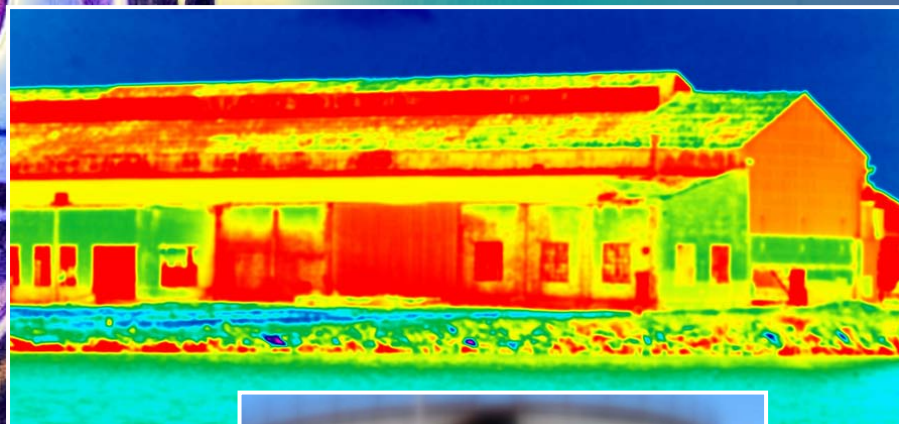


In this issue:

- Alumnus recognized for humanitarian work
- Rogers named Swanlund Chair
- 3D printing lab



Twice the Strain

Ferroelectric thin films' new and improved properties may lead to advances in thermal sensing and more.



Greetings from Urbana

MatSE Alumni News

Department of Materials
Science and Engineering

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A friend of mine, the late Prof. Mark Shannon, former director of the Center for Advanced Materials for the Purification of Water, was fond of quoting the curse “May you live in interesting times” whenever we dealt with a challenging problem in the Center. We certainly live in “interesting times” for public research universities: massive-open-online-courses promise to radically transform higher education; the sequester of federal spending is making the faculty and administrators nervous about research funding; and our increasing dependence on tuition and private giving for funding is changing the covenant between the citizens of states and their flagship land-grant universities. Be assured that throughout these interesting times, the manner in which we invest our time and resources will be guided by our focus on the students, alumni, faculty and staff that form our community.

Many highly accomplished members of our community have been recently recognized for their achievements. John Rogers was invested this past spring as a Swanlund Chair, the highest endowed title on the Urbana campus, in recognition of his groundbreaking research on flexible electronic devices that are revolutionizing electronics, solar-energy conversion, and medical diagnostics. Ismat Shah, Ph.D. Metallurgical Engineering 1986, was honored with the International Achievement Award by the campus for his humanitarian efforts for Pakistani and Afghan refugees displaced by natural disaster and war; his promotion of higher education in Pakistan; and for advancing the use of alternative energy sources in developing nations. Beverley Huss, B.S. Metallurgical Engineering 1982, received the College of Engineering Distinguished Alumni Award for her outstanding leadership in the medical device industry and her dedication to helping people who suffer from obesity and its related health issues.

In March, Prof. Ian Robertson resigned his appointment in our department to start a new chapter in his distinguished career as Dean of the College of Engineering at the University of Wisconsin at Madison. The department benefited greatly from his contributions to scholarship during his 30 year career and his wise leadership as head of the department from 2002-2009. He will be greatly missed and we wish him the best of luck in his new position.

In November, we celebrated the scientific legacy of Prof. Gert Ehrlich who passed away on August 10, 2012. We often talk about the unique culture of scholarship at the University of Illinois that values addressing important questions and carrying out research that will have lasting impact. Prof. Ehrlich epitomized those values and the department benefited hugely from his high standards and kind mentorship over a career of more than four decades (1968-2012) at Illinois.

Sincerely,

David Cahill
Willett Professor and Head

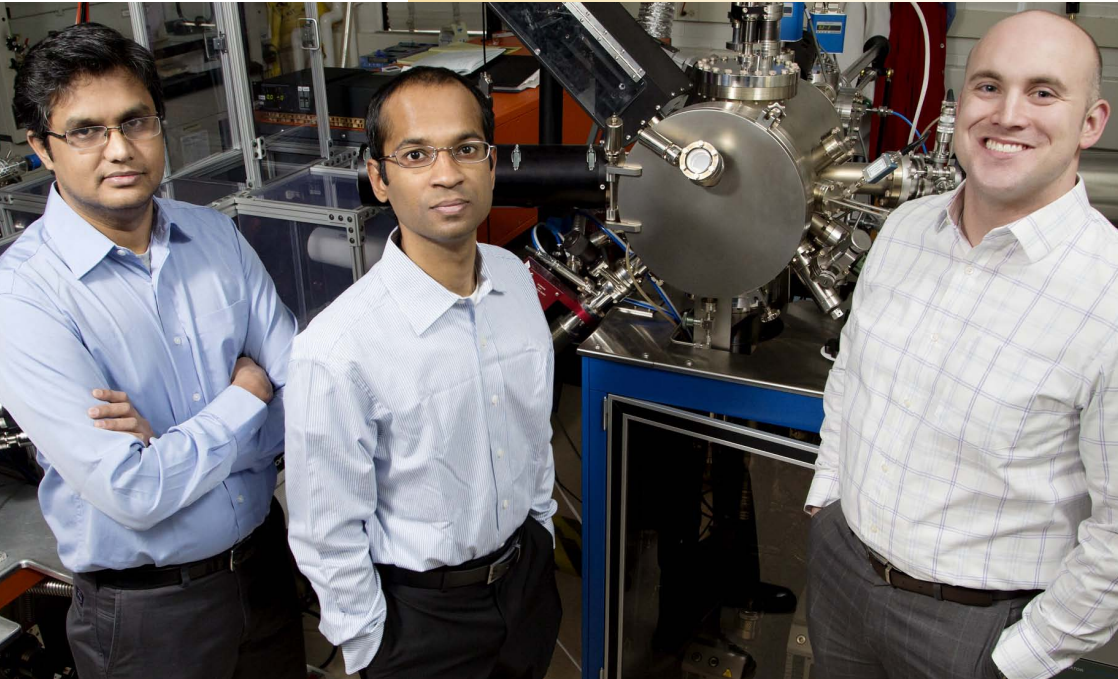
Researchers strain to improve electrical material and it's worth it

University of Illinois News Bureau

Like turning coal to diamond, adding pressure to an electrical material enhances its properties. University of Illinois at Urbana-Champaign researchers have devised a method of making ferroelectric thin films with twice the strain, resulting in exceptional performance.

