

## **Superbatteries: Nanomaterials Enable Fast Charging and High Power**

**Bicontinuous battery electrodes provide superhighways for electrons and ions**



## Greetings from Urbana



We have had a banner year in the Department of Materials Science and Engineering. John Rogers was elected to the National Academy of Engineering. We concluded a highly successful search for new faculty in computational and experimental biomaterials: Kris Kilian and Andrew Ferguson accepted our offers to join the faculty. Kris is an experimentalist currently working at the University of Chicago and will join us this fall; Andrew is a computational scientist currently working at MIT and will be joining us in April 2012. A record number of new students will begin their studies in our department this fall: 100 freshman and 40 graduate students accepted our offer of admission.

Of course, this good news is accompanied by some significant challenges. Costs of remodeling for modern laboratory space in the venerable Materials Science and Engineering Building and providing state-of-the-art facilities for our new biomaterials hires will approach 3 million dollars. In the past, the campus provided a large share of start-up costs for new faculty, but with reduction in funding from the state, the cost of starting new faculty is split only between the department and the College of Engineering. We depend on cost returns from federally-funded research grants and gifts from our friends and alumni to meet these large costs. This investment in the department's future is one that we gladly make as the connections between materials science and engineering and biological science and engineering continue to grow in scope and impact.

The growing popularity of our undergraduate program creates challenges as well. Our three junior-year and five senior-year instructional labs will require additional equipment and technical support to meet the increased demand. The core courses of the junior year curriculum (thermodynamics, kinetics, mechanical-properties, electronic-properties, microstructure-characterization, and two lab courses) have enrollments that, in most cases, exceed 90 students. We need to find ways to keep our students fully engaged in learning and discovery and to provide the instructional support they need to be successful.

One of our new initiatives to address these concerns is to encourage our extremely talented Ph.D. students to contribute in the classrooms as well as the laboratories. Starting in the fall semester, we will allocate endowment funds donated by the late Don Burnett to create an appointment as a "Burnett Teaching Fellow" position that will be selected competitively. The Burnett fund will provide a part-time teaching assistantship and a salary increment. We hope to expand this program as the department's endowment grows.

Sincerely,  
David Cahill  
Willett Professor and Head

## Graduates recognized for research

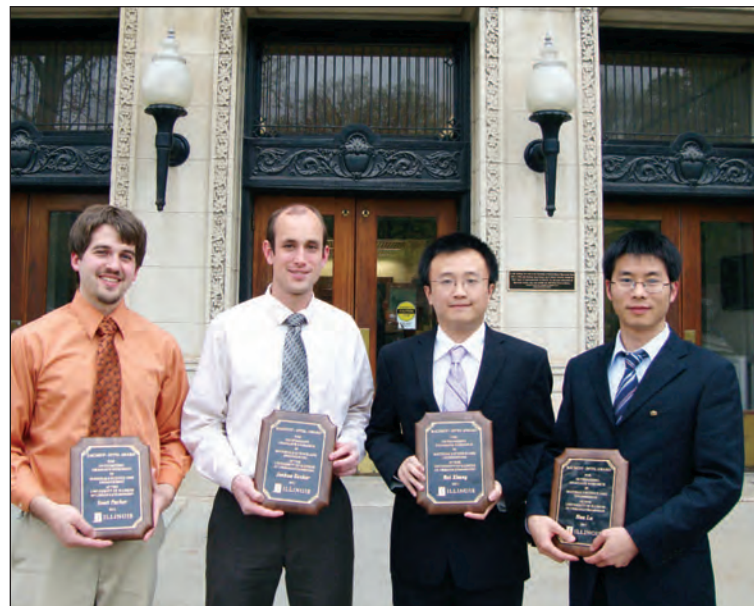
The MatSE Department presented four graduate students with 2011 Racheff-Intel Awards for their research. In memory of Ivan Racheff, a distinguished alumnus of the University of Illinois, the award is given for excellent graduate research in any sub-field of materials science and engineering, to students currently enrolled in the MatSE graduate program at Illinois. The award consists of a plaque and up to \$1,000 financial support to attend a conference at which the student will present the relevant research. The award winners and their research presentations are listed below.

**Scott Parker**, Ph.D. student in Steve Granick's group – "Latent heat cooling in dynamic boiling systems"

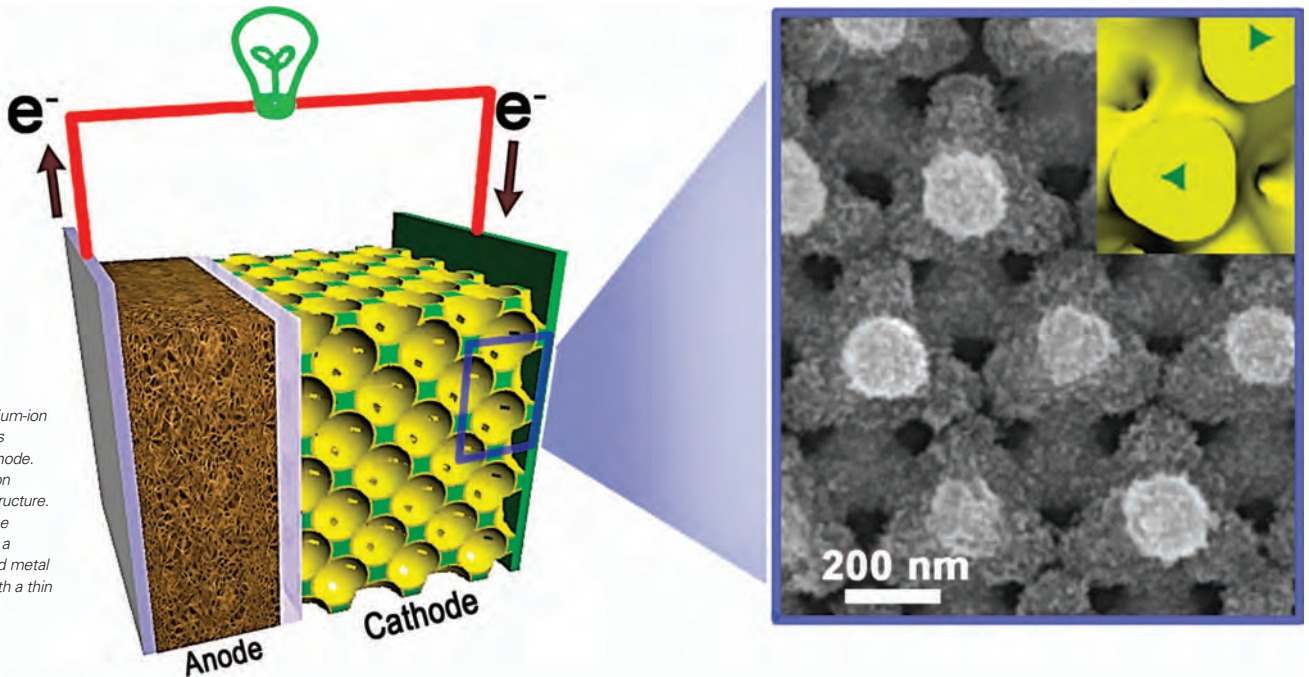
**Joshua Kacher**, Ph.D. student in Ian Robertson's group – "Development and application of 4D electron microscopy for defect studies"

