International Research at the University of Minnesota

Efi Foufoula-Georgiou

Presentation to the Council of Research Associate Deans (CRAD)

November 20, 2014

- Review the VP International Research Committee Recommendations – townhall meeting, June, 2014

- Present some personal perspectives on International research

Action Plan to Enhance and Elevate International Research at the U of M

FIVE YEARS FORWARD

Through Collective Inspiration and Discovery

International Research Draft Recommendations

International Research
Town Hall Meeting
June 13, 2014

UNIVERSITY OF MINNESOTA
Driven to Discover℠

THE COMMITTEE APPOINTED BY DR. BRIAN HERMAN, VP OF RESEARCH

- Karen Brown, Interdisciplinary Center for the Study of Global Change
- David Boulware, Department of Medicine
- Steve Colman, UMD Large Lakes Observatory
- John Deen, Department of Veterinary Population Medicine
- Efi Foufoula-Georgiou, Department of Civil Engineering
- Michael Houston, Department of Marketing
- Chandy John, Department of Pediatrics
- Harry Lando, School of Public Health, Epidemiology
- Allen Levine, College of Food, Agriculture and Natural Resource Sciences
- Meredith McQuaid, Vice-President for International Programs
- James D. Neaton (chair), School of Public Health, Biostatistics
- Terry Roe, Department of Applied Economics
- Abdi Samatar, Department of Geography, Environment and Society
- Peggy Sundermeyer, Office of the Vice President of Research

CHARGE TO THE COMMITTEE BY VICE-PRESIDENT HERMAN

1) Review the breadth of international research at the University
2) Identify short- and long-term objectives and priorities for how the University can enhance it's reputation as a leader of global research
3) Design a structure or model that promotes ongoing collaboration and leadership
4) Recommend ways in which the Vice President's Office can more effectively nurture and support international research by our faculty
5) Define measureable milestones and goals

COMMITTEE REPORT

- 5 recommendations to be implemented in coming year
- 5 additional recommendations to be implemented over next 5 years
- Metrics to evaluate progress

FIVE RECOMMENDATIONS TO BE IMMEDIATELY IMPLEMENTED

1) Vision -- Clearly articulate a vision and mission statement for international research by University faculty
2) Database -- Establish a database of international research at the University.
3) Strategic Alliances -- Prepare a position statement on how international partners are chosen for strategic alliances and broadly communicate which alliances have already been formed
4) Invest & Incubate -- Provide grants to faculty for outstanding international research projects that will enhance and elevate international research at the University
5) Central support -- With central support, organize the funding and human resources necessary to facilitate and nurture the growth of international research at the University.

VISION AND MISSION

Vision:

"Driving discovery and innovation at world leadership levels through international collaborations that enhance the experience and impact of faculty and students."

Mission:

"To create strong, lasting, and mutually beneficial international research collaborations which enhance knowledge, education, innovation, and economic vitality, and contribute to the stewardship of the planet."

DATABASE: DEFINITION OF INTERNATIONAL RESEARCH

- Research collaborations range from sharing advice/ideas/data on occasion to multi-year research projects.
- A broad definition: “Movement of people, materials, or money to support international research collaborations.”

DATABASE: OTHER CONSIDERATIONS

- Comprehensive, up to date, broadly accessible
- “Pyramid” design with interactive map
- Coordination AND support of data collection with departments/colleges
- Multiple uses, including up to date information for presentations by U of M leadership and an annual report on international research

STRATEGIC ALLIANCES: BACKGROUND

- While most international research is “bottoms up”, strategic alliances should be formed considering general U of M objectives.
- A comprehensive list of strategic research alliances is not available.
- Process for identifying international partners for strategic research alliances should be transparent.

STRATEGIC ALLIANCES: SELECTION

- In addition to considering U of M objectives:
  - Mutually beneficial to University investigators and international partners.
  - Likelihood for long-term and broad-based interdisciplinary research activities.
  - Potential for creating teaching-research opportunities.
  - Other criteria?

FACULTY GRANTS: GOALS

- Formation of novel partnerships
- Enhancement of existing international partnerships
- Capacity building of international partners
- Support of trainees and junior faculty in established research partnerships
- Pilot/seed for larger external grants

FACULTY GRANTS: REVIEW AND FUNDING

- Prestigious grants with a high bar for funding
- Reviewed by experts in subject matter area
- Review Criteria:
  - Quality of science
  - Bilateral nature of research project
  - Involvement of students and faculty in research
  - Plans for research dissemination
  - Likelihood of future external funding

CENTRAL SUPPORT FOR ORGANIZATION OF FUNDING AND HUMAN RESOURCES

- Significant investment is required:
  - Liaise with other universities and assess the magnitude of the investment required to make the University a premier leader in global research.
  - Promote the University's international research and communicate how discoveries, novel ideas, and new approaches to address global problems benefit citizens of Minnesota.
  - A sustainable funding model (9th recommendation).

CENTRAL SUPPORT (CONT.)

- Provide guidance to faculty on the management and risks of conducting research in different locations.
- Address University obstacles to international research.
- Work with colleges/departments to determine which responsibilities should be decentralized.

FIVE RECOMMENDATIONS TO BE IMPLEMENTED OVER THE NEXT 5 YEARS

1) Unique strengths: After the database is built, use it to determine what makes the University unique or strong in international research and invest more strongly in those areas.

2) New alliances: Develop new strategic alliances, possibly with regional hubs, considering the position statement (3rd recommendation).

3) Increase investment: Increase University investment in international research infrastructure and administration.

4) Sustainable funding: Develop a sustainable funding model for international research that includes external funding, internal funding and philanthropic gifts.

5) Recruitment: Recruit junior, mid-level and senior faculty with international research interests.

