**NSF Advisory Committee for International Science and Engineering (AC-ISE)**

**Discussion Paper**

***Strategic Framework for NSF's Global Engagement:***

***Enabling Global Science for the U.S. STEM Enterprise***

**April-May 2012**

This paper is based on discussions and correspondence among members of the NSF Advisory Committee for International Science and Engineering (AC-ISE) in 2011 and 2012. It is intended to provide input into the NSF’s strategies for international engagement and leadership, and outline a set of guiding principles, recommendations, and short term actions. AC-ISE urges NSF to move rapidly in building, articulating, and implementing a vision for enhancing international engagements. AC-ISE is ready to take active roles in working with the NSF leadership toward developing and realizing a strategic “*NSFGlobal 2020*” vision.

**Introduction**

Science has always been borderless -- for generations researchers have collaborated around the globe to address professional, institutional, national, and global interests.  Since its inception, NSF has supported international research and education at all levels and has evolved to become an "inherently international" organization through supporting researcher-driven international collaborations, developing mechanisms to promote students international research experiences, and establishing communications with funding partners.  As the world continues its rapid change, there is a growing imperative for NSF’s actions to move toward a "strategically global" approach to international engagements, and to assist the U.S. research and education communities to engage globally and to help facilitate communication and alignment of the global research community.

Key factors that drive the need for an NSF global strategy are:

* An increasing awareness that for the U.S. to be at the forefront of discovery its researchers have to be increasingly engaged internationally, and increasingly involved through long-term partnerships at many levels and in many parts of the world;
* Today, and even more so in the future, leveraging the experience, capabilities, skills, and increasing investments of other agencies, governments, and partners will be necessary to achieve the greatest advances and breakthroughs and collaborative advantage. These leveraged investments will have a positive impact on economic growth and sustainable development.
* In particular, leveraging investments must include engaging students, perhaps our greatest resource, in international research and education activities. Students’ participation should be sought from all sources including foreign students and, especially, from U.S. students under-represented in STEM fields both at the undergraduate and graduate level.
* Many problems facing society today extend beyond national boundaries and demand resources beyond the capability of any single nation to solve. Their solutions require the best talent and all available resources regardless of their location.

Many U.S. universities and colleges are increasing their internationalization, and in the process discovering institutional, policy-related and cultural challenges that many times become barriers. To pursue NSF's roles of fostering global science and engineering for U.S. communities with limited resources dictates prioritizing activities, fostering effective partnerships, and a relentless pursuit of lowering of barriers for internationally minded U.S. based scientists and engineers.

In short, extraordinary talent resides in every corner of the globe; it is the access to local resources, infrastructure, and policy that varies widely.   Many countries are increasing their investments in science, education, and science infrastructure. Leveraging that talent and the global investments to promote the idea that "Good science anywhere is good for science everywhere, provided that a free and open flow of information through a transparent process with measures to promote scientific ethics and integrity flourishes everywhere," is a core value of *OneNSF* and is required to solve truly global problems.

There are tremendous opportunities for NSF to enable global science for the benefit of not only the U.S. STEM research and education community, but for the broader global S & E enterprise. The world is increasing multipolar with intellectual and scientific power emerging across the globe. Knowing and acting on the trends in world scientific investments is an essential component of any strategy for “*NSFGlobal 2020*”. This will require being connected with funding agencies, scientific communities, national academies, and international STEM organizations throughout the world. Participation and leadership in international science and engineering organizations are key for scientist-to-scientist contacts and formulation of partnerships and friendships.

**Guiding Principles for NSF’s Global Engagement**

Development of a strategy for NSF’s global engagement should be guided by the following principles:

Foster Excellence in People, Research and Education, and Collaboration:

* NSF’s international involvement must foster excellence in STEM research and education. The scientific excellence includes involvement of excellent people on each side, excellence in the support of science and engineering research, and ethical and responsible conduct in STEM research and education at a global scale.
* Participation of U.S. students and scientists from underrepresented groups through international experiences will increase the pool of future scientists, and thereby profoundly impact on U.S. ability to lead in the global research and education arenas.

Lead through Partnerships:

* Being a global leader does not mean being first in everything, nor is it about dominance. Collaborations must make sense and provide benefits to all involved, acknowledging and taking advantage of cultural diversity and global expertise.
* Strategic partnerships with U.S. and foreign STEM funding agencies should be developed where each side can bring complementary and synergistic contributions.

Address Global Challenges:

* International engagements need to address major global engineering/science research challenges, especially those in the U.S. national interest that cannot be addressed effectively without international, multi-disciplinary, and multi-stakeholder collaboration.

