

The following draft summary does not necessarily reflect the positions of the National Science Board.

**A Summary of Presentations and Discussion
from the National Science Board Task Force on International Science
Roundtable Discussion on International Science Partnerships**

September 25, 2006
Singapore

Participants addressed four main focal topics, including the benefits and obstacles of engaging in science and engineering (S&E) partnerships, building scientific capacity, internal structures and practices that enhance international science partnerships, and working with U.S. Government science agencies (Appendix A). The agenda for the September 25 roundtable discussion is included in Appendix B, and a list of participants appears in Appendix C.

1. Benefits & Obstacles of Engaging in International S&E Partnerships

International S&E partnerships are of vital importance to the future of the United States and the international community. International collaboration might provide the solution to some of the most pressing issues facing the world today including climate change, energy resources, and pandemic disease. These issues have a global reach and require a global effort that can only be achieved through international partnerships. Science and engineering can no longer be considered individual pursuits as is shown by the number of Nobel prizes awarded to multinational teams. The globalization of S&E is not discriminatory and affects the entire global landscape, including the smallest and most remote economies.

As the world of scientific research becomes increasingly global and increasingly competitive, it is important to establish an environment for future generations of researchers to be able to perform in a more globally aware manner. Future generations of researchers will need to be more cognizant of and be able to successfully address the various international and cultural issues that may influence the development and implementation of science and engineering partnerships. Establishing international networks of S&E colleagues in all nations may prove to be one of the most important qualifications for future researchers.

Discussions held during the May 11 forum concluded that the U.S. is uniquely positioned to shape the direction of international cooperation and provide leadership for these important global issues. While this conclusion remained relevant during the Singapore forum, participants also cautioned that international partnerships should not be pursued at the expense of national S&E priorities of any of the collaborative partners, though this sentiment was especially strong coming from the developing and smaller economies. The costs and benefits of international partnerships from the perspective of Asian-Pacific economies are summarized below.

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Benefits

International S&E partnerships:

- Not only advance research but they have the potential to serve as vehicles for achieving improved relations between countries, stabilize political conflicts, and build capacity and stability in developing countries
- Give countries the opportunity to contribute to meeting global challenges such as the development of clean energy technologies and responding to pandemic threats
- Promote economic development, cultivation of civil society, promotion of general equity and the direction of scientists towards productive pursuits
- Allow developing and smaller countries to participate in “big science and engineering” projects
- Helps researchers forge strong international networks
- Build S&E infrastructure and capacity
- Attract foreign investment to developing nations
- Improves access to the global pool of knowledge
- Ensures the cross-fertilization of ideas

Obstacles

However, despite the many benefits of international S&E partnerships, many concerns remain.

- Despite inequities, many developed nations only fund their half of partnerships and do not frequently extend assistance to other nations, which often mean that partnerships may be cost-prohibitive for smaller or less developed nations.
- Intellectual property restrictions reduce benefits of and incentives for partnerships
- Tension between collaboration and competition makes international S&E partnerships difficult
- Many nations have difficulty justifying money spent on international S&E partnerships to taxpayers, especially for partnership activities outside the nation.
- Many nations run the risk of “brain drain” by exposing their best and brightest researchers to international research projects in other countries that do not mesh with national research priorities and do not ensure that their researchers return home to work.
- The short-term nature of many international S&E partnerships pull national researchers away not only from long-term national research priorities

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2. Building Scientific Capacity

International S&E partnerships are particularly important for small, developing, or geographically remote economies. International collaboration helps these nations build S&E capacity as well as help them remain connected to the global community. However, with fewer resources available than developed or larger economies, small economies must ensure that international partnerships utilize national resources, both human and financial, efficiently to ensure that partnerships support national priorities and are mutually beneficial. As noted above, international partnerships cannot be developed at the expense of national priority research areas or be allowed to interrupt long-term goals.

Additionally, many smaller or developing economies have difficulties in rationalizing the funding of international partnerships to domestic constituencies particularly when resources might be applied with more immediate effect to support the local economy. This problem is exacerbated by the nation's best and brightest minds failing to return to their country following participation in international research or education in other countries. If international S&E partnerships do not complement a nation's research priorities or provide incentives for researchers to return home, they effectively lure scientists away from their nation's scientific capacity building effort.

