Department of Materials Science and Engineering

The past year in the Department of Materials Science and Engineering (DMSE) has been eventful. We have seen the arrival of new faculty and staff, have celebrated many professional accomplishments, and have grieved the loss of our friends and colleagues Frederick H. McGarry, professor emeritus; Dr. Robert C. O'Handley, retired senior research scientist; and Patrick Kearney, long-time technical instructor.

Educational Initiatives

Last year, several DMSE faculty started to bring their academic offerings online. Professor Michael Cima taught 3.091x Introduction to Solid State Chemistry to more than 40,000 students as part of edX. It will be taught for the third time this fall. A new edX offering will be professor Eugene Fitzgerald's 3.086x Innovation and Commercialization. The White House Office of Science and Technology Policy cited the subject as a key resource for bringing innovation to market.

The department is working to support the School of Engineering's Semester from Anywhere (SFA) initiatives. The following subjects in the department were offered as online subjects in spring 2013:

- 3.S044 Materials Processing, undergraduate core subject (professor Christopher Schuh)
- 3.S15 Electrical, Optical, and Magnetic Materials and Devices, restricted elective (professor Caroline Ross)
- 3.S086 Innovation and Commercialization, new undergraduate restricted elective (Professor Fitzgerald)

Students could apply these subjects toward their undergraduate degree program requirements while participating in a co-curricular experience. At the end of spring 2013, the department held focus group meetings with students who enrolled in the online subjects and those who completed the traditional residential-based subjects. Overall, students were pleased with their online educational experiences, felt that they had a firm grasp of the material, and reported very good teacher-student interactions.

Undergraduate Education

With an incoming sophomore class of 37 students, DMSE's undergraduate enrollment will be 132 students, with 62.9% women, 25% underrepresented minorities, and 3.8% international students. Eleven students are designated Course 3-A (a flexible degree program often taken by students intending to continue their education in medicine, business, or law) and two students are designated Course 3-C (archaeological materials science). In addition, a steady number of students are completing a double major. This past academic year, five students graduated with a double major and seven current students are declared double majors.

Earlier this year, the department was able to renovate the Metallography Lab in Room 8-241, giving us more space to hold undergraduate laboratory subjects. We

have also begun a plan to purchase duplicates of some of the equipment used in the undergraduate curriculum, thereby allowing more students the opportunity to perform experiments rather than watching others.

Graduate Education

The department's graduate enrollment remains strong, numbering 194 in fall 2012. Approximately 22% of graduate students are women and 5.2% are underrepresented minorities. Fifteen DMSE students participate in the Program in Polymer Science and Technology. For fall 2013, we anticipate an incoming class of 38, approximately 21% of whom are women and 5% of whom are underrepresented minorities.

Student Organizations

During the course of the academic year, DMSE's student organizations are frequently asked to organize events and develop activities to explain and demonstrate materials science and engineering. They welcome new students to MIT during orientation, help with recruiting efforts, and offer demonstrations at the Cambridge Science Festival and other venues.

The 2013–2014 Society of Undergraduate Materials Scientists (SUMS) officers are president Colleen Loynachan, vice president Caitlin Sample, career development chairs Erica Lai and Jennie Zheng, recruitment chair Victoria Enjamio, publicity chair Mary Elizabeth Wagner, secretary/historian Frances Lenahan, and lounge chair Mina Healey.

The Graduate Materials Council officers for 2013–2014 are president Chris Heidelberger; vice president Kunal Mukherjee; treasurer Corentin Monmeyran; secretary Dina Yuryev; academic committee members Michelle Sing, Gye Hyun (Alan) Kim, and Kelsey Stoerzinger; athletics chair Jessica Swallow; social chairs Thomas Batcho, Scott Grindy, Danielle Raad, and Mike Campion; alumni committee members Ben Grena and Mike Gibson; coffee hour chair Alex Toumar; Departmental Committee on Graduate Students representatives Paul Rekemeyer, Alan Lai, and Nancy Twu; Graduate Student Council representatives Sabrina Yang, Frank Fan, and Sasha Ting-Yun Huang; outreach committee members Sema Ermez and Tim Milakovich; publicity chair Denis Loginov; and Materials Research Society (MRS) student chapter president Ryan Iutzi.

