

**MEMORANDUM**

**DATE:**

**TO:** Bernice Anderson, Senior Advisor for Evaluation  
 Directorate for Education and Human Resources

**FROM:**

**SUBJECT:** COV for IGERT  
 COI and Diversity Memo

The Committee of Visitors report for the \_\_\_IGERT\_\_\_\_\_ Program was approved at the EHR Advisory Committee meeting held at NSF on \_\_\_\_\_. The COV consisted of \_\_\_\_\_ members selected for their expertise related to the goals of the program. They provided a balance with respect to the type of institutions supported through the program, gender, and representation from underrepresented groups. The following table shows the main features of the COV’s diversity.

<b>Category of COV Membership</b>	<b>No. of COV Members in Category</b>
Member of EHR Advisory Committee.....	...5.....
Institution Type: <input type="checkbox"/> University..... <input type="checkbox"/> Four-year College..... <input type="checkbox"/> Two-year College..... <input type="checkbox"/> K-12 School or LEA..... <input type="checkbox"/> Industry..... <input type="checkbox"/> Federal Agency.....	...4..... ..... ..... ..... ...1..... .....
Location <input type="checkbox"/> East..... <input type="checkbox"/> Midwest/North ..... <input type="checkbox"/> West..... <input type="checkbox"/> South.....	...2..... ..... ...2..... ...1.....
Gender <input type="checkbox"/> Female..... <input type="checkbox"/> Male.....	...3..... ...2.....
Persons with Disabilities.....	.....
Race/Ethnicity <input type="checkbox"/> White..... <input type="checkbox"/> Black..... <input type="checkbox"/> Hispanic..... <input type="checkbox"/> Asian/Pacific Islander..... <input type="checkbox"/> Native American.....	...3..... ...1..... ...1..... ..... .....

The COV was briefed on Conflict of Interest issues and each COV member completed a COI form. COV members had no conflicts with any of the proposals or files. (or, if they did, use ‘Proposals and files were not available to COV members in those cases where the member had a COI and members were not allowed to participate in discussions of actions with which they had conflicts.’)

**IGERT POPULATED TEMPLATE**  
**CORE QUESTIONS and REPORT TEMPLATE**  
**for**  
**FY 2008 NSF COMMITTEE OF VISITOR (COV) REVIEWS**

**Guidance to NSF Staff:** This document includes the FY 2008 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2008. 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](http://www.inside.nsf.gov/od/oia/cov)>.

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

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

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

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.

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

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

**FY 2008 REPORT TEMPLATE FOR  
NSF COMMITTEES OF VISITORS (COVs)**

The table below should be completed by program staff.

<b>Date of COV: August 14 &amp; 15, 2008</b>
<b>Program/Cluster/Section: Integrative Graduate Education and Research Traineeship (IGERT)</b>
<b>Division: Division of Graduate Education</b>
<b>Directorate: Education and Human Resources</b>
<b>Number of actions reviewed:</b>  <b>Awards: 15 (5 per year)</b>  <b>Declinations: 15 (5 per year)</b>  <b>Other: Preproposals (15) Full Proposals (15) – 5 per year</b>
<b>Total number of actions within Program/Cluster/Division during period under review:</b>  <b>Awards: 2005 (25); 2006 (22); and 2007 (20)</b>  <b>Declinations: 2005 (89); 2006 (60); and 2007 (78)</b>  <b>Other: Preproposals ( 553; 421, and 443) and Proposals ( 114, 82, and 98)</b>
<b>Manner in which reviewed actions were selected:</b>  <b>Random Sampling</b>

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

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

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE <sup>1</sup>
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments:</p> <p>The IGERT program efficiently and effectively manages a large number of proposals through the use of a two-tiered review process. Panel reviews are used for both preliminary and full proposals. Because of the interdisciplinary nature of the proposals and complexity of the program, special strategies have been developed to ensure that interdisciplinary teams with an understanding of the IGERT program and its goals review proposals. The program has refined the methods for grouping proposals for review through key words selected by applicants. The processes for panel orientation at both the preliminary and full proposal level are comprehensive. Panel moderator and panel team responsibilities are also well defined.</p>	<p><b>YES</b></p>
<p>2. Are both merit review criteria addressed</p> <p>a) In individual reviews? Yes</p> <p>b) In panel summaries? Yes</p> <p>c) In Program Officer review analyses? Yes</p> <p>Comments:</p> <p>The COV finds that the panel review process effectively addresses both criteria</p>	<p><b>YES</b></p>

<sup>1</sup> If "Not Applicable" please explain why in the "Comments" section.

