

Engineering Systems Division

MIT [Engineering Systems Division \(ESD\)](#) encompasses bold, forward-thinking educational and research efforts aimed at tackling real-world challenges, or “trillion-dollar problems.” Using new framing and modeling methodologies, ESD research integrates approaches from engineering, management, and social sciences. A truly interdisciplinary academic unit, ESD spans most departments within the School of Engineering, as well as all five MIT schools.

ESD brings together students and faculty interested in research that focuses on complex systems involving technology, organizations, and individuals. The division focuses primarily on four key domains: extended enterprises, energy and sustainability, critical infrastructure, and health-care delivery. ESD recognizes that the major challenges in these areas do not have purely technical solutions but require more holistic analysis and interdisciplinary approaches. ESD’s research approaches often focus on the areas of people and technology, uncertainty and dynamics, design and implementation, networks and flows, and policy and standards. The division’s faculty and students have forged novel relationships with partners in industry, government, and academia.

Approximately 60 faculty members, most holding dual or joint appointments within ESD and another MIT unit, are devoted to teaching and research in the field of engineering systems. As of fall 2010, 361 students were enrolled in ESD’s five master’s programs, with another 58 students in the PhD program.

ESD’s values, mission, and vision are further described in the division’s [2008 strategic report \(updated version available online\)](#). An additional document, [Engineering Systems Impacts](#) (produced in 2010), illustrates some of the clear, measurable, global impacts of ESD’s wide-ranging research and education activities. In addition, a seven-minute video available on [TechTV](#) provides a look at some of the division’s activities.

Faculty

The ESD director is Yossi Sheffi, Elisha Gray II professor of engineering systems and professor of civil and environmental engineering. Olivier de Weck, associate professor of aeronautics and astronautics and engineering systems, is ESD associate director. Nancy Leveson, professor of aeronautics and astronautics and engineering systems, oversees ESD’s PhD program, including admissions; she also chaired the ESD education policy committee.

In June 2011, ESD welcomed two new joint faculty members: Alex (Sandy) Pentland, Toshiba professor of media arts and sciences and engineering systems; and Eric Klopfer, associate professor of science education and engineering systems.

Graduate Education

The [ESD PhD program](#) has reached a steady state, admitting 16 of 90 applicants for AY2011 (with 14 students matriculating in September 2010). Applications remain strong, with 77 students applying to begin the program in AY2012. ESD awarded 156

degrees in AY2011; read more about these graduates in [News & Events](#). In addition to the engineering systems PhD and master of science programs, master's level programs include [Leaders for Global Operations](#), the [MIT Supply Chain Management Program](#) (which awards the master of engineering in logistics degree), the [System Design and Management program](#), and the [Technology and Policy Program](#) (TPP). More details about these master's programs are provided in this report.

Undergraduate Education

ESD continues to explore how it might respond to an increased desire among undergraduates for more flexibility in their academic programs and an increased interest in real-world system problems by providing an undergraduate offering in engineering systems.

In spring 2011, ESD presented the new undergraduate subject ESD.00 Introduction to Engineering Systems. ESD.00 introduced basic engineering systems concepts in lectures by professor Joseph Sussman and research scientist Afreen Siddiqi, who arranged the class into teams to work on projects that exemplify critical contemporary issues. The d'Arbeloff Fund for Excellence in Education provided funding for the development and assessment of this new subject.

ESD continues to have some involvement with undergraduates via the [Bernard M. Gordon–MIT Engineering Leadership Program](#), directed by Edward Crawley, professor of aeronautics and astronautics and engineering systems and Ford professor of engineering. Also, a number of ESD faculty are involved in developing the new Singapore University of Technology and Design, which features engineering systems (for undergraduates) as one of its major academic pillars.

Research

ESD continues to encompass several major research centers, including the [Center for Engineering Systems Fundamentals](#) (CESF); the [Center for Technology, Policy, and Industrial Development](#) (CTPID); the [MIT Center for Transportation & Logistics](#) (MIT CTL); and the [Center for Biomedical Engineering](#) (CBI). These research programs are described later in this report.

The [MIT Portugal Program](#), launched in October 2006 and hosted by ESD, is a strategic investment in people, knowledge, and ideas by the Portuguese government to strengthen the country's knowledge base and international competitiveness. This transatlantic collaboration involves MIT and government, academia, and industry in Portugal in the development of education and research programs in engineering systems. See the MIT Portugal Program Report to the President for further information.

MIT Press Engineering Systems Books Series

ESD is pleased to announce the new MIT Press Engineering Systems Book Series, which will explore different facets of the field of engineering systems and provide a new venue for publication of textbooks and scholarly works that push forward research and education in this field. The series will start with three publications (with projected publication dates) listed below:

Flexibility in Engineering Design, Richard de Neufville and Stefan Scholtes (August 26, 2011)

Engineering Systems: Meeting Human Needs in a Complex Technological World, Olivier L. de Weck, Daniel Roos, and Christopher L. Magee (November 11, 2011)

Engineering a Safer World: Systems Thinking Applied to Safety, Nancy G. Leveson (November 17, 2011)

ESD will work closely with MIT Press to promote this new book series throughout the upcoming academic year.

ESD Achievements

Faculty and Teaching Staff Highlights

Cynthia Barnhart was appointed acting dean of the **School of Engineering**.

Edgar Blanco, along with team members Leo Bonanni and Ignacio Castro, won first place in the web/information technology track of the [100K Executive Summary Contest](#).

Joseph Coughlin's book *Aging America and Transportation: Personal Choices and Public Policy* (with coeditor Lisa D'Ambrosio) was published by Springer Publishing Company. He was also named one of the 10 Most Creative People on Twitter by Fast Company magazine.

Edward Crawley received the Bernard M. Gordon Prize for Innovation in Engineering and Technology Education.

Michael Cusumano's book *Staying Power: Six Enduring Principles for Managing Strategy and Innovation in an Uncertain World* was published by Oxford University Press.

Eun Suk Suh, Michael Furst, Kenneth Mihalyov, and Olivier de Weck's paper, "Technology Infusion for Complex Systems: A Framework and Case Study," was selected by the International Council in Systems Engineering (INCOSE) to receive the Outstanding Journal Paper Award (awarded 2011). The award is presented annually for one outstanding paper from the Systems Engineering journal.

Qi Hommes received a research grant from the Ford-MIT Alliance. The grant will be used to conduct research on quantifying the value of architecture flexibility for the hybrid vehicle battery hardware and software partitioning decisions. This grant was awarded in collaboration with Richard de Neufville.

Richard Larson received the IBM Faculty Award.

Nancy Leveson gave testimony to the US Senate Committee on Energy and Natural Resources on how to implement the recommendations of the presidential oil spill commission and prevent future accidents in the offshore oil and gas industry.

Dava Newman was appointed to the National Aeronautics and Space Administration (NASA) Advisory Council Committee on Technology and Innovation. Her proposal was among the 12 to be funded by NASA's Human Research Program and the National Space Biomedical Research Institute.

Deborah Nightingale was appointed director of CTPID.

Kenneth Oye was a recipient of the James A. and Ruth Levitan Award for Excellence in Teaching.

Jhonatan Rotberg received an award from the Discovery Channel and Quo science magazine (Mexico) for his work in MIT's [NextLab](#) program. The Quo+Discovery Minds nationwide search honors the most innovative ideas and projects developed by Mexican citizens in the past 10 years.

Noelle Selin was awarded a National Science Foundation CAREER Award for her proposal on mercury and persistent organic pollutants.

Afreen Siddiqi was among those awarded funding from MIT Energy Initiative's latest round of seed grants. Her project, with James Wescoat (Department of Architecture), will focus on linkages between water use efficiency and energy intensity in large-scale irrigation systems.

Yossi Sheffi was awarded an honorary doctorate by the University of Zaragoza, and was selected to receive the [Salzberg Lifetime Award](#) from the Whitman School of Management at Syracuse University.

David Simchi-Levi was elected as an academic member of the Technion-Israel Institute of Technology's Board of Governors.

LGO senior lecturer Steven Spear was awarded the Philip Crosby Medal by the American Society for Quality for his book *The High Velocity Edge*.

Joseph Sussman was reappointed chair of the US Department of Transportation ITS Program Advisory Committee. Professor Sussman's talk "Engineering Systems: Evolution of a Field of Study," presented at Columbia University as part of the Dean's Distinguished Lecture Series, is now available for [online viewing](#).

Annalisa Weigel keynoted the Science, Technology, Engineering and Mathematics Joint Societies Capitol Hill Reception.

John Williams received an award from the Discrete Element Scientific Committee for "pioneering work and outstanding scientific contributions in the field of mechanics of discontinua."

The 2010–2011 MIT International Science and Technology Initiatives Global Seed Funds winners were announced, and included:

Deborah Nightingale and Ricardo Valerdi: Systems Engineering a Brazilian University Pico-satellite – A Focus on Test & Evaluation (MIT-Brazil Seed Fund)

Mort Webster and Ignacio Perez-Arriaga: Stochastic Dynamic Models for Advanced Electric Power Systems Planning (MIT-Spain/La Cambra de Barcelona Seed Fund)

Daniel Frey: Bicycles as a Vehicle for Engineering Education (MITOR Project)

Alumni Honors

ESD PhD alumnus Matthew Silver is chief executive officer and cofounder of the startup firm Cambrian Innovation (formerly IntAct Labs), which specializes in microbial fuel cells and other bio-electrochemical systems focused on environmental sustainability. Dr. Silver testified before Congress upon invitation of the chair of the Small Business Committee, Senator Mary Landrieu, on the suggestion of Senator Scott Brown.

Roberto Perez-Franco (MEng '04, PhD '10) was selected as one of the Ten Outstanding Young Persons of Panama, in the area of academic achievements, by the Junior Chamber International. (Only one of the 10 awards is given in the academic area.)

Student Honors

A number of students representing ESD academic programs were recently on award-winning teams in prestigious social entrepreneurship competitions. Award-winners are cited in the master's programs reports.

Honors for ESD PhD students include:

Danielle Wood was honored at a conference that brought together NASA's information technology community. She received an award that "recognizes undergraduate/graduate students for their use of technology in inspiring the K-12 and peer community through NASA-related outreach activities and educational interactions."

Pearl Donohoo, David Keith, Vivek Sakhrani, and Nidhi Santen were selected to receive AY2012 fellowships from the Martin Family Society of Fellows.

Sahar Hashmi received the Hugh Hampton Young Memorial Fund Fellowship for AY2012.

Candace Brakewood was awarded a 2011 Eisenhower Fellowship from the Dwight David Eisenhower Transportation Fellowship Program.

Rhonda Jordan (and TPP graduate Isaac Matthews) attended the African Presidential Roundtable focusing on energy (held in Port Louis, Mauritius).

