

CORE QUESTIONS and REPORT TEMPLATE
for
FY 2011 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2011 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2011. Specific guidance for NSF staff describing the COV review process is described in Subchapter 300-Committee of Visitors Reviews (NSF Manual 1, Section VIII) that can be obtained at <www.inside.nsf.gov/od/oia/cov>.

NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations and program-level technical and (2) managerial matters pertaining to proposal decisions.

The program(s) under review may include several sub-activities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the sub-activities of the program, with the latter requiring more time but providing more detailed information.

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

Suggested sources of information for COVs to consider are provided for each item. As indicated, a resource for NSF staff preparing data for COVs is the Enterprise Information System (EIS) –Web COV module, which can be accessed by NSF staff only at <http://budg-eis-01/eisportal/default.aspx>. In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

For section IV addressing portfolio balance the program should provide the COV with a statement of the program's portfolio goals and ask specific questions about the program under review. Some suggestions regarding portfolio dimensions are given on the template. These suggestions will not be appropriate for all programs.

Guidance to the COV: The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the *processes* related to proposal review. Discussions leading to answers for Part A of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. ***COV reports should not contain confidential material or specific information about declined proposals.*** The reports generated by COVs are made available to the public.

We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions. For past COV reports, please see <http://www.nsf.gov/od/oia/activities/cov/covs.jsp>.

**FY 2011 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

The table below should be completed by program staff.

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

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.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments: At NSF proposals are reviewed by a combination of ad hoc reviewers and panelists in a thorough manner. There is no triage so every proposal submitted is given a complete review. The CoV commends IOS/NSF on its commitment to the peer review process for every grant and avoiding grant triage. Furthermore, we find the panel to be indispensable to thoroughness and cohesiveness of review, and we encourage IOS to continue the in-person panel review process.</p> <p>The CoV reviewed 191 jackets for proposals submitted 2008-2010. In general, we found that panel activities were well documented, but the subsequent internal review process, which leads to the final funding decision, was less transparent.</p> <p>The COV did not review the results of site visits as none was found among the sample of jackets.</p> <p>The CoV recognizes and supports EAGERs as a mechanism to support transformative research and RAPIDs as a mechanism to support time-sensitive research, but we recommend inclusion of more detailed documentation on the review process for these submissions included in the jacket.</p> <p>Source: jackets, other CoV documents</p>	<p>Yes</p>
<p>2. Are both merit review criteria addressed</p>	<p>a) No b) Yes</p>

<p>a) In individual reviews?</p> <p>b) In panel summaries?</p> <p>c) In Program Officer review analyses?</p> <p>Comments:</p> <p>Proposals are reviewed on the basis of technical merit, creativity, educational impact and their potential benefits to society. The two criteria now in effect address the intellectual merit of the proposed activity and its broader impacts.</p> <p>Intellectual Merit was consistently addressed in all review types (individual, panel summary and review analysis).</p> <p>Broader Impact, however, was often not understood by individual reviewers, and sometimes panelists, in spite of the fact the NSF guide to proposals (http://www.nsf.gov/pubs/policydocs/pappguide/nsf11001/gpgprint.pdf) clearly identify the following issues to be identify for this criteria: 1) How well does the activity advance discovery and understanding while promoting teaching, training, and learning? 2) How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? 3) To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? 4) Will the results be disseminated broadly to enhance scientific and technological understanding? 5) What may be the benefits of the proposed activity to society? As a consequence comments on broader impact often did not translate into unequivocal statements of strength or weakness.</p> <p>The review analyses by the program officers do an excellent job of remediating gaps in the panel summary with respect to broader impacts. We found instances, however, of review analysis with no comments on the broader impacts of the proposal.</p> <p>The CoV recommends that NSF continue its campaign to educate reviewers on the criteria for broader impacts and expectations for their scope and considers structuring these criteria to prevent a disparate array of answers in the review process. For example NSF could create length and content guidelines for PIs to address broader impacts (perhaps include a checkbox with items such as plans to train graduate and/or undergraduate students, involvement of underrepresented groups in the proposed activities, high school and community outreach efforts, and development of educational materials (videos, software, etc).</p> <p>Source: jackets, NSF web pages</p>	<p>c) Yes</p>
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<p>3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals?</p> <p>Comments: The CoV was pleased to see that the majority of individual reviews were comprehensive and constructive, containing guidance for revision in the case of declination.</p> <p>The CoV noted substantial improvement in the evaluation of broader impacts in the individual reviews.</p> <p>Source: jackets</p>	<p>Yes</p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments: The CoV noted that panel consensus was typically evident upon reading the panel summary.</p> <p>The CoV suggests that the utility of panel summaries would be improved by universal inclusion of an explicit statement of the rationale for panel decision.</p> <p>When panel summaries do not provide a clear rationale for decision the CoV recommends the wider use of the PO comment to provide clarity to the PI.</p> <p>Source: jackets</p>	<p>Yes</p>
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>(Note: Documentation in jacket usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.)</p> <p>Comments: The CoV commends IOS on the quality of the panel summaries, which generally contain the rationale for the decision. Thus, in general, the CoV found documentation of the rationale for the award/decline decision in the jacket. In a few instances where high priority proposals were denied, the rationale was unclear. The CoV recommends that the review analysis universally include explicit reasons for decline of high priority proposals.</p> <p>Source: jackets</p>	<p>Yes</p>