METRICS TO EVALUATE PERFORMANCE

- Bibliometric statistics on faculty publications with international partners
- Patents with international partners
- Research awards by U.S. funders for international research
- Research awards by international funders for international research
- Student support and/or field trips associated with international research projects
- Awardees of international seed and other grants by the University
- New strategic alliances formed

Personal reflection

Campuses: Twin Cities

UNIVERSITY OF MINNESOTA
Driven to Discover℠

About the U | Academics and Research | Admissions | Health and Medicine

U of M Home > History and Mission

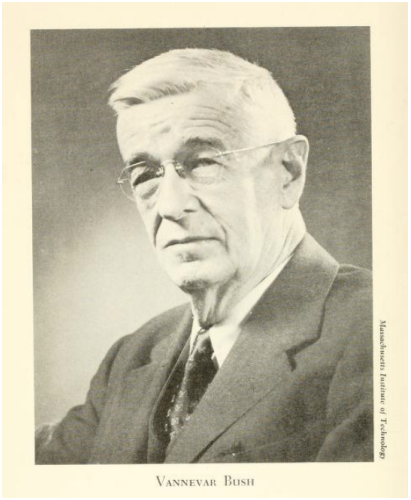
History and Mission

Mission

The University of Minnesota, founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation, and the world. The University's mission, carried out on multiple campuses and throughout the state, is threefold:

1. Research and Discovery, 2. Teaching and Learning, 3. Outreach and Public Service

ESTABLISHMENT OF THE NATIONAL SCIENCE FOUNDATION



Vannevar Bush, 1944 – argued that basic research would have to be strengthened by the use of public funds
Congress passed the NSF Act of 1950 establishing NSF

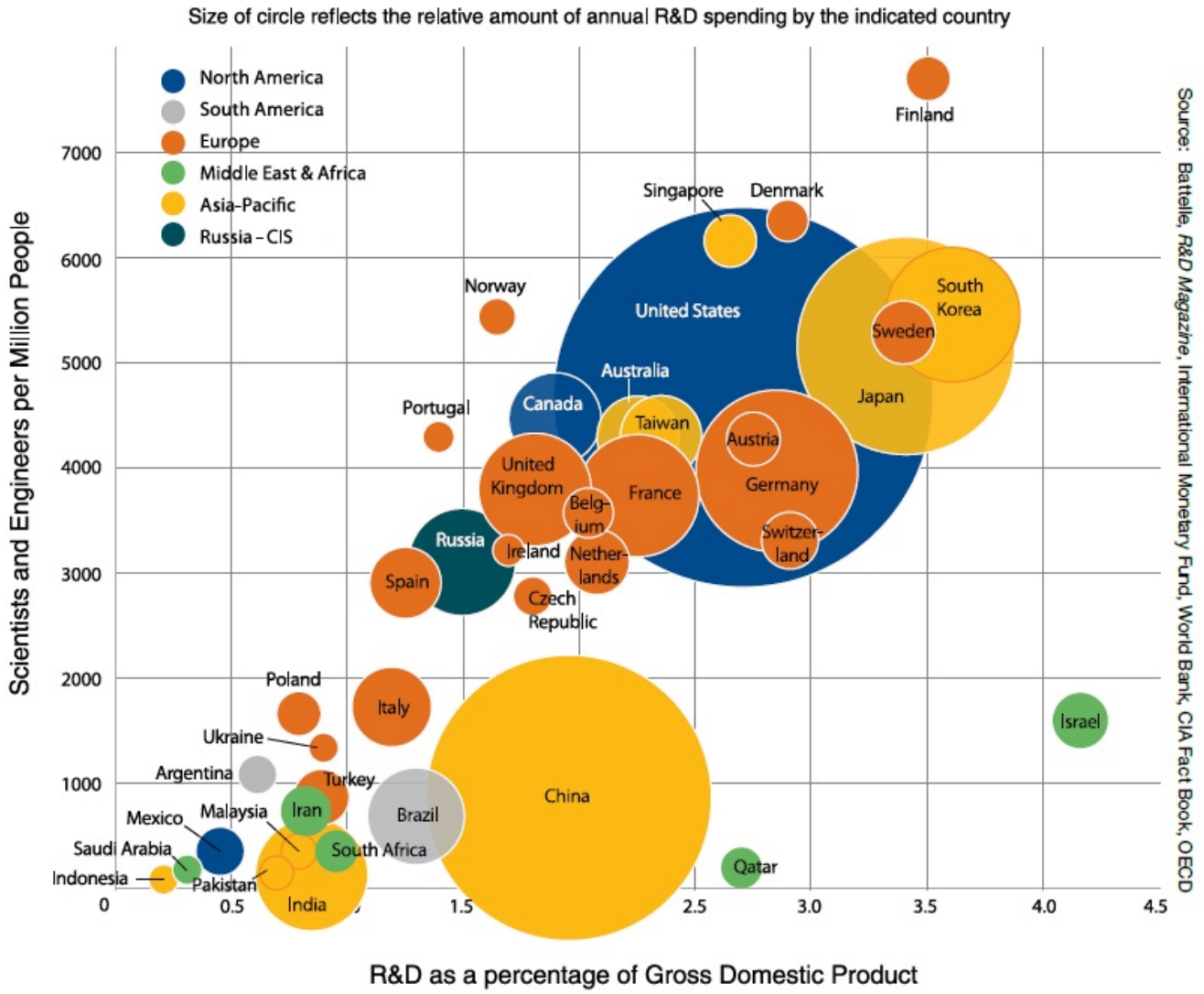
Perhaps more than any other national activity, scientific research and development depend upon close relationships with other countries. Scientific knowledge is not limited by geographical or racial boundaries, and it is almost impossible to think of any branch of science which has progressed very far without amalgamating discoveries made in several different nations. In the past, most

