funding decisions, the COV recommends that data be collected to determine if the rapid return of reviews to investigators has improved the turn-around time for resubmissions, and if there has been an improvement in the rating of these resubmitted grants. We also recommend that, in general, IOB should track resubmissions and their subsequent success rates.

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

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

IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Have the individual reviews (either mail or panel) addressed whether the proposal contributes to both merit review criteria?	NO
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria?	YES

Have the <i>review analyses</i> (Form 7s) addressed whether the proposal contributes to both merit review criteria?	YES
---	-----

Comments on NSF's merit review system:

The data provided to the COV in the IOB self-study report were obtained from the EIS Database. In the self-study, reviewer responses of at least five words in a section relating to criterion 1 or 2 were scored as a positive for having addressed that criterion. These numbers indicated that a few (from a high of 14% in 2002 to a low of 8% in 2004) were missing one of the criteria. To determine the validity of the 5-word metric and whether missing responses were biased toward one of the two criteria, the COV pulled over 100 jackets and assessed the responses provided in individual reviewer comments, panel summaries and the review analyses. We found that review analyses consistently did a good job of addressing whether the proposals contributed to both merit review criteria. This was true for both awards and declines. From 2002 to 2004, panel summaries consistently addressed whether reviews addressed both criteria, and over time this improved for both awards and declines. In contrast, individual reviews did not consistently address both criteria, usually falling short on addressing criterion 2 (roughly half of the reviews in 2002). From 2002 to 2004 there was noticeable improvement, but even in 2004 too many of the reviews (roughly 1/3) lacked substantive, insightful, rigorous comments concerning criterion 2. This was true for both awards and declines.

Recommendations:

We recommend that Program Directors continue to stress to reviewers (both ad hocs and panelists) the importance of addressing criterion 2 with a level of rigor and insight consistent with assessments brought to other components of the proposal. Furthermore, the Program Directors should be vigilant in enforcing the return without review policy for proposals not addressing criterion 2 (Notice No. 127 on July 8, 2002).

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

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
Did the division make use of an adequate number of reviewers for a balanced review?	Yes
Did the division make use of reviewers having appropriate expertise and/or qualifications?	Yes
Did the division make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? (Note: Data for underrepresented groups are not available).	Yes for geographical. No for under represented minorities
Did the division recognize and resolve conflicts of interest when appropriate?	Yes

Comments on selection of reviewers:

The self-study guide was extremely useful in answering the questions in this section. We supplemented the material in the self-study guide by the examination of jackets. We analyzed a number of jackets as a group for a variety of parameters. In addition, we requested and were provided with a number of additional jackets, which also contained the CVs of the panelists who reviewed each grant. Both of these additional analyses supported the numerical analyses in the self-study guide. In particular our jacket analysis supported the view that the reviewers used had an appropriate expertise to review the proposals. Despite the large number of applications, the division has been able to maintain an average of slightly more than 5 reviews per proposal.

It was difficult for the COV to assess the demographic balance of reviewers in the absence of clear targets base on the information in the self-study guide. As an example it is difficult to assess the percentage of reviewers who should come from four-year colleges relative to the portfolio of applications that are received. We noticed no clear imbalances but cannot be more precise in the absence of guidance as to goals. We requested additional information from the science assistants on a geographical breakdown of applications. This was provided to us. While admittedly an imperfect measure, we believed that a list of applications by state would provide some idea of the geographical distribution of those in the NSF community. In examining these data, while there was some slight variations and year-to-year fluctuations the overall geographical distribution of panelists roughly tracked with the distribution of applicants. We note however, that a large percentage of panelists had no geographical identifier and this number was going up (20.9% in 2004).

While information on under represented groups is not available for mail reviews it is available for panelists. In that group the overall percentage of under represented groups has stayed about the same (about 8%) over the last three years. However, in looking at the breakdown of groups the number has shifted from about 60% of the under represented groups being blacks, Hispanics and Native Americans in 2002 to 75% being Asian in 2004. This, as well as the total numbers of under represented minorities is of considerable concern to the committee. The committee recognizes the difficulty in improving these numbers and notes the firm commitment on the part of both senior management and PDs to achieving the goal of diversification. That said, the numbers at this point indicate the need for considerable improvement.

