Report of the International Workshop on International Research Collaboration

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The presentations and reports can be found on the following website: http://nuweb.neu.edu/zippel/nsf-workshop/
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The presentations and reports can be found on the following website: http://nuweb.neu.edu/zippel/nsf-workshop/
Executive Summary

“International S&E partnerships provide wonderful opportunities for educating the participating partners in S&E and, perhaps more importantly, building trust and communication.” “Through cooperative cross-border endeavors, scientists and engineers gain access to foreign data, platforms, facilities, sites, expertise, and technology.” “Climate change, natural disasters, food shortages, sanitation, safe drinking water, energy resources, and the spread of disease are a few issues that have global consequences and that require a collaborative worldwide effort from not only scientists and engineers, but from policymakers at all levels.”

National Science Board’s Compendium International Science and Engineering Partnerships: A Priority for U.S. Foreign Policy and Our Nation’s Innovation Enterprise, February 14, 2008

This report summarizes discussions, findings, and recommendations of the International Workshop on International Research Collaborations, held June 2-4, 2010 at the National Science Foundation (NSF) in Arlington, Virginia. The workshop featured seven panels of US and international scholars, and was organized to both identify barriers to and explore effective models for broader participation in international mobility and collaboration. An explicit goal of the workshop was to highlight what academic institutions and funding agencies could do to support and recognize faculty’s international research collaborations. The workshop included participants from Europe, Asia, Africa, North America and Latin America.

Key points emerging from workshop presentations and discussion include the following:

1. For building international collaboration, the importance of participation and networking at international conferences cannot be overstated. For groups under-represented in science and engineering, international conference participation is particularly significant but often challenging in terms of funding, teaching and other academic commitments, family responsibilities, and obtaining invitations to present papers.

2. Data indicate that women and minority men are less likely than white men to be engaged in international collaboration. Explanations for this difference are complex. Academic institutions and funding agencies need to be aware of, and to address issues of gendered mobility and of exclusion from professional networks. Program design and academic career expectations that assume a one-size-fits-all career model may disadvantage under-represented populations in academic STEM faculty ranks. Consideration of child- and elder care needs, partner support, flexibility with teaching/service assignments and with expectations for duration of overseas stays, etc. is important to start to level the playing field for women and minority men in terms of international research cooperation.

3. Various barriers to full participation by women exist in, and are sometimes amplified by, the international research context. However, engaging in international research collaboration also provides opportunities for visibility and career development that may be limited for women and individuals from minority groups in the United States.

4. There is wide variation in the recognition accorded international activities and research by academic institutions, despite the fact that international recognition is increasingly becoming an expectation for career advancement. In the U.S., lack of familiarity with foreign research systems and capabilities inhibits full support of faculty engagement with colleagues abroad. At many resource-poor institutions, lack of infrastructure and knowledge of how to initiate and support international activities are additional constraints.
5. The perceived risks of international collaboration range from concerns that it could be perceived as a distraction from the focused work required for attaining tenure, to political risks, to concrete issues of personal safety. For women working abroad, sexual harassment and lack of support networks are particular concerns. For minority faculty, knowledge of local environments that is informed by awareness of issues for minorities in that environment is critical. For all, cultural competency including sophisticated understanding of cultural norms and expectations, both in daily life and in the research environment, is essential. Few institutions seem to provide any training opportunities for faculty in this regard.

**Recommendations for NSF:**

**Program Management**

1. All program officers should be aware of the laws, data, and scholarly research on the importance of promoting the full participation in science and engineering (including international S&E collaborations) of men and women, equally, and of people of all ethnic, racial, and economic backgrounds, including people with disabilities. This should be an integral part of training provided to new and continuing NSF program officers. See applicable law below:

**SCIENCE AND ENGINEERING EQUAL OPPORTUNITIES ACT FINDINGS AND POLICY (42 U.S.C. §1885) SEC. 32 (a)**

The Congress finds that it is in the national interest to promote the full use of human resources in science and engineering and to insure the full development and use of the scientific and engineering talents and skills of men and women, equally, of all ethnic, racial, and economic backgrounds, including people with disabilities. (b) The Congress declares it is the policy of the United States to encourage men and women, equally, of all ethnic, racial, and economic backgrounds, including persons with disabilities, to acquire skills in science, engineering, and mathematics, to have equal opportunity in education, training, and employment in scientific and engineering fields, and thereby to promote scientific and engineering literacy and the full use of the human resources of the Nation in science and engineering.