<p>6. Does the documentation to PI provide the rationale for the award/decline decision?</p> <p>(Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written or telephoned with diary note in jacket) of the basis for a declination.)</p> <p>Comments: In our review of 191 jackets, the CoV found that the panel summary, which is provided to the PI, provided the rationale for the award/decline decision in the majority of cases.</p> <p>Proposals that were reviewed strongly in panel but were ultimately declined often lacked an explicit rationale for the decision in the panel summary, which is provided to the PI. Although additional information was generally found in the review analysis, this may or may not have been communicated to the PI. The CoV recommends consistent use of clear program officer comments in the panel summary, where high priority proposals have been declined, or in instances where there was no panel review (i.e. COI).</p> <p>Source: jackets, discussion with program officers</p>	<p>Yes</p>
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>The IOS program directors and staff are to be commended on their commitment to this demanding process in the face of increasing proposal numbers (43% increase since 2000).</p> <p>The CoV was unanimous in the opinion that the merit review process is dynamic and successful in leading to high impact research addressing diverse topics from molecular processes to ecosystem interactions (e.g., Highlights 17010, 15698, 21466, 17178, 18450, 18522, 18531) that readily translate to impacts addressing societal issues. The broader impacts of IOS awards ensure that the research benefits are rapidly translated to both science and society (e.g., Highlights 17025, 17102, 17178, 18531, 19633).</p> <p>Source: jackets, presentation by Director Wingfield, Highlights 2008-2010</p>	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments: The CoV found that reviews were obtained from scientists with appropriate expertise. Reviewers are chosen from lists suggested by the PI, program officer knowledge of the research field, references cited in the proposal, recent technical programs from scientific societies, NSF library resources and reviewer recommendations. Such breadth and diversity of reviewers is impressive.</p> <p>Source: jackets, CoV documents, presentation by Deputy Director Silverthorne</p>	Yes
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments: Reviewers identified potential conflicts before panels met. Examination of material in the jackets indicated that self-identified conflicts of interest were recognized and resolved appropriately during review. The CoV was unable to determine whether additional conflicts existed about which reviewers did not provide information.</p> <p>Source: jackets, Self Study Report</p>	Yes
<p>Additional comments on reviewer selection:</p> <p>The CoV was impressed by the high quality and number of reviews obtained for proposals reviewed externally; we applaud IOS for their efforts. For proposals reviewed internally, however, the documentation of reviews was not as transparent in the jackets reviewed. The CoV recommends that IOS consider the use of ad hoc reviewers to support programmatic recommendations where appropriate.</p>	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

Comments:

The CoV recognizes the outstanding management of IOS during leadership and organizational changes. The model of combining permanent and rotating program officers is believed to be particularly beneficial to the mission of IOS as it allows the influx of new ideas while maintaining consistent and experienced leadership within clusters. As described above, the CoV found the review process to be fairly and efficiently managed. This process led to a diverse and impressive range of funded research with broad importance to the discipline, the mission of NSF and relevance to a number of key societal issues.

Source: CoV documents, jackets, discussions with program officers and IOS/BIO leaders

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

Comments:

IOS is responding well to emerging research. Program descriptions are expansive, encouraging a broad range of submissions. The CoV appreciated the use of EAGERs and RAPIDs as mechanisms where program officers using their own discretion can use a small percentage of programs funds to respond to emerging research ideas and time-sensitive opportunities. The CoV noted other means allowing IOS to respond to emerging research opportunities including through the cross-division Emerging Frontiers program.

The high award rate for REUs indicates a strong commitment of IOS to facilitating education opportunities for undergraduate students.

