



Finesse with Filters

UI researchers develop effective means for ridding water of perchlorate

Greetings from Urbana



The discipline of Materials Science and Engineering is enjoying unprecedented visibility on the national stage with the launching of the Materials Genome Initiative (MGI). President Obama announced the MGI in his June 2011 speech outlining an Advanced Manufacturing Partnership; a follow-up workshop on the MGI was held at the White House a few weeks ago. The word “genome” in the title implies a parallel with the extraordinary advances in science and technology that enabled sequencing of the human genome. The goals of the MGI are to generate similar breakthroughs in how new materials are developed and integrated into new products and to transform how we educate the next generation of materials engineers so that they can effectively leverage the use of emerging computational tools and large-scale databases. As one of the top academic departments in the country, MatSE at Illinois has a critical role to play in both the research and education agendas of the MGI. A new course on computational engineering is in the works and MatSE faculty are working to better integrate computational tools throughout the curriculum.

In this issue of the newsletter, you will read about the new members of our alumni board. With the encouragement of our current students, we are engaging with members of the alumni board and broader community of alumni to mentor our current students and to collaborate on projects for our senior year course on Materials Design.

You will also read about Nicole Robards, our new Coordinator of Instructional Laboratories. I have written many times in these pages about our renewed emphasis on the undergraduate laboratories and the challenges we face in providing the high-quality hands-on instruction as the number of students enrolled in MatSE continues to grow. Nicole is a key player in this enterprise and has already radically improved the efficiency and effectiveness of our instructional facilities.

I encourage you to stop by the MatSE Department the next time you are in the area and tour the undergraduate laboratories.

Sincerely,

David Cahill
Willett Professor and Head

Martin receives 2012 NSF CAREER Award



Lane W. Martin has received a National Science Foundation (NSF) CAREER Award for his proposal, “Enhanced Pyroelectric and Electrocaloric Effects in Complex Oxide Thin Film Heterostructures.”

“Advances in the development of functional complex oxide materials have enabled many of the devices that are utilized on a daily basis from memories to actuators and beyond,” explained Martin, who is also affiliated with the Frederick

Seitz Materials Research Laboratory at Illinois. “Fundamental research in these fields fosters innovation in the growing green economy and high-technology spaces.”

“This project includes research on the creation of new and complex materials, computational and theoretical approaches to materials design and optimization, and advanced characterization of materials properties. We are developing a deeper understanding of electro-thermal responses of materials and finding routes to enhance those effects to enable advanced thermal imaging (e.g., night-vision systems), waste-heat energy conversion for energy efficiency, novel electron emission for high-tech applications,

and low-power solid-state cooling for nanoelectronics,” Martin added.

“We are developing a design algorithm by which researchers can enhance the electric-field and temperature-dependent response of materials for such applications. Beyond these areas, the concepts are developed in this program could potentially impact a variety of applications from communications to data storage to logic to sensing devices.”

The project also promotes discovery and understanding at the K-12/undergraduate/graduate education levels by introducing students to advanced functional materials and broadening the participation of under-represented student groups in science and engineering careers.

Martin joined the MatSE faculty in August 2009. His research group focuses on the exploration of novel oxide materials—both thin film heterostructures and nanostructures—in pursuit of two major research thrusts: multiferroic and multifunctional materials and devices, and solar and waste heat energy conversion.

The NSF’s Faculty Early Career Development (CAREER) initiative selects the nation’s best young university faculty in a highly competitive annual program. These teacher-scholars are recognized for their extraordinary promise to integrate research and education in the nation’s universities and to make lifelong contributions to their disciplines.

-Engineering Communications Office

Lewis elected to American Academy of Arts and Sciences



Jennifer A. Lewis, the Hans Thurnauer Professor of Materials Science and Engineering, is one of two University of Illinois professors named to the American Academy of Arts and Sciences (AAAS).

Through her own work, and in collaboration with researchers in a variety of disciplines, Lewis has made pioneering contributions to the directed assembly of soft functional materials. Her research

focuses on engineering the flow behavior and structure of soft matter composed of colloidal, polymeric, and molecular building blocks where she applies her expertise to the design of functional inks for planar and three-dimensional printing. Recently she and her research group have produced highly conductive electrode inks for printed electronic and solar devices, scaffolds for tissue engineering, and lightweight structural materials.

Lewis also serves as the director of the Frederick Seitz Materials Research Laboratory at Illinois, one of the premier interdisciplinary research facilities in the nation. She joined the Illinois faculty in 1990, where she also is affiliated with the Department of Chemical and Biomolecular Engineering and with the Beckman Institute for Advanced Science and Technology. She has written more than 100 published papers and holds eight patents. Among many other honors, she has been named a fellow of the Materials Research

Society, the American Physical Society, and the American Ceramic Society.

Edward Diener, the Joseph R. Smiley Distinguished Professor of Psychology, was recognized by AAAS for his pioneering contributions to psychological science. Now an emeritus professor of psychology at Illinois and a senior scientist with the Gallup organization, Diener joined the faculty in 1974. Much of his career has been devoted to measuring well-being and understanding the cultural, personality and economic factors that influence it.

"The election of professors Diener and Lewis highlights their extraordinary contributions in scholarship and leadership," said Phyllis M. Wise, the chancellor of the Urbana-Champaign campus. "They are world leaders in behavioral science and materials research, adding their legacies to the tradition of excellence at Illinois. We are proud to have them recognized among such distinguished company."

The academy, founded in 1780, is one of the oldest honorary societies in the nation. Fellowship honors outstanding leadership and scholarship in a variety of fields. New members join the ranks of Albert Einstein, Ralph Waldo Emerson, Benjamin Franklin, George Washington and other influential Americans. Lewis and Diener were among 220 new members elected this year.

The American Academy for Arts and Sciences has more than 4,000 fellows and 600 foreign honorary members, including more than 250 Nobel laureates and 60 Pulitzer Prize winners.

