International Research & Education Collaboration: Opportunities & Resources at NSF

NSF Grants Conference
24 June 2014

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The U.S. in the Global R&D Landscape

- 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
International Work Increasing Across all Fields

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 the year of publication, and are assigned to a country (or economy on the basis of the institutional addresses) 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
And Cooperation Increasing Globally

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

Percent

United States  Canada  United Kingdom  Germany  France  China  Japan  Australia

2002  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 databases, rather than the year of publication, and are assigned to a country/economy on the basis of the institutional addresses 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.


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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/10.1787/88893247406
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

Doctoral degrees in natural sciences and engineering, by selected region/country: 2000 to most recent year

Natural sciences

Engineering

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


Science and Engineering Indicators 2012.
International NSF Strategic Plan

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

NSF Funding for International Activities

**Most** international research and education activities are **funded by NSF disciplinary programs**:
- As part of regular awards
- As supplements to regular awards
**NSF Programs with an International Element**

<table>
<thead>
<tr>
<th>Abbr.</th>
<th>Programs</th>
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<tbody>
<tr>
<td>BIO</td>
<td>Dimensions Of Biodiversity; Developing Country Collaborations in Plant Genome Research; BREAD</td>
</tr>
<tr>
<td>CISE</td>
<td>Collaborative Research In Computational Neuroscience</td>
</tr>
<tr>
<td>GEO</td>
<td>Integrated Ocean Drilling Project; Belmont Forum</td>
</tr>
<tr>
<td>EHR</td>
<td>Graduate Research Opportunities Worldwide (GROW)</td>
</tr>
<tr>
<td>ENG</td>
<td>Nanotechnology; Earthquake Research; Synthetic Biology</td>
</tr>
<tr>
<td>MPS</td>
<td>Astronomical Observatories; Emerging Frontiers in Research and Innovation</td>
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<tr>
<td>SBE</td>
<td>Science Of Science And Innovation Policy</td>
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<tr>
<td>OIIA</td>
<td>INSPIRE, NSF Research Traineeship (NRT), BRAIN</td>
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<tr>
<td>GEO</td>
<td>Antarctica And Arctic Research And Education</td>
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<tr>
<td>CISE</td>
<td>International Research Network Connections</td>
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**Developing an Internationally Engaged Workforce**

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

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

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
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

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
Partnerships for International Research and Education

PIRE
- ISE-managed flagship research program
- Frontier research that leverages unique, complementary expertise of US & international partners
- Extensive overseas research opportunities for US students/early career researchers
- 5 year awards; average award $4M
- ~50 active awards across all NSF disciplines
- New solicitation expected in Summer 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
Global Venture Fund (GVF)

- 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)

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
Catalyzing New International Collaborations

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
  o Demonstrate how the collaboration enhances the research
• Involve U.S. students, junior researchers
  o Prepare, mentor, and assess
  o 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
  o Fly America Act
  o Visa regulations
• Consult ISE program officer early in process
For Further Information
www.nsf.gov/od/iia/ise/
LCAMPBEL@nsf.gov
Thank You!
Global R&D Expenditures by Region

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

- North America: $472 (20.1%)
- Central Europe and Other Western Europe: $342 (14.4%)
- South America: $129 (5.5%)
- East and Southeast Asia: $246 (10.1%)
- Africa: $111 (4.5%)
- Australia and Oceania: $24 (1.0%)
- Central Asia: $20 (0.8%)
- Middle East: $31 (1.3%)
- World total = $2,405

PPP = purchasing power parity.

NOTES: Foreign currencies were 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.


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Some NSF International Programs with External Partners

- Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative
- Dimensions of Biodiversity
- Collaborative Research in Computational Neuroscience
- Partnerships for International Research and Education (PIRE)
- Belmont Forum/G8 Research Councils Multilateral Funding Initiative
- Graduate Research Opportunities Worldwide (GROW)
- Basic Research to Enable Agricultural Development (BREAD)