**Program of U.S.-China Cooperation in Science Policy, Research and Education**

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U.S. National Science Foundation (NSF) to
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George Mason University School of Law

**Carried out in Cooperation with the U.S. National Science Foundation (NSF) National Natural Science Foundation of China (NSFC) Ministry of Science and Technology of China (MOST) and the Science and Technology Policy Institute (STPI)**

The **U.S.-China Cooperation Program in Science Policy, Research and Education** began in 1999. It is built on experience gained from more than three decades of prior cooperation between the United States and the People's Republic of China in science and engineering. The productive, long-standing relationship between the National Science Foundation of the United States of America (NSF) and the National Natural Science Foundation of China (NSFC) is a cornerstone of this cooperation. The Ministry of Science and Technology (MOST) of China also played a crucial role, especially in the October 2006 U.S.-China Science and Technology Policy Forum held in Beijing. The program aims to utilize the various events of the initiative as a basis for expanded bilateral cooperation in science policy, and to provide a foundation for strengthened partnerships in specific areas of science and engineering.

Information on the NSFC can be found at: http://www.nsfc.gov.cn

Information on the NSF can be found at: http://www.nsf.gov

Information on the MOST can be found at: http://www.most.gov.cn/eng
Information on the STPI can be found at http://www.ida.org/stpi/index.html

**Further Information**

In addition to the material on the web sites referred to above, you may obtain additional information on the initiative by contacting:

Dr. J. Thomas Ratchford
E-mail: jratchfo@gmu.edu
Phone: 704-892-3025 (direct)
Fax: 704-892-4910 (direct)

Mailing Address:
P.O. Box 458
Davidson, NC 28036

Dr. William Blanpied
E-mail: wblanpie@gmu.edu
Phone: 703-841-1862
Mailing Address:

1530 N. Key Blvd./Apt. 812
Arlington, VA 22209

Meredith B. Blake
E-mail: mblake@ida.org
Phone: 202-419-5490
Mailing Address:
Science & Technology Policy Institute
1899 Pennsylvania Ave., NW
Suite 520
Washington, DC 20006-3602

**Program Activities**

The program is composed of a variety of activities. It includes a series of science and technology policy seminars, workshops, forums and related events scheduled over the first decade of the twenty-first century. These activities have explored or will explore issues with significant implications for the vitality of science and engineering in the emerging global, borderless, knowledge-based economy. These and other activities are documented through print and electronic publication. Desired outcomes include better information on science and technology policy issues for policy makers in countries as well as increased bilateral cooperation between Chinese and U.S. institutions, including those involved in the initiative's activities. The Science and Technology Policy Institute (STPI) is playing a vital role in the generation and distribution of policy briefs to U.S. decision makers.

Further information on the initiative can be found at:

http://law.gmu.edu/nctl/stpp/us_china.php

## OCTOBER 1999 BEIJING R&D POLICY SEMINAR

The first bilateral event in this program was held in Beijing, October 24-26, 1999. Co- chaired by Wu Weixuan (Chinese Academy of Sciences) and J. Thomas Ratchford (George Mason University Law School), the "Seminar on **R&D and the Knowledge-Based Society:** *Linking the Production, Dissemination, and Application of Research*," was designed to develop guiding principles for the entire initiative. Specific topics addressed at the Beijing seminar include:

- Information and Data Requirements for Policy Making
- Human Resources for Science and Engineering
- Changing Character of R&D
- Challenges for the Future

A short report and Executive Summary of the Seminar can be found at:

http://www.nsftokyo.org/rm00-01.html

A proceedings volume with the full text of papers in both English and Chinese has been published by the NSFC. The complete proceedings are available in English and Chinese at:

http://law.gmu.edu/nctl/stpp/first_scipolicy.php

## DECEMBER 2000 BETHESDA BIOTECH SEMINAR

The second major event was the "U.S.-China Policy Forum on **Biotechnology and Biomedicine**," held at the Lawton Chiles International House of the National Institutes of Health, December 4-5, 2000. The co-chairs were Gerald Keusch (National Institutes of Health) and Ji-Sheng Han (Peking University). Topics addressed include:

