

## Dean, School of Engineering

Comprising an exceptional community of students, scholars, researchers, educators, and engineering practitioners, the MIT School of Engineering's mission is to educate the next generation of engineering leaders, to create new engineering and scientific knowledge, and to serve society. By providing innovative ideas and practical technologies and educating the people who will help create solutions to the greatest technological and social problems of the 21st century, the MIT School of Engineering fulfills its obligation as a world-leading institution.

To advance this mission, the dean, Ian Waitz, in close consultation with the School's leadership, has continued to develop and evolve a vision and an integrated strategy. The elements of this strategy include continuing to attract and support the education and professional development of exceptionally talented students, faculty, and staff; building collaborative intellectual communities—within MIT and with external partners—that enable the School to best tackle complex technological and social problems; developing new paradigms for university-led innovation and entrepreneurship; and reinventing the future of engineering education.

The School of Engineering's eight academic departments, one division, one institute, along with its many research centers, laboratories, and rich array of interdisciplinary graduate degree programs encompass a community of some of the world's most innovative and inventive thinkers. Approximately 37% of the Institute's faculty, 49% of graduate students, and about 68% of the declared undergraduate majors collaborate in the School's 23 undergraduate degree programs and 52 graduate programs. The School's faculty research expenditures were approximately \$392 million in FY2013, accounting for 58% of the on-campus total. The achievements of the School's departments, laboratories, centers, and programs are extensive. Separate reports highlight the activities and accomplishments of the students, faculty, and staff in each of these units over the past year.

In 2012–2013, there were a number of leadership transitions within the School's departments, centers, and laboratories. In August 2012, Stephen Graves, the Abraham J. Siegel professor of management science, was named interim director of the Engineering Systems Division; Professor Graves succeeded professor Joseph Sussman. In November, Sanjay Sarma, the Fred Fort Flowers and Daniel Fort Flowers professor of mechanical engineering and a MacVicar Faculty Fellow, was named MIT's first director of Digital Learning. In March, Mary Cunningham Boyce, the Ford professor of engineering and head of the Department of Mechanical Engineering, was named the dean of the Fu Foundation School of Engineering and Applied Science at Columbia University. Gareth McKinley, School of Engineering professor of teaching innovation and former associate department head for research, was named interim department head, effective July 1, 2013. In May, Markus Buehler, an associate professor of civil and environmental engineering, was named head of the Department of Civil and Environmental Engineering, effective July 1, 2013. Professor Buehler succeeded Andrew Whittle, the Edmund K. Turner professor of civil and environmental engineering. Also in May, Robert Armstrong, Chevron professor of chemical engineering, was named director of

the MIT Energy Initiative, when the outgoing director, Ernest Moniz, was asked to head the US Department of Energy. Finally, in June, Dennis Freeman, professor of electrical engineering, was appointed the dean of undergraduate education for MIT.

As a result of this year's faculty searches, 16 candidates accepted faculty appointments in the School of Engineering, including six women. Their appointments will add to the excellence, excitement, and energy critical to maintaining the School's high standards.

## Awards and Honors

Every year, members of the MIT engineering community receive numerous honors in recognition of their research, scholarship, service, and overall excellence. This year was no exception. The reports of the School's departments, division, laboratories, centers, and programs make note of many of these awards. The following is a sample of the honors and awards garnered by the School of Engineering in AY2013:

Mildred Dresselhaus, from the Department of Electrical Engineering and Computer Science (EECS) and the Department of Physics, was awarded a Kavli Prize for her landmark contributions to nanoscience.

Robert Langer, from the Department of Chemical Engineering, was awarded the National Medal of Technology by President Obama, and was among the eight recipients worldwide of the 2013 Wolf Prize.

Sallie (Penny) Chisholm, from the Department of Civil and Environmental Engineering, was awarded the National Medal of Science.

Sir Tim Berners-Lee, from EECS, was one of the inaugural recipients of the Queen Elizabeth Prize for Engineering for his work in creating the World Wide Web.

Barbara Liskov, from the Computer Science and Artificial Intelligence Laboratory (CSAIL), was named a 2012 Charter Fellow of the National Academy of Inventors.

Shafi Goldwasser and Silvio Micali, both from EECS, won the Association for Computing Machinery's A.M. Turing Award for their pioneering work in the fields of cryptography and complexity theory.

Angela Belcher, from the Department of Biological Engineering, was named the recipient of the 2013 \$500,000 Lemelson-MIT Prize.

