

## Engineering Systems Division

The bold, forward-thinking educational and research efforts of the [MIT Engineering Systems Division](#) (ESD) aim to tackle substantial real-world challenges. 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.

More than 50 faculty members, 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 spring 2013, 336 students were enrolled in ESD's five master's programs, with another 50 students in the PhD program.

### Faculty

The ESD interim director is Stephen Graves, Abraham J. Siegel professor of management science and professor of engineering systems and mechanical engineering. Olivier de Weck, associate professor of aeronautics and astronautics and engineering systems, chaired the ESD Education Policy Committee and oversaw ESD's PhD program, including admissions, in AY2013.

### Graduate Education

ESD awarded 184 degrees in AY2013. Academic programs include the [ESD PhD program](#) (with approximately 50 students enrolled), the [ESD SM program](#), [Leaders for Global Operations](#) (LGO) the [MIT Supply Chain Management Program](#) (SCM) (which awards the master of engineering in logistics degree), [System Design and Management](#) (SDM), and the [Technology and Policy Program](#) (TPP). More details about these master's programs are provided in this report.

In 2013, the ESD graduate program received its first national ranking in *U.S. News & World Report* as part of a new expanded Engineering Specialties category, Industrial/Manufacturing/Systems.

### Research

ESD encompasses several major research programs, including the [Sociotechnical Systems Research Center](#) (SSRC), the [MIT Center for Transportation and Logistics](#) (CTL), the [Center for Biomedical Innovation](#) (CBI), the [Center for Engineering Systems Fundamentals](#) (CESF), and the [Center for Complex Engineering Systems at KACST and MIT](#). These programs are described later in this report.

The Portuguese Science Foundation has renewed its partnership with the [MIT Portugal Program](#) (MPP), adding a second phase that will carry the relationship through 2017. For more details, see the MPP report to the president.

## Achievements

Below are some ESD faculty and teaching staff highlights for AY2013.

- AgeLab director Joseph Coughlin was named by *AARP Magazine* as one of “Nine Influentials Who Are Redefining Our View of Aging.”
- Olivier de Weck was named editor-in-chief of *Systems Engineering*, the flagship journal of the International Council on Systems Engineering (INCOSE). He was also named a fellow of INCOSE.
- Jarrod Goentzel was elected president of the Production and Operations Management Society’s College of Humanitarian Operations and Crisis Management.
- John Hansman was elected to the National Academy of Engineering (NAE).
- “Modeling the Effects of H1N1 Influenza Vaccine Distribution in the United States,” by Richard Larson and Anna Teytelman (a PhD student in the Operations Research Center), was selected by the International Society for Pharmacoconomics and Outcomes Research as the recipient of the 2013 *Value in Health* Paper of the Year Award.
- Nancy Leveson was presented the 2011 Joseph A. Martore Excellence in Teaching Award at the spring 2013 Brunel Lecture for Complex Systems.
- Ernest Moniz was confirmed as US secretary of energy. In addition, Moniz was among the nine MIT faculty members recently elected to the American Academy of Arts and Sciences.
- Noelle Selin and her team received funding from the MIT Center for Environmental Health Sciences for their project “The Health Impact of Use of Leaded Aviation Gasoline.” Also, the School of Engineering and the Research Support Committee granted Selin \$75,000 in Jephtha H. and Emily V. Wade Award funding for her proposal “Integrated Assessment of Mercury Health Impacts.” Selin received the TPP Advisor Award and was selected as a 2013 Leopold Leadership Fellow.
- Jessika Trancik is among the awardees of funding through the Energy Department’s SunShot Initiative and is principal investigator of the project “Evaluating the Causes of Photovoltaics Cost Reduction: Why Is PV different?” Trancik was elected to the external faculty of the Santa Fe Institute.

## Alumni Honors

Honors received by ESD PhD alumni (some in collaboration with ESD faculty/teaching staff) include the following:

- Daniel Livengood received the inaugural Daniel and Eva Roos Engineering Systems Dissertation Prize for “The Energy Box: Comparing Locally Automated Control Strategies of Residential Electricity Consumption under Uncertainty” (Richard Larson, advisor).

- A paper by Jason Bartolomei, Daniel E. Hastings, Richard de Neufville, and Donna Rhodes was selected as the recipient of the 2012 INCOSE *Systems Engineering* Best Paper Award.
- Lynette Cheah and her team won the inaugural Singapore Challenge Prize at the first Global Young Scientists Summit@one-north, a prestigious international conference held in Singapore.

## Student Honors

Below are some of the honors received by ESD PhD students:

- The ESD Student Society received the 2012 Joseph A. Martore (1975) Excellence in Teaching Award at the spring 2013 Brunel Lecture. Society copresidents Rebecca Saari and Vivek Sakhrani accepted the award on behalf of the society.
- Tom Heaps-Nelson won the 2013 Graduate Student Extraordinary Teaching and Mentoring Award.
- Sahar Hashmi was presented the 2013 Bridge Builder Leadership Award at the 2013 Student Leader Awards ceremony.
- Josephine Wolff and Bill Young (as well as a team member from Harvard) won for best written policy brief in the Cyber 9/12 collegiate competition.
- David Keith won the Dana Meadows Award at the International System Dynamics Conference (St. Gallen, Switzerland), given for the best paper presented by a student at the annual conference.
- Jameson Toole had a paper accepted for UrbComp 2012, a conference held in Beijing.

## Conferences and Lectures

The 2013 Brunel Lecture on Complex Systems, “Engineering Systems in the Service Sector: The Launch of the ATM and How It Revolutionized Personal Banking,” was presented by John Shepard Reed, chairman of the MIT Corporation and retired chairman and CEO of Citigroup Inc.

The 2013 Charles L. Miller Lecture, “The Research University in the Digital Age,” was presented by Lawrence S. Bacow, president emeritus of Tufts University and former MIT chancellor.

The ESD Students Society alumni committee held a special virtual/live event in the spring. Daniel Livengood, inaugural recipient of the Daniel and Eva Roos Engineering Systems Dissertation Prize, presented an overview of his dissertation research.

Professor Leveson led the second STAMP Conference, held at MIT in March. (Leveson also gave the keynote address at the STAMP Workshop Europe 2013 conference, organized by the University of Stuttgart and the Technical University of Braunschweig.)

## Alumni Advisory Council Meeting

The ESD Alumni Advisory Council meeting was held in April 2013. ESD maintains communications with the council during the academic year through letters from the ESD interim director.

**Stephen Graves**

**Interim Director, Engineering Systems Division**

**Abraham J. Siegel Professor of Management Science**

**Professor of Engineering Systems and Mechanical Engineering**

## Leaders for Global Operations

The MIT [Leaders for Global Operations](#) program, now in its 25th year, is a partnership of the MIT Sloan School of Management, the MIT School of Engineering, and major companies that support the program's commitment to excellence in manufacturing and operations. LGO offers an MBA or an SM from the Sloan School of Management and an SM from the School of Engineering.

## Governance

LGO is run by a governing board of senior officers from the managing partner companies, program codirectors, and MIT deans, and it is co-chaired by Jeff Wilke (LGO '93) of Amazon.com and Mick Maurer of United Technologies–Sikorsky. The operating committee, chaired by industry codirector Vah Erdekian, handles ongoing program management.

