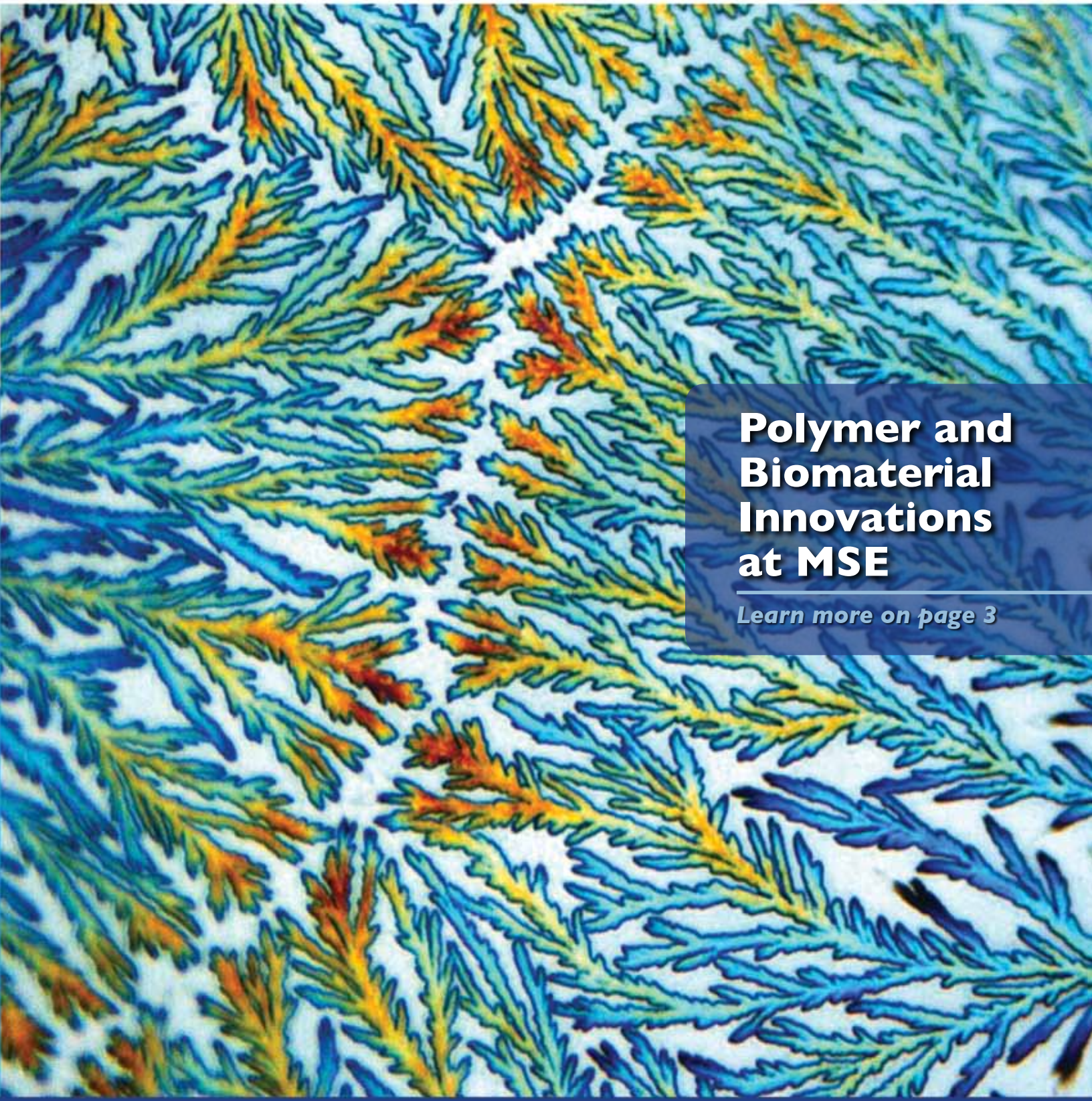
MS NEWS

MATERIALS SCIENCE AND ENGINEERING

Carnegie Mellon University

VOLUME 8 • NUMBER 1 • SPRING 2011



Polymer and Biomaterial Innovations at MSE

Learn more on page 3

A Note From the Department Head

Gregory S. Rohrer, W.W. Mullins Professor

In This Issue:

Greetings to our MSE alumni! In this issue of *MSE News*, we have a lot of great news to share about the achievements of our students, faculty, and alumni. The cover story about polymer-based biomaterials research in MSE is a reflection of our newest research strength that has been built up over the past five years: soft materials.

Research in the area of soft materials seeks to understand the guiding principles for structure formation in polymeric materials of synthetic and biological origin. This research, which spans the nano to micrometer scale, is aimed at defining the relationship between microstructure and macroscopic physical properties. This understanding is then used to design and synthesize new materials with tailored properties for application-specific technologies.