Source: IOS vision statement, awards list, press releases, Highlights, introductory presentation by Director Wingfield

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

Comments:

Program planning and prioritization are guided by portfolio analysis, annual reports, leading edge discussions, community workshop reports and Division retreats. Priorities were identified through National Research Council reports: The Role of Theory in Advancing 21st Century Biology and A New Biology for the 21st Century.

Source: Self Study Report

4. Responsiveness of program to previous COV comments and recommendations.

Comments:

We found the responsiveness of IOS to previous CoV comments and recommendations to be generally good. In particular, we perceived marked progress in panel summaries and increased attention to the description of broader impacts as recommended by the 2008 CoV.

General responsiveness notwithstanding, some comments and recommendations were not adequately addressed as follows:

In reviewing documents associated with previous CoVs (2008 and earlier), we noted consistency among comments and recommendations of successive CoV reports; however, the Self Study Report did not appear to directly reference the previous CoV report. The CoV strongly encourages IOS to strive for continuity from CoV Report to Self Study Report.

The 2008 CoV report raised the issue that proposal outcomes and outputs are difficult to assess. Although we recognize that this is outside the control of IOS, the CoV found this to be an on-going issue.

We note that the number, size and duration of IOS awards remained flat as was indicated by the 2008 CoV. This issue remains a serious concern as numerous highly meritorious proposals are declined. We encourage the leadership to continue developing creative approaches to increase funding for the important and exciting research in IOS, which is uniquely positioned among divisions of the Directorate for Biological Sciences to understand organismal function and address key societal issues such as climate change, crop production and health of populations and environments.

Sources: 2008 COV Report, Response to COV 2008, Self Study Report

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program/s under review.

<p align="center">RESULTING PORTFOLIO OF AWARDS</p>	<p align="center">APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</p>
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub disciplines of the activity?</p> <p>Comments: CoV commends the IOS for a balanced portfolio while recognizing the challenges of establishing an appropriate mix of awards across a diverse portfolio. Funding allocation per program (discipline) is historically based, with minimal annual shift in percentages. Physiological and Structural Systems allocation is a little under 50% of the budget, followed by Neural Systems with about 25% and Developmental Systems with 20%. Behavioral Systems has less than 10% of the budget. Nevertheless, relative to number of proposals received per program, there was a proportional disposition of funds, with the exception of Behavioral Systems, which appeared to be underfunded. The award success rate was very similar for all programs. In conversations with CoV, program officers appeared unaware of the overall balance within the division.</p> <p>Source: Self Study Report, requested analyses placed in eJacket, discussions with program officers</p>	<p>Appropriate</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments: From documentation provided to the CoV, award size and duration was generally appropriate. Given current budget limitations, IOS is commended for rising to the challenge and providing the flexibility for program officers to balance award number and size.</p> <p>Source: Self Study Report, jackets</p>	<p>Appropriate</p>
<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments: The CoV found that IOS funded potentially transformative research through three complementary mechanisms. These included standard proposals that were often recognized as transformative by panels and/or program officers, EAGER awards, and participation in Directorate-wide activities such as the Ideas Lab. The CoV appreciated that proposals identified as potentially</p>	<p>Appropriate</p>

transformative composed a relatively small proportion of the portfolio, allowing the maintenance of significant funding for high quality and important basic research within disciplines. Examination of several panel debriefing spreadsheets revealed that while most proposals flagged as transformative were in the High Priority category, or high in the Medium Priority category, a few ranked much lower. The CoV did not examine the funding fates of these differently-rated potentially transformative proposals.

The first category of awards for transformative research (standard grants) was identified by the CoV through perusal of provided Research Highlights and subsequent examination of jackets, as well as a complete spreadsheet of proposals flagged as transformative in FY2010, when the tracking mechanism was implemented. Sixty-seven proposals (4% of all proposal received) were so designated in 2010, and 53 (79%) were awarded. Thus, IOS is funding potentially transformative research at a high rate. Whether the fact that only 4% of all proposals were designated as potentially transformative means that transformative research is not often recognized as such or proposals do not contain transformative ideas could not be readily determined.

Detailed EAGER award information was provided to the CoV, with 33 EAGER/SGER awards made in FY2008-2010. The EAGER process was highlighted as a mechanism for funding tool development and innovative projects in the Self Study Report and in the CoV's discussion with the Program Officers. Program Officers seem to differ in their use of EAGER as a funding option. Whether a more extensive use of EAGERs would increase the transformative portfolio could be considered at the Division level.

