Left, from top: Electrical engineers such as Associate Professor Valencia Joyner Koomson and graduate student Chenguang Xi design low-power hardware components for smart lighting systems to create truly high-speed optical wireless systems.

Chemical engineers and computer scientists collaborate to develop computational tools to better understand metabolic systems ranging from a single pathway to a whole cell.

In Dan Hannon’s Human Factors and Applied Cognitive Engineering laboratory, students research the human element of design, including team performance during software simulations.

Computer science undergraduates like Connor Gramazio work with computational biologists to develop algorithms that can predict the structure and function of proteins, which are folded in complicated highly asymmetrical 3D shapes.

On the Cover: Associate Professor Sameer Sonkusale’s Nanolab research group creates flexible electronics and metamaterials with applications in sensing, imaging, computing, communications, medical diagnostics, and instrumentation.
Dear friends of the School of Engineering:

The past year was an outstanding one for Tufts University School of Engineering (SOE). It was another record year for admissions, with significant increases in both undergraduate and graduate applications. The undergraduate class of 2016, with women making up well over one-third of the student body, is the most selective in the school’s history. Now in its third year, our Bridge to Engineering Success at Tufts (BEST) program for incoming underrepresented and first-generation undergraduate engineering students continues to thrive. Through the commitment of a generous alumnus, this program will be fully funded for the next five years.

It was also an active year for the development of new curricula. We launched three cross-disciplinary educational programs: an undergraduate minor in music engineering, and, at the graduate level, a joint doctorate in computer science and cognitive science and a Ph.D. program in water diplomacy, sponsored through a National Science Foundation IGERT award. In addition, we secured new external fellowship support for our graduate students and programs, including a new IGERT award for a doctoral program in soft material robotics, in conjunction with the Department of Biology at the School of Arts and Sciences. Through an SOE graduate’s philanthropic support of the dean’s discretionary fund, we had the seed funding necessary to initiate a suite of new engineering elective courses for our first-year students, to be piloted in 2012–13 in support of our vision for project-based learning and leadership development.

Our faculty also had a stellar year, securing many research grants and honors. Of special note is a prestigious Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring and the naming of four of our faculty members to the status of fellow in their professional societies. This coming academic year, subject to provost and trustee approval, we will name the school’s first holders of the John R. Beaver Professorship in Mechanical Engineering and the McDonnell Family Professorship in Engineering Education, bringing our total of current and pledged endowed professorships in the school to eight.

The SOE continues to enjoy significant growth and momentum in research productivity, with fiscal year 2012 research expenditures exceeding $16 million. These expenditures were associated with a 7 percent increase in indirect cost recovery and a continued increase in the number of active grants.
In addition, for an impressive fourth consecutive year, the SOE leads all Tufts schools in technology transfer activity, accounting for more than half of all Tufts intellectual property disclosures. Examples of interdisciplinary research and innovation abound; of particular note was the awarding of the first Stephen and Geraldine Ricci Interdisciplinary Prize and the hosting of our second Wittich Family Energy Sustainability Research Symposium. We further expanded research capabilities in our strategic areas with the successful completion and opening of two new collaborative research environments—the Interdisciplinary Laboratory for Computation at 196 Boston Avenue and the Environmental Sustainability Laboratory in Anderson Hall.

Details of these and other highlights are featured in the pages that follow. These achievements are made possible with the generous support of our alumni, parents, friends, and corporate and foundation partners.

Sincerely,

Linda M. Abriola
Dean of Engineering
Faculty Achievements

President Obama named Karen Panetta, professor in the Department of Electrical and Computer Engineering (ECE), a recipient of the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring (see page 4). This award recognizes the crucial role that mentoring plays in the academic and personal development of students studying science and engineering. Panetta, along with Arts and Sciences colleague physics professor Peggy Cebe, was among nine individuals from across the country cited for their work in teaching and guiding students of all ages in the STEM—science, technology, engineering and mathematics—disciplines. Tufts was the only institution to have more than one faculty member so honored.

Four of our faculty members attained fellowship status in their respective professional societies. Associate Dean and Professor Eric Miller (ECE) was named an Institute of Electrical and Electronics Engineers (IEEE) Fellow for his research in inverse problems and physics-based signal and image processing (see page 5). Miller’s work has applications to breast cancer research, surveillance, and environmental remediation. Professor Diane Souvaine of the Department of Computer Science (CS) was named a fellow of the Association for Computing Machinery for her contributions to computational geometry and for service on behalf of the computing community. Fiorenzo Omenetto, professor in the Department of Biomedical Engineering (BME), was named a fellow of the Optical Society of America for contributions in ultrafast nonlinear optics and photonic crystal fibers and for pioneering the development of silk optical applications and silk-based photonic structures and devices. Michael Zimmerman, professor of the practice in the

Continued on page 6
In December 2011, President Obama recognized two Tufts professors for their efforts in mentoring science and engineering students. Professor Karen Panetta (ECE), along with Peggy Cebe, professor of physics at the School of Arts and Sciences, received the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. Cebe and Panetta were among nine individuals and eight organizations cited for their work in teaching and guiding students of all ages in the STEM—science, technology, engineering, and mathematics—disciplines, particularly students from groups that are traditionally underrepresented in those fields. For her part, Panetta was honored for promoting interest in engineering among women and underrepresented minorities. She founded the highly successful Nerd Girls program, which furthers students’ research skills through real-world interdisciplinary team projects while countering stereotypes of women engineers and scientists. Nerd Girls projects have included building a solar race car, developing alternative energy solutions to power an 18th-century lighthouse off the coast of Rockport, Mass., and devising a system to enable people with physical disabilities to interact more effectively with the assistance of “helper monkeys” trained to aid them with their daily tasks. Ninety-eight percent of Nerd Girls graduates pursue a graduate degree within three years of receiving their undergraduate degree in engineering. “It’s great that it’s been recognized that Nerd Girls has been successful at changing the way our nation views women and engineering and science,” says Panetta. “Now they understand that smart girls can do it all.”


Credit: Official White House Photo by Pete Souza
Hidden Hazards

Eric Miller, a professor of electrical and computer engineering at the School of Engineering, uses imaging science to zero in on hidden scourges like underground pollutants and cancerous tumors. Miller’s specialty is a field called image processing—the art of taking raw data from a sensor and working backwards, mathematically, to turn it into a detailed picture. He’s done research to improve medical imaging devices, creating software that can highlight cancerous tumors in breast tissue, for example. He’s worked with the federal Department of Homeland Security on systems that can automatically find “objects of interest” (read: explosives) in airport baggage. But the work Miller is most excited about is also his most challenging—creating images of chemical spills that have leached deep into the ground, using only the little bit of evidence that’s available. The resulting images—with much more detail than previously possible—could give cleanup crews the ability to target specific areas of a contaminated site making cleanup cheaper, more efficient, and more effective. Miller’s work complements the extensive research carried out in the Integrated Multiphase Environmental Systems Laboratory under the direction of C. Andrew Ramsburg, an associate professor in civil and environmental engineering. Ramsburg, along with collaborators including Dean Linda M. Abriola and others in the school’s new NSF-funded Environmental Sustainability Lab, are looking at new ways to address soil and water contamination found at more than 250,000 locations around the United States. These sites—former industrial sites, landfills, and military installations—have dangerous levels of chemical pollutants in the soil, according to the U.S. Environmental Protection Agency. Helping to bring Miller’s image processing methods to use in the field, colleague Kurt Pennell, chair of the Department of Civil and Environmental Engineering, says, “There are real-world sites that could really benefit from this method.”
Department of Mechanical Engineering (ME), was named a fellow of the American Society of Mechanical Engineers (ASME) for his leadership in the research and development of plastic product engineering.

The year also marked the awarding of tenure and promotion to three assistant professors: **Sam Guyer** (CS), **C. Andrew Ramsburg** in the Department of Civil and Environmental Engineering (CEE), and **Hyunmin Yi** in the Department of Chemical and Biological Engineering (ChBE). In addition, Professor **Elena Naumova** (CEE) was granted tenure, completing her transition from Tufts University School of Medicine to the SOE (see page 7), and **Roni Khardon** was promoted to professor of computer science.

Many of our professors also received teaching and advising awards from Tufts. Assistant Professor **Ben Hescott** (CS) continued to add to his collection of teaching honors with his receipt of two awards: the Henry and Madeline Fischer Award, awarded annually to a faculty member judged by seniors of the School of Engineering to be “Engineering’s Teacher of the Year,” and the AS&E Lillian and Joseph Leibner Award for Excellence in Teaching and Advising of Students. Associate Professor **Laurie Baise** (CEE) received an AS&E Graduate Studies Office Faculty Teaching and Mentoring Award and Assistant Professor **Lauren Black III** (BME) received an award for Outstanding Faculty Contribution to Graduate Studies.