2. NSF’s attention to demographic characteristics of participants in NSF-funded workshops, symposia and conferences is critical to encourage more inclusive networks and broader participation in international research. This scrutiny should be made part of standard program management procedures and supported by NSF management.

**Funding**

3. Developing and implementing programs to encourage greater international engagement is time-consuming and particularly difficult for less well-resourced institutions. NSF programs should fund partnership efforts among groups of institutions to provide opportunities for cross-institutional infrastructure development and knowledge-sharing. Increased grant support for faculty and administrative staff time will allow them to develop the necessary competencies and infrastructure.

4. The opportunity cost of preparing a proposal for international collaboration is high. Use of supplements to existing grants can be an effective mechanism and should be more widely publicized. Supplemental support to awards through programs such as ADVANCE should be encouraged, perhaps through a ‘Dear Colleague’ letter, to facilitate the development of more robust international networks and opportunities, especially for women. Supplements should include support for the

The National Science Board (NSB) has established a goal to actively promote and fund U.S. scientists and engineers to engage in and sustain international S&E partnerships throughout NSF. It provides guidance to NSF in four areas:

- Better publicize opportunities for supplemental funding for PIs to encourage international collaboration;
- Encourage directorates to develop specific plans and programs to support international partnerships;
- Link international S&E research partnerships with curricular pathways for students; and
- Continue to provide support service in support of international partnerships through OISE.

OISE COV Report 2008
administrative costs associated with broadening the scope of the original proposal in order to include facilitation for international collaboration.

Policies and Practices
5. NSF should explore ways in which established practices and policies with respect to support of international travel and foreign partners could be more nuanced, regularly allowing consideration of family commitments and individual circumstances. To increase mobility for U.S. principal investigators to travel we recommend the following:
   a. Some fellowship programs at NSF have dependent support (including health insurance) – and NSF should evaluate how to extend these promising practices to other programs.
   b. Extending lengths of fellowship for childbearing.
   c. Allowing childcare costs in new solicitations and providing supplementary awards for childcare costs to existing grants.
   d. Providing support for spouses/partners to accompany the PI during travel.
These recommendations would allow PIs to balance family demands and international research collaborations better.

Also, the policies on use of travel funds should be reviewed to ensure that they do not disadvantage researchers who have limited mobility options but could work collaboratively with foreign partners if the U.S. researcher supported their visits to the United States. Limited mobility can be a result of structural factors, such as family obligations, physical limitations, lack of institutional capacity, heavy teaching loads, and lack of sabbatical opportunities.

External Engagements
6. Joint, simultaneous reviewing processes between NSF and other national funding agencies should be expanded, with NSF standards on broadening participation included.
7. Professional societies and organizations can be effective as catalysts and as ways to provide information and facilitation resources to a wider community. These societies also have the advantage of understanding the disciplinary contexts for international collaboration. In engaging these resources, NSF should require consistent attention to and accountability for broadening participation.
8. NSF’s continued engagement with foreign partners should be expanded to include a focus on mechanisms for engaging a more diverse set of participants in jointly supported research. Most countries face the issue of women’s lower rate of participation in academic STEM fields, particularly at the senior and leadership levels; joint discussion of the context for supporting women’s greater engagement in international research would be useful. As noted during the workshop, there are numerous programs in Europe and elsewhere that could be instructive.
9. U.S. universities and funding agencies should create mechanisms to remain current on the advances in science worldwide, which are important for an informed assessment of the value of international collaborations.
   a. NSF reviewers should be trained on applying broader criteria of “excellence,” which would include international experience; for example, reviewers might consider how the proposed work contributes to NSF’s goal of preparing a globally ready STEM workforce.
   b. Informed standards to assess the international reputation of the collaboration partners should be developed.
   c. Reliable and valid information should be provided on international rankings of international institution.

