

## **Technology and Development Program**

The Technology and Development Program's (TDP) primary mission is to provide a focus at MIT for research and education related to the role of technology in the socioeconomic development of newly industrialized nations. TDP works with other academic departments and research centers throughout MIT to:

- Promote awareness of the relationship between science, technology, and development among faculty and students at MIT
- Provide a focal point for the technology and development activities of faculty, students, and visiting scholars interested in the field of technology and development
- Assist the faculty, students, and staff of collaborating institutions in other countries to develop research and academic interests consistent with their national needs
- Serve as a contact for interested organizations outside MIT (government, academic, private sector) to access the Institute's resources and its knowledge of developing countries, particularly of their socioeconomic and technological problems.

TDP carries out these objectives through research, academic programs, and contacts with international and national organizations that have an interest in broad areas of technology and development. In order to fully utilize available resources, TDP is structured to interact with other academic departments and research centers throughout MIT.

### **Current Research Programs**

The two major ongoing programs are in Thailand and Abu Dhabi.

#### **Thailand**

In Thailand, TDP collaborates in research and education with two major Thai institutions: the Collaborative Program of Science and Technology with the National Science Technology and Development Agency of Thailand, and the Collaborative Program of Science and Technology with the King Mongkut University of Technology at Thonburi. These two programs are funded under an agreement with Suksapattana Foundation, and both started in 1996.

#### **Abu Dhabi**

Centrally located and having a tradition of addressing issues critical to the Middle East, Abu Dhabi is intent on diversifying its oil-dominated economy and boost its non-oil economic profile. To this end, Abu Dhabi has initiated the Masdar Initiative which is a multifaceted response to the need for a global focus on resource conservation and the alternative energy sector. It is designed to ensure in the long term that Abu Dhabi retains and even grows its share of the global energy market. It is a new economic program in Abu Dhabi aimed at fostering the development and commercialization of advanced and innovative technologies in renewable energy.

One of the Masdar Initiative's objectives is to establish a new institution dedicated to premier engineering research and education. Masdar Institute of Science and Technology (MIST) will serve as the nucleus of the Masdar Initiative, feeding it with talent and innovative technologies to enhance economic development and promote new industries using renewable energy and resources in the emirate and the region. It is envisioned that over the next decade, the institute will subsequently lead to the establishment of an intellectually elite, private, not-for-profit, and independent institute of science and technology devoted to graduate-level education as well as research.

In December 2006, MIT signed a Cooperative Agreement with Abu Dhabi to assist in the establishment of a graduate institute and to collaborate on research projects of interest to both parties. In order for the Institute to make important contributions to national human resources development in Abu Dhabi and the UAE, a wide range of activities are being undertaken by the Institute. These activities are comprehensive in terms of research, industrial and governmental linkages, as well as academics. Also, they encompass a diverse set of disciplines including science, technology, management, and public policy. To expedite this development, the Institute has taken a three-pronged approach: although major emphasis has to be on research and development in several research fields of interest to the region, the Institute should also emphasize its effort in forging strong partnerships with industry and government, and in providing research and development and such educational services to its partners in industry and government as short courses, conferences, and internships.

## **Academic Program**

Graduate classes will begin in Abu Dhabi at MIST on August 23, 2009. Five master of science curricula have been developed for offer in Abu Dhabi fall 2009, namely, mechanical engineering, materials science and engineering, engineering systems and management, information technology, and water/environment. By August 2010, two additional master of science programs will be in place.

## **Research Projects**

To date the following projects have been approved and are ongoing:

- Professor Matteo Chiesa (MIST), with Professor Gang Chen (MIT)—Hybrid Solar Thermoelectric and Photovoltaic Energy Conversion
- Professor Peter Armstrong (MIST) with Professors Leon Glicksman and Leslie Norford (MIT)—Low-Energy Future for the Built Environment
- Professor Ali Tabaei (MIST) with Professor Chiang C. Mei (MIT)—Hydrodynamics for Wave-Power Extraction
- Professor Isam Janajreh (MIST) with Professor Ahmed Ghoniem (MIT)—Renewable Energy and Fuels from Waste: Thermochemical Pathways
- Professor Mahieddine Emziane (MIST) with Professor L. C. Kimerling and Dr. J. Michel (MIT): Towards Very High-Performance Thin-Film Photovoltaic Cells: Designs and Implementation

