CHARGE TO THE COMMITTEE OF VISITORS

Division of Integrative Biology and Neuroscience
Directorate of Biological Sciences
National Science Foundation

April 7 – 8, 2003

The National Science Foundation has a long-standing practice of reviewing all programs on a three-year cycle. The review is performed by a Committee of Visitors (CoV), which serves as a subcommittee of the Advisory Committee for the Directorate of Biological Sciences. The CoV members form an independent group of external experts. NSF uses CoVs to assess the scientific portfolio as well as process.

To meet the requirements of the Government Performance and Results Act (GPRA) for annual performance assessment, NSF developed performance goals for results of NSF's investment in research and education as descriptive standards. Information on the products of NSF's awards provides the basis for assessing NSF's performance against these standards through the judgment of independent external experts.

The 2003 IBN CoV is charged to consider the performance of the Neuroscience Cluster of the Division of Integrative Biology and Neuroscience in two primary areas:

- The degree to which the outputs and outcomes generated by awardees have contributed to the NSF's mission, strategic goals, and annual performance goals [www.nsf.gov/pubs/2001/nsf0104/start.htm].

- Assessment of the quality and integrity of operations, including technical and managerial matters pertaining to proposal recommendations.

To assist CoVs, NSF has developed a basic set of questions and a report template for the entire Foundation. In addition, IBN/BIO would like your advice about several questions related specifically to the Neuroscience Cluster. **Please comment on both scientific and management aspects of each of the following questions:**

1. What is NSF's unique responsibility to neuroscience (e.g., not supported, or under supported, by other agencies)?

2. Are there activities that would advance biology in significant ways that could be catalyzed by the Neuroscience Cluster at NSF?

3. Are the current areas of emphases within the Neuroscience Cluster appropriate?

We would also like your advice on progress we have made on the issues raised by the previous CoV review of the Neuroscience Cluster.

Committee of Visitors Meeting
Neuroscience Cluster
April 7-8, 2003
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Composition of the Committee of Visitors
Neurosciences Cluster
Directorate for Biological Sciences
2003

The COV committee is comprised of four women and five men; one of these individuals is African American, one is Hispanic, two of the nine are from private sector industry, one is from a government federal research agency, and two individuals are from RUI institutions. Collectively, the members are employed at institutions located in 9 different states, including the north, south, east, west and central regions of the United States. All programmatic areas in the Neurosciences Cluster are covered by the expertise of this committee.

Mary E. Clutter
Assistant Director

CORE QUESTIONS and REPORT TEMPLATE
for
FY 2003 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2003 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2003. 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 http://www.inside.nsf.gov/od/gpra/.

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

Many of the Core Questions developed for FY 2003 are derived, in part, from the OMB-approved FY 2003 performance goals and apply to the portfolio of activities represented in the program(s) under review. The program(s) under review may include several subactivities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the subactivities of the program, with the latter requiring more time but providing more detailed information.

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

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

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

FY 2003 REPORT TEMPLATE FOR NSF COMMITTEES OF VISITORS (COVs)

Date of COV April 7-8, 2003
Program/Cluster: Neuroscience
Division: IBN
Directorate: Bio
Number of actions reviewed by COV[1]: Awards: 22 Declinations: 35 Other: 102
Total number of actions within Program/Cluster/Division during period being reviewed by COV[2]: Awards: Declinations: Other:
Manner in which reviewed actions were selected: randomly by Dr. Vessey, acting deputy director of IBN. "Other": we searched for quantitative information from all of the final reports submitted in 2002.

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

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

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

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE

[1] To be provided by NSF staff.
[2] To be provided by NSF staff.

Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Eighteen applications (9 awards, 9 declines) were reviewed at random for this Question. Reviews were derived from Panels (2 critiques typically but , only 1 sometimes) and Ad Hoc reviewers (0-3 critiques). On average, each application received 4-5 reviews; however, a minimum of 2 was also found. No site visits contributed to the reviews examined. We found the response rate from Ad Hoc reviewers was poor (approx. 25%). However, the quality of the reviews from those Ad Hoc reviewers who agreed to do the review was good - substantive reviews would be desirable. A need to provide an incentive to participate in the Review Process is clearly indicated. The CoV was interested in knowing how often current or former NSF grantees agreed to provide Ad Hoc reviews.	Yes
Is the review process efficient and effective? Comments: A better use of informatics and databases could be made. Data (administrative and review) pertinent to each grant should be entered into databases. This would allow these data to be accessible in a consistent manner from file-to-file and program-to-program. As discussed more below, the documentation of the review process was in need of improvement in that it was disorganized and inconsistent across applications. A need to standardize the organization of the left side of each jacket exists.	No

Are reviews consistent with priorities and criteria stated in the program's solicitations, announcements, and guidelines? Comments: In general, the reviews were scientific critiques. Criterion 2 was largely ignored or, occasionally, given lip service by Ad Hoc reviewers. Panelists paid only slightly more attention to Criterion 2 than did Ad Hoc reviewers. If NSF considers Criterion 2 important, clearly more effort needs to be made to alert Reviewers to this and to provide more clear guidelines and instructions to this effect. With respect to specific announcements published to solicit focused research proposals, we had concerns about how NSF was in advertising and implementing these special funding mechanisms. Due to the small sample of applications evaluated by this CoV, it was not clear from reading Reviewer's critiques if Reviewers were aware of the specific criteria that needed to be considered for applications submitted in response to Announcements and Solicitations.	No
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? Comments: Yes, the reviewers, in general, provided detailed and substantive reviews. Together, the summary statements written by the program officers and the verbatim critiques from the reviewers were sufficient to provide the PIs with a detailed understanding of the review outcome.	Yes
Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments: Panel Summaries did an outstanding job of summarizing strengths and weaknesses of applications. The Summaries also indicated the relative ranking of an application within 3 broadly defined groups. For declined applications, more explicit suggestions regarding how to fix a grant should be included in the Panel Summaries if resubmission were encouraged. Further, if the Panel judged that a grant was not fixable, resubmission should be clearly discouraged.	Yes

Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments: The organization of the left side of the jackets was poor and inconsistent. A standard system for presentation of the data included in the left side needs to be devised. Also, dates were lacking on most sheets on the left side. Chronology needs to be represented in some manner.	No
Is the time to decision appropriate? Comments: Dwell time was for the most part acceptable. However, there were some documented examples of applications that had egregiously long dwell times. We also note that some Programs in this cluster have been without a Program Officer for several years, and we strongly suspect that the unacceptable dwell times for some proposals is a direct consequence of this short-staffing.	Usually

Discuss issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures:

1 - A lot of discretion on the part of Program Directors was inferred. There were clear cases of grants receiving VG-E reviews and not being funded, and vice versa, grants receiving fair-poor reviews being funded. It was not clear to the committee what considerations went into the final funding decision. It may prove useful for the rationale for funding/not funding to be included in the program officer's comments.

2 - From review of individual applications, it was hard to assess how well resubmitted applications fared. How do applicants address the critiques of the previous application's review? How does rotation in Ad Hoc and Panel Reviewers and the Program Directors impact on the applicant's ability to address the concerns raised by the Reviewers? (see A5)

3 - The 2nd criterion for review, "broad impact", seemed to be largely ignored by Reviewers. NSF needs to emphasize the importance of this issue to both Applicants and Reviewers if they are serious about using this criterion in the decision process. (see A2)

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? Comments: There was considerable variability among the reviewers. Most addressed criterion 1 (scientific merit) extensively. For criterion 2 (broader impact), some ignored it altogether, while most addressed it in a mere sentence or two. Few reviewers gave much detail on the broader impact, with the exception of an RUI proposal and a proposal in which the applicant was from an underrepresented minority, in which the broader impact was given more weight by most of the reviewers.	No
Have the panel summary reviews addressed whether the proposal contributes to both merit review criteria? Comments: The panel summaries all addressed both criteria, however, as with the individual reviews, there were more details relating to the first criterion (scientific merit) than the second (broader impact), which usually only received a sentence or two of comment.	Yes
Have the *review analyses* (Form 7s) addressed whether the proposal contributes to both merit review criteria? Comments: Both criteria were consistently addressed in these analyses, but again the first criterion was given more attention than the second criterion.	Yes

Discuss any issues or concerns the COV has identified with respect to NSF's merit review system.

The reviewers did not address criterion 2 in much detail, and when they did, they generally referred to potential for training students and sometimes to the number of publications that might be produced. Very little was said as to the broad scientific impact of the research. This may be, in part, because the reviewers do not have much information from the proposal itself regarding the broader impact. In general, the PI's do not write much in their proposals concerning the broader impact, and this may limit what the reviewers can evaluate in this respect. It seems likely that PI's are reluctant to devote much of their limited space to criterion 2. One possible solution to this would be to have a separate section of 1 or 2 pages for proposals to address the broader impact of the research, much like the section allotted to RUI proposals to describe their impact. Investigators would be more likely to write about the broad impact of their research if it did not take away from their description of the scientific merits. If the proposals were required to include 1 to 2 pages on the impact of the research and were allocated space separate from the research proposal in which to do this, the reviewers might be better able to evaluate and comment on this review criterion.

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 program make use of an adequate number of reviewers for a balanced review? Comments: Most proposals had 1-3 ad hoc reviewers. The return rate of ad hoc reviews was very low, about 25%. Better efforts need to be made to encourage the return of ad hoc reviews. Panels generally had 1-4 members assigned to review a proposal. It was unclear why only a single panel member was assigned to review a grant on occasion, but this was noted several times. It is essential that there be a sufficient number of members in each panel so that each proposal is reviewed by at least 2-3 panel members, especially if the return rate for ad hoc reviews is low.	No
Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: Although difficult to extensively evaluate, the panel members and ad hoc reviewers included many leaders in the various disciplines and the COV had no concerns in this area. It was clear that the program officers were very diligent in their selection of appropriate reviewers.	Yes
Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups? Comments: Our scan of 20 or so folders revealed no problems here. However, we recommend in the future that statistics on these issues for reviewers be compiled by NSF staff, ideally through the use of an automated, searchable database.	Yes

Did the program recognize and resolve conflicts of interest when appropriate? Comments: Our examination of folders showed several instances where COIs were identified and dealt with appropriately. NSF continues its tradition of being extremely careful about COI issues.	Yes

Discuss any concerns identified that are relevant to selection of reviewers.

This area is fine.

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 program. Comments: Analysis of the impact of funded research suggests that the quality of the projects supported is outstanding. This is based in part on a quantitative assessment of published work produced as a result of funded proposals whose final reports were submitted in 2002. Of 102 proposals reviewed, 464 peer reviewed articles were published, 103 of these in high impact journals. The publication rate per funded proposal was 4.55. In addition, there were 60 reviews or book chapters published as a result of funded research The educational projects of the program have supported a total of 181 undergraduates, 137 graduate students and 74 postdoctoral students. This represents a notable number, however it is unclear how this reflects the training goals of the Neuroscience Cluster. Is there a specific plan for the number or distribution of those in the educational pipeline?	Appropriate
Are awards appropriate in size and duration for the scope of the projects? Comments: The average duration of awards in the Neuroscience Cluster in FY 2002 was 2.8 years. This is consistent with average durations of 2.9-3.0 years across the IBN Division. The average size of awards in the cluster also is consistent with the Division average of $113,000 for FY2002 awards. We recognize that this size limits the scope of many projects, but represents a reasonable and efficient allocation of limited resources.	Appropriate

