

CORE QUESTIONS and REPORT TEMPLATE

FY 2018 NSF COMMITTEE OF VISITOR (COV) REVIEW

Date of COV: December 4 – 6, 2017
Program/Cluster/Section:
Office: Office of International Science and Engineering
Directorate: Office of the Director
Number of actions reviewed: Awards: 25 Declinations: 11 Other: 12
Total number of actions within Program/Cluster/Division during period under review: Awards: 2,489 Declinations: 856 Other: 618, including co-funds
Manner in which reviewed actions were selected: The sample of proposal actions was selected by OISE staff in consultation with the COV chair using a stratified random process based on active programs, proposal action, and other relevant variables.

COV Membership

	Name	Affiliation
COV Chair	Anne Petersen	University of Michigan
COV Members:	Pius J. Egbelu	Martin Tuchman School of Management New Jersey Institute of Technology (NJIT)
	W. Lance Haworth	Retired NSF, Self-employed
	Steven W. McLaughlin	Georgia Institute of Technology
	Barbara M. Olds	Colorado School of Mines (Retired)
	Melanie Loots	University of Illinois at Urbana-Champaign

MERIT REVIEW CRITERIA

An understanding of NSF's merit review criteria is important in order to answer some of the questions on the template. Reproduced below is the information provided to proposers in the Grant Proposal Guide about the merit review criteria and the principles associated with them. Also included is a description of some examples of broader impacts, provided by the National Science Board

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities. These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. ([GPG Chapter II.C.2.d.\(i\)](#) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including [GPG Chapter II.C.2.d.\(i\)](#), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to:
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

3. Examples of Broader Impacts

The National Science Board described some examples of broader impacts of research, beyond the intrinsic importance of advancing knowledge.¹ “These outcomes include (but are not limited to) increased participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education at all levels; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a globally competitive STEM workforce; increased partnerships between academia, industry, and others; increased national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Investigators may include appropriate outcomes not covered by these examples.”

¹ NSB-MR-11-22

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, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

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

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments The COV reviewed the two programs currently supported by OISE: IRES and PIRE</p> <p>The review methods for proposals consisted of external and panel reviews. Reviews were appropriate, with anywhere from 3-5 reviewers in advance of the panel. Reviews were thoroughly handled and evaluated – and feedback to the PIs was overall very good, consistently enumerating strengths and weaknesses in the panel summaries.</p> <p>Data Source: Jackets</p>	<p>YES</p>
<p>2. Are both merit review criteria addressed</p> <p style="padding-left: 20px;">a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses?</p> <p>Comments:</p> <p>The internal, ad-hoc, and panel summaries usually but not always addressed both merit review criteria. Some of the older panel summaries or program officer summaries were short but the more recent summaries were complete (This was a recommendation from the 2014 COV, and things have improved since that review.)</p>	<p>YES YES YES</p>

<p>The COV noted that some individual reviews (around 3-5%) did not address both criteria. The COV appreciated the format of many of the reviews, which identified and included strengths and weaknesses in both criteria.</p> <p>The COV observed that broader impacts were unevenly addressed in both the reviews and the review analysis. Ongoing guidance to both PIs and panelists on broader impacts is always needed, namely what constitutes broader impact and how to assess it.</p> <p>Most of the Program Officer reviews were very thorough, informative and thoughtful. The COV commends the PO's for the consistency and thoroughness of the review analyses.</p> <p>Data Source: Jackets</p>	
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<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Comments:</p> <p>The individual reviews were thorough and substantive. A small percentage (well under 10%) of the individual reviews for IRES and PIRE were not as substantive as they might have been. PIs rely on feedback to improve their proposals so PO efforts play an important role in increasing proposal quality. The COV recognizes the constraints OISE faces with limited staff resources. Overall, the reviews were good, and many were outstanding.</p> <p>Data Source: Jackets</p>	<p>YES</p>
<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p> <p>For PIRE the panel summaries were generally thorough and very detailed. The COV felt that they were significantly improved from the previous review.</p>	<p>YES</p>