When funded transformative research was examined, the CoV found a variety of types of projects that were at the leading edge of their disciplines. For example, the Center for Behavioral Neuroscience (funded by an RCN) has developed a unique collaborative process and is a "model for the execution of science." Another example (0718890) is a single-investigator proposal which sought to demonstrate a role for an enzyme that metabolizes extracellular ATP as a signaling molecule. Despite the program officer's note that "every aim could fail!" it was funded, and ultimately led to a series of high-profile publications and a successful renewal. An award on seaweed flexibility (0641068) was viewed as potentially leading to "an extraordinary breakthrough" if the molecule lignin could be found in these organisms. Finally, a CAREER award (0546906) supported the synthesis and analysis of proteins predicted to be present in the Paleozoic era. The ability to examine the biological properties of proteins no longer in existence opened a new window into biology. These few examples demonstrate that IOS panels and personnel are open to risk-taking and also can identify unusual opportunities to advance discovery in their target areas.

Source: jackets, Highlights

4. Does the program portfolio include inter- and multi- disciplinary projects?

Appropriate

Comments:

<p>Interdisciplinary IOS research integrates information, data, techniques, tools, perspectives, concepts and/or theories from two or more disciplines within biology to advance understanding of and provide solutions for complex problems.</p> <p>Multidisciplinary research has one or more areas of science outside of biology (ie. engineering, chemistry, mathematics) that provides collaborative research approaches for complex biological systems.</p> <p>NSF promotes multidisciplinary and interdisciplinary research through programs that support development of the next generation of researchers. There is strong funding of interdisciplinary projects as indicated by budget allocation to projects co-funded by programs within IOS and within BIO.</p> <p>About 25% of awards are multidisciplinary as indicated by the PI. The CoV suggests it would be valuable to validate all multidisciplinary designations at the time of award.</p> <p>Source: Self Study Report, jackets, CoV documents</p>	
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments: The CoV recognizes the challenges in determining appropriate geographical distribution. The data provided in the self-study did not explicitly address this question, however, from available data it is obvious that the majority of awards go to historically research-intensive states but awards are distributed across all states. cursory examination of the proposal number submitted per state suggests that award rate is a reasonable reflection of the number of proposals submitted.</p> <p>Source: Self Study Report, requested data placed in Ejacket.</p>	Appropriate
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments :</p> <p>Based on Table 7 in the Self Study Report, the balance of the awards was considered appropriate except that 4-year institutions only get approximately 2.5% of the awards. The COV feels that this proportion is too low. Since IOS is committed to research funding at undergraduate education, additional mechanisms are needed to increase the number of these awards. One possible mechanism considered by the CoV was solicitation of small grants that would allow PIs at PUI institutions a chance to get started, as preparation of preliminary data for an RUI grant can be a high hurdle for someone who is entirely unfunded.</p>	Appropriate

<p>7. Does the program portfolio have an appropriate balance of awards to new investigators?</p> <p>NOTE: A new investigator is an investigator who has not been a PI on a funded NSF grant. A beginning investigator is an investigator that has not previously received federal funds.</p> <p>The CoV commends the IOS and program officers for highlighting the importance of including beginning and early CAREER investigators in the IOS portfolio. The information given in the self study indicates that the percentage of new investigators receiving awards shows a declining trend (24% in 2008, 22% in 2009, 17% 2010). However, new information provided during the CoV meeting (giving the number of submissions from and awards to beginning investigators, new investigators and CAREER proposals separately) indicates that while the percentage of awards to each of these groups is not declining, there is no evidence of increased funding to beginning or early career investigators during the time period under consideration.</p> <p>This is an issue of some concern to the CoV, particularly in light of the fact that program officers actively address the issue during the selection process and the BIO Directorate priorities for 2012 highlight the CAREER program. Perhaps IOS should look at alternatives to address this concern. In addition to all other benefits of funding new investigators, funding of their research may provide additional high-impact and transformational research.</p> <p>Source: Self Study Report, data request by CoV</p>	<p>Appropriate</p>
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments:</p> <p>The vast majority of IOS-funded proposals integrate research and education. The form this integration takes is diverse; ranging from informal laboratory mentoring, to formal teaching, to outreach programs for elementary and secondary education as well as college students. The CoV particularly supported the CAREER program as an excellent means of promoting the integration of research and education. The CoV appreciated the NSF-wide mission to bring the uncertainty and discovery of scientific inquiry and exploration in educational settings but wonders whether a central database detailing educational approaches and outcomes might be created. This would serve as a resource for other NSF investigators as well as the general public in how to effectively bring scientific inquiry into an educational sphere.</p> <p>Source: jackets, Highlights</p>	<p>Appropriate</p>
<p>9. Does the program portfolio have appropriate participation of underrepresented groups?</p>	<p>Appropriate</p>