International Scientific Cooperation

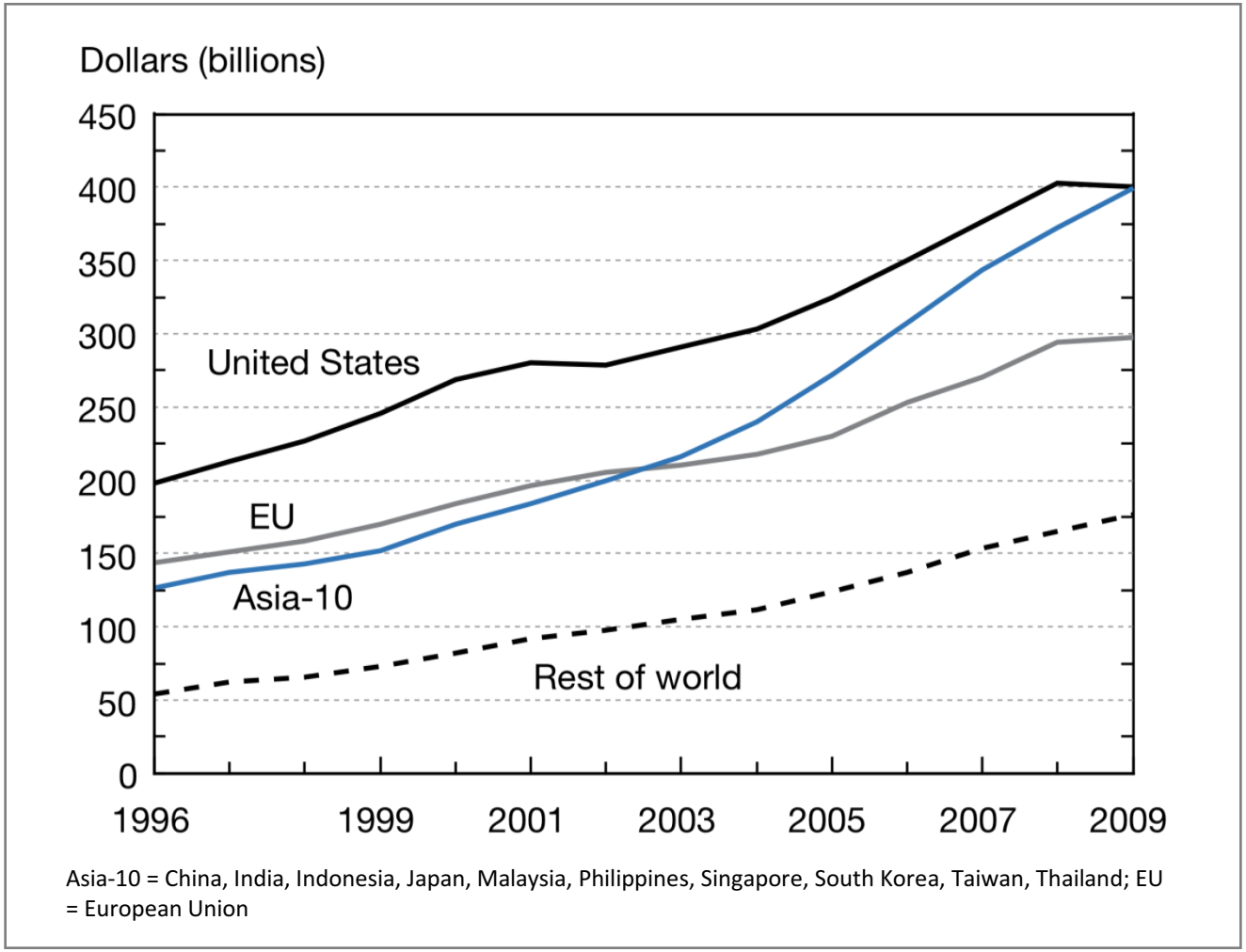
The growth of science in the last few decades and its increasingly close relationship to other national interests have demonstrated the need for more official methods of carrying on international scientific activity.

https://ia700408.us.archive.org/18/items/scienceendlessfr00unit/scienceendlessfr00unit.pdf

WORLD OF R&D 2013



R&D expenditures for United States, EU, and 10 Asian economies: 1996–2009



Asia-10 = China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand; EU = European Union

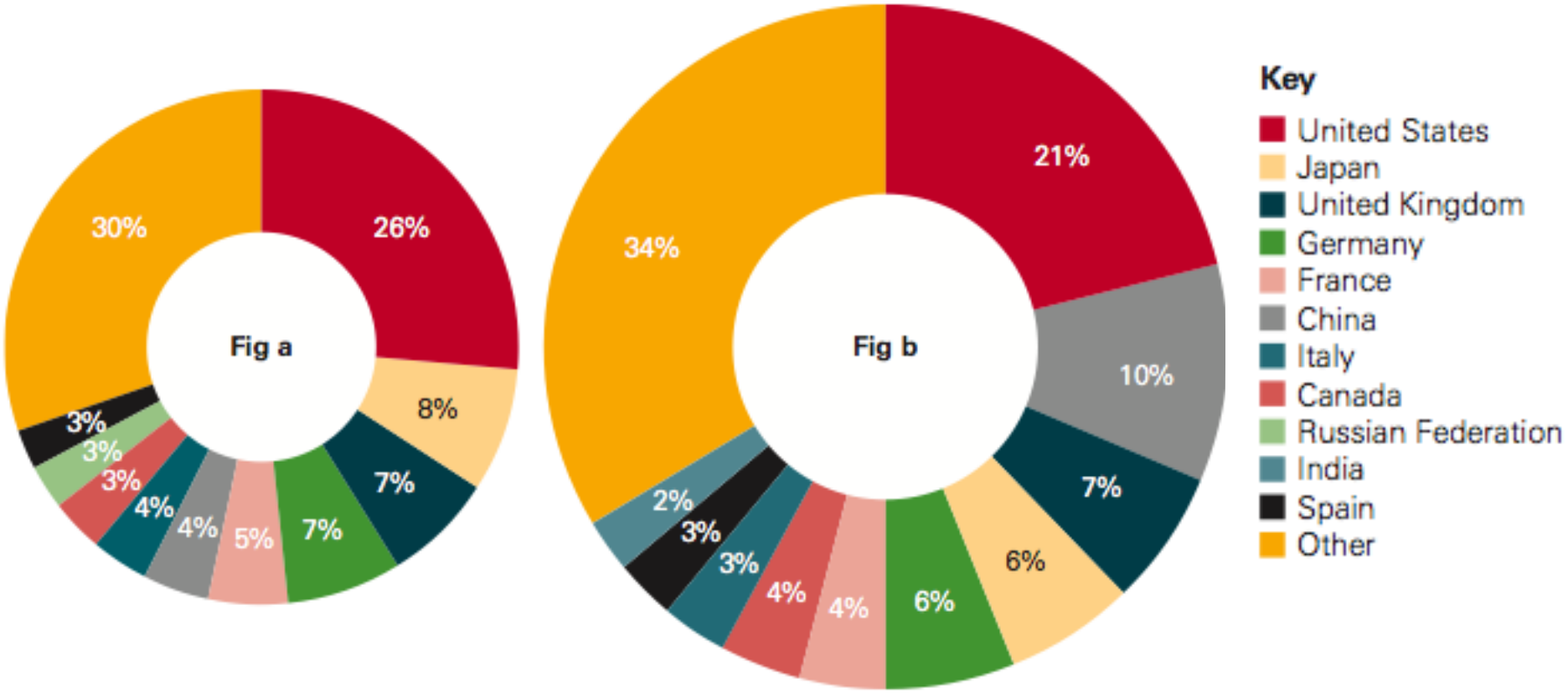
Source: National Science Board, Science and Engineering Indicators 2012

Country Goals

- China – seeks to increase R&D to 2.5% of GDP by 2020
- Brazil: 2.5% by 2022
- South Korea: 5% by 2022
- EU: Lisbon goal of 3%
- USA: goal of 3%
- Japan: well above 3%