The Singapore forum participants all agreed that establishing long-term U.S. commitments to international S&E partnerships would insulate partner economies from funding and political shifts in the U.S. It would also provide nations with stronger justifications to their taxpayers for investing in international S&E partnerships. Additionally, participants concluded that international collaboration is more effective when partnership priorities are in line with their own national priorities and domestic research strategies. There were several participants that noted the U.S. is in a unique position to evaluate the research priority areas of each country, categorize them, and seek mutually beneficial partnerships based on this matrix as well as disseminate this matrix for other economies to seek partnerships based on research priorities. Similarly, the U.S. can focus its international S&E partnerships on global areas of concern – such as the priority areas defined by the UN Commission on Sustainable Development, which include energy, industrial development, climate change and natural disasters. A number of national priority areas mentioned by the participant economies are listed below:

- Agriculture
- Renewable energy
- Transportation
- Information and communication technology
- Health and pharmaceuticals
- Natural disaster management
- Development of human resources
- Innovation
- Nanotechnology

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- Biotechnology

Finally, the participants responded positively to the suggestion that intermediate economies, such as the Republic of Korea, act as “techno-cultural” bridges between developed and developing nations to facilitate development of an effective and mutually beneficial partnership between the U.S. and a developing partner’s S&E enterprise. Recognizing that developing economies cannot transition immediately into a knowledge economy and that even the best experts in the U.S. may not be able to fully understand the needs of developing economies implies that an intermediate economy may be helpful in designing international S&E partnerships.

3. Internal Structures and Practices that Enhance International S&E Partnerships

Many participants spoke about the benefits of having a centralized governmental institution for the development and implementation of S&E policy for their economy. These ministries of science and technology perform the following critical tasks:

- Coordinating national and international S&E policies
- Manage intergovernmental science, engineering, and technology relations
- Remove impediments and identify strategic opportunities for international partnerships
- Monitor and evaluate the process of planning, implementation and organizing national S&E policies and international partnerships
- Build direct and indirect links to national and international research institutes, universities, and non-government organizations
- Advise senior government officials on S&E policy

In addition to having a centralized system for developing and implementing S&E policy, many nations also designate funds specifically for international S&E partnerships – particularly for exchange programs that provide funds for both sending national researchers abroad and bringing international researchers into the country. These funds also support travel to and from international conferences and meeting – an important element for creating international S&E networks.

Many nations also create a national strategic plan to guide the development of S&E research. These plans not only focus national attention and effort on critical capabilities, but also help assure potential partners of a country’s long-term commitment to international S&E partnerships. Other nations may also use this strategic plan to identify areas of potential collaboration.

Most participants agreed that the U.S. could do significantly more to encourage its S&E community to participate in international exchange programs, which are currently primarily one-sided. U.S. funds and sends a disproportionately small amount of researchers abroad, especially in less developed APEC economies, compared to other nations. This practice deprives other nations of U.S. expertise and encourages brain drain or redirection of international scientists towards U.S. priority research areas. Many nations have centers of excellence that are highly

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regarded and most nations feel that U.S. researchers are missing out on opportunities to build U.S. capacity and international networks, by not partaking in more international partnerships.

Participants suggested that collaboration for collaboration's sake is not enough to encourage optimal output, there must be incentives involved to ensure that the partnership succeeds. Partnerships could provide incentives by permitting the researchers to benefit from the commercialization of their findings. International partnerships could involve more S&E incubators to leverage with industry to fund the transition of technologies from the lab into the market.

4. Working with U.S. Government Science Agencies

Participants expressed frustration that funding cycles are frequently out of synch between countries resulting in delayed starts to many programs. To overcome this disability, some have created a fund to support the start of critical international S&E partnerships that covers payments until the partner country can begin payments. This allows the country greater flexibility and does not stall the progress of science.

Participants also expressed concern that unless funds are specifically designated for international S&E partnerships, U.S. science agencies will continue to choose (or be restricted by regulations) to fund U.S. researchers over funding international joint research efforts. This situation seems due in great part to most U.S. agencies have mandates to demonstrate domestic benefits from expenditures of federally appropriated funds to conduct research. This is significantly more difficult to demonstrate to the public and Congress with international S&E partnerships, especially if funds are provided to non-U.S. entities. A mechanism to ensure designated funding must be established in order to effectively foster international partnerships in the U.S.