The year also marked the retirement of Professor **Joseph Noonan** (ECE), who was honored with the Seymour Simches Award for Distinguished Teaching and Advising. This award recognizes Professor Noonan’s three decades of service to the university. Although Professor Noonan was named ECE Professor Emeritus, we are delighted that he continues to be engaged in the SOE as a research faculty member.
Monitoring weather factors like temperature, rain, and snowfall is one way to predict the timing and intensity of rotavirus, a disease that causes extreme diarrhea, dehydration, and thousands of deaths annually, particularly among children. In a paper published in the journal *PLoS One*, a research team led by civil and environmental engineering Professor Elena Naumova correlated temperature and precipitation with rotavirus outbreaks in one of the hardest-hit regions of the world, South Asia.

In 2004, rotavirus resulted in 527,000 deaths worldwide in children younger than five years, the study noted. The majority of deaths are clustered in poor areas of developing countries in Africa and Asia. Being able to predict infection increases opportunities for health professionals to take effective preventive measures such as vaccination that could substantially reduce deaths.

Naumova’s research focuses on developing methodology for analysis of large databases to enhance disease surveillance. In this study the team examined seasonal differences in the environment by creating mathematical models based on factors such as temperature, humidity, and precipitation in the region over 22 years.

“We found that rotavirus is sensitive to seasonal patterns that are defined as a combined effect of temperature and precipitation,” said Naumova, senior author of the study. This work builds on her previous research developing mathematical models to predict the timing, severity, and impact of diseases. “Our goal is to develop an integrated model which will allow monitoring the virus and also forecasting outbreaks.”
STUDENT ACHIEVEMENTS

This year, an astonishing number (13) of current SOE students and recent graduates received awards from the National Science Foundation’s Graduate Research Fellowship Program (GRFP). Award winners from the class of 2012 included Lisa Pinals (ECE), who will pursue her doctorate in electrical engineering at Columbia University; master’s recipient Ingrid Guha (ME), who will pursue her doctoral studies at MIT; and Victor Minden (ECE), who chose to accept a prestigious Department of Energy Computational Science Graduate Fellowship to pursue his doctorate in computational and mathematical engineering at Stanford University. Three of our current graduate students will use their GRFPs to continue their studies here at Tufts: Gregory Ely, EG14 (EE), Abigail Licht, EG15 (EE), and Pami Anderson, EG16 (BME). Also included in the GRFP awardees list are four Arts and Sciences CS graduates and three SOE alumni from the classes of 2010 and 2011.

Other recipients of notable fellowships include: Matthew Becker, EG12, a current doctoral candidate in environmental and water resources engineering, who was awarded an Environmental Protection Agency STAR Fellowship to model the potential environmental and public health impacts of nanoparticles on groundwater resources; ME master’s recipient Ben Partlow, EG13, who was awarded a National Defense Science and Engineering Graduate Fellowship from the Department of Defense to continue his studies in the BME department; and doctoral recipient Erin Solovey, EG07, EG13, who received a Computing Innovation Fellowship to support her postdoctoral studies in the Humans and Automation Lab at MIT.

A number of our graduate students have garnered prestigious research awards: chemical engineering doctoral recipient Nan Yi, EG12, won the Silver Award from the Materials Research Society, and Branko Zugic, EG11, (ChBE) was selected by the International Precious Metals Institute to receive the inaugural Materion Graduate Student Award for his work on platinum-based catalysts for energy applications. This year, engineering claimed the top prize in the Dow Sustainability Innovation Student Challenge. ECE doctoral students Dante DeMero, E08, EG11, and Corey Shemelya, EG10, won the award for their thermophotovoltaics research. As part of our preferred partner status with Charles Stark Draper Laboratories, three outstanding students were also named Draper Lab Fellows: Kevin Yu, EG13, working with Assistant Professor Qioabing Xu (BME); Elizabeth Alexander, EG14, mentored by Assistant Professor Jason Rife (ME); and Wes Uy, EG14, working with Associate Professor Sameer Sonkusale (ECE).
Our students distinguish themselves as outstanding innovators. Seven teams from the Tufts Gordon Institute (TGI) business plan competition were finalists in this past year’s MassChallenge $1 million Start-Up Competition: 1Minute40Seconds, Educate Lanka, Jump off Campus, Pintley, Roof For Two, Sanergy, and Swellr. In addition, current TGI student Dino Sijamic, E07, was featured in the Boston Globe for developing The Black List, one of the movie industry’s most influential websites. CS department seniors Sean (Wenshiang) Chung, Greg Wong, Jason (Yannru) Cheng, and junior Xihan Zhang earned a spot in the top 10 finalists of the Microsoft U.S. Imagine Cup competition. Their team developed a system called “Medivise”—a cloud and mobile-based service that automates the process of monitoring patients undergoing tuberculosis treatment. CEE senior Maia Majumder led her team, Village Zero Project, to the finals in the Clinton Global Initiative University Commitment Challenge. The Village Zero Project tracks the spread of cholera in Bangladesh using cell phones with real-time data collection software. Majumder’s cholera research was also recognized by the American Geophysical Union with an outstanding student paper award.

Seniors Yorman Garcia (ECE) and Kelvin Manuel Perez Macario (CEE) and sophomores Leticia Lopez-Benitez (CEE) and Leiny Garcia (ECE) were honored at the 2012 Latino Science and Engineering Awards Celebration for their leadership in developing the Tufts chapter of the Society of Mexican American Engineers and Scientists.
**ALUMNI RECOGNITION**

University of Cincinnati Professor Dionysios D. Dionysiou, EG95, was the recipient of the 2012 School of Engineering Outstanding Career Achievement Award. Our own Associate Dean Kim Knox, EG80, received the SOE Graduate Alumni Outstanding Service Award. Two alumnae were named 2011 Women to Watch by Mass High Tech: Melissa Pickering, E05, as the co-founder of iCreate to Educate LLC, a startup that uses stop-action animation to teach STEM topics, and Sharon Donald, EG90, as Draper Laboratory’s Division Leader in Embedded Navigation & Sensor Systems. In Hughes After Howard, an exhaustively researched new book, Kenneth Richardson, E52, past president of Hughes Aircraft Company, recounted the accomplishments of the world’s premier military electronics business, which innovated in areas as diverse as lasers, geosynchronous satellites, and signal processors. Emma Cardini, E01, EG09, was among the engineers who inspected the Washington Monument to check for damage after the August 23, 2011, earthquake (see below for more). Ioannis Miaoulis, E83, AG86, EG87, E12P, E15P, president of Boston’s Museum of Science and former dean of the School of Engineering, was awarded the Ralph Coats Roe Medal from the American Society of Mechanical Engineers for his work in elevating the role of engineers in contemporary society. Ellen Kullman, E78, A12P, chair of the board and chief executive officer of the DuPont Company, was appointed to the President’s Council on Jobs and Competitiveness. And the following alumni were named to the school’s board of advisors: Michael Loulakis, E76, E07P; Stacey Coleman Morse, E77; and Robert Stricker, E69.

**SOE Alumna Scales New Heights**

In addition to being part of the four-person “difficult access team” that evaluated damage to the Washington Monument from the 5.8-magnitude earthquake that rattled the East Coast last August, SOE alumna Emma Cardini has also rappelled down columns on Panama’s Bridge of the Americas, dangled from rope inside the Old South Church in Boston, and inspected the Gothic spires at the top of Chicago’s Tribune Tower. Watch a video of Cardini’s workday vantage points at tuftsalumni.org/scaling-new-heights.
ACADEMIC AND ADMISSIONS HIGHLIGHTS

During the year, we welcomed John Barker to the Tufts community. Dr. Barker (Ph.D., University of Rochester) was named to the new joint AS&E position of Dean of Undergraduate and Graduate Students and serves as a member of the SOE Dean’s Leadership Team; he came to Tufts from his position as assistant provost for undergraduate education at the University of Miami. Previously, Barker was an academic coordinator for the McNair Program, a federal initiative to encourage underrepresented students to pursue doctorates and consider a research career.

Associate Dean and Professor Lewis Edgers (CEE) stepped down from his administrative roles. Dean Edgers has served the SOE with great distinction over the past eight years, presiding over major curricular changes and initiatives, engineering leadership planning activities, a tremendous growth in graduate student enrollments, and two ABET reaccreditation visits. We are tremendously grateful for his leadership. Associate Professor Chris Swan (CEE) assumes Edgers’s responsibilities for undergraduate curricula as the new associate dean for undergraduate curriculum development, and Associate Professor Sameer Sonkusale (ECE) takes on the role of associate dean for graduate education.