<p>– intellectual merit and broader impacts – in individual reviews, panel summaries, and Program Officer review analyses. Moreover, the panel summary template and orientation process reinforce the requirement.</p> <p>Within the context of intellectual merit, individual reviews don't always show a balance between the educational and research components of the proposal. This might reflect either a reviewer's lack of expertise or, in some cases, the structure of the proposal.</p> <p>The COV recommends that the panel review process place more emphasis on the importance of research programs as an essential component of intellectual merit. This could be addressed in instructions to panelists and PIs.</p> <p>The COV also supports communication between Program Officers and PIs to resolve issues identified by the panel during the review process. For a proposal on the bubble, this interchange could elevate its priority and/or lead to funding approval. The COV suggests this practice be used systemically to ensure fairness to all applicants.</p>	
<p>3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals?</p> <p>Comments:</p> <p>Guidance to panelists during orientation helps to ensure substantive reviews that address the program goals and indicate the basis for funding recommendations. Pre-proposal reviews tend to be less detailed, particularly with respect to Criterion 2, Broader Impacts.</p>	<p><b>YES</b></p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p> <p>Panel summary checkers help to ensure that the summaries address the issues that lead to the panel recommendation. The checkers scan reviews and monitor the IPS. Proposals with a wide range of ratings are reviewed early in the panel meeting to allow sufficient time for full consideration. Program best practices include reading the summaries aloud to the panel to ensure that important issues are captured. These processes appear to be working well for the IGERT program.</p>	<p><b>YES</b></p>

<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>Comments:</p> <p>The eJackets include four reviews for each full proposal, a panel summary, and a review analysis. The review analyses comment on the relative importance of elements of the reviews as discussed by the panel. The rationale for award or decline by the program officer is clearly stated and based on the strengths and weaknesses of the proposal as they appear in the reviews and panel summary. In cases where the decision to make an award appears questionable due to moderate enthusiasm by the panel, there is documentation that the Program Officer raised questions with the PI that were answered satisfactorily.</p>	<p><b>YES</b></p>
<p>6. Does the documentation to PI provide the rationale for the award/decline decision?</p> <p>Comments:</p> <p>The context statements summarize the number of proposals reviewed, the panel review process, and the deliberation of the ICC following the panel meetings. Reviews provided to the applicant along with the panel summary for full proposals are detailed and provide a rationale for the decision.</p> <p>The COV noted that panel summaries for preliminary proposals do not always contain the same level of detail; however they do provide a rationale for the decision. Providing constructive feedback (both positive and negative) to all applicants is critical, even more so for first time PIs who submit proposals that are declined.</p> <p>Source: Jackets</p>	<p><b>YES</b></p>
<p>7. Is the time to decision appropriate?</p> <p>Comments:</p> <p>Over the past three years, IGERT consistently met the NSF-wide “time to decision” goal of 70% within a six-month time frame. In 2007, nearly 80% of the funding decisions were made within six months. The COV noted an increase in the percentage of proposals requiring 9-12 months for a decision over the previous year. Is this increase due to the complexity of the proposals or other factors?</p>	<p><b>YES</b></p>

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

The COV finds that the panels are of appropriate size to span a considerable range of disciplines while including interdisciplinary members as well. The delineation of responsibilities for leader, scribe, and moderator are clear and constructive, and mitigate the potential for one strong voice on a panel to override less strident ones. A review of the proposals offered as examples reveal reasonable consistency among the individual reviews and the panel report. The decision process that follows the Program Officer's Review Analysis is less clear. The COV has many questions: Does the ICC make collective decisions or do they primarily ratify the decision of the program officers? How do they prioritize across the different panels? When evaluating proposals for funding, does the ICC look for opportunities to diversify? Do we have any information or feedback from members of the ICC on their view of the process?

**A.2 Questions concerning the selection of reviewers. Provide comments in the space below the question. Discuss areas of concern in the space provided.**

<p><b>SELECTION OF REVIEWERS</b></p>	<p><b>YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE<sup>2</sup></b></p>
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>The IGERT panel development and selection process for both preproposal and full proposal reviews follow an established set of best practices. The quality of the IGERT projects seems to indicate that panels are comprised of reviewers with appropriate expertise and qualifications, as well as representative of the various disciplines and institutions that the program impacts.</p> <p>During the recent COV a number of questions arose pertaining to composition of the panels. Some members were troubled that detailed information about the proposals and panelists assigned to specific panels was not available for the COV review. Of particular concern was whether and/or how panel composition may have adversely impacted award selection.</p> <p>The IGERT program staff provided the COV with an overview of the proposal/panel development process. The COV was informed that a significant number of highly qualified individuals with appropriate expertise volunteer to serve as panelists. From the pool of reviewers, the panel management team (PMT) will put together an interdisciplinary panel that follows the “rule of thirds.” That is, one-third IGERT PIs, co-PIs, and participants; one-third previous IGERT panelists; and one-third new panelists. A first-time reviewer is generally selected for a preproposal panel. In addition to the “rule of thirds,” an interdisciplinary panel should also comprise 20% minority and 40% female representation. Demographic data for IGERT panelists with regard to race and ethnicity is self-reported and only minimally available.</p> <p>Furthermore, while panelists represent a broad range of institutional affiliations, the list of affiliations did not appear to correlate well with IGERT institutions. However, when the COV examined the 2007 sample proposals more closely, the findings indicated a solid correlation for five of the six. The sole outlier was a proposal with the key words “Engineering, Geosciences, Physics.” A panel tailored for sustainability and populated by biologists, environmental scientists, anthropologists, ecologists, atmospheric and agricultural scientists, and one geologist reviewed this proposal.</p> <p>All in all, the IGERT panel development and selection process is successful,</p>	<p><b>YES</b></p>

<sup>2</sup> If “Not Applicable” please explain why in the “Comments” section.