Finally, the participants suggested that the Board should consider recommending that USAID return to its focus on funding S&E capacity building programs as it did in the 1960s and 1970s. This recommendation closely follows recommendations made in the AAAS report urging that USAID take a more positive and proactive role in supporting science.

Singapore forum participants were generally in favor of the U.S. science agencies, including NSF, to be more available to support international S&E partnership. However, concerns were raised that such partnership research should align with the partners' national research priorities. If U.S. funds pull scientists into research areas not aligned with national research priorities, it effectively augments the brain drain problem. Secondly, participants suggested that U.S. S&E partnership funds should focus on areas that benefit the public good or that are of global significance. This ensures that a broad selection of nations can compete for these funds as well as benefit from the outcomes.

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Appendix A: Focal Topics for the September 25 Roundtable Discussion

United State National Science Board Task Force on International Science

Roundtable Discussion on International Science & Engineering Partnerships Singapore September 25, 2006

Focal Topics and Questions

Benefits & Obstacles of Engaging in International Science Partnerships

- 1. What are some of the benefits of international science partnerships, particularly with the United States, for your country? Which is the most important benefit?*
- 2. What are some of the obstacles your country faces in building international science partnerships with the U.S.? How are these obstacles overcome?*

Building Scientific Capacity

- 1. Are there examples in your country of scientific partnerships fostering the growth of the science and engineering educational systems in Asia?*
- 2. Are there examples from your country that have produced productive methods for enabling nations that are struggling to build their intellectual capital, infrastructure, and funds necessary for building balanced partnerships?*
- 3. Can you cite an example of a scientific partnership(s) that have been structured to encourage scientific capacity building in developing nations while minimizing brain drain?*

Internal Structures and Practices that Enhance International Science Partnerships

- 1. What kind of organizational obstacles does your government encounter in facilitating international partnerships?*
- 2. How does your country fund international science partnerships? What is the process for scientists and are there 'best practice' examples that might help inform how the U.S. can structure bi-lateral partnerships?*
- 3. How does your nation balance the economic dimension of international partnerships with the need to build capacity?*
- 4. How does your nation strengthen ties with other nations in the Asia Pacific region?*

Working with U.S. Government Science Agencies

- 1. How would the U.S. benefit from opening U.S. research monies from Government funding agencies to international researchers? How would international scientific communities benefit?*
- 2. Do you anticipate any negative effects of opening up U.S. funds to international competition?*

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Appendix B: Agenda for the September 25 Roundtable Discussion

AGENDA

UNITED STATES NATIONAL SCIENCE BOARD TASK FORCE ON INTERNATIONAL SCIENCE

ROUNDTABLE DISCUSSION INTERNATIONAL SCIENCE & ENGINEERING PARTNERSHIPS

**Singapore
Grand Plaza Parkroyal
September 25, 2006**

- 1:00 p.m. Registration**
- 1:30 p.m. Welcoming Comments**
Dr. Jon C. Strauss, Chairman, Task Force on International Science
- 1:40 p.m. Introductions, Overview of Proceedings and Background on the National Science Board**
Dr. Michael P. Crosby, Executive Director, National Science Board
- 2:00 p.m. Perspectives of the National Science Board on the value of international science and engineering partnerships**
Dr. Jon C. Strauss
- 2:15 p.m. Perspective of Principle Asia Pacific Economic Cooperation (APEC) Industrial Science and Technology Working Group (ISTWG) Representatives to the Focus Questions regarding International Science Partnerships¹**
- Panel #1
Dr. Gail Reekie, Australia, Government Department of Education, Science and Training
- Ms. Vanessa Chang, Canada, Industry Canada
- Mr. Su Mingxing, China, Department of International Cooperation, Ministry of Science & Technology (MOST)
- Dr. Finarya Legoh, Indonesia, The State Ministry of Research and Technology
- Ms. Sonoko Watanabe, Japan, Ministry of Education, Culture, Sports, Science, and Technology

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3:00 p.m. BREAK

3:15 p.m. Panel #2

Dr. Jeong Hyop Lee, Korea, Science and Technology Policy Institute

Ms. Norjanah Mohid, Malaysia, Ministry of Science, Technology, and Innovation

Dr. Tobias Nischalke, New Zealand, Ministry of Research, Science and Technology

Dr. Ester B. Ogena, Philippines, Department of Science and Technology

Mr. Alexander Tkachev, Russia, The Russian Federal Agency of Science and Innovation