Impact the U.S. STEM Enterprise:

* International engagements should have a substantial and substantive impact on the U.S. STEM research and education enterprise.
* NSF international engagements should be characterized by efforts to increase the diversity of U.S. institutions, students, and faculty taking part actively in international engagements in pursuit of excellence.

Promote Societal Benefits:

* Investments should promote and include consideration of broad and diverse societal benefits.
* International collaborations should be considered in the context of U.S. national interests.

**Principal Recommendations**

The AC-ISE’s principal recommendation is to develop and act upon a well-informed roadmap for *NSFGlobal 2020* by the end of 2012. The roadmap should identify how NSF can use existing mechanisms, develop new approaches, and structure data flows to create knowledge about significant trends and opportunities in international engagements. These data will inform understanding of where science and engineering will be in the year 2020. In the context of understanding global challenges and opportunities for the STEM communities of the future, the roadmap should:

* Develop ways to broaden participation of S&E leaders across the U.S. and around the world.
* Take advantage of cultural diversity in addressing challenges to international S&E engagements.
* Outline timetable for action.
* Set target goals.
* Pilot new approaches to achieve those goals.
* Establish metrics to determine if those goals are being met.
* Make audits actionable, preferably involving international partners in enhancing interactions..

Additional recommendations include immediate practices that NSF can incorporate in its future plans:

* Embed “international” into *OneNSF* priorities. This will provide long-term commitment to attract partners, engrain an international perspective at the onset of the planning, set an example and a tone for Directorate, Divisional and Program level priorities, and identify a set of questions to help assess when an effort should be international..
* Integrate international experiences into NSF’s human capital development. International experience is a way to engage and retain students, especially those who are underrepresented in STEM. The benefits of the international experience are not only for preparing student for global future, but for our Nation’s innovative capability and for the societal good.
* Promote the use of information and communications technologies (ICT) in advancing global science and engineering. Development of a novel mechanism would send a signal to the broader STEM global community that NSF welcomes ICT-enabled international collaborative activities, and will provide funding for the U.S. side of such activities.
* Leverage the growing capability and interest in emerging countries to share research resources and encourage joint publications
* Review and assess the purpose and value of NSF’s overseas presence and possible expansion beyond the current three locations. Are the current overseas offices being utilized most effectively? Is having a permanent office the best way to have NSF’s presence overseas? Is there a need for more overseas offices? Where does NSF need a presence? What would not happen if there were no overseas offices?

**Short-term Action Items**

There are some actions that NSF should consider taking in the coming months, ideally before the end of FY 2012, including:

* Quantify baseline data and an inventory of NSF’s international activities: The breadth of cross-directorate international programming is extensive. It is important to have reliable and accurate data as a base for shaping and assessing future efforts, as well as to identify best practices and lessons learned from what is now happening. Data for the past 5 years would give us more than a snapshot and would be useful as we move to address some of the large issues facing NSF, and the U.S.
* Establish compelling and defensible performance indicators to understand what success means and how to measure it in the context of NSF’s international engagement.
* Engage the community in helping define trends, opportunities, barriers and needs to enable global science through partnerships.
* Take advantage of opportunities such as panel meetings, professional society meetings, and NSF Day Workshops and Regional Grants Conferences to promote the benefits of international collaborations.
* Communicate broadly the value of international engagement in STEM research and education. One mechanism might be a video that introduces many successful international activities supported by NSF, as well as one that illustrates the STEM established and emerging hotspots of the world.
* Consider a broader approach to ethics and the responsible conduct of research that acknowledges that existing and future challenges require a global approach, such as the proposed Global Research Council.
* Engage AC-ISE in other NSF activities, for example consider *ad hoc* liaisons with other directorates/offices’ advisory committees. AC-ISE can also take on an active role in communicating thevalue of international engagement to the broad STEM research and education community across disciplinary and geographical boundaries in the U.S. This could be done through member presentations at professional society meetings, and social media channels.

**Office of International Science and Engineering (OISE)**

NSF needs a focal point for implementing its vision for its global activities and to act as a champion with a mandate that uniquely contributes intellectually to the mission of NSF.  It is expected that this role will follow naturally from an articulated plan for “*NSFGlobal 2020*”.

At the March 2012 meeting, AC-ISE did not discuss OISE specifically.  However, for now, OISE is a logical unit to serve the champion role given its organizational experience and long-term relationships with other funding agencies in many parts of the world.  OISE can immediately take responsibilities for acting on some of the recommendations above, such as developing metrics to assess NSF’s effectiveness in promoting international activities, promoting internationally engaged human capital development, developing and testing mechanisms for international engagement through partnerships (SAVI and PEER are nice models for this), coordinating an inventory of NSF-wide international activities and the global STEM trend analysis, and assessing NSF’s overseas presence.

In future meetings, AC-ISE should consider refining the OISE’s role within the context of the overall NSF’s international engagement.