- Areas that Offer Mutual Advantages from Cooperation, including case studies from the past and current projects that demonstrate factors that make for successful collaborations.
- New Technologies that Facilitate Cooperation, including information technologies, technologies for understanding biocomplexity in the environment, and genomic sciences.
- Biodiversity and Ecology of Infectious Diseases, including wildlife conservation and biodiversity in China and the U.S. and ecology of infectious diseases in the two countries.
- Clinical Research Systems Compared, including cancer research, organization and management of clinical research, and clinical trial oversight.
- Differences in the Chinese and U.S. IPR and Bioethics Systems, including intellectual property rights, as relevant to research, protection of IPR in biotechnology in China, research on the management of IPR for biology and drug manufacture, technology transfer, ethics in cancer prevention and control in China and protection of human subjects and harmonization of ethical standards for international research.

- Options for Policy and Procedural Changes to Facilitate Research Cooperation.

An English language report on the seminar is available at the NSF Tokyo web site:

http://www.nsftokyo.org/asia/eaprm01-09.htm

The proceedings of the seminar in both English and Chinese are available at:

http://law.gmu.edu/nctl/stpp/biotech.php

**MARCH 2002 WASHINGTON TECHNICAL INNOVATION SEMINAR**

The national headquarters of the Industrial Research Institute (IRI) in Washington was the site of the third bilateral seminar. The "U.S.-China Seminar on **Technical Innovation**" was held March 18-20, 2002, co-chaired by Lewis Branscomb (Harvard University) and Zhu Zuoyan (National Natural Science Foundation of China). The seminar addressed policies and practice affecting the transition from invention to innovation. Major topics included:

- Creation of Innovations: Research Centers, Institutes and Universities
- Innovations in Large Enterprises and Their Supply Chains
- Globalization: Transnational Dependences in Innovation
- Innovation in Small and New High Tech Enterprises
- Financing Innovations
- Innovation Networks and Social Capital

The agenda and proceedings of the seminar in both English and Chinese are available at:

http://law.gmu.edu/nctl/stpp/tech_innovation.php

**JUNE 2002 BEIJING S&T POLICY WORKSHOP**

A "China-U.S. Workshop on **S&T Policy Challenges for the Decade**" was held in Beijing, June 24-25, 2002. The agenda can be found at:

http://law.gmu.edu/nctl/stpp/us_china_pubs/nsfc-nsf_workshop_agenda.pdf

The workshop reviewed progress under the initiative and considered revisions to its themes and content. It also considered dissemination strategies that would make results of the initiative and its various activities more helpful to policy makers. Topics for future seminars were discussed and those in preparation for 2002-2003 were confirmed. A major bilateral seminar to review and compare U.S. and Chinese science and technology policy was recommended for 2004. A workshop report will treat these and other issues in more detail.

## OCTOBER 2002 SHANGHAI & BEIJING ENGINEERING EDUCATION SEMINAR

The fifth event was a "China-U.S. Seminar on **Engineering Education for a Global Economy**" held October 20-24, 2002 in Shanghai and Beijing. The co-chairs were Edward Parrish (Worcester Polytechnic Institute) and Weng Shilie (Shanghai Jiao Tong University). Its theme addresses changing demands for engineering education in the global knowledge-based economy. Underlying the selection of this theme is the assumption that a deeper understanding of and appreciation for differing perspectives and approaches to associated issues will improve planning and implementation - nationally, bilaterally, and regionally - for the effective and balanced development of a global workforce.

There were three topical themes:

1. Lifelong Learning & Distance Education. The rapid pace of technological change necessitates means for engineers to learn continuously throughout their careers. How can they best achieve life-long learning and how can universities and companies best provide opportunities for such learning? What role should universities play in retraining engineers for career changes later in life?

2. Globalization of Engineering Education. The development of the global economy has made more companies multi-national based. International cooperation and collaboration for engineering is becoming a common phenomenon. Issues considered include: what influence should globalization have in shaping policies? How should engineering education curricula and programs be adapted to match this changing environment? How should accreditation in different countries be handled?

3. Innovation and Creation in Engineering Education. The soul of engineering is innovation and creation. Explicit knowledge is generally taught well and transferred easily. Implicit or tacit knowledge, frequently referred as "know-how," is not taught well. The seminar considered how can the principles of knowledge management be applied to strengthen engineering education in the global economy? How can students' identity be strengthened and how can students be encouraged to think critically? What role can partnerships and research parks play in preparing students to be future innovators?