Does the program portfolio have an appropriate balance of: • High Risk Proposals? Comments: Our data suggest that relatively few SGER applications are submitted to the Neuroscience programs, but that there is an excellent record of funding for those submitted. Successful outcomes of many high-risk projects funded in prior years are noted in the Program Directors' Annual Reports. For example, Neuroendocrinology highlighted successful outcomes of 2 SGERs funded in FY1998, including papers published in 2000 in high impact journals. Another SGER funded by Sensory Systems in FY2000 resulted in a Nature paper in 2002. Another noteworthy example is the remarkable progress in discovering circadian photopigment (melanopsin) as a direct result of a high-risk project funded by Neuroendocrinology and Sensory Systems in 1993. These outcomes would suggest that the cluster has been very successful in selecting the best high-risk proposals to support, and that this represents an excellent investment of NSF resources. It is difficult to answer this question directly, as the CoV did not have a representative sample of both unfunded and funded low- and high-risk proposals to evaluate, nor would there have been sufficient time to accomplish this task in the allotted two day meeting.	Appropriate

Does the program portfolio have an appropriate balance of: • Multidisciplinary Proposals? Comments: The CoV shares with the Neuroscience Program Directors the belief that the best research in neuroscience is integrative and multidisciplinary. Although it was difficult to find hard data on this, the strong impression is that a significant fraction, perhaps a majority, of projects supported by this cluster are interdisciplinary. We applaud the efforts of the Program Directors in this cluster to evaluate interdisciplinary proposals by arranging joint reviews by multiple panels (within and beyond the Cluster), in spite of the increase in workload that this represents. This is likely to become increasingly necessary in other Divisions and Directorates, if NSF is to attract and appropriately evaluate proposals that cross disciplines in the coming years. We believe that the Neuroscience cluster represents a model for bridging disciplines and creating an infrastructure that can be applied to other NSF-sponsored programs as well.	Appropriate
Does the program portfolio have an appropriate balance of: • Innovative Proposals? Comments: See comments on High-Risk proposals above.	
Does the program portfolio have an appropriate balance of: • Funding for centers, groups and awards to individuals? The CoV agrees that Science and Technology Centers are outstanding opportunities to do things that are bigger in scope than an individual can do. The Center for Biological Timing was incredibly successful in cracking the puzzle of the circadian biological clock – the genetic screening used in this project was not fundable at NIH (they called it "a fishing expedition"). NSF funding allowed for the productive collaborations that led to these breakthroughs in understanding the circadian clock. The Center for Behavioral Neuroscience in Atlanta is also turning out to be very successful in many realms that are NSF priorities - multidisciplinary and collaborative research, as well as minority recruitment. Although it was difficult of find hard data regarding the balance of funding for centers, groups and individuals, it was our impression that a large fraction of funded proposals in Neuroscience represent collaborative efforts. At the same time, there is strong representation of individual PIs.	Appropriate

Does the program portfolio have an appropriate balance of: • Awards to new investigators? Comments: The percentage of awards going to new investigators across the IBN Division ranges from 31% to 37% in the past 3 years. This is an impressive record. The Neuroscience Cluster is funding new investigators at an even higher level. This is one of the most important ways that Neuroscience at NSF distinguishes itself from NIH or NIMH, NSF has contributed, over an extended period of time, to the growing pool of well-trained and competent neuroscientists, in part, because of its willingness to take risks on new investigators.	Appropriate
Does the program portfolio have an appropriate balance of: • Geographical distribution of Principal Investigators? Comments:	Appropriate
Does the program portfolio have an appropriate balance of: • Institutional types? Comments: Data on this issue were not easy to find in the materials provided to CoV.	Data not available
Does the program portfolio have an appropriate balance of: • Projects that integrate research and education? Comments: The cluster has an excellent record of funding RUIs and CAREER awards, grants that specifically emphasize integration between research and education. We also noted that a great many of the principal investigators of the cluster's portfolio of regular research grants are actively involved in educational outreach activities beyond their normal teaching responsibilities.	Appropriate

Does the program portfolio have an appropriate balance: • Across disciplines and subdisciplines of the activity and of emerging opportunities? Comments:	Highly appropriate
Does the program portfolio have appropriate participation of underrepresented groups? Comments: Funding rates for proposals from African American scientists in IBN for the past 3 years (25-35%) were at least as good as the overall funding rates (26-29%). Funding rates for proposals from Hispanic or Latin scientists were slightly lower (19-29%). This indicates NSF's awareness and that actions are being taken to ensure that 1. applications are encouraged, and 2. applications are funded, resulting in strong representation in neuroscience from these minority groups.	Appropriate
Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports. Comments: Yes, by all assessments, we were impressed with the efficient allocation of resources to promote education, innovation, and high quality, interdisciplinary neuroscience.	Appropriate
Discuss any concerns identified that are relevant to the quality of the projects or the balance of the portfolio. None.	

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

Management of the program.

Comments:

The program is managed remarkably well given the current level of insufficient staffing and funding. As outlined below, we are concerned to note that the decreasing number of proposals submitted to the Neuroscience cluster is inversely related to the explosive growth of the field. We believe this is due to several years of understaffing in this cluster. The program officers handle a very large number of proposals and, in addition, they work hard to create cross-disciplinary interactions between programs within the NSF. This work that builds bridges between programs, divisions and directorates takes significant extra effort and it is core to the mission that makes NSF unique as a funding agency. The interdisciplinary nature of neuroscience requires that the program officers make this effort to interact across division boundaries, however this significantly increases their workload.

The review system works as well as can be expected, given the tremendous workload handled by the program officers. Generally, reviewers and panels are well chosen and the proposal funding decisions are made based on clear evaluations. Noteworthy is the high percentage of women and minorities who serve as panelists and outside reviewers. We believe that the system could be improved by increasing the number of panels so that panelists would provide a larger percentage of the reviews. This would require that the panels have panelists whose area of expertise is more closely related to the topic of the proposal. The development of the electronic submission system for the NSF has increased the efficiency of the proposal review and submission process, however the workload of the program officers remains unreasonably high.