- University of Illinois News Bureau

Rogers named one of Nature's 10

John A. Rogers, the Lee J. Flory-Founder Chair in Engineering Innovation at Illinois, was one of Nature magazine's "10 who mattered in 2011" for taking innovations from ideas to engineering prototypes.

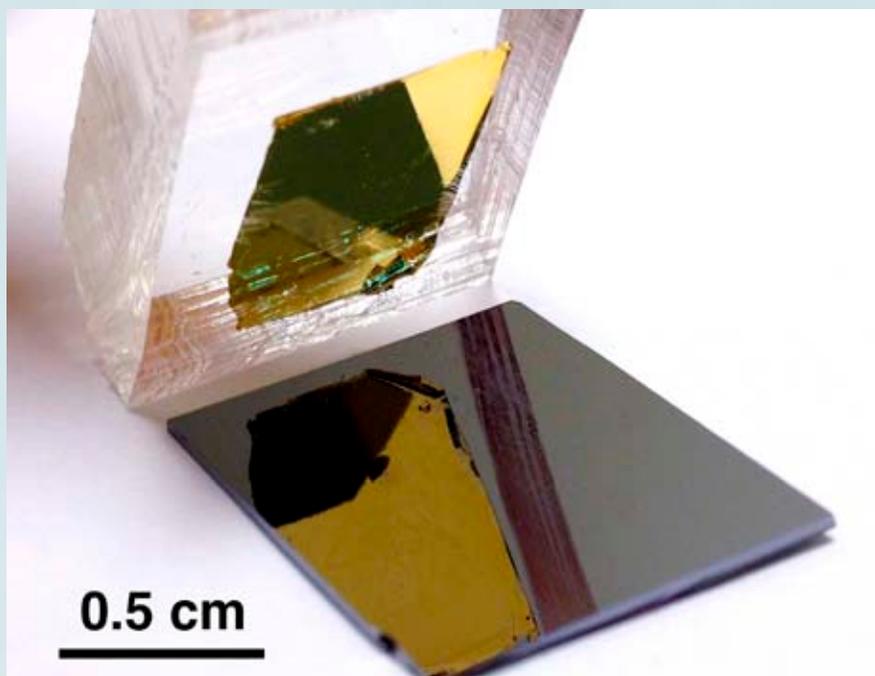
According to the Nature article, one of Rogers' companies, mc10, is working with the sporting-goods giant Reebok to roll out a product this year that will measure an athlete's "kinetic health and well-being." mc10 is also in the process of developing membranes studded with electrodes that can wrap around the brain or heart to provide neurologists and cardiologists with vastly improved diagnostic maps.

Semprius, another spin-off co-founded by Rogers, aims to make photovoltaic arrays that produce solar energy for less than 10 cents per kilowatt-hour, which would make the arrays competitive with coal or gas technologies. The company relies on a transfer-printing technique developed by Rogers to peel tiny, high-efficiency solar cells off gallium arsenide wafers and put them onto arrays.

Previously, Rogers co-founded a successful company, Active Impulse Systems Inc., which commercialized his picosecond laser techniques for analysis of thin films used in the semiconductor industry and was later acquired by a large company. Rogers joined the MatSE faculty at Illinois in 2003.



Controlling heat flow with atomic-level precision



Through a combination of atomic-scale materials design and ultrafast measurements, researchers at the University of Illinois have revealed new insights about how heat flows across an interface between two materials.

The researchers demonstrated that a single layer of atoms can disrupt or enhance heat flow across an interface. Their results are published in *Nature Materials*.

Improved control of heat exchange is a key element to enhancing the performance of current technologies such as integrated circuits and combustion engines as

“The experimental methods developed here will help quantify the extent to which interfacial structural features contribute to heat flow and will be used to validate these new theories.”

well as emerging technologies such as thermoelectric devices, which harvest renewable energy from waste heat. However, achieving control is hampered by an incomplete understanding of how heat is conducted through and between materials.

“Heat travels through electrically insulating material via ‘phonons,’ which are collective vibrations of atoms that travel like waves through a material,” said David Cahill, a Willett Professor and Head of Materials Science and Engineering at Illinois and co-author of the paper. “Compared to our knowledge of how electricity and light travel through materials, scientists’ knowledge of heat flow is rather rudimentary.”

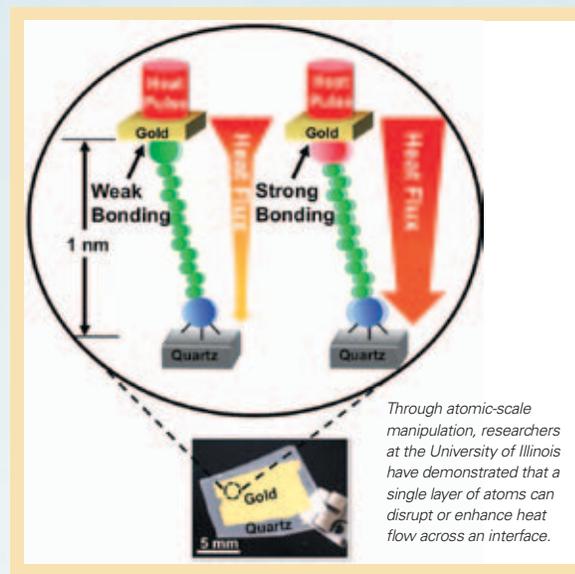
One reason such knowledge remains elusive is the difficulty of accurately measuring temperatures, especially at small-length scales and over short time periods – the parameters that many micro and nano devices operate under.

Over the past decade, Cahill’s group has refined a measurement technique using very short laser pulses, lasting only one trillionth of a second, to probe heat flow accurately with nanometer-depth resolution. Cahill teamed up with Paul Braun, the Racheff Professor of Materials Science and Engineering at the U. of I. and a leader in nanoscale materials synthesis, to apply the technique to understanding how atomic-scale features affect heat transport.

“These experiments used a ‘molecular sandwich’ that allowed us to manipulate and study the effect that chemistry at the interface has on heat flow, at an atomic scale,” Braun said.