Areas of interest encompass self-assembly and phase transformations in polymer and colloidal systems, polymer nanocomposites, electronic polymers, polymer photonics, nanomaterials for energy and biomedical applications, and cell-nanomaterial and cell-biomaterial interactions. Research is often performed in a collaborative manner and draws upon a diverse range of experimental techniques such as electron, scanning-probe, and confocal microscopy; small- and wide-angle X-ray scattering; rheology; dynamic mechanical analysis; and bulk mechanical analysis. Cell-material interactions are being analyzed using a wide range of microscopy techniques and biological assays, including live-cell fluorescent microscopy.

> "Members of the MSE community continue to win recognition on a global level, as evidenced in our Faculty, Alumni, and Student News sections."

MSE faculty members working in the soft materials group include **Chris Bettinger, Michael Bockstaller, Adam Feinberg**, and **Mohammad Islam**. They collaborate with courtesy faculty from the Departments of Chemistry, Chemical Engineering, Mechanical Engineering, and Biomedical Engineering. As this group accumulates successes, you'll be reading about them in future editions of *MSE News*.

This issue also includes other exciting news about the recent achievements of our extended MSE family. Members of the MSE community continue to win recognition on a global level, as evidenced in our Faculty, Alumni, and Student News sections. This international recognition reflects positively on everyone associated with the Department of Materials Science and Engineering at Carnegie Mellon. As always, we encourage you to share your own news with us for future newsletters.

We also encourage you to visit the Department — during formal occasions such as Commencement or the annual MSE Deck Party, as well as during more informal visits when you happen to be here in Pittsburgh. I think you'll be encouraged and excited about the many recent developments at MSE, whether they are new areas of research or new physical improvements, such as our upcoming renovation of the undergraduate laboratory facilities (see page 5). By remaining connected with the Department of Materials Science and Engineering, you can share in all our successes—and help us celebrate the growing and dynamic MSE community.

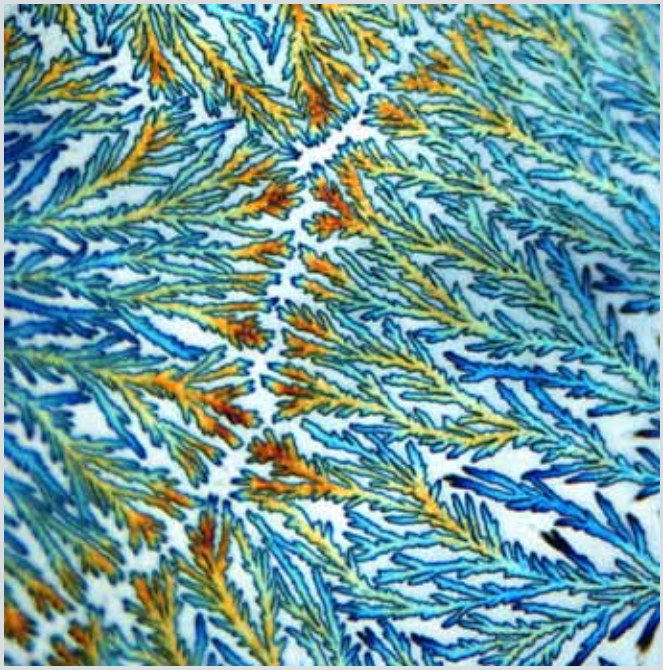
Gregory S. Rohrer,
W.W. Mullins Professor

Polymer and Biomaterial Innovations at MSE

The market for medical devices in the United States is $33 billion and growing at 8 percent annually, while the global market for regenerative medicine is estimated to reach $1.4 billion by 2015. These large, expanding industries offer a tremendous opportunity for innovation in polymeric and biomaterials research. The Department of Materials Science and Engineering aims to play an instrumental role in building a scientific foundation and developing novel materials-based technologies that support this emerging area.

Polymeric and biomaterials research at MSE has been bolstered by the recent addition of **Assistant Professors Christopher Bettinger** and **Adam Feinberg**.

Bettinger directs the Laboratory for Therapeutic Biodegradable Microsystems, which focuses on the design, synthesis, and fabrication of synthetic polymers into intelligent biomaterial networks for use in medical devices. Novel synthetic polymers have the potential to expand the impact of medical devices by imparting unique properties such as shape-memory response, electrical conductivity, and biodegradability. These advanced materials have the potential to revolutionize medical devices and improve patient care. Supervised by Bettinger, doctoral students **Congcong Zhu** and **Suze Ninh** are working hard to bring these materials from bench to bedside.



Melanin, a naturally occurring semiconducting biomaterial, can be processed into thin films for use as biomaterials-based devices. This figure depicts the formation of colorful microscale dendritic structures in melanin thin films.

As demonstrated by Feinberg's work, innovations in polymers and biomaterials can also impact regenerative medicine. Feinberg's research focuses on micro- and nano-fabrication techniques that facilitate the engineering of complex muscular tissues. Using a combination of advanced techniques and natural polymers, Feinberg has succeeded in engineering muscular actuators that can pump, walk, swim, and grasp. He has extended this technology to studying cardiac biomechanics *in vitro*, as well as differentiating and assembling embryonic stems cells into functional cardiac muscle.

