Project on U.S. Policy Towards the Islamic World
Saban Center for Middle East Policy
The Brookings Institution

Conference Report

Science and Technology in U.S. Policy Towards the Islamic World

January 5, 2005

Executive Summary:

On January 5, 2005 the Brookings Project on U.S. Policy Towards the Islamic World, housed under the auspices of the Saban Center for Middle East Policy, hosted a conference on *Science and Technology in U.S. Policy Towards the Islamic World*. The meeting was attended by a wide range of participants (both scientists and policymakers) from across the U.S. Government, including the Office of Science and Technology Policy in the Executive Office of the President, numerous cabinet departments (the Departments of State, Energy, Defense, Commerce, and Health and Human Services), and agencies such as the U.S. Agency for International Development and the National Science Foundation. There were also representatives from academia and private sector institutions, both corporate and non-governmental, in attendance.

Science and technology have played an important role in many parts of the world as engines of economic growth, and infrastructural and social development, as avenues for education and intellectual development, and as forums for inter-regional and transnational cooperation. The aim of this workshop was, therefore, to discuss the current state of science and technology in the countries of the Islamic world, assessing both their strengths and needs, and to review current U.S. engagement with these fields of activity. Looking forward, the workshop then considered how the U.S. could best undertake initiatives and enter into partnerships to assist in the development of science and technology in the Islamic world, and what its priorities and realistic goals should be.

Participants in the workshop received a copy of a white paper *Untapped Potential: U.S. Science and Technology Cooperation with the Islamic World*, written by Brookings scholars Michael Levi and Michael d'Arcy, which acted as a framework for the subsequent discussions. The diverse assembly of participants ensured a substantive, wide-ranging and highly informed consideration of the relevant issues. The workshop heard about the varied, and non-uniform, ways in which countries of the Islamic world lag the developed world in science and technology at all levels, from primary education to industry and academic research. It was also noted, however, that in various parts of the Islamic world models for possible progress already exist, including ongoing scientific cooperation with the U.S., industrial development, private sector partnerships with academia, and international scientific networks; lessons can also be learnt from present difficulties. Several speakers enunciated why it is in the interests of the U.S. to foster science and technology development in the Islamic world, and others described the current activities of the U.S. government in this regard. The range of government activities was found to be rather broad but lacking in coherence and an overall strategy tied to U.S. foreign policy priorities. Difficulties resulting from U.S. policy, such as a lack of funding for collaborative efforts and the difficulty for foreign nationals of obtaining visas that facilitate cooperation, were also highlighted.

A consensus on several recommendations emerged from the workshop. The U.S. should set clear goals for its scientific and technological cooperation with the Islamic world, and develop an over-arching strategy to achieve them. This should be explained to the American public, and optimal use of U.S. public diplomacy in the Islamic world should be made. Industrial and entrepreneurial development must be a priority, but properly funded U.S. engagement should take place at all levels, from primary education to academia, and availing of human resources such as diaspora communities. ICT infrastructure and knowledge accessibility must be improved, and, with suitable attention to national security, hosting of academic visitors and transfer of technology should be facilitated. U.S. – Islamic world collaboration must be a genuine partnership, in which the U.S. listens to its partners and programs are tailored to their priorities. The pursuant possibilities are indeed considerable.

Meeting Report:

On January 5th 2005, the Brookings Project on U.S. Policy towards the Islamic World at the Saban Center convened a diverse set of policymakers, key leaders, and experts to explore science and technology policy towards Muslim states and communities. The science and technology initiative serves both as a *convening* body of leading thinkers and policymakers, and as a *catalyst* for better research, more informed policy, extension of cooperation coming from both the public and private sectors, and strategy development. To address these issues, the workshop hosted representatives from a broad cross-section of the government, including the Executive Branch, Cabinet agencies, and science and technology bodies, as well as experts from outside of government, based in academia and the private sector (both corporate and NGOs).

Jim Steinberg, the Vice President and Director of Foreign Policy Studies at Brookings, opened the first session entitled "Overview of Science and Technology in U.S. Policy towards the Islamic World." Steinberg began by emphasizing that the purpose of this workshop was to examine the possibilities and the prospects for science and technology programming and cooperation between the U.S. and the Islamic world through an assessment of the current and potential science and technology capabilities and needs of countries in the Islamic world and to explore how the development of these capabilities could contribute to broader economic, social, and political goals in the region.

The challenge of developing science and technology capabilities is one that is common to all developing countries. However, the current lack of capabilities in the Islamic world, so dramatically highlighted in the Arab Human Development Report, and the historical strength in science and technology of many of these communities, at the forefront of human knowledge, mean that this challenge in the Islamic world has a unique importance and particular difficulties. Equally important are the political implications that this science and technology deficit has had in terms of how these countries relate to the developed world. Therefore, both the capability gaps and the potential for addressing these gaps have profound consequences for both those countries and the U.S. Steinberg emphasized that the workshop was a key component of Brookings's broader work on the Project on U.S. policy towards the Islamic world. He thanked Lawrence Livermore National Laboratory for its leadership in this effort, especially Jeff Richardson and Gene De La Torre, as well as Peter W. Singer, Director of the Project on U.S. Policy Towards the Islamic World.

