International Research & Education Collaboration: Opportunities & Resources at NSF

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• U.S. R&D spending up 1% to $465B or ~2.8% of GDP
• ~$1.6 Trillion invested in R&D around the world
• Total global investments in R&D (% of GDP) will stay relatively steady throughout the world in 2014
• US share of global R&D spending down 0.6% since 2012; Asia’s up by 2.1%
• China’s R&D spending could surpass U.S. by early 2020’s
Global R&D Expenditures by Region

Figure O-5
Global R&D expenditures, by region: 2011
Billions of U.S. PPP dollars

- North America: $462 (32.2%)
- Central America and Caribbean: $0.6 (< 0.1%)
- South America: $36 (2.5%)
- Europe: $345 (24.0%)
- Middle East: $31 (2.1%)
- Africa: $11 (0.8%)
- Central Asia: $35 (2.5%)
- East and Southeast Asia: $456 (31.8%)
- South Asia: $36 (2.5%)
- Australia and Oceania: $24 (1.6%)

World total = $1,435

PPP = purchasing power parity.

NOTES: Foreign currencies are converted to U.S. dollars through PPPs. Some country figures are estimated. Countries are grouped according to the regions described by The World Factbook, available at www.cia.gov/library/publications/the-world-factbook/index.html.

Figure 5-22
Share of world’s S&E articles with international collaboration, by S&E field: 1997 and 2012

NOTES: Data are from the set of journals covered by the Science Citation Index (SCI) and Social Sciences Citation Index (SSCI). Articles are classified by the year they entered the database, rather than their year of publication, and are assigned to a country/economy on the basis of the institutional address(es) listed in the article. Articles are credited on a whole-count basis (i.e., each collaborating institution or country is credited one count). Internationally coauthored articles may also have multiple domestic coauthors.

And Cooperation Increasing Globally

Figure 5-23
Share of S&E articles internationally coauthored, by selected country: 2002 and 2012

NOTES: Article counts are from the set of journals covered by the Science Citation Index (SCI) and Social Sciences Citation Index (SSCI). Articles are classified by the year they entered the database, rather than their year of publication, and are assigned to a country/economy on the basis of the institutional address(es) listed in the article. Articles are credited on a whole-count basis (i.e., each collaborating institution or country is credited one count). Internationally coauthored articles may also have multiple domestic coauthors.


Science and Engineering Indicators 2014
US Researchers Less Likely to Co-Publish Internationally

Highly cited (top1%) scientific articles by type of collaboration 2006-2008
As a percentage of highly cited scientific articles worldwide

Source: OECD calculations, based on Scopus Custom Data, Elsevier, December 2009
Statlink: http://dx.doi.org/10.1787/836087047406
North American Student Mobility is Flat

Figure 1.20. *Evolution in the number of students enrolled outside their country of citizenship (2000, 2009)*

This figure shows the growth of foreign tertiary student enrolment, by regional grouping, over the past nine years.

U.S. STEM Graduate Degrees are Flat

**Natural sciences**

- Selected EU
- U.S. total
- China
- U.S. permanent resident
- India
- U.S. temporary resident
- Russia
- Japan

**Engineering**

- China
- Selected EU
- U.S. total
- U.S. temporary resident
- Russia
- Japan
- U.S. permanent resident
- India

Note: Natural sciences include physical, biological, environmental, agricultural, and computer sciences, and mathematics.


Science and Engineering Indicators 2012
NSF support for international collaboration aims to:

- **Advance** the FRONTIERS of Science and Engineering
  - ACCESS to unique expertise, facilities, and phenomena
  - LEVERAGE limited resources
  - EXCHANGE insights and techniques

- **Prepare** a GLOBALLY-ENGAGED U.S. S&E workforce
  - NURTURE capable young researchers with strong networks overseas
  - DEVELOP a global perspective
  - FACILITATE mobility
    - Brain circulation
Role of International Science and Engineering (ISE)

Internal
- Support NSF Directorates and Offices
- Leverage Resources and Expertise
- Test New Models
- Provide Data and Oversight

External
- Engage the US Research Community
- Strengthen Partnerships with Foreign Counterparts
- Cooperate with other U.S. Government Agencies
Core Values for International Engagement

- Intellectual partnerships and clear mutual benefit
- U.S. students and junior researchers engaged internationally
- Networks that link expertise and resources
Most international research and education activities are funded by NSF disciplinary programs:

- As part of regular awards
- As supplements to regular awards
Some NSF International Opportunities with External Partners

- Dimensions of Biodiversity
- Collaborative Research in Computational Neuroscience
- Partnerships for International Research and Education (PIRE)
- Belmont Forum Collaborative Research Action
- Graduate Research Opportunities Worldwide (GROW)
- Partnerships for Enhanced Engagement through Research (PEER)
- Several Directorates/Division (SBE, GEO, BIO/DEB) offer lead agency agreements
Developing an Internationally Engaged Workforce

- International Research Experiences for Students (IRES)
- East Asia Pacific Summer Institutes (EAPSI)
- Graduate Research Opportunities Worldwide (GROW)
- Pan-American Advanced Studies Institutes (PASI)
- (International) Postdoctoral Research Fellowship Program
IRES:

- Develop a more globally engaged S&E workforce
- Supports small group of students for focused research experience overseas
- Graduate and/or undergraduate students
- $250,000 maximum budget for up to three years
East Asia & Pacific Summer Institutes

EAPSI:

• Introduce U.S. students to S&E research in East Asia & Pacific
• Foster student-initiated professional relationships to facilitate future international research collaborations
• 8-10 week summer research program in 7 locations
  • Australia (30 positions), China (40), Japan (65), Korea (25), New Zealand (15), Singapore (15), Taiwan (25)
• Open to grad students who are U.S. citizens or permanent residents
• Partnership between NSF and counterpart funding agencies
Graduate Research Opportunities Worldwide

- GROW offers opportunities for 3-12 month international research collaborations to NSF Graduate Research Fellows
- 15 Current Partners
  - Australia, Brazil, Chile, Denmark, Finland, France, India, Ireland, Japan, Korea, the Netherlands, Norway, Singapore, Sweden and Switzerland
- Expanding partnerships for future
- Contact: grow@nsf.gov
Some Tools for International Research

- Partnerships for International Research and Education (PIRE)
- Science Across Virtual Institutes (SAVI)
- Global Venture Fund (GVF)
- Partnerships for Enhanced Engagement in Research (PEER)
- Catalyzing New International Collaborations (CNIC) currently on hold
PIRE

- ISE-managed flagship research program
- Frontier research that leverages complementary expertise of all partners
- Extensive overseas research opportunities for US students/early career researchers
- 5 year awards; average award $4.5M
- ~50 active awards across all NSF disciplines
- Preliminary proposals due Oct 21, 2014
  - Biennial competition
Science Across Virtual Institutes (SAVI)

Platform for teams of NSF-funded investigators to:

- **Network** with partners abroad
- **Leverage resources** to advance shared research interests
- **Engage students** in international collaboration.
- SAVI is a mechanism, not a stand-alone program
  - ISE and NSF Directorate support
  - Support from counterpart agencies overseas
• **INTERNAL** NSF Mechanism

• **Co-funding** of proposals with true intellectual collaboration with foreign partners
  - New and renewal proposals
  - Supplement requests
  - RAPIDs, EAGERs
  - Workshop, conference proposals

• $10,000-$50,000, in principle

• Contact ISE country program officer
Partnerships for Enhanced Engagement in Research

PEER Supports collaborators in developing countries
- USAID provides funding
- U.S. investigator must have active NSF award, may request supplement if partner receives funding
- Only certain countries eligible (check website)
- USAID – development objectives
- Managed by National Academies
CNIC supports initiation of *new* international collaboration

- Planning Visits
- Initial data gathering activities
- Proof-of-concept experiments
- Single or multiple research visits
- Workshops

Maximum 1 year, $10K-$75K

**Intended outcome: Proposal to NSF Research Directorate**

Suspended - Revisions to solicitation currently under discussion
Keys to Success in ISE Funding

- Top-notch science question
  - Demonstrate how the collaboration enhances the research
- Involve U.S. students, junior researchers
  - Prepare, mentor, and assess
  - Pay them: travel, living costs, stipends
- Meaningful attention to diversity
- Include bio-sketch of key collaborator(s)
- Include letter(s) of support from collaborator(s)
- Work with others in your institution
- Know and observe special rules
  - Fly America Act
  - Visa regulations
- Consult ISE program officer early in process
International Science and Engineering (ISE) Section

About International Collaboration & Funding at NSF

NSF highly values international collaboration, as it is critical to keeping the United States globally competitive at the frontiers of knowledge, leading to transformational S&E breakthroughs.

ISE serves as the focal point for international collaborative activities across NSF while working across the Foundation to co-fund awards and supplements in cooperation with NSF’s disciplinary directorates.

To fulfill this unique role, ISE hosts three overseas NSF offices. Located in Paris, Tokyo, and Beijing, these offices promote collaboration among U.S. and foreign scientists and engineers, serve as liaison between NSF and its overseas counterparts, and report on developments in the international science and engineering community.

Links to the international offices, the ISE staff directory, and other ISE resources, are on the left side of this page.

Investigators based at a U.S. research institution may include international dimensions in new proposals that they intend to submit to NSF’s disciplinary directorates or to ISE, or they may request supplemental funding for their existing NSF awards. NSF can support the costs associated with participation of U.S.-based researchers (including students) engaged in international collaboration. U.S. investigators are advised to consult early in the application process with both the disciplinary program manager and an ISE country program manager.

Proposals for international collaboration should fully address the first criterion below, as well as one or more of the subsequent criteria:

- True intellectual collaboration with foreign research partner (Proposals must include foreign partner as a collaborating investigator. If a foreign institution will have responsibilities beyond that of a collaborator, its support for the project must be clearly described in the proposal and must be commensurate with the U.S. counterpart.)
For Further Information
www.nsf.gov/od/iiia/ise/
aemig@nsf.gov
Thank You!