

# DIMACS

*Center for  
Discrete Mathematics  
& Theoretical Computer Science*

**Fred S. Roberts**  
*Director*



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June 27, 2005

Ms. Kathryn Sullivan  
Acting Director  
Office of International Science and Engineering  
National Science Foundation  
4201 Wilson Boulevard  
Arlington, Virginia 22230

Dear Kathryn:

The Advisory Committee for International Science and Engineering is pleased to accept the Report of the Committee of Visitors (COV) for the Office of International Science and Engineering (OISE), April 11-13, 2005 and the OISE Response.

We were impressed with the level of effort and care with which the COV wrote its report and the considerable thought that was put into the response. This report and response come at a major transitional stage for OISE. We are delighted to see the progress that has been made since the last COV and applaud the directions that NSF has taken to strengthen its international activities. In particular, we note the move of OISE with expanded responsibilities to the NSF Director's Office. We also applaud OISE's innovative restructuring of its programs (e.g. larger awards, longer duration, and greater integration of international activities NSF-wide).

We have the following comments about the Report and the OISE Response.

The Committee concurred with the COV recommendation (Recommendation 4) for an OISE mission statement and action plan, and urges the OISE to use its current statement on thematic activities as an "interim mission statement" and basis for planning, pending the appointment of a new director for OISE.

Many of the recommendations endorse OISE's current programs and encourage that these be expanded. This will require resources and prioritization, a point we return to below. Other recommendations call for additional tracking and documentation of international activities. Many of these (Recommendations 3, 11, 12, 13, 14) are more appropriately implemented on a NSF-wide basis and we urge that this be pursued.

With respect to COV Recommendation 6 (which concerns the shift to a smaller number of larger awards and the need to educate and work with the rest of NSF in seeking the continued funding of small cooperative grants), the AC agrees with the spirit of this recommendation in its emphasis on a Foundation-wide vision, the need to foster new cooperative international activities, and the helpful role that small "travel grants" can play in the conduct of an international collaboration. We also agree with its recommendation that OISE and NSF as a whole work together to find means to continue funding such activities. We do not agree with the COV that the preferable solution is for small awards to be drawn from OISE's budget or processed by OISE staff. Methods for handling small awards should be worked out throughout NSF, as this should be an NSF-wide responsibility.

The COV recommends (Recommendation 20) that allocation of adequate funds for staff travel is important for the proper function of OISE. With the expansion of NSF's presence overseas, and with larger awards that call for expanded monitoring, this recommendation seems very appropriate. (Recommendation 8 also recommends periodic site visits for large grants and we wholeheartedly agree with this recommendation.)

We agree with the COV's concern (Recommendation 10) that the OISE discretionary budget needs to be shielded from demands for funding multilateral organizations.

We were pleased to learn from NSF Director Dr. Arden L. Bement, Jr. that efforts are underway to identify and select a new OISE director as early as late summer. This is in accord with Recommendation 24.

We recognize that action on these recommendations by OISE will demand increased resources in terms of staff and funding, and that OISE resources are limited. Dr. Bement has asked the Committee to assist in prioritizing the COV recommendations and categorizing them as to risk, return, and resources required. This task requires time and we propose to continue it at our next Committee meeting. However, we do have the following preliminary comments about the priorities and requirements in addition to those already made above:

1. Some of the recommendations can be adopted relatively quickly, with minimal resources required and minimal risk. Falling in this category are:
  - a. Recommendations 1 and 15 (informing international referees of NSF's review criteria)
  - b. Part of Recommendation 8 (routine review of final reports).
  - c. Part of Recommendation 19 (quantifying non-award activities) of OISE.
  - d. Recommendation 21 (that OISE disseminate information systematically about its evolving role and programs throughout NSF).
  - e. Recommendation 23 (that the OISE director be included in the NSF Assistant Directors meetings)
2. Several of the recommendations will require additional resources but we rate these as low risk and high reward, and having the potential of being implemented at some level with modest additional resources:
  - a. The part of Recommendation 8 that suggests periodic site visits for large

- grants calls for additional travel money, but even a modest addition of resources for staff travel should suffice to initiate this kind of program.
- b. Shielding OISE's discretionary budget from demands to cover obligations to multilateral organizations (Recommendation 10). The Committee feels that these multilateral organization activities are important, but recognizes that the resources required to implement them fully could be substantial. To the extent that additional resources are required for these obligations, the Committee feels that they should not come at the expense of OISE core program support.
  - c. Recommendation 22 (that OISE program officers consider adopting some of the best practices developed by program officers in managing large ongoing collaborative projects). Finding out about these best practices should not be very time-consuming or costly, but implementing them may involve costs.
  - d. Recommendation 17 about improving the dwell time will also require strategic planning.
  - e. The part of Recommendation 9 that suggests shortening the dwell time of proposals for fellowship awards.
  - f. The tracking recommendations (Recommendations 3, 11, 12, 13, 14) referred to earlier fall in this category.
3. Several of the recommendations represent important long-term goals to which we believe OISE is already committed, but which require strategic planning. The return will be high on all of these and the risk will be low, but substantial resources might be required. Strategic planning should help identify the resources needed to implement these recommendations. While some of the implementations can be done with modest cost or effort, most will require significant resources.
- a. Recommendations 2, 16, and 7 (increasing the number of minorities and women supported and capitalizing on opportunities provided by international collaborations with developing countries) and Recommendation 13 (maintaining a balance between junior/senior PI's, diversity, discipline, geographic distribution).
  - b. Recommendation 18, that OISE articulate in more detail the value and scope of the non-award activities to the rest of NSF, the scientific and engineering communities, and the U.S. government. Recommendation 19, which recommends quantifying and evaluating the non-award activities of OISE, is a preliminary step. While it may be difficult to quantify these activities, articulating them should take less resources and it is important that their value be recognized within the Foundation.
  - c. Recommendation 14 concerns OISE efforts to leverage funds from non-NSF sources (other governments, private foundations, individuals). This could be time-consuming, but carries a potentially high reward. Staff resources to support the leveraging efforts will be required.
  - d. Recommendation 9 suggests tracking future success of fellowship recipients, which is a good long-term goal and might be initiated in a modest way with limited resources. We concur with the recommendation that additional resources be allocated to increase the funding rate for this program.