<p>though the wide range of interdisciplinary areas to be covered in each round of review likely makes full coverage difficult to achieve. For future reviews, the COV would find it helpful to know the proposals and panelists assigned to specific panels to ascertain the appropriateness of the panel composition.</p>	
<p>2. Did the program use reviewers balanced with respect to characteristics such as geography, type of institution, and underrepresented groups?</p> <p>Comments:</p> <p><b>Geography</b> Yes. In 2007, 42 states were represented on panels during the preproposal process; 23 states were represented on full proposal panels.</p> <p><b>Type of Institution</b> The COV review of sample IGERT proposals determined that reviewers and panelists represent major research universities as well as smaller state universities. Though present on several panels, private universities seem to be less well represented overall. Flagship state universities dominate the 25 universities that account for half of the active IGERT grants, although they do not populate the ranks of the reviewers to the same extent.</p> <p><b>Underrepresented Groups</b></p> <p><b>Gender</b> In 2007, females were consistently represented on preproposal and full proposal panels. Out of 174 preproposal panelists, 59 were female (33.9%). Out of 59 full proposal panelists, 19 were female (32.2%). The IGERT program goal for female representation on panels is 40%.</p> <p><b>Race/Ethnicity</b> The COV was unable to fully ascertain the racial and ethnic diversity of the IGERT panelists because demographic data is self-reported and only 25% of panelists self-identify race and ethnicity. In looking at the composition of pre-proposal and full proposal panels, reviewers and panelists from minority serving institutions (MSI) comprise approximately 10-15% of the total. The IGERT program goal for minority representation on panels is 20%.</p> <p>The COV recommends that IGERT consider an alternate methodology (for example, observation) for assessing and tracking panel diversity.</p>	<p><b>YES</b></p>
<p>3. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p> <p>Panel reports note when a reviewer was excused as a result of a conflict of interest (COI). Details about the specific nature of COIs were not available. Consequently, the COV could not assess whether or not the COIs were appropriately resolved.</p>	<p><b>YES</b></p>

4. Additional comments on reviewer selection:

IGERT is primarily funding programs at larger institutions, while panelists represent a broader range of institutions. The COV endorses this practice and encourages the NSF to learn what the obstacles are to successful competition. In addition, the COV recommends that IGERT look for ways to impact institutions more broadly given its goal to serve as a catalyst to transform graduate education.

**A.3 Questions concerning the resulting portfolio of awards under review. Provide comments in the space below the question. Discuss areas of concern in the space provided.**

<p align="center"><b>RESULTING PORTFOLIO OF AWARDS</b></p>	<p align="center"><b>APPROPRIATE, NOT APPROPRIATE<sup>3</sup>, OR DATA NOT AVAILABLE</b></p>
<p>1. Overall quality of the research and/or education projects supported by the program.</p> <p>Comments:</p> <p>The 136 IGERT projects submitting annual reports in 2006-2007 cover an admirable breadth of interdisciplinary themes that appropriately reflect critical NSF research investment priorities. The projects reported a total of 335 distinct research achievements, defined as accomplishments of significant impact. Based on the information available to the COV, these achievements are specifically related to the interdisciplinary research of each IGERT and extend across all directorates of the NSF.</p> <p>The quality of the IGERT projects can also be judged – to a certain extent – by the validation of these achievements in academic terms including: 811 journal publications; 345 conference publications; 1,171 conference presentations; 53 book chapters and 14 books; 31 patents; and 61 patent applications.</p> <p>There are opportunities for further enhancing the overall quality and impact of IGERT projects. For example, although climate change: impacts and factors is a very important interdisciplinary area, there are only six (4.4%) IGERT funded climate change projects (4.4%) as compared to 48 (35%) computational science and engineering projects. The same could be said for energy, with a focus on alternative and renewable sources and conservation. There are just four IGERT funded energy projects, which represents 2.9% of all IGERT projects.</p> <p>The academic achievements of the IGERT projects are impressive. However, in the absence of a frame of reference or benchmark, it is impossible to ascertain whether this level of achievement/productivity is exceptional, average, or less than average.</p> <p>The COV suggests the NSF provide some kind of per capita measurement rooted in numbers of participating faculty and students. Data to measure the impact of the educational programs that clearly identify transition points would also be helpful in assessing the overall quality of the IGERT projects.</p>	<p align="center"><b>APPROPRIATE</b></p>

<sup>3</sup> If “Not Appropriate” please explain why in the “Comments” section.

<p>2. Does the program portfolio promote the integration of research and education?</p> <p>Comments:</p> <p>The program description and review criteria place appropriate emphasis on the integration of research and education that is central to the IGERT mission. While the integration of research and education is a part of the NSF traditional profile, with its emphasis on training new generations of scientists through work on funded projects, IGERT has imposed additional standards for educational content related to interdisciplinary content, professional skills development, and preparation for non-academic careers.</p> <p>Jacket proposal samples show interdepartmental and interdisciplinary panels of participants and most of the project areas are problem centered and intrinsically interdisciplinary. The COV recommends that the NSF attempt to document what the COV believes is a successful transformation of the structural elements of graduate education including degree requirements, qualifying examinations, and career destinations.</p> <p>Source: Jackets and program information</p>	<p><b>APPROPRIATE</b></p>
<p>3. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments:</p> <p>All IGERT awards are the same regardless of the scope. The COV agrees that while participant stipends and cost of education (COE) are appropriately established at the same level, it is less certain that the non-stipend component of the awards is appropriate given the diverse array of training grants.</p> <p>The COV also recommends that the NSF investigate whether or not award regulation constitutes a barrier to certain types of institutions.</p>	<p><b>APPROPRIATE</b></p>
<p>4. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Innovative/potentially transformative projects?</li> </ul> <p>Comments:</p> <p>All IGERT projects are expected to incorporate and integrate a comprehensive interdisciplinary theme appropriate for doctoral-level research and based on transformative interdisciplinary STEM research. The current program portfolio appears to have an appropriate balance of innovative and potentially transformative projects. Of the 136 IGERT's reporting in 2006-2007, 64 projects (47%) address the NSF strategic investment priority of fostering transformational research.</p> <ul style="list-style-type: none"> <li>• Materials and science engineering (27 projects)</li> </ul>	<p><b>APPROPRIATE</b></p>