The researchers assembled their molecular sandwich by first depositing a single layer of molecules on a quartz surface. Next, through a technique known as transfer-printing, they placed a very thin gold film on top of these molecules. Then they applied a heat pulse to the gold layer and measured how it traveled through the sandwich to the quartz at the bottom.

By adjusting just the composition of the molecules in contact with the gold layer, the group observed a change in heat transfer depending on how strongly the molecule bonded to the gold. They demonstrated that stronger bonding produced a twofold increase in heat flow.



Through atomic-scale manipulation, researchers at the University of Illinois have demonstrated that a single layer of atoms can disrupt or enhance heat flow across an interface.

“This variation in heat flow could be much greater in other systems,” said Mark Losego, who led this research effort as a postdoctoral scholar at Illinois and is now a research professor at North Carolina State University. “If the vibrational modes for the two solids were more similar, we could expect changes of up to a factor of 10 or more.”

The researchers also used their ability to systematically adjust the interfacial chemistry to dial-in a heat flow value

between the two extremes, verifying the ability to use this knowledge to design materials systems with desired thermal transport properties.

“We’ve basically shown that changing even a single layer of atoms at the interface between two materials significantly impacts heat flow across that interface,” said Losego.

Scientifically, this work opens up new avenues of research. The Illinois group is already working toward a deeper fundamental understanding of heat transfer by refining measurement methods for quantifying interfacial bonding stiffness, as well as investigating temperature dependence, which will reveal a better fundamental picture of how the changes in interface chemistry are disrupting or enhancing the flow of heat across the interface.

“For many years, the physical models for heat flow between two materials have ignored the atomic-level features of an interface,”

Cahill said. “Now these theories need to be refined. The experimental methods developed here will help quantify the extent to which interfacial structural features contribute to heat flow and will be used to validate these new theories.”

Braun and Cahill are affiliated with the Frederick Seitz Materials Research Laboratory at the U. of I. Braun is also affiliated with the Department of Chemistry and the Beckman Institute for Advanced Science and Technology. The Air Force Office of Scientific Research and the National Science Foundation supported this work.

The paper’s co-authors include Materials Science and Engineering professor Nancy Sottos and her graduate student Meg Grady.

University of Illinois News Bureau

MatSE student leads bicycle group in journey to raise cancer awareness



Jaime Kelleher

This summer MatSE undergraduate Jaime Kelleher will ride across America. Kelleher is the ride leader of Illini 4000, a student group and nonprofit organization based out of the University of Illinois at Urbana-Champaign. Every summer, Illini 4000 sends a group of students on a cross-country bicycle trip to raise funds for cancer research, spread information about cancer and interview people who have been affected by cancer.

The group took off May 26 from New York and is expected to wrap up the 74-day, 4,500-mile trek August 7 in San Francisco.

Funds raised will benefit a variety of charities, including the American Cancer Society, Camp Kesem-Illinois, the Lance Armstrong Foundation, the Ishan Gala Foundation, the Damon Runyon Cancer Research Foundation, and Cancer Research at the University of Illinois.

Kelleher, a senior from Western Springs, IL, joined the Illini 4000 her freshman year and participated in the 2010 ride. She said many participants are not cyclists before joining the club. Kelleher joined the Illini 4000 because of the impact cancer has made on her life. “I have had both family members and friends suffer from cancer and have seen other family members and friends be hurt by the suffering of their loved ones as well,” she said.

In addition to cycling, Kelleher loves baseball and softball and played for a German baseball team, the Garching

Atomics, while studying abroad her sophomore year in Munich, Germany. “Studying abroad was truly a unique and amazing experience,” Kelleher said. “I made some awesome friends from all over the world.” She plans to continue to learn foreign languages and to travel in the future.

While traveling across the country, Illini 4000 riders interview cancer patients and survivors from all walks of life and compile their stories. The resulting collection of personal narratives, called the Portraits Project, demonstrates how cancer affects people across America.

Jaime Kelleher is dedicating her ride to every child who has lost a parent too soon and to every parent whose child has been taken away by cancer. “I dream of a world where no parent or child would ever have to endure such pain, and I am glad to be involved in the fight to achieve that.”

The Illini 4000 riders arrive in Urbana-Champaign on their trip west.



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Kevin Howard (PhD Chemistry '88),
Dow Chemical Company

Court Time

MatSE students took on the faculty at a basketball game that raised almost \$150 for the undergraduate society Material Advantage. Students bid \$17 for the chance to play against their professors. A bevy of supporters cheered from the sidelines. No injuries were reported, and everyone had a fun, sweaty time.



Alumni join MatSE Alumni Board



The MatSE Alumni Board welcomed new members Geoff Brennecka (PhD MatSE '06), Angela Gonzales (BS MatSE '07), and Howard Savage (BS Met '84, MS Met '88, PhD Met '91) at the spring meeting.

Geoff Brennecka is a Principal Member of the Technical Staff at Sandia National Laboratories in Albuquerque, NM, where the majority of his work focuses on fabricating and applying ferroelectrics and other electronic oxides to novel applications through clever processing and an understanding of multiscale dynamic processes. He received BS and MS degrees in Ceramic Engineering from the University of Missouri-Rolla (now Missouri S&T) in 2001 and 2002, respectively, and a Ph.D. in Materials Science and Engineering from the University of Illinois in 2006 under the advisement of Prof. David Payne. Geoff is active on the Ferroelectrics committee of the IEEE and in several aspects of the American Ceramic Society (ACerS), particularly those related to student activities; he received the ACerS Emerging Leader Award in 2010 and is coauthor of over two dozen papers. In addition to serving on the MatSE Alumni Board at Illinois, Geoff also holds adjunct faculty positions in the MSE departments of Missouri S&T and New Mexico Tech.