In closing, we would like to recognize once more the progress made by OISE since the last COV review in revising its organization and programs to further NSF's interest in international science and engineering collaboration. We look forward to working with OISE to further refine its directions, taking advantage of the perspective provided by the COV recommendations.

Sincerely,

A handwritten signature in black ink, appearing to be 'FR' followed by a long horizontal flourish.

Fred S. Roberts  
Chair, Advisory Committee

Cc: Advisory Committee



**NATIONAL SCIENCE FOUNDATION**  
**4201 Wilson Boulevard, Arlington, Virginia 22230**

**Office of International Science and Engineering**

**MEMORANDUM**

Date: June 27, 2005

TO: Director, National Science Foundation

VIA: Acting Director  
Office of International Science and Engineering

FROM: Senior Program Manager  
Office of International Science and Engineering

RE: Demographics of the OISE Committee of Visitors

Information is provided about the composition of the Committee of Visitors that met on April 11-13, 2005 to review the activities of the Office of International Science and Engineering for the period FY 2002 through FY 2004.

Gender: 4 Male, 5 Female

Geographic Distribution: 4 East, 1 Southeast, 3 Midwest, 1 West

Minority Representation: 1 African-American, 1 Asian-American, 1 Hispanic

Institutions: 7 public (all undergraduate institutions), 1 private (with 2 Committee members, one of whom is on leave from a private corporation)

Recent NSF Awardees: 5

Number with No Support in Past Five Years: 4

A representative from the International Advisory Subcommittee was a member of the COV.

The introductory session included a conflicts briefing and review of confidentiality requirements by Fae Korsmo, Office of Integrative Activities. None attending had pending proposals at OISE during the period of time they were appointed and completed their assignments for the COV. The procedure for random selection of awards and declinations to be reviewed set aside proposals for which COV members were principal investigators. The selection did not include proposals for which COV members were reviewers. The selection did include some proposals that posed institutional conflicts of interest for COV members; they did not review those proposals.

Report of the Committee of Visitors  
National Science Foundation  
Office of International Science and Engineering

April 11-13, 2005

Contributing members :

Juan J. de Pablo, Chair  
Mostafa El-Sayed  
Vincy Fon  
Kenneth L. Kraemer  
Melanie Loots  
Sophia Perdikaris  
Mary Jane Saunders  
Caroline S. Wagner  
Daniel Wubah (Unable to participate in COV meeting)

Date of COV: April 11-13, 2005  
Office: Office of International Science and Engineering  
Directorate: NSF Office of the Director

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## **Introduction**

A Committee of nine Visitors (COV) was convened at the National Science Foundation during the period April 11-13, 2005 to assess the activities of the Office of International Science and Engineering (OISE). Membership of the COV is listed in the Appendix. Eight members were present for three days; one member, Daniel Wubah, was unable to participate in the meeting. The eight members who were present reviewed the final COV report. The COV was charged with reporting on the process by which decisions are made on proposals submitted to OISE; results of the OISE awards as they relate to NSF's current strategic goals and annual performance goals; response of OISE programs to recommendations of the previous COV; responsiveness of OISE programs and staff activities to international research and education needs and activities; and other issues that the COV feels are relevant to the review.

The Committee appreciated the hard work of the staff in preparing for the meeting, as well as their assistance during the meeting. We were particularly impressed by the extensive documentation provided on the highly functional, user-friendly web pages created for the COV. Dr. Kerri-Ann Jones, the former Director, provided a thorough orientation, and continued to provide information to the Committee throughout the visit. In spite of their ongoing transition to new programs and substantial workload, the staff, especially Senior Program Manager Pat Tsuchitani, provided invaluable assistance to the COV in producing information and data on demand in support of our deliberations.

## **Background**

The Office of International Science and Engineering (OISE) was created by the Director of the National Science Foundation in January 2002, from the Division of International Programs. Its primary responsibilities are to (1) serve as a visible focal point for international science and engineering activities; (2) promote the development of an integrated, Foundation-wide, international strategy; (3) manage international programs that are innovative, catalytic and responsive to the broad range of NSF interests. The Office Director is a member of NSF's Senior Management Integration Group (SMIG). The search for a permanent OISE Director is currently underway. It is anticipated that applicants will be interviewed in May 2005, and that a new head will be in place by the end of 2005.

OISE has a staff of about 38 and is organized into the Office of the Director, five geographic clusters, a trans-regional affairs section, overseas officers in Tokyo and Paris, and an Administrative Unit. A new office will soon be opened in Beijing, China. The FY 2005 annual budget for OISE was about \$34M, exclusive of pass-through funds for special programs.