Recommendations:

Overall the committee believes that the selection of reviewers is extremely appropriate in the vast number of cases. One minor concern is the review of applicants who are active panelists. In some cases alternate committees review applications of panelists while in others they are only reviewed by mail. The use of mail in only reviews without a subsequent discussion of the application may compromise the quality of the review. As a result we very strongly discourage mail in only reviews for standard research grant applications and in cases where they cannot be avoided (a panelist for example) we recommend at least a conference call among the mail in reviewers be added to the process. In addition, we recommend that the division attempt to establish basic guidelines for sought-after demographics among reviewers.

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

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
Overall quality of the research and/or education projects supported by the division.	Appropriate
Are awards appropriate in size and duration for the scope of the projects?	Appropriate. See comments.
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • High Risk Proposals? 	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Multidisciplinary Proposals? 	Appropriate. See comments.

Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Innovative Proposals? 	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Funding for centers, groups and awards to individuals? 	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Awards to new investigators? 	Appropriate See comments.
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Geographical distribution of Principal Investigators? 	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Institutional types? 	Appropriate
Does the division portfolio have an appropriate balance of: <ul style="list-style-type: none"> • Projects that integrate research and education? 	Appropriate See comments.
Does the division portfolio have an appropriate balance: <ul style="list-style-type: none"> • Across disciplines and subdisciplines of the activity and of emerging opportunities? 	Appropriate
Does the division portfolio have appropriate participation of underrepresented groups?	Appropriate See comments.
Are the programs in the division relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.	Appropriate See comments.

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

General Comments

Overall the COV was pleased by the distribution of award types, sizes, institutions, and localities, as well as by the wide diversity in the biological questions under study. While the latter no doubt accurately reflects the wide range of disciplines that fall in the bailiwick of the IOB, the former (i.e., diversity of award types and distributions) reflects a concerted and successful effort by the IOB to fulfill the Foundations' diverse mandates addressing national education and infrastructure needs. Such effort is also evident in the quality of the programs selected for support; although detailed elsewhere in this report, our review of >100 jackets affirmed the judgments and conclusions of the panels. Several members of the COV not that intimately familiar with the reviewing policies and

processes at NSF were impressed by the amount the care and thoughtfulness shown in the vast majority of the reviews and summaries in the jackets, and by the diversity in the types of awards.

Comments Directed to Specific Questions Above

The size of the awards in our jacket review was deemed appropriate to the technology and complexity of the biological questions under scrutiny. We noted from the IOB self-study that the discrepancy between the requested amount and the actual award is smaller in 2004 than in 2002. Similarly, the COV also noted a sharp divergence between the duration requested and that awarded in 2004, which might reflect the budgetary cuts that year. However, the actual magnitude of the decrease is only about 1 month, so that this issue requires continued monitoring to determine whether this trend is real.

Although the distribution of award types has been uniform in most of the categories, the self-study indicates that frequency of multidisciplinary awards dropped by 50% between 2002 and 2004. The COV suspected that this might reflect the fact that such multidisciplinary proposals typically have larger budgets than individual awards, and hence may not have been submitted, hampered in the panel based on cost alone. It is likely that IOB has the data at hand to address this issue. Interestingly, in this era of increasingly collaborative research – few papers are published with a single author – the data in the self-study indicate that the % of applications with a single PI on the cover sheet has remained stable, while the percent with multiple PIs has only increased 6%. This seems a reasonable trend given the scope of the science supported by the IOB, which encompasses several fields where it is still feasible for a small lab with a cadre of students to generate high quality science.

The IOB self-study indicates that 10% of all the divisional awards went to non-baccalaureate undergraduate institutions. However, in follow-up with the DD, this may well be an artifact arising from non-congruence between the institutional classification systems used by the Carnegie Foundation and NSF. Indeed, in the jacket review conducted by the COV, from a random sample of >100 awards and declines, only 2 RUI proposals were found. Nevertheless, almost every proposal evaluated requested support for students at all levels, a tradition and commitment deemed important by the COV.