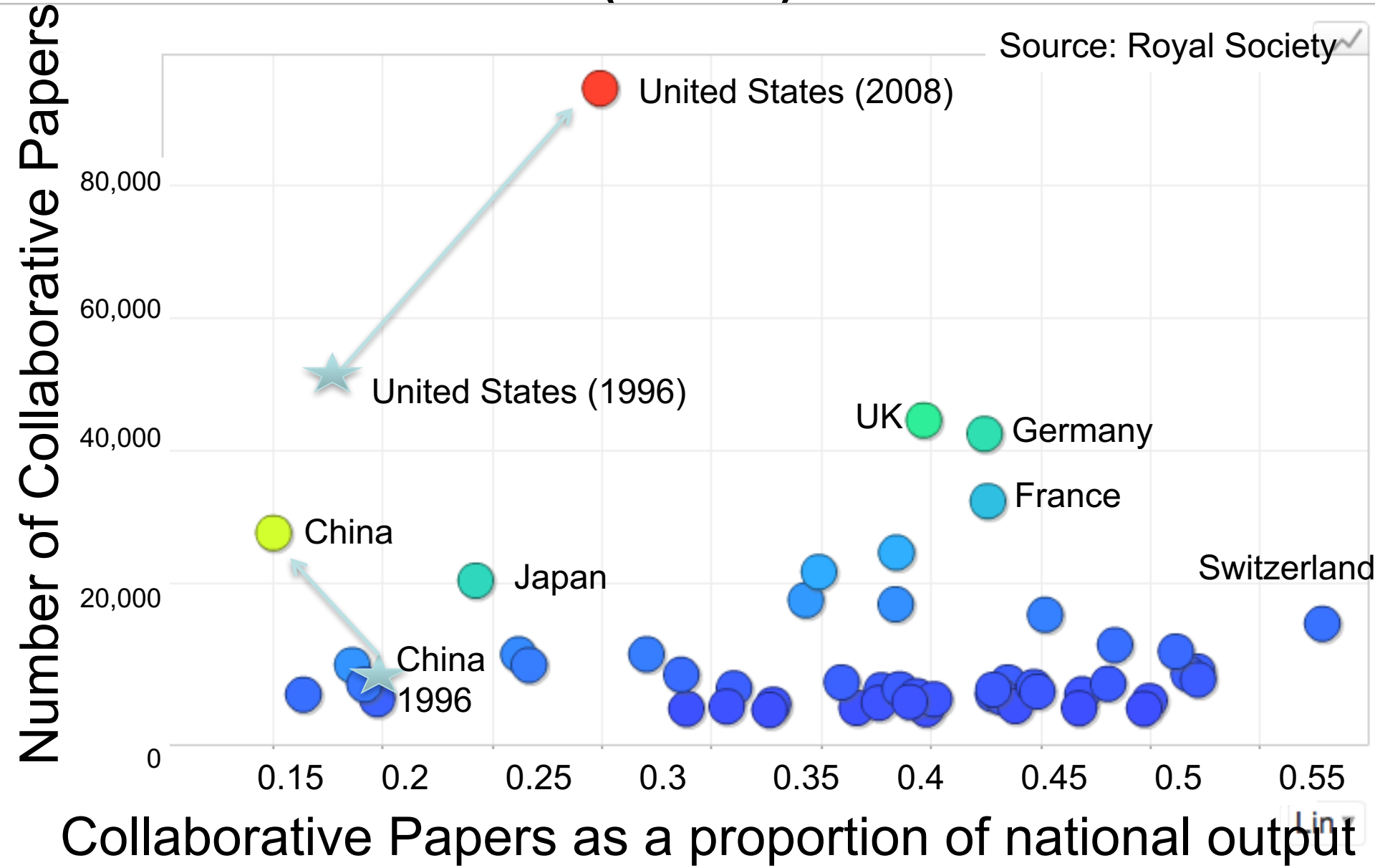
Proportion of Global Publications, by Country

The top ten producing countries in each period are shown. **Fig a.** *1999-2003.* **Fig b.** *2004-2008*



Source: Elsevier Scopus, Royal Society

Internationally Collaborative Papers (2008)

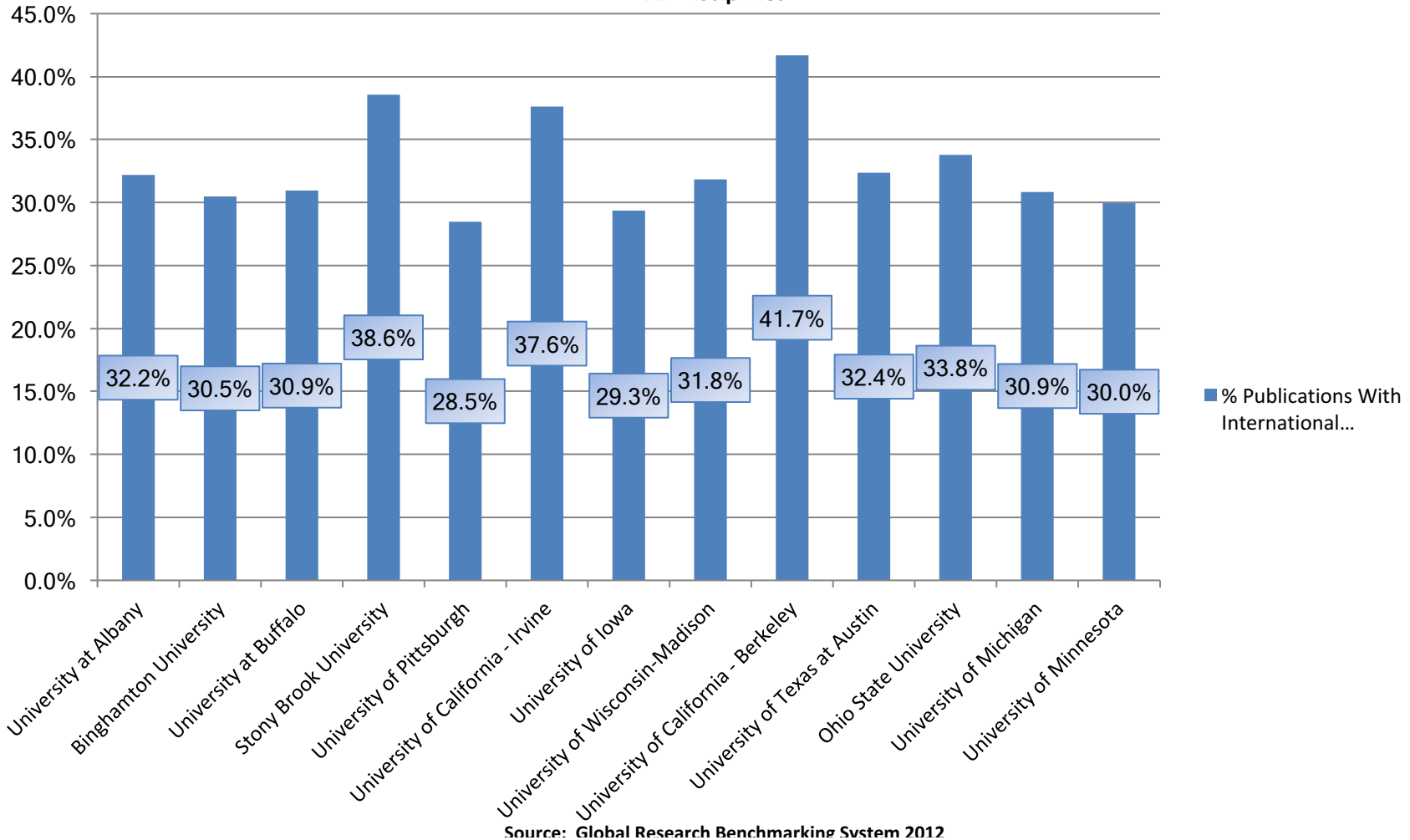


Approximately 35% of the world's papers now have more than one international author