Given the nature of its mission, OISE interacts strongly with most of the disciplinary Directorates within NSF. The magnitude and significance of these interactions varies. During the meeting, the COV had the opportunity to meet with program directors from several Directorates.

The COV found uniform recognition of the important role that OISE plays within the Foundation by non-OISE staff, as well as wide appreciation of the knowledge of international affairs in OISE, a role unique within NSF. OISE support for the international efforts of the Directorates as well as other offices and agencies of the US government is widely valued. OISE personnel frequently play enabling roles in the negotiation and execution of international activities and issues that arise in the Directorates. The value of these OISE activities is generally acknowledged to be far greater than is implied by the OISE budget.

**(A) Review of the Process by which Decisions are Made on Proposals Submitted to OISE**

The COV was provided by OISE with an Adjusted Stratified Random Sample of 300 jackets. The sample was “adjusted” in that the stratified random sample was altered to make it representative of the portfolio for the various regions. The sample was “stratified” in that the total universe of actions for 02, 03, and 04 was broken into strata (smaller groups), the number of elements (awards or declines) was counted for each of the smaller groups, and, depending on their size, random numbers were generated for each group to select however many proposals were desired. Initially 10 awards were pulled, three declines, and two withdrawals per geographic region. Subsequent adjustments were made. For example, it was decided by OISE not to include the withdrawals, and to include "dummy" jackets that represent awards made by other directorates to which OISE contributed funds.

The review team examined approximately 125 jackets out of the 300 provided by OISE, representing all types of proposals, a range of geographic regions, and both awards and declinations (within OISE). The proposals included cooperative research projects, co-funded projects, planning grants, workshops, postdoctoral fellowships, dissertation improvement awards, and undergraduate opportunities. The COV also looked at one proposal that might be considered a precursor to the new Partnerships for International Research and Education (PIRE), NSF 05-533. Finally, the COV reviewed multilateral organization awards and found that OISE has little real control over these awards, as they appear to be basically determined at higher levels within NSF or the federal government in response to international agreements.

The team was favorably impressed by the quality of the projects funded by OISE. The science appeared to be of high quality; the investigators had strong credentials; the international partners and sites were appropriate. Program officers are clearly skilled in evaluation, negotiation, and decision-making. OISE has encouraged the involvement of graduate or undergraduate students in funded projects. Awards varied from \$2,500 to slightly over \$1 million and from six months to five years.

OISE review of proposals nearly always involved consultation with staff in other directorates regarding the scientific or technical content of the project, as well as OISE assessment of foreign partners, and coordination and documentation of internal and external reviews. Reviews were conducted largely by mail rather than using panels; OISE past experience suggests that it is difficult to assemble panels with sufficient scientific and geographical breadth. Mail reviews were also solicited from scientists in other countries, including the countries where research was to be conducted.

*We recommend that OISE staff ensure that these international reviewers understand NSF's scientific merit and broader impact criteria. Letters to all referees should clearly state the additional criteria for review of international projects proposed for OISE funding.*

Discussion with OISE staff indicated that the review process often involved entrepreneurial efforts by staff to secure additional funding from other directorates in order to leverage OISE's funds. Approximately one-half of OISE's competitive awards are co-funded with other directorates, suggesting considerable leverage; however, we were not able to determine the leverage ratio, i.e., the ratio of OISE funds to other directorate funds across all awards. Decisions regarding proposals (award, decline) were usually well documented, justified and communicated. Correspondence with the other directorates indicates that OISE actively solicits input and information on priorities from the program officers.

The team was impressed by the attention of OISE staff in the review process to due process, fairness, quality, and distributional issues related to women, minorities, geographies, disciplines, and developing countries. EPSCoR status was also considered. Although OISE performed as well or better than NSF as a whole on some distributional issues,

*we recommend that OISE work to increase the number of minorities and women supported and capitalize on the opportunities provided by international collaborations with developing countries.*

While we were impressed by the ability of OISE IT staff to provide data on short notice in support of the COV process, our review indicates that *NSF’s Enterprise Information System (EIS) needs improvement, generally and for OISE in particular.* For OISE, there is need to track leverage statistics on co-funded projects, international activities embedded in the proposals of other directorates. For NSF generally, there is need to ensure that program officers and staff do a better job of coding information and that Fastlane be modified to adequately capture reviewer demographics.

Below, we provide brief answers to specific questions in the NSF COV template. These are followed by a section containing our recommendations.

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCEDURES	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE <sup>1</sup>
1. Is the review mechanism appropriate? (panels, ad hoc reviews, site visits) Comments: Small grants (less than 20K) should be reviewed internally. For large grants, site visits by the program manager should be considered.	Yes
2. Is the review process efficient and effective? Comments: Technical aspects of the reviews are sound and appropriate.	Yes
3. Are reviews consistent with priorities and criteria stated in the program’s solicitations, announcements, and guidelines? Comments: In general, yes. Some reviewers place emphasis on the technical aspect and underemphasize the international component in the collaborative research program.	Yes

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

<p>4. 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:</p>	<p>Yes</p>
<p>5. Do the panel summaries provide sufficient information for the principal investigator(s) to understand the basis for the panel recommendation? Comments:</p>	<p>Yes</p>
<p>6. Is the documentation for recommendations complete, and does the program officer provide sufficient information and justification for her/his recommendation? Comments:</p>	<p>Yes</p>
<p>7. Is the time to decision appropriate? Comments: On the average, two-thirds of the proposals are handled in less than six months. Approximately one-third is handled in six to nine months. Fellowship proposals are handled in an average of seven months. While this represents an improvement since the last COV review, means to further reduce dwell time of proposals should be explored.</p>	<p>Yes?</p>
<p>8. Discuss any issues identified by the COV concerning the quality and effectiveness of the program's use of merit review procedures:  Please see Recommendations.</p>	