Anant Agarwal, from EECS; John Hansman, from the Department of Aeronautics and Astronautics; and Edward Merrill, from Chemical Engineering, were among the 69 new members and 11 foreign associates elected to the National Academy of Engineering.

Kripa Varanasi, from the Department of Mechanical Engineering, was selected for the 2013 Outstanding Young Manufacturing Engineer Award by the Society of Manufacturing Engineers.

Timothy Lu, from EECS, was one of five MIT researchers to be selected for a Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the US government on science and engineering professionals in the early stages of their independent research careers.

Anant Agarwal, from EECS; Paula Hammond, from CE; and Andrew Lo, from CSAIL, were among the nine MIT faculty members elected to the American Academy of Arts and Sciences.

Steven Leeb, from EECS, received the Bose Award for Excellence in Teaching.

Geoffrey Beach, from the Department of Materials Science and Engineering (DMSE), received the Junior Bose Award.

Dennis Whyte, from the Department of Nuclear Science and Engineering (NSE); Nikolai Zeldovich, from EECS; Lorna Gibson, from DMSE; and Franz Hover, from MechE, received Ruth and Joel Spira Awards for Excellence in Teaching.

Alan Oppenheim, from EECS, received the Capers and Marion McDonald Award for Excellence in Mentoring and Advising.

Benoit Forget, from NSE, won the American Nuclear Society's 2013 Landis Young Member Engineering Achievement Award.

John Lienhard, from MechE, won the Water Technology Idol of the Year by Global Water Intelligence and International Desalination Association, at the 2013 Global Water Summit, in Seville, Spain, for the humidification-dehumidification carrier gas extraction process developed by his research group.

Alfredo Alexander-Katz, from DMSE, and William Tisdale, from CE, were among MIT's five recipients of the 2013 Early Career Award of the Office of Science of the Department of Energy.

Erik Demaine and his father, Martin Demaine, both from CSAIL, were named 2013 Guggenheim Fellows for their work with origami from wood, plastic, metal, and glass.

Linda Griffith, from BE and MechE, and Robert Miller, from EECS, were among the four MIT professors to be named 2013 MacVicar Faculty Fellows for their outstanding undergraduate teaching, mentoring, and educational innovation.

Jack Dennis, from CSAIL, was named the recipient of the 2013 Institute of Electrical and Electronics Engineers John von Neumann Medal.

Victor Zue, from EECS, was named the 2012 recipient of the Okawa Prize.

Wesley Harris, from Aero/Astro, received the 2012 President's Award on behalf of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers.

Bilge Yildiz, from NSE, won the 2012 Charles W. Tobias Young Investigator Award.

## **Innovation and Entrepreneurship**

Following on the recommendation of the AY2012 faculty committee to better coordinate existing educational offerings and establish new curricular and co-curricular activities and programs in innovation and entrepreneurship, faculty from the School of Engineering and other schools made significant progress in establishing a new undergraduate minor in innovation and entrepreneurship. In addition, the Martin Trust Center for MIT Entrepreneurship, in collaboration with the School of Engineering, launched and operated a new startup accelerator program, the Founders

Skills Accelerator (FSA). Going into its second year in summer 2013, the FSA program has broadened its appeal and applicant pool to become the Global Founders Skills Accelerator Program. The program garnered successful applications from Russia, Turkey, Canada, Germany, Scotland, and China, and the student entrepreneurs will join eight local teams on campus. Each team is eligible for \$20,000 and will receive mentoring from successful entrepreneurs and MIT faculty.

Along with activities to finalize the undergraduate minor, a variety of efforts remain under way within the School to promote innovation and entrepreneurship activities and offerings for students and faculty.

## **Educational Activities**

The School of Engineering continued to make progress advancing its world-leading educational programs during AY2013. Below are brief accounts of the largest of these activities.

### **MITx**

MIT's most significant contribution to educational innovation remains MITx and edX, its partnership in online education with Harvard University. While the efforts of all MIT faculty account for a third of the total course offerings on the edX platform, more than half of those are engineering faculty. From 3.091x Introduction to Solid State Chemistry, which has been offered three times, to 16.100x Flight Vehicle Aerodynamics, which will enroll its first class in the fall, faculty from the School of Engineering continue to be some of the platform's most prolific and creative contributors.

MIT faculty, staff, and students will continue to assess how new models of online instruction might become integral parts of MIT students' on-campus education and explore how global learners can access MIT-quality instructional experiences.