Guinness Book of Records: the largest number of international collaborators on a single paper: 3,222 from 32 different countries (yes, from CERN)

International Collaboration - Journal Publications Written 2009-2012

Journal Co-Authorship Percentage with Non-US Institutions
All Disciplines



Source: Global Research Benchmarking System 2012

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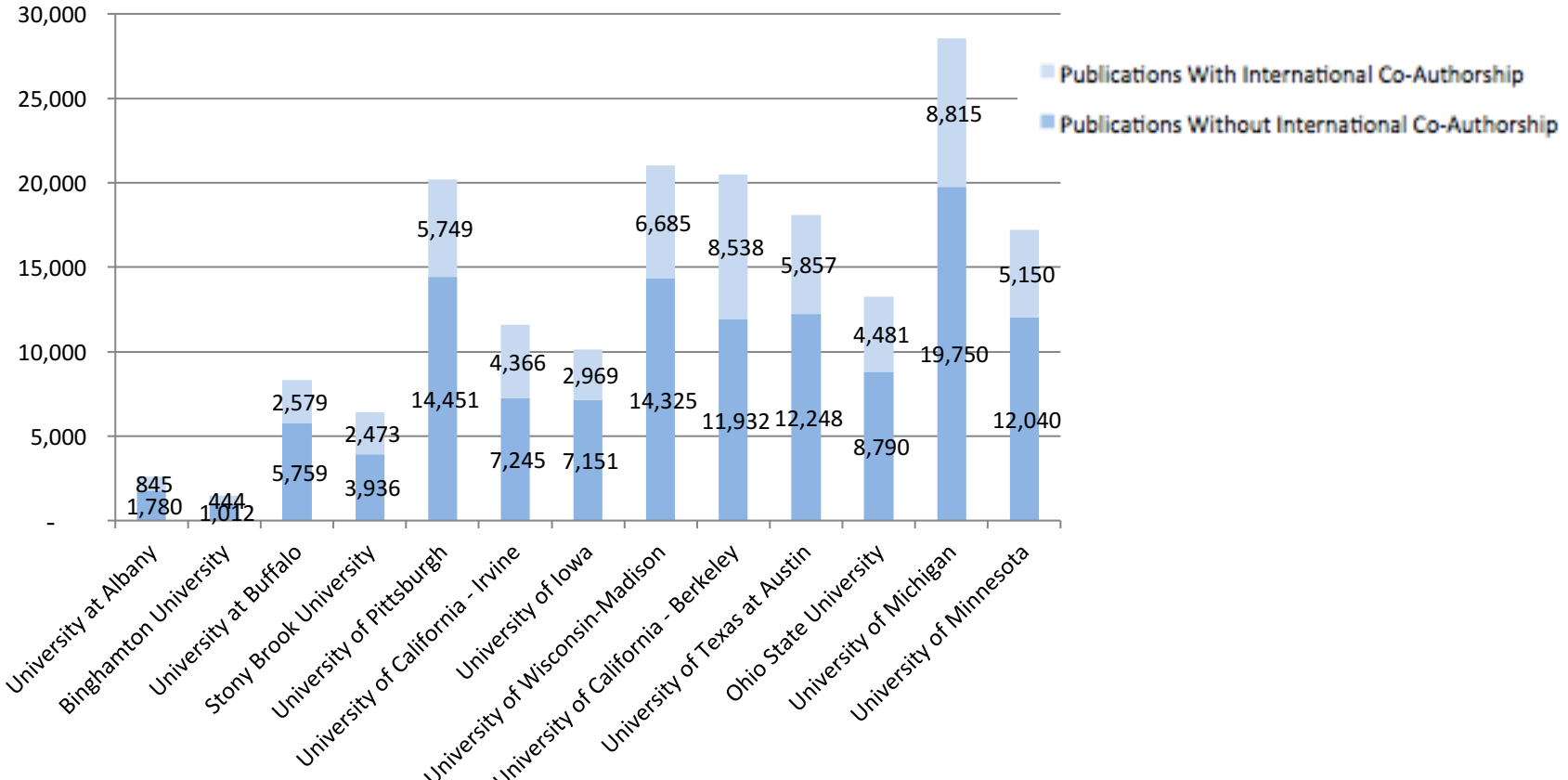