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

<p><b>IMPLEMENTATION OF NSF MERIT REVIEW CRITERIA</b></p>	<p><b>YES, NO,</b></p>
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	DATA NOT AVAILABLE, or NOT APPLICABLE <sup>2</sup>
<p>1. Have the individual reviews (either mail or panel) addressed both merit review criteria?  Comments: The majority of reviews address both. See Recommendations for additional comments.</p>	Yes
<p>2. Have the panel summaries addressed both merit review criteria?  Comments:</p>	Yes
<p>3. Have the <i>review analyses</i> (Form 7s) addressed both merit review criteria?  Comments:</p>	Yes
<p>4. Discuss any issues the COV has identified with respect to implementation of NSF's merit review criteria.   See Recommendations.</p>	

**A.3 Questions concerning the selection of reviewers.**

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

<b>SELECTION OF REVIEWERS</b>	<b>YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE<sup>3</sup></b>
<p>1. Did the program make use of an adequate number of reviewers?  Comments: Small grants (&lt;\$20,000) should be internally reviewed.</p>	Yes
<p>2. Did the program make use of reviewers having appropriate expertise and/or qualifications?  Comments:</p>	Yes
<p>3. Did the program make appropriate use of reviewers to reflect balance among characteristics such as geography, type of institution, and underrepresented groups?  Comments:</p>	Data insufficient
<p>4. Did the program recognize and resolve conflicts of interest when appropriate?  Comments:</p>	Yes
<p>5. Discuss any issues the COV has identified relevant to selection of reviewers.  See recommendations.</p>	

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

**A.4 Questions concerning the resulting portfolio of awards under review.**

<p style="text-align: center;"><b>RESULTING PORTFOLIO OF AWARDS</b></p>	<p style="text-align: center;"><b>APPROPRIATE, NOT APPROPRIATE<sup>4</sup>, OR DATA NOT AVAILABLE</b></p>
<p>1. Overall quality of the research and/or education projects supported by the program. Comments:</p>	<p>Appropriate</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects? Comments:</p>	<p>Appropriate</p>
<p>3. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• High risk projects?</li> </ul> <p>Comments: See Recommendations.</p>	<p>Appropriate</p>
<p>4. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Multidisciplinary projects?</li> </ul> <p>Comments:</p>	<p>Appropriate</p>
<p>5. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Innovative projects?</li> </ul> <p>Comments:</p>	<p>Appropriate</p>
<p>6. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Funding for centers, groups and awards to individuals?</li> <li>•</li> </ul> <p>Comments: While currently balance appears to be fine, the change to partnerships might affect this in the future.</p>	<p>Appropriate</p>

<sup>4</sup> If “Not Appropriate” please explain why in the “Comments” section.

<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>Comments: While currently balance appears to be fine, the change to partnerships might affect this in the future.</p>	Appropriate
<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> <p>Comments:</p>	Appropriate
<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>	Appropriate
<p>10. Does the program portfolio have an appropriate balance of:</p> <ul style="list-style-type: none"> <li>• Projects that integrate research and education?</li> </ul> <p>Comments: Student participation at all levels is essential to the training of scientists. REU, IGERT projects are a good scientific investment.</p>	Appropriate
<p>11. Does the program portfolio have an appropriate balance:</p> <ul style="list-style-type: none"> <li>• Across disciplines and subdisciplines of the activity and of emerging opportunities?</li> </ul> <p>Comments:</p>	Appropriate
<p>12. Does the program portfolio have appropriate participation of underrepresented groups?</p> <p>Comments: Participation of women is below the NSF-wide average. Funding rate for minorities is marginally higher than the NSF wide average but not as high as would be expected due to the particular emphasis of the OISE program.</p>	Not Appropriate
<p>13. Is the program relevant to national priorities, agency mission, relevant fields and other customer needs? Include citations of relevant external reports.</p>	Appropriate

Comments:	
<p>14. Discuss any concerns relevant to the quality of the projects or the balance of the portfolio.</p> <p>No concerns. The committee was favorably impressed by the overall quality of the proposals funded.</p>	

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

<p>1. Management of the program.</p> <p>Comments:</p> <p>It has been a pleasure for this COV to see how the OISE is managed. We extend our thanks to the whole staff for their ceaseless efforts in ensuring that NSF dollars achieve the maximum impact on researchers involved in international research activities. Specific strengths in OISE practices include the following.</p> <ul style="list-style-type: none"> <li>• The COV is favorably impressed with OISE’s sound business practice in leveraging funds available by partnering with other parts of NSF as well as other international agencies. By their extensive diplomatic and scientific international network, OISE managers facilitate the US government business abroad. We urge continued expansion of this practice.</li> <li>• OISE has provided a strong service component for NSF’s international activities. Its role in serving on many interagency working groups is invaluable.</li> <li>• OISE makes good use of their advisory committee in its search for new leadership and in the evaluation of programmatic changes.</li> <li>• The use of temporary staff on fellowships from other organizations, such as AAAS, to supplement OISE staff should be applauded.</li> <li>• OISE web pages are informative and useful.</li> <li>• Proposal evaluations are of high quality. There are detailed and careful review analyses covering all topics.</li> </ul>	
<p>2. Responsiveness of the program to emerging research and education opportunities.</p> <p>Comments:</p> <p>OISE has positioned itself to impact positively the international scientific research communities by</p>	

creating innovative projects such as the new Partnership awards. Please see Recommendations.