**Rui Zhang**, Ph.D. student in Ken Schweizer's group – "Influence of particle shape on activated dynamics, elasticity and kinetic arrest in dense hard and sticky colloidal suspensions"

**Hua Lu**, Ph.D. student in Jianjun Cheng's group – "Ionic polypeptides with unusual helical stability and biomedical applications"



# Batteries charge very quickly and retain capacity, thanks to new structure



"On the left is a diagram of a lithium-ion battery constructed using Braun's nanostructured bicontinuous cathode. On the right is a scanning electron microscope image of the nanostructure. The inset shows the details of the nanostructure, which consists of a three-dimensional nanostructured metal foam current collector coated with a thin layer of active material."

The batteries in Illinois professor Paul Braun's lab look like any others, but they pack a surprise inside. Braun's group developed a three-dimensional nanostructure for battery cathodes that allows for dramatically faster charging and discharging without sacrificing energy storage capacity. The researchers' findings were published in the March 20 online edition of the journal *Nature Nanotechnology*.

Aside from quick-charge consumer electronics, batteries that can store a lot of energy, release it fast and recharge quickly are desirable for electric vehicles, medical devices, lasers and military applications.

"This system that we have gives you capacitor-like power with battery-like energy," said Braun. "Most capacitors store very little energy. They can release it very fast, but they can't hold much. Most batteries store a reasonably large amount of energy, but they can't provide or receive energy rapidly. This does both." The performance of typical lithium-ion (Li-ion) or nickel metal hydride (NiMH) rechargeable batteries degrades significantly when they are rapidly charged or discharged.

Making the active material in the battery a thin film allows for very fast charging and discharging, but reduces the capacity to nearly zero because the active material lacks volume to store energy. Braun's group wraps a thin film into a three-dimensional structure, achieving both high active volume (high capacity) and large current. They have demonstrated battery electrodes that can charge or discharge in a few seconds, 10 to 100 times faster than equivalent bulk electrodes, yet can perform normally in existing devices.

This kind of performance could lead to phones that charge in seconds or laptops that charge in minutes, as well as high-power lasers and defibrillators that don't need time to power up before or between pulses. Braun is particularly optimistic for the batteries' potential in electric vehicles. Battery life and recharging time are major limitations of electric vehicles. Long-distance road trips can be their own form of start-and-stop driving if the battery only lasts for 100 miles and then requires an hour to recharge.

"If you had the ability to charge rapidly, instead of taking hours to charge the vehicle you could potentially have vehicles that would charge in similar times as needed to refuel a car with gasoline," Braun said. "If you had five-minute charge capability, you would think of this the same way you do an internal combustion engine. You would just pull up to a charging station and fill up." All of the processes the group used are also used at large scales in industry so the technique could be scaled up for manufacturing.

The key to the group's novel 3-D structure is self-assembly. They begin by coating a surface with tiny spheres, packing them tightly together to form a lattice. Trying to create such a uniform lattice by other means is time-consuming and impractical, but the inexpensive spheres settle into place automatically.

Then the researchers fill the space between and around the spheres with metal. The spheres are melted or dissolved, leaving a porous 3-D metal scaffolding, like a sponge. Then a process called electropolishing uniformly

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## MatSE Alumni Board welcomes Joyce Yamamoto

Joyce Yamamoto (BS Cer '84) is a newly elected member of the Materials Science and Engineering Alumni Board. She is a Senior Principal Scientist at Medtronic's Cardiac Rhythm and Disease Management, Energy and Component Center in Brooklyn Center, Minnesota.

Yamamoto received her M.S. in ceramic science and engineering (1986) and Ph.D. in solid state science (1990) from the Pennsylvania State University. She was awarded a joint postdoctoral fellowship from the National Science Foundation and the Science and Technology Agency of Japan at the National Institute for Research in Inorganic Materials in Tsukuba, Japan. She was a visiting scientist at Mitsui Mining & Smelting Co. Central Research and Development Center in Saitama, Japan, for two years. Yamamoto worked as a Research Associate in the Materials Science and Engineering Department at Cornell University before joining Motorola. She worked at Motorola's Ceramic Technology Research Laboratory as a Staff Scientist and at Motorola's Flat Panel Display Division and Advanced Display Technologies Laboratory as a Principal Scientist.

At Medtronic she has specialized in hermetic encasement technologies for a broad range of Medtronic implantable medical devices. She is currently leading a cross-functional, cross-business unit program to develop the next generation hermetic encasement component technology. This work has required establishing alliances and partnerships with external suppliers, academic institutions and national laboratories. She also participates in strategic planning, technology scouting activities and helped initiate a technology roadmapping program to ensure technology focus and funding align and support Medtronic's future product pipeline.

She has 21 publications in peer reviewed journals and has made over 20 technical presentations in national and international conferences, including a keynote address at the IMAPS Ceramic Interconnect and Ceramic Microsystems Technologies conference in 2006. She has 13 issued US and Japanese patents and numerous patent applications. She has served on various committees for the Electronics Division of the American Ceramic Society and National Science Foundation and as a technical reviewer for the Optical Society of America. She has volunteered in the STEPS camp at the University of St. Thomas, St. Paul, MN, which aims to encourage middle school girls to pursue a career in engineering.