<p>For IRES, most summaries included clear rationales and documentation. A small number of panel summaries and analyses did not make a clear recommendation regarding funding.</p> <p>Data Source: Jackets</p>	
<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>[Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.]</p> <p>Comments:</p> <p>Overall the jacket provides a good rationale for the final decision.</p> <p>For PIRE, situations frequently arose where there was communication needed between the PO and the PI. In most of the situations where an issue arose that might be resolvable by communication between the PO and PI, those issues were handled very well. However, there was at least one situation where the proposal appeared to be declined based on an issue that may have easily been resolved through such a communication. The COV found no evidence in the jacket that such communication took place.</p> <p>For IRES the rationale for the decision was almost always clear. There were a few panel summaries that did not include a clear funding recommendation.</p> <p>Finally, the terminology regarding funding recommendations from panel review varied across panels and programs (e.g., “highly recommend” vs “fund”, “fund if possible”, etc.).</p> <p>Data Source: Jackets</p>	<p>YES</p>
<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>[Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.]</p> <p>Comments:</p> <p>See previous comments. Documentation to the PI usually includes context statement, individual reviews, panel summary, and explanation from the program officer of the basis for a decision. In the case of PIREs, the report to the PI detailed the strengths and weaknesses, and for the most part, were thorough and complete.</p>	<p>YES</p>

Data Source: Jackets	
<p>7. Additional comments on the quality and effectiveness of the program's use of merit review process:</p> <p>Overall, the COV felt the jackets met the standard of quality and effectiveness required by the merit review process.</p>	

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

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE OR NOT APPLICABLE
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>The COV felt that the reviewers had appropriate expertise in the field of their assigned proposals, and therefore were highly qualified to conduct the reviews that they were assigned.</p> <p>Data Source: Jackets</p>	YES
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments: none</p> <p>Data Source: Jackets</p>	YES
<p>3. Additional comments on reviewer selection: none</p>	

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

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

OISE has managed its program well. It is noteworthy in this regard that OISE has successfully streamlined its portfolio in order to optimize the use of its budget and staff resources. (see question 3 below)

We applaud the recent RFI soliciting ideas for research to be funded by the new AccelNet program. This can serve as a precedent for future efforts to seek input and ideas for OISE programs from the research community.

In general, the COV found that OISE programs follow appropriate practices for soliciting proposals. These include Dear Colleague Letters (DCLs) and standard solicitations. The COV encourages OISE to continue its use of diverse solicitation methods to reach the diverse pool of potential PIs.

The PIRE evaluation found that PIRE appeared to increase graduate student productivity, but was not helpful in developing future strategies.

It is advisable to impose a budget limit on PIRE. The average PIRE grant size has already increased significantly. Given pervasive experience that demand for valued resources will increase continually, it is essential to set reasonable limits on these grant resources. In addition, the COV is concerned about detrimental effects on the IRES and AccelNet programs.

The COV was pleased to note that an evaluation of the IRES program is planned in 2018. This evaluation should be constructed to provide useful information to guide future development of the new program. This requires clear and well-designed evaluation questions addressing goals of the program.

The COV encourages OISE to take advantage of the evaluation and assessment capability (EAC) in NSF's Office of Integrative Activities (OIA). In addition, the committee was pleased to hear that OISE has planned a foresight and analysis project, building on analytics work by Paul Morris in OIA and the *Dimensions of Funding* software and aimed at analyzing NSF's international engagement and its impact, as well as the contributions of programs funded by partner agencies in other countries. The data that result from these efforts can be used by Libby Lyons' inter-agency team to understand US-international collaborations and increase their strategic impact.

Proposal dwell time was generally acceptable, except during 2016.

Recommendation #1. Total funding for each PIRE project should be capped at \$5 million over five years.

Recommendation #2. The pending IRES evaluation should include clear and well-designed questions in order to gather useful information to guide future development of the program.

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

Comments:

AccelNet is an excellent example of OISE's outreach to the community and its intention to use this feedback in developing a new program. We hope that OISE will both utilize a strategic framework and incorporate community input.

The COV urges OISE to fund a review of evaluations of the many international undergraduate opportunities that already exist, especially in STEM fields, and to determine how to both complement and leverage successful international undergraduate programs.