## 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 engineering departments, students can focus on departmental courses of study as well as topic areas related to manufacturing and operations in eight engineering tracks:

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

## Admissions

Forty-eight new students in the LGO Class of 2015 matriculated and began an intensive summer session in June. The class has an average of five years of work experience. The entering class, broken down by engineering discipline, is as follows:

- Aeronautics and Astronautics: 4
- Chemical Engineering: 1
- Civil and Environmental Engineering: 2
- Electrical Engineering and Computer Science: 3
- Engineering Systems Division: 23
- Mechanical Engineering: 15

LGO received 295 applications (up from 286 the previous year), and there was an 80% yield of admitted candidates accepting a place in the program.

## Internships and Research

The LGO Class of 2013 had 47 graduates in June, with an additional member of the class on track to graduate in September. Each graduate completed a six-month internship at a partner company, leading to a master's thesis.

Members of the LGO Class of 2013 had 10 international internships in locations including Argentina, Brazil, Chile, Finland, Italy, Spain, Switzerland, and the United Kingdom. A number of follow-on internships from the work done by the LGO Class of 2012 were handed off to the class of 2013.

## Plant Tours

Local plant tours were held at Amgen, Bose, National Grid, New Balance, Polar Beverages, Raytheon, and United Technologies Corporation–Kidde Fenwal. Students on the annual two-week domestic plant trek visited Novartis in Holly Springs, NC; General Motors in Detroit, MI; Amazon in Indianapolis, IN; Caterpillar in Peoria, IL; Nike in Portland, OR; Boeing in Seattle and Everett, WA; Dell in Austin, TX; and Amgen in Thousand Oaks, CA. The LGO international plant trek visited Brazil, with tours at Dell, General Motors, and Embraer facilities in São Paulo and Samsung in Manaus.

## Leaders for Global Operations Alumni

A special LGO alumni conference was held at MIT on May 2–3 to celebrate the program's 25th anniversary. With more than 220 alumni and dozens of other faculty, students, and friends in attendance, it was the largest such event in LGO history.

Aaron Raphel (LGO '06) continues as the official alumni voice on the LGO operating committee. MIT faculty as well as LGO and SDM alumni continued to present periodic webcasts. An alumni advisory board headed by Andy Storm (LGO '08) continues to oversee fundraising, the annual conference, operating committee representation, and networking events.

Through an organized fundraising effort, alumni contribute to three funds: the William C. Hanson, Don W. Davis, and Jan Klein Leadership Fund; the Alumni Annual Fund; and the Endowed Discretionary Fund. Portions 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.

Among students in the 2013 class to date, 73% have accepted positions in manufacturing and operations companies, and 47% of these positions are in partner companies.

### **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 2012 and spring 2013 included Sujal Bhalakia, vice president for global operations and engineering at Boston Scientific; Fabrizio Bonanni, senior vice president for operations (retired) at Amgen; Jamie Bonini, general manager, Toyota Production System Support Center; and Matthew Bromberg, vice president for corporate strategy and development at the United Technologies Corporation.

### **New Partners**

An active student, staff, and company committee has succeeded in bringing new partners to LGO. Goodyear, Johnson & Johnson, Quest Diagnostics, and Sanofi have joined in the past year, and other companies are in discussions to join the partnership in the coming year.

### **Awards**

- Tom Sanderson (LGO '14) won LGO's Charles Harrison Smith III Memorial Award.
- David Linders (LGO '13) won the LGO Best Thesis Award.
- Matt Kasenga (LGO '13) was named a Siebel Scholar.
- Ashleigh Range (LGO '13) won the Sherburne Scholar Award from the MIT Sloan School of Management.
- David Simchi-Levi, LGO faculty codirector from the MIT School of Engineering, was honored by the Production and Operations Management Society with an article published in the January/February 2013 issue of the journal *Production and Operations Management*.
- Zeynep Ton and Vivek Farias, LGO contributing faculty members, received Outstanding Teacher Awards from the MIT Sloan School of Management.

**Georgia Perakis**

**Codirector**

**William F. Pounds Professor of Operations Research**

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

**Vah Erdekian**  
Industry Codirector

**Don Rosenfield**  
Director, LGO Program

## **System Design and Management**

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

## **Program Communications, 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 2014 and 2015 classes. Additionally, the program continued the MIT SDM Systems Thinking Webinar Series, which has had several thousand registrants and on-demand viewers since its inception in November 2010. SDM also hosted more than 300 attendees at its annual conference in October 2012.

## **Distance Learning**

Significant upgrades have been made to our distance delivery capabilities, including new hardware to make the entire signal path high definition. The delivery mechanism is now Webex.

## **Master of Engineering Management Programs Consortium**

The Master of Engineering Management Programs Consortium continues to provide benefits. This includes the addition of the University of Southern California's master of engineering management program, from which SDM gained insights on distance learning. Also, in late 2012 the consortium formed an alumni council that has hosted events in San Francisco, Boston, New York City, and Chicago. More than 140 alumni have become members of the alumni group.

## **Student Statistics**

In January 2013, SDM admitted its 17th class, enrolling 62 students.

### System Design and Management Student Statistics, AY2007–AY2013

	2007	2008	2009	2010	2011	2012	2013
Applications	107	108	141	117	190	256	222
Company admits	30	16	27	22	24	23	21
Self-sponsored admits	36	44	57	50	51	39	41
Total admits	66	60	84	72	75	62	62
Research assistants	1	4	0	14	12	12	6
Distance education	14	16	19	10	11	11	15
Enrolled current round	61	53	63	52	53	56	46
<b>Total enrolled*</b>	<b>61</b>	<b>55</b>	<b>64</b>	<b>54</b>	<b>71</b>	<b>62</b>	<b>62</b>

\*Includes six second-major students.

### Graduate Certificate in Systems and Product Development

The MIT Graduate Certificate Program in Systems and Product Development is now in its 13th year. Company sponsors have included United Technologies Corporation, John Deere, Cummins, Draper Laboratory, Instrumentation Laboratory, and Biomerieux, among others. John Deere has sponsored over 100 students through either the master's or certificate program. United Technologies Corporation now has more than 250 employees who have benefited from the SDM program.

### Student Awards

Melissa Rosen and the Women in SDM group received Graduate Women of Excellence Awards.

Andrew Campanella, Padmabhushana "Bhushan" Desam, Rajesh Nair, Abhijith Neerkaje, Leena Ratnam, and Lesley Yu were named Tata Fellows.

Jonathan Hickey was honored with the SDM Best Thesis Award for "A System Theoretic Safety Analysis of US Coast Guard Aviation Mishap Involving CG-6505."

Asif Iqbal received the Dr. Mikio Shoji Award for Innovation in Information Technology.

As a member of the Sloan Sports Conference team, Ben Levitt received a Peer Recognition Award.

Terence Teo was a member of the first-place team in the Master of Engineering Management Programs Consortium Simulation Competition.