The inherent interdisciplinary nature of biomaterials research has motivated collaborations with a number of academic departments and research centers in Pittsburgh. Biomaterials research in MSE is supported by strategic collaborations within CIT involving both the Department of Biomedical Engineering (BME) and the Institute for Complex Engineered Systems. Other MSE partners include the Departments of Chemistry and Biological Sciences within the Mellon Institute, as well as the McGowan Institute for Regenerative Medicine, affiliated with the University of Pittsburgh.

Enrollment in the MSE-BME dual-degree program continues to increase, and the Department's expanded focus on biomaterials research is directly impacting undergraduate training. Students will explore advanced topics in polymers and biomaterials in two new MSE courses, "Synthetic Biomaterial Networks" and "Materials Strategies in Tissue Engineering." Coursework will be supplemented by ample undergraduate research opportunities through the Small Undergraduate Research Grant program and the Summer Research Fellowship program. Students outside Carnegie Mellon can pursue polymeric and biomaterials research via the Research Experiences for Undergraduates initiative, supported by the National Science Foundation.

MSE's expanded programs in polymeric and biomaterials research and education will continue to grow and evolve as the Department creates new investments and strategic partnerships. MSE is embracing the opportunity to train the next generation of biomaterials scientists and engineers, in order to address future technical challenges in this rapidly growing field.

Student Symposium Highlights Research

On March 4, the Department of Materials Science and Engineering hosted its fourth "Graduate Student Symposium," a conference-style event that showcases research performed within the Department. This year's Symposium featured 18 oral and 11 poster presentations, which represents about a 20 percent increase when compared to 2010.

The objective of this annual MSE event is to catalyze student collaborations, establish a culture of scientific discussion and cohesion among students and faculty, and provide a platform for networking and career-building. Visitors from academia, industry, and technology commercialization centers attended the recent Symposium in order to learn more about the leading-edge research being conducted at MSE.

Special congratulations go to the winners of this year's Graduate Student Symposium. In the "Oral Presentations" category, **Neerav Verma** won first place, **Dhishan Kande** won second place, and **Vincent Sokalski** won third place. In the category of "Poster Presentations," the first-place winner was **Reeju Pokharel. Andrew Schultz** won second-place, and **Samuel Kernion** won third place.

The Department is extremely grateful to the members of the Student Organizing Committee for the 2011 Symposium: **Sudarshan Narayanan, Aswin Tejasukmana**, and **Joseph Tucker**. The Department is also grateful to the Goodfellow Corporation for providing financial support for the event.

MSE Bids Farewell to Madeline Lesko

After spending more than 20 years at the Center for Iron and Steelmaking Research (CISR), Program Coordinator **Madeline Lesko** announced her retirement this Spring.

Lesko joined CISR—a University/Industry Cooperative Center within MSE—in 1989, just four years after it was founded to foster education and research related to iron and steel production. For over two decades, she has been instrumental to its success, as CISR grew from 12 companies to more than 25 industrial members at its peak.

Lesko managed all CISR events, including bi-annual meetings, which brought together metals professionals from across the country. She also managed Advisory Board Meetings, forming close relationships with Board members which spanned many years. Lesko was responsible for publishing hard copies of bi-annual CISR progress reports, which often were more than 250 pages. She managed procurement and other administrative activities for about 15 researchers at CISR.

"If I had to think of one word to describe Madeline, it would be 'professional,'" says **Professor Richard Fruehan**, Co-Director of CISR. "She has been a key part of managing the day-to-day operations of CISR since 1989, as well as supporting its growth and evolution. It's hard to imagine that she won't be here at 6:30 every morning, making sure everything is running smoothly."

According to Fruehan, Lesko's hands-on, day-to-day management of CISR was well known to everyone affiliated with the Center. "About 10 years ago, I approached the Advisory Board about making some leadership changes at CISR, including naming a Co-Director. The Board went away to discuss this. When they returned, they said we should forget about Co-Directors. The answer was obvious: Madeline Lesko should immediately be promoted to Director of CISR! I think that speaks volumes about the tremendous respect Madeline has earned from everyone she has encountered in the last 20 years."

Lesko is looking forward to spending more time with her husband Steve; her son Jeff, a Carnegie Mellon graduate; and her grandchildren Beck and Ella. She will be recognized for her years of service at the CISR meeting held in May.

