CHAPITRE 14

Networking Project: available S&T resources in the United States for networking with home countries

Jean Johnson

Some science and technology (S&T) policies and programs of the United States would facilitate the networking of the foreign-born scientists and engineers (S&Es) with their home countries to contribute to development. These policies and programs would mainly facilitate networking to build up S&T infrastructure. The Director of the National Science Foundation (NSF) has encouraged the U.S. science community to become even further engaged in the world, and has elevated international science within the NSF and expanded mechanisms for cooperative research. The Department of State has begun to revitalize the science component of U.S. diplomacy by sending "Embassy Fellows" from various U.S. science agencies to conduct 1-2 month assessments of research opportunities within specific disciplines. Some of these Embassy Fellows are identifying research opportunities with developing countries. The National Science Board (NSB) has prepared a report: *Toward a More Effective Role for the U.S. Government in International Science and Engineering*. Some of the major recommendations of this report are to develop an overall strategy of international activities of various federal agencies and to increase collaboration with developing countries. The U.S. government has announced substantial increases for foreign assistance that would include science for development programs.

These S&T policies and programs are not designed or aimed explicitly at expatriates, but are rather open to the entire U.S. scientific community, of which foreign-born scientists and engineers are a significant part. They include international cooperative science, university exchanges and distance education, and technical assistance programs. The scientific Diaspora can use U.S. and international science resources to strengthen scientific infrastructure in their home countries.

International cooperative science

International cooperative science programs are funded by U.S. government science agencies, various U.S. mission agencies and non-governmental organizations (NGOs).

The National Science Foundation (NSF) supports basic research and education in science and engineering, and has a mandate for broad dissemination of the resulting S&E knowledge. Only about 1 percent of NSF's $4.5 bi5.6(y)ln ofbudget goes to the NSF Division of International Programs to fund workshops and exchanges. However, across the research directorates of NSF, about 10 percent of the research funded focuses on international activities. NSF works primarily through grants to U.S. universities and colleges and supports international collaboration through global scale projects, international facilities and linkages to research programs of other countries.

Global scale projects

Some of these global scale projects strengthen the scientific capacity of developing countries and contribute to basic human needs worldwide. For example, Biocomplexity in the Environment encourages international research pa.6(y)rtners and includes funds for equipment and human resource development in developing countries. International Cooperative Biodiversity research identifies therapeutic plants in the context of conservation and sustainable economic development. The Global Change Research Program collaborates with Latin American and Asian institutes to augment their scientific capacity for comparative research and to understand worldwide changes in the environment. The International Digital Libraries Projects create information systems that can operate in multiple languages, formats, media and social and organizational contexts. NSF is attempting to create an internet-based worldwide materials research network to enhance scientific and educational collaborations. With this objective, a series of international workshops have been sponsored to help stimulate enhanced collaboration among materials research and create networks linking the participating countries (http://iumrs.org).

International facilities

NSF supports international facilities abroad and foreign participation in major facilities located in the United States. All of the Material Research Science and Engineering Centers (MRSEC) have active international collaborations ranging from interactions among individual scientists to Center supported workshops and symposia, as well as student and faculty exchange programs. NSF supports the *Arabidopsis* Biological Resource Center (ARBC) at Ohio State University, which serves a worldwide research community by providing collection, preservation and distribution of seeds and DNA. NSF Earthquake Engineering Research Centers develop the knowledge to estimate seismic hazards and improve earthquake hazard mitigation practices. In the future, NSF will develop a Network for Earthquake Engineering Simulation, which will link experimenters and analysts worldwide in an Internet-based system created to share experiments, results, observations and models.

Linkages to research programs of other countries

NSF maintains and participates in over a dozen bilateral agreements (e.g., with Brazil, China, France, Hungary, Indonesia, Japan, Korea, Mexico, Czech Republic, and Russia) and twice that number of informal bilateral arrangements for cooperation in all NSF-supported areas of science and engineering. For example, the U.S.-Mexico program supports cooperative research and research infrastructure in computer science, information systems, computer engineering and engineering research. International collaborative research is increasing from access to the Internet, enabling geographically remote laboratories to work together.