Personnel

In January 2014, Elsa Olivetti will join our faculty as the Thomas Lord assistant professor of materials science and engineering. Dr. Olivetti completed her PhD in our department in 2007, and since then she has been working in MIT's Materials Systems Laboratory as a research scientist. She holds a bachelor of science with highest distinction in engineering science and materials science from the University of Virginia. Dr. Olivetti's research focuses on characterizing and understanding sustainable materials systems and examining the economic and environmental implications of all aspects of the materials cycle, from selection to manufacturing to recycling or disposal decisions.

Effective July 1, 2013, Silvija Gradečak will receive tenure, and Alfredo Alexander-Katz and Geoffrey Beach will both be promoted to the rank of associate professor. Professor

Gradečak joined our faculty in October 2006 and was promoted to associate professor last year. She studies semiconductor materials and low-dimensional systems for applications in optoelectronics, energy harvesting, and energy conversion. She holds a PhD in physics from the Swiss Federal Institute of Technology's Interdisciplinary Center of Electron Microscopy and a diploma in physics from the University of Zagreb in Croatia.

Professor Alexander-Katz's highly interdisciplinary research lies at the interface of materials, biology, physics, chemistry, and medicine and addresses topics as diverse as understanding how blood clots help wounds heal and developing complex microchip structures. He holds a BS in physics from the Universidad Nacional Autónoma de México (1998) and a PhD in physics from the University of California, Santa Barbara (2004). He joined our faculty in fall 2008.

Prior to coming to MIT, Professor Beach earned a BS in physics at the California Institute of Technology (1997) and a PhD in physics from the University of California, San Diego (2003). His group studies spin dynamics and spin electronics in nanoscale magnetic materials and devices. Also effective July 1, he will receive the Class of '58 career development professorship, which recognizes junior faculty who have an innovative and imaginative teaching style and exceptional promise of making important contributions in teaching and research.

DMSE is experiencing a significant change in our faculty, with three senior faculty members who have all served in administrative positions leaving MIT. Sam Allen, current chair of the MIT faculty and POSCO professor of physical metallurgy, will retire on July 1, 2013. Professor Allen came to MIT in 1970 as a graduate student in what is now DMSE and joined the MIT faculty in 1979. Between 2000 and 2006, he was DMSE executive officer, and he served as acting department head in 2004. He has led a freshman advising seminar on blacksmithing since the program began in 1986, he served as a DMSE undergraduate advisor for many classes of students, and he has taught subjects in both the undergraduate and graduate core curricula (which led to two textbooks, *The Structure of Materials*, co-authored with Ned Thomas, and *Kinetics of Materials*, co-authored with Bob Balluffi and Craig Carter). Subra Suresh, Vannevar Bush professor of engineering, will become president of Carnegie Mellon University on July 1 and officially become an emeritus professor at MIT on the same date. Professor Suresh came to MIT in 1979 to pursue a PhD in mechanical engineering; he joined the DMSE faculty in 1993, served as department head from 2000 to 2006, and was dean of engineering from 2007 to 2010. Ned Thomas, now dean of the George R. Brown School of Engineering at Rice University, will also join the emeritus ranks; he has been on leave from MIT since 2011. Ned joined the DMSE faculty in 1989 as the first Morris Cohen professor of materials science and engineering and was the founder and director of the MIT Institute for Soldier Nanotechnologies; he served as head of our department from 2006 to 2011. We are very grateful for the time and energy these three dedicated individuals have given MIT and DMSE.