The selection of proposals for funding is consistent with the NSF's goals and unique mission. We are particularly impressed with the percentage of awards given to new investigators and to underrepresented minorities. It is also clear that this program has had good success funding high-risk proposals that produced significant results. We also believe that the cross-disciplinary nature of the proposals is important for supporting cutting edge research in neuroscience. We believe that all of these represent important contributions of the NSF program to the field of Neuroscience at a national level.

We have identified several areas of concern where we believe improvements can be made. These include some concerns relating to the use of rotating program directors, the inadequate number of program directors, and suggestions for improvements to the review and resubmission process. These concerns are detailed below.

Responsiveness of the program to emerging research and education trends.

Comments:

Research trends are shifting toward multidisciplinary projects. NSF has put an appropriate emphasis on cross-disciplinary efforts at many levels, from the individual awards through the center grants programs. NSF is in a unique position to catalyze the integration of theories and the development of tools from multiple fields to advance neuroscience. These tools could include everything from human-robotics interfaces, improved tools for proteomics, to basic science problems such as efficient delivery of peptides/analogs to the central nervous system (eg., facilitating the interface across bioengineering, materials science, biophysics, neuro-immunology, etc). Moreover, NSF could provide the basic support for tool development and refinement are not priorities for NIH awards. Effective program officers would be expected to facilitate such integration and "steer" efforts to high impact areas.

The linkage with educational institutions, undergraduate research projects and targeted problem solving would be an area to consider expanding influence. The outreach of NSF to educational institutions via NSF-sponsored neuroscience research such as the mammalian brain database is of significant value. NSF's support of training scientists in environments that nurture interdisciplinary research directly demonstrates the foundation's responsiveness to the emerging educational and training needs in the neurosciences. The consistent support of research at undergraduate institutions provides a unique and extremely valuable contribution to the direct education of students in mathematics and science but also introduces students to potential career opportunities at a very influential time during their career development.

As each scientific discipline that contributes to neurosciences becomes more complex, it is becoming less and less realistic that a single PI can competently design and conduct truly integrative and outstanding cutting edge research. . The current grant award-size represents a significant constraint in terms of funding multiple investigators collaborating on a large-scale project to provide funding in an amount that would provide significant impact. Mechanisms should be developed to assist these investigators to access the necessary technological advances, expertise, and collaborative relationships that will continue to foster new breakthroughs in brain sciences. Centers are one highly effective mechanism to support this intellectual exchange; however, other flexible methods of funding should also be considered (eg., distinct grant awards made to each contributor of a collaboration, etc) . Similarly, as the competitive environment becomes more prohibitive to new investigators, NSF is responding with an appropriately high percentage of awards to new investigators and to minorities.

The electronic information environment has also changed considerably. Even since the last CoV. NSF is responding to this with an ambitious effort to conduct electronic review of all grant proposals. This is strongly supported. However, it is important that the Foundation not miss the opportunity to integrate this electronic review process with fully automated grants management, search capabilities, reviewer databases, data collection and compilation and statistical analysis. The true strength of a fully integrated electronic database system would be in terms of reporting capabilities and improved efficiency. This system should improve proposal tracking and eliminate both long dwell-times and loss/misplacement of paper grant proposals.

Panel composition and names may need to be flexible to accommodate the changing face of the proposals and science that NSF is reviewing.

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

Comments:

The Neuroscience portfolio reflects a healthy balance of priorities, encompassing both basic science and its broader impacts.

The priorities reflected in the current portfolio include an emphasis on NSF's unique roles in neuroscience. This includes significant support for new investigators, a priority that is a significant and highly appropriate role for NSF. It is also an efficient use of the cluster's limited resources, which continues to give new investigators an opportunity to become competitive for NIH funding (e.g,. to establish a track record for grant management and productivity).

Another priority reflected in the portfolio is support for a broad scope of basic research in neuroscience, including novel animal models, not only those that can be justified as models for human disease. The NSF is a significant source of support for individual investigators addressing basic science issues in unique animal models. It is also a unique source for researchers addressing ecological or evolutionary aspects of neuroscience, an area that's attracting increasing interest. This is an indicator of the vitality of research in Neuroscience - leading the way in the increasingly integrative cross-disciplinary trends of research in biology in general.

In this regard, the portfolio also reflects the unique position of Neuroscience within NSF. Neuroscience is an inherently integrative field, and the research that has been supported by this cluster includes a healthy representation of multidisciplinary, integrative, and collaborative research. **If this is NSF's model for 21st century science, then it should be noted that the Neuroscience Cluster has been leading the way by funding this type of science for the past 30 years.** The support of Computational Neuroscience by this cluster since the mid-80s is a prime example of how the cluster has been pro-active in supporting research in cutting edge directions, taking advantage of the unique opportunities at NSF for cross-divisional and cross-directorate activities. They have developed a successful paradigm for meeting the challenges of evaluating multidisciplinary proposals in Neuroscience. They recruit reviewers and panelists with diverse technical expertise who also are broadly familiar with different subdisciplines of Neuroscience, as reflected in the six programs of this cluster. Although this sometimes requires that individual proposals be reveiwed by two panels, it ensures fair assessments of both the technical merits and the broader significance of research proposals in this inherently interdisciplinary field.

Another initiative that is appropriate to multidisciplinary program base at NSF are the Science and Technology Centers. The two highly successful STCs in Neuroscience (Center for Biological Timing, and Center for Behavioral Neuroscience) have proven that this mechanism offers an outstanding (and perhaps underutilized) opportunity for neuroscientists.