Angela Gonzales is currently at Northwestern University pursuing her Master's in Business Administration from the Kellogg School of Management and her Master's in Engineering Management from the McCormick School of Engineering. Prior to that, she was with Texas Instruments in Dallas for 5 years as an epitaxial fabrication engineer in the Technology and Manufacturing Group (TMG). While at TI, she worked on projects to improve throughput and reduce cost in one of their largest analog semiconductor fabrication plants. Angela was also active in TI's United Way program, serving as an ambassador to educate others about UW's partner agencies and raise money for the annual campaign. She also helped to spearhead a New Employee Initiative in the TMG, welcoming new employees to TI—including fellow MatSE alumni!—and getting them acclimated to life in Texas. In her spare time, she enjoys photography, live music, entertaining friends, and learning how to cook. She is looking forward to adding traveling as a hobby while in business school.



Howard S. Savage graduated from Illinois with degrees in metallurgy and is currently a Metallurgical Technical Advisor at Cummins Inc. technical center in Columbus, IN and works on material and process selection, innovation, specification, analysis, problem solving, and improvement for engine, aftertreatment, and other Cummins technologies. Prior to joining Cummins in 1997, Howard worked on ferrous metallurgy and welding for 6 years with Exxon Production Research in Houston, TX. Howard is a continuing member of ASM International and the American Vacuum Society. Howard's volunteer activities have included rehabilitation/construction of housing and grooming of bamboo groves. Outside of work, Howard enjoys reading, edible landscaping, geocaching, and other activities and travel with his wife, Angela, and daughters, Valkyrie and Venus.

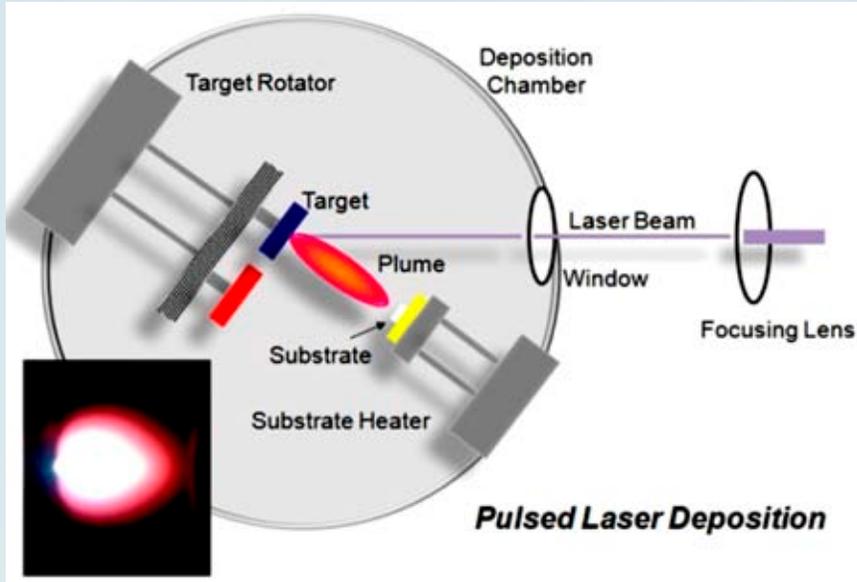
Engineering Homecoming

On Saturday, October 27, cheer on the Fighting Illini as they take on Indiana for Homecoming 2012! Enjoy a pre-game brunch with Engineering at Illinois alumni at the campus Activities and Recreation Center, conveniently located next to the stadium and nearby parking. Brunch will be held from 9:00-10:45 a.m. Tickets for brunch only: \$18 for adults/\$10 for children under 10. Football tickets and brunch: \$55 for adults/\$45 for children under 10. Register online on the Engineering at Illinois alumni web page: engineering.illinois.edu/alumni/alumni-events.



Multidisciplinary team nets MURI funding to develop novel optical metamaterials

A multidisciplinary team of Engineering at Illinois researchers has received \$4.5 million from the U. S. Department of Defense (DoD) for research in the development of new optical metamaterials. The winning proposal was one of 23 awards to academic institutions granted recently through the DoD's Multidisciplinary University Research Initiative (MURI).



"Through this project, our MURI team will produce advances in the fundamental science of metamaterials and demonstrate that eutectic solidification can produce powerful optical devices," explained Paul Braun, the principal investigator (PI) for the project. "These outcomes will provide a foundation for future advances in engineering practice, and will impact a wide variety of DoD applications where the control of light propagation is important: sensing and sensor systems, lightweight optics, optical cloaking, photonic energy harvesting, and thermal IR management."

"Eutectic solidification has never been used to form optical metamaterials," said Braun, adding that during eutectic solidification, a one-phase liquid transforms into a two-phase solid with a highly regular microstructure. "Through close interactions among computational design, photonic theory, eutectic materials development, 3D structural engineering, materials chemistry, and optical characterization, we believe our concepts will come to fruition."

In addition to Braun, the research team includes Jennifer Lewis, Lane Martin, John Rogers, and L. Ben Freund; Easo George (University of Tennessee-Knoxville); Katsuyo Thornton and John Halloran (University of Michigan); and Shanhui Fan (Stanford). The highly competitive MURI program complements DoD basic research programs that support traditional, single-investigator university research. The 23 awards announced recently are for a five-year period, subject to availability of appropriations and satisfactory research progress. MURI awards provide greater sustained support for the education and training of students pursuing advanced degrees in science and engineering fields critical to DoD. The list of projects selected for fiscal 2012 funding may be found at <http://www.defense.gov/news/2012MURI.pdf>.

"Research funded by the MURI program opens up entirely new areas of scientific inquiry, and builds the foundation for future capabilities that will benefit our joint forces," said Zachary J. Lemnios, the assistant secretary of defense for research and engineering. "We are also employing new processes to share research results with our industry partners at a much earlier point to accelerate the transition of concepts from research to end-use products."

Braun named Racheff Professor

In February, the University of Illinois celebrated the investiture of Paul Braun as the Ivan Racheff Professor of Materials Science and Engineering. The Racheff Professorship is made possible through an endowment from the estate of Ivan Racheff, innovative industrialist and dedicated conservationist.