Prior to the upcoming IRES evaluation, the COV hopes that OISE will articulate a clear goal for the IRES program. Does IRES aim to create future global scientists? If so, programs should be evaluated with that goal in mind. For example, one hypothesis is that undergraduate opportunities create an appetite for STEM-oriented international engagement while graduate opportunities are more influential in developing globally engaged scientists. The COV encourages data collection and analysis, so that student programs can be focused appropriately.

Recommendation # 3. OISE should review evaluations of the many existing international undergraduate research opportunities, and determine how to both complement and leverage these.

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

Comments:

The early action by NSF Director Córdova to restore ISE as an independent office within the Office of the Director has provided a sound foundation for OISE program planning and prioritization.

In response to the 2014 COV recommendations, the new permanent office head, Rebecca Keiser, worked with OISE staff to develop a strategic plan. Under this plan, OISE carried out a well-designed process to streamline and reorient its programs, resulting in a portfolio of well-defined programs that invest in research that is inherently international and support the engagement of students.

The COV believes that OISE has successfully addressed the concerns expressed by the 2014 COV through its strategic plan and other actions. The COV recognizes the thoughtful and challenging work that this achievement represents.

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

Comments:

The COV reviewed the *Updated Response to the 2014 COV for International Science and Engineering*. The COV's assessment is that OISE has successfully implemented the first five recommendations.

Recommendation #6 from the 2014 COV for staffing increase has not been implemented. The COV observed that staff reduction over the last ten years has been excessive.

Recommendation #7 from the 2014 COV is in progress. Efforts to increase OISE foresight and analytics capabilities should be included in this goal.

Recommendation #4. The COV urges that staffing be augmented to support analysis and planning, as well as to meet the need to support NSF’s diplomatic mission.

Recommendation #5. Recommendation #7 from the 2014 COV should be incorporated into OISE efforts to increase its foresight and analytics capabilities.

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

<p style="text-align: center;">RESULTING PORTFOLIO OF AWARDS</p>	<p style="text-align: center;">APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</p>
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?</p> <p>Comments: Summary data for IRES awards across disciplines were provided for 44 awards. Data provided for PIRE include 49 awards.</p> <p>From the samples provided, the range of disciplines involved appears to be quite broad. IRES awards included 16 MPS (materials and math), 9 BIO, 9 ENG, 10 all other NSF major disciplines (directorates) including “multi”. The balance appears somewhat skewed towards MPS, BIO and ENG.</p> <p>PIRE awards: 8 ENG, 6 BIO, 5 “civil”, 4 “enviro”, 3 “physics, 23 others across 20 (sic) categories. For 'other', for the most part, awards are not sorted by NSF disciplinary categories, but the disciplinary range appears to be broad and reasonably well balanced.</p> <p>Balancing programmatic and “service” activities continues to be a major challenge for OISE staff, exacerbated by the reduction in FTE slots that occurred prior to the recent reorganization of the Office.</p> <p>Data Source: EIS/Committee of Visitors Module. From the Report View drop-down, select the Funding Rate module to see counts of proposals and awards for programs. The Proposal Count by Type Report View will also provide a summary of proposals by program.</p>	<p>YES</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments: Award size and duration are generally ~\$600K-\$1M per year for 5 years for PIRE, and ~\$50-\$75k per year for up to 3 years for IRES. Award size and duration are appropriate for each program. PIRE award sizes have</p>	<p>YES</p>

<p>been increasing since the award limit was removed. The COV recommends that PIRE awards be capped at \$5M for 5 years (See Recommendation # 1).</p> <p>Data Source: EIS/Committee of Visitors Module. From the Report View drop-down, select Average Award Size and Duration.</p>	
<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments: The COV finds that many PIRE awards are innovative and some are potentially transformative. IRES awards are frequently innovative.</p> <p>Data Source: Jackets</p>	YES
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments: Interdisciplinary and multidisciplinary research is a central feature of many PIRE awards. The project descriptions and list of participating investigators in the sample PIRE jackets reviewed by the COV frequently reveal a wide range of participating disciplines and a correspondingly broad, interdisciplinary/multidisciplinary team approach to complex research problems.</p> <p>Data Source: If co-funding is a desired proxy for measuring inter- and multi-disciplinary projects, the Co-Funding from Contributing Orgs and Co-Funding Contributed to Recipient Orgs reports can be obtained using the EIS/Committee of Visitors Module. They are available as selections on the Report View drop-down.</p>	YES
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments: Summary data for the geographical distribution of IRES awards were only provided for 24 awards in the random sample. This may not be enough to accurately assess the geographical balance of awards across the full portfolio. It would be helpful for the COV to have access to summary data for all IRES awards</p> <p>From the samples provided: 24 IRES awards involve research experience in a total of 16 distinct nations, and the geographical distribution is broad. At most 3 awards involve the same country (The Netherlands). However, IRES awards for research experience in Europe (14/24) do predominate.</p> <p>Awards are broadly distributed geographically across eligible US jurisdictions. IRES awards from 2014-2017 went to PIs in 41 states and the territory of Puerto Rico. The 32 PIRE awards in 2014 and 2017 were made to PIs in 25 states and Puerto Rico.</p> <p>Data Source: EIS/Committee of Visitors Module. Select Proposals by State from the Report View drop-down.</p>	YES.