**If you would like to be considered for membership on the MatSE Alumni Board, please contact Cindy Brya at 217-333-8312, [brya@illinois.edu](mailto:brya@illinois.edu). Meetings are held on campus twice a year.**

**FOR EVERY \$1  
THE STATE SPENDS  
ON THE UNIVERSITY,  
WE GENERATE  
\$17 BACK  
INTO THE ECONOMY!**

**DID YOU KNOW? ■ Illinois has 20 Nobel Laureates and 15 Pulitzer Prize winners. ■ Illinois is home to the largest library at a public institution in the nation. ■ YouTube and the LED were born at Illinois and continue to impact our world. ■ Illinois graduates were ranked in the top 3 in the nation by corporate recruiters. ■ Illinois is building the fastest computer in the world. ■ Illinois students contribute more than 78,000 community volunteer hours annually. ■ IllinoisVENTURES has funded 35 companies based on Illinois technologies. ■ Annually more than 2.5 million Illinoisans benefit from our educational extension programs. ■ The University's state appropriation is below 1970 levels – and yet it serves 28,000 more students. ■ STUDENTS AND FAMILIES CONTRIBUTE MORE TO THE UNIVERSITY THAN THE STATE! **WHAT CAN I DO?****

**Advocate for higher education! Write your legislator, email your newspaper and do your part to tell our story. Join Illinois Connection, the grassroots advocacy network of the University of Illinois Alumni Association at [www.illinoisconnection.org](http://www.illinoisconnection.org), call us at 800-524-1420, or find us on Facebook or Twitter @ICAdvocates. UNIVERSITY OF ILLINOIS ALUMNI ASSOCIATION  
UNIVERSITY OF ILLINOIS ALUMNI ASSOCIATION | 601 SOUTH LINCOLN AVENUE, URBANA, IL 61801 | 800-524-1420 | [ILLINOISCONNECTION@UIILLINOIS.EDU](mailto:ILLINOISCONNECTION@UIILLINOIS.EDU)**

## Rogers elected to the National Academy of Engineering



John Rogers, the Lee J. Flory-Founder Chair in Engineering Innovation at Illinois, is among the 68 new members elected to the National Academy of Engineering.

“This is a significant recognition and prestigious honor for one of our distinguished faculty,” said Ilesanmi Adesida, the dean of the College of Engineering and member of the NAE. “Several of our alumni are among the new NAE members—a reminder of the impact our college and this university has on the world.”

Rogers was cited for his novel electronic and optoelectronic devices and systems. Renowned for his pioneering work in flexible electronics, Rogers combines soft, stretchable materials with micro- and nanoscale electronic components to create classes of devices with a wide range of practical applications. His most recent work has produced devices from biocompatible sensor arrays to implantable LEDs to eye-inspired cameras to stretchable integrated circuits.

After earning his doctorate from MIT in 1995, Rogers was a Junior Fellow in the Harvard University Society of Fellows. In 1997, he joined Bell Laboratories as a member of technical staff, and later, director of the Condensed Matter Physics Research Department. He joined the Illinois faculty in January 2003 and is currently affiliated with the Beckman Institute and the Frederick Seitz Materials Research Laboratory, as well as the Departments of Electrical and Computer Engineering, Mechanical Science and Engineering and Chemistry. He also serves as director of the Center for Nanoscale Chemical-Electrical-Mechanical Manufacturing Systems (Nano-CEMMS) at Illinois.

He has written more than 300 published papers and holds more than 80 patents. Among his many honors, he has been awarded a MacArthur Fellowship and has been elected a fellow of the Institute for Electrical and Electronics Engineers, the American Physical Society, the Materials Research Society, and the American Association for the Advancement of Science.

Election to the NAE is one of the highest professional honors an engineer can garner. The 2,290 members and 202 foreign associates are an elite group distinguished by their outstanding contributions to the fields of technology and engineering.

*-Engineering Communications Office*

## Jim Economy becomes Emeritus Professor

Jim Economy officially retired from the University of Illinois on January 31. However, the emeritus professor has not stopped doing what he loves best: his research.

Economy joined the University of Illinois as Professor and Head of the Materials Science and Engineering (MatSE) Department in 1989. He had worked on the Illinois campus from 1954 to 1956, as a postdoc in the Chemistry Department. “It was a pivotal period because it spelled the end of the Rubber Reserve Program at Illinois...in the country, in fact,” Economy said. Research had just started on high temperature polymers. In 1956 he joined Allied Chemical in Tonawanda, New York, and headed up a research group on the newly emerging field of polyolefins.

When Allied Chemical moved to New Jersey in 1960, Economy transferred to the Carborundum Company. He began as head of chemical research and eventually led all of the company’s research areas. His main responsibility was to develop new products that would move the company from its focus on traditional materials. From 1965 to 1972, he developed more than 20 new materials with commercial potential and brought a number of them to the marketplace (at least four of these are still available today). When Carborundum began to sharply reduce its research funding, Economy moved to IBM to serve as director of polymer research at the San Jose Research Laboratory. By 1979 his research group at IBM had grown from 25 to 60 people. “By 1981, my group was beginning to transfer two new materials each year into the operating divisions, eventually totaling 18 new materials,” he said.

Economy’s research at IBM was gaining the notice of faculty and administrators from the University of Illinois. He had served on a government panel to investigate building up materials programs in the U.S. Plus, “I had an interest in getting involved with the educational programs in materials,” Economy said. In 1988, the University of Illinois offered him the position of Head of the MatSE Department, and he accepted.

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*Department Head David Cahill presents Jim Economy with a certificate from the Board of Trustees recognizing his emeritus status.*



## Department News

**Shen Dillon** is among 65 scientists from across the nation selected for five-year awards under the Department of Energy Office of Science's Early Career Research Program. The five-year awards are designed to bolster the nation's scientific workforce by providing support to exceptional researchers during the crucial early career years, when many scientists do their most formative work. Awardees were selected from a pool of about 1,150 university- and national laboratory-based applicants. Selection was based on peer review by outside scientific experts. The title of Dillon's proposal was "In-Situ TEM Observations of Degradation Mechanisms in Next-Generation High-Energy Density Lithium-Ion Battery Systems."

**Steve Granick** has been selected to present one of the two Langmuir Lectures for the ACS Division of Colloid and Surface Chemistry. The Langmuir Lectures are presented during the fall national meeting of the American Chemical Society.

**Jennifer Lewis** has been selected a Fellow of the Materials Research Society. The title of MRS Fellow honors those MRS members who are notable for their distinguished research accomplishments and their outstanding contributions to the advancement of materials research, world-wide.

**Dallas Trinkle** was named a recipient of one of the 2011 Xerox Awards for Faculty Research. The awards are presented by the College of Engineering.

**Dennis Readey** received the Charles S. Barrett Silver Medal from the Rocky Mountain Chapter of ASM. The medal is presented to individuals whose contributions to the science of metallurgy most exemplify the efforts and career achievements made by Dr. Barrett. In April, Readey presented the 2010-2011 Barrett Award Lecture in Colorado.