Valerie Karplus's paper, submitted for the 29th US Association for Energy Economics/International Association for Energy Economics North American Conference, was selected by the Dennis J. O'Brien Best Paper Awards committee for a student paper award.

Employee Recognition

Robin Lemp, assistant director of the MIT Portugal Program, received a School of Engineering Infinite Mile Award for Excellence. His award citation included extensive praise from colleagues and noted his outstanding abilities in handling the large and complex MIT Portugal Program.

Conferences and Lectures

Brunel Lecture on Complex Systems

Charles Ferguson (filmmaker, *Inside Job*) presented the talk “[The Financial Crisis, the Recession, and America’s Future: A Systemic Perspective](#)” (available on [MIT World](#)). (Ferguson received an Academy Award for Best Documentary for *Inside Job*.)

Charles L. Miller Symposium

ESD presented the April symposium “[The Evolution of Engineering Systems: A Rich Past, an Exciting Future](#),” honoring professor Daniel Roos, founding director of ESD. Symposium presentations are available on [TechTV](#).

Major Meeting

ESD Visiting Committee

ESD hosted a meeting with its Visiting Committee at the MIT Faculty Club on November 16–17, 2010. Attending committee members included James Champy (chair), Vernon Altman, Larry Birenbaum, Arthur Gelb, Sarah Stewart Johnson, Ronald R. Luman, Joseph Nemec, Jr., M. Elisabeth Paté Cornell, William Rouse, and Elisabeth Stock. The meeting resulted in a positive report on ESD that acknowledged the division’s importance and continued progress, and addressed some of its ongoing challenges.

ESD Alumni Advisory Council

The next Alumni Advisory Council meeting is expected to be in fall 2011. ESD maintains communications with the council during the academic year through letters from the ESD director.

MIT150

ESD was involved in the MIT150 initiative in a number of ways. Professor David Mindell was MIT150 steering committee chair, and he and Professor Newman were faculty leads for the symposium “*Earth, Air, Ocean and Space: The Future of Exploration.*” Paul Lagacé was cochair of the working group for the MIT150 Open House held April 30, 2011 (which also helped kick off the annual Cambridge Science Festival). ESD participated in the open house with a number of activities, including demonstrations of the AgeLab driving simulator, MIT CTL’s interactive supply chain map, Blended Learning Open Source Science or Math Studies (BLOSSOMS) video learning modules, and more.

Yossi Sheffi

Director, Engineering Systems Division and MIT Center for Transportation & Logistics
Elisha Gray II Professor of Engineering Systems and Professor of Civil and Environmental Engineering

Master's Programs

Leaders for Global Operations

The [Leaders for Global Operations](#) (LGO) program, now in its 23rd year, offers a master of business administration (or a master of science in management) from the MIT Sloan School of Management and a master of science from the School of Engineering. Focused on leadership and teamwork, the two-year LGO experience features a cross-disciplinary curriculum, a global orientation, and internship opportunities.

Academic Program

The LGO curriculum offers a mix of management and engineering courses. LGO students can earn engineering degrees in seven engineering disciplines. Within their departments, students can focus on departmental courses of study as well as topic areas related to manufacturing and operations in nine engineering tracks:

- Biomechanics (Mechanical Engineering)
- Energy and environmental sustainability (Civil and Environmental Engineering, Mechanical Engineering, and ESD)
- Information and decision systems (Electrical Engineering and Computer Science)
- Manufacturing systems (Mechanical Engineering)
- Ocean systems management (Mechanical Engineering)
- Semiconductor manufacturing (Electrical Engineering and Computer Science)
- Supply chain management (ESD)
- Systems engineering (ESD)
- Transportation (Civil and Environmental Engineering)

Internships and Research

The LGO Class of 2011 had 48 graduates in June 2011. Each graduate completed a six-month internship at a partner company. The LGO Class of 2012 had 14 international internships, in Argentina, Brazil, Costa Rica, Finland, France, Germany, the Netherlands, Spain, and Switzerland. A number of follow-on internships from the work done by LGO '11 were handed off to LGO '12, resulting in a continuity of research.

Admissions

Fifty new students (in the LGO Class of 2013) were admitted and began an intensive summer session in June 2011. The class has an average of 4.6 years of work experience, higher than in the previous year. LGO continues to successfully recruit women (who make up 30% of this year's class) and underrepresented minorities (10% of this year's class).

The entering Class of 2013, broken down by engineering discipline, is as follows:

Aeronautics and Astronautics: 5
 Biological Engineering: 1
 Chemical Engineering: 2
 Civil and Environmental Engineering: 2
 Electrical Engineering and Computer Science: 2
 Engineering Systems Division: 25
 Mechanical Engineering: 13

LGO applications increased significantly for the second consecutive year (from 286 to 308) and there was an 88% yield of admitted candidates accepting a place in the program, suggesting that the change of name in 2009 from Leaders for Manufacturing to Leaders for Global Operations has had a positive effect on recruitment.

Program Leadership and Personnel

Faculty codirectors for the LGO and the System Design and Management (SDM) programs are professors Simchi-Levi of the School of Engineering and Georgia Perakis of MIT Sloan. Professor emeritus Thomas Allen of MIT Sloan served as outgoing management codirector during the academic year. MIT Sloan senior lecturer Donald Rosenfield continues to serve as LGO program director, while Vahram Erdekian remains as LGO industry codirector. Joshua Jacobs was hired as director of operations and partner integration, and Steven Derocher joined the program as web and information technology manager.

China Leaders for Global Operations

The entire China Leaders for Global Operations (CLGO) class visited MIT in July to participate in a joint cross-cultural communications seminar with LGO students, go on plant tours, and sit in on some LGO courses. In January, Professor Allen led the third CLGO review committee, which recommended that the program increase its applicant pool via better marketing, find ways to balance engineering and management, and recruit more partner companies. The committee traveled to Shanghai, where committee members met with Shanghai Jiao Tong University deans, faculty, students, and staff. From there they sent a report to the university deans responsible for CLGO. In May, Professor Simchi-Levi and Senior Lecturer Rosenfield conducted a follow-up visit to monitor progress, participate in the spring CLGO governing board meeting, and take part in the second CLGO graduation ceremony, as well as give presentations at the CLGO Lean Operations Club Forum on Supply Chain Risks after the Japan Mega-Disaster.

LGO Alumni

The LGO 2010 alumni conference, Operations Leadership in a Global Economy, drew many alumni to Miami, FL. Professor Roberto Rigobón of MIT Sloan gave a presentation to the group, as did two current LGO students.

Steve Cook (LGO '98) continues as the elected official alumni voice on the LGO operating committee. MIT faculty and LGO and SDM alumni continued to present monthly webcasts and were instrumental in setting up an infrastructure to support

LGO. An alumni advisory board, headed by Christy Dorris (LGO '06), continues to work on folding alumni activities into one group that oversees fundraising, the annual conference, operating committee representation, and networking events.

Through an organized fundraising effort, alumni established three funds: the William C. Hanson and Don W. Davis Leadership Fund, the Alumni Annual Fund, and the Endowed Discretionary Fund. Parts of the funds were used for immediate needs and were distributed to support student scholarships and plant tour expenses. The alumni fundraising total was approximately \$90,000, a new high.

Speakers at Global Operations Leadership Seminars

LGO students attend weekly on-campus seminars with faculty and industry experts to explore local, national, and international manufacturing, leadership, and business issues. The more than 30 speakers in fall 2010 and spring 2011 included Annette Clayton, vice president for Global Supply Chain Management, Dell; Angel Mendez, executive vice president for Customer Value Chain Management, Cisco; Heiko Schaefer, head of strategy (Global Operations), adidas; and Tana Utley (MIT Sloan Fellow '07), chief technology officer, Caterpillar.

Don Davis Memorial

On January 26, 2011, 80 LGO students, alumni, and friends gathered to remember Don Davis, former chief executive officer of Stanley Works, who passed away in September 2010. Davis was the founding leadership lecturer for LGO and taught hundreds of LGO students from the program's inception in 1988 until shortly before his death. Jeff Wilke, LGO '93, senior vice president for North American Retail Operations, Amazon.com, and cochair of the LGO governing board, was master of ceremonies. Those remembering Davis included Institute Professor Thomas Magnanti, founding director of Leaders for Manufacturing (as the program was initially known), several LGO alumni, and Davis's daughter Ruthie Davis.

Plant Tours

Local plant tours were held at Amgen, Cisco, Gorton's, and United Technologies Corporation–Pratt & Whitney. Students in the annual two-week plant trek visited General Motors and the Ford Motor Company in Detroit, MI; the Boeing Company in Seattle, WA; Amazon.com in Phoenix, AZ; Dell in Austin, TX; and Amgen and United Technologies–Hamilton Sundstrand in Puerto Rico. The LGO international plant tour for the first time visited South America, with tours at Caterpillar, Dell, Embraer, Flextronics, General Motors (Brazil), and Volkswagen (Argentina).

Career Development

Sponsored and non-sponsored LGO students are highly sought after upon graduation. Partner companies and other organizations take a special interest in LGO students, as indicated by their active participation in the Global Operations Leadership Seminar sessions throughout the year and recruiting week. Of the Class of 2011 to date, 64% have accepted positions in manufacturing and operations companies; 38% of these are in partner companies.

Governance

LGO is run by a governing board of senior officers from the managing partner companies, program codirectors, and MIT deans, and is cochaired by Jeff Wilke of Amazon.com and Larry Loftis of Boeing Company. The LGO operating committee, chaired by industry codirector Vahram Erdekian, handles ongoing program management and includes company representatives, faculty, and directors.

The June 2011 joint LGO governing board/operating committee workshop honored former governing board members Bob Baker (Intel), Annette Clayton (Dell), and Dick Johnston (Raytheon), as well as former MIT Sloan faculty codirector Thomas Allen.

New Partners

An active student, staff, and company committee has succeeded in bringing new partners to LGO. Massachusetts General Hospital and Nokia joined in the past year, and other companies are in discussions to join the partnership in the coming year.