Led by Lane Martin, the group published its results in the journal *Advanced Materials*.

Ferroelectric materials, metal oxides with special polarization properties, are used in a number of advanced electronics applications. When electricity is applied, they can switch their polarization, or the direction of their internal electric field, which makes them useful in devices such as computer memories and actuators. Ferroelectric materials are especially useful in aerospace applications because they are less susceptible to radiation than traditional semiconductors.



Professor Lane Martin, right, led the work with graduate student Karthik Jambunathan, center, and postdoctoral researcher Vengadesh Mangalam, left.

Strain in these materials can alter their properties and improve their performance. A lot of research in ferroelectric materials has focused on making strained thin films with alternating layers only a few nanometers thick of materials with slightly different crystal structures.

"It turns out that if you put pressure on certain types of materials, the properties completely change," Martin said. "In our case we administer pressure by straining or stretching thin versions of these materials like one would stretch plastic wrap to fit on a bowl. You can induce things that don't exist at ambient conditions; you can make phases and properties that don't exist."

The films are made of lead zirconate titanate (commonly called

PZT). The relative amounts of zirconium (Zr) and titanium (Ti) in the films determine the shape of the crystals. Traditionally, films of PZT have been made up of a single composition, grown on a substrate with a slightly different crystal structure to cause strain in the PZT. However, too much strain causes the PZT to revert to its original crystal structure. This limits researchers' ability to change the properties of these materials for better device performance.

The Illinois researchers overcame this limitation by gradually shifting the concentrations of Zr and Ti as they grew the thin films, incrementally changing the crystal structure. From layer to layer, the structures are very similar, yet the composition of the PZT at the top and bottom of the film is very different, transitioning from a PZT composition with 80 percent Zr to 80 percent Ti. This gradual change, instead of the usual layered approach, results in little localized strain but large overall strain.

"We have taken a material with similar mechanical properties to a dinner plate, the same kind of hardness, and effectively figured out a way to stretch that plate without breaking it," Martin said. "With our method, we've been able to extend our ability to strain these materials. We go to the nanoscale so we can pull on these films and dramatically change the shape, and that affects the properties."

Thanks to the large strain, the compositionally graded PZT films not only have improved properties, but also entirely new properties. Most notably, the films have a built-in electric field, called an intrinsic potential. This means that it can perform some functions without needing an external current or field applied to it. In addition, it means that the material has a preferred polarity, which opens the door for new applications.

"This sort of built-in field is very useful," said Karthik Jambunathan, a graduate student and co-author

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Shah honored for humanitarian efforts

S. Ismat Shah (pH Met '86) is the recipient of the Madhuri and Jagdish Sheth International Alumni Award for Exceptional Achievement. A native of Pakistan, Shah holds a joint appointment as professor in the Department of Materials Science and Engineering and the Department of Physics and Astronomy at the University of Delaware.

Established in 2000, the Madhuri and Jagdish Sheth International Alumni Award for Exceptional Achievement is awarded each year to one of the University's distinguished international alumni who has helped to better their own nation or the world through their contributions to government, humanity, science, art, or human welfare. Shah was honored for his humanitarian efforts in helping to raise funds and resources for Pakistani and Afghan refugees displaced by natural disaster and war; his promotion of higher education in Pakistan by building schools, providing equipment, delivering lectures and workshops; and advancing the use of alternative energy sources in developing nations from Eastern Europe to South Asia. The award also honored his long-standing commitment to promoting dialogue and fostering cross-cultural understanding between the Muslim community and other religious and social groups in Delaware, particularly after 9/11.

Shah organized the first Engineering Study Abroad program at the University of Delaware in 2001, to further his students' understanding of diverse cultural values. Under his leadership, students have visited Germany, Italy, Greece, Spain, France and Turkey. In 2011, while a Fulbright Scholar, he worked with the U.S. Embassy in Azerbaijan to coordinate community speaking engagements with local high school and college students.

At the University of Delaware, Shah is a Senior Policy Fellow, Center for Energy and Environment Policy, and a Founding Fellow of the Center for Science Ethics and Public Policy. His group has been involved in research in materials physics based on thin films and



President Easter presents Ismat Shah with the Sheth International Alumni Award

nanostructures for energy and environment applications. He has 6 patents and more than 180 publications in these areas. He has also been involved in collaborative research with universities in Turkey, Egypt, Pakistan, France, and Italy. Recent awards include Excellence in Teaching Award in the College of Engineering, University of Delaware (2008), Excellence in Teaching Award, University of Delaware (2011), and Mentorship Award, Society of Vacuum Coaters (2012).

President Robert Easter presented Shah with the award at the International Achievement Awards banquet on April 11. During his visit to campus, Shah gave the Sheth International Alumni Award Lecture, "Diseconomy of Neglect," met with MatSE graduate students, and participated in a panel discussion in the College of Education.

Huss receives award from College of Engineering



Beverly Huss and Interim Dean Michael Bragg

Beverly Huss (BS Met '82) has received the College of Engineering Alumni Award for Distinguished Service. A former Chief Executive Officer for Vibrynt, Inc., Huss received the award "for outstanding leadership in the medical device industry." After co-founding Vibrynt in 2006, a company dedicated to creating minimally invasive therapies for patients suffering from morbid obesity, she served as President and CEO until 2013. She has several patents in cardiovascular and obesity medical devices, including ones for an extendable guide wire and for an intravascular catheter. From 2001 to 2005, she served as President of Endovascular Solutions division and Vice President of Guidant. She was responsible for research and development, manufacturing, sales, marketing, finance, regulatory affairs, quality assurance, clinical affairs and human resources within Endovascular Solutions. She also held various Vice President posts – for Guidant's Canada and Latin America Operations, for Vascular Intervention Global Marketing and for the Stent Business Unit. Huss served as senior advisor to Pervasis Therapeutics, Inc., where she was a consultant. She was chairperson of the Silicon Valley American Heart Association and a director of the Santa Clara County Chapter of the American Heart Association. She has served on the Board of Directors for Dade Behring Holdings and Wright Medical Technology, Inc., and currently serves on the board of Ulthera. She previously held engineering positions at both Honeywell Defense Systems Division and Jones and Laughlin Steel. Huss received her master's degree in Technology Management from Pepperdine University in 1996. She is a member of the MatSE Senior Advisory Committee at the University of Illinois.