<p>Comments: Data provided indicate that the success rate of proposals with minority involvement and from minority serving institutions is largely similar to the success rate of all proposals, which is highly appropriate. The exception is that success rates of minority serving institutions and PUI schools failed to increase in 2009 when other funding rates went up due to ARRA money.</p> <p>The fact that fewer than 10% of the proposals include minority involvement raises concern. IOS is actively involved in discussion and consideration of best practices to mitigate the under-representation of minorities in science. The CoV applauds these essential efforts and concurs with the 2008 CoV in advocating continued support for underrepresented groups throughout their education to increase the pipeline of highly qualified and skilled scientists and educators.</p> <p>Sources: CoV documents, jackets, Self Study Report</p>	
<p>10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p>Comments: The CoV believes that IOS priorities and vision for the future are well aligned with national priorities, agency mission and relevant fields. Specifically, the CoV recognized the significant contribution of IOS-funded projects to national priorities.</p> <p>In the period from 2008 to 2010, the IOS supported diverse and exciting science that is impacting not only the area specifically covered by IOS but also many other fields. Basic research in the area addresses the environmental impacts of climate change, clean energy, food production, human health, and education, all societal issues of great concern. The CoV notes that 26% of the projects funded by IOS were multidisciplinary, a high rate that supports the central position of research in this area to science as a whole. For example, In 2010, IOS funded research led to discoveries that may mitigate the environmental effects of global climate change by increasing understanding of coral reefs (highlight 20973), impact future crop production (highlights 21256, 21262, 21466), and alter the way in which we diagnose and prevent the leading cause of blindness (highlight 21100). IOS also supported education of a new generation of young scientists by involving undergraduates in cutting-edge research (highlight 19742). This is a transitional moment for the field when the knowledge and tools needed to enable rapid progress are established and ready to be implemented. Increased support will enable rapid progress in science that will impact issues of societal concern.</p> <p>Source: Self Study Report, IOS web page, Highlights</p>	<p>Appropriate</p>

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

The overall quality of the supported proposals is high. Eighty percent of the awards are to single PIs, which appeared appropriate for the areas of research supported by IOS.

The CoV suggests that standard operating procedures for proposal and award tracking relative to the questions asked in section IV be developed.

Based on the sample of jackets that we examined, only about a third of the proposals are from female PIs. The CoV was pleased to see IOS involved in ongoing consideration of programs and/or practices that may enhance the involvement (and continuation of) women in science.

IOS funds a wide range of outstanding research proposals that lead to many ground breaking scientific discoveries. However, the IOS budget is clearly a limiting factor. At the current funding level, IOS is only able to award about 17% of all proposals. In the sample of proposals examined (191), 11 were ranked as highly meritorious that were not awarded. Outstanding projects that may lead to major societal benefits are being lost. This can only be corrected by increased funding for IOS-supported basic research.

OTHER TOPICS

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

The CoV noted that program areas covered within IOS were quite comprehensive and no major gaps were evident.

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.

In general, the CoV was impressed with the quality and diversity of research projects represented in the program's portfolio. The proposals funded address core priorities within the program, the Biology Directorate and the NSF mission. Many of the current and future core priorities of IOS also have relevance to scientific and societal challenges such as predicting biological responses to environment and climate change, development of bioenergy, exploration of the genotype-phenotype map, understanding the brain and explaining biodiversity. Further efforts could be made to communicate the inherent connection between IOS priorities and these issues of broad societal and scientific relevance.

IOS core priorities for 2008-2010 included studying emergent properties of organisms, interdisciplinary and multidisciplinary approaches across scales of study and understanding interactions between organisms and their environments in terms of evolution, mechanism and ecology. The CoV recognizes that these IOS core priorities for the period under study (as well as for the future) represent important, challenging and broad issues. We found that many of the funded proposals clearly addressed these broad priorities.

Finally, to facilitate interdisciplinary investigator-initiated research, IOS should consider creative ways, including further Ideas Labs, wiki tools and workshops that could facilitate proposals and research ideas addressing specific aspects of key issues to make definitive progress on the core priorities. For example, if the planned workshops (e.g. on systems biology and behavioral biology in a post-genome era) were coupled with a later call for interdisciplinary and multiple PI proposals (as was the case for 'Advancing Theory in Biology') might facilitate greater progress on these challenging priorities than possible by typical panels and individual PI proposals. A continued commitment to funding some proposals identified as transformative and innovative seems essential to addressing these challenges and should continue in the future. Partnerships with Emerging Frontiers and across the Directorate may further facilitate greater progress on these challenging but important core priorities.