In the Product Design and Development Competition, two teams tied for first place. SDM members of the ChildFirst team were Scott Albrecht, Wilfredo Sanchez, and Bob Zima, and members of the Calcuwait team included Abhinav Kumar, Adeyemi Adepetu, Thomas Casselman, Anton Wirsch, and Greg Wilmer.



## Staffing

David Erickson joined the staff as a lecturer and director of the SDM certificate program. Jonathan Pratt was named director of recruitment and career development. Dave Schultz has been promoted to multimedia specialist, and Bill Foley has been promoted to senior administrative assistant.

**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**

**Executive Director, SDM Program**

## Technology and Policy Program

The [Technology and Policy Program](#) is an interdisciplinary graduate program focusing on issues at the interface of technology, society, and the sociotechnical aspects of complex systems. TPP is 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

TPP offers a two-year master's of science program and supports the ESD PhD doctoral program by encouraging research in the areas of technology, management, and policy. While TPP receives most of its applications from outside MIT, several students already enrolled in other MIT graduate programs join TPP each year; roughly one third of TPP students concurrently pursue a second master's or a doctoral degree in another department. TPP entering classes average 40 students; more than 40% are women and less than 40% are international students. In AY2013, 36 students graduated with an SM in technology and policy. Approximately 20% of these students will pursue a doctoral degree following the completion of their SM. Other graduates take jobs in industry, government service, startups, or consulting.

## Research

This year a few TPP students were funded at least one term with teaching assistantships. Many TPP students are affiliated with the MIT Energy Initiative, where they study the

challenges of energy choices, sustainability policy, and environmental responsibility. TPP students also conduct research for many other labs and centers across campus, including the Joint Program on the Science and Policy of Global Change, the Center for Energy and Environmental Policy Research, 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 Sociotechnical Systems Research Center, and the Center for Biomedical Innovation.

TPP faculty continue to lead the MIT Portugal Program in bioengineering systems, sustainable energy and transportation, and design-inspired products, and many TPP students are pursuing collaborative international research projects in engineering systems as part of MPP. TPP students are also working with MIT and Singapore University of Technology and Design (SUTD) faculty in the development of new curricula for SUTD and, in particular, the International Design Centre.

### **Fellowships**

TPP students received several MIT fellowships, including the Legatum, MIT Presidential, MIT Energy Initiative, and Tata Center for Technology and Design fellowships, as well as the Office of the Dean for Graduate Education Diversity Fellowship. External fellowships awarded to TPP students included fellowships from the National Science Foundation, the Gates Millennium Scholars Program, the Natural Sciences and Engineering Research Council of Canada, and the Fulbright Program, in addition to fellowships from Japan, Qatar, Chile, and Singapore.

### **Curriculum**

The standard TPP curriculum continues to evolve. In fall 2012, first-year and second-year TPP students enrolled in ESD.103 Science, Technology, and Policy (professor Kenneth Oye). In the spring, first-year students enrolled in ESD.101 Concepts and Research in Technology and Policy (Dr. Frank Field) and in ESD.864 Modeling and Assessment for Policy (professor Noelle Selin), the second portion of the traditional Introduction to Technology and Policy core courses.

### **Policy Internship Program**

Fourteen TPP students representing five countries traveled to Washington, DC, in March. This annual trip gives students an opportunity to build professional networks with others working at the intersection of science, technology, and policy. TPP alumni arranged and hosted presentations at the National Aeronautics and Space Administration, the World Bank, SRI International, the White House Office of Management and Budget (Energy Division), the Science and Technology Policy Institute, the MIT Washington Office, the US Department of Energy (Advanced Research Projects Agency-Energy Division), and the American Association for the Advancement of Science. During the trip, TPP hosted a networking reception for students and alumni.

In summer 2013, TPP funding will support students participating in unpaid internship programs at the Federal Emergency Management Agency, the Clean Air Task Force, and

the Monterey Institute of International Studies' Vienna Center for Disarmament and Non-Proliferation. In addition, other TPP students are pursuing paid technology policy internships in the United States 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. The annual meetings of this consortium afford TPP students and ESD doctoral students the opportunity to share their research and network with students across the globe. This year's consortium meeting was hosted at MIT in June 2013. More than 50 students and faculty from 11 universities participated in the event. TPP student Michael Craig received the best poster award.

The annual MIT Energy Conference and MIT Energy Night leadership teams featured several TPP students. Our 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, the Science Policy Initiative, Stand with Science, and the Transportation Club.

### **Student Honors and Awards**

TPP students received honors and awards from MIT and beyond. This year, students received the MIT Graduate Women of Excellence Award, constituted the team that took first place in the United States Association for Energy Economics team case competition, and were finalists and semifinalists in several hackathons, development/pitch competitions, and case competitions. Graduating students Amy Rose and Jan Eide shared Best TPP Thesis honors for their work with Robert Stoner (Rose), Howard Herzog, and Mort Webster (Eide).

### **Student Society**

Among this year's highlights were the "Culture Nights" and the iAmbassador series, which offer international students an opportunity to give presentations about their culture and technology policy issues in their home countries. Additionally, the annual InterYear Retreat continues to be one of the biggest events of the year.

### **Alumni Engagement**

With more than 1,100 alumni, TPP continues to foster a strong alumni community. TPP alumni host students at their organizations during the annual visits to Washington, DC. Alumni also support student and program initiatives, including funding for summer internships, recruitment and outreach, and support for women in technology and policy.

**Dava Newman**

**Director**

**Professor of Aeronautics and Astronautics and Engineering Systems**

## MIT Sociotechnical Systems Research Center

The MIT [Sociotechnical Systems Research Center](#) brings together faculty, researchers, students, and staff from across MIT with partners from around the world to study complex enterprises that span government, industry, the service sector, and health care. This year the center launched its new website. SSRC stakeholders include the Center for Biomedical Innovation, the Center for Engineering Systems Fundamentals, the Ford-MIT Alliance, the MIT Geospatial Data Center, the Lean Advancement Initiative, the MIT Information Quality Program, the Materials Systems Laboratory, Project Health, and the Systems Engineering Advancement Research Initiative.

## MIT Geospatial Data Center

The [MIT Geospatial Data Center](#) (GDC) won several contracts in cyber security, including contracts for King Abdulaziz City for Science and Technology (Center for Complex Engineering Systems), the Intelligence Advanced Research Projects Agency, the State of Massachusetts, the Accenture and MIT Alliance in Business Analytics, and MIT Lincoln Laboratory. GDC has established collaborations with researchers at major institutions worldwide, including the Oxford University Center for Cyber Security, Instituto Tecnológico de Monterrey, and the US Cyber Command. GDC offered a successful summer course on applied cyber security. There are now more than a dozen graduate students and three Undergraduate Research Opportunities Program students on the GDC team.

## Lean Advancement Initiative

After 19 years, the [Lean Advancement Initiative](#) (LAI) is no longer an active research consortium. The LAI website offers accessible online products and tools to enable and accelerate the transformation of complex enterprises.

## MIT Information Quality Program

The [MIT Information Quality Program](#) and SSRC sponsored the 3rd Annual Chief Data Officer Forum, the 7th Annual Chief Data Officer and Information Quality Symposium, and the first Plato-MIT Research Orientation Program. All three focused on information quality and data science.