Source: Global Research Benchmarking System 2012

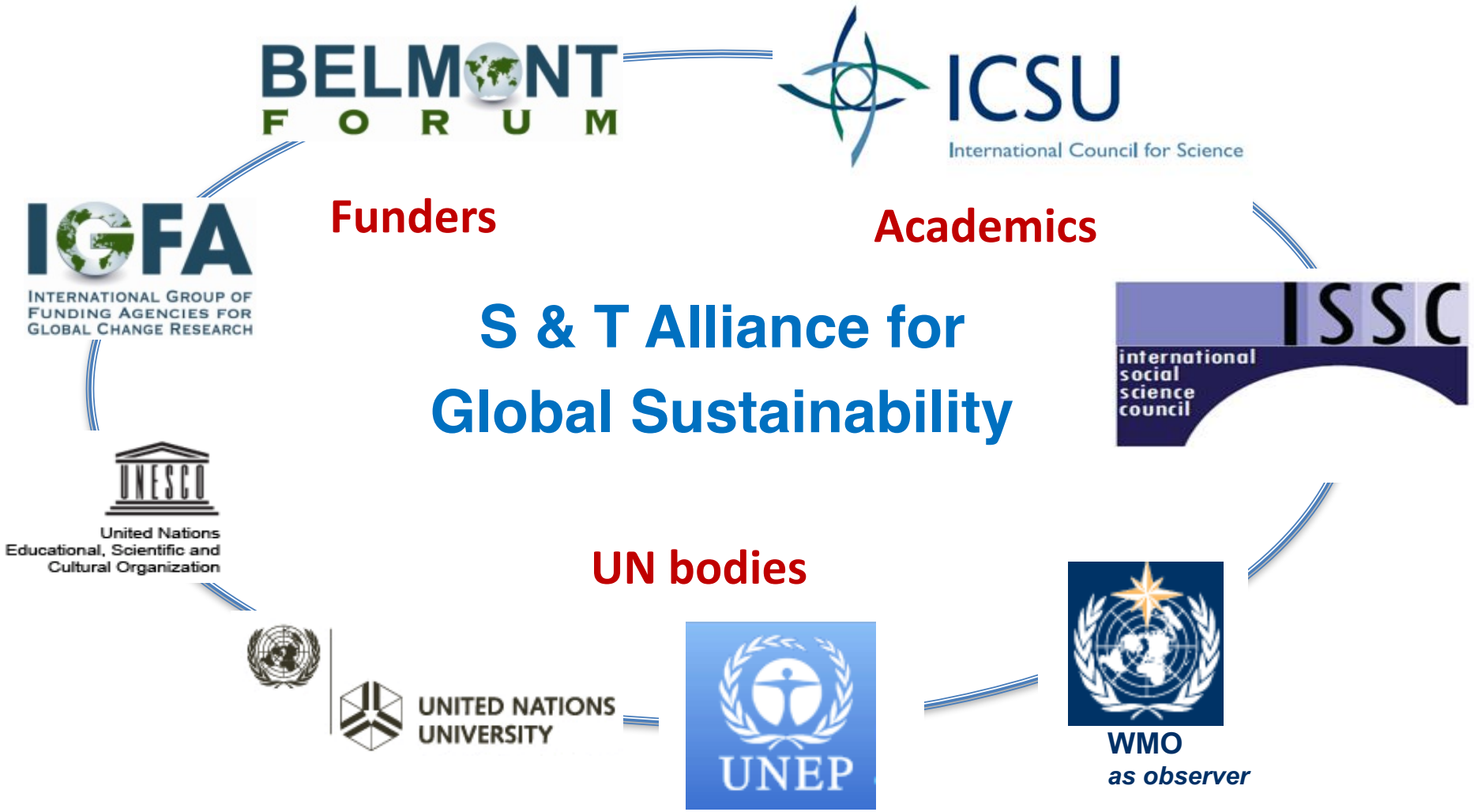
BELMONT FORUM

IGFA
INTERNATIONAL GROUP OF FUNDING AGENCIES FOR GLOBAL CHANGE RESEARCH

- The Belmont Forum gathers the world's **major and emerging funders** of **global environmental change research**, and international science councils

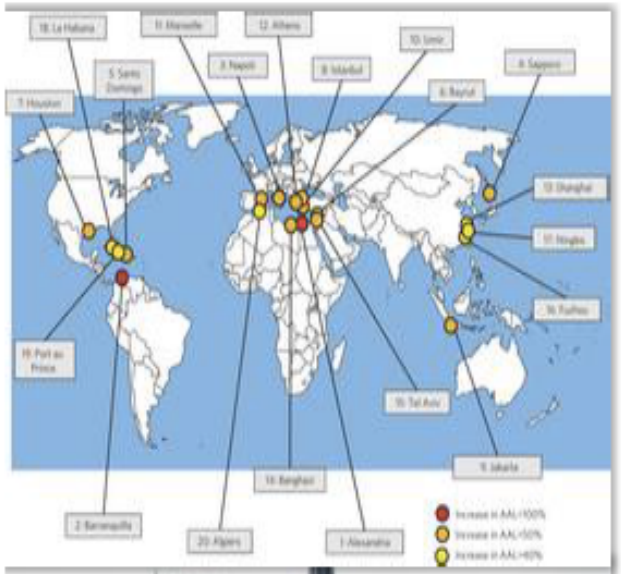
- **Acting as Council of Principals for IGFA**, a larger group of funding agencies

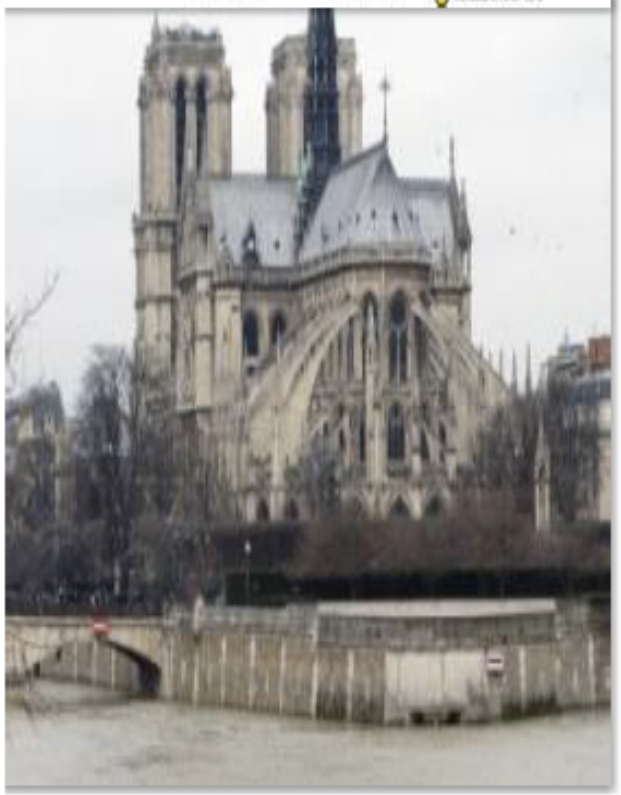
- **Australia/CSIRO**
- **Brazil/FAPESP**
- **Canada/NSERC**
- **China/NSFC**
- **European Commission/DG R&I**
- **France/CNRS&ANR, co-chair**
- **Germany/DFG&BMBF**
- **India/MoES**
- **Italy/CNR**
- **Japan/MEXT&JST**
- **South Africa/NRF, co-chair**
- **Sweden/SSEESS**
- **United Kingdom/NERC**
- **United States/NSF**
- ***International Council for Science (ICSU)***
- ***International Social Sciences Council (ISSC)***



>>> A critical mass with strong international visibility

http://igfagcr.org





Predicted losses from extreme weather events

World bank research (September 2013)

- **136 coastal cities**:
  - Current: $6 billion a year
  - In 2050: $52 billion a year

- **Worldwide coastal cities and areas**
  - In 2050: $1 trillion a year

City of Paris (OESO, 2014)

- **Seine-flooding similar to 1910**
  - € 60 billion losses
  - 5 million people affected,
  - 400.000 jobs threatened