It was another outstanding year for SOE undergraduate admissions, with freshman applications up by 4 percent. This represents the school’s sixth consecutive record-breaking applicant pool, with a total increase in applications of nearly 42 percent in the last five years. With an acceptance rate of 21.4 percent, the Class of 2016 is the most selective in the school’s history. Engineering is also improving its recruitment and enrollment of underrepresented students. Most noteworthy, more than one-third of the incoming students are women (37 percent). This represents a jump of nearly 10 percentage points over last year’s enrollment and is more than twice the national average. Similar to last year, Americans of color make up 26 percent of the enrolled students. Our students’ academic qualifications continue to meet our high expectations, with 93 percent in the top 10 percent of their class, a mean class high school rank of 4 percent, SAT-Math scores of 759 (up 18 points from 2008), and SAT-Critical Reasoning and Writing scores of 697 and 701, respectively. The middle 50 percent of incoming engineers continue to score between 720 and 790 on the SAT-M. The Class of 2016 includes students from
31 states, 9 percent are foreign citizens, and more than 60 percent are from public high schools. Need-based scholarships continue to play a major role in student recruitment, with 46 percent of the admitted class receiving financial aid grants from Tufts.

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<th>BS²</th>
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<th>PhD</th>
<th>BS⁴</th>
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*Engineering degree programs accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).
**Includes Civil Engineering degrees in Architectural Studies and Environmental Health

Over the past few years, initiated with funding from Trustee Emeritus Bernard Gordon and under the auspices of its Curriculum Task Force, the SOE has been undertaking a staged review of the first-year experience, specifically with regard to the first-year curriculum. This spring, through the generous support of Tufts alumnus Jordan Birger, E43, several professors were awarded seed grants to create new first-year courses to be piloted in fall 2012. Each new course will focus on a different cross-cutting field and will include a problem-solving component, apply a state-of-the-art design or computational tool, and address the professional/ethical/social context of the application area. A first-year experience faculty seminar will offer

*August 2011 to May 2012
* Enrollment of first majors as of 3/6/12
* Computer Engineering degrees under Electrical Engineering
* In May 2012 (7) students completed their five-year BS/MS degrees

Continued on page 14
How to Think Like an Engineer

What does it take to be an engineer? More than can be read in a book. It takes a visceral understanding of the principles at work.

“When artists create or musicians perform, they draw on their inner selves as much as, if not more than, their brains,” says Eric Hines, professor of the practice in civil and environmental engineering and a past winner of the Henry and Madeline Fischer Award as Teacher of the Year in engineering at Tufts. “To be a virtuoso only in your mind is a very difficult proposition.”

The same goes for engineers. “Students tell me, we just need to get our hands on the stuff to get an idea,” Hines says. “I want to give them the opportunity to delight in making something out of nothing, to create something that’s more than the sum of its parts—to make magic.” That’s what Hines does in the First Year Experience course he teaches for new engineering students. Those in his Structural Art course this fall will build a 30-foot bridge span out of wood and test its strength and durability at the Wind Technology Testing Center in Charlestown (a building Hines himself helped design). The teaching assistants are SOE seniors who share their own practical experience while serving as “mentors at eye level.”

The message to these students: Welcome to engineering school.

This philosophy inspires the First Year Experience program. One-credit courses offered in each of the six engineering departments (biomedical; chemical and biological; civil and environmental; computer science; electrical and computer; mechanical) expose new students to engineering practice across all disciplines. Entering students are required to take two courses in separate disciplines over their first year. The aim is to engage these new students creatively while motivating and challenging their understanding of fundamental principles of engineering. In addition, the opportunity for seniors to help teach the course makes leadership and responsibility a seamless part of the curriculum.

As part of this pilot initiative, a significant cross section of faculty members in the school are bringing their disciplinary perspectives to bear in the development of the following expanded introductory courses:

- Bridge Engineering (Brenner, CEE)
- Global Product Development (James, ME)
- Innovation and Innovators in ChBE (Georgakis, Lee, Panzer, Matson)
- Intro to Computational Design (Hassoun, CS)
- Music and the Art of Engineering (Hopwood, ECE)
- Simple Robotics (Danahy, CS)
- Structural Art (Hines, CEE)
participating faculty the opportunity for ongoing exchange of ideas and best practices. Courses will be evaluated and refined through a rigorous assessment process, eventually replacing our current half-credit introductory engineering courses.

A new music engineering minor, launched in spring 2011, allows students to explore the intersection of music and technology, from creating instruments and performance systems to distribution of music through physical and virtual media. Since its inception, five students have graduated with the minor, and 17 others are currently enrolled in the program.

Interest in our Entrepreneurial Leadership Program (ELP) remains strong, with more than 470 undergraduates participating in its classes, and 70 students completing the minor—a 64 percent increase from last academic year. Professor of the Practice John Hodgman served as interim ELP director and along with other Tufts faculty, administrators, advisors, and alumni, served on the search committee for a new director. This committee was ably chaired by ELP Advisory Board member Mark Lieberman, E81, and we are grateful for the continued support of the advisory board under Chuck Auster, A73, and the entire entrepreneurship community during this transition. In the upcoming academic year, we are delighted to welcome James Barlow as the new director of the Entrepreneurial Leadership Program and senior lecturer at TGI. Barlow arrives at Tufts with extensive experience and a strong reputation in the entrepreneurship education community. Most recently, he served as head of outreach for the National Collegiate Inventors and Innovators Alliance (NCIIA), which includes more than 200 college and university members and engages more than 5,000 student and faculty entrepreneurs annually. Previously, Barlow was the chief executive of the Scottish Institute for Enterprise, the national organization for supporting entrepreneurship in Scotland’s universities. He has more than a decade of experience teaching internationally at various universities, including Memorial University of Newfoundland in Canada, Thammasat University in Thailand, and Stockholm School of Entrepreneurship in Sweden.

After its deliberate expansion (a doubling) over the previous two years, enrollment in TGI’s M.S. in Engineering Management (MSEM) program was level, with 120 students from 80 different companies, including Akamai Technologies, AstraZeneca, Boston Scientific, Draper Labs, Genzyme, iRobot, Millipore Corporation, MITRE, Pfizer, Raytheon, Samsung Electronics, and Thermo Fisher Scientific. This year, TGI formed an Industrial Advisory
Committee [IAC] to serve as a forum for communication between the TGI and its industry partners. Composed of senior leaders from a variety of companies and organizations—including Cambridge Consultants, Draper, GT Advanced Technologies, MITRE, Pfizer, and Raytheon—the IAC is intended to serve as an opportunity for members to provide guidance on the continued evolution of the MSEM program.

The number of SOE graduate applications continues to grow, increasing nearly 25 percent over last year (from 892 in fall 2010 to 1,110 in fall 2011), with more applicants in both master’s and doctoral programs. The quality of our fellowship applicant pool also continues to increase, with yields on fellowship offers remaining at about 33 percent. In the fall, we will welcome our second scholar from the National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM) and seven new Provost and Dean’s Fellows, as well as the SOE’s first Stern Fellow in BME. This prestigious fellowship, in particular, is made possible through the generosity of James Stern, E72, chair of Tufts’ Board of Trustees. Our entering Ph.D. cohort in 2011 was 51, up from 40 in fall 2010. Consistent with these growing Ph.D. enrollments, we continue to see a sharp upward trend in the number of doctoral degrees granted, with 31 doctoral degrees awarded in 2012—an increase of approximately 50 percent over the previous year.

This academic year, the school completed its accreditation process for eight engineering degree programs. The following degree programs are accredited by the Engineering Accreditation Commission (EAC) and the Computing Accreditation Commission (CAC) of ABET Inc. (www.abet.org): biomedical engineering, chemical engineering, civil engineering, computer engineering, computer science, electrical engineering, environmental engineering, and mechanical engineering.
INTERDISCIPLINARY RESEARCH AND EDUCATION

The school continues to enjoy significant growth and momentum in research productivity. Total annual research expenditures in FY12 were at record highs, exceeding $14 million, with a 7 percent growth in indirect cost recovery over FY11. An additional $2 million in grants was dedicated to new construction. Faculty submitted approximately 300 proposals and had more than 200 active grants, with more than 100 new and supplemental awards. These encouraging research trends reflect active involvement of an increasing number of engineering faculty members in research (75 percent of faculty are now funded, compared to 46 percent in FY03) and demonstrate the caliber of our faculty members and the success of our strategically focused interdisciplinary research model.

Professor Eric Miller (ECE) stepped down from his position as associate dean for research to assume the position of chair of the ECE department, succeeding Professor Jeff Hopwood, who has completed a remarkable five-year term as chair. The SOE is grateful for Miller’s strong contributions.
to advancing the research activities in the school. In particular, Dean Miller was responsible for developing and implementing a new pre-award research database and proposal submission system for the SOE, creating research workshops for our junior faculty, and helping to foster a number of fruitful interdisciplinary partnerships across the university and with industrial collaborators. Professor Elena Naumova (CEE) will take on the role of associate dean for research in the coming academic year.

In the second-round solicitation of provost-funded collaborative teaching and research grants, SOE faculty members led or took part in an impressive number of successful proposals, garnering two Tufts Innovates and seven Tufts Collaborates Awards. The sections following highlight other significant achievements in interdisciplinary research and education, organized by strategic area.
Clubfoot, one of the most common orthopedic birth defects in the United States, affects more than 4,000 newborns each year. Without braces or multiple corrective surgeries, a child will never walk without a pronounced limp.