## Systems Engineering Advancement Research Initiative

The [Systems Engineering Advancement Research Initiative](#) (SEArI) leads MIT's continuing participation in the US Department of Defense University Affiliated Research Center and Systems Engineering Research Center (SERC). SEArI also collaborates with other universities involved in the SERC research program. Several SEArI research projects continued with government agencies in the United States and Singapore, as well as with the Naval Postgraduate School and NTNU (Norwegian University of Science and Technology). Thirteen graduate students, two visiting graduate students, and four undergraduate students from several departments performed research with the group.

SEArI hosted an NTNU visiting faculty member and held an MIT/NTNU workshop on “Risk, Safety and Uncertainty in the Design and Operation of Complex Marine Systems.” The SEArI team presented 10 conference papers and published two journal papers. A group of SEArI authors were awarded the 2012 Outstanding Journal Paper by *Systems Engineering*. In addition, a paper by a group of SEArI/NTNU authors published in the *Journal of Ship Production and Design* will be featured as an archival paper in the 2012 Society of Naval Architects and Marine Engineers’ *SNAME Transactions*.

**Deborah Nightingale**

**Director, Sociotechnical Systems Research Center**

**Professor of the Practice of Aeronautics and Astronautics and Engineering Systems**

### **Center for Biomedical Innovation**

The [Center for Biomedical Innovation](#) integrates high-impact collaborative efforts across the MIT campus as well as with external stakeholders from the global biomedical and health care innovation ecosystem. The size and diversity of its ecosystem of collaborators continues to grow.

### **Multistakeholder Collaborations**

The Biomanufacturing Program leverages the expertise of MIT faculty from the Departments of Chemical, Mechanical, and Biological Engineering; the Department of Electrical Engineering and Computer Science; the Departments of Biology and Chemistry; the Research Laboratory of Electronics; the Auto-ID Laboratory; and the Sloan School of Management. Research focus areas include new analytical tools for improving quality and consistency during manufacturing, micro-scale manufacturing platforms, and regulatory science.

During 2012, members of the Consortium on Adventitious Agent Contamination in Biomanufacturing completed a comprehensive questionnaire regarding their experience with virus contaminations and false-positive tests in cell culture operations. This is the first time that such information has been collected in a single database, and it includes significant amounts of previously unpublished information. The final output, a publication summarizing findings and takeaways, will be of tremendous value to those interested in mitigating the risk of virus contaminations in biomanufacturing. The consortium also hosted two workshops, one in December 2012 and one in June 2013, bringing industry and academia together to discuss specific adventitious agent contamination topics. Professor of nuclear science and engineering Michael Golay and members of Professor Leveson’s group participated and shared their research at the June workshop.

The research of NEW Drug Development ParaDIGmS (NEWDIGS) is informing the design of initial real-world pilot projects in the European Union in collaboration with the European Federation of Pharmaceutical Industries and Associations and the European Union’s Innovative Medicines Initiative. Sample research activities focus on modeling and simulation of adaptive approaches to clinical trial designs, benefit/risk decision

making and reimbursement, and collaboration science in biomedical innovation, funded by a Robert Wood Johnson Foundation grant. Support for NEWDIGS to date totals over \$6.5 million from industry sponsors, private gifts, and the Robert Wood Johnson Foundation grant, and negotiations are currently under way to support collaborative activities in the European Union from 2014 to 2019.

### **Industry/Academia Collaborations**

The biomanufacturing partnership between Biogen Idec and CBI will provide the framework to develop a new process control paradigm for the biopharmaceutical manufacturing industry. The work will leverage the expertise of Edwin R. Gilliland professor of chemical engineering Richard Braatz. The initial proof of concept will be funded by Biogen Idec with a grant of \$202,000.

The master research agreement with Novartis includes advanced sensor and formulation projects in the labs of Hilda Roddey associate professor of chemical engineering Michael Strano and Novartis professor of chemistry and bioengineering Alexander Klibanov, respectively.

The alliance between Sanofi and CBI provides MIT investigators with opportunities for funding and other translational resources for their research, while Sanofi is given the opportunity to develop therapeutic, diagnostics, and prognostic applications based on the discoveries made. Since 2010, 13 innovation awards totaling \$4.2 million have been granted through the MIT-Sanofi Biomedical Innovation Award Program, including four in 2012 to associate professor of materials science and engineering Polina Anikeeva, David H. Koch professor of engineering Michael Cima, professor of biology Hidde Ploegh, and associate professor of biological engineering Ron Weiss.

### **Sponsored Research Projects**

Investigators from CBI's Biomanufacturing Research Program have received \$10.4 million to further the Defense Advanced Research Projects Agency's Biologically-derived Medicines on Demand program. The MIT program will seek to develop innovative methodologies for engineering robust, flexible microbial strains capable of synthesizing multiple protein-based therapeutics, as well as portable device platforms for rapid manufacturing of multiple biologics with high purity, efficacy, and potency at the point of care. This two-year contract includes a two-year option that, if exercised, would bring the potential value to \$21.8 million.

Supported by the Alfred P. Sloan Foundation, the ongoing "Regulatory Economics of Global Biopharmaceutical Manufacturing" research program examines the organizational, technical, and location-specific factors underlying manufacturing and regulatory performance.

### **Educational Activities**

The Amgen-CBI Biomanufacturing Educational Initiative aims to increase undergraduates' awareness of and experience with biopharmaceutical manufacturing. Through collaborative efforts with professor J. Christopher Love, professor Anthony

Sinskey, and Dr. Stacy Springs, the program will consist of three elements: online biomanufacturing education; a biomanufacturing summer residency program with research and education related to biomanufacturing technology, business, policy, and regulation; and the Leaders for Biomanufacturing Seminar/Webinar Series, which will facilitate relationships between undergraduates and members of the biomanufacturing industry and government. If funded, the proposal, which is up for review in August 2013, will provide a \$951,988 grant through the first two and a half years of operation from the Amgen Foundation.

## Community

Current participants in CBI's research and educational activities include the following.

### Industry

Aetna  
 Alnylam Pharmaceuticals  
 Amgen  
 Aquafine BioProcess  
 Asahi Kasei  
 Baxter  
 Biogen Idec  
 BioMarin  
 Boehringer Ingelheim  
 Bristol-Myers Squibb  
 EMD Millipore  
 Genentech  
 Genzyme  
 GlaxoSmithKline  
 Inno Biologics Sdn. Bhd.  
 Johnson & Johnson  
 KEW Group  
 Latham BioPharm Group  
 LFB Biotechnologies  
 Life Technologies  
 MedImmune  
 Merial  
 Merrimack Pharmaceuticals  
 Metabolix  
 Millennium Pharmaceuticals  
 Novartis Pharma AG  
 Novartis Vaccines & Diagnostics  
 Pall Corporation  
 PerkinElmer  
 Pfizer  
 Sanofi  
 Sanofi Pasteur  
 Shire

**Government Agencies**

Centers for Disease Control and Prevention  
 Defense Advanced Research Projects Agency  
 European Medicines Agency  
 Health Canada  
 National Institute for Clinical Excellence  
 National Institute of Standards and Technology  
 National Institutes of Health  
 Singapore Health Sciences Authority  
 United States Food and Drug Administration