The "BF-DELTAS Team" Led by University of Minnesota

USA: E. Foufoula-Georgiou and V. Voller (*Univ. of MN*); I. Overeem (*Univ. of Colorado*); S. Goodbred (*Vanderbilt University*); I. Harrison (*Int. Union for Conservation of Nature*); C. Vorosmarty and Z. Tessler (*City College of New York*); E. Brondizio (*Indiana University*)
Japan: Y. Saito (Geological Survey of Japan, Japan);
Germany: S. Dech and C. Kuenzer (University of Wuerzburg); F. Renaud (United Nations Univ.);
France: E. Anthony (Aix-Marseille University);
U.K: Z. Matthews, R. Nicholls, J. Dearing, A. Lazar, and A. Baschieri (Univ. of Southampton); J. Hutton (UNEP - World Conservation Monitoring Centre);
India: R. Ramachandran (Anna Univ.)
Netherlands: M. Marchand and T. Bucx (Deltares)
Bangladesh: K.M. Ahmed (Univ. of Dhaka); M.M. Rahman (Bangladesh Univ. of Engineering and Technology);
Vietnam: V. L. Ngugen (Vietnam Academy of Science and Technology); M. Goichot (World Wide Fund for Nature – Greater Mekong)
Norway: A. Newton (Norwegian Inst. for Air Research, Norway);
Brazil: S. Costa (University of Vale do Paraíba),
Canada: G. Lintern (Natural Resources Canada); P. Van Cappellen and H. Durr (University of Waterloo),
China: S. Gao (Nanjing Univ.)

The DELTAS project brings together world experts from the physical and social sciences with local stakeholders from government and non-profit organizations to enhance our scientific understanding of deltas as coupled socio-ecological systems.

Over the next three years, the cumulative research and knowledge of the team will develop a science-based integrative modeling framework that can be used to assess delta vulnerability and guide sustainable management and policy decisions at the regional and local scales. This modeling framework will be tested on three delta demonstration sites: the Ganges-Brahmaputra-Meghna (GBM) delta, the Mekong River delta (MRD), and the Amazon River delta (ARD).

Learn more about the DELTAS project, including why deltas are threatened, our Belmont Forum sponsor, our project researchers and partners, the research framework of the DELTAS project and the demonstration deltas.

Sponsored by the Belmont Forum

BELMONT FORUM

Project partners:

University of Minnesota, USA
University of Colorado-Boulder, USA
Vanderbilt University, USA
International Union for the Conservation of Nature
City College of New York, USA
Indiana University, USA
Geological Survey of Japan, Japan
University of Wurzberg, Germany
United Nations University, Germany
Aix-Marseille University, France
University of Southampton, UK

LIFE: Linked Institutions for Future Earth

LIFE, or Linked Institutions for Future Earth, aims to create an international network of researchers, institutions, and experimental sites/field observations dedicated to advancing the quantitative predictive understanding of the Earth surface system. LIFE is a **Virtual Institute**, sponsored by the National Science Foundation (NSF) Science Across Virtual Institutes (SAVI) program, working to catalyze global research activities efficiently and economically while mentoring and creating international research opportunities for junior researchers.

The objectives of LIFE include:

1. Creating a global network of leading institutions to understand and predict the evolution of the Earth-surface environmental under natural and human-induced change;

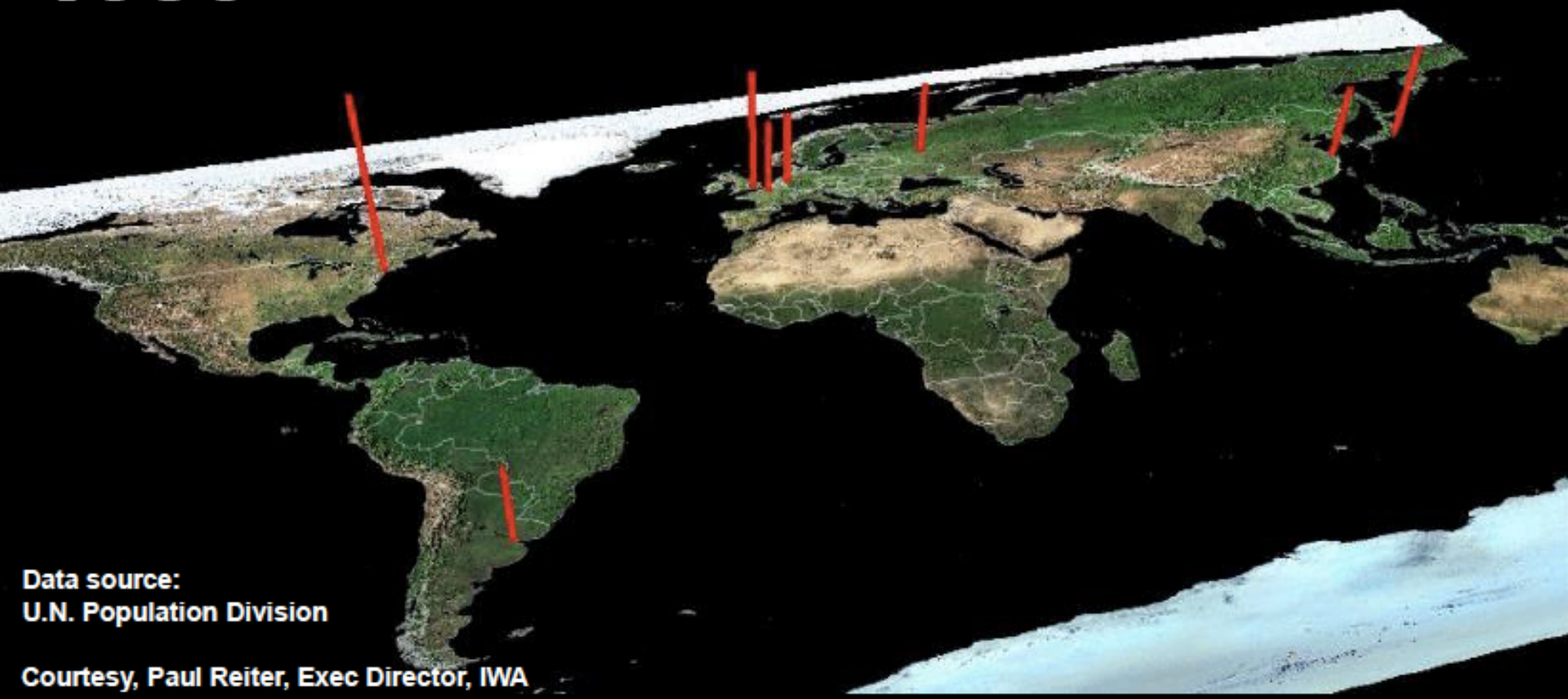
2. Cultivating a culture of action-oriented research; and