The full proceedings in Chinese and English are available at:

http://law.gmu.edu/nctl/stpp/eng_education.php

## DECEMBER 2003 HONOLULU INTERNET SEMINAR

A Trilateral Seminar on **Science, Society and the Internet** was held December 14-16, 2003 at the East-West Center in Honolulu. For the first time in this program there was Japanese participation, along with delegations from the U.S. and China. The Japan Society for the Promotion of Science (JSPS) joined the National Natural Science Foundation of China (NSFC) and the U.S. National Science Foundation (NSF) in supporting the seminar. The co-chairs of the Trilateral Seminar were Toshihiko Hayashi (Stanford Japan Center, Japanese co-chair); Li Xiaoming (Peking University,

Chinese co-chair); and Wesley Shrum (Louisiana State University, U.S. co-chair).

This seminar brought together scientists from the United States, Japan and China, as well as other policy makers and experts from the three countries. These experts were concerned with and knowledgeable about the impacts of the Internet on science and society. Many of the issues discussed at the seminar involved balances and tradeoffs: for example, between the desirability of open communication among scientists, and the imperatives to maintain national and international security and protect personal and institutional privacy. The overall objective of the seminar was to identify and illuminate the most critical issues associated with the impacts of the Internet on science and society, rather than to seek to identify definitive solutions to the significant national and international issues that arise.

The full English language proceedings are available at:

http://law.gmu.edu/nctl/stpp/Internet.php and http://law.gmu.edu/nctl/stpp/us_japan.php

**FEBRUARY 2004 BEIJING FORUM ON BASIC SCIENCES**

Long range planning for basic research was the topic of the Sino-U.S. Forum on Basic Sciences for the Next Fifteen Years held February 16-17, 2004 in Beijing. The Forum took place in conjunction with efforts by the National Natural Science Foundation of China (NSFC) to coordinate the development of a national basic research plan covering the next fifteen years in that country. This in turn is part of a larger effort, known as "China's Science & Technology Advance Towards 2020," coordinated by the Ministry of Science and Technology in China (MOST), and covering all aspects of science and technology and their roles in education and the economy. Experts from both countries evaluated and compared the content, funding and management of basic research at the national level in the U.S. and China.

The forum provided explicit information about approaches the Chinese scientific community is taking to the complex set of technical and economic issues associated with the support and conduct of basic research during the medium and long-term future. The forum also provided information of a more implicit nature about the attitudes of the Government of the People's Republic of China, and of the Chinese scientific community, towards the support of basic research, and research and development (R&D) more broadly. One set of issues concerned the increasingly significant role of enterprises in China both in the performance and support of R&D. However, in view of its focus on basic sciences, the "world view" of the forum was primarily that of government.

Information from the Forum will be useful to U.S \ and Chinese policy makers in government, universities and industry. \ Discussions are underway as how best to use the February 2004 Forum as a point of departure for a Forum on Science and Technology Policy in the United States and China. The latter event would examine and compare science and technology policies more broadly than the Forum on Basic Science for the Next Fifteen Years. Co-chairs of the Forum on Basic Science for the Next Fifteen Years were Chen Jia'er, Honorary President of NSFC, and Joseph Bordogna, Deputy Director of NSF.

A detailed English language report on the Forum is available at:

http://law.gmu.edu/nctl/stpp/us_china_pubs/proceedings_sino-US_science_forum.pdf

## DECEMBER 2005 BOSTON TRILATERAL SEMINAR ON R&D POLICIES RELATED TO EMERGING AND RE-EMERGING INFECTIOUS DISEASES

A Trilateral Seminar on **R&D Policies Related to Emerging and Re-emerging Infectious Diseases** was held December 14-16, 2005 at Boston University in Boston, MA. This is the second trilateral event in the series, with the Korea Science and Engineering Foundation (KOSEF) joining the NSFC and NSF in support.

The co-chairs were Wu Guanling (Nanjing Medical University, Chinese co-chair); Hae-Kwan Cheong (Sungkyunkwan University School of Medicine, Korean co-chair); and Gerald Keusch (School of Public Health, Boston University, U.S. co-chair). The four major themes were:

**Surveillance.** This was a review of existing and potential local and national mechanisms for the early detection and diagnosis of new or emergent infectious diseases. It also covered approaches for international collaboration in surveillance. There was a special emphasis on respiratory infections, notably SARS and influenza. Factors contributing to past successes and failures were considered along with feasible means for improving the relevant mechanisms.