Paul Braun joined the University of Illinois faculty in 1999, with a primary appointment in Materials Science and Engineering, and now has additional faculty affiliations with Chemistry, Mechanical Sciences and Engineering, the Materials Research Laboratory, the Beckman Institute, and the Micro and Nanotechnology Laboratory. He earned his B.S. degree with distinction from Cornell University in



Paul Braun's family joined him for the ceremony. Pictured with him are: Jack Braun (Paul's father), Jack, Paul, Colleen, Lauren, Lucas and Elizabeth (Paul's mother).

1993 and his Ph.D. in 1998 from the University of Illinois, both in Materials Science and Engineering. From 1998 to 1999, he was a postdoctoral scientist at Bell Laboratories, Lucent Technologies.

Braun's research melds modern concepts in materials synthesis, self-assembly, and 3D fabrication to generate materials with unique optical, electrochemical, thermal, and mechanical properties. Recent discoveries from his group include ultra-high power density rechargeable batteries, the first optoelectronically active 3D photonic crystal, a new class of self-healing coatings, and materials with unique thermal properties.

Department News

Eugene Cho, Zach Dahl and **John Glauber** are Bronze Tablet recipients. Selection for the Bronze Tablet is a recognition of continuous high academic achievement and is awarded to students in the top 3% of their college graduating class. The recipients' names are inscribed on the Bronze Tablet, which hangs in the Main Library building of the University of Illinois at Urbana-Champaign.

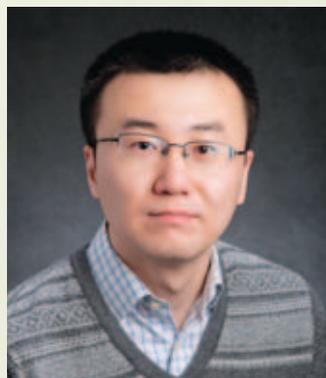


Nicole Robards is MatSE's new Coordinator of Instructional Labs. She took over for John Bukowski (BS Cer '74, MS Cer '76) who retired in December. Robards received her bachelor's degree in Chemistry from the University of Illinois in 1996. After graduation, she stayed in the Champaign-Urbana area and worked at Cabot Corporation in Tuscola, IL, with fumed metal oxides in the areas of technical service and new product

development. In 1999, she moved to BASF Corporation, working as a Technical Service and Sales Representative for the Automotive Coatings Business in Illinois, Indiana, and Missouri. She helped customers in the application, testing, and use of a variety of coatings and chemicals used in automotive part production. During this time, she also completed her MBA through the part-time program at the University of Illinois. After 9 years within the Automotive Segment, she moved into the Agricultural Chemical Business Unit for BASF. In this capacity, she worked to support market development, sales, and end user experience with a wide variety of Herbicides and Fungicides for the corn and soybean markets in central Illinois. "With my diversified experience, I have developed a love of troubleshooting, process improvement, and educating customers about how things work," Robards said. She will be using these interests to support the Instructional Labs within the MatSE Department.

He is the recipient of the MatSE at Illinois Young Alumnus Award (2011), the Friedrich Wilhelm Bessel Research Award of the Alexander von Humboldt Foundation (2010), the Stanley H. Pierce Faculty Award from the College of Engineering (2010), Robert Lansing Hardy Award from TMS (2002), Beckman Young Investigator Award (2001), Xerox Award for Faculty Research from the College of Engineering (2004, 2009), and multiple 3M Nontenured Faculty Awards and teaching honors from the College and University of Illinois. In 2006, he was named a University Scholar by the University of Illinois.

Kenny Long was named a Knight of St. Patrick, an honor given by the College of Engineering to approximately 10-15 students who represent leadership, excellence in character, and exceptional contribution to the College. Long served as president of Engineers Without Borders, Global Development Council and Honors Student Council, and was a member of the Board of Governors for the University YMCA. He was also the 2012 recipient of the Calvin Ke Award from the Campus Honors Program.



Bo Wang received the Ross J. Martin Award from the College of Engineering for outstanding research achievement. Wang received his Ph.D. degree in MatSE in 2011. At graduation, he had 19 papers either accepted or in press stemming from his undergraduate and graduate research. His broad range of research interests has evolved over the years. His research initially

focused on dynamics in complex fluids explored by single molecule/particle fluorescence imaging and tracking. Later, his interest shifted to active transport of organelles along microtubules in crowded cytoplasm. As a postdoctoral fellow at the Institute for Genomic Biology, he is combining methods of biochemistry, genetic engineering, and imaging with genetic markers and developmental biology with stem cells. His career goal is to be a professor at a research university. His awards and honors include the national Frank J. Padden, Jr. Award from the American Physical Society, the Institute of Genomic Biology Fellowship and Mavis Memorial Fund Scholarship Award from the University of Illinois, and Chinese Academy of Sciences Scholarship Award. The Ross J. Martin Award, worth \$2,000, was presented to Bo Wang at the Engineering Awards Convocation on April 23.

Finesse with Filters

UI researchers develop effective means for ridding water of perchlorate

By Don Dodson Copyright 2012 The News-Gazette Published March 11, 2012 Photos by Vanda Bidwell/The News Gazette



Jim Langer of Serionix pours water through filter material designed to remove the rocket-fuel component perchlorate. A grant will help the firm commercialize the technology for removing perchlorate and other contaminants.

Jim Langer and Weihua Zheng have come up with a relatively inexpensive—but effective—way to remove perchlorate from water. Perchlorate is a rocket-fuel component that has found its way into water sources, sometimes near air force bases. Exposure to it can affect the thyroid gland. But by using “clever chemistry,” Langer and Zheng have been able to develop a filter material that can remove the contaminant from water. The filter can be used on a faucet or in a pitcher, and the researchers see commercial potential for it.

They’ve started a company, Serionix, in the University of Illinois Research Park with their advisor, James Economy, professor emeritus of materials science and engineering. Already, the company has received two Small Business Innovation Research grants—\$150,000 from the National Science Foundation and \$100,000 from the Department of Defense. The NSF grant will be used to commercialize the technology for removal of perchlorate and possibly other contaminants from water. The Defense Department grant will be used to develop ways of protecting facilities from chemical warfare—possibly by using the filter material in heating, ventilating and air-conditioning systems.