LGO Awards

Missy Brost, LGO '10: Distinguished New Engineer of the Year, Society of Women Engineers

Jason Chen and Limor Zehavi, LGO '12: Charles Harrison Smith III Memorial Award

Kacey Fetcho-Phillips, LGO '11: 2011 MIT Sloan Achievement Award for Leadership and Community Contribution

Marnix Hollander and Kurtis McKenney, LGO '12, and teammates: Winners, MIT 100K Elevator Pitch/Executive Summary Contest, and Berkeley-Stanford Cleantech Launchpad Grand Prize (for PolyChroma)

Craig Rothman, LGO '12, with MIT Sloan MBA teammates: Winners, 15th Annual International Operations Case Competition at the Carnegie Mellon Tepper School of Business

Steven Spear, LGO contributing faculty member: Philip Crosby Medal from American Society for Quality

Steven Stoddard, LGO '12, and teammates: MIT Clean Energy Prize (for CoolChip Technologies)

Timothy Vasil, LGO '11: LGO Best Thesis Award

Georgia Perakis, Codirector
William F. Pounds Professor of Management

David Simchi-Levi, Codirector
Professor of Civil and Environmental Engineering and Engineering Systems

Vahram Erdekian, Industry Codirector

Donald Rosenfield, Director, LGO Program

MIT Supply Chain Management Program

The Master of Engineering in Logistics program was launched in fall 1998 to offer intensive, focused graduate education to practitioners in the areas of logistics and supply chain management. Over the course of 12 years, the profession evolved so that most senior executives now have the term “supply chain” in their title. In response to this shift, a new identity for the program was launched in August 2010, with the name [Supply Chain Management](#) (SCM) program. Students in the SCM program still receive the same high-quality education culminating in the master of engineering in logistics degree.

The SCM program launched a new website that enables visitors to quickly find the information they are seeking and connect with a person or experience that resonates with them. The website demonstrates the impact of SCM, primarily through telling the stories of its students and alumni.

The program curriculum underwent a shift in AY2011. The requirement to take the System Dynamics course was replaced by a System Analysis Focus, which allows students to take Engineering Systems Analysis for Design. At the same time, a formal Financial Analysis Focus was added, which includes a new course option: Supply Chain Finance, created by Jarrod Goentzel, SCM executive director. SCM welcomed a new writing instructor, Neal Lerner, to a core faculty that continued from the previous year.

SCM Class of 2011

In spring 2010, 28 students were selected from more than 250 applicants to join the SCM program as its Class of 2011. The class was geographically dispersed, with students coming from five continents. At an average age of 29.3, the students brought several years of professional experience to the program.

Campus recruiting activity continued to grow, with more than 60 companies targeting the SCM program via information sessions, résumé drops, and interviews in 2010–2011. As a result, 96% of students had one or more job offers by graduation. As in the past, the program made a significant impact on the salary level of the class, with the median outgoing base salary of \$111,000, representing a 76% increase over the median incoming base salary.

SCM Thesis Partners

This year, 13 companies participated as Supply Chain Exchange Thesis Partners. A team of students is assigned a jointly planned project that has both practical and research aspects. This year’s projects included:

Electric and Plug-in Hybrid Electric Vehicles: An Energy and Storage Resource for the Electric Grid

Preserving Shelf Life and Reducing Reefer Fuel Consumption in Fresh Produce Distribution

Collaborative Direct-to-store Distribution: The Consumer Packaged Goods Network of the Future

Incorporating Cycle Time Uncertainty to Improve Railcar Fleet Sizing

Risk Sharing in Contracts: The Use of Fuel Surcharge Programs
 Improving a Sustainable Packaging Delivery System
 Supply Chain Responsiveness for a Large Retailer
 Modeling Order Guidelines to Improve Truckload Utilization
 Multi-echelon Inventory Optimization for an Oil Services Company
 e-Commerce Fulfillment Models for Luxury Brands in Asia
 A Qualitative Mapping and Evaluation of an Aerospace Supply Chain Strategy
 Marine Dock Optimization for a Bulk Chemicals Manufacturing Facility
 The Effects of Vendor and Quality Control Variability in the Procurement of Raw Materials in a Bio-pharmaceutical Company

In addition, a pro bono project, Supply Chain Strategy in Post-earthquake Haiti, was conducted with Partners in Health, a nonprofit organization.

SCM Speaker Series

During AY2011, the following speakers participated in the Supply Chain Innovation and Leadership Series:

Bill Sweasy, chairman and chief executive officer, Red Wing Shoe Company
 Bindiya Vakil, president, Resilinc
 Peter Gibbons, executive vice president, Global Supply Chain Operations, Starbucks Coffee Company
 Roger Bloemen, vice president, Global Supply Chain, Solutia
 Mark Buckley, vice president, Environmental Affairs, Staples
 Robert Blackburn, senior vice president and head of Global Supply Chain, BASF
 Kelly Abney, vice president, Corporate Transportation, Walmart
 Howard Smith, senior vice president, Global Supply Chain Operations, Polo
 Ralph Lauren

SCM students also participated actively in the Humanitarian Speaker Series, organized by the MIT Center for Transportation & Logistics (MIT CTL) Humanitarian Logistics Initiative, with support from the Center for International Studies (see section on Humanitarian Logistics).

SCM Alumni Interaction

The SCM program now has 365 alumni working on all six populated continents in myriad industries, and focused predominantly on supply chain management and logistics.

MIT CTL held its sixth annual alumni reconnect event in June 2011. This one-day event featured Tim Stratman, founder and president of Stratman Partners Executive Coaching, a consulting firm focused on helping C[chief]-level executives become more effective leaders. The event also included an education session on the supply chain carbon

footprint, and updates on the education and research activities at MIT CTL and in the Global Supply Chain and Logistics Excellence Network.

An updated MIT CTL Alumni ReConnect book was distributed at the event, providing updates since the previous version in 2008. The [SCM Alumni](#) section of the new website also offers a place for alumni to maintain an online profile as their career path progresses.

System Design and Management

The [System Design and Management](#) (SDM) program combines cutting-edge courses from the MIT Sloan School of Management and the School of Engineering, enriching the program experience with innovative distance learning, flexible matriculation options, and an interdisciplinary perspective.

Senior lecturer Patrick Hale continues as director for his seventh year. Although his tenure as president of the International Council on Systems Engineering (INCOSE) ended in January 2010, he continues to serve INCOSE's board of directors as cochair of the nominations and elections committee. SDM's academic codirectors, professors Warren Seering and Steven Eppinger, are now in their second year with SDM. Both are experts in the field of product development and design and worked with SDM during its founding.

Joan Rubin joined SDM as industry codirector in January 2011. An MIT alumnus who comes to SDM from Covidien, where she served as vice president of business development, she brings 17 years of business development, marketing, market development, and strategic planning experience in the medical device field, and a network in health care and related fields. Her focus in the near term is to expand the breadth and depth of industry sponsors.

Program Marketing and Corporate Sponsorship

SDM's marketing activities continue to be highly successful. The program held several information evenings for local MIT alumni and others interested in SDM, as a way to recruit prospective students for SDM's Classes of 2012 and 2013. These evenings were aggressively promoted via WBUR, Boston's National Public Radio news station; underwriting campaigns; the MIT Sloan and the School of Engineering home pages; and social media.

Master of Engineering Management Program Consortium

In June 2011, SDM joined the Master of Engineering Management Programs Consortium, a select group of professional graduate engineering management programs from Cornell University, Dartmouth College, Duke University, Stanford University, and Northwestern University. Consortium member institutions combine public relations efforts and share ideas, expertise, new curricula ideas, and best practices.

Student Statistics

In January 2011, SDM admitted its 15th class, enrolling 71 students (53 from the 2011 admissions cycle, plus 18 deferrals from the two previous years—a higher than normal deferral yield).

System Design and Management Student Statistics, AY2007–AY2011

	2007	2008	2009	2010	2011
Applications	107	108	141	117	190
Company supported	30	16	27	22	24
Self-supported	36	44	57	50	51
Total admitted	66	60	84	72	75
Research assistants	1	4	0	14	12
Distance education	14	16	19	10	11
Enrolled current round	61	53	63	52	53
Total enrolled*	61	55	64	54	71

*Includes matriculating deferrals from previous years

Distance Education Delivery

SDM continues to evaluate its distance education delivery, with the goal of increasing the quality of the remote learning experience while reducing costs both for MIT and for sponsoring companies. This process includes streaming all classes on the web so that students who cannot attend a session can view the video of it almost immediately.

Sponsoring Theses of Self-funded System Design and Management Fellows

In the past few years, companies have also engaged the program by using self-funded fellows for research internships that they develop into SDM theses. Support typically involves identifying a thesis topic and naming a company mentor to work with a student and an MIT faculty member on a topic of pressing concern.

SDM Industry Partners and the MIT Graduate Certificate in Systems and Product Development

The MIT Graduate Certificate Program in Systems and Product Development is now in its 11th year. Company sponsors have included United Technologies Corporation, John Deere, Cummins, Draper Laboratory, Instrumentation Laboratory, and Booz Allen Hamilton, among others. United Technologies Corporation now has more than 250 employees who have benefited from the SDM program.

Career Development for SDM Self-sponsored Students

Led by career development director Helen Trimble, SDM has provided career services to its self-funded students for the past seven years. Preliminary data indicate that this year's graduates will achieve the same success as in previous years, with 100% employment in various industries and organizations. Recent students are

tending toward technical consulting, energy, startups, information technology, telecommunications, and venture capital firms.

MIT SDM Conference on Systems Thinking

On October 21–22, 2010, SDM sponsored the third annual MIT SDM Conference on Systems Thinking for Contemporary Challenges, which was attended by almost 300 faculty and students from MIT and other universities, SDM alumni, and industry executives from around the world.

MIT SDM Systems Thinking Webinar Series

SDM communications director Lois Slavin initiated the MIT SDM Systems Thinking Webinar Series in November 2010. SDM alumni, students, and industry sponsors have delivered webinars on the use of systems thinking in health care, drug development and commercialization, banking/mergers, software development, and more.

Awards for SDM Students

Andrei Akaikine (SDM '10) received the SDM Best Thesis Award for “The Impact of Software Architecture on Product Maintenance Efforts and Measurement of Economic Benefits of Product Redesign.”

Rafael Maranon won the first MIT SDM Award for Leadership, Innovation, and Systems Thinking. The annual award was established by SDM staff to recognize strategic, sustainable contributions to the SDM and MIT communities.

Rupreet Singh Soni, Vivin Nath, and Nirmalya Banerjee (all Class of 2011) and their teammates won \$10,000 in MIT’s annual IDEAS Competition and Global Challenge, for EyeCatra. EyeCatra won two prizes: a \$5,000 IDEAS award and a \$5,000 MIT Global Challenge–Community Choice Award for receiving the most MIT votes online.

Chunguang Charlotte Wang and her teammates won the grand prize in the 2011 Berkeley-Stanford Cleantech Launchpad green entrepreneurship competition. The team also placed first in the MIT \$100K Entrepreneurship Competition’s Executive Summary Contest.

Staffing

Christine Bates was promoted to SDM operations manager.