Although presentations dealt primarily with national programs there was discussion on how these translate into operations at city and/or local or regional levels.

**Modeling and Simulation.** Emerging and re-emerging infectious diseases occur in the context of uncertainty with regard to their control. However, data from past or similar experiences can be integrated to formulate decision support models. Quantitative variables that describe biological properties (microbial niche, transmission dynamics, natural history with hosts, population immunity profiles), intervention effectiveness (social spacing, vaccines, therapeutics) and operational/logistical response to implement population-based controls, can help describe the impact of an emerging disease and possible response scenarios. This portion of the seminar addressed how some of these modeling tools have been used to inform decision making in both real time and in future planning. Issues covered included the use and limits of models, collaborations to facilitate data collection/collation and how to address uncertainty.

**Products and Technologies.** This session considered two aspects of product development for emerging infectious diseases: drugs and vaccine on the one hand, and tools for surveillance, rapid diagnosis and determination of virulence and drug resistance profiles on the other. It covered the technical, development, testing and safety challenges associated with designing and manufacturing drugs and vaccines for these agents, which may be locally important and limited in capacity to spread widely or rapidly pandemic in nature. A second emphasis was on the need for and existing barriers to development and dissemination of new and rapid technologies for epidemiological and clinical use to identify and characterize emerging infectious agents, whether in the environment, in reservoir hosts, or in individual patients.

Issues such as sensitivity, specificity, cost and availability were considered. The potential for and barriers to international collaboration in the development of products and diagnostic technologies were highlighted.

**Implementation of Effective Policies.** This session, based in part on lessons learned from past experience, considered how to put in place feasible national policies and institutional mechanisms for dealing effectively and rapidly with specific threats associated with the spread of infectious diseases. Short-range measures intended to deal with infectious diseases that may emerge within the next five years, as well as longer-term measures were addressed. The long-term measures include areas where additional research should be emphasized, as well as education and career paths for the next generation of scientists and policy specialists.

The full English language proceedings and presentations are available at:

http://law.gmu.edu/nctl/stpp/infectious_disease.php

## OCTOBER 2006 BEIJING SCIENCE AND TECHNOLOGY POLICY FORUM

The U.S.-China Science and Technology Policy Forum was held in Beijing, Peoples Republic of China, on October 15-17, 2006. The Forum was held in conjunction with the 12th China-U.S. Joint Commission (JMC) Meeting, October 18-19, 2006.

The overall objectives of the Forum were to:

- Explore issues important to the future China-U.S. bilateral relationship;
- Be useful to policy makers and decision makers in both countries, including the 2006 (12th) JCM;
- Generate a baseline of knowledge relating to the U.S.-China S&T policy relationship through commissioned background papers;
- Involve outstanding leaders in the Forum with knowledge, experience, and wisdom who will examine issues and synthesize useful ideas and conclusions for better dealing with bilateral S&T policy challenges;
- Provide a structure to participants to examine and discuss issues and ideas;
- Insure participation of outstanding individuals with relevant experience in academia, government, and industry;
- Enhance the understanding of relevant intellectual and practical information and data through careful selection of paper authors and speakers;
- Provide opportunities for young scholars to learn and to participate in dialogue with senior participants, with the possibility of attracting young talented scholars into areas related to some of the bilateral policy issues examined at the Forum;
- Document the background papers, presentations, discussions, and conclusions through print and electronic media; and
- Disseminate the printed and electronic record of the Forum to decision makers and the general public in both countries through a variety of means.

Approximately 120 Chinese and 50 U.S. leaders from government, industry, and academia were invited to attend the Forum. Among these some two dozen each from

the Chinese and American sides played active roles as Forum participants.

The core of the Forum consisted of two roundtables: the first of these, on *Lessons Learned during the Evolution of China-U.S. Relations Since Normalization*, was held during the afternoon of October 16; the second, on *U.S.-China Relations in the Globalized 21st Century*, was held on the morning of October 17. Each roundtable featured prepared remarks by three Chinese and three American speakers, followed by brief comments on those remarks by additional Chinese and American participants. Both roundtables were followed by open discussion periods.