John Marburger, director of the Office of Science and Technology Policy (OSTP), was the first speaker and, after welcoming the white paper, *Untapped Potential: U.S. Science and Technology Cooperation with the Islamic World*, presented at the workshop by Brookings scholars Michael Levi and Michael d'Arcy, he made five general points in an overview of U.S. policies on science and technology in the Islamic World. First, from the perspective of science and technology policy, he questioned whether the term "Islamic world" was a useful categorization. In view of the high degree of heterogeneity between Islamic world countries, the white paper can be read as an overview of science and technology in foreign policy for developing countries in general, with Muslim countries providing case studies across a very wide spectrum of conditions.

Second, part of U.S. policy in the current administration is to unleash the power of private enterprise and resourcefulness of private individuals to achieve national objectives. The white paper does review private-sector activity, but this category merits even more attention. For example, the U.S. higher education establishment provides substantial direct and indirect support to foreign science and technology development through programs and direct assistance to individual students and faculty. These efforts need better documentation in the context of science and technology policy and especially in view of their sensitivity to visa and export control policies.

Third, it is important to clearly explain to the American public why the United States should invest in science and technology in other nations. Foreign policy is crafted to serve national interests, and it is possible to frame the justifications in terms of specific interests. There must be better-explained justifications for spending public funds in other nations. Society generally supports science and technology cooperation because it is intrinsically worth pursuing as a human endeavor and because international collaborations make science more productive eventually for all people.

The U.S. government supports international research and development to achieve one or more of the following ten national objectives. These objectives apply to initiatives in countries at all levels of development and demonstrate that science and technology investments differ from humanitarian aid because the U.S. gets something out of the investment.

1. Performing science to the highest standards: To maintain and continually improve the quality of U.S. science by applying global standards of excellence.
2. Access to the frontiers of science without borders: To provide access by U.S. scientists to the frontiers of science without regard to national borders including access to facilities, to physical phenomena, and to the best people.
3. Access to scientific talent: To increase the productivity of U.S. science through collaborations between U.S. scientists and the world's leading scientists regardless of national origin.
4. Augmentation of scientific human capital: To strengthen U.S. science through visits, exchanges and immigration by outstanding scientists from other nations.
5. Security through technology-based equity: To increase U.S. national security and economic prosperity by fostering the improvement of conditions in other countries through increased technical capability.
6. Leveraging on foreign capabilities: To accelerate the progress of science across a broader front than the U.S. may choose to pursue with its own resources.
7. Science diplomacy: To improve understanding by other nations of the U.S. values and ways of doing business.
8. Global science: To address U.S. interests of such global nature that the U.S. alone cannot satisfy them such as global change, global observations, and ocean resources.
9. Science as a tradable asset: To discharge obligations negotiated in connection with treaties.
10. Science for glory: To increase U.S. prestige and influence with other nations.

Fourth, there are policies in the U.S. that can prevent investment in foreign science and technology due to concerns over the proliferation of weapons of mass destruction. These policies particularly affects the development of nuclear technology in selected countries even for peaceful purposes. Iran offers the best example of a conflict between the potential benefits from increased collaboration and nonproliferation. The U.S. government currently addresses these concerns by attempting to filter the pool of applicants for student and scientific visas. However, this process of filtering is inefficient, offensive to some, and causes anxiety in science and education communities here and abroad. The U.S. government is also concerned about trade and armaments and related technology. This leads to export control regulations that, like the visa screening process, create further anxiety in the science and education communities. Dealing with these security concerns and balancing them against the benefits of international collaboration is extremely difficult.

Fifth, it is much easier to make and author policy than it is to implement it. U.S. science and technology activities are highly dispersed throughout government and nongovernmental sectors. For example, within the federal sector the research and development resources now exceeds $130 billion, and a half of that goes for nonmilitary science and technology and is disbursed through nearly a dozen agencies. Each agency has its own budget examiner who participates in a complex White House budget process managed by the Office of Management and Budget. To fund a policy initiative, consensus must be achieved first within the department or agency, then within the White House, and finally within Congress. Even after budgets are funded, programs are sensitive to the skills and interests of individual program managers and investigators. Such complexity offers a daunting challenge to coherent policy implementation.

U.S. science and technology policy coordination is conducted through a well-defined interagency process managed by the Office of Science and Technology Policy (OSTP), under the aegis of what is known as the National Science and Technology Council (NSTC). OSTP acts as an advocate for the NSTC consensus view within the White House policy machinery and leads advocacy on Capitol Hill for programs that emerge with approval from this process. In order to be effective, policy advice has to engage this entire machinery and understand the rather complex but well-defined rounds by which money and programs get into places where they have the most impact.