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

The CoV recommends development of a template for broader impacts with specific page limitations.

The CoV recommends increased efforts to effectively communicate outcomes to stakeholders and emphasize the accomplishments of NSF-funded research and education, especially the broader impacts and value to the general public.

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

None

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

Organizing the work flow in the CoV was challenging for two main reasons. First, an enormous volume of information is provided to the CoV via eJacket and Sharepoint. Second, most CoV members do not have prior experience with the process. Since at the beginning of the CoV meeting, Division leadership is present for an introduction, permanent staff could suggest strategies that would lead to an effective process. This could also occur prior to the CoV through interaction with the Chair or full committee.

One possibility to consider would be to place the report template in Google Docs or the equivalent, to allow simultaneous editing by the full committee as different parts are assigned to individuals or subgroups. Otherwise even an effective scribe can become a bottleneck in the editing process. Inclusion of members with recent CoV experience would be helpful.

The above comments are minor, and the CoV was greatly appreciative of the many resources provided, as well as the responsiveness of staff to several additional requests for information.

OUTPUTS AND OUTCOMES GENERATED BY AWARDEES CONTRIBUTE TO ATTAINMENT OF NSF'S MISSION AND STRATEGIC GOALS

[NSF Strategic Plan: <http://www.nsf.gov/pubs/2006/nsf0648/nsf0648.jsp>]

NSF's vision is to advance discovery, innovation, and education beyond the frontiers of current knowledge, and empower future generations in science and engineering. The specific goals are:

Discovery: the fostering of research that will advance the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit and establishing the nation as a global leader in fundamental and transformational science and engineering;

Learning: cultivating a world-class, broadly inclusive science and engineering workforce, and expanding the scientific literacy of all citizens;

Research infrastructure: building the nation's research capability; and supporting excellence through a capable and responsive organization.

Between 2008 - 2010, IOS has supported these goals in the following ways:

Discovery

In the period from 2008 to 2010, the IOS supported diverse and exciting science that is impacting not only the area specifically covered by IOS but also many other fields. Basic research in the area addresses the environmental impacts of climate change, clean energy, food production, human health, and education, all societal issues of great concern. The CoV noted that 26% of projects funded by IOS were multidisciplinary, a high rate that supports the central position of research in this area to science as a whole. For example, in 2010, IOS funded research led to discoveries that may mitigate the environmental effects of global climate change by increasing understanding of coral reefs (highlights 20973), impact future crop production (highlights 21256, 21262, 21466), and alter the way in which we diagnose and prevent the leading cause of blindness (highlight 21100). In the area of animal behavior, it was discovered that the main effect of wolf predators on their elk prey is not that they kill elk, but that the presence of wolves affects elk by altering female hormone levels and behavior in a way that lowers pregnancy rates, a finding that transforms both wildlife management practices and our understanding of how stress affects reproduction in mammals (highlight 0642393). A novel developmental strategy was discovered in *Arabidopsis* for manipulating flower development by regulation of protein degradation (highlight 17004). This research has impact on many agronomically important plant species. Other research has found that reef-building corals may not have the ability to recover from thermal stress events ("coral bleaching") as previously thought (highlight 21535). Their findings have long-term implications: as global climate change continues, ocean health will continue to decline, with direct impacts on commercial fishing, and beach erosion.

Learning

IOS supported projects enhanced scientific literacy and understanding by explaining aspects of science to the general public, and training the next generation of scientists. For example, public education was enhanced by publication of a book that explains how the brain works in language accessible to the general public (highlight 17012, and a two week session in which 5 elementary school teachers worked with an IOS-funded scientist (highlight 17025). Overall, IOS supported projects involved 12,391 people. The number of undergraduate, graduate and postdoctoral scholars who were trained through their direct involvement in the projects exceeded 4,750. This number is an underestimate because undergraduate students involved in REUs are listed in a separate section (participant support) and does not include the other professional participants, whose training is also advantageous to national goals.

Examples of IOS research grants that have particular impact for this goal are: 1) A Freshman Research Initiative trained 16 freshmen in a study of root hair growth in Arabidopsis (highlight 16997). Their research resulted in first place in a college wide research competition and two students winning awards in a statewide competition for minority students. Training freshman in research is a novel approach to introducing undergraduates to science. 2) Highlight 15011 involved 25 undergraduates in research which made the novel discovery that the bottom turtle shell is formed from neural crest cells which goes against the current dogma that these cells are incapable of forming bone. This study offers new insight into the evolution of novel structures in vertebrates.