Data Analysis
10. NSF should develop a program of support for research on international collaboration, including: collection of current cross-national data; analysis of patterns and trends; development of indicators of important outcomes; and research on gendered barriers to both the geographic and upward mobility of researchers and the gap in international research collaborations by sex and ethnicity.
11. NSF should continue to monitor who participates in NSF-funded research and exchange programs, and obtain as detailed information as possible on the gender and minority status of post-docs and (graduate) students participating in experiences abroad.
Overview

There can be little doubt that scientific expertise and opportunity exist worldwide, and that international collaboration is an important, if not essential, element in many research projects, both large and small. While this has been recognized for some time, the changing nature of scientific communities worldwide - and especially in rapidly developing countries - gives urgency to ensuring that U.S. researchers and students are fully prepared, equipped, and engaged with a wider, global research community.

Engagement internationally at the faculty level, however, is uneven, raising concerns about institutional and individual barriers to the pursuit of collaborative research internationally. In response to this concern, NSF supported a workshop to explore who among STEM faculty does and does not participate in international collaborative research, and to understand barriers to greater international engagement. This report summarizes the discussions, findings, and recommendations of the International Workshop on International Research Collaborations, held June 2-4, 2010 at NSF under the auspices of an award to Northeastern University, PI Kathrin Zippel and co-PI Lisa Frehill.

The workshop featured seven panels of U.S. and international scholars, and was organized to both identify barriers to as well as explore effective models for broader participation in international mobility and collaboration. An explicit goal of the workshop was to highlight what academic institutions and funding agencies could do to support and recognize faculty’s international research collaborations. The workshop benefitted greatly from the contributions of international participants who brought a diverse set of experiences and perspectives. Participants from Europe, Asia, Africa, North America, and Latin America attended; see Appendix A for the list of attendees. Workshop panelists provided comprehensive overviews of different national, regional, and international programs for international cooperation, with a focus on programs that are particularly concerned with enhancing opportunities for women in science, including opportunities to participate fully in international science collaborations.

Presentations during the session on Gender and Collaboration in the USA and Abroad provided a detailed backdrop for the discussions. As noted in the literature review prepared for the workshop, academic scientists in the United States are not taking full advantage of the opportunities for collaborative international research, despite the expansion of research and development worldwide. Smykla and Zippel (2010) remarked in their literature review that:

Several sources have noted the relative insularity of American scientists in terms of international collaborations, and suggest that this lack of involvement is an intellectual and economic “disability” for the country (Finkelstein, Walker, and Chen 2009: 2). Altbach and Lewis (1996), using data from the original Carnegie Foundation for the Advancement of Teaching’s International Faculty survey (a 1992 survey that provided comparative data on academics from 14 countries), discovered that “the United States…came in dead last in the proportion of faculty reporting that ‘connections with scholars in other countries are very important to my professional work’” (quoted in Finkelstein et al. 2009: 1).

Fifteen years after this 1992 survey, Finkelstein et al. (2009) found that little had changed. Indeed, in a 2007 follow-up to the original Carnegie study, American faculty again came in “dead last” on “the percentage of articles published in a foreign country” and “among the bottom 3 to 4 countries” for “percent of publications coauthored with foreign colleagues” (Finkelstein et al 2009: 12). They suggest that these
insular attitudes reflect “a sense of the U.S. as the ‘center’ of the scientific—and economic universe” and could hold American scientists back as the production of science necessitates a more global worldview and a broader range of collaborative partners.

Furthermore, data indicates that women and individuals from underrepresented minority groups are even less likely to be engaged in international collaboration. While more women students participate in study abroad programs, women with Ph.D.s have fewer international collaborations than do men. As Zippel and Frehill (2009) note in the project summary:

“In the internationalization processes occurring in many disciplines, careers of faculty in the US depend no longer only on national reputation but also on international visibility, particularly for promotion from associate to full professorship and/or prestigious endowed chairs. Women scientists, however, participate less in international activities than do men. Internal evaluation reports of the NSF Office of International Science and Engineering (OISE) have found that there is a significant gender gap in participation in international grant activities in all fields and disciplines. Moreover, the 2006 NSF Survey of Doctorate Recipients survey results reveal that women participate less than men do in international networks and research collaborations across all fields and independent of their citizenship status. While only 24% of women doctoral degree holders are involved in international collaborations, 33% of men are (NSF Survey of Doctorate Recipients 2006).”