The COV noted that the percent of the portfolio being awarded to New Investigators has remained steady during the study period, but that while the percent success in all investigator types declined slightly, that for New Investigators rose in the same period. We suspect that this increasing success for New Investigators may reflect the outreach and tutorial efforts by NSF staff to encourage and guide them.

The COV was heartened by the increasing number of proposals submitted by minority PIs, and also by the striking increase in the number with “minority involvement”, as reported in the self-study. NSF awards within BIO, and likely in other Directorates, almost always includes support for students, ranging from undergraduate to postdoctoral levels. Because the ethnicity of the students receiving such support is not always specified in final reports (it’s a self-reporting process), it seems likely that the extent of minority support from NSF supported is underestimated by the data in the self-study.

It was also commented that, judging from our jacket reviews and experience on panels and as reviewers, NSF budgets rarely contain requests for technicians. Rather, no doubt in response to the continuing emphasis on Merit Review Criteria #2 throughout NSF, and emphatically within IOB, proposals not requesting support for students were the rare exception. As a result, the COV believes that IOB is vigorously fulfilling the NSF mandate to integrate research and education. As

discussed in this report, increased mining of the data in the Final Reports ought to quantify more accurately the number of students supported, and further document NSF's contributions to its education mandates.

The IOB self-study provides a series of external studies that document the concordance between IOB efforts and national priorities, agency mission, relevant fields, and other customer needs. The COV concurs that IOB is very effectively discharging its obligations to the public and the scientific community, while at the same time vigorously addressing the Foundation's other mandates. Moreover, it was concluded that the content of the portfolio in terms of the variables covered in this section – size, duration, type, applicant pool, geographic distribution, etc. - reflects insightful and well-informed guidance by the Program Officers and IOB in toto.

Recommendations:

As put forth elsewhere in this report, this COV believes that if NSF were more proactive in assessing the outcomes of its awards, the Foundation should be able to more clearly document its successes. For example, to address the mandate to foster minority involvement in science, documenting in the Final report of every award how many minority students were supported would make manifest the continuing commitment of NSF to this effort.

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

The division has undergone a very significant reorganization over the review period. This was orchestrated by the divisional leadership in a deliberate and thoughtful process, and resulted in the generation of 4 new operative clusters. The COV panel recognized this reorganization as an innovative and creative response to the overall Directorate and Foundation challenge of making NSF responsive to the research and education community. The IOB transition was marked by strong and open communication. This openness was evident within the review process as well. Nonetheless, the DD, DDD and PDS all recognized the need for patience and flexibility in this transition period, especially with regards to possible re-organization of units within the clusters.

Responsiveness of the division to emerging research and education trends:

The reorganization of IOB is a direct and very evident attempt to increase the responsiveness of the unit to emerging trends in research and education.

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

The IOB Division invested extensively in the development of the self-study guide that was instrumental in providing information and data for the COV review.

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

Cluster leaders are being asked to determine and distribute incoming applications in 2 different formats. The new, redundant electronic distribution format is requiring an extraordinary effort that needs to be re-considered.

Recommendations:

The IOB-COV panel recommends that the number of permanent Program Directors be increased in line with the relative percentage of permanent officers in other Divisions.

While the COV committee recognized the significant improvement in training activities for the rotating PDs, we strongly recommend the development of a strong mentoring system (PD to PD), supported with a searchable and practical daily guide/handbook.

PART B. RESULTS: OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

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

The following questions are developed using the NSF outcome goals in the NSF Strategic Plan. The COV should look carefully at and comment on (1) noteworthy achievements of the year based on NSF awards; (2) the ways in which funded projects have collectively affected progress toward NSF's mission and strategic outcomes; and (3) expectations for future performance based on the current set of awards. NSF asks the COV to provide comments on the degree to which past investments in research and education have contributed to NSF's progress towards its annual strategic outcome goals and to its mission:

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

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

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

Our study is based on materials provided by the IOB self study, reading of more than 100 grant jackets of awarded and declined grants from the last 3 years, and discussions with the division director, deputy division director and program directors of IOB, and program directors from other divisions within BIO. We also received information from science assistants who conducted brief data gathering forays on our behalf.