3. Creating a forum for sharing data, ideas, and expertise while mentoring

Development of World Cities

1950

World Cities exceeding 5 million residents



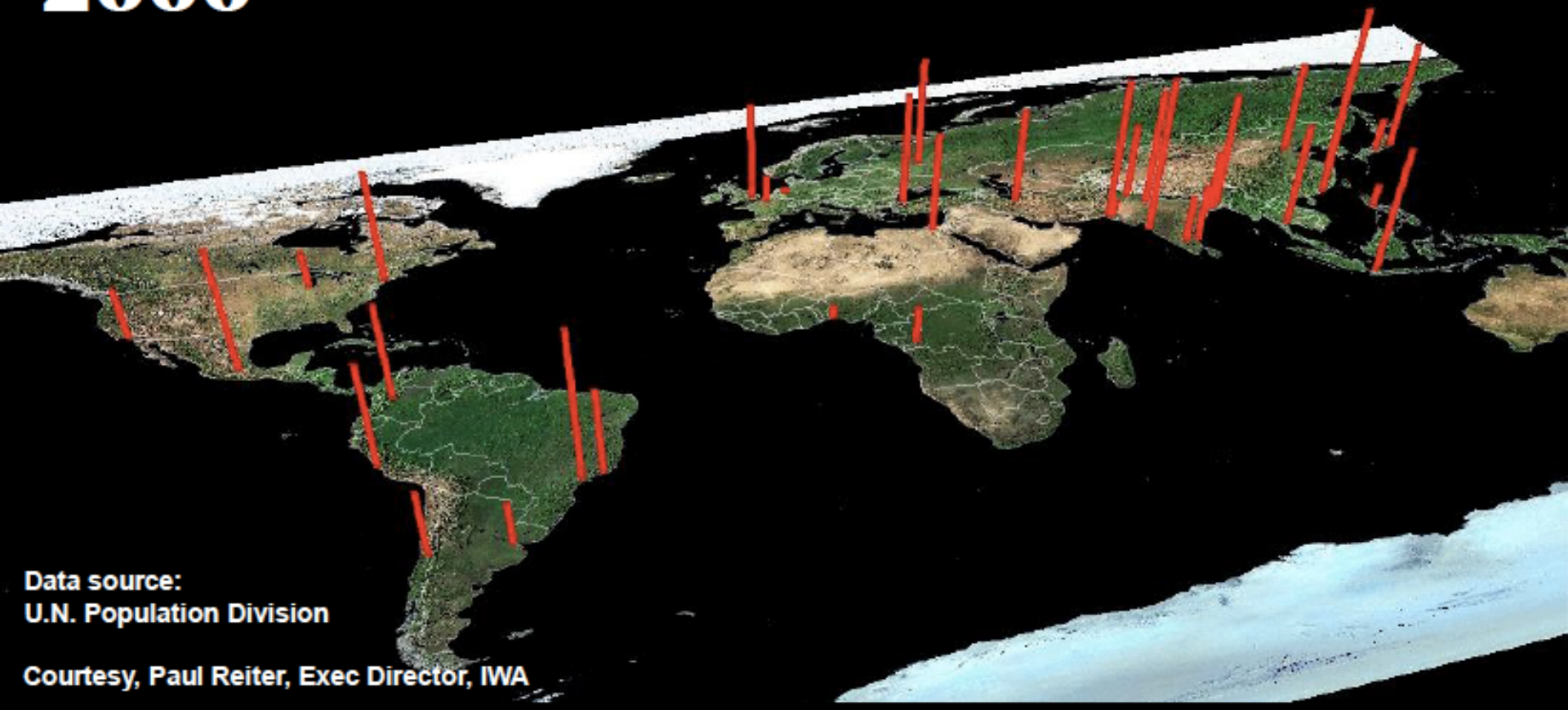
Data source:
U.N. Population Division

Courtesy, Paul Reiter, Exec Director, IWA

Development of World Cities

World Cities exceeding 5 million residents

2000



Data source:
U.N. Population Division

Courtesy, Paul Reiter, Exec Director, IWA

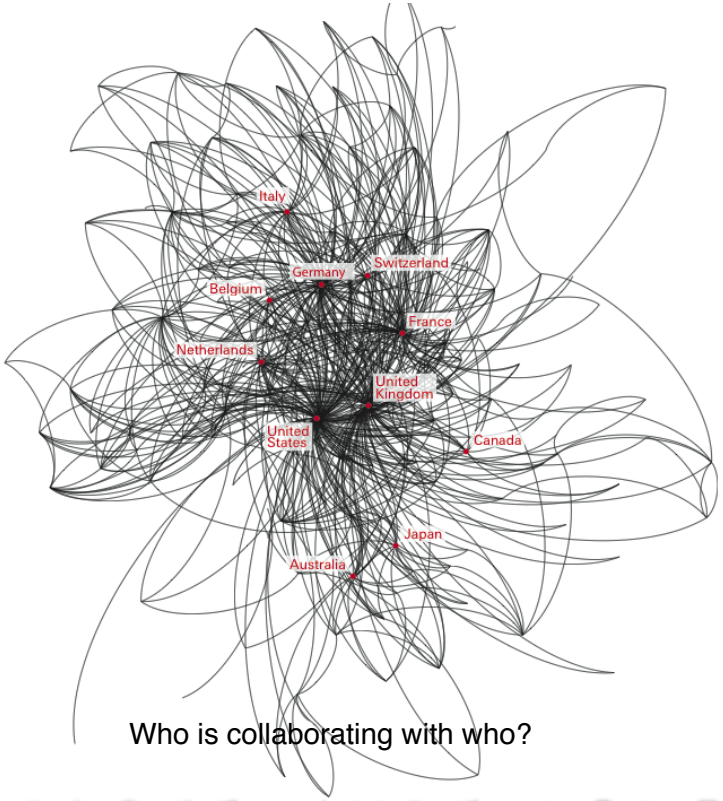
Development of World Cities

Strategic Partnering

- Lead on a handful of Strategic grand challenges (e.g., sustainability, big data, collaboration technologies, research-infused education, etc.)
- Scientific infrastructure and facilities
- Adopt best practices – emphasis on leveraging
- Partnerships with emerging powerhouses
- Strategic regional hubs (including developing world)
- Develop the human capital

Closing thoughts

"The days of overwhelming U.S. science dominance are over, but the country can actually benefit by learning to tap and build on the expanding wellspring of knowledge being generated in many countries."
The Shifting Landscape of Science, C. S. Wagner, Issues Online in Science and Technology, NRC, 2011



Who is collaborating with who?

RESEARCH.UMN.EDU/FORWARD