<ul style="list-style-type: none"> <li>• Civil infrastructure and monitoring (2 projects)</li> <li>• Neuroscience: biology and psychology (10 projects)</li> <li>• Biological evolution and development (11 projects)</li> <li>• Sensing, signals, imaging, and signal process (14 projects)</li> </ul> <p>Based on the information available for review, the COV could not determine the extent to which these projects resulted in transformation.</p>	
<p>5. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Inter- and Multi- disciplinary projects?</li> </ul> <p>Comments:</p> <p>Interdisciplinarity is a requirement of the IGERT program. Accordingly, the 136 IGERT projects that comprise the current portfolio reflect the expected balance of inter-and multi-disciplinary projects. Moreover, the interdisciplinary research themes of IGERT projects reach across all NSF directorates.</p>	<b>APPROPRIATE</b>
<p>6. Does the program portfolio have an appropriate balance considering, for example, award size, single and multiple investigator awards, or other characteristics as appropriate for the program?</p> <p>Comments:</p> <p>The program portfolio reflects projects that appear to be consistent with the IGERT solicitation in terms of award size (one type of continuing grant of \$3M over five years), the number PIs-Co-PIs, and institution requirements.</p>	<b>APPROPRIATE</b>
<p>7. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Awards to new investigators?</li> </ul> <p>NOTE: A new investigator is an investigator who has not been a PI on a previously funded NSF grant.</p> <p>Comments:</p> <p>According to the program description, new awardees for IGERT are typically PIs who have not previously received a NSF grant, but not PIs who have never had a grant at all. If more experienced investigators better serve as PIs and Co-PIs, then this question does not seem applicable to IGERT.</p> <p>The COV suggest that given the collaborative nature of the IGERT program, it might be better to ask whether the project teams include new investigators as participants who would benefit from mentoring by senior faculty as part of the project.</p>	<b>DOES NOT APPLY TO IGERT</b>
<p>8. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Geographical distribution of Principal Investigators?</li> </ul>	<b>APPROPRIATE</b>

<p>Comments:</p> <p>Yes, the data indicates there is generally a good balance in the geographical distribution of PIs. The awards issued from 2005-2007 demonstrate that progress was made in the Central Plains (EPSCoR) states. The COV commends IGERT's effort to close the geographical gap identified in the 2005 COV report.</p> <p>Nevertheless, a large part of the Central North Territory, including North Dakota, South Dakota, and Wyoming remains underrepresented. The COV would be interested to know why these states are underrepresented. Are the deficiencies due to the lack of submissions by applicants from these states? Of are the deficiencies the result of declinations?</p> <p>The COV recommends that the NSF intensify efforts to increase outreach to these states. Collaboration with EPSCoR could be worthwhile.</p>	
<p>9. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Institutional types?</li> </ul> <p>Comments:</p> <p>Generally speaking, yes. Large institutions produce significant numbers of Ph.D.s. The representation of large institutions in the IGERT program portfolio is appropriate and may increase the potential impact of IGERT on graduate education. Nevertheless, the COV believes there are opportunities to strengthen IGERT's impact by stepping up its outreach and increasing its visibility to other institutional types.</p> <p>For example, despite the program's ongoing efforts to increase awards at Minority Serving Institutions (MSIs), there have been just two awards in the last three years. This number is consistent with the program's overall MSI award level history. The COV would like to know what the barriers are to increasing awards at MSIs. On the other hand, there has been noticeable progress in increasing the number of MSI partners. IGERT could draw upon the best practices used to attract MSI partners to refine its efforts to bring more MSIs into the program.</p> <p>The COV review of the program portfolio determined that approximately 20% of awards have been to private institutions. The COV would find it useful to know how this number compares to the overall percentage of doctoral degrees awarded each year by private institution in the U.S. Are private institutions underrepresented in the IGERT portfolio? Finally, an IGERT may have a greater potential for transforming graduate education at a smaller institution and the COV encourages the program to look for opportunities to experiment.</p>	<b>APPROPRIATE</b>
<p>10. Does the program portfolio have an appropriate balance:</p> <ul style="list-style-type: none"> <li>• Across disciplines and subdisciplines of the activity?</li> </ul>	<b>APPROPRIATE</b>