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

Comments:

See Recommendations.

4. Additional concerns relevant to the management of the program.

See Recommendations.

### **(B) Results of the OISE awards as they Relate to NSF's Current Strategic Goals and Annual Performance Goals**

Below we provide selected examples from the OISE project portfolio, illustrating the results of awards as they relate to NSF goals.

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

REU Site at the European Laboratory for Particle Physics

Award Number: 0139604

PI: Homer Neal, University of Michigan

Research experiences for undergraduates at CERN, which was supported jointly by NSF and Ford Motor Company, provided opportunities for 11 students to train at one of the premier high-energy physics laboratories in the world. They engaged in a summer-long program that included functioning independently on a research project in a laboratory setting, learning from lectures and making scientific presentations. Students participating in the program were inclined to attend graduate school in a scientific field and to be more internationally oriented in their future research.

Preparing Undergraduates for the Global Workforce in Cyber infrastructure

Grant Number: 0407508

PI: Gabriele Wienhausen, UCSD

In cooperation with the Pacific Rim Undergraduate Experience Program, UCSD provided opportunities for 9 undergraduate students to participate in the development of computer code, building shared infrastructure for research across biological, chemical, environmental and engineering applications. Partners included Osaka University in Japan, the National Center for High-Performance Computing in Taiwan and Monash University in Australia. This experience enabled students to work in cross-cultural team environments that are important to developing a globally engaged technical workforce.

Pan-American Advanced Studies Institute on Green Chemistry

Award Number: 0221274

PI: Mary Kirchoff, American Chemical Society

Supported by an award from OISE and the Department of Energy (DOE), Dr. Mary Kirchoff of the Green Chemistry Institute of the American Chemical Society and Dr. Patrick Moyna of the National University of Uruguay in Montevideo, organized a Pan-American Advanced Studies Institute (PASI) at the University July 6-17, 2003. Graduate and post-doctoral students from Western Hemisphere countries engaged in ten intensive days of activities focusing on relevant topics not found in a typical chemistry curriculum. Leading experts in green chemistry held discussions on policy and economic factors driving green chemistry and conducted group problem-solving sessions and hands-on laboratory experiments. In the longer run, this PASI helped to establish a network of scientists throughout the Americas to promote green chemistry through their teaching, research, and industrial involvement. The opportunity for students from Mexico, Central America, and South America to participate in the Institute also allowed significant participation from Hispanic students, a group that has been traditionally underrepresented in the physical and biological sciences.

Synthesis of Novel Magnetic Nanoparticles

Award Number: 0207035

PI: Linda Harris (postdoctoral fellow)

Most current anticancer treatments destroy cancer cells by inhibiting growth or multiplication. In the process, healthy cells can be harmed and cause damaging side effects to cancer patients. Dr. Linda Harris, a synthetic polymer chemist from Virginia Tech and recipient of an International Research Fellowship Program (IRFP) award, is working with world-renowned scientists at the University of Western Australia to provide doctors and patients with a better alternative that could use advanced nanoparticles to deliver drugs directly to a cancerous tumor without harming other parts of the body. Their research is an interdisciplinary collaboration to specially prepare optimized iron oxide nanoparticles. Dr. Harris brings experience in polymers. Her colleague at the University of Western Australia, Tim St Pierre, studies the structure and magnetism of nanoscale iron oxides, particularly those found in biological systems. This multidisciplinary approach to this topic has enabled an unprecedented systematic investigation into the relationships between structure and magnetic properties of oxide nanoparticles.

Algal Biodiversity and Landscape Patterns in Tropical Streams

Award Number: 0202673

PI: Rebecca Bixby (postdoctoral fellow)

Dr. Rebecca J. Bixby, supported by OISE's International Research Fellowship Program (IRFP), has studied the biodiversity and landscape patterns of diatoms in lowland neotropical streams. These streams are located at La Selva Biological Station, in the lowlands of Costa Rica's northern Caribbean slope. Dr. Bixby, in collaboration with Costa Rican and American scientists and students, has collected over 800 diatom samples from these rainforest streams over a two-year period. Understanding the diversity and role of diatoms in streams is important to comprehending how rapid deforestation in the neotropics is affecting associated stream ecosystems.

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

Detrimental Effect of Climate Change on Fish Populations in East Africa

Award Number: 0223920

PI: Andrew Cohen, University of Arizona

The Nyanza Project has long been supported by NSF as a Research Experience for Undergraduates Site at the University of Arizona. This project not only offers valuable training opportunities for a new generation of cross-disciplinary and internationally-skilled young scientists, but the students' contributions have played a major role in developing these new insights into the impact of climate change. In collaboration with Tanzania's University of Dar es Salaam, U. S. researchers examined recent and historical records of air temperature, wind velocity and water temperature, estimates of aquatic plant growth derived from lake sediment cores, and recent historical fisheries records. They were able to rule out overfishing and conclude that higher surface water temperatures and lower wind velocities have decreased the amount of mixing of lake waters, decreasing the amount of nutrient-laden water to reach the surface and nourish aquatic plants. The reduced plant growth has, in turn, led to reductions in fish numbers. The results were reported in *Nature* (August 14, 2003).