Exactly what goes wrong in these tendons is unclear, but Catherine K. Kuo is examining the problem by studying how they form in a developing embryo. "If we engineer embryonic-like tendons we can actually study them [in the lab]" versus the womb, says Kuo, an assistant professor of biomedical engineering at the School of Engineering.

Welcome to developmental biology as seen through the lens of an engineer.

Tendons and ligaments carry the brunt of the body’s physical load, transferring forces from muscles to bone and stabilizing joints. To build them, Kuo gathers tendon cells from chicken and mouse embryos and then seeds them into a scaffold that acts as a cradle for the developing cells, giving them a structure in which to grow and mature.

Once the cells start to develop, Kuo puts the cell-seeded scaffolds into a custom-made enclosure that can simulate conditions inside the womb, called a bioreactor. Using computer controls, she’ll regularly flex and bend the lab-grown ligaments and tendons, increase or decrease pressure on them, and mimic muscle movement inside a developing fetus to see how her engineered tissues react.

It’s too early to tell just how these physical effects come into play, but if Kuo’s research can eventually show how tendon development goes awry, it may help other scientists counteract the process.

“I’m a card-carrying engineer who asks biological questions and knows enough about biology to do some,” says Catherine Kuo. “The inclination in a lot of my research is to look at the engineering aspect first.”

Photo: Kelvin Ma
Engineering for Human Health

Professor **Sergio Fantini** (BME) received a grant from the National Cancer Institute of the National Institutes of Health (NIH) for the development of a noninvasive diagnostic tool for detecting breast cancer and monitoring the effectiveness of cancer treatments. This noninvasive technology, optical mammography, can be used repeatedly without risking harm to patients. Fantini has begun clinical trials in collaboration with Tufts University School of Medicine. Professor Fantini also received additional NIH funding for his continued noninvasive studies of the brain using near-infrared spectroscopy.

Other noninvasive diagnostic research conducted by Associate Professor **Irene Georgakoudi** (BME) was supported through a fellowship from NIH’s National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) for postdoctoral associate Kyle Quinn to study optical biomarkers to quantify engineered bone tissue development.

The NAIMS also awarded Stern Family Professor and Chair **David Kaplan** (BME) a $3.3 million grant to explore the effects and mechanisms of electrical cellular control on connective tissue healing and regeneration. The goal of this work is to develop novel electrotherapeutic devices for potential regenerative medicine applications. Kaplan’s postdoctoral associate **Kelly Burke** was awarded a fellowship from the National Institute of Diabetes and Digestive and Kidney Diseases to investigate insulin resistance in a Type 2 diabetes tissue model. Assistant Professor **Lauren Black**’s tissue model research on the mechanical environment of heart cells was supported through a fellowship for student **Raymond Wang**, E13, from the American Heart Association.

Professors Kaplan and **Fiorenzo Omenetto** (BME) have continued to receive federal government funding for their work in novel silk-based platforms, including “resorbable radios,” which are transient electronic devices that once implanted in the body or used as environmental sensors can be designed to completely disappear through reabsorption or...
dissolution. These devices, powered by scavenging radio frequencies, have potential applications that are unachievable with conventional electronics, such as active implants that exist for medically useful timeframes. Professor Kaplan has also expanded his investigation of silk-based wound-healing technologies with funding from corporate and government sponsors.

Esha John, E12, Brian Rohr, E13, and James Sims, E14, were named the first recipients of the Stephen and Geraldine Ricci Interdisciplinary Prize for their project **Automated Adipocyte Analysis**: Quantification of Adipocyte Size, Lipid Droplet Distribution and Total Lipid Content for Evaluating Potential Anti-Obesity Therapeutics. This team of electrical and chemical engineers, advised by Professors Eric Miller (ECE) and Kyongbum Lee (ChBE), developed a program that analyzes images of fat cells, or adipocytes, to identify new therapeutic targets to treat obesity.

**Engineering for Sustainability**

In fall 2011, Tufts launched a new interdisciplinary doctoral program in water diplomacy, with support from a $4.2 million NSF Integrative Graduate Education and Research Traineeship (IGERT) grant awarded to Professor Shafiqul Islam (CEE) and his colleagues. This program leverages SOE’s strength in sustainable water research and capitalizes on faculty expertise in the Fletcher School and the School of Arts and Sciences. Building on the new interdisciplinary doctoral program, Islam also received an NSF Research Coordination Network grant to create a network of professionals who can share research and field-based experience as part of an effort to promote a greater understanding of the dynamics of diplomatic negotiations around complex water resource issues.

We hosted our second Energy Sustainability Research Symposium sponsored by the Wittich Family Fund for Alternative Energy Research. The symposium highlighted the findings from the laboratories of Professors Marc Hodes, Jeff Hopwood, Kyongbum Lee, Matthew Panzer, Sameer Sonkusale, and Thomas Vandervelde. Associate Professor Marc Hodes (ME) received funding from the armed

*Continued on page 22*
Bioengineers at the School of Engineering have developed a new silk-based microneedle system able to deliver precise amounts of drugs over time and without need for refrigeration. The tiny needles can be fabricated under normal temperature and pressure and from water, so they can be loaded with sensitive biochemical compounds and maintain their activity prior to use. They are also biodegradable and biocompatible. The research paper “Fabrication of Silk Microneedles for Controlled-Release Drug Delivery” appeared in Advanced Functional Materials. While some drugs can be swallowed, others can’t survive the gastrointestinal tract. Hypodermic injections can be painful and don’t allow a slow release of medication. Only a limited number of small-molecule drugs can be transmitted through transdermal patches. Microneedles—no more than a micron in size and able to penetrate the upper layer of the skin without reaching nerves—are emerging as a painless new drug delivery mechanism. But their development has been limited by constraints, including harsh manufacturing requirements that destroy sensitive biochemicals, the inability to precisely control drug release or deliver sufficient drug volume, and problems with infections due to the small skin punctures. The process developed by the Tufts bioengineers addresses all of these limitations. Professor Fiorenzo Omenetto, senior author on the paper, said: “The new system addresses longstanding drug delivery challenges, and we believe that the technology could also be applied to other biological storage applications.”
forces to investigate the properties of Galinstan, a low-melting point alloy for cooling microelectronics. With its higher thermal conductivity, Galinstan may offer a new alternative to other cooling liquids. Assistant Professor Matthew Panzer (ChBE) was named one of three recipients of a grant from the Massachusetts Clean Energy Center’s Catalyst Program, which supports the commercialization of game-changing clean energy. Panzer will use the funding to build an ionogel-based supercapacitor device prototype and to assess its energy storage and delivery capabilities.

**Engineering the Human-Technology Interface**

In fall 2011, in collaboration with Arts and Sciences and under the leadership of Associate Professor Matthias Scheutz (CS), the SOE launched a joint interdisciplinary doctoral program in computer science and cognitive science that focuses on language and helps strengthen Tufts’ leadership position in the science of the mind. This new joint Ph.D. program complements and strengthens the recently implemented cross-school undergraduate program in cognitive and brain science. In his own research, Scheutz is designing fully autonomous robots that are able to understand commands, ask questions to clarify instructions, and learn to recognize objects they have never seen before. With collaborators from the University of Michigan and UMass-Lowell, Scheutz’s team received a $385,000 grant from the National Science Foundation to design navigational robots that can build an increasingly sophisticated cognitive map as they travel.

Assistant Professor Jason Rife (ME) has received an NSF small business innovation research (SBIR) grant to develop a new sensing technology to enable enhanced control of the relative positions for a group of transport aircraft flying in formation, an activity referred to as “station keeping.” The proposed terahertz system will use a laser to transmit a navigation signal with higher accuracy than existing station-keeping equipment and produce a signal that is more difficult for remote sensors to detect.

A $2.3 million NSF grant was awarded to Research Assistant Professor Ethan Danahy (CS), director of engineering research at the Center for Engineering Education and Outreach (CEEO), to create a collaborative, web-based learning environment. The Interactive Learning and Collaboration Environment project, or InterLACE, will provide high school students with a toolbox of web-based solutions to facilitate productive collaborative classroom activities.
A $1.1 million NSF Integrative Graduate Education and Research Traineeship (IGERT) grant was awarded to Professor Barry Trimmer (Biology), co-PI Stern Family Professor David Kaplan (BME), and other engineering faculty colleagues to develop an interdisciplinary doctoral program in soft-material robotics. The goal of the program is to develop novel, mobile machines that can change shape and size by deforming. These machines, inspired by animals, will be capable of complex tasks difficult to achieve with conventional robots made of hard materials. The research will employ techniques from tissue engineering methods and use control strategies derived from evolutionary principles—approaches that are comparatively rare in conventional robotics. This program leverages the interdisciplinary research already well established in the engineering labs at 200 Boston Avenue and capitalizes on faculty expertise at SOE and Arts and Sciences.