To address the ongoing challenge of staffing an undergraduate curriculum that includes intensive laboratory instruction, DMSE hired three technical instructors this

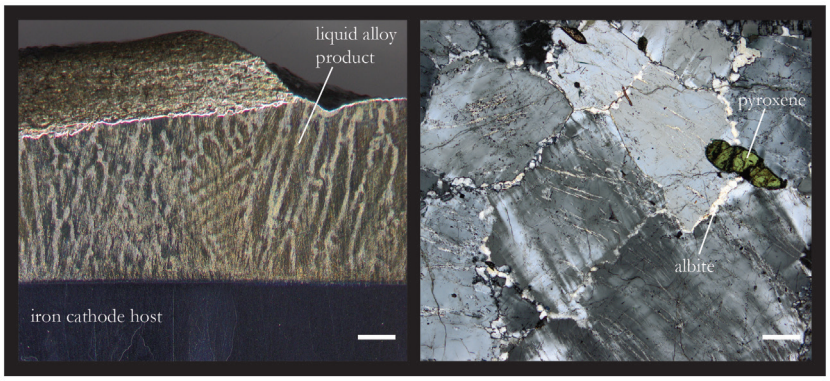
year; Christopher Di Perna, Isaac Feitler '02, and Franklin Hobbs each have specific responsibilities related to teaching laboratory subjects and running shared facilities. Filling these positions was part of DMSE's 2012 strategic plan.

Bruce Siegal joined DMSE as development officer. With the department head and the School of Engineering development staff, he will foster new relationships with DMSE donors and alumni, helping the department build a stronger financial foundation.

Rachel Kemper was promoted to communications coordinator in recognition of her increasing responsibilities in promoting DMSE's research and programs inside and outside MIT, both in print and on the web. She works closely with department faculty, students, and staff and creates our newsletter, maintains our web and social media presence, and installs displays throughout DMSE's hallway spaces. She also coordinates our stewardship efforts and our alumni appeals.

Research Highlights

DMSE faculty and students continue to find new ways to use materials research to address challenges currently facing society, ranging from reducing emissions from steel production to data storage improvements and a complete mapping of the "materials genome." Here we describe research from four of our faculty as a representation of some of the exciting work coming from DMSE.



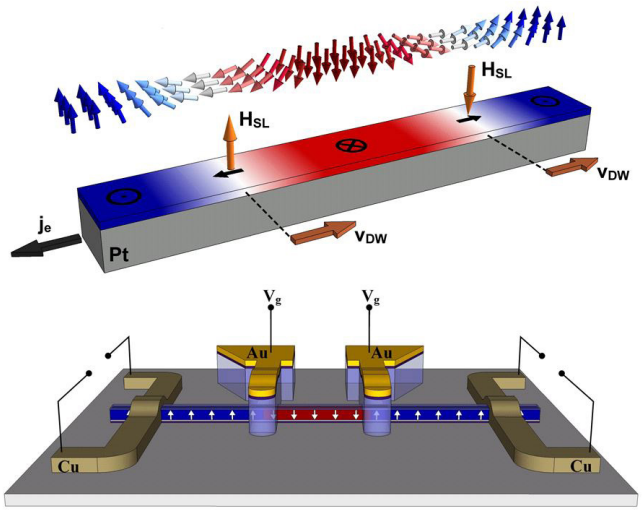
Left: Optical micrograph of a liquid ferromanganese alloy produced by high-temperature electrolysis, with a carbon content of less than 40 ppm (1 mm scale bar). The recent discovery of an inert anode material opens a new era in metal extraction where oxygen becomes a byproduct and exceptional metallurgical products can be produced. Right: Petrographic observation of syenite rock, revealing an exceptional content in K-feldspar with characteristic twinning and a perthite structure. Several processing techniques are under development to convert this abundant material into a potassium fertilizing product.

Professor Antoine Allanore conducts research in sustainable metals production as applied to the development of innovative technologies for green and energy-efficient materials extraction and processing. His main research effort is dedicated to the application of electricity, which has allowed remarkable improvements in the energy

efficiency and productivity of extraction processes over the previous century. In the field of hydrometallurgy, Professor Allanore is investigating electro-reduction of solid oxide particles at nearly room temperature (100°C) to provide the first of its kind iron electrowinning process for steel production without greenhouse gas emissions. His research results proved valuable beyond the field of iron making since they demonstrated that solid oxide particles can be completely depleted from oxygen in direct contact with a cathode, leading to the electro-crystallization of iron metal. This unconventional physics setting allows the deoxidation of a dense, insulating iron oxide compound (hematite) at rates commonly achieved in much more drastic elevated temperature conditions.