Langer, 32, of Urbana said the filter is made possible by composite materials known as “ion-exchange fiber composites.” The technology involves coating tiny fibers with resin and activating the material by chemical or temperature means. That gives the material the functionality of ion exchange. In water softeners, ion exchange is used to remove calcium and magnesium from water. In Serionix filters, ion exchange is used to convert perchlorate to chloride.

The technology has won Serionix recognition on several levels. In February, the company won the Student Startup Award at Champaign County’s Innovation Celebration. Langer was one of five UI finalists for

the \$30,000 Lemelson-MIT Illinois Student Prize, given for creative solutions to real-world problems.

Langer said Serionix is working with Champaign-based Serra Ventures to develop corporate strategies.

He figures Serionix may work with corporate partners to manufacture materials for Serionix—or the firm may license the technology so interested companies can integrate it into their products.

Among the best-known filtration products on the market today are Procter & Gamble’s PUR water filter and Clorox Co.’s Brita water filter. “There are probably 10 or 15 more companies in that space,” Langer said. Serionix’s material could “add functionality and marketability” to those kinds of products, he added.

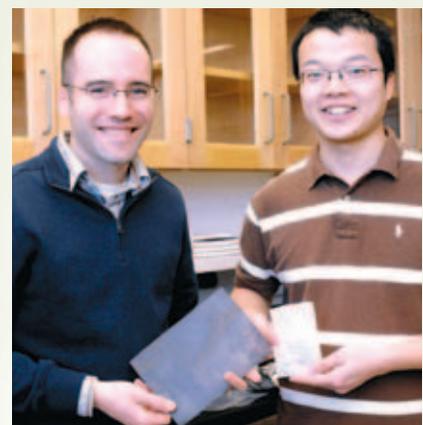
In February 2011, the U.S. Environmental Protection Agency announced it would develop regulations for perchlorate in drinking water. Just what the regulations will be isn’t clear yet. But Langer said that in developing regulations for arsenic in water, the EPA allowed small municipalities to treat water in the home, rather than centrally. If the EPA were to take the same approach for perchlorate, Serionix’s filter could become an important “regulatory compliance tool,” he said.

Langer is the president and CEO of Serionix. Originally from the Minneapolis area, he received a bachelor’s degree in chemistry from the University of St. Thomas in St. Paul, Minn., in 2002. He then worked four years as an analytical chemist for CIMA Labs before joining the doctoral program at the UI.

Co-founder Weihua Zheng, 26, of Savoy is originally from China’s Hebei province. He received a bachelor’s degree in chemical engineering from Zhejiang University in China in 2007. After working a year at an ion-exchange plant in China, he came to the UI in 2008.

Both credit Economy with helping them start Serionix. “For a long time, he’s encouraged us to have an entrepreneurial mind-set,” whether in collaborating with other groups on campus or approaching companies to see what interest they may have in research, Langer said.

The latter half of the Serionix name is loosely derived from “ion exchange,” Langer said. As for the origin of the first half, “we liked how it sounded.” Both Langer and Zheng said they plan to devote full time to Serionix after they complete their degrees. “Definitely, I want to see this through with the company,” Langer said. “I could see myself being a professor 10 to 20 years from now, but I feel connected with the entrepreneur community here.”



Jim Langer, left, and Weihua Zheng show some of the composite materials used in their filter.

Editor’s Note:

Serionix won 1st place (\$15,000) in the Cozad New Venture Competition.

Graduate Students Recognized for Research

The MatSE Department recognized four graduate students for outstanding research in April, presenting them with Racheff-Intel Awards. The award consists of a plaque and up to \$1,000 financial support to attend a conference within eighteen months from the date of the award, at which the student will present the relevant research. The top student, Li Tang, also received money from Intel for a new computer.

2012 Award Winners and their Research:



Brett Beiermann, Li Tang, and Karthik Jambunathan

Li Tang

Precisely size controlled drug-silica nano-conjugates for cancer therapy
Advisor: Jianjun Cheng

Karthik Jambunathan

Dielectric and pyroelectric susceptibilities of epitaxial ferroelectric thin films

Advisor: Lane Martin

Brett Beiermann

Force-driven chemistry: How to achieve mechanochemical activation in bulk linear polymers

Advisor: Nancy Sottos

May Martin

Discovering the fundamentals mechanisms of environmental fracture

Advisor: Ian Robertson



May Martin

Undergraduates Present their Research Findings at College-wide Expo

The 2012 Illinois Scholars Undergraduate Research Poster Expo was held on April 11 on the University of Illinois campus. Four MatSE undergraduates — Andrew Lee, Monisha Menon, Wen Yang, and Stephanie Nemece — presented posters of their undergrad research projects (titles below).

The College of Engineering Illinois Scholars Undergraduate Research Program (ISUR) creates research opportunities for a select group of engineering students. Through this program, undergraduate scholars are offered a unique opportunity to expand their academic experience beyond the classroom. Small groups of students work closely with graduate mentors and sponsoring faculty on research projects. Through hands-on instruction and collaboration, students become familiar with research methodologies. Andrew, Monisha, and Wen worked in John Rogers' research group, and Stephanie worked in Jianjun Cheng's research group.



Pictured, from left: Andrew Lee, Monisha Menon, Wen Yang and Stephanie Nemece

Andrew Lee *Improving the growth density of aligned arrays of SWNTs on a quartz substrate*

Monisha Menon *Study of aligned single-walled carbon nanotubes on crystalline substrates*

Wen Yang *Optimization of single-walled carbon nanotube growth using ferritin and PVA via water assisted growth*

Stephanie Nemece *Monodisperse disulfide bridged polysilsesquioxane nanoparticles in drug delivery and release*

Class Notes

Lowell Hoffman (BS Met '63) has developed a Speakers Resource as a public service of his Governors Club community in Chapel Hill, NC. The roster of 25 accomplished people achieved a milestone with its 300th presentation and a total audience now exceeding 13,000. Host organizations include service, academic, professional and community groups throughout the Raleigh-Durham-Chapel Hill Triangle region. In addition to golf and gardening, Lowell serves UNC's Kenan-Flagler Business School as an Adjunct Research Professor and Industry Fellow. Lowell and his wife, Ruth, "retired" to Chapel Hill's Governors Club community following his 30 year corporate career in global purchasing and supply management.