University names John Rogers a Swanlund Chair

On March 13, John Rogers was invested as one of five new Swanlund Chairs at the University of Illinois. Swanlund Chairs are the highest endowed titles on the Urbana campus. Rogers' groundbreaking research on flexible formats for electronic devices has transformed the way the world thinks about electronics manufacturing, devices for solar-energy conversion, and the interfaces between electronics and biology. His research includes fundamental and applied aspects of nano and molecular scale fabrication as well as materials and patterning techniques for unusual electronic and photonic devices, with an emphasis on bio-integrated and bio-inspired systems. Two major start-up companies have evolved from his work (MC10 and Semprius). He was named a MacArthur Fellow in 2009, won the Lemelson-MIT Prize in 2011, and was chosen by Nature magazine as one of "Ten People Who Mattered in 2012." He is a member of the National Academy of Engineering and has authored more than 350 journal articles.

The Swanlund Chair awards are for five years and may be renewed.

John Rogers and his team have developed a small, flexible circuit device that sticks comfortably to the skin and is camouflaged as a temporary



Chancellor Phyllis Wise, John Rogers, and Provost Ilesanmi Adesida

tattoo. The electronic tattoo can read a patient's brainwaves, heart rate and muscle activity while they are going about their normal activity. Check out the video: <http://www.youtube.com/watch?v=zVa5apPRdpg>

MatSE Alumni Board welcomes new members



Robert Schwartz

Robert Schwartz (PhD Cer '89) serves as Chief of Staff in the Office of the President at the University of Missouri System, a position he has held since April 2012. He previously served as Interim Provost and Executive Vice Chancellor for Academic Affairs and as Vice Provost for Academic Affairs at the Missouri University of Science and Technology (Missouri S&T). Prior to his administrative appointments, Schwartz was employed as Professor of Materials Science and Engineering at Missouri S&T, Associate and Assistant Professor of Materials Science and Engineering at Clemson University,

Senior Member of the Technical Staff at Sandia National Laboratories, and Research Engineer at B. F. Goodrich. His research interests include piezoelectric composites, dielectric materials and the chemical synthesis of electronic ceramics. He holds two U. S. patents, has published more than 100 papers, and has authored eight book chapters. He is a member of the Institute of Electrical and Electronic Engineers, the American Ceramic Society, the Materials Research Society, and the American Society of Engineering Educators. Schwartz is a member of Sigma Xi, Tau Beta Pi, and is a Fellow of the American Ceramic Society. He is Past Chair of the Electronics Division of the American Ceramic Society and currently serves on the American Ceramic Society Board of Directors.



Martin Brotschul

Martin Brotschul (BS Cer '96) is a Principal in the Strategy and Operations Energy & Resources practice at Deloitte Consulting LLP. He has 16 years of experience serving a wide variety of clients delivering significant value to his client's organizations. Brotschul has extensive experience in the Alberta Oil Sands and the North American Shale Gas businesses. He has been focused within the supply chain area, specifically

working in supply chain transformations, strategies, organization and operating model designs, strategic sourcing and category management efforts. His industry experience is broad with a deep focus in the energy and resources space, including chemicals, oil and gas, and mining clients.

He has an M.B.A. from the J.L. Kellogg School of Management at Northwestern University.

MatSE Career Services

Whether you are looking for someone to fill a position at your company or you are on the job hunt yourself, the MatSE Department can be of assistance. MatSE offers the following career services at no cost.

Resumes: MatSE Resume CDs contain the resumes of students at all levels of education (B.S., M.S., Ph.D.), plus resumes of students seeking summer employment, and alumni resumes too. The Resume CD is available in the fall semester. Contact Cindy Brya to request a copy or to include your resume in the CD.

On-Campus Interviews: The MatSE Department can assist you in coordinating on-campus interviews of MatSE students. You are encouraged to contact students directly, using the Resume CD or their resumes on the AfterCollege website. However, Cindy Brya can contact students for you and set up an interview schedule according to your needs. The department can provide an interview room and help you make arrangements for an information session.

Job Posting: If you would like to make job opportunities with your company available to MatSE students and alumni, please establish an account at www.matse.illinois.edu/employers.html. Affiliate members can post jobs and access online resumes for free. (Note: This job section is powered by an outside vendor AfterCollege.) If you have internships for current students or openings for recent graduates, contact Cindy Brya directly and she will forward the information to students.

Contact: Cindy Brya, brya@illinois.edu, (217) 333-8312.

Engineering Career Fairs

ECS Fall Engineering Career Fair: September 9-10, 2013

The Engineering Career Services (ECS) career fair is for companies seeking students for full-time positions, internships, and co-ops. Attendance is limited based on available space, and more than 1,200 students attend. The career fair is for students and alumni from the Urbana-Champaign campus only. Online registration through <https://business-illinois-csm.symplicity.com>. For more information, e-mail ecs-fair@illinois.edu.

Fall Engineering Employment Expo: September 23-25, 2013

The Fall Engineering Employment Expo is hosted by Engineering Council, a student organization, and is for both full-time and internship recruiting. It is similar to the ECS Fall Engineering Career Fair, but it is managed by students. For more information, go to <http://expo.web.cs.illinois.edu>.

Get involved with MatSE

By Allison Winter, Assistant Director of Advancement



Allison Winter with Kristiann Rushton (BS MatSE '07) at an Engineering at Illinois event in Houston

Over the past two years in my role as Assistant Director of Advancement for MatSE, I have enjoyed meeting a diverse cross-section of our alumni. We have over 3,500 alumni working in a variety of industries, and we boast a 17% participation rate to our MatSE annual fund. This is among the highest participation rate in the College of Engineering at Illinois! Thank you to our annual fund donors—your yearly donations to MatSE really add up and help us retain our position as one of the top materials departments in the nation.

In addition to the annual fund, we are committed to fundraising for scholarships and fellowships, so that bright young students have the opportunity to get an education in MatSE at Illinois regardless of their financial capability. Further, we've set other goals to continue to raise money to improve our labs and our 100-year-old facilities. In particular, we want to ensure that our labs and equipment are up-to-date and well-maintained for the next generation of scientists and engineers. We appreciate all of your gifts, and without your generosity, none of these goals can be realized.

With such big goals in mind, it is critical for our alumni and friends across the generations to know that we are looking to partner with you for more than just financial support.