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

Comments:

From our assessment above we concluded that the division has made great efforts to develop a diverse, competitive and engaged workforce of scientists. The foundation achieves this goal by:

- Support of students in laboratories via special grants and individual investigator grants. A very large percentage of awards (85-90% of all REU requests and approximately \$350,000 per year) receive REU supplements. RUI institutions receive awards regularly.
- Through conferences and workshops that provide scientists opportunities to interact and communicate at the cutting edge of science. Among the 92 conferences and workshops supported, we note in particular support for conferences that explore new areas of science, such as the Genetics of Behavior or meetings on Evolution of Diversity.
- A clear priority in the division to support underrepresented minorities and minority serving institutions. The success rate of minority PIs and PIs from minority institutions is slightly higher or equal, respectively, than the average for all institutions.
- By emphasizing the second criteria (broader impacts). We noted that over the review period, emphasizing this criterion resulted in increased responses by the applicants, the review panel and in the summary statement. However, there is still room for improvement with regard to rigor.

Although we believe that the division has accomplished this goal, it has not developed the mechanisms to document progress in this area. We recommend modifying annual and final reports to facilitate data gathering on the outcomes of this goal for each proposal. The data gather should be broad because the goals of NSF are broad (see below).

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

Comments:

From our study we conclude that the division has made great efforts to enable discovery across the frontier of science connected to learning, innovation and service to society. The division has fostered and helped to propel areas that are now at the frontier of the biological sciences. A few examples are the following: the identification and development of new model organisms, plant genomics, evolution and development, evolutionary physiology, and computational neuroscience among others.

IOB has been successful in identifying and supporting outstanding science and the best ideas. Data we gathered from a specific panel indicate that the NSF review process identifies and eventually leads to funding of more than 50% of proposal rated outstanding. The division does not fund all outstanding proposals, an outcome that would best serve the progress of science. However, we are confident that, given budgetary constraints, this division funds outstanding science within its domain. Again, better documentation of outcomes would facilitate assessing progress. The panel would have liked to see evidence regarding the development of intellectual property that resulted from these grants.

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:

From our study we concluded that the division has made great efforts to provide broadly accessible, state-of-the-art facilities, tools and other infrastructure that enable discovery, learning and innovation. Our analysis of budget on equipment on individual grants, as well as specified instrumentation grants disclosed that the foundation directly and indirectly fosters the development of instrumentation and infrastructure of science.

Inherent in the nature of the proposal is the development of scientific methods. However, it would be beneficial for the division to develop better mechanisms to document more efficiently the development of tools, dissemination of data, website hits, requests for reagents, intellectual property and patents. We emphasize that one number metrics cannot possibly capture the richness of the performance of the diversity of PIs funded by IOB. Furthermore, documenting these metrics does not imply that they will be used as single criteria to evaluate new proposals. However, these two considerations should not preclude the division from documenting its performance using a variety of quantitative and qualitative criteria. NSF in general and IOB in particular are leaders in the improvement of financial performance and expanded e(electronic)-government initiatives, we believe that they can exercise similar leadership in the assessment of performance outcomes.

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: Our interviews with personnel revealed an unusually collaborative management style. The upper administration is accountable and responsive, yet it drives new initiatives and changes. This style facilitated the reorganization into clusters, which permit agile assessment of research needs, and may foster innovative ways to interact and maximize communication within and among clusters. An added benefit of this organizational scheme is its relatively small administrative cost. Although we are enthusiastic with the novel organization of the division, we recognize that it is a work in progress. We are confident that its collaborative management style will facilitate and affect change when it is needed.

A direct line between PIs to program directors, and the presence of rotating program officers, facilitate rapid feedback between scientific trends and developments, and funding.

PART C. OTHER TOPICS

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

- a. Increase the percentage of permanent PDs to improve institutional memory; one per cluster may not be sufficient.
- b. The current workload among the PDs continues to be unbalanced across the culture. A more equitable arrangement should be implemented.
- c. Improve training and mentoring of rotating Program Directors.
- d. Clarify the description of the research topics of the reorganized clusters and communicate these to the research community.