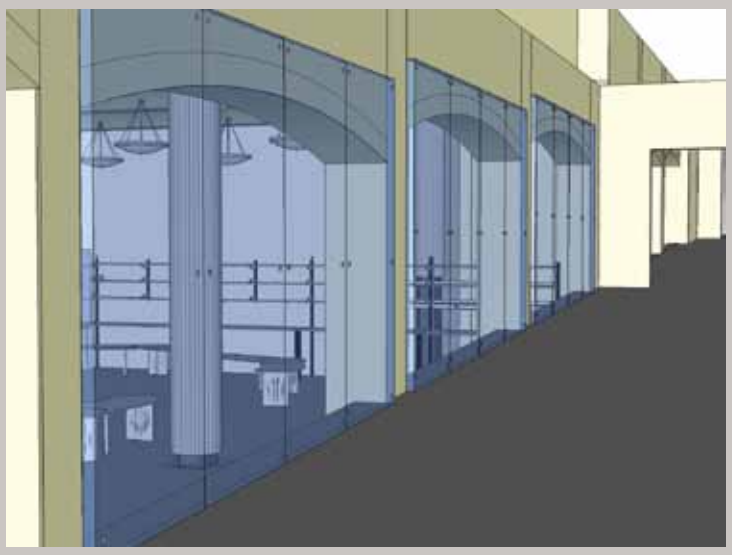
Raising Our Profile

Renovations Will Increase MSE's Visibility

As the Department of Materials Science and Engineering has grown over the years, its space planning has not always kept pace with its expansion. As a result, today MSE faces several challenges. One of them is the need for updated undergraduate laboratory facilities that truly represent the leading edge in materials science.

To address this issue, the Department has exciting plans to renovate its space on the A and C levels of Doherty Hall. This plan includes a renovation of both levels, as well as construction of a new staircase that will connect them. Bulky experimental equipment will be housed in the C level. There will be an imaging lab on the A level, as well as reconfigurable lab space, an undergraduate student lounge, and office space.

In addition to meeting MSE's needs for additional space and improving the student experience, the renovation will accomplish a third objective of raising the profile of MSE on campus and helping to sustain enrollment in the Department. The renovation will increase MSE's visibility because the undergraduate labs are along the main A-level corridor through Doherty Hall — one of the highest-traffic areas on campus. Currently, people passing this way have no idea they are walking by the MSE undergraduate labs, because structural arches along the corridor were covered

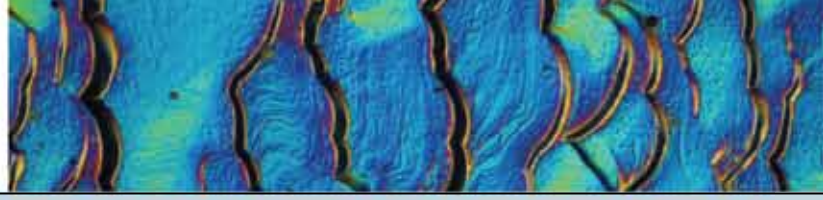


by plywood more than two decades ago. When these arches are opened up, everyone who uses this corridor will look down into a new state-of-the-art MSE imaging facility that includes optical microscopes, scanning electron microscopes, and atomic force microscopes (see rendering above). This will significantly raise awareness of the groundbreaking research happening in MSE.

Watch for ongoing news about these exciting renovations in future editions of *MSE News*!

Alums Return for Deck Party

On Friday, April 15, the Department of Materials Science and Engineering hosted its third annual "Deck Party" in conjunction with Carnegie Mellon's Spring Carnival. The weather was perfect, and about 20 alumni attended this outdoor reception. There was also a high level of faculty and staff turnout for this event, which provides an invaluable opportunity to reconnect with other members of the MSE community. The MSE Deck Party grows in popularity each year—and we hope to see you for our 2012 event!



Porter Leads Workshop for Teachers

Event Introduces Local Instructors to Materials Topics

On Saturday, April 2, **Professor Lisa Porter** led a six-hour workshop called "The Science of Engineered Materials for the 21st Century" in Doherty Hall. This event introduced 30 local high-school and middle-school math and science teachers to basic topics in materials science. **Dr. Neetha Khan**, Associate Director of the Materials Research Science and Engineering Center, consulted on the workshop outline and assisted with some of the activities.

During the workshop, Porter discussed several examples of contemporary materials engineering applications that make use of four major classes of materials: metals, ceramics, polymers, and composites. Scientific topics that lay the groundwork for materials engineers—such as atomic bonding and crystal structures—were also introduced. Participants had opportunities to experiment with hands-on demos and work in small groups to brainstorm ideas they could take back to their classrooms. Topics were presented in a way that made them easy to insert into teachers' existing math and science curricula.

Hands-on activities included identification of various household materials, thermal expansion of steel wire, building crystal structure models, super-absorbance and flame-retardant properties of sodium polyacrylate, and heating of thermoplastics.

"Whether they realize it or not, teachers and students are surrounded by materials innovations every day," notes Porter. "Whether they are using computers that contain millions of

silicon-based micro-processors, working in buildings with more natural lighting thanks to low-emissivity windows, or enjoying the benefits of low-density composites when they bike or ski, they may not consider the role of materials in their daily lives. The purpose of this interactive workshop was to get teachers—and their young students—to start thinking about the incredible potential of materials engineering."

"The Science of Engineered Materials for the 21st Century" was sponsored by the Leonard Gelfand Center for Service Learning and Outreach at Carnegie Mellon. The Center supports more than 75 University-wide programs for K-12 students and teachers, aimed at improving and enhancing the teaching and learning process.

A Digital Doorway to the Past

The University Archives recently created a new Web site where visitors can view digital copies of the *Carnegie Tech Faculty Bulletin*, with publication dates ranging from 1916 to 1971.