Consider engaging with us in the following ways:

- Send us your news for our alumni newsletter
- Post on the MatSE at Illinois LinkedIn group page and the MatSE Facebook page
- Participate in an alumni seminar or speak at an undergraduate society meeting or class
- Attend Engineering at Illinois events in your area
- Host an event or dinner for alumni
- Sponsor a senior design project
- Notify the department of internships or openings at your company
- Give – major gifts, special gifts in honor of a professor or loved one, annual gifts to MatSE
- Suggest speakers for events or offer to speak at events
- Share testimonials for department and college publications
- Update your contact information

There are many ways that alumni can give back and remain connected to the Materials Science and Engineering Department. Please don't hesitate to reach out to me if you have questions about how you can become involved. I look forward to meeting you on my trips across the country in the months to come! GO ILLINI!

Allison Winter
310 Engineering Hall, 1308 W. Green St.,
Urbana, IL 61801
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Department Notes



Interim Dean Michael Bragg and Lane Martin

Lane Martin received the Dean's Award for Excellence in Research from the College of Engineering.

John Rogers was the 2013 recipient of the MRS Mid-Career Researcher Award. He received the award "for fundamental and applied contributions to materials, mechanics designs, and assembly techniques for stretchable/flexible electronic systems."

JJ Cheng has been named a Willett Faculty Scholar by the College of Engineering. He is

one of eight faculty in the College selected for this honor in recognition of his research accomplishments.

Kris Kilian, Angus Rockett, Pascal Bellon and **Lori Sanders** received Engineering Council Advising Awards.

Robert Averback, Pascal Bellon, Paul Braun, Ken Schweizer and **Matt Sherburne** made the University's list of Teachers Ranked as Excellent for the fall 2012 semester.

Joseph Flanagan, Ph.D. student in the Shim group, received a 2013 Carver Fellowship from the College of Engineering.

Christian Espinoza Santos' poster won 2nd place in the poster competition at the 37th International Conference on Advanced Ceramics & Composites (ICACC). The title of the poster was "Stress Wave Management in Obliquely Laminated Composite Systems," and Trudy Kriven, Mariana Silva, and Daniel Tortorelli contributed to the work. **Christian Espinoza Santos** and **Daniel Ribero Rodriguez**, Ph.D. students in the Kriven group, won the shot glass drop competition during the ICACC conference. The competition involves engineering a container composed of plastic straws that protects a shot glass as it is dropped from increasing heights.

Karthik Jambunathan, Ph.D. student in the Martin group, received the MRS Silver Award for "Effect of 90 degree domain walls and thermal expansion mismatch on pyroelectricity in epitaxial ferroelectric thin films."



Xuan Zhang and Jing Yan

Jing Yan, Ph.D. student in the Granick group, and **Xuan Zhang**, Ph.D. student in the Bellon/Averback group, received Racheff-Intel Awards. They presented their research at the MatSE colloquium on April 29. The award, which recognizes outstanding graduate research, consists of a plaque and up to \$1,000 financial support to attend a conference and give a research presentation.

Kaila Bertsch, Ph.D. in the Robertson group, and **Lisa Pogue**, Ph.D. in the Rockett group, received 2013 NSF Fellowships. A record 43 students were awarded NSF fellowships for graduate study at the University of

Illinois this year, the most in one year since the program was established in 1952. NSF received more than 13,000 applications for the 2013 competition and made 2,000 award offers. The program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering and mathematics disciplines who are pursuing research-based master's and doctoral degrees at accredited U.S. institutions. Fellows receive three years of support, including a \$30,000 annual stipend, \$12,000 cost-of-education allowance to the institution, international research and professional development opportunities and access to the XSEDE Supercomputer.

Brett Walker, Ph.D. in the Lewis group, was a finalist for the \$30,000 Lemelson-Illinois Student Prize, which awards innovative students who are passionate about solving grand challenges and who

are entrepreneurial.

Lito de la Rama, Ph.D. student in the Allen group, won a Silver Medal Award from the Materials Research Society. He presented his paper, "Size Dependent Melting of Magic Size Materials," at the Spring MRS meeting in San Francisco. After graduating in August 2013, De la Rama will join SanDisk Corporation as a failure analysis engineer for flash memory products.



Lito de la Rama receiving his award from Materials Research Society president Orlando Auciello

Bai Cui, a postdoctoral research associate in MatSE, received the 2012 Sir Richard Brook Prize for the Best Ceramics PhD in the U.K. The prize was presented to Cui for his study on Microstructural Evolution and Oxidation Behaviour of Spark Plasma Sintered MAX Ceramics.

Spencer Wells received a National Defense Science and Engineering Graduate (NDSEG) Fellowship. The Department of Defense offers these fellowships to individuals who have demonstrated the ability and special aptitude for advanced training in science and engineering. NDSEG Fellowships last for three years and pay for full tuition and all mandatory fees, a monthly stipend, and up to \$1,000 a year in medical insurance.



Jaime Kelleher

Jaime Kelleher received the H. L. Wakeland Undergraduate Leadership Award from the College of Engineering. The Wakeland Award is given annually to a junior or senior student who has demonstrated outstanding leadership accomplishments and has a minimum grade point average of 3.0/4.0. Kelleher was a team leader for Illini 4000 for Cancer, a registered student organization dedicated to raising

Department Notes, continued



Parul Koul

funds and awareness for cancer through cross country bicycle rides. This fall she will pursue her master's and Ph.D. in mechanical engineering at the University of Colorado at Boulder, likely working with nanostructured polymers.

Seth Cazzell, sophomore in MatSE, earned honorable mention in the national Barry M. Goldwater Scholarship competition. The scholarship program is for sophomores and juniors from the U.S. who intend to pursue doctorates in the fields of science and engineering.

Parul Koul received the Stanley H. Pierce Award from the College of Engineering for fostering

student-faculty cooperation. As Vice President of Material Advantage, she was the lead coordinator for the MatSE Department's Engineering Open House exhibits. She initiated student-faculty lunches in the department and led an effort to produce videos of many of the MatSE professors. After graduation in May, she started her new job at ExxonMobil.

Jaime Kelleher and **Miheer Munjal** made the Senior 100 Honorary. The Senior 100, sponsored by Student Alumni Ambassadors and the U of I Alumni Association, recognizes outstanding seniors for their academic achievement, leadership, and commitment to the University.