Steven Eppinger, Codirector
General Motors Leaders for Global Operations Professor of Management Science
Professor of Engineering Systems

Warren Seering, Codirector
Weber-Shaughness Professor of Mechanical Engineering
Professor of Engineering Systems

Joan Rubin, Industry Codirector

Patrick Hale, Director, SDM Fellows Program

Technology and Policy Program

For the past 35 years, the [Technology and Policy Program](#) (TPP) has remained dedicated to educating engineers and scientists who wish to lead in the development and implementation of responsible technology strategies and policies to benefit humankind.

Students

In AY2011, 35 students graduated with the of master science in technology and policy. More than 25% of these students will pursue a doctoral degree following the completion of their master's degree. Other graduates have taken jobs in industry, government service, or consulting; this year several are pursuing startups that relate to their thesis research and other work they completed at MIT.

TPP Research

All TPP students are funded for their graduate studies with full or partial research assistantships or fellowships in a wide range of research areas across MIT. TPP students are advised by faculty in all five schools at MIT, with the majority in the School of Engineering.

Many TPP students are affiliated with the MIT Energy Initiative. TPP students also conduct research for the Joint Program on the Science and Policy of Global Change; the Center for Energy and Environmental Policy Research; the Industrial Performance Center; the Computer Science and Artificial Intelligence Laboratory; the Partnership for Air Transportation Noise and Emission Reduction; and a number of research initiatives connected with ESD, including the Lean Advancement Initiative; the Center for Technology, Policy, and Industrial Development; and the Center for Biomedical Innovation. MIT Sloan School of Management faculty have served as advisors for a number of TPP theses.

TPP faculty continue to lead the MIT Portugal Program in bioengineering systems, sustainable energy and transportation, and design-inspired products, while many TPP students are pursuing collaborative international research projects in engineering systems as a part of the MIT Portugal Program.

As well, TPP students are working with MIT and Singapore University of Technology and Design faculty in the development of new curricula for the university; in particular, for the International Design Centre.

Fellowships

TPP fellowship funds in AY2011 came from the Rabinowitz and de Neufville Funds. The Office of the Dean for Graduate Education also provided tuition fellowship funding for incoming underrepresented minority students. With these fellowships, TPP has been able to achieve a very high yield of admitted underrepresented minority students; the fellowships have allowed TPP to attract almost all of the underrepresented minority students who have been admitted over the past five years. Several Institute-wide fellowships also were awarded to TPP students in AY2011: first-year students Amanda

Cuellar and Lisa Schlecht were awarded a Lemelson Presidential Fellowship and an Ida Green Fellowship, respectively.

Additionally, many TPP students were awarded external fellowships, including those from the National Science Foundation (US) and the Natural Sciences and Engineering Research Council (Canada), as well as fellowships from Japan, Mexico, Germany, Sweden, Spain, and Chile.

TPP Curriculum

Teaching schedules in AY2011 required adjustments to the standard TPP curriculum. In fall 2010, all TPP students (both first- and second-year) took ESD.103 Science, Technology, and Public Policy (professor Ken Oye), along with a reduced-unit version of Introduction to Technology and Policy. In spring 2011, ESD.864 Modeling and Assessment for Policy (professor Noelle Selin) was offered as the second portion of the traditional Introduction to Technology and Policy core course.

TPP students continue to thrive in their economics courses (usually 14.003 or 15.011) and appreciate the opportunity, when appropriate, to cross-register for courses in policy, law, and economics at Harvard University.

TPP Policy Internship Program

Eleven TPP students traveled to Washington, DC, in March 2011. This annual trip provides students with an opportunity to build professional networks with others who work at the intersection of science, technology, and policy. TPP alumni arranged and hosted presentations at the US Departments of State, Energy, and Transportation; the Environmental Protection Agency; the World Bank; the American Association for the Advancement of Science; the National Academies of Science; and Phase One Consulting Group.

In summer 2011, TPP will send two MIT student interns to the Far East Organization in Singapore; one student to Washington, DC, to serve as science fellow for a US senator; one student to India to work on a clean energy utility startup in Delhi; one student to New York to work with United Nations Children's Fund's water, sanitation, and hygiene department; and a student to Toronto to conduct research at a policy think tank. Beyond TPP-funded internships, other students are pursuing paid technology policy internships in the US and abroad.

Conferences and Workshops

TPP is a founding member of the Technology Management and Policy Graduate Consortium, which includes programs in North America, Europe, and Asia, and allows TPP students and ESD doctoral students to share their research and network with students in sister programs across the globe. At the consortium's 10th annual conference, hosted by Pennsylvania State University on June 26–28, 2011, four MIT students presented their research. Jordan Peck (TPP '08, current ESD PhD) was awarded the consortium-wide best paper prize for "Using Prediction to Improve Patient Flow in a Health Care Delivery Chain."

The annual MIT Energy Conference leadership team featured TPP students, who made up over half of the leadership team. TPP students are involved in leadership of a number of organizations and initiatives across the Institute, including the MIT Energy Club; the MIT Clean Energy Prize; and the Science, Technology, and Policy Crossroads initiative.

Faculty and Student Honors

Professor Dava Newman's proposal "Spacesuit Trauma Countermeasure System for Intravehicular and Extravehicular Activities" was one of 12 funded by the National Aeronautics and Space Administration's Human Research Program and the National Space Biomedical Research Institute to investigate questions about astronaut health and performance on future space exploration missions. Professor Newman was also named British Broadcasting Corporation Inventor of the Week, and was featured in the Emmy-nominated NOVA The Secret Life of Scientists and Engineers web series, and in the NOVA scienceNOW episode "Can We Make It to Mars?" with astronaut Michael Massimino (TPP '88). From March–August 2010, her work was featured in Paris at the Cite des Sciences et de l'Industrie in its show Les Nouvelles Technologies de la Protection Corporelle.

In November 2010, professor David Marks was honored at the MIT symposium "Complexity and Sustainability: Perspectives on Environmental Technologies and Global Systems."

Professor Selin was awarded a National Science Foundation CAREER Award for her proposal on mercury and persistent organic pollutants.

TPP Best Thesis Prize was awarded to James Morrison ("Game Theory Analysis of Aircraft Manufacturer Innovation Strategies in the Face of Increasing Airline Fuel Costs," advised by professor John Hansman) and to Pernilla Redgardh ("Safe, Secure, and Ethical: Assessing and Regulating Risks Associated with Synthetic Biology," advised by Professor Oye).

Maximilian Parness (TPP '11) was awarded a Switzer Environmental Fellowship for his work in energy and climate change.

An Vu (TPP '11) was awarded a Legatum Fellowship.

Anna Delgado and Mauricio Gomez (both TPP '12) were awarded a fellowship by the Dell Social Innovation Competition for Project Yele, which seeks to spark social and economic development in sub-Saharan Africa.

Arjun Gupta (TPP '11) and teammate Priyanka Bakaya (MIT Sloan '11) won third place overall and Best Energy Team in the Rice University Business Plan competition for their business PK Clear, which aims to convert plastic wastes to crude oil using a patented and 100%-owned catalytic de-polymerization process. They were also one of five finalists in the MIT Clean Energy Competition.

TPP had two other teams among the top five finalists in the MIT Clean Energy Competition: LinkCycle, with Alex Loijos (TPP '11), whose online tool lets companies assess the environmental impact of their products; and Made in the Commonwealth, which aims to produce 5% of Massachusetts diesel and jet fuel use, with Matthew Pearlson (TPP '11), Michael Hagerty (TPP '12), Philip Wolfe (TPP '11), and Jim Morrison (TPP '11).

MIT's IDEAS and Global Challenge competitions also included a number of award-winning projects spearheaded by TPP students, including Assistive Technology @ MIT (William Li, TPP '11; Rachna Pande, TPP '11; and Alexandre Jacquillat, TPP '12); and Safe Water World (Samantha O'Keefe and Philip Wolfe, both TPP '11).

Alumni Engagement

Now with more than 1,000 alumni, TPP fosters a strong alumni community by bringing alumni back to campus, providing alumni updates, publishing a biannual alumni directory, and holding regional gatherings in Washington, DC, and Boston. In March 2011, approximately 50 alumni attended a gathering in Washington, DC, and several more attended a gathering hosted by Professor Newman in Singapore.

Alumni have served as speakers at the TPP Leadership Lunches (e.g., Sharon Gillett, TPP '95, of the Federal Communications Commission, in fall 2010); as judges for prize competitions (including Jennifer Gustetic, TPP '06, for the MIT Global Challenge), and as hosts and speakers for the annual Washington, DC, trip. Financially, alumni have supported student and program initiatives, including funding for summer internships, recruitment and outreach, and support for women in technology and policy.

Dava Newman

Director, Technology and Policy Program

Professor of Aeronautics and Astronautics and Engineering Systems

Research Programs

Center for Engineering Systems Fundamentals

Research at the [Center for Engineering Systems Fundamentals](#) (CESF) was funded by a variety of sources during AY2011. Projects included the following:

Towards Intelligent Societies: What Motivates Students to Study Science and Math? How Do We Provide for Flexible Learning Pathways?, a three-year research contract with Fujitsu of America (new this year), \$500,000

Developing a Scientific Workforce Analysis and Modeling Framework, National Institutes of Health grant, joint with Ohio State University, three years (new this year), \$450,000

Pandemic Influenza: Social Distancing and Hygienic Policies to Reduce Its Prevalence, Alfred P. Sloan Foundation of New York, \$350,000

LAMPS (Linking Assessment and Measurement to Performance in Public Health Emergency Preparedness Systems), US Centers for Disease Control and Prevention five-year cooperative agreement; Harvard School of Public Health Center for Public Health Preparedness and CESF, \$8M total, approximately 25% for the MIT effort

BLOSSOMS (Blended Learning Open Source Science or Math Studies), William and Flora Hewlett Foundation, Alfred P. Sloan Foundation of New York, Lord Foundation of Massachusetts, Lounsbery Foundation, and (new) corporate sponsorship from Fujitsu of America, IBM, and Saudi Aramco Corporation

CESF is in the fifth year of a multiyear research project, Decision-oriented Analysis of Pandemic Flu Preparedness and Response, with principal investigator Professor Larson and coprincipal investigator senior research scientist Stan Finkelstein. The research support now includes a five-year grant from the Centers for Disease Control and Prevention, in conjunction with partners at the Harvard School of Public Health. For this latter grant, Dr. Finkelstein is principal investigator and Professor Larson is coprincipal investigator.

Supported by the MIT Portugal Program, the Energy Box is being designed and created as an Open Source software system to manage the electricity usages of a home or small business silently in the background from an available desktop computer.

A queuing model of driver behavior was developed. Katsunobu Sasanuma, a TPP alumnus, completed this research as part of his master's thesis in August 2009 (supervised by Professor Larson).

The fifth MIT Learning International Networks Consortium conference was held May 24–26, 2010. More than 200 attendees from 40 countries participated. The LINC 2010 Conference website includes the full list of [plenary speakers](#) and the [full program](#), which included more than 80 contributed papers.