Escape from European Soil Biota Promotes Exotic Plant Invasion in North America

Award Number: 0331964

PI: Ragan Callaway, University of Montana

The goal of Callaway's international research project with Romanian partner Alecu Diaconu of the Biological Research Institute, in Iasi, is to learn how certain invasive weeds change from minor components of their natural communities to overwhelming dominants in invaded communities. Recent findings, published in *Nature* (Vol. 427 19 February 2004), indicate that *C. maculosa* and soil microbes do participate in different plant-soil feed back processes outside *Centaurea's* home range. In native European soils, *C. maculosa* cultivates soil biota with increasingly negative effects on the weed's growth, possibly leading to its control. But in soils from North America, *Centaurea mauclosa* cultivates soil biota with increasingly positive effects on itself, which may contribute to the success of this exotic species in North America. This research may lead to the

formulation of a new theory on the organization of natural ecological communities and how they are invaded by exotic species. This new knowledge may facilitate development of novel and practical weed management practices for controlling knapweed invasions.

**B.3 OUTCOME GOAL for TOOLS: Providing “broadly accessible, state-of-the-art S&E facilities, tools and other infrastructure that enable discovery, learning and innovation.”**

Little GLORIAD

PI: Greg Cole, University of Illinois

Award Number: 0196478

Cole and co-workers have linked up the first global-ring network for advanced science and education (Little GLORIAD) between the U. S., Russia and China. This network marks a significant development in academic cooperation among the three countries. OISE played an important coordinating role between Illinois, the Chinese Academy of Sciences, and Russia’s Kurchatov Institute. This first global-ring network will provide both increased reliability and flexibility for researchers from the three countries as they address scientific issues including joint responses to natural and man-made disasters, better understanding of the human genome, distributed monitoring of seismic events, and environmental studies and simulations.

New Wireless Sensor Network for Studying Lake Metabolism

PI: Peter Arzberger, University of California-San Diego and Stephen Carpenter, University of Wisconsin

Award Numbers: 0314015 and 0217533

A U.S. team worked with researchers in Taiwan to study lake metabolism. This is the first-of-its-kind project using intercontinental wireless connectivity to field sensors on two sides of the Pacific Ocean. Scientists were involved from the following institutions:

- LTER North Temperate Lakes Site (NTL)
- University of California San Diego (UCSD)
- San Diego Supercomputer Center (SDSC)
- Taiwan Forestry Research Institute (TFRI)
- Taiwan National Center for High-Performance Computing (NCHC) and
- Academia Sinica (AS)

They joined forces to put instruments in several lakes at the NTL site in Wisconsin and Yuan-Yang Lake in Taiwan. Wireless sensors and cyberinfrastructure enable measurements of gross primary production, respiration, and net ecosystem production in the remote lake. Wireless communication with the buoys from anywhere in the world with Internet access is a prominent part of the research.

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

Below we offer several examples of OISE leadership in implementation of best organizational practices.

#### Japan: Sharing Program Officer Best Practices

The Japan Science and Technology Agency (JST), in response to a Japanese government-wide initiative to introduce a “program officer” system into the management of competitive grant awards, developed a seminar project to bring the experiences of foreign counterpart funding organizations to the Japanese government and academic communities. The National Science Foundation Tokyo Regional Office was engaged by JST to assist in its “First Program Officer Seminar,” convened on September 21-22, 2004. The Seminar was supported financially by Special Coordination Funds for Promoting Science and Technology provided by the Japanese Ministry of Education, Culture, Sports, Science and Technology, under which JST is organized.

#### European Commission (EC) – Building Collaborations across NSF

The EC develops its programmatic investments through its Framework Programs. These are five-year strategic and programmatic documents, which spell out activities, budgets, and procedures. In its recent Framework programs and as a result of the EU-US Science and Technology Agreement, the EC has been expanding its programs in research and development and the opportunities for the participation of non-European researchers. Prior to these changes, NSF had not had a working relationship with the EC because its programs had been closed to cooperation with countries outside the European Union. Now with an annual budget of about 5 billion Euros or research and development, EC programs constitute an important investment opportunity for NSF to leverage for US researchers.

For several years, OISE has been working to develop collaborative programs with the EC. These efforts have been made in partnership with the NSF research directorates and have evolved over time. OISE staff facilitated the early efforts of the Division of Materials Research by identifying appropriate programs and counterpart managers at the EC, coordinating contacts with the EC in developing workshops to explore topics for cooperation, and attending planning meetings at NSF and in Brussels to develop mechanisms for collaboration. These include: implementing arrangements, Dear Colleague letters, and appropriate procedures for addressing intellectual property rights.

Based on its earlier experiences and models, the Foundation subsequently developed an arrangement between the EC’s Environment Directorate and five NSF organizations – the Biosciences and Geosciences directorates, the Office of Polar Programs, earthquake engineering activities, and OISE. Participants from both sides, including OISE, meet once or twice a year to discuss common activities and potential areas for collaboration. Collaborative efforts have now expanded to include the interests of several other NSF groups (CISE and SBE) and their counterparts in the EC.

In the past year, the EC's Directorate for Science and Society has begun funding activities to foster the development of research careers. Through OISE staff's knowledge of the Commission and of NSF, OISE brought EC and NSF staff together to develop cooperation in this area. They will initiate a series of joint workshops to explore collaboration in May 2005.

#### China: Establishing the NSF Beijing Office

Based on the growth of China's science and engineering capabilities and on the increasing ties and interactions between China and the United States in science and engineering, the Foundation decided in late 2002 to begin the process of establishing an office in Beijing. This office would be the third overseas office of the Foundation, with the two others being located in Tokyo and Paris.