Program directors should be commended on the high quality of panelists. Panel input is critical to setting funding priorities (at least with respect to scientific merit). Program directors also use diverse funding mechanisms to direct resources to new investigators and to proposals that integrate research and education (CAREER and RUI awards). They have also been creative in directing resources to emerging research areas, some of which are highlighted in their "Leading Edge" reports. For example, funding of conferences and workshops has been used creatively to encourage growth and focus attention to new areas, e.g. glial biology and neuroinformatics. The SGER mechanism allowed support of high-risk research piloting the use of intravascular nanoelectrodes to monitor neural activity. Some funding mechanisms appear to be underused, however, which might be remedied by more aggressive promoting of these mechanisms.

Discuss any concerns identified that are relevant to the management of the program.

1) Number of Program Officers. Our number one concern is the understaffing of the cluster, which appears to be at least a division-wide problem. We recommend that there should be an immediate increase in the number of program officers and the number of panels. The current situation is three program officers and three panels (six merged panels) for six programs. Plans to hire one additional program officer were expressed but not implemented. It is absolutely imperative that this position be filled. Even if this position is filled, this remains an insufficient number of program officers and panels to ensure that this cluster flourishes and too few to cover the wide diversity of neuroscience, which, by its very nature is multi- and cross-disciplinary.
2) One unique aspect of the Neurosciences at NSF compared to NIH is the **opportunity** to be multi- and cross-disciplinary. When program officers and panels are overloaded, they have to turn away opportunities for cross-disciplinary activities. In addition, overloading creates a situation in which programs become more competitive than cooperative. We recommend a goal of 4 permanent program officers and two rotators. Although there may not currently be the number of primary proposals to justify this recommendation, the future growth and the potential of the six programs depends on an adequate number of program officers. Workloads extend well beyond the primary proposals, and this is especially true of the neurosciences because of the extreme importance of fostering cross-disciplinary approaches. The areas without a program officer clearly suffer in terms of PI relationships and definition of future growth and directions. In addition to an increase in the number of program officers, we recommend that each area have a separate panel to ensure a fair and expert review. An increase in the number of panels will also increase the number of neuroscience experts that can be called on to participate in cross disciplinary reviews and will increase those opportunities. Size of panels should not be capped and ad hoc panel members should be called in when necessary. These changes are necessary to attract proposals to each of the areas and should result in an increase in the number of proposals. The perception that certain areas are not valued at NSF because they do not have a PO or separate panel discourages PIs from applying. It should be noted that we are at least the third consecutive COV to identify this as a problem.
3) Rotators. The current system with too few program officers exacerbates the problems of rotating program officers. Rotators have the benefit of bringing fresh ideas and perspectives into the NSF. However, they also create problems because 1. the learning curve necessary to be effective, 2. the difficulty establishing continuing relationships with PIs, and 3. the rotator's term is too brief (and there are competing demands on their time) to impact the field significantly. The latter is especially important for new investigators who appear to be a significant focus for the Neuroscience cluster. It is difficult for rotators to lead the growth and development of an area, a fact reflected in the lack of continuity of the Leading Edge reports. Hence, we wonder if the use of rotators is the best use of taxpayer's money. The immediate recommendation is to increase the number of permanent Program Officers to stabilize the neuroscience cluster. Once a base of permanent program officers is established, rotators can be brought in to enhance the perspectives. We recommend that wider attempts be made to advertise Program Officer vacancies, which should include Science and Nature advertisements, use of society placement services and contact of presidents of relevant professional societies. In addition, restrictions on permanent program officers such as the need to serve first as a rotator and the requirement that IPAs leave NSF first should be dropped. Finally, the new cap on IPA travel exacerbates the difficulties of recruiting

rotators. We recommend this cap be dropped.

3.) Institutional Memory. The lack of institutional memory is reflected in the turnover in Program Officers, Panel Members and ad hoc reviewers. It is demoralizing to investigators to have to deal with a moving target with respect to trying to get proposals, especially resubmissions, considered. We have already recommended an increase in the number of permanent program officers. We further recommend that panel members be offered extended terms whenever possible. Finally, we think that the same ad hoc reviewers should be used whenever possible for resubmissions as were used in the original proposal (see further recommendations below).

4.) Resubmissions. Many investigators have the experience of having to resubmit a proposal one or more times to get it funded. This process should be done in as fair and stable a way as possible. First, PIs should get a clear indication from the panel whether resubmission is recommended. We recommend that this specific question be incorporated into the panel summary forms. Proposals that have little realistic chance of being funded in the current environment should be discouraged from further resubmission. Second, better mechanisms should be in place for explicit reply to the criticisms. The history of a grant should be considered in its re-review. Reviewers of the revised proposal should be provided at least with the previous panel summary and preferably with all the reviews. This would alleviate the problem that reviewers do not understand why proposals they rated excellent would need a subsequent review. It would be helpful if additional pages could be provided to the PI on the resubmission for reply to reviewers. Even better would be if the PIs had a chance to prepare a 2-3 page response to the reviews before the grant went to panel. This would allow the panel to consider both the reviews and the PIs response, removing the need to resubmit proposals for minor changes or to address issues that the PI did not anticipate. This would reduce the burden on the panel and on the PI to prepare complete resubmissions when only a few substantive issues are raised and would ensure that the grant gets the fairest and most complete consideration the first time it goes to panel.

PART B. RESULTS : OUTPUTS AND OUTCOMES OF NSF INVESTMENTS

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

The following questions are developed using the NSF outcome goals in the FY 2003 Performance 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.

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

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

Comments:

Many scientists and scientists in training have been supported by NSF awards. We counted the number of people supported by Neuroscience Cluster awards whose final report was submitted in 2002 and found that the following impressive numbers of people were supported:

Senior investigators: 169
Postdocs: 74
Graduate Students: 137
Undergraduate Students: 181

Many projects within the IBN portfolio that were funded illustrate the activities that conform to the NSF 's strategic outcome goals for people. One such project is:

0118477, "Derby, Charles- Functional Organization of a Continuously Growing Compound Nose" This project is aimed at understanding how the nervous system is organized to allow animals to perceive odor worlds and respond appropriately.. The project employed the spiny lobster and its chemosensory system, the olfactory organ. Like many proposals in this portfolio, the PI understated the impact, which, to a great extent, was related to a high level of training of undergraduate students, graduate students and postdocs in a research environment. The proposal reviewers concluded that the scientific problem is an important one and that the research outcome should have a large impact on the field.