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

None

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

- a. Increase the cost of living compensation of rotating PD to alleviate financial hardship associated with maintenance of two households necessitated by temporary duty in DC. The panel thinks that the system of rotating program directors is critical to the quality of the review process. It would be tragic if the quality of the review process was compromised by the cost of housing in the DC area.
- b. Improved collection of outcome data will greatly assist the foundation in justifying budget requests to congress. It will also allow the division to better assess outcomes and output in order to increase division success. Additionally, this would greatly assist the foundation in justifying financial requests from congress.
- c. Although the number of proposals from underrepresented groups have increased and the success rate is comparable to all PI types, the absolute numbers are still low and efforts should be made to increase this trend.
- d. Increase the participation of underrepresented groups on panels and ad hoc reviews.
- f. BIO has implemented several new programs targeting underrepresented groups (Research Initiation Grant, Career Enhancement Award, Post-Doc Awards). Are there similar programs offered by other NSF directorates?
- g. The new electronic systems may be too restrictive with respect to access of certain documents and actions. This restriction appears to have altered the logical distribution of work and impedes the efficient processing of proposals.
- h. Formalize Susan Lolle's notes, which are already in wide use by some Program Directors, into a handbook for all new program directors.
- i. The self-study report was extremely valuable to the COV. It freed the committee from spending excessive time on cursory data mining from jackets. It also allowed for the

increased exploration of content, conceptual issues and provided time for more in depth interaction with program directors.

- j. Given the strength of the mandate for criterion 2, a five-word metric for its satisfactory inclusion in a proposal is grossly inadequate. A more rigorous metric is recommended.

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

- a. Improve tracking of outcomes from funded research by collecting data electronically in annual and final reports. These data should facilitate better management of current and future project portfolios and could be invaluable in any decisions regarding strategic reallocation of funds.

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

- a. Include descriptive statistics (means, standard deviations, range) on the data in the self-study.
- b. The COV report template should be organized and numbered exactly as the self-study report. (A few minor errors were noted in comparing the current COV template to the IOB self-study report).

PART D. DIVISION LEVEL QUESTIONS

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

- a. Agency rule prevents release of decline reviews without prior approved by DD.
- b. Progress has been made in training new Program Directors and a mechanism has been put in place for bringing back former Program Directors as requested, however, a more formal mentoring system with a current program director is recommended.
- c. Steps have been taken to improve dissemination of the expectations for satisfying criterion #2.
- d. Efforts are being made to increase diversity participation in review.
- e. It is unclear if a database of active underrepresented scientists and under-represented awardees has been created.
- f. Previously it was found the IBN was not successful in attracting applications from under-represented groups - we now see signs of improvement.
- g. Previously recommended that IBN make efforts to increase awareness for IBN funded ROAs - no data has been supplied to indicate if this recommendation has been acted upon.
- h. Time provided to meet with IOB and other cluster managers and Directors was provided in the current COV panel.

DIVERSITY DOCUMENT

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

June 8-10, 2005

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

The 2005 Committee of Visitors for the Division of Integrative Organismal Biology (see attached list) was composed of 9 members, including Dr. Richard McCombie, who represented the BIO Advisory Committee. Three of the members are female, and three members are from an under-represented minority. Members currently work in 8 different states, including Kentucky, Texas, California, New York, Wyoming, Indiana, Rhode Island, and the District of Columbia. Seven members are from academic institutions, one is from industry, 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.

Mary E. Clutter
Assistant Director
Biological Sciences

Committee of Visitors
Division of Integrative Organismal Biology

June 8-10, 2005

Committee Members

Joe Chappell (Chair)
Agronomy Department
University of Kentucky
Lexington, KY

Mark Brodl
Department of Biology
Trinity University
San Antonio, TX

Jim Dykens
Senior Director, Technology
Development
Migenix, Inc.
San Diego, CA

Ruth Lehmann
New York University Medical Center
New York, NY

Carlos Martinez del Rio
Department of Zoology and Physiology
University of Wyoming
Laramie, WY

Richard McCombie
Cold Spring Harbor Laboratory
Cold Spring Harbor, NY

Steve Scofield
US Department of Agriculture
West Lafayette, IN

Sonya Sobrian
Department of Pharmacology
Howard University
Washington, DC

Cheryl Wilga
Department of Biological Sciences
University of Rhode Island
Kingston, RI