

Department of Civil and Environmental Engineering

This past year has been intense for the Department of Civil and Environmental Engineering (CEE). We have completed our major strategic planning process and started implementing steps toward achieving our vision. The department has had a very distinguished and innovative history at MIT, and it is clear that its future promises to be as exciting and innovative. Following are key points summarizing mission, vision, and focus for the department.

The provision of human services in a sustainable way is the most formidable and fundamental extension of the mission of civil and environmental engineering one can possibly envision, and the department fully embraces this mission. It is imperative that human infrastructure and the natural environment be viewed in a synergistic way in order to fulfill this mission.

We believe that the most effective way for CEE to provide leadership toward such a transformation is to focus along the intellectual dimensions associated with technological innovations, advances in basic knowledge, and a systems perspective.

Providing a further sharpening of this focus, we have decided to concentrate our efforts on quantitative and analytical approaches, novel experimentally based modeling, and development and use of sensing, information technology, and advanced computing.

We also fully recognize that a broader perspective is needed in order to fully tackle the many challenges toward a meaningful integration of the built and natural environments, but we strongly believe that this can be best achieved at MIT through partnerships with other units that will bring the best expertise for these other dimensions (economics, public policy, urban planning, political science, etc.).

We have engaged in an ambitious journey that requires—more than ever—tremendous investments in people and facilities. This report provides examples of the steps and directions we have taken with respect to educational activities and research initiatives.

On the faculty hiring front, we are very pleased to announce that Dr. Edward DeLong has accepted our offer to join MIT as a tenured full professor in the Department of Civil and Environmental Engineering and in the Biological Engineering Division, effective July 1, 2004. Dr. DeLong is a spectacular addition to our faculty. He is widely recognized as a pioneer in establishing the field of microbial systems biology. We expect that he will nucleate an exceptionally strong and exciting research program.

Initiatives

The faculty continues to provide first-class, worldwide recognition to the department. Research is a process driven largely by faculty ideas and initiatives, and we have many such vibrant programs. Numerous high-profile research projects are underway on exciting and timely topics such as environmental genomics, remote sensing, data fusion,

sensor networks, logistics, intelligent transportation, network design, and durability mechanics, to name a few.

In some cases it goes beyond a given discipline. Examples include the Earth System Initiative (ESI, <http://web.mit.edu/esi/>) and its affiliated Terrascope program for MIT freshmen (<http://web.mit.edu/terrascope/www/>). Codirected by Professor Chisholm and Professor Hodges from the Department of Earth, Atmospheric, and Planetary Sciences, ESI is designed to bring together earth science and engineering activities at MIT, with a special emphasis on topics such as remote sensing, genomics, geobiology, landscape evolution, and high performance computing, which cut across traditional science-engineering boundaries. The Terrascope program is a sequence of two freshman subjects that give new MIT students the chance to tackle a major environmental topic in depth, to scope out the issues, and to design solutions. Terrascope is run as a group project, with lots of open-ended problem-solving interaction with faculty and upperclassmen who serve as voluntary advisors. Last year's spring field trip took Terrascope students to the Amazonian rain forest, and this year they traveled to the Alaskan wilderness and the Arctic National Wildlife Refuge.

We are also nurturing the growth of other interdisciplinary departmental initiatives such as the Geogenome and Advanced Innovative Material (led by Professor Ulm) and the Mobility and Transportation in the 21st Century (led by Professor Barnhart).

The department is housed within two main facilities, Building 1 and Building 48. We have just completed a much-needed multimillion dollar renovation of Building 48, under the supervision and leadership of Professor Hemond. It includes the extension of the second floor across the hydraulic bay to provide office space, refurbishment and rearrangement of the hydraulics lab itself, development of new multipurpose office and meeting space in multiple locations, expansion and refurbishment of faculty offices, and a new staircase and gathering area centrally located on the third floor. Finally, we are in the process of completing renovations for Professor DeLong's laboratory on the fourth floor. This was made possible via a very generous contribution from Dr. Lawrence H. Linden, and we take this opportunity to thank him for his generosity.

Educational Activities

Student Enrollments over the Past Five Years

	AY2000 (Fall 1999)	AY2001 (Fall 2000)	AY2002 (Fall 2001)	AY2003 (Fall 2002)	AY2004 (Fall 2003)
Total Undergraduates	76	69	62	77	80
MEng	47	66	38	61	33
SM	164	152	165	160	135
PhD	68	71	71	68	71
Total Graduates	279	289	274	289	239

Undergraduate Program

The undergraduate program currently has about 80 students and continues to provide a first-rate experience for students, with a dedicated internship program, study tours in foreign countries, participation in an exchange program with Cambridge University, and UROP (research) opportunities. We are working on a plan to deliver a new integrated sophomore program starting fall 2005. An important investment will be in the development of key “hands-on modules,” pairing fundamental core courses with laboratory experiments and design. We are aiming at doubling the number of undergraduates enrolled in Course 1 within the next three years.

Graduate Programs

The graduate programs are critical to the vitality of the department. Our three main graduate degree programs (the Master of Engineering [MEng], the Master of Science [SM], and the Doctor of Philosophy [PhD]) total 239 students.

Master of Engineering Program

The MEng is a nine-month program with several tracks (environmental engineering, high performance structures, and geotechnical engineering) and has a very significant role in producing students highly sought after by industry and other agencies. After a rigorous and positive review during AY2004, we are now working on a plan to significantly increase its visibility. The MEng program attracts both students and employers who appreciate the mix of fundamentals and practical experience that this program offers, and it is an integral part of our strategic direction.

Master of Science and Doctor of Philosophy Programs

Many SM degrees in the department are given as a passageway toward the doctoral degree, but some, like the master of science in transportation (MST, now fully administered within the department), results in many students taking jobs in industry and government.