Technology Transfer

The Tufts Office of Technology Licensing and Industrial Collaboration (OTL&IC) reported 61 invention disclosures from across the university in FY12; of these, the School of Engineering leads all Tufts schools, accounting for more than 50 percent (31). This is the fourth consecutive year that engineering has led all other schools in disclosures across the university.
Over the past several years, the school has made substantial strides in increasing faculty critical mass and diversity. At the start of the appointment of Linda M. Abriola as dean in AY03–04, the SOE had 54 tenure-track/tenured faculty members, of whom eight were women and nine were ethnic minorities. In AY11–12, the size of the tenure track/tenured stands at 72, of whom 15 are women and 16 are ethnic minorities. AY11–12 was an extraordinarily successful recruitment year for new faculty, with six new tenure-track hires, three of whom are women. These hires will bolster our research and teaching programs in strategic areas.

In fall 2012, Professor William C. Messner (Ph.D., University of California, Berkeley) will join the SOE as the John R. Beaver Professor (subject to provost and trustee approval) and new chair of the ME department. Messner comes to the school from the College of Engineering at Carnegie Mellon University, where he currently holds the Theodore Ahrens Development Chair in ME and is the lead investigator in the Control Systems Laboratory, conducting research on data storage systems and robotics with applications in microfluidics, mechatronics, and computer vision. Professor Messner is a fellow of the AAAS and the ASME and winner of both the ASME’s Education Award from the Dynamic Systems and Controls Division and the ASME’s Educom Medal, which recognizes outstanding contributions for improving undergraduate education through information technology.

Ben Shapiro (Ph.D., Northwestern University) will be the first holder of the McDonnell Family Professorship in Engineering Education (subject to provost and trustee approval). Professor Shapiro will join the Tufts CS department from the Wisconsin Institute for Discovery at the University of Wisconsin, Madison, where he is a researcher in the Educational Research group leading the design, development, and study of educational video games. Shapiro was formerly a member of Northwestern’s Center for Connected Learning and Computer-Based Modeling and the Information Infrastructure Systems research group at the University of Chicago.

Two new assistant professors in the CEE department will add to our research areas in environmental health and geotechnical engineering. CEE Jumbo Robert Viesca, E05, (Ph.D., Harvard University) will join the CEE department’s geotechnical engineering research group from his postdoctoral fellow position at Dalhousie University. Viesca uses modeling to understand how sediment behavior and environmental conditions create landslides. Daniele Lantagne (Ph.D., London School of Hygiene and Tropical
Daniele Lantagne comes to Tufts from her position as a Giorgio Ruffolo Research Fellow in Sustainability Science at the Center for International Development at Harvard University’s Kennedy School of Government. Lantagne, who holds B.S. and M.S. degrees in environmental engineering from MIT, is an expert in assessing and implementing household water treatment projects in developing countries and emergency contexts. She is the recipient of the CDC’s Global Health Achievement award and last year was appointed by the United Nations Secretary General to an independent panel tasked with investigating a cholera outbreak in Haiti.

The ChBE department has recruited new Assistant Professor Ayşe Asatekin (Ph.D., MIT), who will join Tufts from her postdoctoral position at MIT. Asatekin’s research interests include improving water treatment through the development of novel membrane materials for small molecule separations. She is also interested in the development of gas separation membranes for carbon capture. Asatekin is principal scientist and co-founder of Clean Membranes Inc., a startup company that seeks to commercialize her polyacrylonitrile-based membrane technology.

Mai Vu (Ph.D., Stanford University) will be joining the ECE faculty as an associate professor, effective January 2013. Vu is currently an assistant professor in ECE at McGill University, and previously, she was a lecturer and postdoctoral researcher at Harvard University. Her research interests span the areas of wireless communications, information theory, signal processing, and convex optimization, with her current work focusing on multiuser communications and cognitive wireless networks.

The School of Engineering welcomed a number of new research faculty members this year. The BME department was especially busy: Zoia Monaco (Ph.D., University of London, UK) became a new research professor along with her colleague, Research Assistant Professor Daniela Moralli (Ph.D., University of Pavia, Italy). Their work is focused on the development of mammalian artificial chromosomes, including human artificial chromosomes, which help them study the long-term expression of genes in mammalian cells. Hu Tao (Ph.D., Boston University) was promoted from a postdoc position to research assistant professor in Professor Fiorenzo Omenetto’s lab, where they are applying biopolymer photonics in a high-tech way: essentially using silk as an optical material for applications in biomedical engineering, photonics, and nanophotonics. Additionally, BME partnered with the Tufts University School of Medicine this spring to help them recruit Bree Aldridge (Ph.D., MIT), whose research centers on understanding how the bacteria that causes tuberculosis can withstand antibiotic treatment and the host immune response. Aldridge will begin as an assistant professor...
in TUSM’s Department of Molecular Biology and Microbiology in fall 2012 and will hold a secondary appointment in Engineering. CS welcomed a new research assistant professor, Paul Schermerhorn (Ph.D., Notre Dame University), who will continue his work with Associate Professor Matthias Scheutz on affective action-selection mechanisms for robotic applications. And in CEE, Yonggang Wang (Ph.D., Georgia Institute of Technology) was promoted to research assistant professor from a postdoc position in the IMPES lab, where he works with Professors Andrew Ramsburg and Kurt Pennell and Dean Linda M. Abriola on the fate and transport of emerging contaminants in porous media.

Optical microscopy is used to visualize a heart from collagen fibers to organ structure.
THANKS TO OUR SUPPORTERS

Under the direction of Senior Director of Development Cynthia LuBien, with assistance from Associate Directors Jackie Natale and William Lavin, the SOE raised $3.9 million for endowment, capital, and current use. Included in this generous support, more than 2,900 alumni and friends made gifts to the Tufts Fund for Engineering totaling more than $1.4 million, an increase of 21 percent from the prior year. Among the highlights, the school received a significant gift to provide sustained funding for its bridge program (BEST) for underrepresented and first-generation engineering students from Peter H. Kamin, A84, and established its eighth current and pledged endowed professorship, thanks to the estate of John Beaver, E51. Daniel V. Byrne, P.E., E76, pledged resources to the ME department for an engineering scholarship and a student innovation fund.

We are grateful to all of the alumni, friends, and organizations who have supported the School of Engineering.

Dean’s Inner Circle

Honoring Leaders in Giving.
Supporting the Engineering Leaders of Tomorrow.

In 2007, Dean Linda M. Abriola instituted the Engineering Dean’s Inner Circle to recognize and celebrate the outstanding contributions of our most dedicated supporters. The Inner Circle honors those alumni who make current-use annual gifts that match or exceed $100 times the number of years since their graduation. It also recognizes the many generous friends and parents who donate $1,500 or more.

Outside the dean’s office in Anderson Hall, a recognition wall proudly displays the names of our Dean’s Inner Circle members. The dean commissions a unique coin each year as a keepsake. This year, the Dean’s Inner Circle includes 108 members. They contributed more than $1 million during fiscal year 2012.

It’s critical that we recognize the many dedicated alumni and friends who consistently support the School of Engineering, growing with us as we take the school to the next level. The support of our Dean’s Inner Circle reinforces the momentum we have gained in recent years with excellent new faculty members and increased activity in interdisciplinary research. Not only does this program reinforce the significance of giving, but it’s important to me, as dean, to celebrate the individuals who truly are our inner circle of friends.

— Dean Linda M. Abriola
Dean’s Inner Circle

Peter H. Kamin, A84
James A. Stern, E72, A07P, and Jane Y. Stern, A07P
Jordan Birger, E43
Susan C. Madaus, E14P, and Martin D. Madaus, Ph.D., E14P
Fahd A. Alireza, E80
Steven R. Kolttai, A76, FG78, E12P
Ellen J. Kullman, E78, A12P, and Michael E. Kullman, A12P
Jon A. Levy, E83
Peter L. Wittich, E83, and Denise Wittich
Earle Yaffa, E61, and Elizabeth Yaffa, J85P
Lance E. Johnson, E69, J95P, and Susan Johnson, J95P
Kristy F. Tiamo, Ph.D., E83, and James J. Tiamo, A83, E83
John E. Roberts, E81, EG83, and Lisa DeMichele Roberts, J82
Fredric S. Berger, A69, and Elizabeth V. Brannan, J69
Peter H. Rothschild, E77
Charles F. Auster, A73
Daniel V. Byrne, P.E., E76
Andrew J. Frommer, E79
David A. Feinburg, A74
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Jeffrey W. Schwarz, E78, and Kim E. Schwarz, J78
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John J. M. Fitzsimmons, E52, A84P
Matthew D. Sabel, A97
Marilyn Forman Jacobowitz, M.D., E85
Stephen D. Normandin, E08P
Ivan Xavier Baquerizo, E89
Dr. Robert H. Bedoukian, E70, A02P, and Gail Anne Bedoukian, A02P
Colin H. Cooper, E83
Robert B. Coutts, E72, and Ingrid C. Coutts, J74
Erica L. Drazen, E68, and Jeffrey M. Drazen, M.D., A68
James B. Flaws, E71, and Marcia D. Weber, J71
Kimberly A. Hartman, J85, and Alan P. Hartman
Steven E. Karol, A76, A04P, A13P, and Michelle M. Karol, A04P, A13P
Professor Yih-An Liu, EG70
Stacey Coleman Morse, E77
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D. Kenneth Richardson, E52
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Peter J. Cheever, E75, and Lucy H. Cheever, J78, AG80
William S. Cummings, A68, H06, J97P, M97P, and Joyce Cummings, J97P, M97P

The Dean’s Inner Circle coins are numbered, with the top contributor receiving the coin numbered 1. The names appear here in that same distribution order.