What happens at a University besides classes? What do faculty do beyond teaching? The new online *Faculty Bulletins* answer these questions by outlining, on a week-by-week basis, what various faculty were doing both professionally and personally.

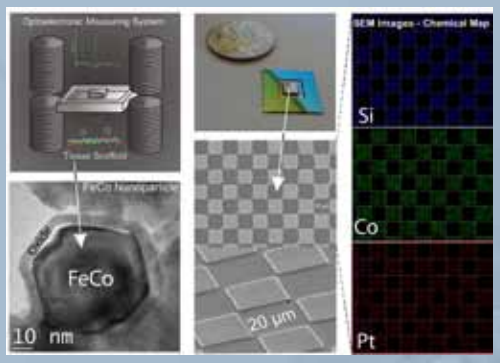
These invaluable documents provide snapshots of the lectures, classes, research, programs, clubs, demonstrations, parties, and policies of any given moment in the early and mid history of Carnegie Mellon University.

Digitizing the *Faculty Bulletin* has made it possible to trace the activities and careers of Carnegie Mellon faculty in ways that the unindexed, hard-copy originals cannot. By providing full-text searching of these critical documents, the University Archives is illuminating the lasting impact of our faculty's work, both professional and personal, on the University community specifically and the global community at large.

To open this fascinating doorway to the past, visit http://diva.library.cmu.edu/webapp/faculty/.

FACULTY NEWS UPDATES

Professors Michael McHenry (left) and **David Laughlin** are co-authors of a paper that appears on the cover of the May issue of *Journal of Applied Physics*. The paper is titled "Fabrication of Thin Films for a Small Alternating Gradient Field Magnetometer for Biomedical Magnetic Sensing Applications." This research represents a collaboration between Carnegie Mellon University and the Spanish space agency, Instituto Nacional de Técnica Aeroespacial (INTA). The project was funded by the National Science Foundation. Co-authors include MSE grad students **Nicholas Jones** and **Kate McNerny**, as well as Marina Díaz Michelena of INTA.



• • • • •

Assistant Professor Jay Whitacre is the co-author of a paper that was chosen by *Science* as its "Editors' Choice" in the February 18 issue of the magazine. Engineering and Public Policy (EPP) grad student Scott Peterson is first author on the paper, and EPP Professor Jay Apt is also a co-author. "Net Air Emissions From Electric Vehicles: The Effect of Carbon Price and Charging Strategies" originally appeared in *Environmental Science & Technology*. The paper describes the results of modeling the overall impact on emissions when some conventional vehicles are replaced with plug-in hybrids. In the model, CO_2 and NO_x reductions were generally achieved, but increased coal combustion resulted in an increase in SO_2 emissions.

• • • • •

In January, **Professor Katayun Barmak** began serving as the Women in Engineering (WIE) representative from the IEEE Magnetics Society. WIE is a committee of the IEEE Board of Directors and is devoted to promoting the advancement of women in IEEE fields of interest, as well as encouraging youth to pursue careers in science and engineering. The largest international professional organization dedicated to promoting women engineers and scientists, WIE focuses on awards, networking opportunities, technical conferences, mentoring programs, and other initiatives that recognize and encourage women's outstanding achievements.

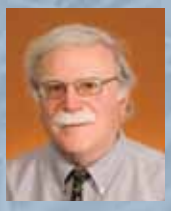
• • • • •

Professor Warren Garrison was named a Fellow of the Indian Institute of Metals at the Institute's Annual Technical Meeting, held at the Indian Institute of Science in Bangalore in November. The Indian Institute of Metals, with its family of more than 10,000 professionals, represents a vibrant community of scientists, engineers, and managers engaged in the practice of mineral processing, metallurgy, and materials.

• • • • •

Professor Chris Pistorious has received the prestigious *Billiton Gold Medal* from the Institute of Materials, Minerals, and Mining. This annual honor goes to the best paper published in *Transactions C: Mineral Processing and Extractive Metallurgy*, based on recommendations received from the editorial board. The prize was awarded to Pistorious and co-author Lesley Andrews of Anglo Research in Johannesburg, South Africa. Their paper, "Nickel, Copper, and Cobalt Distributions and Equilibria in Anglo Platinum Furnace Slags," appeared in volume 119, number 2, pages 52-59, 2010.

• • • • •



Professors David Laughlin (left) and **Michael McHenry** are co-recipients of a patent for their soft magnetic alloys, as well as specific applications of these alloys. The soft magnetic alloys have huge potential for electronic power applications—including transformation and conversion for power grid and electrical vehicle applications. Other co-owners of the patent include alum **Jianguo Long** *(Ph.D. 2008)* and Vladimir Keylin, Joseph Huth, and Ed Connelly of the Magnetics Technology Center, Division of Spang & Company.

Alumni Profile: John E. Allison

When **John E. Allison** *(Ph.D. 1982)* was elected to the National Academy of Engineering's Class of 2011, it was only the most recent honor in a long, illustrious career.