<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments :</p> <p>The COV believes that both IRES and PIRE have an appropriate balance of awards to different types of institutions. The COV found that awards are made to a broad variety of institutional types in reviewing the portfolio sample. The preponderance of proposals in both programs in the stratified random sample reviewed by the COV was from state PhD granting institutions. Thirteen percent of the IRES awards and 18 percent of the PIRE awards were made to minority serving institutions (MSI) and 26 percent of IRES and 15 percent of PIRE awards were to PIs in EPSCOR states. The COV encourages OISE to continue to support a variety of institutional types in its programs.</p> <p>Data Source: EIS/Committee of Visitors Module. Select Proposals by Institution Type from the Report View drop-down. Also, the Obligations by Institution Type will provide information on the funding to institutions by type.</p>	<p>YES</p>
<p>7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators?</p> <p>Comments:</p> <p>There are a number of new PI's in both the PIRE and the IRES portfolios (8 percent in PIRE and 24 percent in IRES). In addition, there are a number of investigators with new involvement in the projects (51 percent in PIRE and 43 percent in IRES). Because of the larger size of the PIRE grants, the COV expected to see a higher percentage of new investigators in the IRES program relative to the PIRE program, and this expectation was confirmed.</p> <p>NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award.</p> <p>Data Source: EIS/Committee of Visitors Module. Select Funding Rate from the Report View drop-down. After this report is run, use the Category Filter button to select New PI for the PI Status filter or New Involvement (PIs & coPIs) = Yes.</p>	<p>YES</p>
<p>8. Does the program portfolio include projects that integrate research and education?</p>	<p>YES</p>

<p>Comments: Both programs that the COV evaluated require both research and education components. The COV found that successful proposals included in the stratified random sample included both elements. Both the IRES and PIRE solicitations include specific language related to the integration of research and education.</p> <p>From the current IRES solicitation: “IRES focuses on active research participation by undergraduate or graduate students in high quality international research, education and professional development experiences in NSF-funded research areas”</p> <p>From the most recent PIRE solicitation: “The primary goal of PIRE is to support high quality projects in which advances in research and education could not occur without international collaboration. PIRE seeks to catalyze a higher level of international engagement in the U.S. science and engineering community.”</p> <p>Data Source: Jackets</p>	
<p>9. Does the program portfolio have appropriate participation of underrepresented groups²?</p> <p>Comments: Both PIRE and IRES support a number of women and minority participants. IRES has 17 percent minority and 50 percent women participation, and PIRE has 28 percent minority and 75 percent women involvement. The COV commends OISE for the diversity represented in its funded projects and encourages OISE to continue to support a diverse community of participants.</p> <p>Data Source: EIS/Committee of Visitors Module. Select Funding Rate from the Report View drop-down. After this report is run, use the Category Filter button to select Women Involvement = Yes or Minority Involvement = Yes to apply the appropriate filters.</p>	YES
<p>10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.</p> <p>Comments: Science and engineering are inherently international and thus programs that support international partnerships and give students international research experience are vital. The OISE program is highly relevant to many national priorities, including for example, international competitiveness, workforce development, mitigation of natural risks, energy independence.</p>	YES

² NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

From August 17, 2017 Memorandum for the Heads of Executive Departments and Agencies from OMB and OSTP
Subject: FY 2019 Administration research and Development Budget Priorities (this is an excerpt)