A full list of our Packard Society and Dean’s Inner Circle donors can be found outside the dean’s office in Anderson Hall. A list of endowed funds can also be found inside the Burden Lounge in Anderson Hall.
Jeannie H. Diefenderfer, E84
Thierry A. Dreyfus, A00, E00, EG04
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Pamela W. McNamara, E81, and
George C. McNamara, E79
Omar K. Abboud, E82, E14P, and
Catherine D. Abboud, E14P
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Neill Taylor, E14P
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Laurie E. Sims, E13P
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Michael E. Carolan, E06, EG08, and
Sarah S. Wong, M.D., A06, M11
Andrew J. Sayler, E11

Gifts to Establish New Funds*

- Daniel V. Byrne, P.E., E76, to establish the Daniel V. Byrne Scholarship in Mechanical Engineering and the Daniel V. Byrne Innovation Fund for Mechanical Engineering
- Peter H. Kamin, A84, A16P, to fund the Bridge to Engineering Success at Tufts (BEST) Program

* $10,000 and above
New Estate Gifts*

- Estate of Joseph G. Landry, E50, to support financial aid at the School of Engineering
- Estate of Hugh W. Schwarz to support the School of Engineering
- Estate of Gladys Swartwood to support the Gerald L. Swartwood, E46, Endowed Scholarship Fund

Gifts and Payments to Existing Funds*

- Fahd A. Alireza, E80, to support the School of Engineering
- Charles F. Auster, A74, to support the Entrepreneurial Leadership Program Fund
- Ivan Xavier Baquerizo, E89, to support the School of Engineering
- Robert H. Bedoukian, E70, A02P, and Gail Anne Bedoukian, A02P, and Bedoukian Research to support the School of Engineering
- John J. Bello, A68, A13P, to support the Entrepreneurial Leadership Program Fund and the athletics complex
- Jordan Birger, E43, to support the Dean of Engineering Discretionary Fund
- Kenneth Bloom, E85, A14P, and Debra Bloom, J85, A14P, to support the Kenneth L. and Debra L. Bloom Endowed Scholarship Fund
- Fredric S. Berger, A69, and Elizabeth V. Brannan, J69, to support the Dean of Engineering Discretionary Fund, Engineers Without Borders, and the School of Engineering
- Daniel V. Byrne, P.E., E76, to support the Hybrid Racing Team and the Department of Mechanical Engineering
- Stanley E. Charm, E79P, J82P, D85P, and Shirley Charm, AG67, E79P, J82P, D85P, to support the Department of Chemical and Biological Engineering
- Peter J. Cheever, E75, and Lucy H. Cheever, J78, AG80, to support the Kentaro Tsutsumi Fellowship and the Department of Civil and Environmental Engineering
- Colin H. Cooper, E83, to support the School of Engineering
- Robert Coutts, E72, and Ingrid Coutts, J74, to support the School of Engineering
- Jeannie H. Diefenderfer, E84, to support the Jeannie H. Diefenderfer Endowed Scholarship Fund
- Abraham Dranetz, E44, J84P, and Marianna Dranetz, J84P, to support the Abraham and Marianna Dranetz Endowed Scholarship Fund and the School of Engineering
- Erica L. Drazen, E68, and Jeffrey M. Drazen, M.D., A68, to support the School of Engineering
- Frederick J. Emmett Jr., E66, and Marcia L. Emmett to support the Frederick J. Emmett Scholarship Fund for the College of Engineering
- David A. Feinburg, A74, to support the Entrepreneurial Leadership Program Fund
- John J. M. Fitzsimmons, E52, A84P, to support the School of Engineering

* $10,000 and above
• James B. Flaws, E71, and Marcia D. Weber, J71, to support the School of Engineering
• Andrew J. Frommer, E79, to support the School of Engineering
• Robert J. Haber, E79, EG80, to support the Robert and Marcy Haber Endowed Professorship in Energy Sustainability
• Kimberly A. Hartman, J85, to support the Entrepreneurial Leadership Program Fund
• Monte R. Haymon, E59, J83P, J85P, and Jane (Kraft) Haymon, J60, J83P, J85P, to support the Monte R. and Jane Haymon Endowed Scholarship
• Marilyn Forman Jacobowitz, M.D., E85, to support the School of Engineering
• Lance E. Johnson, E69, J95P, and Susan Johnson, J95P, to support the School of Engineering
• Steven E. Karol, A76, A04P, A13P, and Michelle M. Karol, A04P, A13P, to support the School of Engineering
• Steven R. Koltai, A76, FG78, E12P, to support the Entrepreneurial Leadership Program Fund
• John Kokulis, E81, to support the Entrepreneurial Leadership Program and the Summer Scholars
• Ellen J. Kullman, E78, A12P, and Michael E. Kullman, A12P, to support the Steve Tisch Sports and Fitness Center and the School of Engineering
• Robert P. Leis, E78, to support the School of Engineering
• Jon A. Levy, E83, to support the Dean of Engineering Discretionary Fund
• Robin Liss, A06, to support the Entrepreneurial Leadership Program Fund
• Prof. Yih-An Liu, EG70, to support the Department of Chemical and Biological Engineering
• Susan C. Madaus, E14P, and Martin D. Madaus, Ph.D., E14P, to support the School of Engineering
• Stacey Coleman Morse, E77, to support the Dean of Engineering Discretionary Fund
• The Normandin Family and Braun’s Express to support the School of Engineering
• Jon D. Packer, E13P, AG14P, and Sarah F. Packer, E13P, AG14P, to support the School of Engineering
• D. Kenneth Richardson, E52, to support the School of Engineering and the Dean of Engineering Discretionary Fund
• John E. Roberts, E81, EG83, and Lisa DeMichele Roberts, J82, to support the Entrepreneurial Leadership Program Fund
• Peter H. Rothschild, E77, and Laura Rothschild to support the Dean of Engineering Discretionary Fund
• Matthew D. Sabel, A97, to support the Entrepreneurial Leadership Program Fund
• Ankur A. Sahu, E91, and Mari Sahu to support the Ankur and Mari Sahu Endowed Scholarship Fund
• James A. Stern, E72, A07P, and Jane Y. Stern, A07P, to support the Stern Endowed Graduate Research Fellowship and the School of Engineering
The following members of the School of Engineering community belong to the Charles Tufts Society as they have included a gift for Tufts University in their estate plans.

Anonymous (7)
Barbara L. Bacheler, J40, widow of Albert T. Bacheler, E41
David J. Beecy, E56
Fredric S. Berger, A69, and Elizabeth V. Brannan, J69
Jay M. Berkson, E46, A79P, and Charlotte “Chicki” Berkson, A79P
Stephen L. Bishop, EG70
Albion P. Bjork, E58
Capt. Andrew Bodnaruk, E45

Robert Stricker, E69, and Jane Stricker to support the Zeta Psi Class of 1969 Scholarship in Memory of Paul Montle
Kristy F. Tiamo, Ph.D., E83, and James J. Tiamo, E83, A83, to support the School of Engineering
Gregory A. White, E78, to support the Allan H. Clemow Endowed Scholarship Fund and the Entrepreneurial Leadership Program Fund
Peter L. Wittich, E83, and Denise Wittich to support the Wittich Family Fund for Alternative Energy Research and the Dean of Engineering Discretionary Fund
Martha M. Wyckoff, E77, and to support the School of Engineering and the Undergraduate Engineering Scholarship for the Study of the Environment
Earle Yaffa, E61, and Elizabeth Yaffa, J85P, to support the Entrepreneurial Leadership Program Fund
Michael Zak, E12P, and Roxanne Zak, E12P, to support the Steve Tisch Sports and Fitness Center

Corporate and Foundation Giving*

- Charles Stark Draper Laboratories to support the Draper Fellowships
- Dow Chemical Co. Foundation to support the Dow Sustainability Innovation Fund
- The Kodowsky Foundation to support the Program for Engineers as Teachers
- March of Dimes to support research
- The James S. McDonnell Foundation in support of the Center for Engineering Education and Outreach
- Microwave Engineering Corporation to support research
- Northeastern University to support the Lab for Imaging Science Research
- P.M. & A.M. Research to support research
- Steinway Musical Instruments Inc. to support the Music Engineering Program

* $10,000 and above

The Charles Tufts Society

The following members of the School of Engineering community belong to the Charles Tufts Society as they have included a gift for Tufts University in their estate plans.