**Academia (including teaching hospitals)**

MIT (School of Science, School of Engineering, Sloan School of Management, and School of Humanities, Arts, and Social Sciences)  
 Georgetown University  
 Harvard Medical School  
 Massachusetts General Hospital  
 Memorial Sloan Kettering Cancer Center  
 National University of Singapore  
 Northeastern University  
 Rensselaer Polytechnic Institute  
 University of Prince Edward Island

**Other**

Alfred P. Sloan Foundation  
 European Federation of Pharmaceutical Industries and Associations  
 Friends of Cancer Research  
 Genetics Alliance  
 Innovative Medicine Initiative (European public-private partnership)

**Paula (Gigi) Hirsh**

**Executive Director, Center for Biomedical Innovation**

**Center for Complex Engineering Systems**

The [Center for Complex Engineering Systems](#) (CCES) is a joint research program between MIT and the King Abdulaziz City for Science and Technology (KACST), the national science agency of the Kingdom of Saudi Arabia. CCES was created in 2011 to improve the understanding of complex infrastructure systems and to jointly conduct world-class research. Saudi Arabia faces rapid population growth, depletion of natural resources, and the need to create a more sustainable society for the future. CCES takes a comprehensive wealth perspective and develops new methods of analysis, simulation, collaboration, and decision making to optimize the portfolio of infrastructure investments and policies that will best lead to such transformation.

At KACST, the center is located in state-of-the-art facilities in Riyadh, the capital of Saudi Arabia. At MIT, the center is hosted in ESD, giving it access to all five schools via dual and joint faculty appointments. The collaborative agreement between MIT and KACST



covers the 10-year period between 2011 and 2021; the base budget at MIT is \$20.5 million, including the design of the state-of-the-art Collaborative Design Laboratory. In addition to sponsorship of research at MIT, KACST is in the process of hiring 20 new employees, young Saudi researchers with an interest in modeling and simulation of complex engineering systems. Some of these researchers have successfully applied to come to MIT and other leading US research universities as regular students for advanced degrees.

CCES facilities include high-performance computing, linked through the Collaborative Design Lab, using the latest in virtual presence technology. The problems that CCES addresses are situated in one or more domains. Tackling engineering systems challenges requires an engineering problem-solving mindset, as well as new framing and modeling methodologies that are referred to as engineering systems approaches. CCES has started and/or completed the following research projects:

- *Urban Traffic System*: analysis of urban traffic congestion data and dynamic mobility patterns in Riyadh
- *Sustainable Infrastructure Planning System*: assessment of infrastructure investment strategies for better comprehensive wealth
- *Integrated Energy Decision Support System*: scenario modeling and simulation for transformation of the Saudi electricity grid
- *Labor Management Decision Support System*: analysis and policy assessment of Saudi labor market programs
- *Cyber Security Initiative*: modeling and simulation of cyber attacks on the Kingdom of Saudi Arabia's information technology infrastructure, including data privacy protocols
- *Strategic Solar Desalination Network*: strategic analysis of future options for water desalination with renewable energy
- *City Dynamics*: visualization and pattern analysis of urban dynamics, including mobility and water and energy consumption
- *City Schema*: development of tangible interfaces and analytic models for new city planning (e.g., the New Taif Technology Park)

CCES is actively seeking and finding third-party sponsors to expand its research portfolio. The design lab facility at MIT will be located in Building E38 and will include about 3,500 square feet of faculty, staff, student, and visitor offices and state-of-the-art collaboration studios. Renovations are expected to begin in September 2013, with an anticipated move-in date in January 2014. MIT faculty that collaborate with CCES belong to a number of departments, labs, and centers from across the Institute, including ESD, the Department of Civil and Environmental Engineering, the Department of Urban Studies and Planning, the MIT Energy Initiative, the Department of Economics, the Media Lab, and the Department of Earth, Atmospheric and Planetary Sciences.

**Olivier de Weck**

**Codirector, Center for Complex Engineering Systems at KACST and MIT**

**Associate Professor of Aeronautics and Astronautics and Engineering Systems**

## Center for Engineering Systems Fundamentals

Research and educational initiatives at the [Center for Engineering Systems Fundamentals](#) were funded by a variety of sources during AY2013.

The MIT Education-as-a-Complex-System Group is funded by a four-year grant from the National Institutes of Health (in collaboration with Ohio State University) and by a three-year contract from Fujitsu Laboratories of America. Progress has been made on a number of fronts, including an analysis of how changes in federal research funding levels up or down are magnified several times for large research agencies such as the National Institutes of Health and the Centers for Disease Control and Prevention. With Fujitsu support, work was completed on a software system architectural design of a potentially transformative new online learning platform, Guided Learning Pathways.

Pandemic influenza research is supported by the US Centers for Disease Control and Prevention under a five-year cooperative agreement with the Harvard School of Public Health, and by the Alfred P. Sloan Foundation of New York. This past year, a new vaccine allocation method was derived that, had it been in place in 2009 during the H1N1 flu pandemic, might have averted millions of flu infections in the United States.

Supported by the MIT Portugal Program, a software system called “Energy Box” is being created with the goal of managing electricity usage in a home or small business from a desktop computer.

In October CESF, in collaboration with SSRC, conducted its second MIT election conference, “Does the Current Presidential Election System Serve America Well?”

In June, in partnership with the new MIT Office of Digital Learning, CESF conducted the Sixth Conference of MIT’s Learning International Networks Consortium. There were about 300 participants from 49 countries. The title was “Realizing the Dream: Education Becoming Available to All: Will the World Take Advantage?”

**BLOSSOMS** (Blended Learning Open Source Science or Math Studies) now includes more than 100 video learning modules from MIT, Jordan, Lebanon, Pakistan, and Saudi Arabia. Modules are also available from volunteers in the Washington, DC, public school system and Singapore, as well as volunteers at Georgia Tech, the University of Wisconsin, IBM, and Teachers Without Borders. During the past year, the program offered several teacher training workshops in Massachusetts and at the University of Technology, Malaysia.

Professor Richard Larson serves on the senior advisory board of the School of Science and Engineering, Lahore University of Management Sciences (Pakistan). He also serves as co-chair of a new joint Institute of Medicine/National Academy of Engineering Innovation Collaborative, Systems Engineering in Health.

**Richard Larson**

**Director, Center for Engineering Systems Fundamentals**  
**Mitsui Professor of Engineering Systems**

## MIT Center for Transportation and Logistics

For over 40 years, the [MIT Center for Transportation and Logistics](#) (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 approximately 50 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.

There were 152 active projects in FY2013. Major projects and initiatives are described below.

### MIT Global SCALE Network

The [MIT Global SCALE \(Supply Chain and Logistics Excellence\) Network](#) continued to enhance its offerings. CTL continues to explore additional centers in China, India, and other global logistics hubs.

### Center for Latin-American Logistics Innovation

The [Center for Latin-American Logistics Innovation](#) has cultivated deep relationships with 27 top Latin American universities and institutions outside the region. It currently has nine full-time research staff and, as an official national center of excellence, has access to government grants and various thought leadership opportunities.