- Professor Marwan Khraisheh (MIST) with Professor Mary Boyce (MIT)—Proton Exchange Membrane Fuel Cells: Innovative Design and Manufacturing Concepts
- Professor Toufic Mezher (MIST) with Professor Nazli Choucri (MIT)—Modeling Technology Policy for Energy and Water: Applications and Extensions of System Dynamics
- Professor Hatem Zeineldin (MIST) with Professor James Kirtley (MIT)—Power System Planning with Integrated Renewable Energy Sources
- Professor I-Tsung Tsai (MIST) with Professor Michael Greenstone (MIT)—Modeling and Predicting the Impact of Climate Change on Health in the Middle East, South Asia, and Africa
- Professor Georgeta Vidican (MIST) with Professors Richard Lester and Michael Piore (MIT)—The Development of Innovative Industries and the Role of Public Research Institutions: The Case of Renewable Energy
- Professor Wei Lee Woon (MIST) with Professor Stuart Madnick (MIT)—Semantics-Enabled Technology Forecasting
- Professor Sgouris Sgouridis (MIST) with Professor R. John Hansman (MIT)—Commercial Aviation in a Carbon Constrained Future: Effective Technological, Operational, and Policy Responses from an Enterprise of Enterprises View
- Professor Scott Kennedy (MIST) with Professor James Kirtley (MIT)—Examining Power Market and System Operation Interactions
- Professor Youssef Shatilla (MIST) with Professor Mujid Kazimi and Dr. Pavel Hejzlar (MIT)—A High-Efficiency and Environmentally Friendly Nuclear Reactor for Electricity and Hydrogen

To date, 17 MIT departments and all five schools have actively participated in the Abu Dhabi Cooperative Program.

### **Governance of Cooperative Program**

The Cooperative Program Steering Committee oversees the intellectual and strategic goals of the program, as well as any modifications or extensions to the agreement. Members of the committee at MIT consist of a senior faculty member appointed by the provost representing the Office of the Provost; the dean of the School of Engineering; and the two codirectors of the Cooperative Program. The Cooperative Program Steering Committee will meet at least annually, alternating location between Cambridge, MA, and Abu Dhabi to: (a) review with the Joint Executive Committee the progress of the Program; and (b) to review and approve the nominations for Joint Executive Committee member replacements necessitated from time to time.

Members of the Joint Executive Committee of the Cooperative Program are Sultan al Jaber, Khaled Awad, Steven Geiger, Russel Jones, Fred Moavenzadeh, David H. Marks, Charles L. Cooney, and Patricia Vargas. The Joint Executive Committee is responsible for reviewing and approving the activities to be developed under the cooperative agreement and, through its program directors, implementation thereof.

At MIT the implementation of the Cooperative Program is being directed by Dr. Fred Moavenzadeh, director of MIT's Technology and Development Program, and Dr. David H. Marks, codirector of MIT's Laboratory for Energy and the Environment. In Abu Dhabi, implementation of the Cooperative Program and cooperation with MIT is directed by the MIST president and the MIST provost.

### **Future Research Initiatives**

TDP will continue to work cooperatively with King Mongkut University of Technology and with the National Science Technology and Development Agency in Thailand on research relative to the interests of MIT and Thailand, and will work with the Masdar Institute of Science and Technology on research initially focused on energy, environment, water, and logistics. It is anticipated that another 10–12 research projects will be initiated in the coming period, including interaction with the MIT Energy Initiative. In addition, TDP continues its discussions with other appropriate institutions throughout the world, i.e., in Colombia and Norway.

### **Other Initiatives**

The TDP-sponsored Middle East Program at MIT has completed its 19th year. The program (under the direction of professor and TDP associate director Nazli Choucri) involves faculty from throughout the Institute and enables students to examine through their research endeavors the processes of socioeconomic change, technological development, political change, institutional development, capital flows, and business and investment patterns in the Middle East.

### **Organization**

The director of TDP is Professor Fred Moavenzadeh, of the Department of Civil and Environmental Engineering. Professor Nazli Choucri, of the Department of Political Science, is the associate director; Patricia Vargas is the assistant director. Dr. Steven Griffiths is the executive director of the Abu Dhabi Cooperative Program. Susan Cass serves as TDP's communications officer.

**Fred Moavenzadeh**

**Director**

**James Mason Crafts Professor of Engineering**

*More information about the Technology and Development Program can be found at  
<http://web.mit.edu/mit-tdp/www/>.*