**Hefei Hu**, a Ph.D. student in Jim Zuo's group, has been selected to receive a 2011 Distinguished Scholar Award from the Microanalysis Society for his paper "Nanostructure of the Iron Chalcogenide Superconductor  $\text{Fe}_{1+y}\text{Te}_x\text{Se}_{1-x}$ ."

**Rannesh Lokesh**, Ph.D. student co-advised by Pascal Bellon and Robert Averback, was selected for Outstanding Poster in the Microstructural Processes in Irradiated Materials (MPIM) symposium at the TMS 2011 conference. The poster was titled "Nanoscale precipitation in Cu-TiB<sub>2</sub> thin films under ion irradiation."

**Rong Tong** (PhD MatSE '10) won the 2011 AkzoNobel Award for Outstanding Graduate Research in Polymer Chemistry. An award symposium for Rong Tong will be held at the fall meeting of the American Chemical Society in Denver. His Ph.D. advisor at the University of Illinois was Jianjun Cheng.

**Nhon Vo**, Ph.D. student co-advised by Pascal Bellon and Robert Averback, received the Gold Award from the Materials Research Society during the society's fall meeting in Boston. MRS Graduate Student Awards are intended to honor and encourage graduate students whose academic achievements and current materials research display a high level of excellence and distinction. The title of his presentation was "Nanocrystalline Materials in Extreme Conditions."

The poster "Direct-Write Assembly of 3D Microperiodic Hydrogel Scaffolds for Human Embryonic Stem Cell Culture" received first prize (\$1,000) at the 2010 International Conference on Biofabrication held in Philadelphia last October. Authors included **Lucas Osterbur**, Ph.D. student in Jennifer Lewis' group, postdoc **Scott Slimmer**, **Jennifer Lewis**, **Jianjun Cheng**, and **Fei Wang** (Cell & Developmental Biology).

**Cassandra Kingsbury** (MSE 308), **Damon Herbert** (MSE 405) and **Lito De La Rama** (MSE 462) were selected as the first group of Racheff Teaching Fellows for the spring 2011 semester.

**Zachary Jones**, Ph.D. student in Trudy Kriven's group, and **Amanda Emmett**, Ph.D. student in Nancy Sottos' group, were married at the Church of the Immaculate Conception in Arnold, MO, on January 8, 2011.

**James Young** won 1st place in the physical sciences category of the annual DOE undergraduate student research competition (SERCh). The competition was held at Argonne National Laboratory last November.

**Alicia Cintora**, freshman in MatSE, received the Engineering Council Outstanding Student Contribution Scholarship. She is the freshman secretary for the Society of Hispanic Professional Engineering (SHPE). She plans to concentrate in polymers and hopes to one day work for NASA.

**Jonathan Naber**, senior in MatSE, received the Lisle Abbott Rose Award and the Wakeland Undergraduate Leadership Award from the College of Engineering. The Rose Award is given to a senior who most nearly approaches the ideal of technical excellence combined with cultural breadth, depth, and sensitivity. The Wakeland Award is given to a student who has demonstrated outstanding leadership accomplishments. He was also named a Knight of St. Patrick.



Shen Dillon



Dallas Trinkle



Charles Tucker III, Associate Dean for Undergraduate Programs in Engineering, and Alicia Cintora

## Graduate student uses research knowledge to launch start-up company



*SilverScreen, Inc. founders Nihal and Zeba Parkar*

Not many students leave the University of Illinois with a degree and their own start-up company. As many of our alumni readers can attest, start-up companies require a lot of dedication, business acumen, and let's face it, money. Luckily for students at the University of Illinois, programs exist to help aspiring student entrepreneurs turn their ideas into real businesses.

Zeba Parkar, a Ph.D. student in Professor Jim Economy's group, is simultaneously completing her doctoral work while launching her new company SilverScreen, Inc. The company's product, called Milkshield, has the potential to revolutionize the dairy industry in developing countries. "Two years ago when my dad (Dr. Abdul Samad, a veterinary researcher) was visiting me from India, we were discussing the water purification research we do in our research group," Zeba Parkar said. "We came to the conclusion that some of the antimicrobial materials could be modified for the preservation of milk." With Professor Economy's guidance and support, SilverScreen was begun.

Milkshield can preserve milk against spoilage without refrigeration. Milkshield is a low-cost material that acts through contact. It is a small insert that is simply immersed in milk to inhibit the activity of microorganisms. This makes Milkshield an affordable alternative for small subsistence farmers in developing countries. Milkshield will allow the dairy industry to cut refrigeration costs by transporting and storing milk at relatively higher temperatures. It also has the potential to extend the shelf-life of pasteurized milk.

Nihal Parkar, Zeba's husband and partner in SilverScreen, recently received an MS in Chemical Engineering from the University of Illinois at Chicago. Both Nihal and Zeba received their undergraduate degrees at the Institute of Chemical Technology in Mumbai, India. The couple has been working with the University of Illinois' Academy on Entrepreneurial Leadership and Illinois Launch to secure funding for their business through grants and venture capital. "Illinois Launch has provided nurturing 360-degree mentoring," Zeba said, "where they guide us through various aspects involved in technology commercialization and networking with investors." The University of Illinois College of Law conducts a patent clinic which provided them invaluable assistance by drafting a patent application for the technology.

Professor Jim Economy and Dr. Abdul Samad, founder of Infovet in India, are advisors for SilverScreen. The start-up has two business majors helping with SilverScreen's business plan and taking care of finances. SilverScreen is housed in the EnterpriseWorks incubator at the University of Illinois Research Park.

In February, Zeba was named one of three finalists for the \$30,000 Lemelson MIT-Illinois Student Prize, awarded to a student who has demonstrated remarkable inventiveness and innovation. Zeba will complete her Ph.D. at the end of this summer and join 3M's Corporate Research Lab in Minnesota. Nihal will be going to law school at the University of Minnesota. Zeba expects it will take around two more years to scale up manufacturing and meet regulatory requirements before Milkshield can be commercially released. "This has been a great learning experience," she said. "I have learned so much about business in the last four months." For more information on SilverScreen, go to the company's website [www.milkshield.com](http://www.milkshield.com).



*Intern Zehra Jaffery, a senior in MatSE, works in the SilverScreen laboratory.*



## EOH defines the future

“Define the Future” was the theme for the 2011 Engineering Open House (EOH) at the University of Illinois, held March 11-12. Visitors of all ages converged on campus to see and experience the technological achievements of students in the College of Engineering. This is the largest student-run event at the University of Illinois with over 20,000 visitors each year.