Research Infrastructure

IOS promotes the development of research infrastructure through support of research centers and through the development of new research tools. The IOS-supported Center for Behavioral Neuroscience brings together scientists from multiple disciplines and institutions. A recent site visit found that "research programs supported by the CBN are outstanding. CBN has not only helped develop and promote the work of individual scientists but has been transformative in shifting the approach that CBN neurosciences take in collaboration based research" (2009 highlight 18211). IOS also supported many projects aimed at tool development. For example, IOS supported research resulted in an enhanced multiplex system for visualization of gene express (highlight 14908 from the 2008 highlights). Future advances can be expected from grants awarded recently. For example, in 2009, two EAGER awards (0929758 and 0929484) aimed to produce a platform for enzyme sequestration, and enhance transformation technologies. IOS has been proactive in creating a discussion space for consideration of tool development through the innovative use of a Wiki. In spring 2010, coordinated with the implementation of this Wiki, IOS issued a Dear Colleague Letter that ultimately resulted in 9 projects that were awarded through the EAGER program. These projects are listed below.

Proposal ID	PI Name	Institution	Title	Cluster
1035960 1035975	Albers Young	Georgia State University Emory University	Collaborative Research: Neurogenetics of Social Behavior	NSC
1045243 1045257	Crandall Oakley	Brigham-Young University UC Santa Barbara	Collaborative Research: Developing genomic tools for integrative biology research	NSC
1046863	Mahaffey	North Carolina State University	Targeting protein function <i>in vivo</i> using Small Interfering Proteins (SIPs)	DSC
1045226	Rosenthal	Texas A&M Research Foundation	Enabling Partnerships to Enable Science (TOOLS): anyFish: a user-friendly software package for creating realistic animations for animal behavior	BSC
1045256	Chory	Salk Institute	Quantifying Small Molecules in Cells of Live Organisms	PSS
1045185	Frommer	Carnegie Institution Stanford	EAGER: A microfluidic platform for accelerated construction of nanosensors for high-resolution analysis of hormone levels <i>in vivo</i>	PSS
1048133	Buie	MIT	Culturing the Uncultured: Custom Microfluidic Systems for Growth and Isolation of Environmental Microbes	PSS
1045314	Palanivelu	University of Arizona	Interdisciplinary Collaborative Research: A high throughput, quantitative analysis of Arabidopsis pollen tube guidance using a novel microsystem-based assay	DSC
1045239	Shin	University of North Carolina Charlotte	Collaborative Research: Towards Real-time, High throughput Insect Behavior Analysis	BSC

IOS REQUESTED THE CoV TO ADVISE ON SEVERAL QUESTIONS RELATED SPECIFICALLY TO THE DIVISION:

1. What **new opportunities** in integrative organismal systems science should the Division address?

The CoV supports "The Way Forward" in the IOS Vision 2010. Several key areas were considered by this CoV as unique new opportunities or as having potential to develop new opportunities for IOS. These included:

- a) The full utilization of all the 'omics' tools, particularly for non-model organisms, in all program areas;
- b) IOS should consider additional collaborations both within the Foundation (e.g., Polar Programs) and outside (DOE, NASA, DOD, NOAA, NIH, international funding agencies and private foundations) to leverage opportunities for funding;
- c) IOS should develop a "pet" grand challenge, which they take leadership to develop, drive and ultimately increase the amount of funded research; in essence one thing that IOS can rally behind and develop into a "sales pitch". Such a grand challenge should be broad enough to allow the continuation of investigator-initiated projects. The goal is to provide a platform for increasing the funding available for the type of research currently being submitted by investigators and not redirect their research. The CoV believes that with recent organizational changes in the division and the current leadership the division is ready to undertake this challenge.

2. How can the Division encourage **interdisciplinary and integrative** research in organismal biology?

IOS is integrative by definition and often interdisciplinary. The fact that approximately 25% of the projects funded by IOS are already multidisciplinary and the workshops and Wiki tools as well as the proposed meetings with professional societies already in place support that IOS has an integrative approach. Potential encouragement to further interdisciplinary and integrative research could include travel and sabbatical grants that support interdisciplinary collaborations and mechanisms that bring IOS funded project directors together at NSF or professional meetings would increase the opportunity to develop interdisciplinary networking.