Developing a Future-Focused Workforce

The Administration is committed to improving the technical training of the American workforce through Science, Technology, Engineering, and Math (STEM) education and apprenticeships. Emerging technologies will present tremendous opportunities for new job creation, but will also require a technically skilled and capable workforce to meet demand. In order to maintain American competitiveness and help ensure that the domestic workforce is available and qualified for the jobs of the future, agencies should incorporate STEM education, including computer science education, and workforce training opportunities into their programs. Agencies should give priority to policies and actions that place an emphasis on expanding the STEM workforce to include all Americans, both urban and rural, and including women and other underrepresented groups in STEM fields. In order to track improvements in these areas, agencies should develop quantitative methods or metrics and collect data to analyze the effectiveness of the STEM programs.

How OISE ties into agency mission (from NSF Strategic Plan 2014-2018).

At stake is the competitive strength of the Nation in the coming decades. NSF is not alone in this view. Many authoritative and diverse accounts of the increasing need to meet global challenges to U.S. economic and scientific leadership have drawn attention to the importance of continuing to invest in science that will yield new knowledge and improve the human condition.

The new OISE strategic plan fits well with the NSF strategic plan, Big Ideas, and other relevant plans. There has been a pervasive call for a globally-competent workforce.

National Academies of Science, Engineering, and Medicine (NASEM) reports (examples).

Developing a National STEM Workforce Strategy.

<https://www.nap.edu/read/21900/chapter/1>

Strategic Engagement in Global S&T: Opportunities for Defense Research.

<https://www.nap.edu/read/18816/chapter/1>

US and International Perspectives on Global Science Policy and Science Diplomacy. <https://www.nap.edu/read/13300/chapter/1>

Other report examples:

US Chamber of Commerce, *A National Competitiveness Strategy: The Seven Pillars*

The Federal Reserve, *Investing in America's Workforce: Report on Workforce Development Needs and Opportunities*.

Data Source: Jackets	
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>Overall the quality of the projects funded is excellent and the portfolio is well-balanced. PIRE funds fewer than one out of ten pre-proposals, and those are vetted within institutions before being submitted to NSF.</p>	

OTHER TOPICS

The COV offers this overall reflection to frame this final section.

In the last decade, OISE has experienced sweeping changes and has remained adaptive, flexible, and successful. The period between the last COV and today has been no exception. The OISE staffing level has been substantially reduced since the early 2000s, and the organization has now adapted and reorganized accordingly. The major changes in staff and mission in the last four years include: i) a change in leadership and a reorganization of personnel into three strategic clusters, ii) following the staff cuts, a reduction in the number of core programs to three, and iii) assumption of an expanded scientific diplomacy role. OISE has remained a highly-valued partner with collaborations and partnerships across the Foundation. The Directorates rely on OISE on a number of fronts, including: country- and region-specific expertise with local partners, funding basic team-oriented research across multiple international sites with student mobility at the core, brokering relationships with international partners, and co-funding of proposals.

Today's research landscape in science and engineering is inherently global. Many of the solutions to the major challenges faced by the US and exemplified by the NSF 10 Big Ideas require international teams and a global perspective. This global research landscape is well-addressed by the three strategic pillars of the NSF: advance research, develop a STEM workforce, and leverage resources through collaboration. Similarly, OISE's core programs are well-aligned to NSF's, with its focus on: i) international team science (PIRE), ii) global workforce development (IRES), and iii) a new network-to-network program (AccelNet, under exploration).

Given that science is inherently international, and that each of the NSF Directorates already engages internationally through its investigators, as well as individual and institutional collaborations and partnerships, the natural question is what role does OISE play? The short answer is that there is a need to be *intentional* on the aspects of NSF's international role that the Directorates are not positioned to support and lead. The international areas where NSF should be intentional include

- i) Science diplomacy and country- and region-specific knowledge to support the Director and Directorates
- ii) International partnerships that encourage, support and lead to effective team science
- iii) Student mobility to increase the number of students with international (research) experience
- iv) Partnerships that leverage investments made by other countries for the benefit of US researchers
- v) International leadership and participation such as with the Global Research Council, G7, etc.