The 39 students in the fifth class of the Graduate Certificate in Logistics and Supply Chain Management program were selected from 94 applicants from 17 universities across Argentina, Brazil, Colombia, Mexico, Peru, and Ecuador. To date, the program has graduated 66 students, hosting them for three weeks in Bogotá and two weeks on the MIT campus alongside students from CTL and the Zaragoza Logistics Center. Starting with the 2014 class, the MIT campus will host both sessions of the graduate certificate program.

The second CLI initiative in education is to “teach the teachers” through a series of English-language academic workshops that take place annually at various venues in the region. The latest workshop took place in October 2012 in Quito, Ecuador, following a series of meetings in the United States, Panama, Colombia, and Brazil. Also available at the faculty level are three- to six-month visiting research fellow positions at CTL. In the past five years, 10 faculty members have taken advantage of this program: three from Mexico, two from Colombia, two from Chile, and one each from Panama, Brazil, and Ecuador. As of 2013, visiting faculty stays are focused around research themes.

Corporate education is CLI's third educational initiative. The center currently has 12 corporate partners with whom it develops a wide range of executive and collaborative research.

## Zaragoza Logistics Center

In 2012, the [Zaragoza Logistics Center](#) (ZLC) was formed with 49 people from some of the world's most prestigious universities: 11 permanent faculty members and adjunct faculty, 14 researchers and doctoral students, and 24 professionals in finance, marketing, information technology, human resources (HR), and education and research management.

Over the past year, 250 students participated in the educational programs offered by ZLC. Last May, 40 students from the 11th class of the Master de Logística and the eighth class of the MIT-Zaragoza Master of Engineering in Logistics and Supply Chain Management (ZLOG) program—from 13 different countries—graduated at the University of Zaragoza's Paraninfo Hall. In 2012, for the second consecutive year, the ZLOG program was ranked first in the field of logistics in *El Mundo's* rankings of the 250 best master's programs in Spain. Four ZLOG master's students participated in the Vestas Winnovation Challenge 2012 in Denmark, and one student won first place. Two other students in the ZLC part-time master's program also won local awards (Best Junior Aragonese 2012 and Best Logistics PILOT Project).

The MIT-Zaragoza doctoral program had 10 students. Two students successfully defended their dissertations at ZLC and the University of Zaragoza in 2012 to complete their PhD program requirements. Twenty-seven students participated in the fifth edition of ZLC's annual PhD summer academy. In addition, more than 150 professionals participated in different executive education programs in supply chain management designed and taught by ZLC for diverse organizations.

In 2012, there were over 30 ongoing research and development projects at ZLC. Funding sources included the European Commission, private companies, the Spanish Ministry of Economy and Competitiveness and Ministry of Industry, and the government of Aragón. ZLC also performed several research projects with private companies that resulted in a direct transfer of research and innovation. The income generated in 2012 through research grew by over 50% relative to 2011. The research work at ZLC has resulted in six articles published in peer-reviewed journals, one book chapter, and several research reports. ZLC faculty and research staff presented their research findings at key national and international conferences.

In 2012, ZLC organized several outreach activities that attracted more than 300 attendees. Major events included the International Closed Loop Supply Chain Conference, the Supply Chain and Finance 2nd Annual Symposium, the Council of Supply Chain Management Professionals roundtable "Supply Chain vs. Finance Where to Invest?" and the launch of professor Yossi Sheffi's book *Logistics Clusters* in Spain. Also, experts from universities around the globe participated in the MIT-Zaragoza speaker series organized at ZLC.

In 2012, ZLC obtained over 1.6 million euros in direct funding from outside Spain for public and private research projects and education. Despite the recession in Spain and weak economic conditions throughout Europe, ZLC's revenues increased by 25% from 2011 to 2012. ZLC also had a direct financial impact in the local community:

more than 1.75 million euros were spent in Aragón by ZLC visitors and students from outside Spain. ZLC reduced its total expenses by over 13% from 2011 to 2012 without compromising the quality of its educational and research activities.

### **Malaysia Institute for Supply Chain Innovation**

In August 2012, the [Malaysia Institute for Supply Chain Innovation](#) (MISI) began operating as an institute for higher education. During the past year, MISI has established a solid relationship with various stakeholders including government agencies, industry, and other universities in the region. The culmination of these efforts was MISI's convocation of the inaugural group of MSc students in May 2013.

Full MQA (Malaysian Qualifications Agency) accreditation has been awarded to the Malaysian supply chain management program, with approval to proceed with a part-time MSc program. The MISI team is made up of nine faculty and research members from seven countries with a supporting staff of 13 professionals in finance, marketing, information technology, and human resources.

The first 16 MSc students arrived on August 8, 2012. During a program spanning more than nine months, 15 thesis research projects supported by MISI industry partners were completed. Students' in-progress work was displayed during Independent Activities Period at MIT in January 2013. Support from MISI's partners contributed to more than 24 industry lectures given to students throughout the program. The first student convocation was held on May 30, witnessed by the MISI board of governors and the US ambassador to Malaysia as the guest of honor. After graduation, all students actively seeking jobs exceeded their placement expectations in terms of both salary and role.

The first summer academy was held in 2013 with students from Thailand and Kazakhstan, who participated in programs specifically designed to meet their supply chain management education requirements. The MISI summer school program aims to deliver a selection of academic lectures, supply chain management simulation games, and industry visits to allow students to develop a good understanding of logistics and supply chain processes.

A number of industry outreach programs were also conducted during this period, including a three-day global health and humanitarian conference in collaboration with MIT and Georgia Tech; the event, held at the Bank Negara, attracted 120 global participants. In addition, a two-day leadership seminar was offered by Dr. Shalom Saar.

MISI has successfully bid to host the 2015 International Association of Maritime Economists conference for the first time in Malaysia. In October 2012, MISI launched the Supply Chain Leadership and Innovation Program in the Asian region, with plans to expand globally. This four-month executive education program combines theory and practice in supply chain management. To date, two programs have been completed.

MISI faculty have published 12 articles in academic journals and presented at more than 20 international conferences throughout Malaysia, Singapore, Thailand, Iran, Korea, Greece, the United Arab Emirates, and Indonesia. MISI has tendered five applications

for research grants with the Malaysian Ministry of Higher Education. Six short executive development programs have been delivered to a mix of participating companies.

The next class of MSc students represents 12 countries, and students will arrive on campus in July 2013.

### **Leaders in Environmental Assessment and Performance**

The research activities of the [Leaders in Environmental Assessment and Performance](#) (LEAP) consortium are ending in 2013. CTL and the Material Systems Lab will continue to develop activities under the LEAP brand, including monthly webinars that address strategic topics relevant to environmental supply chain strategy. Future LEAP engagements will be developed on a project-by-project basis.

A book describing the insights gained from the research activities of the LEAP initiative, as well as other research activities in the area of environmental supply chain management, is expected to be released in 2014.

### **Megacity Logistics Lab**

Starting in 2012 as an outgrowth of research activities in logistics and supply chains in emerging markets, CTL created the [Megacity Logistics Lab](#) (MLL) to focus on understanding and transforming the supply chains that interface with megacities.