Born and raised in Missouri, Allison attended the US Air Force Academy in Colorado Springs, where he discovered engineering—and found his lifelong vocation. After earning his B.S. in Engineering Mechanics, Allison traveled to Wright Patterson Air Force Base in Ohio, where he worked as an engineer, while earning his M.S. in Metallurgical Engineering from Ohio State University.

"As a Structural Integrity Engineer, I was interested in fatigue crack propagation in titanium alloys," remembers Allison. "Everyone kept saying I should connect with **Professor Jim Williams** of Carnegie Mellon's MSE Department, who conducted similar research. After meeting Jim—who later became Dean of CIT—I decided to pursue a Ph.D. at Carnegie Mellon."

Allison looks back at his doctoral years at MSE as a "watershed" time in his career, when he was working with a great group of faculty and students on exciting research— and building lifelong friendships.

In 1983, Allison joined Ford Motor Company, where he would spend the next 27 years. He led groundbreaking work in developing advanced Integrated Computational Materials Engineering (ICME) methods, computer-aided engineering tools, and light metals technology for automotive applications. He earned two *Henry Ford Technology Awards*, two *Ford Technical Achievement Awards*, and five *Ford Innovation Awards*, among other honors.

In 2010, Allison moved from Ford to become a full-time Professor of Materials Science and Engineering at the University of Michigan, where he had been an adjunct faculty member since 1989. "This semester I'm teaching a graduate class in Advanced Mechanical Behavior of Materials," says Allison. "It's interesting to revisit, as a professor, topics that I was first introduced to in my graduate studies at Carnegie Mellon."

John Allison has matched his track record of professional success with personal happiness in his marriage to bookbinding scholar Julia Miller—whom he married at Phipps Conservatory in 1981—and in being the proud father of John Robert, who is pursuing a degree in Journalism at Michigan State.

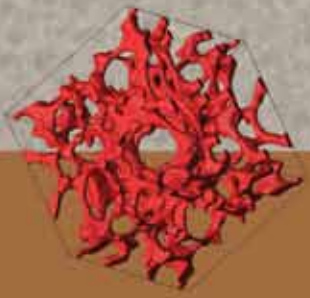
ALUMNI NEWS UPDATES

Frank Johnson *(B.S. 1996, Ph.D. 2003)* is the head of GE's magnet research program. He was recently quoted in an article in *MIT Technology Review* that focused on new nanocomposite materials that might replace rare-earth metals in magnets—making them stronger, lighter, and easier to produce. The goal of GE Global Research is to demonstrate new magnet materials in the next two years.

Franco Fabiilli *(M.S. 2010)* is currently on an internship assignment at the Johnson & Johnson Group of Consumer Companies in Skillman, New Jersey. He is working as a research and development engineer of absorbent material systems for women's health care.

Cong Wang *(M.S. 2008, Ph.D. 2009)* and **Eric Schmidt** *(B.S. 2004, Ph.D. 2007)* recently were honored with the *2011 TMS Young Leader Professional Development Award*. Only 10 scientists nationwide received this recognition. Chosen from each of the five TMS technical divisions, these 10 winners receive support from the TMS Foundation to attend two TMS technical conferences, become more involved with the society, and network with TMS leadership. Wang is a Senior Research Engineer at Alcoa Technical Center, and Schmidt is a Research Engineer with Vallourec Research Aulnoye.

Il Sohn *(M.S. 2002, Ph.D. 2005)* is an Assistant Professor at Korea's Yonsei University in the Department of Materials Science and Engineering. He continues to work on iron-making and steel-making issues, with a particular focus on molten slags and continuous casting. He teaches several courses, including Thermodynamics, Kinetics, Transport Phenomena, and High-Temperature Physical Chemistry in Iron and Steel.



Sofman Wins Two Major Awards

MSE Senior Earns Fulbright Scholarship and NSF Fellowship

Marianna Sofman, who will receive her B.S. in Materials Science and Engineering and Biomedical Engineering this Spring, has received two prestigious awards.

After a rigorous application process, she was named a Fulbright Scholar—and will spend 10 months doing research in Germany as part of this award. When she returns to the US in 2012, a Graduate Research Fellowship from the National Science Foundation (NSF) will provide three years of support for graduate school.

Fulbright: An International Opportunity

Funded by the US government, the prestigious Fulbright Scholar Program is an international educational exchange program established in 1946. It has honored almost 300,000 awardees for their academic achievements and leadership qualities. Fulbright Scholars travel abroad to study, teach, conduct research, exchange ideas and collaborate on global solutions.

"I decided to apply for Fulbright funding in my junior year, after meeting some Fulbright Scholars who had taken advantage of this rare opportunity to experience other cultures," says Sofman. "Conducting research abroad seems like the perfect transition between college and graduate school."

Sofman will continue her research at the renowned Fraunhofer Institute for Cell Therapy and Immunology in Leipzig. She will support the development of a rapid, low-cost infection diagnostics system called MinoLab. A mobile platform the size of a credit card, MinoLab contains magnetic particles that lock onto blood cells in a patient sample. By running the cells through an analysis unit with magnetic force, an accurate diagnosis can be made using magnetic sensors.