Cooperative science programs of mission agencies

Besides the NSF and the National Institutes of Health (NIH), mission agencies support international collaboration, including the U.S. Department of Agriculture, Department of Energy (DOE), National Aeronautics and Space Administration (NASA), and the Agency for International Development (AID). For example, Samuel Ting, Nobel laureate in physics, Professor at the Massachusetts Institute of Technology (MIT), and member of Taiwan's *Academia Sinica*, encourages collaboration of teams of scientists in 16 countries and his home country Taiwan. As chairman of the Alpha Magnetic Spectrometer (AMS) research program under the Department of Energy and National Aeronautics and Space Administration (NASA), Ting established international collaboration with Taiwanese researchers to manufacture all AMS electronics (NSB, 2002).

The Small Business and Innovation Research (SBIR) program is also a potential funding source for networking of expatriate scientists and engineers with their home countries. SBIR receives $1 Billion annually in federal funds from NSF and several other science funding agencies. One project with global relevance is the award to Virginia Polytechnic Institute (VPI) to support U.S. and Russian physicists in collaboration on the development of a sensitive nitrogen camera that could quickly locate land mines. The portable device would detect the nitrogen concentrations in land mines.

International collaboration funded by non-governmental organizations

Generous grant programs of non-governmental organizations (NGOs) would support networking activity in areas relevant to development. For example, the Pew Charitable Trust Fund is funding Dr Steven Ruth of George Mason University to set up local area networks with wireless Internet connectivity in small countries lacking good phone infrastructure. Pew seeks to increase access to broadband communication in developing countries to improve their international research capability. Presently, 95 percent of broadband access is concentrated in the United States, Europe, and Japan; with 5 percent distributed throughout the rest of world.

The Ford Foundation has initiated a new fellowship program to support advanced education in science and engineering for future leaders from underprivileged groups in developing countries. In addition, the Gates Foundation is providing large grants for medical research on tropical diseases and health improvement programs in developing countries.

Network associations of expatriate scientists and engineers could use their expertise in proposal writing and fellowship applications to channel these Foundation grants and fellowships to appropriate people and projects in their home countries.

University Exchanges and Distance Education

The decentralized nature of U.S. higher education and the large percentage of foreign-born science and engineering faculty provide opportunities for networking through university exchanges and distance education. Within U.S. universities, approximately 36 percent of the engineering faculty are foreign-born, as are 26 percent of the mathematics and computer sciences faculty, and 20 percent of the faculty in the physical sciences (SESTAT, 1997).

Foreign-born faculty are mainly from Asia and Europe, with the largest number from India and China. While expatriate scientists and engineers from any one country represent a small percentage of overall S&E faculty, they have an opportunity for networking with home-country institutions. Foreign-born scientists and engineers heading S&E departments within U.S. universities can readily arrange Memoranda of Understanding for exchange of students and faculty with their home institutions. For example, the Materials Science Department of Northwestern University, headed by an alumnus of IIT Bombay, has arranged for the exchange of students and faculty from IIT Bombay with his department (Menon, 2002).

U.S. institutions and S&E faculty are also active in international distance education in developing countries. For example, the University of Maryland is helping Uzbekistan create a virtual university (Aron, *Chronicle of Higher Education*, August 29, 2001), and E. S. Tackle's "Global Climate Change Course", Iowa State University, International Institute of Theoretical and Applied Physics, is available throughout Latin America[1].

In addition, George Washington University (GWU) provides a master's degree in Taiwan in Engineering Management and Systems Engineering, using GWU faculty on site in Taipei (Sarkani, 2002).

International S&T resources

There are many international research organizations open to expatriate scientists and engineers, such as the Consultative Group for International Agricultural Research Centers (CIGAR), initiated by the UN Food and Agricultural Organization (FAO). The U.S. Department of Agriculture (USDA) and Agency for International Development (AID) fund the network of CIGAR laboratories as well as U.S. universities conducting basic research on high yielding varieties, pest resistance, and biological nitrogen fixation for enhancing food security in Africa and tropical countries.

[1] http://www.iitap.iastate.edu/gccourse ; Dr Takle described his "Interdisciplinary Internet Course on Global Change for Present and Future Decision-makers" in the keynote presentation at the International Symposium on the Learning Society and the Water Environment (Paris, June 2-4, 1999).