<p>Comments:</p> <p>The IGERT projects presented in the Annual Report make clear that interdisciplinarity is the cornerstone of the program. A wide range of projects that address many aspects of STEM research are also well represented in the portfolio. Furthermore, there are – and rightfully so – a significant number of projects in applied science and technology because this is what society at-large demands from today’s scientific community.</p> <p>While the program portfolio has an acceptable balance across disciplines and subdisciplines, there are opportunities for the IGERT program to strengthen its impact by expanding its focus in several areas. For example, are there opportunities for interdisciplinary research in the basic sciences as well as the applied, problem-oriented research that is typical of IGERT proposals.</p> <p>The current portfolio demonstrates that the majority of interdisciplinary partnerships are in the areas of natural and physical science and technology. There is little collaboration between science and the humanities. The COV believes that projects in this area have the potential to foster true out-of-the-box thinking and should be encouraged.</p> <p>Given the success of the IGERT program, the NSF may need to consider whether training programs in the basic science areas would be appropriate. Doctoral students in the basic sciences would also benefit from the same type of professional skills preparation as students in interdisciplinary areas, and they too, are not likely to receive these types of experiences in a traditional graduate school program.</p>	
<p>11. Does the program portfolio have appropriate participation of underrepresented groups?</p> <p>Comments:</p> <p>Yes, the IGERT program portfolio has appropriate participation from underrepresented groups. In terms of individual PIs, the program continues its success in soliciting preproposal submissions. There was no significant change in the percentage of underrepresented groups in both the preproposal and full proposal competitions.</p> <p>The COV noted that over the last three years, the percentage of underrepresented groups has decreased in the final award stage. It would be interesting to understand the reasons for this decrease. Mentoring potential PIs could help improve their understanding of the program and its requirements.</p> <p>Trainee demographics show a highly diverse group with stronger representation from underrepresented groups compared to the national norm. This success reflects the commitment the program made in 2005 to actively recruit trainees from underrepresented groups. <b>The COV notes that comparing averages to national norms may not be an adequate measure and</b></p>	<p><b>APPROPRIATE</b></p>

<p>the program needs to continue to place emphasis on the recruitment of underrepresented groups by all IGERT programs.</p> <p>The COV addressed representation from MSIs in Section A.3.9.</p> <p>Diversity is not just about numbers but also about having access to the full IGERT portfolio. Therefore, providing non-aggregated data to the COV on the number of women and URM per program and disciplinary area is needed.</p>	
<p>12. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p>Comments:</p> <p>The IGERT program is very well aligned with the national priorities articulated in the NSF Strategic Plan. All thirteen areas identified in the NSF Strategic Plan are represented, with heavy emphasis in the areas of Sustainability, Computational Science and Engineering, Materials Science and Engineering, and Human and Social Dimensions of New Knowledge and Technology. The COV noted that the two most pressing national issues – climate change and energy – received relatively few awards (10 out of 136 or 7.3%).</p> <p>Projects with an international component (21%) provide trainees with much needed exposure to different cultures and work environments. The networks that trainees establish through their participation in IGERT may prove beneficial later on in their careers.</p> <p>The number of projects (more than 20%) with either an industrial or a governmental collaboration is also quite impressive. What is less clear is how many of these collaborations resulted in actual immersion of the trainees in the real working environment. Experiences such as a short-term internship would enable trainees to better understand how a “real” company or agency operates. It would also give them a baseline to evaluate their own career goals and aspirations.</p> <p>Through the outreach component of many projects, IGERT also serves to inform communities and society at large about important scientific and technological advances. Outreach helps build bridges between the general public and the scientific research community that, in turn, can solidify the unwavering support for frontier scientific research.</p> <p>IGERT is extremely successful in broadening the educational experience of graduate students beyond their particular technical and/or scientific areas of focus and as a result makes significant contributions toward NSF’s goal of preparing a diverse and globally engaged STEM workforce. National surveys, such as that conducted by Golde, have shown that while doctoral students are very confident in their research skills, they are often uncertain about and keen to experience other forms of professional skills preparation.</p> <p>Many of IGERT’s requirements and activities offer graduate students</p>	<p><b>APPROPRIATE</b></p>

<p>enhanced training in communication and team-building skills beyond what is traditionally provided. The ability to communicate a complex, scientific concept in straightforward language that can be tailored to various audiences cannot be underestimated. This is a skill that will prove valuable to trainees if they choose to work in a non-academic environment in the future.</p>	
<p>13. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>The COV was surprised to find that the template lacked questions that specifically address the global or international aspects of the IGERT program. Given the ever-increasing global economy, future generations of the workforce must be versatile and able to adapt to the diverse cultures, languages, and work styles around the world. The COV recommends that the IGERT program push hard to increase the number of globally focused proposals that would lead to international experiences for trainees.</p>	

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

##### 1. Management of the program.

###### Comments:

IGERT at ten years remains an exciting program with the potential to transform science and engineering by training young investigators in areas of science that are important for the future and giving them the professional skills they need to be successful in their careers.

The program is managed with efficiency and effectiveness:

- The proposal review process is designed to advance the goals of the program. Information to potential applicants and panelists about NSF and IGERT goals is clearly presented.
- The program has adopted best practices for program review that have improved the feedback to applicants over time and made the basis for decisions less opaque.
- PI workshops have provided opportunities for faculty and trainees to shape the program and share best practices.

Since the previous COV, a lot of emphasis has been placed on improving pre-award processes. State-of-the-art technologies (IGERT Web site, webinars, and other electronic media) streamline workflow and support preproposal and full proposal panel reviews. Restricting institutions to four preproposals (new and renewal) and three full proposals reduces the workload of the NSF and universities. The majority of applicants that reach the full proposal stage will receive notice of a decision within six months of the submission deadline. The FastLane award and declination system speeds up the notification process.