The session then turned to general discussion. The participants discussed whether or not it is appropriate for the administration to discourage investment in such scientific research areas as neutrino physics, low-energy nuclear structure physics, radiochemistry, health physics, and reactor engineering due to concerns about nuclear technology. These fields are safe in most respects but the difficulty comes when examining the instrumentation and the technology with which research in these fields is conducted because there are some protected technologies associated with export controls and arms limitations that are used. These limitations create a conflict between the U.S.'s desire to collaborate in these fields and the need to participate in an international program of nonproliferation and arms control. The session also addressed the fact that MEPI and USAID programs tend to focus on short term results rather than long term engagement due to political pressures. To address this problem, the Office of Management and Budget is working on better identifying to Congress the benefits of long term engagement and developing evaluation and assessment guidelines that are appropriate for basic science and research. The session also discussed other reasons for supporting cooperation in science and technology, such as recognizing the U.S.'s unique responsibility as a privileged country to be responsive to other countries' needs as well as humanitarian reasons. The participants explored the role national laboratories can play in science and technology cooperation. Laboratories that are focused on the infrastructure needed for modern science, such as accelerators, X-ray synchrotron light sources, and huge electron microscopes, are used to assist science and technology policy objectives directed toward other countries. However, national laboratories are also engaged in sensitive activities. Therefore, the Department of Energy has elaborate rules for regulating the flow of international traffic to achieve of international collaboration without compromising national security.

Shere Abbot, Chief International Officer of the America Association for the Advancement of Science (AAAS) initiated the second session entitled “Science and Technology Capacities and Needs Within the Islamic World.” AAAS is the largest multidisciplinary scientific professional society in the world and publishes the journal *Science*. The central questions addressed in this session were: What are the needs in the Islamic world? How can Islamic world countries best build their science and technology capacities to meet them? Finally, how can the U.S. match its policy objectives with these needs? Other important questions included: What is the balance of imported knowledge and indigenous knowledge that these countries need? How do they get there? How can they measure progress toward achieving those goals?

In exploring these questions, it is necessary to address issues such as marshalling the knowledge gained from science and technology investment in weapons programs towards more positive outcomes, removing the barriers that isolate scientists from their international partners, and, in some cases, building science and technology capacities anew. National strategies for building these capacities are needed; these must include improvements in science, engineering and math education in institutions, which need to be top-down as well as bottom-up, as well as an effort to ensure gender equality in these fields. Indicators for measuring success that do not necessarily include traditional indicators for scientific achievement, such as terms of patents and numbers of scientists and publications, need to be created.

Michael d'Arcy, Science and Technology Fellow at Brookings and coauthor of the science and technology white paper, highlighted a number of important observations from his research. First, in a generally post-industrial and high-tech age it is going to be all the more important to ensure that science and technology development takes place in order to allow the optimal type of advancement globally, and specifically in Islamic world countries. Second, despite the U.S. being fairly unpopular in large regions of the Islamic world, there is generally a strong level of admiration for the U.S.'s achievements in science and technology. This means that not only is U.S. cooperation in science and technology with the Islamic world important and necessary, but it is also feasible and likely to be welcome. Third, although the Islamic world is very inhomogeneous, all Islamic world states lag the developed world in science and technology; the variation is by how much they lag.

To illustrate these points, d'Arcy presented the salient data from his research. The different measures used to assess levels of development in science and technology characterized the spheres of education, academic research, industrial export activity, and transnational scientific collaborations. With regard to education, there is a general lag behind the developed world but huge variations within the Islamic world. At the primary and secondary level, only Central Asia and Malaysia are exceptions to the lag. Within the Islamic world, only Libya has a level of involvement in third-level education comparable with the West. However, almost all of the Islamic world countries show a fraction of university students in science and technology comparable with the developed world. This demonstrates that people in the Islamic world do seem to realize and value the importance of science and technology expertise and training.

In the area of academic research, there are three different figures of merit: research journal articles published per million citizens, scientists per million citizens, and pure spending on science and technology. In the U.S., there are 550 journal articles published annually per million citizens. In Japan, the number is around 400. Much of the Islamic world produces only one research article per million citizens per year. The strongest countries tend to be in the Middle East, with Kuwait in the lead (with about 120) but far behind Japan and the U.S.

Central Asia leads the way in the Islamic world in terms of research scientists per capita. The U.S. has around 4,000 research scientists per million citizens, and Azerbaijan has nearly 3,000. Other regions in the Islamic world are far behind, however: Qatar has 600, Turkey 300, the large southeast Asian states only 200, and other states even fewer.

Not only do Central Asian states have a large level of scientific expertise, they also have some very strong institutions that are a legacy of the Soviet Union. Individually strong institutions, often in the absence of a general level of scientific attainment, tend to be a characteristic all over the Islamic world. There are many individual universities and research institutions, which have a high level of expertise and even a degree of cooperation with the developed world. Their areas of expertise often tend to be tailored to the particular needs and priorities of the country in which they stand.

Developed countries tend to spend around 3 percent of their GDP on research and development. Pakistan leads the Islamic world with 1 percent. Other Islamic countries are far behind, with certain exceptions like Iran and Turkey, which spend about 0.5 of 1 percent. There is a general figure of around 0.2 percent of GDP across the whole Islamic world.

In terms of industrial activity, Malaysia is by far the strongest in the Islamic world, and the fraction of its exports that can be classified as medium- or high-tech (65 percent) is characteristic of a developed country.