New faces in the department

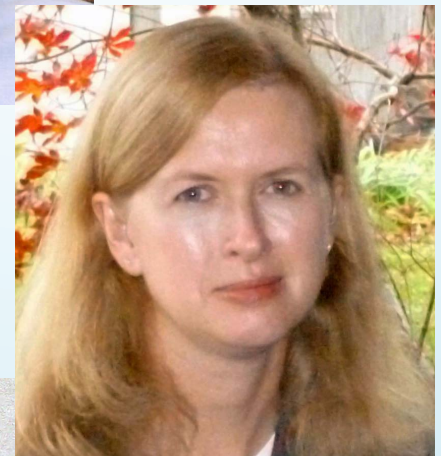
Nate Gabrielson joined MatSE as a Lecturer in November 2012. He received his Ph.D. in Chemical Engineering from the University of Illinois in 2009. He worked as a postdoc with JJ Cheng in the MatSE Department for one year and as an IGB Fellow in the Regenerative Biology and Tissue Engineering Theme at the Institute for Genomic Biology for two years. The bulk of his graduate research was in the field of non-viral gene delivery. At the IGB, he shifted his focus to the development of microfluidic systems for biological assays. Gabrielson taught MSE 472 (Biomaterials Laboratory) in the spring and will teach MSE 452 (Polymer Characterization Laboratory) in the fall semester. "I find the laboratory environment to be very stimulating and always look forward to starting new experiments," Gabrielson said. "As a lecturer for MSE 452 and MSE 472, I'm hoping to make the laboratory an exciting place for students as well. It's my hope that students will enjoy their experience and come to view the lab as a place for active learning and collaboration rather than a room full of chemicals and beakers."

Laura Nagel is a new Lecturer and serves as the Associate Chief Advisor for MatSE undergraduates. She has a B.S. in Materials Science from Rice University and M.S. and Ph.D. in Materials Science from Caltech. She spent 4 years on the faculty in Engineering Technology at West Texas A&M University. Nagel taught the Project Lead the Way pre-engineering curriculum at Parkland College for two years and is currently an Affiliate with Project Lead the Way. More recently, she has worked with the Women in Engineering program in the College of Engineering. Originally from Kentucky, Nagel has lived in Champaign for the last 12 years.

Kimberly Anderson is a new Office Support Associate in the department office. She grew up in Villa Grove and currently lives in Paxton. She attended Parkland College, earning her degree in nursing, and has spent the last several years working at home as a medical transcriptionist. She and her husband, Gary, farm and like to work in their yard. They also enjoy basketball, football and baseball games.



Nate Gabrielson



Laura Nagel



Kimberly Anderson



Ilyan Shao

Baby boom!

The MatSE family grew by leaps and bounds as four new babies were born to MatSE professors in the months of February and March. Moonsub Shim and his wife, Su-Jeong, welcomed their firstborn sons, Adrian Jamyung and Darian Jamin, on February 15. Adrian was born one minute older and weighed 5 lbs. 11 oz. Darian was a bit smaller at 5 lbs. 4 oz. JJ Cheng's second child, Ilyan Shao, was born March 4. His daughter, Irina, is very happy to have a baby brother. Cecilia Leal's first child, Amy Celeste, was born March 23. She weighed 6 lbs. 13 oz.



Darian and Adrian Shim

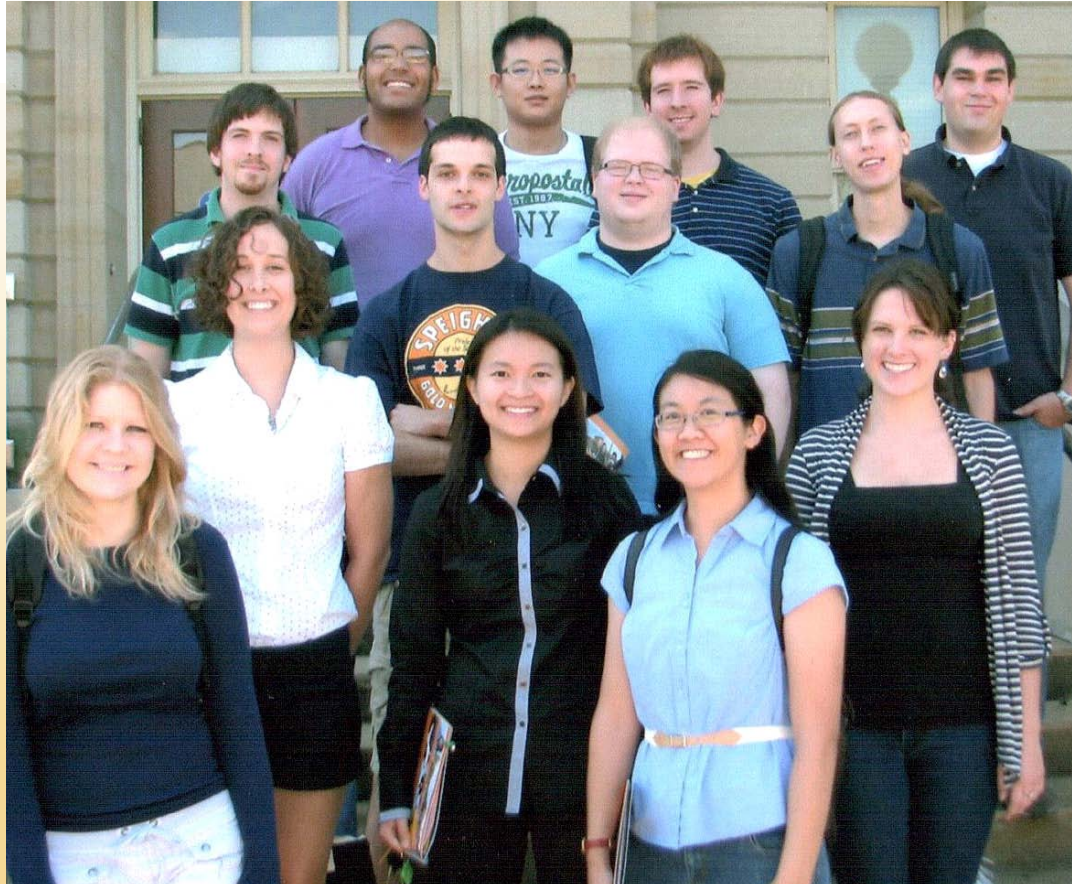


Amy Celeste Faulkner

Graduate students honored with Hamer Fellowships

Since 2001, the Donald W. Hamer Fellowship has helped the Department of Materials Science and Engineering recruit exceptional students into the MatSE graduate program. Below are the names of the Hamer Fellows for 2012-13 and their undergraduate institutions.