3. How can the Division **assess** the quality and impacts of science supported by the Division?

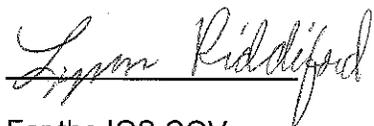
The CoV was not provided with materials to enable evaluation of post-award function. Attention to the documentation provided in the annual and final reports is key to capturing quality and impact of the research, and program managers need to insist on this material being provided in the reports. Panel recommendations for awarding renewals are another in-depth review of projects that can be used to identify high impact science.

4. How can IOS, as a Division that supports fundamental research, promote **issue-inspired science**, including research that addresses societal needs?

The CoV advises IOS to continue and increase in-house efforts to communicate the relevance of the supported research to issues of societal concern. In 2010, IOS-funded research led to discoveries that may mitigate the environmental effects of global climate change, impact future crop production, and lead to changes in how we diagnose and prevent the leading cause of blindness. For example, coral reefs in many places are in decline due to climate change. IOS-supported research into specific problems faced by the corals shows that the coral-algae relationship is based on delicate communication that prevents coral from treating algae as a parasite or invader. The CoV encourages IOS to select dynamic discoveries like these for show-casing in museums, on television

programs (Discovery Channel, PBS, children's programs), multimedia outlets. IOS should partner with the Directorate for Education and Human Resources for efficient promotion of exciting science to the public.

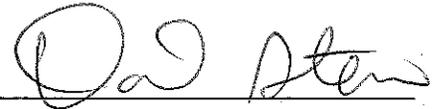
SIGNATURE BLOCK:

A handwritten signature in cursive script, reading "Lynn Riddiford", written over a horizontal line.

For the IOS COV
Lynn Riddiford
Chair

Friday, July 1, 2011

As the designated Advisory Committee Representative to the BIO/IOS 2011 Committee of Visitors, I hereby submit the attached Fiscal Year 2011 COV Report to the Directorate for Biological Sciences Office of Assistant Director.

A handwritten signature in black ink, appearing to read "David Stern", written over a horizontal line.

David Stern

Advisory Committee Representative

Integrative Organismal Systems
Committee of Visitors Meeting
Signature Block



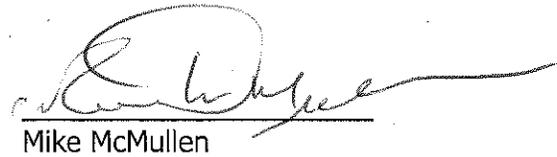
Suzanne Alonzo



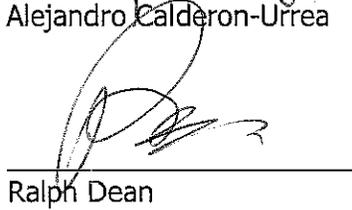
Marta Laskowski



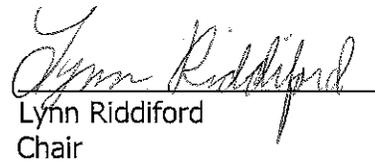
Alejandro Calderon-Urrea



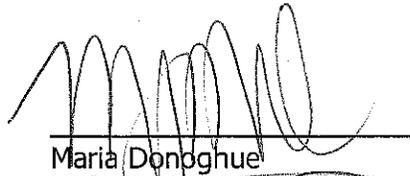
Mike McMullen



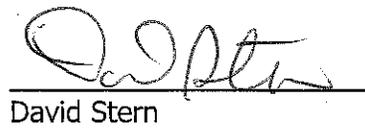
Ralph Dean



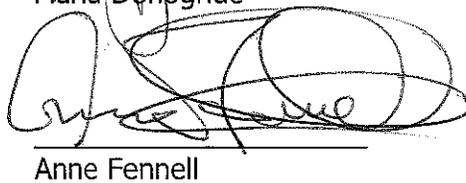
Lynn Riddiford
Chair



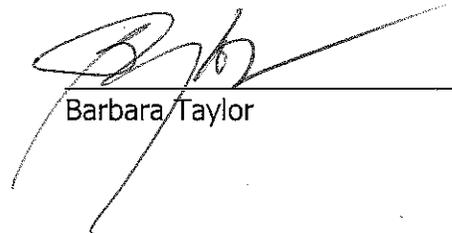
Maria Donoghue



David Stern



Anne Fennell



Barbara Taylor



Ed Kaleikau

As the designated Advisory Committee Representative to the BIO/IOS 2011 Committee of Visitors, I hereby submit the attached Fiscal Year 2011 Report to the Directorate for Biological Sciences, Office of the Assistant Director.

David Stern
Designated Representative of the BIO Advisory Committee

Date