The PhD degree remains the ultimate research degree and is critical to our mission to educate intellectual leaders for academia and national research laboratories. We have many areas of specialization.

Faculty Notes

Professor Cynthia Barnhart received the 2003 Franz Edelman Award for achievement in operations research and the management sciences (2nd prize). She also received the Institute of Operations Research and the Management Sciences (INFORMS) First Prize Award for best paper in transportation science and logistics, “Composite Variable Formulations for Express Shipment Service Network Design.”

Professor Rafael Bras received the 2003 Hispanic Engineer National Achievement Award, and he was elected a corresponding member of the Mexican National Academy of Engineering. He was the Lorenz lecturer at the fall 2003 American Geophysical Union meeting held in San Francisco.

Professor Penny Chisholm was the focus of an article in the December 2003 issue of *Scientific American* entitled "The Cells That Rule the Seas." The article centers around Professor Chisholm's discovery of *Prochlorococcus* in 1988 and her subsequent research with these tiny species of phytoplankton.

Professor Herbert Einstein was appointed to the National Research Council/Transportation Research Board Project Panel on "Assessing and Improving Rail and Highway Tunnel Operational and Structural Security and Safety."

Professor Richard Larson was awarded the Harold Larnder Prize from the Canadian Operational Research Society for an individual who has achieved international distinction in operational research. He is president-elect of INFORMS.

The Engineering Systems Division Technology and Policy Program Faculty Appreciation Award went to Professor David Marks.

Professor Joseph Sussman received the Council of University Transportation Center Award for distinguished contribution to university transportation research and education. The award honors an individual who has a long history of significant and outstanding contribution to university education and research.

Student Notes

Civil and Environmental Engineering students were honored this past year with awards, fellowships, and recognition at the local, regional, national, and international levels. Following are some of the highlights of these accomplishments.

Chi Epsilon, the national civil engineering fraternity, welcomed its new inductees in April. The new members from CEE were Steven Alpert '05, Ayse Ercumen '04, Katherine Lin '05, Thomas Kilpatrick '05, and Michael Young '05.

Frederic Chagnon (G), Aaron Chow (G), Daniel Collins (G), Jean Fitzpatrick (G), Anke Hildebrandt (G), and Joon Sik Yoon (G) were awarded membership to the Martin Society of Fellows for Sustainability. Ramahi Sarma-Rupavtarm (G) was awarded the Senturia Fellowship for Interdisciplinary Studies.

Richard Camilli '03 (PhD) received the 2003 New England Division of the Society of Naval Architects and Marine Engineers Best Graduate Student Paper Award for his work with Kemonaut, an underwater vehicle designed as a platform for the NEREUS mass spectrometer.

Brittany Coulbert (G) an MEng student in one of the water and sanitation in developing countries projects (Peru) was a leading member of the four-person team “Test Water Cheap” that won first prize in this year's IDEAS competition. The prize was for a simple laboratory analytical filtration unit used for membrane filtration testing of coliform and other bacteria that costs \$15 instead of \$1,000.

Tarek Nabil Dajani '04 (MEng) was one of the winners of the Staples Radio Frequency Identification Tags Competition.

Arthur Fitzmaurice '02 received the Buddy Messing Award for the most outstanding undergraduate brother of Zeta Beta Tau Fraternity for 2003.

Forest Flager '03 (MEng) received the 2003 American Institute of Steel Construction/Structural Steel Fabricators of New England Fellowship.

Thomas Kilpatrick '05 was one of the four MIT student athletes named to the Academic All American teams by the College Sports Information Directors of America. A football player, he was MIT's only First Team selection.

Katherine Lin '05 was awarded the Barry M. Goldwater Scholarship.

Hai Ning '04 (PhD) won the best paper in the teaching and learning session at the International Conference on Education and Information Systems: Technologies and Applications (EISTA03). The title is “On-line Peer Review in Teaching Design-oriented Courses.”

Tomer Toledo '03 (PhD) received two awards for his doctoral thesis work. INFORMS gave him an honorable mention in the 2003 Transportation Science and Logistics Dissertation Prize Competition, and he received another honorable mention in the 2002 Eric Pas Dissertation Competition in Travel Behavior Research, awarded by the International Association for Travel Behavior Research.

Departmental Awards

The Department of Civil and Environmental Engineering held its annual Awards Dinner on May 21, 2004. Many students, faculty, and staff were honored for their achievements and accomplishments over this past academic year.

The Maseeh Excellence in Teaching Award was presented to Professor Heidi M. Nepf.

The Maseeh Annual Award for excellence as a teaching assistant went to graduate student Jedidiah Northridge '04. He was the head teaching assistant for Course 1.00/1.000 Introduction to Computers and Engineering Problem Solving in fall 2003.

The 2004 Tucker-Voss Award went to Juan Marchini-Blanco '04, a graduate student in construction management. Jedidiah H. Horne '04 won the Leo ('24) and Mary Grossman Award in recognition of high scholastic standing and a strong interest in transportation.

Ayşe Ercumen '04 won the Richard Lee Russel Award for an outstanding undergraduate in CEE who plans to continue with graduate study.

The student outreach coordinator for the American Society of Civil Engineers presented an award to Brittany Montgomery '06 for her efforts with the CEE Students' Association.

The following staff received Special Service Awards conferred in recognition of outstanding service to the department in AY2004: Dr. John Germaine, principal research associate; Dr. George Kocur, senior lecturer; Stephen Rudolph, designer/CAD operator; and Cynthia Stewart, academic programs administrator.

Patrick Jaillet

Department Head

Edmund K. Turner Professor of Civil and Environmental Engineering

More information about the Department of Civil and Environmental Engineering can be found on the web at <http://web.mit.edu/civenov/>.