This is an example of many such projects in which the development of future scientists at the leading edge is having a significant impact in the field of Neuroscience.

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

Comments:

The Neuroscience cluster has done a very good job supporting "discovery across the frontier of science and engineering, connected to learning innovation and service to society." This is evidenced by a number of facts, including the success of the proposals funded, as measured by the number of publications produced, the enabling of cross disciplinary research by scientists by facilitating co-reviews between programs and divisions, and in the funding of grants to investigators who support the training of students at the undergraduate and graduate levels, including funding of RUI proposals.

In examining the results of the proposals funded, we reviewed all of the final project reports that were submitted in the year 2002 and determined the total number of papers published in peer reviewed journals as well as reviews and book chapters that resulted from the funded projects. For the 102 grants for which we had data, there were 464 total articles published in peer-reviewed journals. Of these, 103 articles were published in high impact journals. In addition, there were 60 publications that were review articles or book chapters. This is a publication record of 4.5 publications per grant, with the average grant length of 3 years. These numbers did not include papers listed as submitted for publication, so it is likely that the total publications per grant is actually somewhat underestimated from the final reports. We believe that this is an excellent success rate and shows that the proposals that are being funded are producing significant results that are contributing to the knowledge and understanding of neuroscience.

Neuroscience is a particularly interdisciplinary field, with many interactions occurring, not only within different areas of biology, such as developmental, molecular and behavioral, but also across other areas of science and mathematics. For example, many computational neuroscience proposals have significant mathematical components or shared research goals with the field of computer vision. An excellent example of this is "Computational analyses of leech swimming" by Peter Brodfuehrer of Bryn Mawr College (proposal #IBN-0113276) which uses contemporary computer algorithms to process complex signal analysis to understand biological processes underlying the coordination of swimming movements. Another example is a grant to Bartlett Mell of the University of Southern California (IBN #9734350) who is working on the role of dendritic subunits in cortical visual processing. This proposal uses an interdisciplinary approach using techniques from biomedical engineering and neuroscience. There are also proposals dealing with the biophysical properties of neural membranes that have significant interactions with chemistry and physics. The program officers in this cluster work hard to facilitate the interactions among these different fields within and across division boundaries. We feel that this is a crucial role for this cluster in catalyzing significant new approaches to neurosciences and it should be encouraged and supported.

Finally, this cluster does an excellent job supporting education in neuroscience. Many of the individual grants funded support undergraduate, graduate and post-doctoral students. The funding provided these students can be crucial for their continued training in neuroscience. The RUIs enable faculty working at undergraduate institutions to involve undergraduates in research projects that give these students scientific research experience that might otherwise be unavailable to them. The proposal mentioned above from Bryn Mawr college is a good example of this support. This funding will allow many undergraduates, and women in particular, to participate in cutting edge scientific research. These activities should be continued and supported as they are the foundation for our future researchers.

All of the above factors represent an invaluable service to society. This program supports successful research facilitates interdisciplinary research that will lead to new innovations in

neuroscience and helps to educate society's next generation of scientists. In addition, there is tremendous value of understanding the structure and function of the brain, and this understanding is undoubtedly enhanced significantly by the NSF neuroscience cluster.

B.3 OUTCOME GOAL for TOOLS: Providing "broadly accessible, state-of-the-art and shared research and education tools."

Comments:

The committee did not see any evidence that the Neuroscience Cluster is specifically addressing this goal. There are many tools that are being developed in the life sciences at the present time, many of which will be of interest to the Neuroscience Cluster. A few examples are multiphoton and fluorescence resonance energy transfer (FRET) technologies, technologies for analyzing gene expression data, methods for quantifying animal behavior in an automated way that is able to be repeated from one laboratory to another. We feel that the Foundation could catalyze research in all of Life Sciences, and Neuroscience in particular, by offering programs that support the development of tools. Although it is true that tools can be developed as a part of NSF supported individual awards, the culture of the panels is to focus on the results of scientific investigation, not on development of tools, and we therefore believe that a separate initiative would be appropriate. This initiative should not be part of any one particular cluster and should involve appropriate Engineering directorates. One example of a program for the development of tools is the NIRT initiative in Nanotechnology. Some of the tools, in fact, that are being proposed for the NIRT initiative will be applicable for Life Sciences.

PART C. OTHER TOPICS

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

1) Insufficient Number of Program Directors

Three Program Directors now manage 6 Programs. While IBN increased the number of permanent officers from one to two, they decreased the number of Program Directors from five to three. This situation creates substantial difficulty for Program Directors and is potentially problematic for applicants. The three existing Program Directors deserve strong kudos for their dedication and perseverance under inadequate staffing conditions. The reason for the inordinate delay in providing adequate staffing conditions to these dedicated, excellent, expert, and motivated Program Directors was not explained. This delay threatens the unique and critical role that NSF plays in the Neuroscience Scientific Community.

2) Role of "Rotators"

The management of applications is most efficiently and effectively done by individuals who are familiar with NSF's administrative and electronic systems and who will be on board for a term longer than one year. Further, the individual who serves as the contact person for applicants can operate most effectively if s/he has a large "reservoir" of institutional memory and a relevant history with the applicant and the field.

So, how can the unique and valuable perspective of Rotators be best realized? Rotators should contribute at the level of funding decisions and identification of emerging research areas that need to be brought to the attention of the scientific community and funding authorities. Further, Rotators are also in an advantageous position to identify research areas that would benefit from collaborations involving investigators in different areas/disciplines.