CESF now has more than 60 BLOSSOMS video learning modules, with more in production, from MIT, Lebanon, Pakistan, and Saudi Arabia, and from volunteers at the University of Wisconsin, IBM, and Teachers Without Borders. The program presented six teacher training workshops: one in Washington, DC; one in Providence, RI; two in Massachusetts; one in Istanbul, Turkey; and a five-day workshop to 200 teachers in Dhahran, Saudi Arabia. The State of Florida has begun the process of reviewing selected BLOSSOMS modules and posting them on its education department website. By the end of 2011, CESF should have about 80% of BLOSSOMS video modules available in Portuguese (via subtitles).

Professor Larson and two other senior faculty members have been serving on the senior advisory board of Lahore University of Management Sciences, School of Science and Engineering, in Pakistan.

Richard Larson
Director, Center for Engineering Systems Fundamentals
Mitsui Professor of Engineering Systems

Center for Technology, Policy, and Industrial Development

The [Center for Technology, Policy, and Industrial Development](#) (CTPID) is a cross-disciplinary research center focused on studying and solving the high-impact, complex, sociotechnical challenges that shape our world. CTPID brings together faculty, researchers, students, and staff from across MIT with industrial, government, and academic partners to study complex national and global enterprises within government, industry, the service sector, and health care. CTPID is associated with the MIT Sloan School of Management and the School of Engineering's ESD.

Deborah Nightingale, professor of the practice in aeronautics and astronautics with a dual appointment in ESD, and codirector of the Lean Advancement Initiative, was appointed director of CTPID in fall 2010. CTPID was founded in 1985 and its total research volume in FY2011 was \$7.3M.

CTPID programs include the following:

- Center for Biomedical Innovation (CBI)
- Center for Engineering Systems Fundamentals (CESF)
- Ford-MIT Alliance
- Lean Advancement Initiative (LAI)
- Materials Systems Laboratory (MSL)
- MIT Geospatial Data Center (GDC)
- MIT Information Quality Program (MITIQ)
- Systems Engineering Advancement Research Initiative (SEArI)

Center for Biomedical Innovation

The [Center for Biomedical Innovation](#) (CBI) experienced tremendous growth in sponsored research activities and cross-campus collaborations in the last year.

Highlights included:

- NEW Drug Development ParaDIGmS (NEWDIGS), three-day symposium on innovations in regulatory science (August 31–September 2, 2010)
- Science to Manage Risk in Biomanufacturing, CBI summit (November 17, 2010)
- Consortium on Adventitious Agent Contamination in Biomanufacturing, kickoff meeting (November 17, 2010)
- NEWDIGS oncology module focused on optimizing the development and use of combination treatments in cancer, kickoff meeting (January 7, 2011)
- Innovation in Healthcare Symposium, cohosted with Department of Biological Engineering; sponsored by Merrimack Pharmaceuticals (February 1, 2011)
- Sanofi Biomedical Innovation Awards (nine) to MIT faculty and researchers
- Strategic roundtable discussions between CBI-affiliated faculty and Sanofi leadership, hosted

CBI is also actively exploring new research programs in collaboration models in life sciences, and health care and intelligence in health (with MIT's Intelligence Initiative [i2]).

Biomanufacturing Research Program

Last year, the Biomanufacturing Research Program (BioMAN) won a grant from the Alfred P. Sloan Foundation to study the impact of globalization of the biomanufacturing industry on quality and regulation. Data for this study has been collected in collaboration with the biomanufacturing industry and the US Food and Drug Administration, and some preliminary analysis has been performed. BioMAN is developing innovative simulation models to aid in decision-making processes related to biomanufacturing. BioMAN-affiliated faculty member Scott Stern is examining the economics associated with policy and regulation of biosimilars (generic biologics) with a grant from the National Science Foundation. The program is engaged in a study with the Food and Drug Administration and Georgetown University to examine the issues that have led to a lack of implementation of rapid manufacturing technology for influenza vaccine manufacturing. BioMAN held a summit at MIT in November 2010, with invited presentations and a panel discussion titled "Science to Manage Risk in Biomanufacturing."

Consortium on Adventitious Agent Contamination in Biomanufacturing

On January 1, 2011, CBI started a consortium to look at adventitious agent contamination in biomanufacturing. The goal of this initiative, sponsored by six founding biopharmaceutical manufacturers, is to utilize systems engineering approaches to perform a comprehensive analysis of adventitious agent contamination and risk mitigation strategies. Find more information about [the consortium](#) on the CBI website.

NEW Drug Development ParaDIGMS (NEWDIGS)

Support for the NEWDIGS initiative is growing rapidly, both within MIT and externally.

A formal collaboration between NEWDIGS and the European Medicines Agency was announced in December 2010.

The European Medicines Agency's senior medical officer, Dr. Hans-Georg Eichler, is working in residence for much of 2011 as an appointed CBI visiting scholar and a Center for International Studies Robert E. Wilhelm Fellow.

A NEWDIGS press release issued in May 2011 announced three-year sponsorship commitments of five companies: Bristol-Myers Squibb, Johnson & Johnson, Life Technologies, Quintiles, and Pfizer.

A monthly NEWDIGS research seminar was launched in 2010, with regular attendance of 20–25 students and faculty from across the schools of science, engineering, and management.

Module 1 of NEWDIGS focuses on innovations in regulatory science, with initial research centered on analyzing the current evolution in global pharmaceutical regulation from a rigid, binary model of product approvals to a more flexible, adaptive paradigm. Initial research activities focus on:

Adaptive licensing: The global context in the pharmaceutical industry. Principal investigators, Professor Oye (ESD and Political Science) and Dr. Hans-Georg Eichler.

Analysis and learnings from applications of existing adaptive regulatory tools (e.g., risk evaluating and mitigation strategies and accelerated approvals). Principal investigator, Professor Oye.

Intelligence in health: Advanced computational learning to support a learning health system. Principal investigators, professor Charles Cooney and research scientist Luis Perez-Breva (Innovation Teams and School of Engineering). Subprojects within this research program area are now being formulated, to be carried out in collaboration with researchers involved in MIT's [i2 initiative](#).

Economic modeling to evaluate the implications of adaptive licensing for pharmaceutical companies and for society. Principal investigators, professor Ernst Berndt and visiting scientist Mark Trusheim, both of MIT Sloan.

The global landscape of active safety surveillance in the pharmaceutical industry. Principal investigators, Professor Oye and Paula (Gigi) Hirsch, MD.

Module 2 of NEWDIGS focuses on oncology, specifically on optimizing the development and use of combination treatments in cancer. The vision for this framework is now being shaped by senior scientists and executives from the David H. Koch Institute for Integrated Cancer Research at MIT, the Dana Farber Cancer Institute, the Massachusetts General Hospital, and the Memorial Sloan-Kettering Cancer Center, as well as by representatives from the health insurance industry, biopharmaceutical companies, global regulatory agencies, and other key industry stakeholder groups.

CBI looks forward to growing NEWDIGS in ways that will optimize its intellectual and financial value to the MIT community.

Sanofi-aventis Biomedical Innovation Program

On May 5, 2010, Sanofi-aventis entered into an alliance with CBI to advance knowledge in the area of human health through basic and applied research and to promote scientific exchange that is mutually beneficial. Sanofi-aventis committed \$4.2M over three years to fund a biomedical innovation award program at CBI. To date, the program has awarded nine innovation grants, in areas spanning from drug delivery to the development of humanized zebrafish models, to the development of real-time glucose monitoring devices. In addition, a small grant to examine stratification of the oncology drug pipeline has been funded through CBI and Sanofi-aventis. Two major sponsored research collaborations, totaling approximately \$4.3M, support projects in the labs of professors Robert Langer (to develop drug delivery to the back of the eye) and Ian Hunter (to develop a needle-free drug delivery device).

CBI hosted two strategic meetings to promote further expansion of the alliance:

On April 11, 2011, Christopher Viehbacher, chief executive officer of Sanofi, met with MIT leadership and with investigators who had received innovation awards.

On June 24, 2011, Elias Zerhouni, head of research and development for Sanofi, met with MIT leadership and with innovation award recipients.

Novartis Biologics Master Research Agreement

In 2010, CBI negotiated a master research agreement with Novartis Biologics. The agreement supports two projects at a level of \$1.2M in the laboratories of professors Michael Strano and Alex Klivanov, and discussions are now under way about potential new projects focused on continuous biologics manufacturing.

Ford-MIT Alliance

During December 2006, the [Ford-MIT Alliance](#) was renewed for its third five-year term at \$3M annually, beginning January 1, 2008, and running through 2012. The alliance is the Institute's longest running large-scale commitment from industry and represents a significant acknowledgment by the Ford Motor Company of MIT's relevance and impact on its research.

The Ford-MIT Alliance research portfolio is managed by an operating committee, including codirectors professor John Leonard (MIT) and Edward Krause (Ford); Elaine Savage, MIT's alliance executive director; and Robert Karp, Industrial Liaison Program. The operating committee reports to an executive committee that includes MIT's leadership champion, vice president for research Claude Canizares, and works in close partnership with Ford's key executives, including its chief technology officer and vice president of research.

Ford-MIT Alliance research focuses on vehicle electrification, vehicle connectivity, vehicle lightweighting, active safety, powertrain fuel efficiency technologies, business analytics, enterprise modeling, and in-vehicle health and wellness.

MIT researchers involved in alliance projects have come from the Department of Mechanical Engineering and the Department of Materials Science, MIT Sloan, the MIT Center for Transportation & Logistics, the Laboratory for Information and Decision Systems, and the Computer Science and Artificial Intelligence Laboratory. The outcomes of such research will lead to greater innovations in fuel economy, vehicle efficiency, and safety for drivers.

Lean Advancement Initiative

The [Lean Advancement Initiative](#) (LAI) works with sponsors from government, industry, and academia to enable the effective and sustainable transformation of complex enterprises. LAI produces a unique body of research, methodologies, and tools based on collaborative interactions with sponsors. LAI's Educational Network (EdNet) is an international consortium of colleges and universities that translate LAI research findings and practitioner knowledge into undergraduate and graduate curricula. EdNet includes more than 60 educational institutions on five continents.

LAI's current sponsors include:

- BAE Systems US
- BAE Systems UK
- Boeing Defense, Space & Security
- Cluster de Empresas de Automoción de Galicia
- Northrop Grumman Electronic Systems
- Pratt & Whitney
- Raytheon Company
- Rockwell Collins
- Siemens AG Corporate Technology
- Sikorsky Aircraft
- United Launch Alliance
- US Military Health System

Professor Nightingale and professor John Carroll (MIT Sloan and ESD) are LAI codirectors. Research affiliate Richard Lewis is LAI's executive director.