Recently Professor Allanore began to develop a method to transform a potassium (K)-rich material into fertilizer, as a replacement for potash and a new sustainable resource for the Southern Hemisphere. A new process transforms K-feldspar into a partially amorphous material that leaches into soil at a rate 30 times faster than the starting mineral. In the area of pyrometallurgy (high-temperature processing), he has designed an anode material that allows oxygen evolution from molten oxide systems as a by-product of metal electrowinning, in this case during liquid iron production at 1,600°C. The approach combines thermodynamics, oxidation science, and electrochemistry and reveals an exceptional physical chemical situation. Indeed, the electric field and the electrolyte components collectively act to develop a refractory, electronically conductive, and stable layer that protects a metal alloy core. This result upsets most predictions and offers new insight into the development of oxidation-resistant materials in extreme conditions. Another contribution in high-temperature metallurgy has been the demonstration of iron production with exceptional metallurgical properties.

Professor Beach's group develops nanoscale magnetic materials and devices for advanced data storage, logic, and biomedical applications. He has recently discovered new mechanisms to control magnetism electrically by tailoring the interfaces between magnetic and nonmagnetic materials. A sequence of magnetic domain walls in a ferromagnetic nanowire can be used to encode information in low-power, high-performance solid-state memories. In work published in *Nature Materials*, Professor Beach showed that by sandwiching an ultrathin ferromagnet between an oxide and a heavy metal, domain walls can be propelled by an electrical current with very high efficiency. When electrical current passes through certain nonmagnetic heavy metals, spin-up electrons tend to scatter to the left and



Top: Chiral domain walls driven by an effective magnetic field generated by spin current injected from a nonmagnetic platinum layer. Bottom: Three-bit magnetic nanowire memory with voltage-controlled domain wall gates.

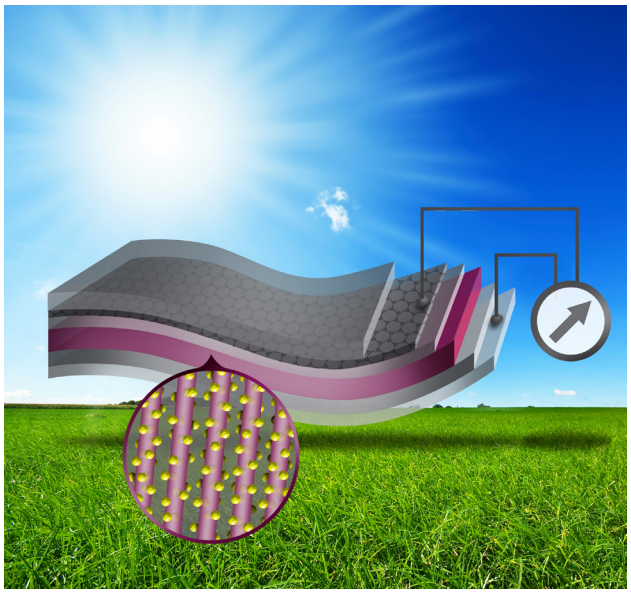
spin-down electrons to the right, or vice versa. By placing a thin ferromagnet in contact with such a material, one can pump a pure spin current into the ferromagnet with very high efficiency. However, the Beach group showed that the key to harnessing this spin current derives from another effect that is extremely rare in magnetism: chiral symmetry breaking due to asymmetric interfaces. In these materials, this leads to a new kind of magnetic domain wall whose structure allows it to absorb the spin current and move at very high speeds.