The communication tools used to support IGERT outreach, monitor, and report progress and accomplishments have also been enhanced. The IGERT Annual Report is a descriptive document that provides stakeholders and the IGERT community with an overview and better understanding of the program. Highlights and best practices also facilitate information dissemination among participants and catalyze further ideation.

The annual IGERT grantee meeting is an effective mechanism for sharing common experiences and developing best practices among the PIs, senior administrators in attendance, and the NSF on issues that are critical to increasing program impact and sustainability. IGERT trainees have participated since 2005.

The grantee meeting also includes a popular career panel where representatives from academia, industry, and government meet with PIs and trainees to discuss the skills sets and expectations of potential employers. Another component of the grantee meeting is a media/PR panel in which the mainstream media share their perspective on scientific communication and outreach strategies. Both provide excellent networking opportunities for PIs and trainees.

Post award, the COV commends the NSF's efforts to obtain input from PIs and trainees through participation in a variety of meetings and workshops along with the IGERT Annual Report Web Survey.

The COV recommends more attention to the following post-award issues:

1. Measurements:

- Broaden the measures of success—capture more information, particularly in renewals about state and local impacts, commercialization of research products.
- Sharpen measures being used—trainee publications, impact factors, refereed publications.
- Student retention, graduation, and career outcomes; completion rates; time to degree; first authored papers by trainees—generally, a richer picture of who the IGERT students are, what they are doing, and where they are going.
- Are we attracting more U.S. citizens and permanent residents to S&E.? IGERT trainees have to be US citizens and permanent residents but that doesn't necessarily mean that we are attracting more. We could be redistributing those who are already in the pipeline. **We need disaggregated data to know whether underrepresented minorities are being successfully recruited by programs or whether or few successful program give the impression of overall success/**

2. Models—how do we develop replicable models to attract U.S. students and URMs in particular to graduate education?

- How does NSF think about transporting important lessons from IGERT to other programs that involve graduate training, including ERCs and regular research grants? How many IGERT trainees have also had support from regular research grants?
- Does IGERT work for basic interdisciplinary science, as opposed to the highly problem focused projects that characterize IGERT grants?

3. Other evidence of impact:

- Have ideas about research incubated in the IGERTs been embraced within the directorates?
- What about institutional change? Especially in those institutions with multiple grants – have there been changes in hiring practices, courses, or curricula? What is the evidence that the programs are being sustained beyond the IGERT funding period?
- What is the impact of IGERT on new faculty hires, job announcements, tenure decisions, growth of interdisciplinary appointments, and so on?

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

Comments:

The proposals funded have successfully integrated research in NSF's high priority areas with graduate education. In addition, IGERT projects have connected research groups with industry, government, and local communities, thereby applying science to local or regional issues and communicating the value of science and graduate education to the public.

In some of the programs that have been renewed for an additional five years of funding, it is clear

that much is being learned about how to promote interdisciplinary research, train students in an interdisciplinary environment, and connect students with issues from a local to international scale. There is evidence that curricula are being revised and that the standard single mentor apprenticeship model for graduate education is giving way to new models. There are an increasing number of partnerships or collaborations with industry including internships, industrial provision of facilities for research, research collaborations, and exchange of personnel.

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

Comments:

The IGERT Strategic Plan and goals are well aligned with the NSF Strategic Plan and goals. In fact, the NSF Strategic Plan forms the framework in which the IGERT solicitation operates. The current IGERT portfolio reflects NSF investment priorities and goals in four key areas:

- Transformative research achievements and discoveries in cutting edge interdisciplinary science, technology, engineering, and math.
- Innovative interdisciplinary graduate education with curricular options, courses, interactions, and partnerships, including methodologies for developing trainees with the technical, professional, and personal skills to become leaders and creative agents for change in a globally engaged science and engineering workforce.
- Informing the general public, undergraduates, and K-12 students about the innovative science in IGERTs.
- Broadening participation in STEM graduate education.

Budget contributions from other directorates indicate the commitment of the directorates to IGERT but given the importance of graduate education and the training of U.S. students in scientific and national security issues, the COV would hope to see annual budget increases, not flat or declining funding. Moreover, the COV would expect that clear and demonstrable successes would positively impact contributions from the directorates and offices that fund IGERT awards.

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

Comments:

Updated, timely, and reasonable responses seem to be in place for most suggestions made by the previous COV. There are several suggestions that the current COV would like to revisit.

COV Suggestion 3 recommended the formulation of an ad hoc group of advisors to consult with the program management team on program-specific issues. Based on the initial and updated program response in the Updated 2005 COV Report, it is unclear whether the external group of advisors was addressed. Given the critical role of ICC and the tremendous investment in graduate education for U.S. students, it might be useful to involve community stakeholders in an advisory capacity.

COV Suggestion 5 discussed the potential benefits of exploring a co-funding mechanism between IGERT and EPSCoR. While the response from program management indicated that strengthening

the partnership of IGERT and EPSCoR was of interest, no definitive progress appears to have occurred.

In its initial response to COV Suggestion 6, program management noted the establishment of an ICC diversity subcommittee and strategies to work more closely with AGEP and LSAMP. The updated program response does not address the effectiveness of either initiative. Understanding the role of the diversity subcommittee and its impact on improving participation of underrepresented groups was of particular interest to the 2008 COV.