3) Alerting the scientific community to Announcements of and Solicitations for Proposals

Awareness regarding NSF's proposal announcements and solicitations relied upon the dedication of individuals in the community to visit regularly the NSF's website. Awareness could be improved by having NSF send information on a regular basis to undergraduate and graduate institutions so that this information would be disseminated more widely by publishing such notices in well-read journals or making the email notification service of the NSF better known.

4) Preparation of application jackets

Jackets need to be organized in a more systematic and consistent manner. More data should be entered into databases that would provide a consistent organization to the data relevant to review of the application. This would prevent the unfortunate circumstance of misplaced applications. (The CoV was unable to obtain several applications that were specifically sought.)

5) Resubmission Advice

Applicants who have applications that are declined should receive clear statements regarding the appropriateness of resubmission. Clear instructions regarding how to address reviewers' concerns should be provided and applications should have a separate section for

resubmitted applications that specifically addresses the response of the applicant to the previous review.

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

The CoV was convinced that NSF scientific investment has long-term impact on advancing neuroscience, scientific infrastructure and education. The CoV had difficulty identifying quantifiable indices of this impact, but focused on evaluating publications and the quality of the journals in which they published and identifying the numbers of students supported by NSF funds. Further, the committee expressed the view that impact was likely to be more appropriately addressed over an extended period, one that is not within the purview of the current CoV review. For this reason, it is strongly recommended that a special task force be assembled to 1) define and operationalize "impact", 2) develop a plan to assess by quantitative and/or anecdotal evidence the long-term (eg., within 10 years) impact of NSF funded research. This should include items relevant to education, preparedness of the citizenship for careers in science, overarching influence on neuroscience/science/biotechnology, science infrastructure and specific examples of unique and/or enabling discoveries, and 3) determine a timeline for the execution and completion of the evaluation plan prior to the next CoV.

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

1) The COV was extremely impressed with the dedication and competence of the program level staff. Their expertise, breadth of knowledge of their scientific communities' needs and willingness to serve their constituency in the best manner possible is to be commended. It is imperative that NSF focus on sustaining a highly effective workforce.

However, NSF's unique position and promise to the biological sciences, including Neuroscience, is being compromised. The major deficiency is clearly the excessive workload handled by the staff. This is severe and has a negative impact on the mission of the Foundation. Staff is so overworked with maintaining their mandated activities (to establish thorough understanding of their primary proposals, manage their triage process, direct their panels, handle co-reviews by multiple panels, and meet GPRA requirements) that their ability to engage in the more creative endeavors and to engage in cross-agency and cross-directorate activities is remarkably constrained. Program officers are handling unreasonable numbers of primary proposals, secondarily-assigned proposals, cross-directorate activities, cross-agency initiatives and other service requirements. There remains little time for creative program direction, nurturing new ideas and exploring program officer-initiated activities.

Our understanding is that the staff of the NSF has remained constant or decreased during the past 15 years, despite the fact that the level of Foundation funding has more than doubled. There has been a corresponding increase in the number of proposals submitted and reviewed plus an increase in extra-NSF originated initiatives and projects. In addition, this Division has

begun capping travel for rotating staff, the number of reviewers on panels, numbers of ad-hoc reviewers, and has left positions vacant for extended periods, etc. making the jobs of the program officers even more difficult, in its attempt to manage programs using the minimum possible resources. This shortage of FTEs is exacting a toll on staff motivation and enthusiasm. This is overburdening permanent staff. The excessive workload inhibits the recruitment of rotator staff and is likely to affect recruitment of permanent staff as well.

A greater proportion of program officers need to be permanent staff. This would enable NSF to better serve the NSF grant recipients by providing in depth expertise and consistency in the Program Officer -PI interaction across time. The quality of permanent program officer recruitment may currently be limited by the practice of recruiting from the very small available pool of rotators. Permanent staff should be recruited from the national pool of the most qualified and talented scientists. Finally, rotators may be in particularly well-suited to engaging in some of the cross-agency, directorate and program functions as well as education and outreach program.

We had an additional and significant concern with regard to the above issue of the use of permanent versus rotator staff by NSF. The CoV was dismayed at hearing the plan presented to us by the NSF leadership that many Division Director positions will be filled by rotators (using the IPA or Visiting Scientist mechanisms). We believe this to be a grave error, in that this will produce an inconstant and inadequately aware leadership at this most important level to interact with the scientific community being served and to advise and lead the Program Directors/Officers. This is especially alarming in this apparent period of "crisis management" by the Program Directors/Officers. The explanation that was provided to us for this policy by the NSF leadership was that the transient presence of these Division leaders was a virtue, in that it would provide a continuous infusion of fresh ideas and perspectives to the Division. We believe this to be an incorrect judgment. Most scientific institutions that we are aware of, public and private, use Scientific Advisory groups, whose members usually have a 3 year term and meet at least twice a year, to analyze the institution's specific scientific programs and to advise about current scientific trends and needs in the specific fields under consideration. In the case of the Neuroscience Cluster, indeed for the entire Division of Integrative Biology and Neuroscience in the NSF, it would be highly desirable to have at least one standing Scientific Advisory Committee that could: 1) Evaluate whether the now existing specific cluster structures and substructures should be reorganized into different scientific domains or themes, 2) Assess the effectiveness of management at all levels and most important, 3) To provide a systematic and continual flow of specific scientific advice and analyses each year to the (hopefully) permanent Division Directors, especially related to whether the important contributions of NSF to the various scientific communities it serves are being optimally performed.

As the NSF fosters ideas as a core activity, it becomes critical for rapid turn-around of funding decisions for hot new conceptual breakthroughs or the enabling of creative exploration. There should be few or no instances in which grant proposals have dwell times in excess of 1 year. Increasing program staff would address this problem. Those few examples of excessive dwell times that the CoV noticed may be attributable to the overload on program officers.