MLL has secured seed funding from the MIT International Science and Technology Initiatives, the Itaú Foundation, and the International Research Opportunities Program office to support partnerships, workshops, and data collection efforts in a number of cities around the world (Beijing, Bogotá, Casablanca, Kuala Lumpur, Madrid, Mexico City, Rio de Janeiro, Santiago, and São Paulo).

More than 300 people from business, academia, and government have participated in MLL activities. Eighteen MIT students, including 10 undergraduates, have experienced firsthand the challenges of freight movement. MLL has also hosted doctoral students from Mexico, Brazil, and Chile as it builds its research agenda.

In 2013, MLL launched the first “global urban logistics atlas” with the goal of providing policymakers and logistics managers with standardized, detailed, and context-specific information on patterns of logistics intensity in megacities.

### **MIT Hi-Viz Project**

The [Hi-Viz](#) (high visibility) project is building a system to automatically display a flow diagram and map of a manufacturing or distribution company’s supply chain, allowing decision makers to quickly grasp the essence of the whole supply chain. The next phase of the project is to connect the Hi-Viz system to automated geo-based and financial alerts and to geo-based disaster frequency “shape files” (heat maps). Such additions will enable the system to monitor the health of the supply chain in real time.

## Humanitarian Response Capacity

The [Humanitarian Response Lab](#) (HRL) and three other research groups spanning three MIT schools were awarded a multimillion-dollar five-year grant from the US Agency for International Development. As part of the grant, MIT joined the Higher Education Solutions Network, a groundbreaking partnership providing strategic funding to seven top American and foreign universities to address global development challenges. Other newly funded research projects this year were conducted with the International Federation of Red Cross and Red Crescent Societies, the United Nations World Food Programme, the United Nations Department of Field Support, the New England University Transportation Center, and the government of Chile, through support from the MIT-Chile Seed Fund. Additional projects continued with the International Rescue Committee, Heart to Heart International, and Partners in Health. Staff and students also volunteered with the New York City Office of Emergency Management during the response to Hurricane Sandy.

HRL education efforts continued through the MIT graduate course on humanitarian logistics and a collaboration with Harvard and Tufts on “Essentials for Humanitarian Action in the Field,” a three-day simulation held in a state park near Boston. HRL co-organized the fifth annual Health and Humanitarian Logistics Conference in Kuala Lumpur, Malaysia, with Georgia Tech and MISI in June 2013, drawing 150 participants from around the world. HRL also co-organized (with Gordon College) a local conference in March, “Humanitarian Response: Innovation to Meet Needs,” that connected students with leaders from government and nongovernmental organizations.

## Logistics Clusters

In October 2012, Professor Sheffi’s book *Logistics Clusters: Delivering Value and Driving Growth* was published by the MIT Press. The book won the Professional and Scholarly Excellence Award from American Publishers. It is now in its third printing.

## MIT-Volpe Transportation Human Factors Research Program

The [MIT-Volpe Transportation Human Factors Research Program](#) awarded five new projects: CO2 Emission Metrics for Commercial Aircraft Certification and Fleet Performance Monitoring (professor R. John Hansman), Human Factors Research in Support of NHTSA Rule Making on Keyless Ignition (principal research associate Joseph F. Coughlin), Assessment of CO2 Emission Metrics for Commercial Aircraft Certification and Fleet Performance Monitoring (Professor Hansman), Solar Glare Mitigation Study at Manchester Airport (professor Christoph Reinhart), and Design of Pilot Procedures and Instrument Operations Research (Professor Hansman).

## MIT FreightLab

The [MIT FreightLab](#) was exceptionally productive this year, with more than a dozen graduate students, postdoctoral candidates, and researchers participating in various activities. Work was focused on teaching graduate-level courses, advising master’s thesis projects, continuing work on long-standing research initiatives, and running executive roundtables. The FreightLab launched ESD.266: Freight Transportation Systems and Analysis, which was attended by 25 students from engineering, management, and urban planning.

Eight master's theses were produced by FreightLab students on topics ranging from trucking productivity to ocean transit reliability. Sponsored freight thesis projects were completed for Amazon, Coyote Logistics, and CH Robinson.

Work continued on three long-running research projects: Future Freight Flows (FFF), Living Plan, and Global Transit Reliability. The FFF project, sponsored by the US Department of Transportation, was completed. The material developed for scenario planning has been incorporated into overall master's- and executive-level educational programs. The FreightLab has conducted additional FFF-based scenario planning engagements with organizations ranging from the United Nations to 7-Eleven stores. The Living Plan project, sponsored by the United States Transportation Command, is entering its third year. This project explores methods of developing robust transportation planning tools under uncertainty. The work is based on pioneering efforts conducted by FreightLab researchers in an earlier project with Wal-Mart. The project examines how robust planning and operational flexibility interact. A large-scale simulation test bed is being created to understand the trade-offs of these different approaches to managing uncertainty. The Global Transit Reliability project analyzed transactional data from a dozen different importing and exporting companies, exploring and quantifying sources of uncertainty in transit time as well as the impact of this variability on supply chain costs. The team developed specific guidelines for companies (based on level of service and transit variability) to determine when and if they should adapt more sophisticated enterprise resource planning systems.

### **New England University Transportation Center**

MIT has rebid the competitive grant for renewal of the [New England University Transportation Center](#). Notice of award is expected in fall 2013. This consortium of universities includes MIT as the lead institution along with the University of Connecticut, University of Maine, University of Massachusetts, and Harvard University.

Should the grant be renewed, it will allow further development of a living laboratory in Cambridge, the Massachusetts Avenue Area Living Laboratory (MALL), with an urban landscape from Harvard Square to Memorial Drive. MALL is the first project of its type to create a platform for research and education in technology development and deployment, travel behavior, retail and commercial development, architecture, and design with a special focus on disadvantaged populations.

### **AgeLab**

[AgeLab](#) has grown in the number of students, staff, and faculty from engineering, social and behavioral sciences, and management as well as from Harvard Medical School. 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., retail, auto, financial services, pharma, and consumer products).



## Outreach

The foundation of 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. A list of exchange partners is available on the CTL [website](#).

## Corporate Relations

During FY2013, CTL dropped three companies from the Supply Chain Exchange: Coca-Cola, Chick-fil-A, and Solutia (purchased by Eastman Chemical). This is a reduction from FY2012 in the number of companies dropped. CTL continues to maintain and nurture its relationships with these companies and expects some to resume active membership in FY2014. Six companies were added as partners to the exchange: 7-Eleven, Boeing Company, CVS/Caremark, IPC (Independent Purchasing Cooperative), Flextronics, and Schneider National.

## Events

CTL organized 16 outreach events in FY2013. New in FY2013, the CTL Advances in Supply Chain Management webinar series featured three events that drew more than 300 participants: "Rethinking Supply Chain Strategy in Complex Markets" (November 14); "Ocean Transportation Reliability: Myths, Realities and Impacts" (February 6); and "Delivering Green: Three Case Studies in Carbon-Efficient Logistics" (April 17).