Another way in which to assess levels of attainment in science and technology is by measuring academic exchange. Islamic countries already engage in international cooperation, predominantly with the U.S. In Indonesia, Pakistan, most Middle Eastern states, and Turkey, around 40 percent of their international collaboration is with the U.S. and the institutions within it. This is very significant and something that can be built on. Other areas of the Islamic world cooperate with regions with which they have historical ties. For example, Central Asian states predominantly work with Russia, while North African states overwhelmingly work with France. The U.S. should, perhaps, consider encouraging these historic ties as well as getting directly involved in these regions. Malaysian universities tend to be very industry-oriented and are actively looking for overseas collaboration. There are a lot of collaborative projects in Turkey funded by NATO and the European Union. Various institutions within the United Nations such as the World Health Organization and the Food and Agriculture Organization fund research, some collaborative, in various institutions throughout the Islamic World. The U.S. hosts thousands of visiting students and academics from countries throughout the Islamic World and particularly from the Middle East. Although this has become more difficult with the visa restrictions, it is important to continue and build upon such activities.

An important point is that although African countries lag behind the developed world and also other Islamic world states in their level of attainment in science and technology, they lead the way in terms of transnational collaborative institutions. The states in sub-Saharan Africa have instituted a number of transnational cooperative centers and organizations. This is something that can certainly be built upon and could also act as a model for other regions. Examples of this are the UAE-based Arab Science and Technology Foundation (ASTF) and the Association of African Universities. In conclusion, although science and technology in the Islamic world generally lag the developed world, the situation is complex and there are many hopeful signs to build upon.

Elizabeth Lyons, of the Office of International Science and Engineering at the National Science Foundation (NSF), discussed the challenges and opportunities for the U.S'.s engagement with the Islamic world in the realm of science and technology. The NSF is a domestic agency that funds American research. As part of its mandate to strengthen U.S. science, it encourages international collaborations, which are supported after a peer review process of submitted proposals. The NSF is currently working more with developing countries through collaborations with the World Bank, USAID, and some of the private foundations that fund science in the developing world. NSF activities include hosting visitors from science agencies across the world, engaging in the Embassy Fellows program, working with international organizations such as the Third World Academy of Science, and providing research opportunities for U.S. students overseas. Initiatives in the Islamic World include examples such as an award of $3 million to Princeton University to work with five U.S. universities in material science collaborations with ten countries in Africa. Lyons defined the challenges to such engagement as weak investment in sciences, education, equipment, and resources in the Islamic world, as well as differences in language, geography, and history. Lyons identified the needs of the Islamic world as being in the areas of cyber infrastructure, rural electrification, and investment in education.

Osman Shinaishin, from the Office of International Science and Engineering of the NSF, gave impressions from his years working with Islamic world countries through the NSF. Most of these countries have average or below average systems of higher education, with only a few centers of excellence that offer potential for collaboration with American scientists. Turkey's institutions are an exception; new universities that were established by private sources are already doing very well and exhibit high levels of scientific collaboration with the U.S. There are a number of broad issues that it may be helpful to keep in mind when discussing these countries. First, there are a number of documented cases where scientists who are under contracts or grants for collaboration with American scientists are trapped by visa restrictions. Second, there is a need for collaboration among the countries themselves, and the U.S. should help encourage this, by financial means if necessary. Third, there is a proposal for digital infrastructure for the entire Middle East to build all of their science and technology infrastructure on a digital basis in order to promote linkage and collaboration. Instead of traveling many times for collaboration, scientists can carry out many activities involving science and technology data and information exchange via fiber optics and broadband systems. Suggestions that Shinaishin made to the Arab Science and Technology Foundation, to help in establishing their science and technology program, included emphasizing the critical thinking process instead of rote memorization at the college and pre-college levels, improving scientific media for the public through museums, and improving the R&D operation of existing institutions, especially the organization management and the accountability system. He emphasized that the U.S. could help in the implementation of these ideas.

Elizabeth Daugharty, of the Office of Science and Technology Cooperation at the State Department, discussed science and technology in the Central Asian Republics. On account of their becoming independent of the USSR in 1991, the republics are different from other states in the Islamic World in that they have the science and technology institutions and capabilities left behind by the Russians. They lack interregional cooperation but have a history of cooperation with the U.S. because they dealt with the U.S. under the science and technology cooperation research agreement that the U.S. had with the Soviet Union. The U.S. is presently in the process of negotiating an agreement with Kazakhstan that includes a regional cooperative effort. The U.S. has an interest in the Central Asian republics because of their strategic location, weapons of mass destruction capabilities, and existing weapons, and the U.S. desire to build a more stable and economically sound region. Due to the fact that Central Asians have a strong science pedigree and many trained scientists, the main need in the region is money and support in building a science education infrastructure, as well as creating challenging projects for already-educated, but currently under-employed, scientists.