#### Partnering with USAID to Enhance NSF Awards in Developing Countries

This effort addresses an OISE goal derived from the 2001 National Science Board Report, "Toward a More Effective Role for the U.S. Government in International Science and Engineering", i.e., to build partnerships with private foundations, other USG agencies, and/or international organizations to leverage NSF funding to enable high quality, collaborative research in developing countries.

Early in FY 2003 OISE assembled a team to address how NSF could fund more research in developing countries, ensuring that those projects were strong and sustainable when the host country often had little or no funding to support salaries, equipment, or students on the foreign side. The group identified USAID (U.S. Agency for International Development) as a strong potential partner with whom NSF has worked in the past, sometimes with considerable success, other times not.

In almost a dozen meetings between NSF and USAID, OISE staff have established a collegial relationship with USAID staff, working primarily with the Higher Education Group in the Global Bureau. Several USAID staff also participated in OISE's recent Africa PI meeting, as well as in the IT meeting that followed. These meetings, which enabled a rich exchange of information on the culture of the two agencies (i.e., goals, activities, funding mechanisms), identified many areas of potential interaction. However, there was consensus that successful interagency cooperation depends on developing efficient mechanisms for finding and co-funding complementary projects.

#### **(C) Other Topics**

Below we have included the portion of the template dealing with comments on other topics.

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

See Recommendations.

**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.**

See Recommendations.

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

See Recommendations.

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

See Recommendations.

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

#### **D. Recommendations on Other Relevant Issues**

The COV offers the following additional recommendations on 1) OISE mission, 2) international programmatic aspects, 3) other OISE non-award activities; and 4) communications and OISE leadership within NSF.

##### **1. OISE Mission**

International collaboration in science and engineering is an increasingly important component of knowledge creation. International links among researchers form a growing share of all activities, as demonstrated by National Science Board data. International science is funded by all parts of the National Science Foundation, but only the OISE has international research, collaboration and expertise as its core activity. As such, its mandate involves service to the agency, as well as program responsibilities. This creates an unusual set of requirements for both the Office and the staff. Many of the contributions of the OISE cannot be measured using the same criteria applied in other NSF offices and divisions. The COV is pleased to see OISE assuming a higher profile within the agency, and endorses this. In addition, the value of OISE should be highlighted and promoted as a key resource. As international activities play an increasingly important role within NSF, we encourage the OISE to take a leadership role in determining strategy and action for the direction of international science and engineering as it serves both the agency and the larger interests of the United States, consistent with the mission of NSF.

*The COV recommends that OISE develop a mission statement and action plan that recognizes the increasingly international character of knowledge creation*

*and research activities. The action plan should be articulated throughout NSF and to the scientific and engineering community.*

The importance and relevance of international interactions is greater than ever before. The pool of outstanding foreign students and visitors that have built the US scientific and engineering enterprise is shrinking dramatically, largely as a result of successful efforts by others (e.g. the European Union) to recruit from that same pool. This problem is exacerbated by issues related to difficulties in obtaining visas.

*OISE needs to be proactive in maintaining US international presence and leadership. OISE should identify centers of scientific and engineering excellence abroad and establish or strengthen connections. Creative mechanisms for redirecting scientific talent to the US should be developed.*

## **2. International Programmatic Aspects of OISE Mission**

**Cooperative Grants.** The cooperative grants provide a valued source of funding for junior scientists seeking to establish international collaborations and set the groundwork necessary for initial data collection necessary for formulating large grants. Over the last three years, according to NSF, seed investments have led to subsequent funding; for example the “New Wireless Sensor Network for Studying Metabolism” award (Award Numbers: 0314015 and 0217533), led to a grant from the Gordon and Betty Moore Foundation of \$1.76 million to further the research and development of this global cyber network.

Other OISE grantees have begun with small grants and progressed to larger NSF grants (that have been co-funded by OISE and other directorates). This has dramatically enhanced the research climate in various third world institutions, while producing internationally recognized scientific results. For example, Regents professor Steven Manson from Georgia State University (Award Number 0138115) was honored by the American Physical Society with the John Wheatley Award, 2005 for contributions to the development of physics in countries of the Third World. Projects such as the “Exotic sp<sup>2</sup> Carbon Systems” (Award Number 0096097), a collaboration between Professor Peter Eklund of the University of Kentucky, Professor Mildred Dresselhaus of the Massachusetts Institute of Technology, and collaborators led by Professor Toshiaki Enoki of the Tokyo Institute of Technology in Japan, has resulted in over 100 papers published in refereed journals, conference proceedings, and numerous invited talks.

Small grants have been the core of OISE activities and have served to connect OISE with other directorates. In order to launch the new PIRE program, the COV understands that OISE chose to reduce its support for small cooperative awards, seed funding and cross-funding to other directorates. The COV believes strongly in the importance of these smaller awards in fostering “international research experiences early in their careers” for future U. S. scientists, in facilitating or embarking on emerging opportunities, and in supporting the scientific community across a wide range of disciplines. Responsibility for

these smaller grants is now shifting to the other directorates. These grant activities should not be allowed to wane without attention.