This report, together with supporting materials, including (1) a literature review on international scientific collaboration with a focus on differences by gender; (2) an analysis of the 2006 Survey of Earned Doctorates to compare/contrast international research activities of women and men separately by race/ethnic group; and (3) a summary of 40 qualitative interviews and 100 internet surveys with NSF-funded researchers involved in international collaborations, seeks to offer insight and recommendations that can broaden participation in and access to the international research opportunities that are increasingly key to success.

**Barriers, Myths, and Risks**

Workshop participants discussed a number of the barriers, myths, and risks of international collaboration to describe more fully the landscape that women and minority faculty encounter in considering international collaboration. Barriers include the institutional infrastructure required to identify, secure, and conduct successful international research collaborations; getting invited to key invitation-only conferences; the perception among international students and post-doctoral fellows that women are less attractive mentors with whom to work (this is based on gender stereotypes that women with children are less committed to their lab work and might lack the recognition in the students’ home country that would be crucial for the students’ career prospects after returning from the U.S.); and little alignment between institutional priorities and time spent developing international partnerships. Insufficient funding and particularly, flexible funding for travel abroad, as well as to host collaborators, were identified as consistent barriers.

Perspectives from outside the U.S. made clear that in many, if not most, countries, the opportunity to access training abroad as a young researcher and to collaborate on research projects as a more senior scholar is critical to earn recognition. In the UK, for example, as an island nation, mobility for researchers is expected. Peer review routinely includes international scientists, and references from international scholars are an essential element in attaining the rank of full professor. For South African scholars, international research collaboration is a *sine qua non* that allows South Africa, as a developing country, to benchmark research for quality and relevance. It is evident that the ability to engage with partners abroad is widely recognized outside the United States, in both developed and developing countries, as a key element for success.
As Frehill and Vlaicu (2010) discussed, faculty often meet their foreign collaborators at international conferences, which are important for staying current in the field, and for finding people with common interests. In the sample interviewed for the report, half of the men who were interviewed reported meeting a collaborator at an international conference, but only about a third of women had done so. Women were more likely than men to report networking with specific academic colleagues, such as students, post-docs, visiting professors, and former advisors (42 percent versus 32 percent of men). Especially for women, networks built on prior connections can be key.

Networks are clearly crucial to initiate and sustain collaboration. Numerous studies have shown that women have a more difficult time gaining access to informal networks. This is especially true in STEM fields, where women are underrepresented, particularly in the senior and leadership ranks. Steffen-Fluhr (2006) outlines how network formation begins (or is stunted) early in an academic’s career and continues to shape his or her professional life. She explains:

> Male protégés are introduced into these networks by their mentors in graduate school, with whom they serve a cognitive apprenticeship. They draw on the senior faculty member’s bank of social capital initially, until they have accumulated enough to open their own accounts. Although graduate school is ostensibly a meritocracy powered by a strong individualistic ethos, for male graduate students it functions more like a coterie, protecting and nurturing their development. Success generates positive feedback from the network which, in turn, generates more success…(5)

As Smykla and Zippel (2010) summarize, Steffen-Fluhr asserts that women are not given this same treatment—they are seen as outsiders by the more senior faculty (usually male) and are therefore denied the valuable mentoring that men automatically receive based on their gender and ‘insider’ status.

Workshop panelists noted that barriers to U.S. participation in international collaboration also include institutional barriers, particularly for less well-funded institutions, such as minority-serving institutions and community colleges. The opportunity cost of initiating a partnership with a colleague abroad can be daunting, as few resources are in place to facilitate the necessary administrative processes of working internationally and few incentives exist to encourage it. Funding is limited, and assumptions that such institutions are neither good sites of investment for international research support nor attractive for international students further limit opportunities to develop networks internationally.

Faculty at community colleges, key in training and retraining the American workforce, face challenges of obtaining even small amounts of support to attend conferences, purchase equipment, identify, meet, and host foreign partners - all typical aspects of collaboration. Absent the opportunity to be part of an international research team, these faculty members and their students cannot participate in the processes that support global competence, a key NSF objective.