2) Electronic review and data-basing should extend across all NSF divisions. This should be integrated into a fully automated data management system for data collection and compilation

that is able to reflect individual and program workload more accurately and provide a basis for staffing and workload management. Documentation in the "jackets' should be standardized; electronically available and reliably accessible. Data search and analysis capabilities need to be incorporated and technology, overall, could be better integrated and leveraged within the Foundation.

3) Because NSF award size has remained relatively modest compared to NIH grants, and because indirect costs are subtracted directly from the grants, the actual size of the awards may no longer be sufficient to fund integrative or collaborative research projects, particularly those requiring participation of multiple institutions or parties with deep technical expertise.

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

Present staff maintains a remarkably high level of productivity. The CoV believes that the understaffing has reached a level of crisis that is and will continue to negatively impact the field. Neuroscience proposals are decreasing, while the field of neuroscience is increasing its numbers and breadth in an explosive way. As a result of the apparent inattention to neuroscience by NSF, the neuroscience community is becoming reticent to submit their best ideas to NSF, leading to a continuing downward spiral. Most tragic, is that some of the most original and creative Neuroscience will not get done if it is not funded by NSF. Neuroscience is one of the foremost models for cross-disciplinary efforts, and a model for integrative science of the 21st century. Without immediate bolstering of staff in this cluster, the CoV does not believe that this cluster can continue to realize this potential. If NSF continues on the present trajectory, it will forfeit the opportunity to impact the future of Neuroscience.

NSF's ability to meet its mission would be enhanced if the Foundation's organizational structure facilitated and rewarded cross-Directorate and other cross-organizational intellectual exchanges and activities.

It is recommended that the Division Director of IBN (and all four divisions in the Bio Directorate) be permanent NSF staff positions. Across the Division, we found a need for expert, long-term consistent leadership and vision that is responsive to both their program officer's needs and the scientific community. Terms of only 2-3 years allotted to rotating staff is an insufficient time to effectively manage the division, since rotating Division Directors face the same "learning curve" problems as rotating Program Officers. Moreover, the limited pool of qualified scientists with sufficient administrative skills and experience to provide effective leadership and vision in these critical positions introduces a continuous high risk of poor management for the those divisions that have rotating Directors.

A mechanism needs to be established by which the Bio-Directorate regularly solicits direct feedback from the program officers and responds to that feedback.

NSF's unique role in supporting neuroscience is highlighted in many areas of this report. The Neuroscience cluster provides a unique source of support for research involving animal models that are advantageous for asking basic questions about the structure and function of the nervous system. These include invertebrates and non-mammalian models, which may not be models for human disease. Important scientific questions that are uniquely addressed by NSF support include the neural mechanisms underlying many species-specific behaviors, social behavior, and interspecies interactions. It also includes cross-cutting research dealing with increasingly neurobiological questions in behavioral ecology, as well as evolutionary aspects of brain and behavior. Other critically important roles for this cluster are to support new investigators, as well as proposals that integrate research and education. NSF plays a major role in exposing undergraduates to cutting edge research, and we agree that this must continue to be a high priority. We believe that these activities contribute significantly to advancing biology. In addition, we believe that the cluster could productively contribute to development of tools useful to biology in general, and technologies designed to make modern tools more affordable for research labs at various types of institutions. But this question, and that of the relative emphasis in different areas of neuroscience, and how these are handled within the cluster, was beyond our ability to address responsibly within the time frame of the CoV meeting. We recommend that a separate advisory committee be recruited to address this important question adequately.

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

The committee felt that the materials provided in the binder and the proposals selected for our review were extremely helpful in reviewing the programs in the Neuroscience cluster. There were a few items of data that the committee felt would have been helpful to have in hand at the time of the review in order to evaluate better the quality of the research that has been supported and its impact and the effect that NSF support has had on bringing a diverse set of new investigators into the field.

First, the committee felt that it was valuable to have access to the list of publications describing the research supported by the cluster in the FY2002 annual reports. This allowed the committee to determine that not only the specific areas that were funded but also broader areas were impacted by the support. It would have been more helpful, however, to have access to this information for *each* supported proposal at the end of the supported interval. This information, although useful, would be even more useful if supplemented by information the number of times the work was cited by the time of the review. Although citation frequency is inappropriate to use as a sole source for deciding on the impact of a publication, it is helpful information to have at hand.

Second, data related to the efficacy of the review process would be very helpful to have at hand before the following information:

A. Information about the ad hoc reviewers: their ethnic background and the type of institution where they are employed.
B. Information about the people who are supported by the supported research.

C. Information about the workload for Program Officers. This information needs to include the efforts required for cross-institute and cross-directorate initiatives and *not* only the primary proposal workload.
D. This information needs to be integrated with the proposal and needs to be accessible to searches.

The committee feels that it would be very helpful to have an entirely electronic, searchable, submission protocol so that it will be easier to glean data of the type that is needed. These data need to be organized in a consistent manner from proposal-to-proposal. The committee needs to be able to access all of the data. We felt that the LAN was very helpful for the review process.

Furthermore, the committee feels that it is imperative to obtain follow up information about the careers of investigators who are funded for the first time by the NSF: do they go on to tenured positions? Do they go on to become funded by the NIH?

In addition, follow up information is needed for the undergraduate and graduate students who are supported by NSF grants. Do they go on to careers in science?

The committee recommended that it meet on a five-year cycle, provided that the Foundation is able to respond with positive action to the recommendations of this committee, but on a three year cycle if the Foundation does not respond to our action of hiring more program officers!

The Chair of the CoV felt that it would be good to re-evaluate this template after the present cycle of reviews. This form does not make clear what the intent of many of the questions is nor for whom the answers are primarily intended. The questions in many cases are intentionally vague to allow the CoV latitude in answering but the committee struggled with their meaning for too long in too many instances. This interfered with the high level of efficiency required by the short time allowed to evaluate and write the report.

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For the [Replace with Name of COV]
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Chair