Anonymous (7)
Barbara L. Bacheler, J40, widow of Albert T. Bacheler, E41
David J. Beecy, E56
Fredric S. Berger, A69, and Elizabeth V. Brannan, J69
Jay M. Berkson, E46, A79P, and Charlotte “Chicki” Berkson, A79P
Stephen L. Bishop, EG70
Albion P. Bjork, E58
Capt. Andrew Bodnaruk, E45

Martin Brandt, E44, and Ruth Brandt
Arnold E. Carlson, E46
Edward L. Cherenson, E46
Ming Y. Chow, E02, EG04
Richard J. Coar, E42
Robert A. Coccozella, E52, and Eleanor L. Coccozella
Edward M. Colbert, E53
Robert J. Cranshaw Jr., E50
Jonathan G. Curtis, E69, EG72, AG05P
Catharine M. de Lacy, EG82
Christopher R. Di Fronzo, E96, and Vada Seccareccia
Jeannie H. Diefenderfer, E84
Leonard A. Di Lorenzo, E66, and Annmarie P. Garceau
Jerry A. Dinardo, E43
Marjorie A. Donohue, widow of
  Henry P. Donohue Jr., E50
Mark E. Dorros, E81, EG87
Abraham Dranetz, E44, J84P
Dania A. El Hasan, E08
Elaine Amass Ellis, widow of
  Edward A. Ellis, E67, J87P, J90P
Robert W. Ellis, E46, and Dorothy F. Ellis
Frederick J. Emmett Jr., E66
Keith A. Farnsworth, E72
Edchen Querker Ferguson, E55, widow of
  Paul F. Ferguson, E53
Kenneth G. Fettig, E52
Henry L. Fischer, E52, and
  Madeline E. Fischer
John J. M. Fitzsimmons, E52, A84P
Diann S. Goldstein, EG82
Robert J. Haber, E79, EG80
Susan Smith Hager, E71, and
  Rodney Hager
Richard C. Hansen, E72, and
  Kristin E. Yanker-Hansen, J73
William T. Harris III, E63
Harold A. Hawkes, A60, E62
Monte R. Haymon, E59, J83P, J85P, and
  Jane (Kraft) Haymon, J60, J83P, J85P
Lonnia Gomez Horn, J67
Albert S. Hovannessian, E46
Margaret A. Hunter, E06
James C. Jones, E66, J90P
Golsima Kim Knox, E78, EG80
Ellen J. Kullman, E78, A12P
Richard J. Kulinski, E59
Capt. Richard L. Lammerding, E58, and
  Nancy K. Lammerding
J. Philip Lane, E41, and Winifred Lane
Raymond B. Larter, E47
Richard E. Leach, E67
John Edward Lecky and Laurel Saville
Jon A. Levy, E83
P. Stuart Locke, E42
Col. William J. Lynch, E41
George Mavridis, E61
Ioannis Miaoulis, Ph.D., E83, AG86,
  EG87, E12P, E15P
David B. Moffatt, E57, E83P
Ruth S. Ogilvie, widow of
  Frank L. Ogilvie Jr., E48
James C. Polk, E57
David F. Pollard, E40
Dr. Richard E. Poppele, E58, J87P, and
  Meredith B. Poppele, J58, J87P
David B. Porter, E47
Stuart Portnoy, M.D., E85
Douglas P. Rayner, E74, and Mark Miller
Bruce N. Reed, E47
Marc L. Resnick, Ph.D., E89
Stephen J. Ricci, E67, E88P, J88P, and
  Geraldine R. Ricci, E88P, J88P
Christopher M. Roughton, E05
Barbara F. Rubin, J78P, widow of
  Melvin R. Rubin, E50, J78P
Sumner W. Rupprecht, E58
Richard M. Sakakeeny, E70, E98P, E04P
Eleanor Samuels, E84P, widow of
  Jason H. Samuels, E45, E84P
Werner H. Schmidt, E36
Jeffrey W. Schwarz, E78, and
  Kim Brush Schwarz, J78
Richard D. Siegel, Ph.D., E64, EG66, and
  Barbara S. Siegel
Robert M. Simonetti, E56
Guy A. Simonian, E76, and
  Darlene C. Simonian
Dorothy L. Smith, widow of
  Edward Smith, E37
Laurence V. Snow, E41
Miriam A. Snyder, J43, widow of
  Marshall E. Snyder, E42
Dr. Robert B. Stanfield, E53
Robert A. Steeves, E72
Peter J. Wetzel, E61, and Martha Wetzel
Christopher G. White, E84
Edward A. White, E47
Stephen T. Witkowski and
  Laura Witkowski
Paul I. Wren Jr., E57
C. Fredric Young, E59, and
  Judith A. Young, E60
ADVANCEMENT AND OUTREACH

We were pleased to award, in collaboration with Tufts’ Jonathan M. Tisch College of Citizenship and Public Service, the first Shahbazi Public Service Fund fellowships, established by Kambiz Shahbazi, E82, to increase the number and quality of civic engagement and public service opportunities available to engineers. Members from six student teams were named Shahbazi Fellows and worked on a variety of projects, from engineering outreach in local high schools to storm water management in the Mystic River.

Under the leadership of Jonathan Kaplan, A96, associate director for alumni relations, our alumni outreach program held its sixth annual Boston-area engineering alumni reception hosted by Michael A. Cantalupa, E83, of Boston Properties, featuring presentations on cutting-edge BME research by Professors Sergio Fantini and Fiorenzo Omenetto. The fall Lyon & Bendheim Alumni Lecture featured Robin Liss, A06, who shared her insight into starting her company, Reviewed.com, while at Tufts. Also in the fall, Robert Sterne, E73, EG75, hosted a Washington, D.C., reception and alumni panel discussion, with moderator Steve Wermiel, A72, A10P, and co-panelist Michael Loulakis, E76, E07P, which explored the intersection of technology and the law in an event co-sponsored by Tufts Lawyers Association. Sterne, director at Sterne, Kessler, Goldstein & Fox, and one of the leading patent attorneys in the United States, joined us in the spring as the guest lecturer for the Lyon & Bendheim Alumni Lecture Series. During the second Alan Shapiro Entrepreneurial Lecture, Charles Sennott, co-founder and executive editor of international news agency GlobalPost, visited Tufts to speak of journalism, of covering Egypt’s revolution in the digital age, and his experience as an entrepreneur. The spring 2012 Knox Lecture featured senior energy & environmental expert David O’Connor, senior vice-president for Energy & Clean Technology at ML Strategies. Previously the Commissioner at the Massachusetts Division of Energy Resources, O’Connor covered the risks of the liquefied natural gas storage facility in Everett, Mass. Following our successful seventh annual Engineering Alumni Weekend Reception on Commencement weekend, we held two West Coast events to highlight our new music engineering minor. The first event was hosted at the Los Angeles offices of Skadden, Arps, Slate, Meagher & Flom by Brian J. McCarthy, A75, A07P, incoming president of Tufts Alumni. Charles M. Salter, E65, whose San Francisco acoustical engineering firm was an ideal venue for this topic, hosted the second event. CEEO co-director and Professor

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“Which instrument is the most fun to play?”

Elementary school students the nation over have pondered that question for decades. Taking the leap from plastic recorder to the weight and maturity of, say, a trombone can be daunting; but kids at the Acoustics and Music Technology: Bringing Sound to Life event in San Francisco on May 23 had a host of instrumental opportunities at their fingertips beyond mere brass or strings.

The event, sponsored by Tufts Alumni and hosted by Charles M. Salter Associates, asked more than 50 alumni and their children to create their own musical instruments using a combination of LEGO®s and the iPad app GarageBand. Explains attendee Tim Nelson, E04, EG07, “A small computer interface connected the LEGO® sensor devices and motors—sensors that detected things like proximity and movement, and motors with wheels you could spin at varying speeds, among other things.”

Using the sensors and motors and manipulating them in different ways, adds Nelson, created a variety of sounds with different pitches and tempos. The devices were then integrated into the LEGO® structures to create instruments.

The instruments produced from the workshop ranged from truly outside the box to traditional, many “with the potential to ‘embellish’ an orchestra or wind ensemble sound,” says Nelson, especially in a new age setting. In all instances fun, learning, and innovation played a part in the creative process and it was clear that the “inventors” were letting a creative spirit take over.

Chris Rogers, professor of mechanical engineering, was on hand for helpful hints throughout the workshop, later giving a presentation on creativity in the classroom and what he says is “a need for engineering education for all.”