In addition, heavy teaching and service loads, as well as domestic care obligations, pose barriers to even short-term international mobility and conference participation for community college faculty and those at teaching-intensive institutions. These local commitments, together with time pressures and lack of funding to attend conferences, prevent faculty from participating in international networks.

While benefits of international collaboration are evident, the impact of international collaboration on careers is complex. Workshop panelists noted the importance of considering how international research activities will support the outcomes that are valued by home institutions and peer communities, particularly for junior faculty who may be pre-tenure and less able to tolerate delay in publications. Publications with international collaborators might involve more “risks” as a consequence of more complex logistics and different cultural and institutional attitudes.

At the same time, the workshop attendees repeatedly raised the importance of being recognized internationally, of having an ‘international reputation’ in a field, as an increasingly critical component for promotion and advancement, especially in internationalized fields in STEM and at major research universities. For some U.S. participants, international collaboration has actually been a life-saver, a way
to break out of a professional environment characterized by bias and exclusionary networks, and to attain peer recognition and encouragement necessary for career advancement.

For international participants, international collaboration was often an essential, normal part of career development. Discussion at the workshop reflected a changing environment and set of assumptions about mobility and about support for more flexible options, particularly for women. There was general agreement that successful international collaboration required careful definition of a research topic, and that finding common research questions was a major challenge. Participants endorsed the opportunity to join networks of women internationally as a way to augment and expand access to professional systems of connection. In Japan, for example, greater emphasis on inviting foreign researchers to Japan is expected to help increase international cooperation opportunities, especially for women. This is intended to address the decline in interest among Japanese researchers in pursuing postdoctoral training abroad as well as the conflicts between study abroad and starting a family.

Discussion of various national programs intended to increase women’s participation and advancement in science and engineering suggests opportunities for national funding agencies to compare notes, understand the context of programs for women and minorities, and develop approaches that will facilitate collaboration. In particular, the United States might benefit from exploring the wide range of programs abroad that support women in science, including their research partnerships with foreign colleagues. Mexico, for example, has extended the eligibility period for access to postgraduate support, in order to accommodate women who have chosen to have families. The European Alliance for Research Career Development has focused on providing flexible support and scientific independence, allowing individuals to bring grants with them (money follows the researcher) to new institutions. Mandated parental leave and reduced working hours in Germany provide an important framework for managing the dual demands of family and research. Workshop panelists noted that as in the United States, use of generous policies in many parts of Europe for parental leave is not always favored by researchers who recognize the potential cost of being absent from labs and departments.

Given the reported high value women place on efficiency in pursuing international partnerships, funding agencies could be of considerable assistance if there were more uniform approaches across governments or, at least, a deeper understanding of the international context for academic women in STEM. There was general agreement among workshop participants that a wide variety of innovative policies had been mentioned during the workshop, policies that might be widely beneficial worldwide. A basic principle of many of the innovative policies was flexibility: consideration of individual circumstances; alternative concepts of mobility, such as virtual mobility, more flexible, shorter term mobility (e.g., Feodor Lynen Research Fellowships, Alexander von Humboldt Foundation); and ‘flexicurity’ (portable social security benefits in the European Union). In general, Europe seems to have much more substantial experience in supporting multilateral collaborations, including joint proposal review, and a more extensive framework of support for working parents, facilitating international collaboration.

Workshop panelists raised questions about the myths, or perceived barriers that persist with respect to women’s participation in international collaboration, particularly regarding short-term travel and mobility in general. Several presentations served to provide more nuanced perspectives, noting, for example, that family obligations include care for children, dual-career issues, and care for elderly and family members with disabilities. These are not only issues for women, but increasingly for newer academic men. As Frehill and Vlaicu (2010) note, men of earlier generations benefited from the “marriage advantage,” but
men in recent generations are both increasingly likely to be married to a spouse who also has a full-time job, and increasingly expressing interest in being closer to their children. Workshop panelists confirmed Frehill’s findings that even senior women faculty who had children were able to figure out ways to engage in international collaborative relationships. Findings from a pre-summit survey of participants in the Women’s International Research Engineering Summit held 2009 in Barcelona indicate that participants perceived obtaining funding and finding collaborators as the top barriers to pursuing international collaboration, while time, family commitments, and communication issue were perceived more as barriers for others. Workshop participants were intrigued by these findings, which suggest that family commitments limiting international engagement may be more of a myth than a reality. More research is warranted to explore these perceptions of barriers and burdens. Is this true more generally, or is there something particular to engineering that produces these findings? Or, as Zippel suggests, are American academic women reluctant to acknowledge the extent to which family responsibilities hinder advancement?