The Keramos EOH exhibit “Freaky Non-Newtonian Fluids” won the second place “Just for the fun of it” hands-on learning award. It is an exhibitor award judged by approximately 30 individuals consisting of graduate students, faculty and alumni. Sheryl Tipton (BS Met ‘80) returned to campus to serve as an EOH judge.



Visitors have fun playing with Non-Newtonian fluids and learning about their properties at the Keramos exhibit.



Michael Nauheimer uses his hand to mix up a batch of goop for the Non-Newtonian fluids exhibit.



Rui Wang and Lucas Raleigh talk to a visitor about the evolution of light. The Material Advantage exhibit showed how light can be used in lasers, fiber optics, liquid crystals, and mood detectors.



Stephen House, Dan Heinzel (2010-2011 President), and Allen Hall demonstrate the effects of a vacuum. Not pictured: AVS members Yiming, Liu (visiting student, Beijing, China) and Kelly Henderson. Photo courtesy of librarian Betsy Su.

## AVS student chapter wraps up a busy year

The University of Illinois student chapter of the American Vacuum Society visited Fermi National Accelerator Laboratory in Batavia, IL, last fall. The students talked with two materials scientists and toured the facilities. Dr. Cooley of Materials R&D described the method to produce the high power superconducting electromagnets for beam quadrupole and dipoles used in the Tevatron and LHC accelerators as well as new linear-collider sections used in a proposed meson collider project. Dr. Pla-Dalmou discussed die-molecule enhanced polystyrene scintillation filaments for use in ionizing radiation detectors as well as ionized-gas filament grid detectors which were being tested for defects in the detector laboratory. Students also learned about the many uses of particle accelerators which include cancer-therapies and material enhancement through radiation modification.

Also, this school year the Illinois student chapter of the AVS tried something new—their first ever community science outreach at the Champaign Public Library’s after-school program “TeenSpace.” AVS members performed a number of experiments and discussed the nature of vacuums and pressure with ~20 teens. The experiments included experiments similar to those performed at Engineering Open House: “Peeps in Space,” balloon expansion, boiling and freezing of water through the triple-point, expansion of shaving cream, etc. The demo was possible with the help of Doug Jeffers (MRL staff) and organized by Joanne Manaster (JoanneLovesScience.Com) and Allen Hall (pictured, AVS student member). The AVS student chapter hopes to continue its community outreach to students. If you know of anyone who would like to have the AVS perform a demo for student groups, please contact [illinoisavs@gmail.com](mailto:illinoisavs@gmail.com).



AVS members visit the Fermi National Accelerator Laboratory.



## Jim Economy, continued

The MatSE Department was still in its early stages, having been established in 1987 with the merger of the Department of Ceramic Engineering and the Department of Metallurgical and Mining Engineering.

“One of the first things I had to do as Department Head was to get a curriculum put together that would integrate the four areas of concentration—metals, ceramics, polymers, electronic materials,” Economy said. Over the next few years, he hired around 10 faculty members, bringing a new breadth of expertise to the department. Most remain key faculty members in the department today. He also hired staff including MatSE’s business manager and assistant to the head, Jay Menacher, and alumni coordinator, Cindy Brya.

The new MatSE curriculum started in the 1991-92 academic year. In the new curriculum, MatSE students could specialize in a given material while learning about the broad spectrum of materials. Economy developed and taught two courses at the University of Illinois: an undergraduate materials synthesis course and a graduate course on polymer synthesis. The department began offering scholarships to incoming freshmen and actively recruiting top students, which resulted in an increase in the quality and number of undergraduates enrolled in MatSE. The Kiln House was renovated into state-of-the-art undergraduate laboratories. A new alumni group was established, the MatSE Alumni Association. During Economy’s tenure as Head, the materials program at Illinois became one of the top three programs in the nation, which it continues to be today.

“The department’s greatest strengths,” Economy said, “are the high quality of research, high quality of teaching, and generous support of our alumni.” Donations from Don Hamer, Ron Morris, Hans Thurnauer, and Don Burnett were critical to building up the department. Alumni Board members Ray Capek, Ken Kuna, and Howard Friedman, to name a few, helped the department with new enterprises over the years.

After serving as head for 11 years, Economy decided it was time to step down. Almost immediately he took the initiative to organize a successful submission for an NSF Science and Technology Center on Advanced Materials for Water Purification. He subsequently headed the program for the first two years during its formative period. “The goal of the center,” Economy said, “was to develop revolutionary materials and systems for safely and economically purifying water.” The award was worth \$4 million per year for 10 years.

To the outside observer, Economy’s research group definitely has an entrepreneurial bent. All of his students are currently involved in some way with starting up business activities. [One of his students, Zeba Parkar, is featured in this issue.] Economy is a strong proponent of the Illinois Launch program at the University. “Our graduates have a unique potential, as opposed to any other students in the College of Engineering, to pursue start-ups because of the critical role of new materials development in start-up companies,” he said. Economy recently discovered a thermosetting polyester which seems to solve a host of problems. He also continues research into advanced materials for water and air purification. These research activities have led to several new companies established jointly by Economy and his students.

He is a member of the National Academy of Engineering and a fellow of Polymer Materials Science and Engineering and the American Academy of Arts and Sciences. In 2007 he was named a Founder Professor in the College of Engineering at the University of Illinois. He has 100 U.S. patents with many foreign equivalents, and his list of publications numbers close to 250.

In retirement, he plans to maintain an active research group but to no longer teach. Scottish author James Barrie once said, “Nothing is really work unless you would rather be doing something else.” For Jim Economy, there is nothing he would rather be doing than his research. He will give new meaning to the word “retirement.”

## Keramos BBQ

Keramos held a BBQ for students and professors on Saturday, April 16, at the Illini Groves. Everyone had a good time and enjoyed hamburgers and hotdogs despite the colder than average temperatures. In the 2010-2011 academic year, Keramos began a mentoring program between underclassmen and upperclassmen. The pilot program was a success and Keramos plans to continue mentoring next year.



Prof. John Abelson, Xiaolin Zhang, Divija Alluri, and Prof. Shen Dillon enjoy the Keramos BBQ. Zhang and Alluri are co-presidents of the Keramos honor society.



Students stay close to the grill at the Illini Groves to keep warm.



## Class Notes

**Russell Bolton** (BS Cer '55, MS Cer '59, PhD Cer '68) is Vice President of R&D for Sensor Scientific in Fairfield, NJ. Bolton's Ph.D. thesis was the basis of major developments in ceramic capacitors worldwide. It enabled the growth of the multilayer ceramic capacitor industry and the development of new products, including cell phones.