Pictured in the front row: Kaila Bertsch (Texas A&M), Kaitlin Tyler (Michigan State University), Thu Doan (University of New Mexico), Grace Huang (Georgia Institute of Technology), Megan Emigh (New Mexico Institute of Mining and Technology). Back rows, left to right: Daniel Bacon-Brown (University of Kentucky), Justin Kardel (University of California, Berkeley), Eric Epstein (University of Maryland, College Park), Runyu Zhang (University of Nebraska, Lincoln), Leo Falgout (Georgia Institute of Technology), Joseph Flanagan (Purdue University), and Andrew Long (Carnegie Mellon University). The fellowship was established through the generosity of Donald Hamer (BS Cer '45).

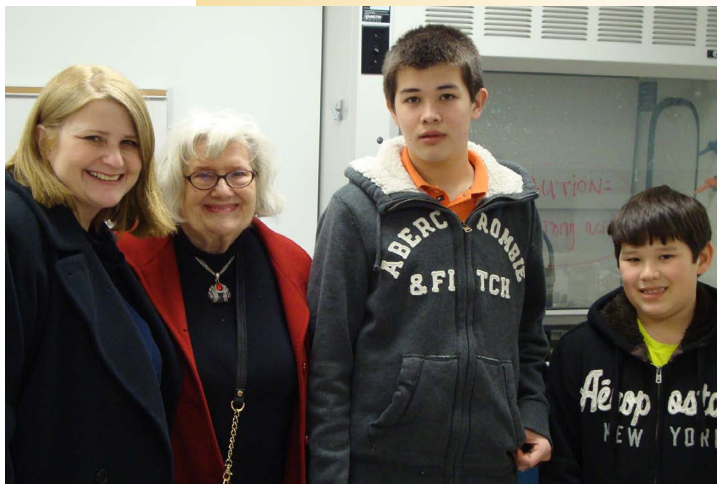


Class Notes

Sanak Mishra (MS Met '70, PhD Met '73) received the JRD Tata Award for Excellence in Corporate Leadership in the Metallurgical Industries for 2012. He was presented the award during the annual technical meeting of the Indian Institute of Metals. The JRD Tata Award is one of the top corporate awards in India.

Frederick James Holdener (BS Cer '72) is a customer service engineer for Ameren Missouri. He is also an instructor for Dale Carnegie Courses and principal partner of Vertical Performance, a company that "helps individuals and organizations be the best they can be." He is on the Board of Directors for the Better Business Bureau of eastern Missouri and southern Illinois and on the Board of Directors for The Illinois Autism Development Center. He has 18 year-old twin sons headed for the University of Kansas. In April, he and his fiancé, Mary Jane, were married and went on a honeymoon in Italy. The couple resides outside of Belleville, IL.

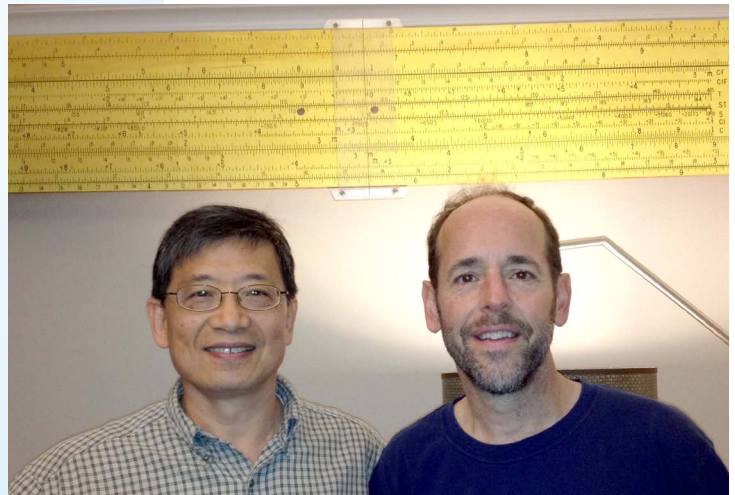
Frank Canzolino (BS Met '76, MS Met '78) was on the U of I campus in February for an event he planned for Senator Kirk Dillard. After Canzolino retired, he became the senior campaign staffer for Sen. Dillard. He previously worked for Chrysler, Sikorsky Aircraft, and MPC Woodward. He also expanded his family carpentry business, taught high school physics, and owned and sold MacSpecialist (www.macspecialist.com).



Karen Wan and her family visit the undergrad labs

Karen (Powers) Wan (BS Cer '84) returned to campus in March to serve as a judge for Engineering Open House. After graduation, she went to work for IBM as a product engineer. Later, she wrote user guides, brochures, training guides and marketing copy for businesses as a professional writer. Her work as a sustainability director led her to develop and launch the Waste to Profit Network for the City of Chicago from 2005-08 and serve as its first program director. In the last few years, she has been doing individual executive coaching. Karen's sons, Alex (11) and Nicholas (13), and her mother joined her for a tour of the MatSE undergraduate laboratories.

Ming H. Wu (MS Met '83, PhD Met '86) and **James McMahan** (MS Met '83, PhD Met '86) met at McMahan's home in Temecula, CA. Wu is Vice President Engineering at Edwards Life Sciences in Irvine, CA. McMahan is Quality Systems Manager at Abbott Vascular and also on the adjunct faculty for the University of Redlands School of Business where he teaches MBA and undergraduate courses in Management



Ming Wu and James McMahan

Science, Statistics and Operations Management. Of the photo, McMahan said, "We are standing underneath the largest member of my slide rule collection. Ming and I were the very last generation of engineers to calculate with a slide rule."

Mustafa Pinarbasi (MS Met '85, PhD Met '89) has been appointed the Chief Technology Officer and Senior Vice President of Magnetics Technology for Spin Transfer Technologies, Inc. (STT) The company is a leading developer of breakthrough MRAM (Magnetoresistive Random Access Memory) technology. Pinarbasi joined STT from SoloPower, a thin-film solar company. He spent the first 18 years of his career at IBM and Hitachi Global Storage Technologies. He was recognized with the IBM Corporate Award in 2000 for his work on developing the giant magnetoresistive (GMR) sensors that resulted in the introduction of the first GMR-based hard disk drives in the world. He was also named an IBM Distinguished Engineer for his contributions to the thin film magnetic field. He is an inventor with over 177 US patents and 25 pending applications.