*During this period of transition, OISE staff must work to educate the rest of NSF about the need to identify and continue to fund these opportunities. As OISE shifts its focus to a smaller number of larger awards, it must develop an action plan to promote its stated mission of “a foundation-wide vision of international research and education” within other NSF directorates. We urge that both OISE and NSF as a whole work together to find means to continue funding of these small awards, preferably via OISE, given its regional connections, expertise and stated mission of funding junior investigators.*

**PIRE Program.** The COV saw clear evidence of leadership in the transformation of the mode of operation of the OISE. New high-risk programs such as the Partnerships for International Research and Education (PIRE, NSF 05-533) have the potential to generate interesting results. The transition to larger and longer grants, however, represents a bold step whose outcome is uncertain. It is likely that this new program will indirectly impact funding of projects that do not fit under the umbrella of a “large partnership.”

*During this transition in the OISE Program, we recommend that the partnerships with developing countries be preserved and expanded as an integral part of the structure of the program and allocation of funds.*

*Evaluation of the program would be facilitated by routine requirement of final reports and follow up with the PI regarding post-award progress. We recommend that annual reports and periodic site visits be required for large grants.*

**International Research Fellowships.** The committee was impressed by the quality of proposals funded by the International Research Fellowship Program, NSF 02-149. Pre- and post-award communication with fellows is outstanding. The re-entry provision was viewed favorably by the COV. While anecdotal evidence indicates that the Fellows program is particularly successful, we did find some minor problems. The highly qualified applicant pool increased significantly in 2004.

*The COV recommends that a system of tracking the future success of fellowship recipients be developed. We encourage OISE to seek mechanisms to shorten the dwell time. OISE should consider allocating and seeking additional resources to preserve and increase the funding rate for this program.*

**Multilateral Activities.** A significant fraction of OISE resources (almost 1/3 of the budget) is devoted to mandates or mandated dues for membership in multilateral organizations. This should be widely recognized.

*The COV encourages NSF leadership to shield the OISE discretionary budget from these demands to the extent possible.*

**Award/ Review and Metrics.** Awards are distributed in response to proposal pressure. Data are collected, but additional information is needed for effective international program tracking and monitoring. This information would allow NSF to identify needs and opportunities that might be hidden in the statistics that are now collected, and would be useful in guiding future decision making. OISE should be proactive in funding and reporting on partnerships with developing countries. While we were favorably impressed by the ability of OISE IT staff to provide data on short notice in support of the COV process, our review indicates that NSF's Enterprise Information System (EIS) needs improvement, generally and for OISE in particular. To improve tracking and monitoring, we make the following recommendations:

*OISE should identify the extent to which OISE is leveraging co-funding and the extent that international activities embedded in the proposals of other directorates.*

*NSF in general should ensure that program officers and staff do a better job of coding information and that Fastlane be modified to adequately capture reviewer demographics.*

*OISE should continue to maintain a balance between junior/senior PI's, diversity, discipline and geographic distribution. We recommend that awards be tracked according to discipline, geographic location and type of award.*

*OISE efforts to leverage funds from non-NSF sources to support collaboration with developing countries should continue and expand (this should include other governments, private foundations and individuals). The success of such efforts should be tracked and evaluated.*

**Letter Review Process.** Mail reviews were solicited from scientists in other countries, including the countries where research was to be conducted. The team was impressed by the attention of OISE staff in the review process to due process, fairness, quality and distributional issues related to women, minorities, geographies, disciplines and developing countries. However, in some places, this process could be improved

*The COV recommends that OISE staff ensure these international reviewers understand NSF's scientific merit and broader impact criteria. Letters to all referees should clearly state the additional criteria for review of international projects proposed for OISE funding.*

*The COV recommends that OISE work to increase the number of minorities and women supported and capitalize on the opportunities provided by international collaborations with developing countries.*

*The dwell time should be improved.*

### **3. Other OISE Non-Award Activities**

The knowledge, experience, and cooperation of OISE staff is highly valued by other Directorate staff and the US government. This was apparent in discussions with other NSF (non-OISE) staff. This knowledge is crucial for the US scientific role in the global society. OISE staff spend half of their time on non-award activities that are highly valued. *The office should articulate in more detail the value and scope of these activities to the rest of NSF, the scientific and engineering community, and the US government.* One of the unique characteristics of OISE is the knowledge and regional expertise of the staff. Keeping up to date with changes and trends requires proactive involvement, and personal interaction with both scientists and government representatives in specific regions.

*The COV recommends that these activities be quantified and evaluated since they are such a large and important part of the work of OISE.*

*Allocation of adequate funds for travel is important to the proper function of OISE.*

### **4. Communications and OISE Leadership**

Discussions with other NSF (non-OISE) staff suggest that communication between OISE and other parts of NSF has at times been ineffective. OISE has not clearly communicated the new vision, plans and changes in function of this office. While the COV recognizes that communication is a two-way enterprise, this needs improvement.

*OISE should make efforts to disseminate information systematically on its evolving role and programs throughout NSF.*

OISE's transition to management of a small number of large awards creates a need for new ongoing relationships between program officers and PI's.

*The COV recommends that OISE Program Officers consider adopting some of the best practices developed by Program Officers with experience in managing large ongoing collaborative projects (such as the MRSEC's).*

*The COV recommends that the OISE director be included in the NSF Assistant Directors' Meeting to facilitate needed communication with the rest of NSF and participation in priority setting and budgetary discussions.*

The OISE requires an experienced, highly skilled, visible director to lead its efforts during a time of administrative and functional transition.

*It is important that all efforts be made to identify and select a new director in a timely manner.*

## APPENDIX

### Office of International Science and Engineering (OISE) 2005 Committee of Visitors

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