NSF: Support for Graduate Studies

In Fall 2012, Sofman will begin graduate studies in Biological Engineering at the Massachusetts Institute of Technology. Her three-year Graduate Research Fellowship from NSF will provide a $30,000 annual stipend, as well as a $10,500 cost-of-education allowance.

The NSF Graduate Research Fellowship Program recognizes outstanding students who are pursuing research-based masters and doctoral degrees in a range of science, technology, engineering, and mathematics disciplines.

"I consider myself very fortunate to have won these two awards, which will enable me to continue my studies in immunology and cell mechanics by partnering with some of the world's leading scientists," says Sofman. "I'm looking forward to the exciting opportunities this funding has made possible."

Tisherman Named Goldwater Scholar

Junior **Robert Tisherman** has been named a Barry M. Goldwater Scholar for the 2011–12 academic year. Each year, this prestigious scholarship program recognizes juniors and seniors who have outstanding potential and intend to pursue careers in mathematics, the natural sciences, or engineering.

To be considered, a student must be nominated by a university faculty member. With a dual major in MSE and Biomedical Engineering (BME), Tisherman received two separate nominations—from **Professor Katayun Barmak** of MSE and Associate Professor Conrad Zapanta of BME.

Following his nomination last fall, Tisherman submitted a full application for the award in January, including essays, letters of recommendation, a list of extracurricular activities, and other materials. A key element was a description of his research, which focuses on measuring cell forces on substrates and studying other extracellular mechanical issues. Tisherman has also conducted research on electric vehicles, focusing on gas-to-electric vehicle conversion.

The purpose of the Barry M. Goldwater Scholarship and Excellence in Education Foundation, established by Congress in 1986, is to alleviate a critical current and future shortage of highly qualified scientists, mathematicians, and engineers. Up to 300 awardees are announced every year.

Each scholarship covers eligible expenses for undergraduate tuition, fees, books, and room and board, up to a maximum of $7,500 annually.

STUDENT NEWS

STUDENT NEWS UPDATES

Doctoral student **Abhijeet Budruk** has received an *MSA Student Award* from the Microscopy Society of America (MSA). Budruk, who was chosen from more than 175 applicants, will be recognized at the Opening Plenary Session of the Microscopy & Microanalysis 2011 Meeting, held in Nashville in August. The winning paper will be presented in platform or poster format. The award includes all registration, travel, and accommodation costs associated with Budruk's trip to Tennessee.

• • • • •

Ph.D. candidate **Dooho Choi** was awarded two named fellowships. The first of these is the *Alessandro and Piermaria Reggiori Fellowship*, presented in recognition of outstanding research. The second is the *Bertucci Graduate Fellowship* awarded by the College of Engineering to outstanding doctoral students in Carnegie Institute of Technology in recognition of their accomplishments. Choi's doctoral project addresses W as an alternate interconnect to Cu for sub-30 nm linewidths in semiconductor metallization.

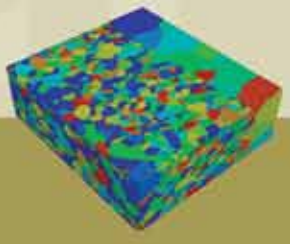
• • • • •

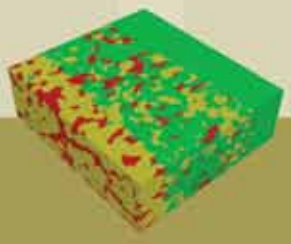
Fang Liu, a doctoral student, has won an *Alternate Sponsored Fellowship* at the Pacific Northwest National Laboratory, operated by Battelle for the US Department of Energy. Throughout this fellowship, Liu will work in the Environmental Molecular Sciences Laboratory Directorate. This award recognizes academic and professional achievements, enabling students to pursue research, training, and professional development opportunities that will enhance their research and academic pursuits.

• • • • •

Doctoral candidate **Satyajeet Ojha** won a *GSA Student Travel Grant* from the Graduate Student Assembly (GSA) at Carnegie Mellon, in collaboration with the Graduate Support Programs Office and the Provost's Office. Each year, the GSA offers approximately 90 financial awards of $500 to help students make presentations or attend conferences or exhibitions in their fields. Ojha used this funding to attend the American Chemical Society Conference in Anaheim in March.

• • • • •





Ph.D. student **Dhishan Kande** has received significant recognition recently. Kande won an *IEEE Magnetics Society Travel Grant* to attend the IEEE International Magnetics Conference in Taipei, Taiwan, in April. This award is given to only 26 selected doctoral candidates working in the area of applied magnetism and magnetic materials. In addition, he received a $500 *GSA Student Travel Grant* to attend this conference. Kande was also a finalist for the *IEEE Magnetics Society Best Student Paper Award* at the conference, where he gave an oral presentation. Kande has also been honored with an invitation to the IEEE Magnetics Society Summer School, held in May in New Orleans. Support is typically provided for approximately 60 students, based on a competitive application process.