Karl Western, Director of the Office of Global Affairs of the National Institute of Allergy and Infectious Diseases (NIAID) at the National Institutes of Health (NIH), offered a summary of NIAID activities and objectives. NIAID is singled out in the white paper as having the broadest, most comprehensive scientific exchange in cooperation with Islamic countries at the NIH. NIAID's mission is in research and research training in microbiology and infectious diseases, including tropical medicine and tropical diseases. The major research areas include influenza and sexually transmitted diseases and, more recently, coordinating civilian biodefense research efforts. The outbreak of exotic diseases in various parts of the U.S. makes NIAID work in these areas directly relevant to U.S. interests. There have been several trends that have driven NIAID to the forefront of the international research scene. The first and most important is the dramatic advances in scientific tools and technologies that are being brought to bear on infectious disease pathogens, and the need to go outside the U.S. to find clinical examples of the pathogens. The second force is the rising priority being assigned to health and development in U.S. foreign policy and, more recently, to health threats to our national security.

NIAID looks for several characteristics in international partners. First, NIAID seeks international partners that can collaborate from the basic science to the production of a license-approved product that is manufactured up to international standards. Second, NIAID seeks help from regions with large, diverse geographic areas with large populations, and places in the world that have a disproportionate burden of disease, or unique risk groups. Third, NIAID seeks collaboration with exceptional individuals, whether they be a scientist, an influential person, or a national policymaker. Fourth, it looks for scientific and academic institutions with whom to cooperate that have a laboratory infrastructure on site. Fifth, NIAID is looking for ways in which they can partner with national and international entities to develop the health care infrastructure for delivering the product. Sixth, NIAID is looking for public, private, or other regional facilities, whether in developed or developing countries, which can produce the product.

The session then turned to general discussion. The participants discussed the best ways to arrange scientific collaborations with counterparts abroad given the current security environment and visa restrictions. American scientists are often uncomfortable going to certain countries due to safety concerns while foreign scientists are hindered from coming to the U.S. because of visa difficulties. Possible solutions to this problem include virtual collaborations and lab meetings via the internet, meeting in neutral countries, promoting trilateral cooperation, and augmenting digital libraries with the premier science and engineering journals. Utilizing the internet to facilitate scientific cooperation is critical because it can increase 'brain exchange' (as opposed to brain drain) and help women obtain greater access to information and education and thereby bridge the gender gap. However, the critical importance of face-to-face interactions in building relationships, especially in the Middle East, cannot be overlooked. In any exchange, it is also important for the U.S. to acknowledge the Islamic world's historical contribution to science and technology, particularly during the Middle Ages, and for both sides to learn lessons for the future from the Islamic world's rise and decline as the global leader in science and technology. Other issues of importance in the region that merit more attention include water scarcity and agriculture concerns.

George Atkinson, the Science and Technology Advisor to the Secretary of State, addressed the third session entitled "How Do Science and Technology Link to the Overall U.S. Foreign Policy." The Science and Technology Advisor to the Secretary is responsible for examining emerging issues that might be important for setting foreign policy. The main issue Atkinson focused on is the need for an overarching, coherent strategic policy that helps to effectively integrate policies from the government, nongovernmental organizations, the private sector, and the academic world.

The public's reaction to the tsunami in Asia has demonstrated that the public turns to science and technology to prevent national disasters but at the same time has difficulty understanding why the U.S. supports basic research or basic technology deployment for events that seem so unlikely. The dichotomy of having a society that depends so critically on technology and yet simultaneously is ill informed about science policy is a problem that needs to be addressed.

There is a sense of urgency in any discussion of science and technology policies towards the Islamic World. However, this urgency can be leveraged in a more productive way if some general themes that might be appropriate for the long term can be agreed upon. Atkinson suggested three characteristics that might characterize some cardinal points on what a long-term strategy might be for engaging science and technology in the Islamic community. First, there is a need to recognize that science and technology is a long-term effort best accomplished through partnerships, coordination, and collaboration. Second, the gap between the Western and Islamic view of science and technology is not that important for determining policy. Third, there must be an emphasis on listening to the individuals in the Islamic world.

Atkinson outlined three projects that are underway in the government that center on science and technology in Iraq, but can serve as a model for other countries. In the first project, the Nonproliferation Bureau of the Department of State created the Iraqi Center for Science and Industry, which focuses on providing alternatives to scientists in Iraq who have had engagement in weapons of mass destruction. There is a second project underway to provide the Iraqi scientific community access to scientific literature worldwide. The third project involves the Science, Technology, and Engineering Mentorship (STEM) initiative that attempts to engage scientists and engineers in a way that might establish a long-term interaction between American and Iraqi scientists.

Atkinson concluded by noting that the Department of State could provide leadership but that this should be in partnership with NGOs, government agencies, the private sector and the academic community. It is important to remember that science and technology also have an impact in fostering civic values of respect among individuals based on the merit of their work, and the recognition of one's contribution based on an unbiased evaluation by one's peers.