In related work published in *Nature Nanotechnology*, Professor Beach showed how to design a magnetic field-effect device that is a spin-based analog of a field-effect transistor. By applying a gate voltage at the interface between an ultrathin ferromagnet and an oxide, his group showed that it is possible to dramatically alter the magnetic properties and locally change the magnetic energy landscape. They designed a metal/oxide interface in which the magnetic properties were highly susceptible to a gate voltage and used this effect to engineer domain wall gates in a magnetic nanowire. By turning the gate on or off, they showed that magnetic domain walls could be trapped and released, and they designed a new prototype memory cell that can operate at extremely low power.

For the last six years, the research group of professor Gerbrand Ceder has developed the Materials Genome Project with the objective of making large amounts of materials data available to the materials community. High-throughput materials computing has now become synonymous with Professor Ceder's research group, and, as a culmination of this leadership, President Obama announced the national Materials Genome Initiative in June 2011; this initiative, inspired by MIT's Materials Genome Project, has pushed computational materials modeling to the forefront of science. Professor Ceder's project, now renamed simply the Materials Project in deference to the White House's use of the original moniker, includes computed properties (structure, phase stability, analysis of chemical and electronic structure, etc.) spanning more than 33,000 distinct inorganic compounds and is growing in scope every month. The project is committed to accelerating materials research toward optimized and novel materials with target properties by bringing vast amounts of computed data to the scientific community for data mining and extraction of structure/chemistry-property trends. The new tool could revolutionize product development in fields from energy to electronics to biochemistry, much as search engines have transformed the ability to search for arcane bits of knowledge.

The Materials Project is much more than a database of known information, but it computes many materials' properties in real time, upon request, using the Lawrence Berkeley National Laboratory's vast supercomputing capacity. According to Professor Ceder, although most properties of most materials are still unknown, in many cases these properties can be derived from known formulas and principles. The Materials Project has had a significant impact on industry-academy involvement (30% of registered users are from industry) and continues to garner groundbreaking success in high-throughput materials design resulting in several novel materials primarily in the energy storage application area. Recently, the Materials Project was funded as one of the Department of Energy's Materials Genome Centers.

Professor Gradečak's interdisciplinary research program is based on synthesis of materials with confined dimensions—including two-dimensional films, one-dimensional nanowires/nanotubes, and zero-dimensional nanocrystals—and their assembly into functional devices for applications in nanophotonics, nanoelectronics, and energy harvesting and conversion. In the past year, her research has focused on controlled modulation of nanowire composition and morphology. Her group has developed an approach to modulate both the diameter and composition of individual III-V nitride nanowires by adjusting in situ the nanowire seed particle composition and volume. By combining growth studies and advanced electron microscopy techniques, they elucidated the underlying mechanisms controlling structural evolution and demonstrated the synthesis of axial InN/InGaN nanowire heterojunctions in a nonpolar m-direction for the first time. They have recently extended their approach beyond III-V materials to consider the potential and limitations of diameter modulation in other materials systems.



Schematic illustration of hybrid bulk heterojunction solar cells on graphene.

In a separate but closely related study, Professor Gradečak's group has developed graphene-based nanowire solar cells. Growth of semiconducting nanostructures on graphene would open up opportunities for the development of flexible optoelectronic devices, but challenges remain in preserving the structural and electrical properties of graphene during this process. In collaborations with others, the group has demonstrated growth of highly uniform and well-aligned ZnO nanowire arrays on graphene by modifying the graphene surface with conductive polymer interlayers. Based on this structure, they then demonstrated graphene cathode-based hybrid solar cells using two different photoactive materials—PbS quantum dots and the conjugated polymer P3HT—with AM 1.5 G power conversion efficiencies of 4.2% and 0.5%, respectively, approaching the performance of indium tin oxide (ITO)-based devices with similar architectures. Their method preserves beneficial properties of graphene and demonstrates that it can serve as a viable replacement for ITO in various photovoltaic device configurations.

Awards and Honors

Professor Alexander-Katz received an Early Career Award from the US Department of Energy for "Biomimetic Templated Self-Assembly of Light Harvesting Nanostructures." This funding supports outstanding young scientists and helps them advance research related to energy issues.