• • • • •

Doctoral student **Hoan Cong Ho** has also been invited to the IEEE Magnetics Society Summer School in New Orleans. All expenses, including travel to New Orleans, will be paid by the IEEE Magnetics Society and the National Science Foundation. Ho's research is advised by **Professor David Laughlin** and MSE courtesy faculty **Professor Jian-Gang Zhu**.

• • • • •

Ph.D. candidate **Lu Yan** has been selected by the Dokiya Fund to receive a travel grant to attend and present at the 219th ECS Meeting in Montreal, Canada. The topic of the paper that she co-authored is "Microstructural Effects on the Oxygen Exchange Kinetics of $La_{0.7}Sr_{0.3}MnO_3$ Thin Films."

• • • • •

Ph.D. candidate **Amith Darbal** will be recognized with a *Distinguished Scholar Award* presented by the Microanalysis Society for his submission to the Microscopy & Microanalysis 2011 Meeting. Among other benefits, Darbal will receive complimentary registration for the meeting and up to $750 to defray travel costs. He will accept the award at the Plenary Session in Nashville on August 8.

RECENT PH.D. DISSERTATIONS

Jason Gu
"Characteristics and Mechanisms of Electrical Response to Hydrogen by Nitride-Based Heterostructures"
Advisor: Robert Davis

Lam Helmick
"Microstructural Characterization of Solid Oxide Fuel Cell Cathode Materials"
Advisor: Paul Salvador

Kelsey Miller
"Investigation of FeCo Nanocomposites for High-Frequency Applications"
Advisor: Michael McHenry

Jeong-Heon Park
"Magnetoresistive Devices With Perpendicular Magnetic Anisotropy for Spin-Torque Driven Applications"
Advisor: Jian-Gang Zhu

Soyoung Park
"Extending the Recording Density in Perpendicular Recording Media"
Advisors: David Laughlin and Jian-Gang Zhu

Hyung Ju Ryu
"Microstructure Evolution During Thermal Treatment in Block Copolymer and Block Copolymer Blend Systems"
Advisor: Michael R. Bockstaller

Kumar Abhishek Singh
"Charge Injection and Transport in Regioregular Poly (3-hexylthiophene)-Based Field-Effect Transistors"
Advisor: Lisa Porter

Amul Tevar
"Manganese Oxide Sodium Intercalation Cathode Materials for Aqueous Electrolyte Energy Storage Devices"
Advisor: Jay Whitacre

Matthew Walker
"Fundamentals of Several Reactions for the Carbothermic Reduction of Alumina"
Advisor: Richard Fruehan

En Yang
"Development of FePt/Oxide High Anisotropy Magnetic Media"
Advisor: David Laughlin

Lan Yin
"Effects of Residual Elements on Surface Hot Shortness"
Advisor: Sridhar Seetharaman

Jingxi Zhu
"Fundamental Studies on Controlling Scale Growth in Fe-Cr Alloys Through Additions of Reactive Elements"
Advisors: Sridhar Seetharaman and David Laughlin

MSE Shines at Young Members Night

On February 17, the ASM Pittsburgh Golden Triangle Chapter hosted its annual Young Members Night at the Holiday Inn in Oakland. Students from Carnegie Mellon MSE once again dominated the awards presentation at this annual event. **Ellen Tworkoski** won the *Outstanding Senior Award,* while **Helen Ye** received the *Past Chairperson's Educational Assistance Award.*

MSE students swept the undergraduate poster competition. **Emily Walker** was awarded first place for her poster, "Novel Solder-Magnetic Nanoparticle Composites and Their Reflow Using AC Magnetic Fields." **Itai Stein** won second place for "Thermal and Electrical Properties of Carbon Nanotube Aerogel." **Nathan Howell** and **Sarah Prozeller** created a poster called "Effects of Temperature Gradient on Industrial Coal Slag Infiltration Into Porous Refractory Materials in Slagging Gasifiers" that received the third-place award.

Graduate students from MSE also won the top three prizes in the graduate poster competition. First place was awarded to **Li Li** for the poster "Hydrogen Synthesis From Heterostructured (Ba,Sr)TiO_3/TiO_2 Composite Photocatalysts." **Ayesha Hashambhoy** won the second-place award for a poster titled "Aqueous Lithium-Ion Batteries of the Future: Structural and Electrochemical Characterization of $LiMnPO_4$ Fabricated Using Microwave Irradiation." The third-place award went to **Nicholas Jones** for his poster, "Observations of Oxidation Mechanisms and Kinetics in Faceted FeCo Magnetic Nanoparticles."

The turnout for this local celebration was the highest in many years, with 121 attendees. MSE faculty in attendance included **Professors Katayun Barmak, Warren Garrison, Michael McHenry**, and **Anthony Rollett**.

Congratulations to all of this year's MSE student winners!

Department of Materials Science and Engineering
Carnegie Mellon University
Pittsburgh, PA 15213-3890

Carnegie Mellon
ENGINEERING

Department Head:
Gregory S. Rohrer

Editor:
Suzanne B. Smith

Designer:
Dan Hart

Contributing Writer:
Cynthia Fusco

Photographers:
Ken Andreyo
Glenn Brookes