Six U.S. young scholars, ranging from a June 2006 bachelor's degree recipient to two post-doctoral scholars who had received their PhD degrees within two years of the Forum, were among the participants. Four of the Young Scholars were supported by NSF and two by the Motorola Foundation. They were selected by means of a nationwide competition. These young scholars served as rapporteurs for the various sessions of the Forum. On the two days immediately following the Forum the young scholars visited Tsinghua University, the National Natural Science Foundation of China (NSFC), the Institute for Policy and Management of the Chinese Academy of Sciences (CAS/IPM), and the National Center for Science and Technology for Development (NRCSTD). During these visits they were briefed on various aspects of China's Science and Technology Policy, and had opportunities for open discussion with Chinese attendees.

A detailed English language report on the Forum is available at:

http://law.gmu.edu/nctl/stpp/STPolicy_Forum.php

## JULY 2008 CHINA-INDIA-US WORKSHOP ON SCIENCE, TECHNOLOGY AND INNOVATION POLICY

A **China-India-US Workshop on Science, Technology and Innovation Policy** was held at the National Center of Advanced Study (NIAS), Bangalore, India, July 7-9 2008. The workshop was supported by the Indo-US Science and Technology Forum, the Chinese Academy of Sciences, and NIAS.

Much has been written about India and China as emerging or, better, re-emerging powers on the world scene, and it is often stated that science, technology and innovation are essential keys to their re-emergence. Yet few if any detailed comparative studies exist about their science policies, capabilities, or likely future trajectories. There are few U.S. experts on science and technology policies in both India and China. Relatively few Indian scientists and scholars have in depth familiarity with science, technology, and innovation policies and trends in China nor, reciprocally, are there Chinese scientists and scholars with in depth familiarity with science, technology and innovation policies and trends in India.

As a partner in research, a source of advanced training for Indian and Chinese students, as a frequent host at universities to visiting scholars from the two countries, and as a model of a successful national innovation system which both countries have studied and selectively emulated, the United States has a vital interest in these attempts to further develop the national capabilities of the two countries.

As a means for introducing experts from each of these three countries to the science, technology, and innovation policies of the other two, a Workshop on Science, Technology and Innovation Policy was held at the National Institute for Advanced Study in Bangalore, India, from July 7-9, 2008. The organizing committee for the workshop determined that issues associated with science, technology, and innovation policy could best be introduced and their commonalities and dissimilarities identified by focusing on case studies from three sectors in which all three countries have a significant level of capability and interest, namely:

- Power Generation by Coal,
- Information Technology,
- Pharmaceuticals

Accordingly, the core of the workshop consisted of three sessions in which experts on each of these topics summarized prepared presentations distributed in advance to all workshop participants, followed by comments by two discussants, and open discussion. During the course of the three-day workshop, four-distinguished speakers made presentations on broader aspects of the relations between R&D and innovation beyond the three specific sectors considered in the core sessions. The workshop was officially inaugurated by Shri Kapil Sibal, Indian Minister of Science, Technology and Earth Sciences.

Proceedings of the China-India-US Workshop on Science, Technology and Innovation Policy may be accessed at www.law.gmu.edu/nctl/stpp/us_china.php by selecting the Recent Events option.

## ADVISORY COUNCIL

An Advisory Council has provided advice and guidance to the program since 2003. Dr. Fred Bernthal, President of Universities Research Association, chairs the panel. Other members are drawn from government, universities, research laboratories and companies.

A core group of council members comprised the U.S. delegation to the June 2002 Beijing Workshop. The Advisory Council held its first meeting in November 2002 and met again on August 2, 2004. Council members have contributed to the program in many ways: serving as authors of papers, participants in seminars, forums and workshops, and members of selection committees. Advice via electronic "virtual meetings" has been the predominant mode.

Council members are: Frederick M. Bernthal, Council Chair, Universities Research Association; Mary Brown Bullock, Agnes Scott College; Alex DeAngelis, U.S. National Science Foundation (ret.); James Decker, Decker, Garman, Sullivan & Associates, LLC; Paul Gilman, Covanta Energy Corporation; Gretchen Kalonji, University of California; Ruth Kirschstein, National Institutes of Health; J. Thomas Ratchford, George Mason University School of Law; Maxine Savitz, Honeywell (ret.); Allen L. Sessoms, University of the District of Columbia; Denis Simon, Pennsylvania State University; and Lilian Wu, IBM Corporation.