Professor Allen received MIT's Arthur C. Smith Award for meaningful contributions and devotion to undergraduate student life and learning. He was also presented the Making the Difference Award by the Mentor Advocate Partnership in recognition of his years of outstanding service and commitment to MIT.

Professor Polina Anikeeva received a National Science Foundation (NSF) CAREER Award for "Optoelectronic Neural Scaffolds: Materials Platform for Investigation and Control of Neuronal Activity and Development." These awards support junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and integration of education and research.

The United States Nuclear Regulatory Commission appointed professor Ronald Ballinger to the Advisory Committee on Reactor Safeguards for a four-year term.

Professor Beach won the Junior Bose Award for Excellence in Teaching, presented by MIT's School of Engineering.

Professor Angela Belcher was awarded the 2013 $500,000 Lemelson-MIT Prize. This annual prize honors an outstanding mid-career inventor who is dedicated to improving our world through technological invention. Professor Belcher will allocate a portion of her award money to the development of outreach programming focused on getting others, especially young people, excited about science—a lifelong cause of hers. Professor Belcher was also the winner of the Boston Museum of Science Walker Prize, which recognizes "meritorious published scientific investigation and discovery" in any scientific field.

Professor Craig Carter received a Wolfram Innovator Award in recognition of his use of the Mathematica system in the classroom and in his research.

Professor Yet-Ming Chiang won the Energy and the Environment Innovation Award, presented by *The Economist*.

Professor Michael Demkowicz received an NSF CAREER Award to support his research in mesoscale modeling of solid-state interfaces in metals, with a view to predicting interface structures and interface interactions with crystal defects.

Professor Lorna Gibson received the Ruth and Joel Spira Award for Excellence in Teaching. For the past several years, she has taught the undergraduate core subject 3.032 Mechanical Behavior of Materials and the undergraduate/graduate elective 3.054/3.36 Cellular Solids: Structure, Properties, Applications. She is consistently acknowledged by students and colleagues as one of DMSE's best instructors, and she truly cares about students' learning and overall experiences. The Spira Award rotates among five departments in the School of Engineering; this is the first time it has been won by a DMSE faculty member.

Professor Gradečak gave the inaugural *Nano Letters* Young Investigator Lecture at the American Chemical Society's fall 2012 meeting.

Professor Darrell Irvine was elected a fellow of the Biomedical Engineering Society.

Professor Ross was named a member of the 2013 class of Institute of Electrical and Electronics Engineers fellows.

Professor emeritus Ken Russell received an Alumni Achievement Award from Carnegie Mellon University.

Professor Don Sadoway received a doctor of engineering, honoris causa, from the University of Toronto in recognition of his pioneering research and outstanding contributions to higher education and sustainable energy.

Professor Schuh and two of his collaborators received an award and commendation from the Japan Institute of Copper. They were recognized for contributing new developments to copper and copper alloy technologies.

In April, Professor Suresh received the Benjamin Franklin Medal in Mechanical Engineering and Materials Science. In addition, Professor Suresh received an honorary doctor of science from Dartmouth College in recognition of his extraordinary contributions to science and engineering and his role as a visionary leader in the global scientific community. He was also presented the 2013 Robert Fletcher Award from Dartmouth and the Alan Cottrell Gold Medal from the International Congress on Fracture. In Hangshou, China, he received an honorary doctoral degree and a certificate of honor and badge from Zhejiang University.

Professor Harry Tuller was elected vice president/president elect of the International Society of Solid State Ionics at the society's meeting in Kyoto. He sees a need for educating the public, government agencies, industry, and universities on the importance of clean energy and the strategic contributions that the field of solid-state ionics can make. Professor Tuller also received the Helmholtz International Fellow Award; he will visit and perform research at the Helmholtz-Center Berlin for Materials and Energy.