OISE is well-positioned and appropriately staffed to lead major aspects of this international agenda, as detailed below. The COV believes that Office Head Keiser has brought outstanding leadership to this effort, and while understaffed, OISE has an outstanding staff with the unusual strength of global/regional/country expertise essential to NSF's international engagement responsibilities together with STEM expertise. The cluster matrix organizational design is the best one to meet the demands of OISE.

Moving ahead, as many nations strengthen their basic and applied research to levels that are comparable to and in some cases greater than that of the US, the intentionally-international roles that OISE plays will only increase and require the continued support of NSF and OISE.

Questions under Other Topics

1. What is the existential value-added proposition of OISE, and its programs, to the NSF and the larger scientific community?

The overall OISE strategy for advancing research, developing STEM workforce and leveraging resources through collaboration remains valid and important to NSF. The recently restructured and focused OISE organization is well-positioned to advance these goals through international team science (PIRE), global workforce development (IRES), and leveraging strengths through networks of people and resources (AccelNet).

The increased OISE role in scientific diplomacy is extremely important to NSF and the nation, and should be supported. The COV values the contributions of OISE and recognizes the additional demands it places on staff, especially when responding to urgent requests and rapidly evolving situations. It is essential that NSF recognize this role as well.

The COV values the leadership role OISE is playing in identifying and understanding NSF's international engagement and its plans to broaden this across other federal research agencies.

2. Are the recent organizational changes appropriate?

Yes. The program management consolidation developed out of necessity following the staff reductions that preceded it. The resulting cluster matrix structure is well-conceived and will enable OISE to pursue its strategic goals. OISE's country and regional expertise permeates the matrix, and is essential to carry out NSF's international mission. The dual expertise required by the cluster structure presents challenges to staff and requires that OISE recruit uniquely talented individuals.

The COV concludes that staff reduction over approximately the last ten years has been challenging, in view of the broad and unique responsibilities of OISE, and urges that creative approaches to staffing be undertaken to support analysis and planning, as well as NSF's diplomatic mission. (See Recommendation #4.)

3. What are the thematic (i.e. strategic) areas the Office should emphasize going forward?

The COV believes that OISE is well-positioned with its intentional and strategic approach. Further, it is essential that OISE articulate clear goals for each program and measure their outcomes.

The COV applauds OISE for effectively utilizing NSF's new evaluation and data analysis capabilities to determine current NSF international engagement. The analytic activities underway will be useful for establishing future strategic priorities for OISE.

Given OISE's small program budget, strategy should continue to align with NSF's thematic priorities, recognizing that the current NSF focus on "10 Big Ideas" will undoubtedly evolve. This alignment should focus on activities that are explicitly international and complementary to other (e.g. big science) international activities underway.

OISE must continue to take an intentional and strategic approach going forward. Further, the COV urges consideration of regular review and refresh of OISE programs, with the expectation that all programs will conclude at some point.

Recommendation #6. OISE should align its programs with NSF's thematic priorities – currently the 10 Big Ideas – and concentrate on those that are explicitly international and complementary to other (e.g. big science) international activities.

Recommendation #7. OISE should take leadership with data collection, analysis, storage and management regarding the extent of international research and education across the Foundation.

4. What role (if any) should OISE have in coordinating international engagement for the Foundation? Should it include increased awareness/guidance of PD travel?

Efforts to gather data Foundation-wide on international engagement, including PD travel, should be included in OISE's developing analysis and foresight activities. The current OISE plans for information-gathering and dissemination activities on international engagement will position OISE to lead productive discussions of current activities and enable effective future strategy. These activities reinforce OISE's leadership position in international engagement.

5. International student programs—how can we get more benefit for the U.S. from such a program? Is a different structure needed?

OISE can play a catalytic role in transforming the federal investment in international STEM-related student programs.

To achieve this, OISE must determine the most strategic academic level, undergraduate or graduate, for its investment in international student research engagement.

We urge OISE to search for knowledge and evaluations of existing international undergraduate opportunities, and to determine how to both complement and leverage these, in order to maximize the effectiveness of OISE student programs. This will include assembling existing reports on undergraduate and graduate international research programs, and the impact of these activities on the career development of the participating students. (The best evidence would be longitudinal or retrospective analyses of the impact of student programs, but we recognize that such studies are too expensive for OISE to undertake.)