During AY2011, LAI supported four doctoral and 21 master's students and advised three doctoral and 10 master's-affiliated students.

LAI and Collaborative Initiatives at MIT are working in partnership with the US Military Health System, with collaboration from the US Armed Services, on a research project titled Post-Traumatic Stress Innovations: US Military Enterprise Analysis. The project, which started in fall 2010, is designed to develop innovative recommendations for helping the military enterprise identify opportunities to better manage post-traumatic stress and related conditions, in support of service members and their families.

Materials Systems Laboratory

The [Materials Systems Laboratory](#) (MSL) studies the strategic implications of materials and materials processing choices. It works jointly with corporate, government, academic and industrial consortia as research partners. MSL's research seeks to understand the competitive position of materials in specific applications, such as assessment of different candidate materials, assessment of process technologies, and evaluation of both the economic and non-economic consequences of each alternative. MSL also evaluates the promise and limits of materials, processes, and designs; identifies specific areas of improvement for each alternative that will improve its competitiveness; and determines the best-case scenario for each option.

Professor Joel Clark is MSL faculty director; research associate Richard Roth is MSL director. ESD PhD graduate Randolph Kirchain is principal research scientist. Find a list of [current projects](#) and [recent publications](#) on the MSL website.

MIT Geospatial Data Center

On May 18, 2010, three MIT laboratories—Auto-ID Lab, Center for Grid Computing, and Intelligent Engineering Systems Lab—collaborated to become the [MIT Geospatial Data Center](#) (GDC). Professor John Williams, director of the three laboratories, was named director of GDC. Abel Sanchez, software architect for the Auto-ID Lab and lead researcher for the Intelligent Engineering Systems Laboratory, was named GDC executive director. Steve Chan was named chief software architect of GDC.

The center has won a number of contracts from industry and government—including Microsoft, King Abdulaziz City for Science and Technology, Masdar, and the Intelligent Advanced Research Projects Agency—and has established collaborations with researchers at major institutions worldwide. GDC has established relationships, via non-disclosure agreements and other legal agreements, with major defense contractors. The center was recently invited to submit proposals to the Department of Homeland Security on five broad agency announcements, totaling \$10M in the area of cyber security. GDC was featured in the highly acclaimed movie *Connected*. Representatives from GDC were invited to the initial screening at the 2011 Sundance Film Festival.

GDC sponsored the Independent Activities Period course, ESD.937 Special Graduate Studies in ESD—Geospatial Leadership, at the University of Central Florida in Orlando, and funded five Department of Urban Studies and Planning students to attend the week-long course. GDC was honored by sponsoring a mobilization and deployment ceremony for the US Army Cyber Command, Northeast Information Operations Center, to wish them well on their active deployment. GDC was awarded a Pentagon flag and several citations.

GDC collaborated with the University of Wales to invite world-renowned experts to a conference on cyber/physical security in March 2011. The chair of MIT's graduate program in science writing, professor Thomas Levenson, filmed the event for a future Sundance Film Festival entry. In April 2011, Professor Williams gave a keynote address at the Institute of Electrical and Electronics Engineers Computational Intelligence in Cyber Security Symposium in Paris (Professor Williams was accompanied by Dr. Chan and Industrial Liaison Program representative Maren Cattonar). The GDC website was a finalist in the school/university category for this year's Webby Awards.

MIT Information Quality Program

On January 11, 2011, Richard Wang led the Inaugural MIT–Army Chief Data Officer Forum in Arlington, VA. Together with the US Army, Lockheed Martin Corporation, and Gartner, Inc., the forum focused on developing strategies for winning executive support and defining management and technical issues. Participants offered guidelines that help an enterprise adopt the chief data officer role and disciplines, and further help chief data officers ensure tactical and strategic success.

In April 2011, Dr. Wang returned to head the MIT Information Quality (MITIQ) program after his assignment as the US Army's chief data quality officer through the Intergovernmental Personnel Act Mobility Program. In July 2011, MITIQ will hold its fifth annual industry symposium, which will bring together more than 350 practitioners, vendors, and academics to address information quality issues.

During the past year, MITIQ conducted research on the application of information quality theory to the complex engineering information management problems in the oil and gas industry. In addition, MITIQ collaborated with the Lincoln Laboratory to investigate issues of information integration and isolation in the intelligence community, problems that parallel concerns found in many areas in government and industry. MITIQ expects this research to continue in the coming year at an MIT funding level of approximately \$600K and to produce significant results.

With support and guidance from Professor Nightingale, professor Stuart Madnick, visiting scholar Yang Lee, and research scientist Allen Moulton, MITIQ is establishing its five-year agenda for research sponsorship development.

Professor Madnick and Dr. Lee will continue their roles as coeditors-in-chief of the Association of Computing Machinery's Journal of Data and Information Quality. The journal, along with many other initiatives in the information quality field, was a direct result of the activities of MITIQ.

Systems Engineering Advancement Research Initiative

The [Systems Engineering Advancement Research Initiative](#) (SEArI) brings together sponsored research projects and a consortium of systems engineering leaders from industry, government, and academia.

Several research projects were continued with government agencies in the US and Singapore, and with the involvement of 14 graduate, two visiting graduate, and four undergraduate students. SEArI also continued its research effort under the MIT Portugal Program, working with Portuguese faculty and students.

Two MIT professional short courses were held in July 2010 on SEArI research methods for tradespace exploration and epoch-based thinking.

SEArI held its annual research summit in October 2010, attended by research sponsors and invited leaders from 12 government agencies and corporations.

Nine conference papers were presented at five events, including two that received conference best paper awards.

SEArI director and principal research scientist Donna Rhodes was selected by the International Council in Systems Engineering to receive the Outstanding Journal Paper Award (awarded 2010). The award is presented annually for one outstanding paper from the **Systems Engineering journal**.

Joel Moses

Acting Director, Center for Technology, Policy, and Industrial Development

Institute Professor

Professor of Computer Science and Engineering Systems

MIT Center for Transportation & Logistics

For more than 35 years, the [MIT Center for Transportation & Logistics](#) (MIT CTL) has been a world leader in supply chain management, logistics, and transportation education and research. The center's world-renowned research programs directly involve more than 47 faculty and research staff from a wide range of academic disciplines, as well as researchers in various affiliate organizations around the world. In education, MIT is consistently ranked first among business programs in logistics and supply chain management.

Research

During the past academic year, many new research projects were added to existing ones, with 140 active projects in FY2011. Major projects and initiatives are described below.

MIT Global SCALE Network

The [MIT Global SCALE \(Supply Chain and Logistics Excellence\) Network](#) continued to grow in AY2011. As the only international alliance of leading research and education centers dedicated to the development of supply chain and logistics excellence through innovation, the SCALE Network promises to increase the center's research and education reach and reputation. Currently, the SCALE Network spans North America, Latin America, Europe, and Asia, and consists of MIT CTL; the Center for Latin-American Logistics Innovation in Bogotá, Colombia; the Zaragoza Logistics Center in Zaragoza, Spain; and the Malaysia Institute for Supply Chain Innovation. MIT CTL continues to explore additional centers in China, India, and other global logistics hubs.

Center for Latin-American Logistics Innovation

In the three years since it was formed, the Center for Latin-American Logistics Innovation has launched multiple research projects, has established a regional network for academic collaboration, and has recruited leading companies as corporate strategic partners. The center is now extending its geographical reach and establishing a richer base of educational and research programs. The center has cultivated deep relationships with 23 top Latin American universities and institutions outside the region.

The center is structured around the three core elements of its mission: education, research, and outreach. Its flagship student program is the Graduate Certificate in Logistics and Supply Chain Management, the most extensive nonformal education program of its kind in Latin America. Offered by the center and presented by MIT CTL faculty, the program's overarching goal is to train aspiring logistics and supply chain professionals in the region. The 16 students in the third class of this program were selected from 25 applicants from 11 universities from Argentina, Brazil, Colombia, Mexico, and Panama. To date, the program has graduated 26 students, hosting them for three weeks in Bogotá and two weeks on the MIT campus alongside students from MIT CTL and the Zaragoza Logistics Center.

The second level of the center's initiative in education is designed to "teach the teachers" by providing opportunities for academics from the region to improve teaching methods and program content in the supply chain field at their local universities. This is achieved through a series of English-language academic workshops that take place twice a year

at various venues in the region. The latest workshop took place in October 2010 at MIT, following a series of meetings in Panama, Colombia, and Brazil. This fifth edition of the academic workshop brought together 29 academicians from nine Latin American countries, confirming the position of the center as a world-class organization for supply chain education and research.

Also available at the faculty level are three- to six-month visiting research fellow positions at MIT CTL. In the past three years, six faculty members have taken advantage of this program: two from Mexico, two from Colombia, one from Chile, and one from Panama. Faculty from Brazil, Peru, and Ecuador are already slotted to participate in this vibrant academic exchange.

Corporate education represents the third layer of the center's educational base. Over the past three years, the center has brought world-class content to more than 1,200 practitioners through a combination of open seminars and executive education programs. In 2011, the center launched its first executive education certificate program. This program, the first of its kind in Latin America, includes faculty from MIT CTL and the Zaragoza Logistics Center, as well as thought leaders from the region. Companies can also attend the LOGyCA annual leaders summit to gain insights into the latest thinking in supply chain management.

The Center for Latin-American Logistics Innovation is consolidating as one of the region's leading centers for supply chain research. It currently has 10 full-time research staff and, as an official national center of excellence, has access to government grants and various thought leadership opportunities. All center projects actively engage with the center's corporate strategic partners, including 13 companies from a wide variety of sectors.

Finally, the center has started collaborative research projects in the area of mobile-enabled logistics, or mLogistics, with universities in Colombia, Chile, and Mexico. These collaborative projects bring students and industry together to develop and deploy pilot technology solutions in the region.

MIT-Zaragoza International Logistics Program

MIT CTL has a multiyear partnership with the government of Aragón, Spain, to help create the leading European education and research program for logistics and supply chain management in its capital city of Zaragoza. MIT works with the Zaragoza Logistics Center, a research institute associated with the University of Zaragoza, on research, graduate education, executive training, and outreach events for the international community.

The center's faculty expanded this year to 26, including full-time, adjunct, research staff, and ad honorem members from 15 different countries who were trained at leading universities. Overall, the center's full-time staff consists of 44 people from 15 countries.