“He made a lot of points that made so much sense,” Nelson adds of Rogers’s emphasis on the benefits of an interactive learning process. “What really hit home for me were his comments about the traditional style of teaching children, which focuses a lot on memorization and doesn’t leave a lot of room for creativity.”

Timothy Martin, E13, performed an original composition on a small “table harp” that he had built in class with Professor Rogers—just another reminder for Nelson of his own integration of music and engineering at Tufts.

Now a designer at Degenkolb Engineers in San Francisco, Nelson says the performance brought him back to the days of “playing in the wind ensemble and conducting Torn Ticket II musicals. It also made me even more intrigued by the new music auditorium, which I’ve yet to see!”
Chris Rogers (ME) began each event with a demonstration of instrument building combining LEGO® MINDSTORMS® NXT 2.0 and iPad technology. Associate Director of Corporate and Foundation Relations Sandy Yulke has helped us to strengthen ties with the Charles Stark Draper Laboratories, securing funding for three student fellow positions inaugurating a successful Tufts-Draper seminar series, which resulted in research collaborations with three SOE faculty members. Through a generous gift from Steinway Musical Instruments, Inc., we launched the successful Music Apps for the iPad course taught by Ming Chow (CS) and Paul Lehrman (Music). This funding and several pieces of Steinway-provided equipment were also the basis for a senior capstone project led by Associate Professor Alva Couch (ECE). We chose our first Luce Fellow in CS, who will hold one of two Clare Booth Luce Graduate Fellowships funded by the Luce Foundation.

Under the leadership of Robin Kahan, A80, associate director of career services, nearly 800 engineering students and alumni sought individual consultations with career advisors—a more than 30 percent increase over the previous academic year. The job market for engineering graduates has continued to improve, as demonstrated by a 47 percent increase in the number of entry-level job listings and a 126 percent increase in internship postings for engineering/computer science majors. SOE students received roughly 250 interviews for full-time and intern positions through on-campus and virtual recruiting, a 23 percent increase over last year. Graduating seniors reported job offers from top companies, including Microsoft, BAE Systems, GE Aviation, Google, Mass Biologics, Goodrich, Fuss & O’Neill, Clorox, Motorola, and DuPont. Employer numbers at the spring Sci-Tech Fair also increased to capacity, with 56 companies seeking interns and full-time hires from STEM fields. Additionally, student participation in the career fair was up by 30 percent.

Continuing the trend of increasing positive press, the SOE was featured prominently in the news media this year. Our bioengineering research in silk-based technologies was featured by National Public Radio, the Discovery Channel, CBS News, Wired, the Economist, the Washington Post, the Wall Street Journal, Scientific American, Science Daily, New Scientist, and the International Business Times. The latter also featured our research on the human/technology interface. Our research in engineering sustainability was featured on BBC News and The Huffington Post. Our innovations in engineering education were highlighted on NBC, and in the Atlantic and the Boston Globe. The Globe, Boston Business Journal, and other local media outlets also covered our student participation in the Formula Hybrid racing competition,
our successful MSEM student work and business plan competitions, and our research in clean energy. And the *New York Times* covered the study by Shafiqul Islam, professor in the CEE department, about the relationship between warm temperatures and cholera outbreaks.

**DIVERSITY**

This year, under the leadership of *Travis Brown*, the Center for STEM Diversity (CSD) has undergone extensive growth and development, including new programming, additional student-focused events, a marketing campaign to increase the visibility of the center and its work, and increased administrative support. In fall 2011, *Geena Marquez* was hired as the center’s programs assistant. Marquez came to Tufts from MIT’s Office of Minority Education. Brown was honored for his service and leadership this spring with two prestigious Tufts awards: the Gerald R. Gill Distinguished Service Award and the Tufts Bridge Builders Distinction Award.

The year’s most important CSD achievement was in securing a generous donation from *Peter Kamin*, A84, which will support the direct costs of the BEST program over the next five years. Two new programs were developed to increase student interest in STEM fields. In February, the center sponsored an Interdisciplinary Research Seminar Series, hosting faculty members from SOE and the biology department in the School of Arts and Sciences to share their career paths and what led them to their current research.

The CSD also took responsibility for directing the last year of the Computer Science Engineering Math Scholars (CSEMS) program. Under NSF sponsorship, CSEMS ran for nine years and successfully helped retain students with large financial needs. This program will continue next year, with CSD oversight, with a similar programming model but under a new name—Promoting Retention in Science and Engineering (PRISE). The spring semester marked the annual Diversity Symposium, which coincided with the first meeting of the center’s newly formed external advisory board, comprising representatives from the MITRE Corporation, GE Aviation, Analog Devices, Draper Labs, and UC Berkeley.

View the award-winning video created by the Tufts National Society of Black Engineers members for the fifth annual engineering video scholarship award competition sponsored by the Institute of Electrical and Electronics Engineers (IEEE)-USA: [go.tufts.edu/NSBE_IEEE](go.tufts.edu/NSBE_IEEE)
Growing up next to the elevated railway in Brooklyn, N.Y., Aliandro Brathwaite, E14, (pictured above) developed an early fascination with engineering. “I’d always lived next to a subway line, and I was interested in how it was built, how the very heavy trains stay on this elevated track,” he says.

Now the kid who grew up next to the El is pursuing his engineering dream at Tufts. He was among eight students in the Class of 2014 who enrolled prior to their first semester in a six-week summer bridge program, created to make engineering a viable option for talented students from diverse backgrounds who would benefit from extra academic preparation. They took two classes for credit, participated in academic and college life workshops, and gained an edge in their math studies.

Six of the eight students went on to make Dean’s List in their first year.

What is called the BEST (Bridge to Engineering Success at Tufts) program was piloted by the School of Engineering and the Center for STEM (Science, Technology, Engineering, and Mathematics) Diversity, in conjunction with the Office of Undergraduate Admissions. A third group of incoming freshmen participated in the six-week BEST program on campus in summer 2012. The aim is to attract and retain members of populations underrepresented at the school, focusing on first-generation college-goers with high financial need, says Travis Brown, project manager for the Center for STEM Diversity. Support to launch the BEST program came from the Dean’s Discretionary Fund at the School of Engineering.

When Corey Mason, E14, from rural West Virginia, learned he would receive an ROTC scholarship to study engineering anywhere he wanted, he wondered what may lie beyond the “cornfields, cows, and mountains” of Appalachia. “Tufts seemed like a good reach for me,” he says. Yet he wondered if finishing at the top of his high school AP calculus class would be enough. “I was sincerely worried about how well the math program at my high school had actually prepared me,” he said.

Mason was in the inaugural BEST group. After what he called the hardest—and best—six weeks of his life, he walked onto campus in September with an ace in his pocket. “I went in feeling a step ahead,” he says. “I don’t think anyone else came in quite as prepared as the BEST Scholars.”
INFRASTRUCTURE DEVELOPMENT

Working with the Office of the Vice President for Facilities and Planning, the school has completed the first step in developing a space master plan that examines both traditional campus space (classrooms, offices, and labs) and nontraditional, leased space at Boston Avenue. Led by Executive Associate Dean Scott Sahagian, the process included in-depth interviews with department chairs, assessment of current and projected enrollments in undergraduate and graduate programs, and evaluation of current research lab conditions for future use. With the completion of the Steve Tisch Sports and Fitness Center, the athletics department will be vacating space in Halligan Hall, allowing us to plan for the building’s renovation. We will be participating in the planning of a new facility to house an interdisciplinary institute.

This year, we opened two new interdisciplinary lab spaces, creating new collaborative environments to advance research in our strategic areas. The Interdisciplinary Laboratory for Computation came online in our newly leased space at 196 Boston Avenue. Joe Marks, vice president for Disney Research, delivered the keynote address at the grand opening held in the fall. The 10,000 square-foot space is a collaborative environment for CS, ECE, and CEE researchers working in such areas as visualization, human-computer interaction, signal processing, statistics, and machine learning. In the spring, we opened the doors to the NSF-sponsored Environmental Sustainability Laboratory in Anderson Hall. Under the direction of CEE Chair Kurt Pennell, this 6,000 square-foot lab space serves as a model for interdisciplinary research in biology and environmental engineering.

The Interdisciplinary Laboratory for Computation is a special space at Tufts where faculty and graduate students from across many disciplines can gather together and rub shoulders as they conduct their research. This lab will present many opportunities for our faculty and students to apply computation in addressing the world’s problems.
As current STOMP Fellows, Emma Rubin, E14, Hannah Garfield, E14, and Andrew Bennett, E15, more than understand the importance of multiple methods in teaching. From hands-on activities to written or spoken instructions, these fellows have done it all to teach K-12 students engineering and problem-solving skills. In summer 2012, they outdid themselves and created one of the most creative and entertaining engineering videos of all time to explain the different types of engineering—with LEGO®s!

STOMP began at Tufts in 2001 as a CEEO initiative and has since grown within the university at the same time that it has been launched at 17 other schools across the nation.