The session then turned to general discussion. Atkinson elaborated on how the National Science and Technology Council is coordinating efforts among agencies about what is needed, what is being done, where the gaps are, and which areas of emphasis agencies and departments should be encouraged to invest in. It was emphasized that any science and technology efforts should not just be a U.S.-centric effort but a regional-centric effort (in Central Asia, for example, support comes from both the U.S. and Europe). There are some important Islamic countries that can, perhaps, be regional points of excellence. The trust built through scientific engagement transcends cultural differences and will expand into areas of greater sensitivity such as scarcity of, and competition for, resources. The best way to overcome security challenges and visa issues is to make clear to the public the benefits of continuous exchange. The penalty paid by the scientific community because of travel restrictions is enormous, and the long-term intellectual security of the U.S. is harmed dramatically. The goal is to develop a system allowing a return to the previous, and very successful, type of U.S.-hosted scientific collaboration. Projects underway in Iraq include the development of a web portal to provide access to science and technology literature, and the STEM II program, in coordination with the Iraqi ministry and the academic community in the U.S. Gender equality issues can best be overcome by not allowing the current inequality to hinder collaboration. While it is important to focus on primary and secondary education, it is also important to engage at the university level simultaneously in order to establish relationships with the key people who make decisions in society.

Judy Levin, Program Officer for the Middle East and North Africa at the Fogarty International Center at NIH, discussed NIH activities in the Islamic world in the fourth session entitled "Current U.S. Science and Technology Activities and Programming." Forty-seven percent of the non-military research budget of the U.S. Government goes to the NIH, a $27.8 billion budget that is primarily divided into two sections, the extramural program (receiving 84.8 percent of this sum) which funds research that is conducted by scientists at institutions all over the U.S., as well as internationally, and the intramural program (9.6 percent) which consists of the research that is done by primarily U.S. Government scientists on the campus of the NIH and its several satellite laboratories. Out of about 3,500 foreign scientists in the visiting program, forty-three come from the Middle East and North Africa (excluding Israel, which has 70 scientists), and there are ten Pakistanis, nine Bengalis, eight Thais, six Indonesians, and one from a number of Central Asian countries. As a comparison, 400 came from China. Funding to the Middle East, including Israel, represented 4 percent of the total NIH research awards in fiscal year 2003, and the types of projects funded in the region ranged from basic science to clinical research trials. Areas of research that are important to both the U.S. and the Middle Eastern and North African region, and of great interest to their respective scientists, include genetics (particularly on account of the relatively high degree of intermarriage in the region), cancer (especially invasive breast cancer), and neurological disorders. There are currently two large research grants in bioethics in the region, one in Pakistan in partnership with the Aga Khan, and one in Egypt with the University of Maryland.

The National Cancer Institute (NCI) has been a leader in the Middle East Cancer Consortium, which meets on the margins of the World Health Assembly every year with the five original members Cyprus, Egypt, Israel, Jordan and the Palestinian Authority, and Turkey. This consortium stimulates research in cancer, surveillance, and cancer registries. For example, the King Hussein Cancer Center in Amman in Jordan has been very heavily supported by the NCI in an effort to build a comprehensive cancer care center for the region. Also at King Hussein, they have done an enormous amount of training and treating Iraqi children with cancer, Iraqi pediatric oncology cases, and they have made an effort to raise the quality of care with the few pediatric oncologists that still exist in Iraq. The Substance Abuse and Mental Health Services Administration are working together with the National Institute of Mental Health to try to implement a new mental health plan for Iraq.

Stephen Carpenter, Director of the Office of International and Academic Affairs at the National Institute of Standards and Technology (NIST), discussed NIST's international engagement. NIST has the primary mission of enhancing trade through measurements and standards for the industrial sectors in the United States. Due to the fact that both documentary standards and physical or measurement standards have become very important in trade and commerce, NIST has to work with many of the world market countries to ensure that no U.S. industries will be hampered through any technical barriers to trade. Islamic world countries can also be affected by this type of issue, an example of which was the E.U.'s requirement that the level of pesticide present in exported textiles be declared.

Out of 1,600 researchers and associates at NIST, between 600 and 700 come from about 71 different countries around the world. Of these foreign scientists, a third come from U.S. universities and the rest come directly from their home countries for a period of up to three years. Since September 11th, NIST has suffered many problems in getting visas for foreign guest scientists and therefore the number of foreign scientists hosted has dropped. Some examples of NIST projects in Islamic world countries include work on infrastructure development and capacity building in Central Asia with a contractor for USAID, and work with similar aims, also addressing standards and metrology issues, in Iraq and Afghanistan.

Arian Pregenzer, Senior Scientist of the Cooperative Monitoring Center and Sandia National Laboratories, offered a review of the objectives of Sandia programs, gave examples of projects underway with countries in the Arab world, and offered lessons learned that might be of value in the science and technology engagement with the Islamic world. The Cooperative Monitoring Center's goal is to develop international technical collaborations to achieve common security objectives. One of the premises is that many international security problems cannot be solved by one country alone and therefore require effective regional and international partnerships. The focus is primarily on countries and regions where there is a concern about the proliferation of weapons of mass destruction. Sandia strives to promote better regional cooperation on some common security concerns to reduce regional tensions, thereby decreasing the motivation to develop weapons of mass destruction, and to develop better partners for the U.S. government.