Recommendation #8. OISE should contract with an evaluator to conduct a study of undergraduate and graduate research programs within NSF and beyond, and assess the impact of these activities on the career development of the participating students, and their effect on international STEM effectiveness.

6. PIRE—should it be more focused and strategic or broad as it is now?

What is the purpose of OISE funding PIRE projects? Is it to create novel team science, to catalyze and support new international collaborations, or to address programs that can't be effectively tackled at the individual investigator level and that are not being addressed by individual NSF directorates?

OISE should align its programs with NSF's thematic priorities (see recommendation #4) – currently the 10 Big Ideas – and concentrate on those that are explicitly international and complementary to other (e.g. big science) international activities. Priority should be given to proposals that cross disciplines, require a team approach to solve complex problems, and can't be funded through existing programs in the NSF directorates. The current requirement for international collaboration is essential to continuing the PIRE program.

OISE should begin looking ahead to a post-PIRE future and work to develop its next transformative international research program. The periodic renewal of signature programs should be seen as an opportunity and not a threat.

Recommendation #9. OISE should review examples from Engineering and other agencies and directorates to gain knowledge on best practices to manage large research projects to ensure success. This knowledge gained should be used by OISE to develop effective strategies, including site visits, to assess award progress

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

The COV views the development of AccelNet very positively, especially the approach of going to the community to define what the focus of AccelNet should be. The COV sees a valuable role for NSF in connecting networks and supporting team science. Scientific collaboration using more developed social networks and tools is rapidly evolving.

Recommendation #10. OISE should partner with directorates such as SBE, EHR and CISE to leverage their networking expertise.

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

The COV supports OISE's intention to make its co-funding more strategic and proportionate to programmatic budgets. The current gross imbalance of funds out of versus into OISE program budgets must be addressed.

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

The COV members are extremely appreciative of the hospitality and assistance provided by OISE during our visit. Staff made extra efforts to provide additional data that we requested and to ensure that we were comfortable during our work.

The data provided were adequate to evaluate the proposal review and award process and the jacket review process for the PIRE and IRES programs.

The COV had limited information to help answer the more strategic questions about the future-looking strategy of OISE.

More detailed programmatic budget information should be provided.

We recognize that COV time was limited, and we requested additional time with staff to gain more information on the two current OISE programs. With hindsight, the COV would have appreciated the opportunity to talk with a group of ADs, or a group of program managers from various directorates, as had been originally scheduled.

Recommendations:

We have provided recommendations throughout the report, and repeat them here.

Summary of Overall Recommendations:

Section III.1

Recommendation #1. Total funding for each PIRE project should be capped at \$5 million over five years.

Recommendation #2. The pending IRES evaluation should include clear and well-designed questions in order to gather useful information to guide future development of the program.

Section III.2

Recommendation # 3. OISE should search for information on and evaluations of the many existing international undergraduate research opportunities, and determine how to both complement and leverage these.

Section III.4

Recommendation #4. The COV urges that staffing be augmented to support analysis and planning, as well as to meet the need to support NSF's diplomatic mission.

Recommendation #5. Recommendation #7 from the 2014 COV should be incorporated into OISE efforts to increase its foresight and analytics capabilities.

Other Topics, Question 3

Recommendation #6. OISE should align its programs with NSF's thematic priorities – currently the 10 Big Ideas – and concentrate on those that are explicitly international and complementary to other (e.g. big science) international activities.

Recommendation #7. OISE should take leadership to address data collection, analysis, storage and management regarding the extent of international research and education across the Foundation.

Other Topics, Question 5

Recommendation #8. OISE should contract with an evaluator to conduct this a study of undergraduate and graduate research programs and the impact of these activities on the career development of the participating students.

Other Topics, Question 6

Recommendation #9. OISE should review examples from OIA, Engineering and other agencies and directorates to gain knowledge on best practices to manage large research projects to ensure success. This knowledge gained should be used by OISE to develop effective strategies, including site visits, to assess award progress.

Other Topics, Question 7

Recommendation #10. OISE should partner with directorates such as SBE, EHR and CISE as well as OIA to leverage their networking expertise.

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SIGNATURE BLOCK:

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For the FY 2018 Office of International Science and Engineering Committee of Visitors
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