**Hugo Toscano** (BS Met '57) is president of EPC Toscano Ltd. in Bogota, Colombia.

**Ron Sprague** (BS Mining '60) is retired and living in Tucson, AZ. He had a distinguished career in the U.S. Army and retired as a full colonel after 23 years of service. He worked as a military attache overseas and served on the faculty of the Army War College. He has an MBA with an emphasis in international economics and foreign relations. Following his military career, he spent 15 years in the financial industry at Merrill Lynch.

**Jim Barnett** (BS Cer '67) visited campus on May 17. He had lunch with his thesis advisor, Professor Clif Bergeron, and received his plaque for the 2010 Distinguished Alumni Award.



Jim Barnett

**Sanak Mishra** (MS Met '70, PhD Met '73) received the Prof. Jai Krishna Memorial Award of the Indian National Academy of Engineering (INAE) at its annual meeting held in Vizag on December 10, 2010. The award is given to "an engineer or technologist of high achievement and standing" and is one of the top three honors of the Academy.

**Robert Shull** (MS Met '73, PhD Met '76) was recently named a Fellow of NIST. He joins 35 other such individuals, out of 3,000 employees, at the National Institute of Standards and Technology who are part of an elite cadre of senior professional scientists within the government. The citation noted the contributions he has made during his 30 year career at NIST in the areas of rapid solidification, phase equilibria, superconductivity, magnetic refrigeration, magnetic exchange bias, nanotechnology, and magnetic nanocomposites.

**Peir Chu** (PhD Cer '92) is a managing attorney for IP Centrix in Portland, OR. He received his JD from Lewis and Clark College.

**James Dudek** (BS Met '96) became plant manager of U.S. Steel's Clariton Plant in November. He oversees the coking and coal chemical operations at the company's largest coke making facility located near Pittsburgh. Dudek began his U.S. Steel career in 1996 as a management associate in

quality assurance at the company's Gary Works in Gary, IN. He advanced first through multiple positions in quality assurance and then roles of increasing management responsibility in several areas of Gary's finishing operations before being named division manager-sheet products at the plant in July 2007 and division manager-hot rolling in November 2007. He and his wife and son will relocate to the Pittsburgh area.

**Paul Osenar** (PhD MatSE '98) has been named President and Chief Executive Officer of Protonex Technology Corporation, a leading provider of advanced fuel cell power systems. Osenar is a co-founder of Protonex and has served as its Chief Technology Officer since 2004 and on the Company's Board of Directors since inception. Prior to Protonex, Osenar was Project Scientist at Foster-Miller working on novel proton exchange membranes for fuel cells and several other advanced technology programs. In co-founding Protonex, he played a key role in identifying both the technical strategy and market focus of the Company. Since its inception, Osenar has played a key role in company financings, business development, sales and resource acquisition and allocation.



Paul Osenar

**David Honecker** (BS MatSE '01) and his wife Sharon (PhD ME, UIUC '05) welcomed their firstborn son, Andrew, on March 25. Honecker is a Senior Engineer in Product Development for Climax Molybdenum in Sahuarita, Arizona.

**Andy Powell** (BS MatSE '01) and his wife Kate welcomed the birth of their son Jack on October 17, 2010. Powell is currently a senior engineer in Materials Behavior at GE Aviation in Cincinnati.

**Sreenivas Jayaraman** (PhD MatSE '05) is a group leader/manufacturing engineering for First Solar in Perrysburg, OH.

**Chloe Miles** (BS MatSE '07) will marry James Ellis in August 2011 in Morristown, NJ. She is a product manager for Sabert Corporation, and her fiancé is employed with Packaging Corp. of America.

**Jake Chen** (BS MatSE '09) founded Musefy.com, "a virtual representation of the entire local musician community, thus providing ways to branch out and meet new characters that you would normally happen through mutual friends or sheer luck."



Andy Powell and his son Jack



## Companies invited to network with students

Several teams of student leaders in the College of Engineering are working with Engineering Career Services at the University of Illinois to host a series of new recruiting events during Fall 2011. The night before the first day of the Engineering Career Services Career Fair (scheduled for September 7 and 8), companies are invited to participate in a more informal networking event with targeted groups of students in the College of Engineering departments.

These events will be held on the evening of Tuesday, September 6, in various locations. This is a great opportunity to interact more personally with students in specific areas who are interested in working with your company.

One or two of your company representatives can attend the events that fit your talent needs, which will involve some form of networking activity followed by a networking reception. There is a cost of \$300 per company per event to attend. If your company is interested in participating in the networking event, please contact Sarah Zehr, Director of Engineering Career Services, at [szehr@illinois.edu](mailto:szehr@illinois.edu) or 217-333-1960.



## MatSE celebrates graduation

The department congratulated graduates and presented them with MatSE lapel pins at a special luncheon for graduates and families on May 15. This spring there were 48 students who received their B.S. degree in Materials Science and Engineering.



# In Memoriam

## Howard Snodgrass (BS Cer '37)

Howard Snodgrass died December 22, 2010. He proudly served his country in the Navy during WWII. After college, he worked at Kelvinator and retired from Kent County Health Department as a supervisor. He enjoyed many things including photography, working in his yard, traveling and playing his harmonica, and was always "tinkering" with something. He is survived by his wife of 67 years, Anita, daughter Marti, and grandchildren.

## John Teeter (BS Cer '38)

John Teeter died December 14, 2010, in Hendersonville, NC. He received his early schooling in the Mt. Carroll Public Schools and graduated from the University of Illinois in 1938, where he had studied under Prof. Andrews. For 44 years Teeter was employed by the Thomas C. Thompson specialty glass manufacturing business in Highland Park, Illinois. He served as President for many years and retired as a majority owner. He was preceded in death by his wife of 68 years, Jeanette. Most of his married life was spent in Deerfield, IL, and following retirement they spent their years in Hendersonville, NC and Naples, FL. Teeter was an avid camper, fisherman, bowler, and golfer. He is survived by a daughter Diane, son Frederick, and several grandchildren and great-grandchildren.

## Eugene Bodian (BS Cer '44)

Eugene Bodian died July 3, 2010, in Great Neck, NY. He was Chief of Dermatology at North Shore University Hospital for 25 years.

## John Refieuna (BS Mining '46)

John Refieuna died October 28, 2010. He worked for Orient Coal Company at Orient II Mine and designed the Waltonville Mine and then worked there. He attended Our Lady of Mount Carmel Catholic Church in Herrin. He was an avid ballroom dancer with his partner Mary. He enjoyed hunting, fishing and gardening. He is survived by a son and two daughters.