COV Suggestion 9 urged program managers to develop a set of best practices that could be shared across IGERT institutions. While the current COV commends the solid job that Abt Associates did to assess the “impact of IGERT,” IGERT would be better served by having a complete set of best practices that also quantifies, statistically speaking, the real impact of the program.

Finally, with respect to COV Suggestion 10, the current COV agrees that IGERT’s partnership with industry is critical to long-term success. Internships play a big role in IGERT and there is little information about the extent to which they are available to IGERT trainees.

5. Additional comments on program management:

The COV commends the IGERT management team for the great job it does in managing a large and diverse portfolio. In light of the ongoing challenges to recruit U.S. minorities into the program, the COV reiterates its position that enhancing IGERT’s partnership with EPSCoR is vital to the program’s success. Strengthening connections to AGEP, LSAMP and non-NSF programs such as Ford’s and Sloan’s might also bring added value to IGERT in its outreach to underrepresented groups.

In the absence of a clear understanding of the role and impact of the diversity subcommittee, the COV suggests that program management dissolve the subcommittee and instead make diversity a responsibility of the ICC.

Given the complexity of the management scheme and the shared funding of the IGERT program, the COV would find helpful and strongly recommends that the COV have an opportunity to meet with the ICC during the review.

## PART B. RESULTS OF NSF INVESTMENTS

The NSF mission is to:

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

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

NSF investments produce results that appear over time. Consequently, the COV review may include consideration of significant impacts and advances that have developed since the previous COV review and are demonstrably linked to NSF investments, regardless of when the investments were made.

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

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

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

Comments:

Among the current portfolio of IGERT awards, there is significant potential to advance NSF's strategic outcome goal for Discovery. In reviewing the IGERT Annual Report and NSF Highlights 2007, the COV found many examples of IGERT projects with a primary strategic outcome goal of Discovery and a secondary strategic outcome goal of Learning. These projects include:

NSF Award Numbers: 0504103

Award Title: IGERT: Assessing Change in Coastal Ecosystems: Integrating Natural and Societal Sciences

PI Name: Peter August

Institution Name: University of Rhode Island

NSF Award Numbers: 0504507

Award Title: IGERT on Multi-scale Computations of Fluid Dynamics

PI Name: Sumanta Acharya

Institution Name: Louisiana State University & Agriculture and Mechanical College

NSF Award Numbers: 0504304  
Award Title: IGERT: Computational Molecular Biology Training Group  
PI Name: Drena Dobbs  
Institution Name: Iowa State University

NSF Award Numbers: 0504331  
Award Title: IGERT: Nanomedical Science and Technology  
PI Name: Srinivas Sridhar  
Institution Name: Northeastern University

NSF Award Numbers: 0504361  
Award Title: IGERT: An Entrepreneurial Ph.D. Education in Fuel Cell Manufacturing, Materials Development, and Modeling  
PI Name: Michael Jensen  
Institution Name: Rensselaer Polytechnic Institute

All of the projects presented in the IGERT Annual Report address strategic priorities and the featured project examples appear to be making contributions to knowledge based on the descriptions and academic achievements noted. However, without more information about the state of the field, it is difficult to fully assess the significance of these contributions. In addition, it would be helpful to have specifics about the presentations, publications, patents, and patent applications and information on which IGERT projects achieved these results. The PI's assessment of the project findings as it relates to the interdisciplinary area or for solving the problem in focus would also be of interest.

The COV recommends that IGERT broaden the criteria upon which the program measures successful outcomes. Place more emphasis on local applications, technology transfer, and commercial success. The University of Alaska-Fairbanks project "*Regional Resilience and Adaptation: Planning for Change*" (NSF Award Number 0114423) is an example of a project with significant impact.

For publications, look beyond the numbers and consider qualitative measurements, as well as first-authored and/or jointly authored papers by students.

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

Comments:

Among the current portfolio of IGERT awards, there is significant potential to advance NSF's strategic outcome goal for Learning.

Of the 136 IGERTs submitting an annual report in 2006-2007, 122 reported 328 educational achievements for their IGERTs that directly address the NSF goal of learning and the sub-goal of integrating research and training to prepare a diverse and globally engaged STEM workforce. These achievements include new courses (80), workshops, seminars, and conferences (81), new degrees or certificates (16) and trainee's involvement with course development (573).

IGERT is also the only national program that integrates the development of professional skill sets into graduate program education. This includes training that prepares students to communicate their STEM research and experiences, conduct research, and develop professional skills applicable

to careers in industry, government, or the private sector.

The COV once again references the University of Alaska–Fairbanks renewal proposal as an example of how to effectively document retention and completion outcomes, as well as demonstrating the time it takes to achieve solid data. Suggested data categories for student outcomes include academic (tenure track, teaching term, postdoctoral); industry/business/corporate; government; or nonprofit.

Finally, the COV restates the recommendations it made in Section A.4.1 concerning post-award emphasis on student outcomes. Sharpen measures to include retention, time to degree, completion rates, first-placement, and career outcomes.

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

Comments:

Not applicable to the IGERT program.

## **PART C. OTHER TOPICS**

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

The issues of diversity when it comes down to the selection of panelists (race, ethnicity, gender, geography, institution type) are critically important since a key objective of IGERT is to impact and innovate current models of graduate education with an emphasis on bringing U.S. citizens and permanent residents into the research and educational enterprise. IGERT is certainly having an impact on our universities' graduate education models. That said, it is not succeeding to the same degree at creating models that attract a large percentage of URM who are receiving an increasing percentage of STEM degrees. Attention to this issue is imperative given the dramatic demographic changes that are taking place at our universities.