4:00 p.m. Panel #3

Prof. C. K. Lee, Taiwan, Industrial Technology Research Institute

Ms. Churdchan Juangbhanich, Thailand, Ministry of Science and Technology

Mr. E. Bruce Howard, United States, U.S. Department of State

Mr. Bui Quoc Khanh, Vietnam, Ministry of Science and Technology

4:45 p.m. BREAK

5:00 p.m. Open Roundtable discussion by all invited participants

5:50 p.m. Summaries of Discussion and Next Steps for the Task Force

Dr. Strauss

Dr. Crosby

¹ National Science Board. *Charge to the Task Force on International Science*. September 19, 2005 (NSB-05-134).

This National Science Board Roundtable Discussion will focus on the current and potential role of the U.S. Federal government in achieving the following international science and engineering partnership policy objectives, stated in the task force charge:

- facilitating partnerships between U.S. and non-U.S. scientists and engineers in the U.S.;
- facilitating partnerships between U.S. and non-U.S. scientists and engineers outside the U.S. in both developed and developing countries;
- utilization of science and engineering partnerships for improving relations between countries; and
- utilization of science and engineering partnerships for improving quality of life and environmental protection in developing countries.

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Appendix C: List of Participants for the September 25 Roundtable Discussion

LIST OF ROUNDTABLE PARTICIPANTS

UNITED STATES NATIONAL SCIENCE BOARD TASK FORCE ON INTERNATIONAL SCIENCE

ROUNDTABLE DISCUSSION ON INTERNATIONAL SCIENCE PARTNERSHIPS

**Singapore
September 25, 2006**

Participant	Affiliation
<i>National Science Board</i>	
Dr. Jon C. Strauss	NSB Member, Chairman, Task Force on International Science
Dr. Dan E. Arvizu	NSB Member
Dr. Patricia D. Galloway	NSB Member
Dr. Michael P. Crosby	NSB Executive Director
<i>Australia</i>	
Dr. Gail Reekie	Australian Government Department of Education, Science and Training
<i>Canada</i>	
Ms. Vanessa Chang	Science and Innovation Sector, Industry Canada
<i>People's Republic of China</i>	
Mr. Su Mingxing	Department of International Cooperation, Ministry of Science & Technology (MOST)
Dr. Sun Qijun	China Science and Technology Exchange Center
<i>Indonesia</i>	
Dr. Finarya Legoh	The State Ministry of Research and Technology
Ms. Nada Marsudi	The State Ministry of Research and Technology
<i>Japan</i>	
Ms. Sonoko Watanabe	Ministry of Education, Culture, Sports, Science, and Technology (MEXT)
Mr. Masanori Kawabata	Ministry of Education, Culture, Sports, Science, and Technology (MEXT)
Mr. Isao Kiso	Japan Society for the Promotion of Science (JSPS)
Ms. Reiko Nagata	Ministry of Economy, Trade and Industry (METI)
Dr. Yasuyuki Yagi	National Institute of Advanced Industrial Science and Technology (AIST)

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Participant	Affiliation
<i>Republic of Korea</i> Dr. Jeong Hyop Lee	Science & Technology Policy Institute
<i>Malaysia</i> Ms. Norjanah Mohid	Ministry of Science, Technology, and Innovation
<i>New Zealand</i> Dr. Tobias Nischalke	Ministry of Research, Science and Technology
<i>Philippines</i> Dr. Ester B. Ogena	Science Education Institute, Department of Science and Technology
<i>Russia</i> Mr. Alexander Tkachev	The Russian Federal Agency of Science and Innovations
<i>Taiwan</i> Prof. C. K. Lee Ms. Jennifer Hsiou-chuan Hu	National Science Council National Science Council
<i>Thailand</i> Ms. Churdchan Juangbhanich	Ministry of Science and Technology
<i>United States</i> Mr. E. Bruce Howard	Office of Science and Technology, U.S. Department of State
<i>Vietnam</i> Mr. Bui Quoc Khanh Mr. Le Thanh Binh	Ministry of Science and Technology Ministry of Science and Technology