## Thomas Lunak (BS Cer '48)

Thomas Lunak died January 31, 2011. He was a retired lieutenant commander, USNR, and a member emeritus of the American Ceramic Society. He was operations manager and sales manager for Eisenmann Corporation until his retirement in 1991. He leaves behind his wife of 62 years, Lorraine, of Palatine, IL, and three children Nancy, Janice, and Thomas Jr.

## Charles Cook Jr. (BS Met '44, MS Met '48)

Charles Cook died March 19, 2011. He was a veteran of the U.S. Army, serving in the Corps of Engineers in WWII and the Korean Conflict. He was a metallurgist at TRW in Cleveland, OH, for 28 years. He is survived by his wife of 64 years, Ruth, of North Myrtle Beach, SC, three daughters, seven grandchildren, and eight grandchildren.

## William "Andy" Anderson (BS Met '50)

William "Andy" Anderson died September 28, 2010. During his professional career, he was employed with Bethlehem Steel, Pratt and Whitney, Sperry Rand, Rockwell International, HMT Technology, and Portsmouth Naval Shipyard. He was experienced in engineering management, project engineering, design analysis, failure analysis, materials selection, and experimental research. He retired the first time in 1985 to fulfill his dream of joining the Peace Corps. He met his wife Trudy in 1987 while both were Peace Corps volunteers in Morocco. They were married for 22 years and traveled the world together. Following their Peace Corps service, the couple worked for Habitat for Humanity in Africa. Andy returned to work as an engineer but continued to be active in several non-profit organizations. He finally retired at the age of 84 from Portsmouth Naval Shipyard. He and Trudy were committed to The Hunger Project, a global movement for the sustainable end of chronic hunger in the world. Andy enjoyed gardening and handyman work and making the world a better place.



## John MacKenzie (BS Met '58)

John MacKenzie died January 20, 2011, in Columbus, OH. He was a retired engineer from Superior Die Tool and Machine Company. He received his MBA from Ball State University. He was a member of St. John's Lutheran Church in Grove City, OH, and taught Sunday School for over 40 years. Survivors include his wife of 41 years, Averil (Olsen) and four children, Cynthia, Donna, John, and David.

## Timothy Nosbisch (BS Cer '73)

Timothy Nosbisch died November 8, 2010, in Naperville, IL. He had been employed as a plant manager at ANH Refractories. Survivors include his wife Pam, daughters Katie and Laura, and granddaughter Zoey.

## Michael Boyle (BS Met '79)

Michael Boyle died on October 1, 2010, after a long battle with leukemia. Boyle graduated from the University of Illinois with his B.S. degree in Metallurgy in 1978. On September 22, 1979, he married his high school sweetheart Laurie Edmeier. They moved to Cleveland, OH, where he worked for Alcoa Aluminum. In 1980 they moved to southern California where he worked at Shultz Steel before taking a position at Forged Metals in Fontana where he eventually became the company CEO. He transferred to Forged Metals' sister company, Viking, in Verdi, NV, where he worked until retiring in 2007. Survivors include his wife Laurie, their daughter Jamie and son Michael.



## Terrence “Matt” Schroeder (BS MatSE '96)

Terrence “Matt” Schroeder died January 14, 2011, at his home in Moline, IL. He worked as a mechanical engineer at Nichols Aluminum in Davenport, IA. He was an avid fisherman and enjoyed the culinary arts. He was devoted to the Divine Mercy and loved helping various charities.

## Wendell Williams

Wendell Sterling Williams, 82, emeritus professor of physics, materials science and bioengineering and director emeritus of the Program on Ancient Technologies and Archaeological Materials at the University of Illinois, died November 20, 2010.

Williams attended Deep Springs College in California on full scholarship and graduated from Swarthmore College in Pennsylvania. At Swarthmore, he co-founded the Swarthmore Savoyards with his wife-to-be, Dorothy Watt, and as music director and conductor produced several Gilbert and Sullivan operettas.

After receiving his Ph.D. from Cornell University, Williams was a research physicist for Union Carbide Corporation, Cleveland, working on transition-metal carbides, nitrides and borides and leading a lab chorus, the Carbon 14. In 1967 Williams joined the Illinois faculty as associate professor, later professor, of physics, ceramic engineering and bioengineering. In 1986 he received the Chancellor’s Award for Excellence in Undergraduate Teaching and in 1987 won the Burlington Northern Award for Excellence in Teaching and Research. He also was honored as instructor of the year for three separate years by Alpha Epsilon Delta, undergraduate premedical society.

For several years Williams headed the university’s Program on Ancient Technologies and Archaeological Materials, which brought together faculty from across the campus to apply scientific techniques to the analysis of art and archaeological objects from Illinois and also from major museums.

On leaves from Illinois, he served as Energy Research Coordinator, 1974-75, and Section Head, Division of Materials Research, 1977-78, for the National Science Foundation, and directed a study of science and engineering education for the National Academy of Sciences. He also was a senior research visitor at Cambridge University, Oxford University and Imperial College, London.

Retiring from Illinois in 1987, he was appointed chairman of materials science and engineering at Case Western Reserve University, Cleveland. In his first year as chairman, he was chosen by students throughout

the campus for the university’s Carl Wittke Award for Distinguished Teaching. He retired from CWRU in 1995 and returned to Urbana. After his second “retirement” he taught at MIT and at New College, honors college of the University of South Florida. He was also an adjunct professor at SUNY Albany. During his long career, he supervised 56 graduate theses at Illinois and CWRU and published more than 100 research papers.

He was a consultant for the National Science Foundation, the National Research Council, the Department of Energy, Argonne National Laboratory, Oak Ridge National Laboratory, Sandia Laboratory, and the Nordson Corporation.

He was a fellow of the American Physical Society and the American Ceramic Society, councillor of the Materials Research Society, and past president of the Society for Physical Regulation in Biology and Medicine. For his scientific achievements, he was elected to the Cosmos Club, Washington, D.C.

He leaves his wife, Dorothy; daughters Jennifer and Laura. Donations in his memory may be made to Deep Springs College, Dyer, NV, or the Alzheimer’s Association.

## George Conlee

George Wilbur “Will” Conlee passed away December 4, 2010, in Holladay, Utah. He was 90 years old. Will was born on October 14, 1920, in Louder, IL. He fell in love with Grace Adele Tucker and married her in 1942 while a pharmacy student at the University of Illinois.

He then served in the Army in the South Pacific during World War II and was awarded the Bronze Star for his valor during combat. After the war, Will returned to his bride and remained married to her for 68 years until his death. They raised two sons, Tom and John Conlee, in Urbana-Champaign.