The center's education programs continue to grow. In 2011, the seventh class graduated from the MIT-Zaragoza international master's degree program, an intensive nine-month program modeled on MIT's Supply Chain Management Program. The class of 2011

consisted of 31 students selected from more than 200 applicants. The MIT–Zaragoza doctoral program also grew to a total of nine, with one additional student starting in fall 2011. (Second-year PhD students will visit MIT in AY2012 to take courses.) In addition, the center offers executive education programs for its partner academic institutions INCAE Business School (Costa Rica), European Business School (Germany), and other European institutions, and is starting new open executive programs in global health supply chains and supply chain and finance. In summer 2011, the center is hosting its fourth PhD summer academy, gathering leaders from global business and academia to discuss the impact of leading supply chain issues on business strategy and public policy.

The Zaragoza Logistics Center continued its leadership of the Spanish National Center of Excellence in Integrated Logistics and its work on the singular strategic project for research in logistics. The Spanish National Center serves as the coordinator for the national technology platform for integrated logistics, Logistop, which engages industry and research institutes to define research and development priorities and action plans on strategically important issues for Spain’s future growth and competitiveness.

The Zaragoza Logistics Center also plays a key role in the integration of the Aragónese logistics sector. In December 2010, the Innovative Logistics Association of Aragón was created by the Zaragoza Logistics Center Foundation in collaboration with Aragón Abroad, the Technology Institute of Aragón, and the Aragón Board of Chambers of Commerce and Industry, along with support from the government of Aragón.

The number of funded research projects continued to grow with new partners, including the Bill and Melinda Gates Foundation, Medicos Sin Fronteras (Doctors Without Borders), the Transpirenaica Foundation, the Spanish Agency of International Cooperation for Development, and the World Bank. Within the past two years, the center has been awarded funding for six projects in the frame of the European Seventh Framework Programme, which is the main instrument for funding research at the European level.

Following three successful years, the Fourth Annual Global Health Supply Chain Summit will take place on November 3–4, 2011. This year’s summit will be hosted by the University of Southern California, in Los Angeles, CA.

The MIT–Zaragoza Distinguished Speaker Series featured many leading academics between July 2010 and June 2011.

Malaysia Institute for Supply Chain Innovation

The fourth center in the SCALE Network (and the third international center) is to be located in Shah Alam, Malaysia. The contract establishing the Malaysia Institute for Supply Chain Innovation was formally signed in early January 2011. The institute will leverage Southeast Asia’s growing position in world commerce and MIT CTL’s experience as the preeminent center for knowledge creation.

The building that will house the institute has been identified and plans for renovations are under way. The institute will feature an independent, stand-alone, degree-granting academic institution established under Malaysian law. The institute will attract students,

faculty, supply chain and logistics experts, and corporations from around the world to Southeast Asia's burgeoning supply chain and logistics industry. Based on the model of the Zaragoza Logistics Center in Europe, the institute will feature both master's and doctoral programs in supply chain management and logistics. The institute plans to admit its first master's degree students in fall 2012. It will conduct related research and corporate outreach activities for firms within the Southeast Asia region.

The official launch on March 22, 2011, was attended by the Malaysian prime minister. Currently, MIT CTL is developing curriculum, recruiting faculty, and finalizing logistical details. Additionally, it is planning corporate- and research-oriented events to be held quarterly, starting on July 19, 2011, with the Global Supply Chain SumMIT taking place at the Shah Alam Convention Centre in Malaysia. Leading academics from top institutions around the world will convene at the convention center for a one-day conference that will explore the future of global supply chain management.

Global Leaders in Environmental Assessment and Performance

MIT CTL, in partnership with the Material Systems Laboratory, has developed a dynamic consortium of leading companies called [Global Leaders in Environmental Assessment and Performance](#) (LEAP). LEAP brings together member companies and top environmental and supply chain experts to address company-specific performance issues and plot solutions that will strengthen both the companies and the environment.

The outgrowth of the pioneering Carbon Efficient Supply Chains project, LEAP offers an unprecedented opportunity for fact-driven and solution-oriented analysis of companies' products and supply chains. It gives organizations the tools and information needed to measure their total environmental footprint, evaluate tradeoffs, and shape a sustainable action plan.

LEAP partners to date include General Motors, Lockheed Martin, Chiquita, ASICS, and the Environmental Defense Fund. Besides offering biannual meetings and access to cutting-edge research, LEAP has developed a series of monthly webinars that address strategic topics relevant to environmental supply chain strategy, such as carbon offsets and water footprints.

NextLab

The [MIT NextLab Program](#) works closely with industry partners worldwide to design and deploy mobile technologies that catalyze new opportunities in the form of the development of new business models, intracompany innovation, or the launch of new ventures in their verticals. These opportunities stem from disruption created by trends currently occurring in the mobile industry.

Renewable Energy Delivery

The [Renewable Energy Delivery](#) project collaborates with key organizations across the renewable energy space (e.g., generators, technology providers, and electric grid operators) to design new supply chain systems for cost-effective renewable energy delivery to end consumers. Research associate Jarrod Goentzel leads the Renewable Energy Delivery initiative.

Work concluded on systems modeling and analysis of the hydrogen supply chain in support of a grant from the government of Spain. The project was developed in direct collaboration with Acciona Energy, the world's largest developer of wind parks and third-largest operator of wind energy. The team developed a comprehensive decision support model—utilizing principles from commercial supply chain, systems engineering, and operations research—to design the delivery network for hydrogen under various scenarios. Researchers applied the model to various future scenarios to inform strategic evaluation of various technologies for the production, storage, and distribution of hydrogen and to assess infrastructure development as a phased rollout.

Master's students continued to look at the economic viability of adding electric grid storage capacity to facilitate growth in renewable generation. A new project evaluated the opportunities for electric vehicles and plug-in hybrid electric vehicles to participate in vehicle-to-grid markets. Analysis combined realistic fleet costs, based on interviews of early adopters, with projected potential vehicle-to-grid revenue from a simulation model developed by a grid system operator. Results indicated that electric vehicle and plug-in hybrid electric vehicle fleets offer lower operating expenses for urban pickup and delivery services. In addition, fleet managers can expect to offset 5–11% of the total cost of ownership with vehicle-to-grid revenue.

Humanitarian Logistics Initiative

The [Humanitarian Logistics Initiative](#) examines supply chain strategies, processes, and technologies that will help make humanitarian operations more effective.

A strategic partnership with the World Food Programme, the food aid arm of the United Nations system, continued to provide various opportunities to engage with this sector.

MIT continued its multiyear engagement with World Food Programme Ethiopia by starting a new project on procurement and management of third-party transport carriers to improve service quality and reduce costs. Initial work included econometric analysis of the historical transportation rates in Ethiopia to determine cost/service drivers and predictive parameters. Further data collection and analysis will help to develop indicators to measure carrier performance and define a tool to facilitate carrier selection using multi-criteria decision-making methods. The work included a two-week visit to Ethiopia and participation in the Food Management Improvement Project conference cosponsored by the World Food Programme and the government of Ethiopia.

MIT continued its collaboration with the Logistics Cluster, which coordinates logistics in response to major emergencies requiring the participation of a wide range of humanitarian actors (the World Food Programme is the lead agency for the cluster). An ESD PhD student, Erica Gralla, participated in two more semiannual global training exercises for the World Food Programme Logistics Response Team, which is immediately deployed upon activation of a United Nations-coordinated response. The student gathered data while supporting training activities. Work continued with the Logistics Cluster and the World Food Programme Logistics Development Unit on developing planning tools to support critical decision making during an emergency response.

A project funded by the International Rescue Committee focused on humanitarian logistics process oversight and control. The team developed a resource toolkit for field logistics staff that included simplified logistics process maps, checklists, and guidance on required internal controls. MIT CTL also proposed key logistics data and metrics for the rescue committee to create a standardized country-level logistics report that informs country and headquarters management on logistics issues and performance.

A master's thesis project with Partners in Health focused on enabling this important nonprofit health-care provider to scale up its supply chain in Haiti to support increasing health service offerings following the 2010 earthquake. Detailed analysis of the product formulary enabled Partners in Health to define segments that can more effectively be supported by tailored supply chain strategies. Partners in Health plans to deploy this strategy in Haiti over the next year. The project resulted in Scott Alexander's master of engineering thesis, "Supply Chain Strategy in Post-Earthquake Haiti" (May 2011).

Researchers published book chapters, reports for the US Agency for International Development, and working papers from data collected during their involvement in the Haiti earthquake response. They also spoke at various events coordinated by the United Nations, the US Federal Emergency Management Association, the US Transportation Command Joint Interagency Coordination Group, the National Hurricane Conference, the Council of Supply Chain Management Professionals, the Transportation Research Board, and various universities and academic associations.

An important output of the Humanitarian Logistics Initiative was the creation of unique material for a graduate-level course offering. A half-semester course offered in spring 2011 incorporated guest speakers from the Red Cross, Oxfam, and the International Rescue Committee. Students conducted projects analyzing extensive data from the 2010 Haiti earthquake. The course was well-received, with more than 40 students from a variety of local schools participating.

The Humanitarian Speaker Series, organized by the Humanitarian Logistics Initiative with support from the Center for International Studies, introduces Supply Chain Management students and the wider MIT community to leaders in humanitarian assistance and disaster response. View the 2010–2011 speakers on the [MIT CTL website](#).

In June 2011, the Humanitarian Logistics Initiative received a major alumni donation. MIT CTL is considering how to effectively scale up research in this important area.

Logistics Clusters

The cluster project looks at the impact of logistics clusters around the world, and focuses on the Singapore port area; the Panama Canal Zone; Rotterdam Port in Holland; Zaragoza, Spain; Memphis, TN; and Alliance in Fort Worth, TX. The project looks to add to the emerging theory of logistics clusters in general, and to develop insights into why logistics clusters work, the advantages of such clusters to members, how they form, and most importantly, their impact on economic growth.

Supply Map Development

MIT CTL has partnered with Media Lab researchers to develop creative and interactive supply mapping tools. The goal is to create a touch-screen “canvas” that can be used by multiple supply chain partners to overlay the basic structure of a supply chain. Once the supply chain map is built, it can be updated in real time as information changes and can be used to measure a variety of supply chain metrics (service, risk, or carbon footprint) in a seamless way. In the first generation, special emphasis will be placed on the graphical user interface, as well as the robustness of the underlying technology platform. The tool is now being included in several graduate-level supply chain courses. It is also being used to help new partner companies explain or draw their supply chain in a very short period of time (less than 10 minutes).

MIT-Volpe Transportation Human Factors Research Program

The MIT-Volpe Transportation Human Factors Research Program was created in FY2007 to initiate active research collaborations in several areas. Since its inception, the program has been awarded four projects: Human Factors Pertaining to Uncertainty and Dynamic Contradictions in Air Traffic Flow Management (professor Amedeo Odoni), Locomotive Cognitive Alerting Technology Development and Evaluation (senior research engineer Charles Oman), Pilot Computer Model Development and Aircraft Computer Model Integration (Dr. Oman), and Instrument Procedures Research (professor R. John Hansman).