F. Robert Setlak (BS Met '64) received the Award of Merit from ASTM International Committee A01 on Steel, Stainless Steel and Related Alloys. The Award of Merit and its accompanying title of fellow is ASTM International's highest organizational recognition for individual contributions to standards activities. Robert serves as user vice chairman on Committee A01 and as chairman of Subcommittees A01.20 on Tin Mill Products and A01.98 on Long-Range Planning. He has chaired several A01 task groups and received the Award of Excellence from the committee in 2004. Prior to starting his own consulting business in 2005, he was a research metallurgist and manager of metallurgical services at Continental Can Co., Chicago, and manager of materials science at Crown Cork and Seal, Alsip, IL.



Jack and Cheryl Moorman with Jim Barnett

Jack Moorman (BS Cer '69) and his wife Cheryl attended the Engineering at Illinois reception hosted by **Jim Barnett** (BS Cer '67) at Jim's home in Woodside, CA.

Charles Rosenberg (BS Met '71, MS Met '72) specializes in family law and litigation. He regularly practices in all state and federal courts. His focus is in business law, divorce, domestic relations, family, patent, trademark, and copyright law. Charles received his J.D. from The John Marshall Law School in 1983.



Charles Rosenberg and another engineering alumnus enjoy the Engineering at Illinois event held on March 29 at Boeing in Seal Beach, CA. Photo courtesy of Boeing

William Ellis (BS Met '74) is in his third 'career' as an engineer. He plans, designs, and build facilities all around the world for the US Army. As a Civil Service employee, he has worked in over a dozen countries—the U.S., Europe, Middle East, and Far East. He recently completed the Army's largest vehicle storage building in Korea, and is developing a unique warehouse in Japan. "The Strength of Materials, Mechanical Metallurgy, Corrosion, and Welding courses I took have

served me well," William said, "but I have not been near a metallograph or electron microscope in a very, very long time."



Jim and Barbara Burk

Jim (BS Met '73, MS Met '74, PhD Met '78) and **Barbara Burk** get ready to board their boat, "the Kristina Lynn," for a cruise of Galveston Bay with Allison Winter, MatSE's Assistant Director of Advancement. Jim, a former MatSE Alumni Board President and now ex-officio member, is with BP America in Houston, TX, working in a worldwide leadership position in the Materials Selection, Corrosion and Welding. Barbara is a Master Gardener and travels with Jim regionally and internationally.



Tony and Leilani Tagliavore

Tony Tagliavore (BS Cer '84) married Leilani Miranda on May 9, 2012, in Antigua.

Brett Wilson (BS Cer '89) is R&D Manager for CARBO Ceramics in Houston, TX.

Chris Coad (BS MatSE '97) is Development Engineering Manager

for the New Product Development group and the DS/SX Engineering Department at ESCO Corporation in Cleveland, OH. The company manufactures nickel and cobalt based superalloy castings for the aerospace and industrial gas turbine market.

My Nguyen (BS Cer '96, MS MatSE '97) is Director of Quality Management Services at SunEdison in San Francisco.



Christina Abel, Mark White, and John Osgood (BS Civil '79). Photo courtesy of Boeing.

Mark White (BS MatSE '00) and his fiancée, Christina Abel, attended the Engineering at Illinois event held at Boeing in Seal Beach, CA. Mark is a Technical Sales Engineer for Newport Corporation in Irvine, CA.

Joyce Chan (BS MatSE '01) is Technical Manager for Cemention Connection

Limited in North Point, Hong Kong, and Deputy General Manager (Technical/R&D) for Dongguan Far East Dry Powder Manufacturer Co. Ltd. in Guangdong Province, China.

David Honecker (BS MatSE '01) was elected Secretary of the TMS Refractory Metals Committee. He is Chief Engineer, Product Development, for Climax Molybdenum Company in Sahuarita, AZ.

Jeremy Repede (BS MatSE '01) is a Furnace Design Engineer for PPG Industries in Shelby, NC.

Adan Castillo (BS MatSE '03) is a Ceramic Engineer and Acting Plant Manager for Holland Manufacturing Corporation in Dolton, IL.

Jeff Kalish (BS MatSE '06) is employed at 3M in St. Paul, MN. He received his Ph.D. in polymer science and engineering from the University of Massachusetts-Amherst last year.

Stephanie (Pruzinsky) Rinne (PhD MatSE '06) and James Rinne (PhD MatSE '09) welcomed the birth of their daughter, Adrienne, on December 27, 2011.

Tim Tyler (BS MatSE '06) recently received his Ph.D. from Northwestern University and is now a Senior Process Engineer at Intel.

Marianne Marshall (BS MatSE '07) received her M.S. in Cancer Biology at the University of Colorado at Denver and Health Sciences Center. She is currently pursuing her Doctor of Veterinary Medicine at Colorado State University.

Megan Labahn (BS MatSE '10) and **Matt Seebeck** (BS MatSE '10) were married in October and reside in Colorado Springs, CO. She works as a Materials Science Engineer at the Center for Aircraft Structural Life Extension, the research center for the Mechanical Engineering Department at the U.S. Air Force Academy. He is a Project Engineer at Qualtek Manufacturing Inc.