CTL hosted the fourth annual partners meeting on June 25, which convened key contacts from CTL's partner companies for a review of research and customer feedback and input sessions.

This year's CTL Crossroads Conference (June 26) focused on supply chain management as a future enabler, allowing markets to be reinvented with faster, nimbler, smarter supply chains to transform the way companies operate.

CTL held two sessions (in January and June) of its major supply chain management executive education course, "Supply Chain Management: Driving Strategic Advantage."

CTL conducted custom scenario-planning workshops at partner locations. Additionally, CTL planned and delivered several custom educational programs for a key partner that featured new educational content developed from research.

On January 17, CTL held its fifth annual networking night/poster session. Nearly 100 students from the SCALE Network programs (CTL, ZLC, CLI, and MISI) presented over 60 thesis projects to more than 50 representatives from 35 companies. Earlier that same day, CTL hosted its third Supply Chain Talent Management Forum for HR and supply chain management executives.

CTL also hosted the following events for Supply Chain Exchange partners:

- “Supply Chain Planning Roundtable” (August)
- “Advancing Supply Chain Risk Management: Emerging Challenges and Strategies Symposium” (October)
- “The Carbon Footprint of Freight: Tools and Methods Workshop” (October)
- “Global Ocean Transportation Roundtable” (November)
- “Supply Chain Inventory Analytics Roundtable” (April)
- “ResearchFest” (student thesis final presentations) (May)
- “Supply Chain Visualization Analytics Roundtable” (June)

## Personnel

In FY2013, new hires and appointments at CTL included Dana Rose Ellis, technical associate; Daniel Francois, financial assistant II; Alexis Hickman, postdoctoral associate; Michelle Isaacson, postdoctoral fellow; Martin Lavalliere, postdoctoral fellow; Hale Mcanulty, technical associate; Cheryl A. Mcleod, administrative assistant II; Julie B Miller, research associate; Sarah J. Smith, communications specialist; Allison Rose Sturchio, SCM recruiting and career development administrator; Yan Yang, postdoctoral associate; and Lucas Yoquinto, technical associate. In addition, visitors to CTL included visiting military scholar Col. Daniel Rickleff; domestic and international visiting scholars Dr. Charles Davis, Dr. Gary Graham, and Dr. John H Park; and international visiting students Yutao Ba, Karla Balderas Perez, Gustavo Beauregard, Andres Bronfman, Sergio Caballero, José Cohen, Victor Manuel Martinez, Ana Teresa Mendez, Jorge Moreno, Peter Oberhofer, Adrian Rumpold, Cecilia Silva, Julien Tanneau, Dimitri Weideli, and Matthias Winkenback.

Departures from CTL included Jonathan Pratt, who moved to another department at MIT, and Tara Faulkner, Basak Kalkanci, Vignesh Kumar Krishnamurthy, Zachary Slater, and Ying Wang. After 33 years at MIT, CTL’s Paula Magliozzi, administrative assistant II, retired on April 2, 2013.

## Recognition

CTL’s 2012–2013 United Parcel Service Fellowships were awarded to two outstanding students studying logistics, freight transportation, or supply chain management: Michael Chun (master of science fellowship, Leaders for Global Operations program) and Arzum Akkas (PhD fellowship, Engineering Systems Division).

**Yossi Sheffi**

**Director, MIT Center for Transportation and Logistics**

**Elisha Gray II Professor of Engineering Systems and Civil and Environmental Engineering**

## MIT Supply Chain Management Program

The [Supply Chain Management Program](#) continues to receive six to seven times as many applications as there are available slots in the program.

SCM collaboration with other SCALE programs continues to increase, with cross-center teams and international travel. All SCALE students congregate at MIT in January for an intense month of team projects, lectures, workshops, and presentations, followed by a one-week trek to Spain or Panama.

SCM has established the MIT Supply Chain Excellence Award at Penn State, Arizona State, Lehigh, and Texas A&M universities. The award is given annually to the most outstanding graduating supply chain major in each school (only US citizens are eligible). To date, three female supply chain graduates from Penn State have been recognized with a partial scholarship to attend the SCM program.

### 2013 Class

In spring 2012, 36 students (eight women and 28 men) were selected from more than 250 applicants to join the SCM program as its class of 2013. Students came from 15 countries; their average age was 30 (with a range from 23 to 38), and they had an average of five years of professional experience.

A total of 73 companies recruited SCM students in 2012–2013. Among students who sought employment, 83% had received job offers by graduation. SCM students received an average 71% boost in salary, with the average outgoing annual base being \$116,000 (ranging from \$90,000 to \$150,000).

### Thesis Partners

Fifteen companies participated as Supply Chain Exchange thesis partners. This year's projects included:

- Using Big Data for Decisions in the Agricultural Supply Chain (agricultural chemical company)
- Inventory vs. Capacity in Production Scheduling (agricultural chemical company)
- Measuring Port Capacity: A Case Study on a Southeast Asian Port (CTL and MISI)
- Outbound Transportation Collaboration: Do-It-Yourself (DIY) (CTL)
- Analysis of Truckload Prices and Rejection Rates (logistics company)
- Ethanol Supply Chain and Industry Overview: More Harm Than Good? (CTL)
- The "+Add" Supply Chain Framework for Defense Product Support (aerospace company)
- Communicating Optimization Model Results (Semiconductor Company)

- Access to Medicines in the Private Sector of Zambia and Zimbabwe (pharmaceutical firm)
- Calculating Humanitarian Response Capacity (CTL Humanitarian Response Lab)
- Foreign Trade Zones and Bonded Warehouses for Luxury Goods (luxury apparel company)
- Right-Sizing Supply Chain Planning Functions in the CPG Industry (consumer products company)
- Absenteeism Prediction and Labor Optimization (large US railroad)
- SC Network Design for a Low Volume Industrial Chemical Product (large chemical company)
- Inventory Management of Externally Sourced Medical Devices (Johnson & Johnson)
- How to Find Indicators for Scenario Monitoring (large chemical company)
- Future Scenarios for Green Chemical Supply Chains (large chemical company)
- A Should-Cost Tool in the Oilfield Services Industry (oil field services firm)
- Spot-Market Rate Indexes for Truckload Transportation (logistics company)
- Building a Demand Signal Repository to Forecast Demand (beverage company)
- Multi-Echelon Inventory Optimization for Fresh Produce (large grocery retailer)

### Alumni Interaction

The SCM program has approximately 430 alumni, in addition to 200 alumni from other SCALE centers. SCM alums are working on six continents in myriad industries.

CTL held its eighth annual alumni reconnect event in June 2013 with the theme “Climbing the Corporate Ladder.” The panel of speakers included Cynthia Bellefeuille Stanton (MLOG ’05), director of product management at Verizon Communications; Colby Chiles (MLOG ’05), director of transportation at Home Depot Direct Fulfillment; Jon Pulido (MLOG ’04), director of network strategy for H-E-B; John Parsons (MLOG ’04), principal at McKinsey & Company; and Lalitendu Panda (MLOG ’99), CIO at Tronox Inc.

**Yossi Sheffi**

**Director, MIT Center for Transportation and Logistics**

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