Several of the heavily funded project areas have failed to attract a significant number of URM. Why do some projects fail to recruit a diverse group of participants or have issues with retention while other programs are successful? What kind of interesting scientific projects will attract students from these populations? Would interdisciplinary projects that combine social and biological sciences or economics and biological sciences or economics and energy or equivalent combinations generate a more diverse set of proposals that in turn, might attract more URM? The COV strongly suggests that the program continue to push for increased representation of women, minorities, and persons with disabilities in IGERT projects.

Additional efforts by the program management team will be necessary to close the geographic gaps identified in section A.3.8. Opportunities to shore up participation in the underrepresented Central North Territory include in-state workshops for potential PIs, incubators to foster inter-institutional partnerships, mentoring by representatives from states or institutions that are experienced with the program, and a more aggressive promotional campaign to attract applicants to the program.

The aforementioned techniques could also be applied to efforts to increase the participation of MSIs as well as the underrepresented academic disciplines including interdisciplinary basic science, engineering science, and humanities. Interdisciplinary science and engineering science probably suffer in the review process because they may not be as easy to appreciate as the highly applied initiatives that seem to connect immediately to societal problems. On the other hand, if complemented with suitable professional development they provide the depth of education needed to sustain an extended career as a contributor and leader in a technical field.

The COV recommends the program increase funding that would allow for regular site visits by the IGERT management team. Site visits that also look to evaluate institutional impact and/or change would be valuable.

As competition becomes keener and renewals of successful IGERTs become more frequent, the review process might include reverse site visits that would allow face-to-face presentations to the panel. This approach has proven successful for the MRSEC program in DMR.

### **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.**

IGERT seeks to promote graduate education at the intersection of interdisciplinarity, collaborative science, and a global context. The questions in the COV review do not directly address this. There is little opportunity to evaluate the contributions of the program to fostering collaboration or internationalization.

The COV recommend that the program further investigate opportunities to enhance the innovation/entrepreneurial component of the program by encouraging PIs and trainees to take their research results one step beyond publication via technology transfer such as partnership with industry, start ups, etc. Look into the feasibility of establishing a specific resource center where PIs and trainees could meet with experienced entrepreneurs, venture capitalists, and/or technology executives from industry.

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

One area where the COV believe more attention might be focused is the ICC. The ICC's role seems the most critical when it comes down to issues of access, funding, leadership and diversity, however the workings of the ICC are the least transparent aspect of the review.

The COV has a number of questions with respect to the ICC: What are the ICC's working relationships like across the directorates? What are the challenges to decision-making across administrative boundaries? Do IGERT initiatives migrate into the directorates? Are the people on the ICC given adequate support to participate in the IGERT program? Do the ICC participants become ambassadors for the program within their respective directorates? What is the exact nature of the interactions between IGERT and other programs including VIGRE, AGEP, LSAMP and related non-NSF programs?

In addition, the COV strongly recommends that IGERT use upcoming evaluations to put the program's outcomes in context. Benchmark data to enable the COV to judge program performance in research productivity, student success, and access for diverse students and faculty are needed.

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

IGERT is a major investment in innovation in graduate education in science and engineering. The program has translated the recommendations of reports like the COSEPUP report into action. The STEM disciplines need to understand the impact of those actions on the careers of young scientists and engineers. After 10 years of operation, it is important to understand the career trajectories of scientists trained in the IGERT model, whether the initiatives launched with IGERT funding have been sustained by institutions, and whether IGERT grants seed transformation at the institutional level.

The professional development component of the IGERT program could be used to establish training standards for graduate student research assistant appointments associated with NSF sponsored research.

Consider establishing an external advisory board that brings field perspectives to the NSF on how to successfully address geographical and diversity issues (gender, URMs).

IGERT's efforts to assess progress and contributions of the program are laudable. The key is to very clearly define the meaning of the data in terms of research or educational accomplishments. Every IGERT would benefit from tracking students' successes at each critical transition point – recruitment, admission, completion of first year, passing of the qualifiers and completion of an MS degree, admission to candidacy, publications or submissions, dissertation, and so on. It is important that all reports and evaluations provide detailed accounts of IGERT's impact on the number of Ph.D.'s awarded and on retention rates.

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

University best practices for visiting or review committees always allow time for onsite discussions with constituents. The COV highly recommend that program management consider building this into the IGERT review process. Interviews with all stakeholders including the ICC, other directorates within the NSF, selected PIs and trainees would greatly enhance the depth and quality of the review.

In general, the documents prepared by the program officers were very thorough and appropriate for the review. The availability of more benchmark data against peer programs, especially regarding outcomes, would be extremely useful during future reviews. The COV found the IGERT staff to be extremely responsive to our questions during the review.

Making the data available in electronic (CD) format to facilitate a pre-meeting review was also very helpful.

**NO ADDITIONAL IGERT QUESTIONS**

**SIGNATURE BLOCK:**

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For the 2008 NSF Integrative Graduate Education and Research Traineeship Program COV  
Dr. James Renick  
Chair

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For the 2008 NSF Integrative Graduate Education and Research Traineeship Program COV  
Dr. Joan Lorden  
IGERT Committee Sub-Chair