Workshop panelists also explored risks of international collaboration, ranging from professional concerns, such as the perceptions that international research collaboration is a distraction from the focused work required for attaining tenure and takes away from activities more valued by home institutions, to political risks, to concrete issues of personal safety. The cultural context in which collaboration might take place should be well understood, and provisions should be made for supporting researchers and their students abroad if there should be such issues. For women working abroad, sexual harassment and lack of support networks are particular concerns. For minority faculty, knowledge of local environments that is informed by awareness of issues for minorities in that environment is critical. For everyone, cultural competency, including a more sophisticated understanding of cultural norms and expectations - both in daily life and in the research environment - is essential. So far, however, few institutions seem to provide any training opportunities for faculty in this regard.

Long-held assumptions about scientific competencies abroad were also discussed in the context of better understanding the global environment for collaboration amid global inequalities. Workshop panelists from outside the U.S. urged that there be a re-thinking of the nature of partnerships with rapidly developing economies, suggesting that there is now more likelihood than ever before of equal intellectual partnerships, and that these could take different forms such as South-South collaboration that could flourish without any U.S. involvement. Panelists also suggested that funding agencies facilitate support of international partnerships by viewing international collaborations as standard practice and providing more bottom-line budgetary flexibility. This flexibility would, for example, allow the use of grant funds to invite international research collaborators or their students to one’s home institution, more easily facilitating collaboration with resource-poor institutions abroad. Additional flexibility of this sort would particularly aid researchers who have limited mobility due to other responsibilities.

**Needs and Opportunities**

The research that informs the NSF ADVANCE Program provides a comprehensive framework for understanding how institutional policies and processes can disadvantage women in the academic science, technology, engineering, and mathematics fields. From exclusionary informal networks to penalties for success in traditionally male areas, academic women in STEM encounter a wide array of obstacles to success. Less literature exists that describes barriers for minority faculty in academic STEM fields. Workshop participants cautioned that barriers for women of color, in particular, could not readily be extrapolated from understanding barriers for white women, and urged that more research be done to illuminate the barriers to international collaboration for underrepresented minority faculty. This is important, as without more data and study, it will be difficult to design programs that are responsive to the real needs of faculty of color. The impact of exclusionary networks cannot be overstated; if you are not one of the people that others ‘naturally’ think to include on an organizing committee, as a speaker, as a partner, as a reviewer, etc, the opportunities that seem so effortlessly available to others may linger outside the realm of possibility for many women and minority scholars and scientists, with more intense effects for those who experience double binds, such as women of color. Research suggests that accountability has a significant role in broadening participation. Ensuring a diverse roster of participants
on all federally funded conferences, seminars, and workshops is essential. There have been periods in some NSF directorates when such cautious scrutiny was the norm. It is a relatively simple aspect of program management that should be encouraged.

The workshop revealed multiple opportunities to share tacit knowledge and effective practice for stimulating more effective, international collaboration particularly among groups not as well represented currently. In this regard, data presented by Frehll suggests that this approach might be widely beneficial as academics, in general, are less active internationally than scientists in business/industry and government sectors. Lessons learned from programs such as the Integrative Graduate Education and Research Traineeship (IGERT) suggest that professional skills development that prepares students and faculty from both/all collaborating countries to understand the different research systems, the goals for the collaboration, and the expectations about how the collaboration will unfold are extremely useful, particularly at overcoming the stereotypes that participants may bring to the partnership. Engaging in a skilled manner with international research partners is an important aspect of global competence that can be learned, provided there are appropriate opportunities to do so.

**Participants (Panelists and other Invitees)**

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The research reports and presentation are available for download at http://nuweb.neu.edu/zippel/nsf-workshop/