### **Educating for Innovation and Entrepreneurship**

In its findings, the faculty committee on innovation and entrepreneurship (I&E) cited a strong need to create a cohesive curriculum with co-curricular activities focused on educating students to be skilled in I&E practices. The committee recommended that MIT establish an I&E foundational curriculum and take a leadership role in I&E research, leveraging existing activities as a base. Specifically, this could assume the form of an interschool undergraduate I&E minor, a program for which there is enthusiastic faculty support. Furthermore, an innovation opportunities program, modeled after the Undergraduate Research Opportunities Program, could be created to expose undergraduates to entrepreneurship.

The committee recommended that the I&E curriculum be a partnership among the MIT Sloan School of Management, the School of Engineering, and the School of Science to encourage joint teaching and joint listing of I&E subjects and to promote cross-campus faculty and student collaborations. The committee supports co-teaching between practitioners and academics to provide students with alternative perspectives and broader networks and recommends that MIT offer workshops to students,

postdoctorates, faculty, and alumni for the development of demos and prototypes. The space dedicated to this activity should be designed and located to facilitate strong interaction among existing I&E centers and activities.

### **Semester from Anywhere**

At the beginning of AY2012, the dean requested that each department head in the School investigate the possibility of creating mechanisms and programs through which the undergraduate students in their academic programs would be able to pursue their courses of study from remote locations for one semester, or through which residential-based students would be able to use online resources to create additional flexibility and enhance their on-campus experiences. Aero/Astro and MechE have created functional prototypes of several subjects, and DMSE has launched three such subjects for the spring 2013 semester. The dean's office has also been working with faculty from the School of Humanities, Arts, and Social Sciences and other offices and programs at the Institute to develop a sufficiently broad set of options for students to take a full schedule of subjects while they are away from campus for a semester. The School's efforts to expand these options are expected to continue.

### **MIT+K12**

Launched in April 2012 in collaboration with Khan Academy (a free online education resource founded by MIT alumnus Salman Khan), [MIT+K12](#) is a program through which MIT students create short instructional videos for K–12 audiences. The videos are typically less than five minutes long and are devoted to hands-on explanations of engineering and science concepts at an age-appropriate level. All of the video content is produced by MIT students, fact-checked by MIT postdoctoral associates, quality checked by video production professionals, and then released for free via YouTube and a variety of other online avenues.

As part of a broader strategy to consolidate MIT's efforts in online education, ownership and funding for the MIT+K12 program was transferred to the Office of Digital Learning at the end of AY2013.

### **Reporting Tools**

During AY2013, the dean's office completed the first phase of development on a new system to collect and make better, more coordinated use of information about members of the faculty and principal investigator-level researchers in the School of Engineering. This system combines Institute-maintained data with information that has previously been maintained by individual faculty members on faculty personnel records, and all of this information is rendered as a set of reportable and manageable database fields. Modeled on existing forms and administrative processes within the School, the principal function of the "electronic Faculty Personnel Record" (eFPR) is to serve as a platform and collection system for faculty to use during the tenure and promotions process. At the end of AY2013, ownership for the eFPR system was transferred to the Office of Institutional Research, in the Provost's office, for broader implementation across the Institute.

## Development and Communications

The development and communications staff in the School of Engineering worked in close collaboration on a range of projects throughout AY2013.

- A new development and communications plan for the School was initiated, and partially completed, in 2012–2013. Working closely with the President’s office, the School created a new visual identity for itself, and helped establish new visual identity guidelines for the Institute.

In anticipation of the Institute’s upcoming capital campaign, the dean’s office completed its implementation of a new staffing plan for resource development and hired five new frontline resource development officers to work with individual academic departments.

An external media relations and corporate communications firm was hired to do media training for all members of the School of Engineering’s leadership team. The dean’s office also leased access to a media tracking service to better identify appearances of faculty in major-market media outlets.

A term staff position was added in the dean’s office to enable and facilitate web services and digital communications in general across the School.

The dean’s office arranged and coordinated regular, structured interactions between the dean’s office; the departments, laboratories, and centers within the School; the MIT News Office; and central Resource Development communications staff to facilitate and improve collaboration.

## **Statistics for 2012–2013**

### **Undergraduate Enrollment**

2,178 declared majors

960 women

138 international students

### **Graduate Enrollment**

3,305 students

888 women

1,349 international students

### **Degrees Awarded, 2012**

647 bachelor's degrees

772 master's degrees

324 doctoral and professional degrees

### **Faculty**

264 full professors

68 associate professors

51 assistant professors

**Ian Waitz**

**Dean**

**Jerome C. Hunsaker Professor of Aeronautics and Astronautics**