Undergraduate Awards

Shannon L. Taylor received an outstanding SB thesis award for "An Investigation of the Mechanical and Physical Properties of Copper-Silver Alloys and their Use in Pre-Columbian America" (professor Heather Lechtman, advisor). Shannon's thesis reports an outstanding body of research that provides a major and unique contribution to establishing the materials and cultural foundations of ancient American metallurgies. At the same time, the research results determine fundamental mechanical and physical properties exhibited by copper-silver alloys that are not available in the published literature. In the fall, Shannon will begin her PhD studies in materials science and engineering at Northwestern.

Samuel Shames also received an award for his thesis, "Modeling Trabecular Microstructure Evolution via Genetic Algorithm" (Professor Carter, advisor). Sam was intrigued by Professor Gibson's work on the phenomenon of bone remodeling in which a trabecular bone dynamically adjusts its microstructure in response to its stress state. He independently came up with the original idea of developing a genetic algorithm (i.e., a computational method of finding optima) that would generate bone microstructures and optimize them. In addition, he finished second in the Dewitt Wallace Prize for Science Writing (public section). In his essay, "Nature's Legos," he described how amino acids are powerful and versatile building blocks. Sam is a junior, and this summer he is doing research on solar thermal fuels with professor Jeff Grossman's group.

Garrett C. Lau received the Horace A. Lubin Award for DMSE Community Service. During his senior year, Garrett served as SUMS vice president. In that role, he was a driving force in many DMSE community events, including the Freshman Pre-Orientation Program, recruiting, and outreach with grammar school students. In the fall, he will begin the materials science and engineering doctoral program at Northwestern.

The Joseph M. Dhosi Outstanding Internship Award was presented to Astera S. Tang for "Yielding Behavior in Nanostructured (Ultrafine Grained) FCC Metals" (Professor Demkowicz, advisor). Astera's internship focused on investigating the mechanical properties of ultrafine-grained face-centered cubic (FCC) metals. During her internship, she carried out tensile test on TWIP steels with different grain sizes and found that below a grain size of 1μm there is a transition from uniform flow upon yielding to non-uniform flow accompanied by formation of Lüders bands. Astera was unfailingly professional in all of her duties, including providing timely and exhaustive updates on her work. In the fall, Astera will begin graduate studies at MIT.

Miriam E. Zachau Walker was named outstanding senior, Class of 2013. She is graduating with a 5.0 grade point average and plans to teach physics at a charter school in the Detroit area.

Erica L. Lai received the Julian Szekely Award for Outstanding Junior, Class of 2014. This summer, Erica will do an internship at the Brookhaven National Laboratory's Center for Functional Nanomaterials.

The outstanding sophomore, Class of 2015, is Carolyn M. Joseph. Over the summer, Carolyn is interning in Houston with the ExxonMobil Development Company in the Materials Selection and Corrosion Control group.

Evelyn Zuniga '13 won MIT's Albert G. Hill Prize, awarded to a minority undergraduate junior or senior student who has maintained high academic standards and made continued contributions to improving the quality of life for minorities at MIT. Next year, Evelyn will pursue an MPhil in microtechnology and nanotechnology enterprise at the University of Cambridge.

Allan Blanchard ’13 was awarded the Ronald E. McNair Scholarship, presented to a black undergraduate who has demonstrated academic excellence and community service. The award honors the MIT alumnus astronaut who died in the Challenger explosion. Allan has accepted a job at the liquid-metal battery company Ambri.

Colleen Loynachan was awarded the Barry Goldwater Scholarship. Her goal is to conduct research in a biomolecular materials group developing materials and devices for clinical applications.

Shannon Taylor, Arfa Aijazi, and Rachel Davis were all included in Business Insider’s list of the 14 most impressive students at MIT this past academic year.

Graduate Awards

Reid C. Van Lehn received the John Wulff Award for Excellence in Teaching for his work as a teaching assistant in 3.091.

Satoru Emori won the Graduate Student Teaching Award for his work as a teaching assistant in 3.23 Electrical, Optical, and Magnetic Properties of Materials.

Charles Edward Sing received the Best PhD Thesis Award for “Blood Clotting Inspired Polymer Physics.” After a postdoctoral appointment at Northwestern University, he will be an assistant professor in the Chemical Engineering Department at the University of Illinois.