## PROGRAM WEB SITE

The China Program recognizes that the information generated by the series of seminars and forums on U.S. and China S&T policy is only as effective as its dissemination. An effort has been made to make the project web site as useful to decision makers and the informed public as possible. It contains not only the collection of proceedings of program events and related publications, but also other recent literature on China S&T policy. Its links to a variety of China S&T policy sites provide additional clues and assistance to the serious researcher, member of the interested public or policy maker interested in China. See

http://www.law.gmu.edu/nctl/stpp/us_china.php

for details.

The program is undertaking an expanded effort to disseminate information on China S&T policy both to decision makers and the interested public in this country. The objective is to use existing material and the input of experts to produce and distribute widely a series of web-linked policy briefs. The Science and Technology Policy Institute is playing a central role in this effort. Objectives are to:

- Identify policy issues related to the U.S.-China S&T cooperation that are important to policy makers
- Develop a series of "Policy Briefs" related to the identified issues
- Base policy briefs on contents of existing program web site and input from scholars, interested public and policy makers
- Initiate a process that will generate, evaluate and update the briefs and permit their evolution to accommodate changing needs of both the facts and needs of the policy community
- Involve both experts and the broader interested public in the process of identifying, developing and editing these briefs
- Disseminate the products (policy briefs and related information) aggressively

A list and brief description of existing policy briefs and access to them can be found at www.law.gmu.edu/nctl/stpp/policy_brief.php

## POLICY BRIEFS

Several briefs are posted on the above-noted website. The briefs provide ready access to bibliographic entries on the web.

The briefs are web-based. This means "home" for the briefs are the web, where they are posted and available to the public. Distribution of printed (and e-mailed) versions will refer to the website for updates and changes.

The briefs are also web-linked. This means the contents of briefs are linked to other relevant web sites and/or web documents (there are a high density of links in most documents). This magnifies the degree of detail available to the interested reader. Bibliographic material associated with briefs make use of linked entries found on the China Program web site and others.

A modified "Wikipedia" updating process will be used. A panel of experts for each brief bring not only their own expertise, but input from policy makers and the interested public will be solicited. The briefs are updated as needed, after appropriate evaluation of scope, accuracy and content.

**STEERING GROUP**

General oversight of the Policy Briefs Project is provided by a Steering Group co-chaired by Ed David and Neal Lane. The Steering Group suggests and reviews policy topics and potential authors, comments on individual briefs, and suggests ways to make the dissemination of briefs more effective.

The Steering Group approves the general process by which Policy Briefs are produced. Its members may agree or disagree with specific content of individual briefs. The content of individual briefs, including associated editorial and policy judgments, is the responsibility of the authors and reviewers, and should not be attributed to the Steering Group itself.

Members of the Steering Group are: Edward E. David, Jr., EED Inc.,Co-Chair; Neal Lane, Rice University, Co-Chair; Erich Bloch, The Washington Advisory Group; Joseph Bordogna, University of Pennsylvania; Rita Colwell, University of Maryland College Park and Johns Hopkins University Bloomberg School of Public Health; Evan Michelson, The Rockefeller Foundation; Norman Neureiter, American Association for the Advancement of Science; and William A. Wulf, University of Virginia.

**FURTHER INFORMATION**

In addition to the material on the web sites referred to above, you may obtain further information on the initiative by contacting:

Dr. J. Thomas Ratchford
E-mail: jratchfo@gmu.edu
Phone: 704-892-3025 (direct)
Fax: 704-892-4910 (direct)

Mailing Address:
P.O. Box 458
Davidson, NC 28036

Dr. William Blanpied
E-mail: wblanpie@gmu.edu
Phone: 703-841-1862
Mailing Address:
1530 N. Key Blvd./Apt. 812
Arlington, VA 22209

Meredith B. Blake
E-mail: mblake@ida.org

Phone: 202-419-5490
Mailing Address:
Science & Technology Policy Institute
1899 Pennsylvania Ave., NW
Suite 520
Washington, DC 20006-3602