Sandia has various projects in progress in the Arab world, of which Pregenzer gave several examples. The first project is collaboration with the Arab Science and Technology Foundation to engage the Iraqi science and technology community. Working with the ASTF was instrumental in putting a more regional face, instead of an American face, on efforts to engage Iraqi scientists. Rather than trying to bring in money to fund specific projects, the goal for the next year is to try to make a select group of Iraqi scientists more able to compete for international sources of funding. There is currently a significant gap between their proficiency in writing grant proposals and the level needed for them to be internationally competitive candidates. The second project discussed was the establishment of a Cooperative Monitoring Center (CMC) in Amman, Jordan, as a sister center in the Middle East to that in Sandia. This was accomplished by partnering with the Royal Scientific Society in Amman and the Higher Council for Science and Technology. The CMC's goal is to bring people together from the region to examine how technology can help solve some of their common problems. The three areas that it is primarily focusing on are public health, a meteorological system, and border security. The third project highlighted was a cross-calibration project for radiation measurements, aimed at creating a network of scientists and technologists in the region who can work together.

There are a number of lessons learned from these projects. First, it is important to have very clear objectives and measures of success in mind. Second, working with Arab countries is different from working with countries in Europe or other parts of the world, especially due to the low value that Arab governments place on science and technology infrastructure. Third, Arab scientists need to improve their scientific credibility; they are not used to having to compete for funds. Fourth, it is important to keep expectations high and not take a patronizing attitude and accept low quality work. Fifth, in order to have effective U.S. involvement in these activities there need to be sources of money to pay for extensive mentorship.

Fred Tipson, Director for International Development at the Microsoft Corporation, sought make technology a more central focus of the workshop; the main focus up to that point had been on science, which, he said, neglected an important component of the meeting's topic. There is a contrast between what is needed in science and what is needed in technology in the Islamic world, and there is a fundamental challenge because of a tendency to lump the two subjects together and then address only one of them. Microsoft is trying to address some of the capacity and skills gaps in the Islamic world with a very extensive program of educational programs and building capacities. There is an urgent need to give people the capabilities to adjust to globalization by using technology. Microsoft works with organizations such as the World Bank, USAID, UNDP, and UNICEF to make their technology more effective in developing countries. Additionally, Microsoft examines how to segment these societies in a way which makes important distinctions as to how technology can be used, what priorities there are, and what resources there are to work with. Microsoft strives to adjust its products to make them more relevant to developing societies, improve the price points of their products, and create an IT industry in these countries so that people can make money from this technology. Microsoft has no difficulty attracting interest from all kinds of governments, NGOs, international organizations and working to make this agenda go forward, but it is key to have leadership from the U.S. Government that focuses specifically on how to help that process go forward.

The session then turned to general discussion. The importance of focusing on technology and technological applications, rather than simply "blue skies" research, was stressed. Dr. Tipson highlighted a Microsoft initiative called the Partners in Learning Program, which has succeeded in convincing almost 30 countries, including Egypt, to include IT skills training in the schools curriculum. It was pointed out that there is a lack of will on the part of many Islamic world countries to foster technology development. The fact that important issues such as population growth and global climate change, not addressed at this workshop, would need to be discussed at a future time was also noted.

David Sandalow, Environment Scholar at Brookings, chaired the last session entitled "A Science and Technology Strategy for the Future?" He summarized the two main goals that had come up throughout the day as improving relations between the U.S. and the Islamic world, and the advancement of science in general. The main barriers to cooperation appeared to be visa problems and a lack of funding specifically for science and technology activities with the Islamic world.

Michael Levi, Non Resident Fellow at Brookings and coauthor of the white paper, highlighted several of the report's recommendations for the future. The report's conclusions were arrived at by looking at the Islamic world's capacity and needs both at the statistical level and institutional levels, by studying U.S. governmental and nongovernmental activities, and by examining lessons from past attempts of engagement with the Islamic world and other states. The report made two broad sets of recommendations. The first is to clearly establish what the goals of science and technology engagement are. The second looks at both broad principles and specific programming ideas to achieve these goals.

The three goals of cooperative efforts are: promoting economic development as a counter-terrorism effort, addressing direct needs, whether they be local needs, regional needs, or global needs, and improving public diplomacy. As many participants in the forum noted, the view of American science and technology in the Islamic world is much more favorable than that of the U.S. in general. The U.S. should take advantage of that position by promoting, publicizing, and intensifying its efforts.

The report makes a number of specific recommendations. First, and most importantly, goals should focus on science and technology, not research and development, and on applied technology such as that used in medicine and industry. Second, the U.S. government needs to be better organized, more coherent and more integrated in its activities. It should conduct and support institutional surveys in critical regions and organize cooperation with the Islamic world by involving the Islamic world diaspora. Third, it is important to expand the scope and consistency of graduate fellowships, visa issues notwithstanding, and institute a travel fund for workshops and conferences that will help bring Islamic world scientists, technologists, and engineers together with western and American counterparts to initiate collaborations. Fourth, science and technology cooperation needs to be used very carefully and sparingly as a tool to achieve policy changes, and any science and technology strategy has to be integrated with a serious arms control and nonproliferation strategy.