In Memoriam

Col. Donald King Stevens (BS Cer '42) died January 9, 2012, in Arlington, VA. He was commissioned as a 2nd Lt. US Army in 1942 and served as an Air Defense Officer in England, Algeria, Tunisia and Italy from 1942-1944. He was a regimental staff officer in the 473rd Infantry Regt., Italy, 1945. He worked as a Ceramic Engineer with Harbison-Walker Refractories Co., Pittsburgh, from 1945-1946. He earned his M.S. in Aeronautics and Guided Missiles from the University of Southern California in 1949. From 1946-1972 he served at Fort Bliss, TX; the Pentagon; UN Command/US Forces, Korea; as Commander, Niagara-Buffalo Defense; Chief, Air Defense & Nuclear Br, War Plans Div., Dept. of the Army; Chief, Operations US Army, Washington, DC; Chief Strategic Forces Div., Office Deputy Chief of Staff for Military Operations, US Army; and Chief, J5 Special Weapons Plans, US European Command, Germany. He retired from active duty as a full Colonel in 1972. He was decorated with the Distinguished Service Medal, Legion of Merit, Bronze Star, and Order of St. Barbara. After retirement, he served as a consultant to the US Army and the Office of the Asst. Secretary of Defense. He was a member of First Christian Church, Falls Church, VA, and served as a choir member and Elder. He was a member of the Terrapin Club, Sigma Xi, Tau Beta Pi, Phi Kappa Phi, and Alpha Phi Omega. Survivors include his wife of 69 years, Adele de Werff Stevens, two daughters, two grandchildren and one great-granddaughter.

Robert Matter (BS Met '43) died May 9, 2012, in West Lafayette, IN. He earned his master's degree from Ball State University and was a process engineer for General Motors for 39 years. He married Elizabeth Cobb in 1943, and she preceded him in death in 2010. He was a member of the First Presbyterian Church, where he served as an elder. He was a member of the American Society for Metals, a founding member of Toastmasters International, volunteered as a Red Coat at Community Hospital Anderson, owned seven industrial patents, and was a morning radio personality on WCBC known as "Red Robin Bob." His hobbies included electronics, sailing, stained glass, astronomy, philosophy, reading, writing poetry, and planning skits, and theatrical skit designing. Surviving are two children, Robert B. Matter of Greenfield, IN, and Kathryn Matter of Lafayette; two grandchildren; and one great-grandchild.

Howard Randall (BS Met '47) died May 22, 2012, in Houston, TX. He joined the Army in 1944 and became a rifle platoon leader in Patton's 3rd Army during World War II. He showed extreme valor in combat in Luxembourg and Germany and was awarded the Silver Star, Bronze Star, Purple Heart and other medals. His wartime reflections were filmed in Bill Moyers' TV documentary, "From D-Day to the Rhine," which aired on PBS. He wrote four books and a screenplay about World War II and several technical journals as a metallurgical engineer. He is survived by his wife, Carolyn, and two children, John Randall and Lynne Gullette.

In Memoriam, continued



Ted Rowland, physicist, educator and researcher, died May 20, 2012, at the age of 85. He earned his BS at Western Reserve University, 1948; MA Harvard University, 1949; PhD Harvard University, 1954. He began his career as a research physicist at Union Carbide Metals Co, Niagara Falls, NY, 1954-1961. At the University of Illinois, he served as Professor of Physics and Metallurgy 1961-1992, Assistant Dean of the College Engineering, Acting Associate Dean of the Graduate College 1990-1991, Professor Emeritus 1992-2012. He was President of Materials Consultants, Inc. 1961-1992. He was the editor of two books, and contributed numerous articles to professional journals. He was a Senior Fellow of the American Physical Society; member AIME, AAAS, AAUP, Phi Beta Kappa, Delta Phi Alpha, Sigma Xi. Other achievements include initial verification of charge density waves in dilute alloys; original contributions to theory and experiment in nuclear magnetic resonance in pure metals and alloys. He is survived by his son Theodore Justin Jr., and his daughters Dawson R. Davis and Claire M. Brock, as well as three grandchildren and two great-grandchildren.

MatSE merchandise

Show your pride in your alma mater by wearing a MatSE shirt to work, a sporting event, or around the house. All clothing items have the MatSE Illinois logo embroidered on them. Polo shirts are 100% cotton and come in navy or orange, men's and women's sizes. Windshirts are 100% polyester microfiber and are wind and water-resistant with side pockets. Windshirts come in navy, men's size only. Nano-Fleece shirts are ¼ zipped, non-static and non-pill. The nano-fleece shirts are ultrasoft and come in navy, men's and women's sizes. Prices include shipping (domestic) and handling.

For questions about orders and information on international shipping, contact Cindy Brya at brya@illinois.edu or 217-333-8312.

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Mail completed order form with check (payable to the University of Illinois) to:

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Urbana, IL 61801



Material Advantage chapter seeks alumni assistance

MSE 441 students tour the Nucor plant in Crawfordsville, IN.



The Material Advantage (MA) University of Illinois Chapter is looking to expand its network and bridge the connection between MA and MatSE alumni in the next school year (2012-2013). The chapter would like to connect with alumni interested in hosting a plant trip of their company or coming to campus to speak to students.

Plant trips provide a great opportunity for a company to demonstrate firsthand to a large audience of materials engineering students what engineers in industry do on a daily basis. Ideally, the visits would be conducted on the weekend, but arrangements can be made for trips during the week. MA would limit the size of the tour group according to the number of students the host company can accommodate.

MA is also looking for corporate speakers for MA's general meetings. General meetings typically last just over one hour, with 40-50 minutes of the company presentation and 10-20 minutes of MA announcements. MA will handle all arrangements including promotions for the event, room reservations, food and drink, and setup of AV equipment and computers. MA will ensure that all information for the meeting is passed on to the host company's point of contact at least two months prior to the meeting.

Please contact Parul Koul, MA Vice President, at pkoul2@illinois.edu if you have questions or to arrange a plant trip or speak at a general meeting.

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New graduates welcomed as alumni

The Department of Materials Science and Engineering welcomed 67 new alumni on May 13, the day of the University of Illinois spring commencement. This photo was taken at the MatSE Graduation Lunch in the Illini Union.

Connect with MatSE!

Join us on Facebook (www.facebook.com/matse.illinois) and LinkedIn (www.linkedin.com). The MatSE at Illinois LinkedIn group is a networking group for alumni and students of the Department of Materials Science and Engineering at the University of Illinois. Stay in touch with your classmates and find out the latest department happenings.