He worked for more than 40 years as a potter in the Ceramic Engineering Department at the University of Illinois in Urbana-Champaign.

He is survived by his wife, Grace, and son, John, of Salt Lake City, Utah. Memorials can be made to the St. Patrick’s Church Education Fund in Urbana.

## New Battery Technology, continued

etches away the surface of the scaffold to enlarge the pores and make an open framework. Finally, the researchers coat the frame with a thin film of the active material.

The result is a bicontinuous electrode structure with small interconnects, so the lithium ions can move rapidly; a thin-film active material, so the diffusion kinetics are rapid; and a metal framework with good electrical conductivity. The group demonstrated both NiMH and Li-ion batteries, but the structure is general, so any battery material that can be deposited on the metal frame could be used.

“We like that it’s very universal, so if someone comes up with a better battery chemistry, this concept applies,” said Braun. “This is not linked to one very specific kind of battery, but rather it’s a new paradigm in thinking about a battery in three dimensions for enhancing properties.”

The U.S. Army Research Laboratory and the Department of Energy supported this work. Visiting scholar Huigang Zhang and former graduate student Xindi Yu were co-authors of the paper.

*-University of Illinois News Bureau Editor’s Note: Braun plans to start a company this summer to commercialize this technology.*



## Illini reception in Ohio

MatSE is heading to the Buckeye State this fall! Alumni and friends are invited to join us for the University of Illinois Alumni Reception on Monday, October 17, from 5:30-7:00 p.m. in downtown Columbus. Complimentary hors d'oeuvres and beverages will be provided. Come for the evening and visit with Illinois alumni, faculty, and students attending the Materials Science & Technology Conference & Exhibition (MS&T'11).

For more details and to register, go to [www.matse.illinois.edu/events.html](http://www.matse.illinois.edu/events.html). If you have any questions, please contact Cindy Brya at 217-333-8312 or [brya@illinois.edu](mailto:brya@illinois.edu).

MS&T'11<sup>®</sup>



## Alumni give seminar on prosthetics



Joe (BS MatSE '00) and Casey (BS MatSE '00) Harmon returned to campus on April 29 to give a special seminar for MatSE undergraduates on the development and business of prosthetics. Joe is Associate Product Director for Depuy Orthopedics, and Casey is Senior Research Engineer II for Zimmer, Inc. They were visiting Champaign-Urbana to run the Illinois Marathon on April 30.

## Planning a trip to the area?

**The MatSE Department would love for you to share your experiences with our students, either in a seminar or class.**

**Please contact Cindy Brya, Coordinator Alumni Relations and Development 217-333-8312, [brya@illinois.edu](mailto:brya@illinois.edu).**



## Support the Future of MatSE and the University of Illinois

Brilliant Futures, the Campaign for the University of Illinois, is an ambitious undertaking to raise \$2.25 billion. The resources generated through the Campaign will ensure that Illinois continues to create a better world through our teaching, research and public engagement. Gifts to the campaign will provide more scholarships and fellowships, endow more faculty positions, improve programs and research and update facilities across the campus.

Brilliant Futures are what happens when you give someone a chance. When you make a gift, of any size, to the University of Illinois you create an endless ripple effect—one life brightening another, then another, and on for generations. Your gift can become something that is larger and more powerful than all of us. Campaign priorities include:

### Leadership for the 21st Century

Leadership is learned through excellent programs and experiences both inside and outside of the classroom. The campus is focused on enhancing students' intercultural, research, creative and experiential learning opportunities. The success of these programs will build on a great Illinois tradition of fostering innovative leadership.

### Enhance Academic Excellence

Attracting and retaining diverse, exceptional faculty drives our academic excellence, as do educational programs that attract excellent, ambitious, diverse students. We must also ensure the wise use of financial and other resources to gain the greatest impact.

### Pursue Knowledge and Breakthrough Innovation

Creating knowledge and innovative uses of existing knowledge are essential to the research mission of the institution. The campus must enable discoveries to occur in new and different ways.

### Foster a Transformative Learning Environment

A vibrant university fosters a vibrant, dynamic learning environment. Essential to this environment are world-class facilities, a culture of conservation and sustainability, the development of living/learning communities that augment the traditional classroom and a culture that embraces diversity across the campus.

### Ensure Greater Access to the Illinois Experience

We seek to improve access to the Illinois experience by increasing the diversity of the student population, providing additional merit- and need-based aid, and increasing the use of online learning alternatives.

To learn more about the Brilliant Futures campaign, visit [brilliantfutures.illinois.edu](http://brilliantfutures.illinois.edu)



THE CAMPAIGN FOR THE  
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**We want to hear from you!**

Send comments and letters to the editor to *MatSE News*, Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign, 201B MSEB, 1304 W. Green Street, Urbana, IL 61801 or email [brya@illinois.edu](mailto:brya@illinois.edu)

The screenshot shows the homepage of the Department of Materials Science and Engineering at the University of Illinois at Urbana-Champaign. The header features the department name and navigation links: Home, Current Students, Prospective Students, Faculty and Staff, News, Job Placement, Alumni, Support MATSE, and Quick Links. A large banner image shows a student working in a laboratory. Below the banner, there is a search bar and a 'Department News' section. The news section includes three articles: 'Lokesh wins outstanding poster at TMS', 'Stretchable balloon electronics get to the heart of cardiac medicine', and 'Tong receives ACS award'. A sidebar on the left contains the text: 'Our department of 23 faculty, 308 undergraduates, and 160 graduate students welcomes you. Established in 1867, we have a long tradition of excellence in teaching, research, and service.' At the bottom, there are several small images of people and a footer with contact information.

## New Look for MatSE

The MatSE Department will unveil a new website this summer. Check it out at [www.matse.illinois.edu](http://www.matse.illinois.edu). The website will be easier to navigate and include a mobile application. Here are just a few of the features for alumni (*with the corresponding links*):

- Take a trip down memory lane—Past issues of the alumni newsletter are available online, from the 1940s to the current issue. (*Alumni*)
- Find or post a job opening online (*Job Placement*)
- Make your donation to the department online (*Support MatSE*)
- Watch Prof. Paul Braun's interview with WGN-TV about faster charging batteries and read more MatSE news coverage (*News*)

In addition, we have a new LinkedIn Group called MatSE at Illinois. This is a networking group for alumni and students of the Department of Materials Science and Engineering at the University of Illinois. Join us at [www.linkedin.com](http://www.linkedin.com).