Kathleen C. Alexander and Jessica Gabrielle Swallow received First-Year Graduate Student Exceptional Performance Awards. Kathleen also won the Best Paper Award for a First- or Second-Year Student for “Exploring Grain Boundary Energy Landscapes with the Activation-Relaxation Technique,” and she will receive a Hertz Foundation Fellowship Award starting in the fall term.

Ahmed F. Al-Obeidi was the recipient of the Graduate Student Community Service Award. For the last four years, he has volunteered as a tutor and a “future engineer” program instructor for low-income youth living in Cambridge’s Area IV neighborhood. He also designed and developed the programming for Tutoring Plus’s “Future Engineer” Program. Each year, Ahmed leads the staff in developing challenging engineering projects for youth. Additionally, he engages other MIT students and professors in the program, giving students the opportunity to visit the campus or participate in an experiment in an MIT lab.

Alexandra Toumar was named an MIT Graduate Woman of Excellence. Presented by the Office of the Dean for Graduate Education, these awards were made to 47 women at MIT, all of whom were nominated and selected based on their leadership and service contributions at the Institute, their dedication to mentoring, and their drive to make changes to improve the student experience.

William Woodford received a gold medal at the spring MRS meeting in San Francisco for his work on "Mesoscale Mechanical Failure of Batteries." He has begun a postdoctoral position at MIT.

David Cohen-Tanugi's image depicting desalination using graphene was a finalist in the spring MRS "Science as Art" contest.

Uwe Bauer and Elizabeth Rapoport of the Beach group were two of the five finalists for the Best Student Presentation Award at the Joint International Magnetics Conference/ MMM Conference.

Nancy Twu was appointed a fellow of the Joint US-Africa Materials Institute on Materials for Sustainable Energy.

Staff Awards

Angelita Mireles received a School of Engineering Infinite Mile Award for Excellence. Angelita joined DMSE as an academic administrator in 2006, returning to the office where she had worked while she was an MIT student. Angelita's devotion to DMSE and to her job is obvious to all who meet her; she is always accessible and ready to pitch in, whether it's during the workday, in the evening, or on the weekend. Her job entails working with departmental and Institute committees on academic policies and procedures, leading the DMSE recruiting and admissions programs, and serving as a sympathetic ear and problem solver for our students. This is her second Infinite Mile Award, and we are delighted that her hard work and dedication are recognized by others at MIT.

Future Plans

In the coming year, we will continue to work toward the goals outlined in our 2012 strategic plan. At that time, our faculty decided that DMSE would work toward a curriculum and facilities that can accommodate an increased undergraduate enrollment. In AY2014 we will continue to add SFA subject offerings, and one of last year's SFA subjects will become part of edX. In order to help faculty create the materials for these subjects, we will hire a technical instructor with both an educational and materials science background. As incoming undergraduate enrollments have dropped slightly, we will take time this coming year to examine our recruiting practices and how our curriculum addresses students' interests and goals.

Over the next several years, we will continue to search for new faculty; next year, we have two anticipated retirements, and we will identify strong candidates who will bring expertise in "frontier areas" of research or who will strengthen DMSE in traditional research areas.

We recognize that graduate students are the key to a growing department and that endowed fellowships must be used to attract the best students to our program. We now guarantee support to all incoming graduate students until they join a research group, which is generally partway through their first semester. The DMSE administrative officer is working on how to maximize the use of our current endowed funds, and the development officer will define new funding sources that will help us grow these funds for the future.

By the end of AY2014, renovations to the basement of Building 8 will have begun. These renovations will provide new facilities, including a forge (for metalworking) and foundry (for metal melting and casting), for hands-on teaching in the processing and production of materials. The Glass Lab will also be renovated. These are all important areas for hands-on educational experiences. We are also actively engaged in developing plans for the nMaSS building and determining the opportunities it will offer our faculty and research staff.

Christopher A. Schuh
Department Head
Danae and Vasilis Salapatas Professor of Materials Science and Engineering