William Fahrenholtz (Photo by B.A. Rupert/Missouri S&T)

William Fahrenholtz (BS Cer '87, MS Cer '89) has been named Curators' Professor of Ceramic Engineering at Missouri University of Science and Technology. He is known for his research on processing and characterization of ceramics. His recent research has focused on ultra-high-temperature ceramics – materials with melting temperatures above 3,000 degrees Celsius. These ceramics could be employed on hypersonic aerospace vehicles to protect them from the heat generated as they fly through

the atmosphere at speeds five times the speed of sound or higher. Fahrenholtz joined the Missouri S&T faculty in 1999. He has authored or co-authored more than 95 publications in peer-reviewed journals and delivered or co-authored more than 200 presentations at international technical conferences. He will receive the 2013 Greaves-Walker Award from the National Institute of Ceramic Engineers (NICE), in recognition of his outstanding service to the ceramic engineering profession and for exemplifying the aims, ideals, and purpose of NICE.

Paul Clem (PhD Cer '96) is a 2013 Fellow of the American Ceramic Society. He is Manager of the Electronic, Optical and Nano Materials Department at Sandia National Laboratories in New Mexico. A third generation Illini, Clem has over 90 publications, 1800 citations and five



My Nguyen, center, with Pankaj Sarin and Trudy Kriven

patents. The ACerS Fellow award is for outstanding contributions to the ceramic sciences, broad and productive scholarship in ceramic science and technology, and service to the Society. He served as an officer of the ACerS Electronics Division from 2005-2011, chair of the Electronics Division from 2010-2011, and co-founder of the Electronic Materials and Applications conference, hosted annually by the ACerS Basic Science Division and Electronics Division.

My Nguyen (BS Cer '96, MS MatSE '97) returned to campus in April to talk to MatSE students about the solar industry. Nguyen is Vice President of Customer Loyalty and Quality for EchoFirst in Fremont, CA. At the seminar, he discussed issues of quality and reliability and trends to watch in the solar industry. Among the advice he gave to students is that working in a start-up company requires a lot of different skill sets but is a very rewarding experience.

Peter Cheng (MS MatSE '97) is a senior microdevices engineer for Jet Propulsion Laboratory in Pasadena, CA.

Ganpati Ramanath (PhD MatSE '97) has received the prestigious Friedrich Wilhelm Bessel Research Award from the Alexander von Humboldt Foundation in Germany. The award includes an invitation to meet the president of Germany and spend up to one year in the country as a visiting scholar at research institutions. This honor is

continued, page 12

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Ganpati Ramanath

reserved for scientists and scholars who are internationally renowned in their fields, who completed their doctorates less than 18 years ago, and who are expected to continue producing leading-edge achievements that will have a seminal influence on their discipline. Ramanath is a professor in the Department of Materials Science and Engineering at Rensselaer Polytechnic Institute. His research focuses on nanostructured materials and interfaces for applications in electronics and energy. His recent discoveries include

a new class of thermoelectric nanomaterials built from assemblies of sculpted nanostructures for high-efficiency solid-state refrigeration and electricity harvesting from waste heat, along with nanomolecular layers of "nanoglu" that can join non-sticking materials, inhibit chemical intermixing, and boost thermal transport. He has published 145 referred articles in journals and has been cited more than 3,500 times and yielded seven patents.

Dave Honecker (BS MatSE '01) visited the department in May when he was in the Midwest on business. He is Chief Engineer, Product Development, for Climax Molybdenum Co., a subsidiary of mining company Freeport-McMoRan Copper & Gold, in Sahuarita, AZ. In his position, he is responsible for product development, tech support, and supervising a team of engineers. He travels frequently, both in the U.S. and internationally. Prior to joining Climax in 2006, he worked at APL Engineered Materials in Urbana. He and his wife Sharon (PhD Mechanical Engr. '05) have a two-year-old son, Andrew. The couple met when they were playing ice hockey at the U of I. She works for a reliability engineering firm, specializing in software, training, and consulting on a part-time basis and cares for their son. The family resides in Tucson, AZ.

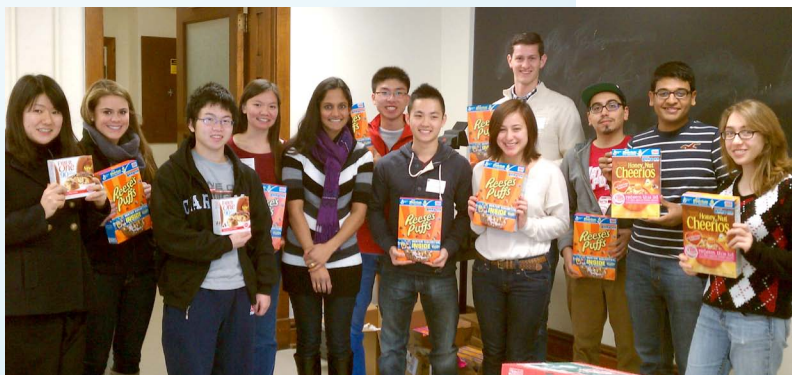


Dave Honecker

Paul Ditiangkin (BS MatSE '03) is a materials and process engineer for Space System Loral. He was previously a nuclear engineer officer (lieutenant) in the U.S. Navy. He is currently working on his M.S. degree in Materials Science and Engineering.

Peter Hawkins (BS MatSE '03) was selected as a 2013 Illinois Rising Star, a designation given to the legal industry's best lawyers under the age of 40, as nominated by their peers. He is an attorney at Ulmer & Berne in Chicago. Illinois Super Lawyers showcases outstanding lawyers in Illinois who are recognized by their peers for professional accomplishments. Only five percent of Illinois lawyers are chosen as Illinois Super Lawyers and 2.5 percent are recognized as Rising Stars.

Meena Banasiak (BS MatSE '06) returned to campus in January to interview candidates for Knight of St. Patrick and to talk to MatSE undergraduates about her career with General Mills. She advised students to take risks and "do something that you care about and that intrigues you." The students learned how to engineer a material — taking into account the interface between the material and the product, machine, operator, and consumer. At the end of the seminar, students received General Mills products to take home.