John Boright, Deputy Executive Director of Policy and Global Affairs at the National Academies, offered his suggestions for future science and technology policies. First, it is better both strategically and tactically to present initiatives in a global framework, as opposed to a focus strictly on individual Islamic world countries. Second, it is important to be highly sensitive to the priorities articulated by partners in other countries, such those outlined in the Arab Human Development Report. Thirdly, it is important to have a strategic plan and collective discussions between U.S. organizations; this will also benefit prospective partners in the Islamic world by making collaboration simpler and the organization of the U.S. government less opaque. Fourth, it is important to make a commitment to program continuity and longevity. Fifth, quality education is an essential priority that needs the utmost commitment.

Norman Neureiter, Director of the AAAS Center for Science, Technology and Security Policy, discussed the importance of science and technology cooperation in U.S. foreign policy towards the Islamic world. Many members of the administration have recommended to the National Security Council that science and technology cooperation should be an essential part of any American foreign policy towards the Muslim world; the definitive response of the NSC is awaited. The National Academies are currently carrying out an assessment of how science and technology should form part of the work of USAID. Pursuing a foreign direct investment (FDI) policy in industrial production is a way to train hundreds of people in management, computer technology, and running production; this subsequently permits the growth of indigenous capabilities. A solid educational base in IT and engineering builds the capabilities, the knowledge, and the educated workers that could attract the kind of high tech FDI that India has attracted. Some obstacles to science and technology engagement in the Islamic world are religious and cultural considerations, rivalries and lack of unity within the Islamic world, and the lack of a tradition of funding science and technology foundations. Again, there is a need to convince the public that building stable, long-term constructive relationships throughout the world is in fact building national security. Long-term security for the U.S. will not come from building more walls around America, but from building a global, stable series of relationships. The current lack of funding for science and technology cooperation with Islamic world states is a major barrier to progress. On the visa issue, there is an academy study going on now regarding international graduate students and their importance to the U.S.

The session then turned to general discussion. The balance between security and openness and how to reconcile the need for security with the need for scientific exchange was a major topic of discussion. It is important to remember that universities play a big part of U.S. engagement with the

Islamic world and to protect their openness and ability to interact with the rest of the world. There are also several reasons why science and technology engagement is part of the answer to the war on terrorism. First, science and technology have the answer to the need of many of these societies to be more effective in providing water, health, energy, and transport to their citizens. Failure in these areas undermines both states and stability, thus aiding radical forces. Second, science and technology allows engagement with elites in the society, people who are influential, highly-educated, and respected. This is a promising avenue by which to begin changing the hearts and minds of people. Third, as important as exporting the products that come out of science and technology engagement is exporting the scientific method, which represent civic values as well. Peer review, publishing, and awarding grants to the best proposals embody, in many respects, elements of good governance such as transparency, accountability and meritocracy.

There are three major questions that should be answered in order to move forward. First, how should these policies be implemented with a focus not only on elites but also on the broader population, and, for example, its educational needs? Second, what are the themes around which the U.S. might organize individual groupings of countries or experts? Third, what is the role of the U.S. government versus the role of nongovernmental organizations, versus the role of the private sector?

Jeff Richardson, P. Division Leader at the Lawrence Livermore National Laboratories, summarized several major points in the conclusion session. Science and technology include more than just research and development but also commercialization, public health, economy, security, and capacity building. Face-to-face contact and sensitivity to cultural differences as well as partnerships of all the potential players including the U.S. Government, NGOs, private industry and academia are very important to any successful policy. Science and technology's role with in the context of nonproliferation and counter-terrorism should be considered. Long term commitment, especially in education, is essential.

Peter W. Singer, Senior Fellow and Director of the Brookings Project on U.S. Policy towards the Islamic World, concluded the forum by noting important public policy issues. First, the science and technology debate needs to be recast in terms of security. The national security strategy of the U.S. and the 9/11 Commission has found that U.S.-Islamic world relations are the fundamental challenge of this period. This finding starkly highlight the lack of resources that the U.S. is devoting towards Muslim world relations, including in the science and technology community, with many such gaps between needs and current S&T programming illustrated today. This needs be addressed in both internal discussions and in discussions with Congress. Second, there seems to be a clear need for an inter-agency working group, especially to address visas and public diplomacy. The science and technology community needs to better link with the public diplomacy apparatus, not only at the embassy level but all the way up to the under secretary for public diplomacy level in the Department of State, in order to better highlight positive U.S. engagement with the Islamic world. Finally, while science and technology is often focused on intrinsic needs or interesting research riddles, it also would benefit in funding support and effectiveness, by becoming more problem-driven in seeking to provide solutions to real world human demands in the region and connected to U.S. foreign policy strategy.

With support from LLNL, Brookings will continue its engagement in these issues and invites all comments on the white paper and advice about the research needs from a public policy angle. The next meeting on this issue will be to create a regional counterpart. Taking place at the U.S.-Islamic World Forum on April 10th to 12th in Doha, Qatar, it will involve leading American and Muslim science and technology leaders as well as leaders from both the private and public sector.