FAA NEXTOR Center of Excellence Program

Four new projects were started this year under the FAA Nextor program: Comparisons of the Operational Performance of US and European Airports—Phase 2, Performance Metrics Development and Analysis Support (professor Odoni); ADS-B AIRB with Alerting Research (professor Hansman); Global Mega Trends and Expected Utilization of Extended Range Aircraft in the NAS (professor Hansman); and User Equipage: New TFM Procedures and Investment Incentives (Professor Hansman).

MIT FreightLab

Work is concluding on the development of a transportation portfolio management tool for Walmart stores. The freight network optimization tool determines the optimal allocation of different transportation resources on a freight network. The levels of resources include private fleet, dedicated fleet, for-hire carriers, and spot market carriers. This project considers the variability in demand on the various lanes within a network when making the allocation decisions. The prototype has been implemented at Walmart and is being used in production on a daily basis. It has led to dramatic changes in the way Walmart designs and deploys its private fleet.

Also this year, the [MIT FreightLab](#) conducted work looking at how large buyers of global ocean transportation services should design, procure, and manage their network. Working with Ford Motor Company, the research team conducted more than two dozen interviews with Ford and ocean carrier executives to better understand how the relationship is managed. The team analyzed shipment transaction data from across the company’s global network to understand the level of variability across the different

tradelanes. Analysis revealed that the majority of all variability within these global shipments occurs at the landside connection points.

Future Freight Flows

Sponsored by the American Association of State Highway and Transportation Officials, and managed by the Transportation Research Board of the National Academies, the [Future Freight Flows initiative](#) examines how and where federal and state levels of government should invest in freight transportation infrastructure for the year 2040 and beyond. Utilizing scenario-planning techniques, the project team has developed four long-range scenarios for the US freight system for the year 2037. The team conducted six workshops across the country, demonstrating to and testing the scenario-planning technique with more than 300 shippers, carriers, third-party logistics, and government agencies at the federal, state, and local levels. In order to better immerse the participants in the scenarios, the team developed detailed brochures as well as four separate six-minute “future news” broadcasts. The workshops were well-received and the scenario-planning process is being adapted to fit into the planning processes of different states. The project team included three research associates, one postdoctoral associate, one PhD student, and one master’s student; project work will result in a PhD dissertation as well as one master’s thesis.

New England University Transportation Center

In August 2006, the US Department of Transportation Research and Innovative Technology Administration named MIT as the lead university of the [New England University Transportation Center](#). The US Department of Transportation has extended the grant, and funding will continue beyond 2011. This year’s funding enabled MIT CTL to engage and fund research with colleagues in the Computer Science and Artificial Intelligence Laboratory, the Department of Urban Studies and Planning, and the Department of Civil Engineering. MIT CTL is the Institute’s host department for the New England Center, which is one of 10 university centers set up in each of the US Department of Transportation’s standard federal regions to provide a national resource for research and education in both freight and passenger transportation. Dr. Coughlin, founder of MIT CTL’s AgeLab, is the director of the New England Center.

AgeLab

[AgeLab](#) continues to expand and is defining a new systems approach to the field of aging, technology, and innovation. Professional societies in aging, such as the Gerontological Society of America, and federal agencies have formally recognized AgeLab as the leader in bringing a unique multidisciplinary, multidomain approach to translating aging into an opportunity to invent how we will live better tomorrow. Working with researchers across MIT, AgeLab has developed a robust research agenda that addresses transportation, health and wellness, and longevity planning. This past year, AgeLab launched a new program on information seeking and the role of social media in caregiving and health/wealth decision making by older adults in the US and globally.

AgeLab expects to continue expanding the students, staff, and faculty it engages. Research will explore social science questions around trust and risk in longevity,

technology-enabled services, and the role of design in improving independent living. AgeLab now enjoys sponsorship from corporations that have previously not been engaged by ESD or were involved in the needs of an aging society (e.g., financial services, sports apparel, and consumer products). Companies such as Bank of America Merrill Lynch, TIAA-CREF, New Balance, PepsiCo, and others are now lab members.

Port Resilience Project

MIT CTL is a funded partner in the National Center for Secure and Resilient Maritime Commerce, a Department of Homeland Security Center of Excellence (The Center for Maritime, Island, and Port Security), which was launched in July 2008 with the Stevens Institute of Technology as the lead institution. In response, MIT CTL focuses on developing resilient and secure ports. The MIT Port Resilience Project builds upon MIT CTL's recent research on supply chain resilience, supply chain risk management, and supply chain security. MIT's role in the new Center of Excellence will be to develop the principles and actions for making ports resilient to disruptions.

Center for Transportation and Logistics Outreach

The foundation of MIT CTL's corporate outreach is the Supply Chain Exchange—believed to be the largest and most active membership program in the supply chain management field. Since mid-FY2004, new exchange members have paid an annual fee of \$25,000. Membership in the exchange is a prerequisite to deeper interactions with MIT CTL, including directed research projects, sponsorship of Supply Chain Management thesis projects, and membership in higher tiers of the outreach model (research partner and strategic partner). View a list of exchange partners on the [MIT CTL website](#).

Corporate Relations

The ongoing strategy that drives MIT CTL's outreach program is to increase the number of its partner organizations via membership in the Supply Chain Exchange program and to deepen its engagement with individual partners by growing their participation in MIT CTL's educational and research activities.

During FY2011, MIT CTL dropped nine companies from the exchange: Adidas Group, Boston Scientific, Fairchild Semiconductor, Manhattan Associates, Monsanto, Philips Healthcare, Schwann Foods, Tempus Group, and Transplace. This list includes a number of companies that went on hiatus from active membership during FY2010, reflecting a continuation of economic and organizational disruptions related to the recession. MIT CTL continues to maintain and nurture its relationships with these companies and expects some to resume active membership in FY2013.

Ten companies were added as partners to the Supply Chain Exchange program: AB-InBev, Association for Healthcare Resource and Materials Management, BASF, BNSF, Chick-fil-A, GSI Commerce, Niagara, Solutia, Walmart, and Wallenius Wilhelmsen Logistics. This list includes several companies that have re-joined the exchange after a short-term departure. MIT CTL continues to be optimistic about growing its partner base during the next year, based on increased attendance at its events, increased member engagement in research activities, a dramatic increase in executive education enrollment

by member personnel, and the attraction of its newly expanded Global SCALE Network, now covering Asia through the newest center in Malaysia.

Outreach Events

In FY2011, MIT CTL organized symposia, roundtables, workshops, conference sessions, and a research fest to achieve its varied outreach objectives. MIT CTL organized and hosted the annual partners meeting, which convened key contacts from more than 20 of MIT CTL's partner companies.

This year's MIT CTL Crossroads Conference, which took place on June 16, 2011, focused on technology innovations that could disrupt future supply chains. The event convened experts from MIT and industry thought leaders to identify the innovations that might transform supply chains and change the competitive landscape in future years. The proceedings are available to MIT CTL partners via the MIT CTL online partner area.

MIT CTL held two sessions of its major supply chain management executive education course during the year, from January 4 to 7 and from June 7 to 10, 2011. This four-day program for supply chain executives and management teams, "Supply Chain Management: Driving Strategic Advantage," offered a combination of MIT-developed hands-on exercises and simulations, case studies, and highly interactive sessions. Both sessions of the executive course included a supply chain scenario-planning exercise featuring unique and applied content based on research conducted by MIT CTL.

This past year, MIT CTL conducted custom scenario-planning workshops at partner locations or at MIT CTL not only as part of a MIT CTL research initiative but also as part of value delivery to MIT CTL partners. Similarly, MIT CTL offers open enrollment executive workshops in strategy alignment and scenario planning.

On January 14, 2011, during Independent Activities Period, MIT CTL successfully held its third annual networking night/poster session. Students from the SCALE Network programs (including the Master of Engineering in Logistics program, the MIT-Zaragoza international master's degree program, and the Graduate Certificate in Logistics and Supply Chain Management) presented 70 thesis projects to 40 representatives from 25 companies (58 representatives from 40 companies registered but due to a severe snowstorm the day before, some companies could not attend). Attendees ranged in positions from chief executive officer to human resources director to global supply chain manager; companies that attended ranged from the Adidas Group to the Clinton Foundation.

Center for Transportation & Logistics Web Presence

The development of MIT CTL's web presence and web communications strategy continues to evolve and expand. The partners area on the MIT CTL website, created exclusively for existing partners, now has 315 registered users. This area provides the portal through which partners can receive an abundance of information on the center, find MIT CTL's latest publications and research, and participate in online collaboration on topics of interest via its discussion board. MIT CTL is actively searching for a new web marketing manager to take the website to the next level of capability.

Personnel Changes

In FY2011, new hires and appointments at MIT CTL included: Angelina Gennis, technical associate; Suzanne Greene, project manager; Basak Kalkanci, postdoctoral associate; Alea Mehler, technical associate; Zachary Slater, financial assistant; Xu (Cissy) Yang, postdoctoral associate. In addition, visitors to the center included visiting military scholar Colonel Michael Snyder; international visiting scholars Robert Blackburn, Jan Fransoo, Miguel Gutierrez, Fernando Jimenez Lopez, Ioannis Lagoudis, Andreas Lauenroth, Arnold Maltz, Mahour Mellat-Parast, Valerie Moatti, Elena Revilla, and Camilo Salazar Paris; and international visiting students Wenyi Chen, Sang Jo Kim, Loraine Main, Anna Matias, Marie-Eve Rancourt, Josue Velazquez, and Nan Zhao.

Departures from the center included web communications manager Wendy Lin. After 15 years at MIT, David Riquier, MIT CTL's director of corporate outreach, retired on June 30, 2011.

Recognition

MIT CTL's 2010–2011 United Parcel Service Fellowships were awarded to two outstanding students studying logistics, freight transportation, or supply chain management. The winners were Gaurav Nath (master of science fellowship, SCM program) and Vikrant Vaze (PhD fellowship, Department of Civil and Environmental Engineering).

AgeLab's research associate Lisa D'Ambrosio led the MIT work with The Hartford on a research and public education guide that won a Silver Award from the National Mature Media Awards. *Your Road Ahead: A Guide to Comprehensive Driving Evaluations*, a public education brochure for older drivers and their families, describes what comprehensive driving evaluations are, how drivers and families might benefit from having an evaluation, and resources and suggestions for finding a program that conducts these types of assessments. *Your Road Ahead* is based on research conducted by the AgeLab with The Hartford Advance 50 Team and the American Occupational Therapy Association.

Yossi Sheffi

Director, MIT Center for Transportation & Logistics

Director, Engineering Systems Division

Elisha Gray II Professor of Engineering Systems

Professor of Civil and Environmental Engineering