Meena Banasiak and undergrads

Geoff Brennecka (PhD MatSE '06) will receive the Karl Schwartzwalder-Professional Achievement in Ceramic Engineering (PACE) Award at the American Ceramic Society fall meeting. The award, presented by the National Institute of Ceramic Engineers, recognizes the nation's outstanding young ceramic engineer whose achievements have been significant to the profession and to the general welfare of the American people. Brennecka is Principal Member of the Technical Staff at Sandia National Laboratories.

Jessica (Koschmeder) Krogstad (BS MatSE '07) and **Dan Krogstad** (BS MatSE '06) celebrated the birth of their first child, Madeline, on January 23. She was 8 lbs. 6 oz. and 20 inches long.



Madeline Krogstad

See Wee Chee (PhD MatSE '08) is an applications scientist at Hummingbird Scientific in Olympia, WA.

Kristina Galis (BS MatSE '08, MS MatSE '09) and **Stefan Vukajlovic** (BS MatSE '12) enjoyed dinner with engineering students at the Engineering Convergence event in Schaumburg, IL, over spring break. Galis is Project Manager, Supplier Changes for Baxter International Inc., and Vukajlovic is Process Engineer for Anchor Brake Shoe Co.

Hua Lu (PhD MatSE '11) received the 2013 AkzoNobel Award for Outstanding Graduate Research in Polymer Chemistry from the American Chemical Society for his thesis work with JJ Cheng at Illinois. ACS will organize a half-day symposium during the 2013 fall meeting in his honor.



Stefan Vukajlovic and Kristina Galis participate in Engineering Convergence

Aaron Jackson (PhD MatSE '11) took his FIRST robotics team to the world championship. He has coached the FRC 3941/Absolute Zero Electricity team from Havre de Grace, MD, as part of his outreach activities at the Army Research Laboratory. The team achieved the Rookie All-star award their first year and the Inspire award their second year. FRC is a high school robotics competition based on the FIRST principles. This year's team challenge was to build, in six weeks, a robot that could shoot frisbees and climb a pyramid. In addition to designing and building a robot, the teams develop a business plan, marketing plan, and outreach.



Aaron Jackson with his robotics team

Jonathan Naber (BS MatSE '11) was named a Marshall Scholar, one of the most prestigious scholarships in the nation. Naber plans to undertake an MSc in Public Health in Developing Countries at the London School of Hygiene and Tropical Medicine and a second MSc in Development Management at the London School of Economics and Political Science. After his studies in England, he envisions forming a new team and addressing some systemic failings in how amputees are cared for, as well as work to prevent future amputations.

Former MatSE classmates win social enterprise competition

Kate Jakubas and Kyle Wilcoxon, both B.S. MatSE '06, have a knack for winning. In 2005, the pair produced a movie for Engineering Open House which investigated the science behind ice skating. Their "Materials Myths" video was one of thirteen EOH projects sent to Chicago's Museum of Science and Industry for a "Best of EOH" exhibit.

Eight years later, the duo competed against each other and won the top two prizes in the Quinlan Social Enterprise Competition, which took place on April 20 at Loyola University. The competition is an opportunity for individuals who are interested in developing and launching social enterprises around the world to present their business plans to a panel of judges.

Jakubas won first prize and \$5,000 for her new company, Meliora K, and Wilcoxon won second prize and \$3,000 for his business concept, A Safe Kennel.

Jakubas' company, Meliora K, produces powdered laundry soap made from familiar and safe ingredients, targeted at consumers that care about their health and the environment. The business model is based on ingredient disclosure beyond what is current best practice in the consumer products industry. "Laws in the U.S. don't require companies to tell consumers what is in the household chemicals they sell," Jakubas said. "Some companies are starting to provide this infor-



Kate Jakubas receives \$5,000 for Meliora K

mation due to public pressure." Each box of Meliora K laundry soap doesn't just contain a list of the ingredients used but also the actual recipe, so consumers fully understand what does (and doesn't) go into the product. "You can make this at home, using our recipe, with items from any grocery store. We want everyone to use better laundry soap, even if they don't buy it from us."

Kate Jakubas is a regulatory specialist at SRAM Corporation. She recently completed her master's degree in Environmental Engineering at the Illinois Institute of Technology. She plans to launch online sales of the first product this summer and have it available in local Chicago

continued, page 14

Social Enterprise Competition, continued

stores shortly thereafter. For more information, please see www.meliorak.com.

Kyle Wilcoxon, a senior scientist at The Clorox Company, received his MBA from Loyola University in February. It was while he was a business student at Loyola that he heard about the Quinlan Social Enterprise Competition. He used social media to spread the word and encourage friends to participate.

Wilcoxon's business concept, A Safe Kennel, would offer veterinary care and pet boarding services in Chicago while providing job training opportunities for individuals transitioning from homelessness to self-sufficiency through its partner organization, A Safe Haven. A Safe Kennel's organization would be led by a state-certified veterinarian to administer and oversee all pet care, while other tasks such as cleaning, grooming, and dog-walking would be handled by highly motivated and professionally trained graduates from A Safe Haven.

A Safe Haven is a foundation in Chicago that "helps people aspire, transform, and sustain their lives from homelessness to self-sufficiency with pride and purpose." A Safe Haven partners with for-profit and non-profit social enterprises to provide graduates of the program with critical job skills to become self-sufficient. Thousands of A Safe Haven graduates are now supporting themselves,



Kyle Wilcoxon's team receives \$3,000 for A Safe Kennel

their families, paying taxes, and contributing to their communities. For more information on A Safe Haven's mission and social enterprise, visit www.asafehaven.org.



Field trips show MatSE in action

MatSE undergraduates had the chance to step out of the classroom and onto a plant floor when they visited the Steel Dynamics plant in Plainsboro, IN, on December 1 and the ExxonMobil Joliet refinery on February 15. Field trips are a great way to show students the many



opportunities in Materials Science and Engineering. If your company would like to offer a field trip to MatSE undergraduates, please contact Cindy Brya at brya@illinois.edu or (217) 333-8312.

In Memoriam

Edward A. Thomas (BS Cer '41) died on January 24, 2013, in Salem, OH. He was last employed by the Wallace Murray Corporation, where he was plant manager for the Salem and Marysville divisions of the Eljer Company for many years. He retired in 1980 as senior ceramic engineering consultant. He had previously been on the Board of Directors for the old Farmers National Bank and had been a longtime member of the Salem Golf Club. He served in both the Army and Air Force and was a lieutenant at the time of his discharge. He was an avid outdoorsman who enjoyed hunting, fishing, gardening, golfing, and walking with his Irish Setters. His wife, Ruth, whom he married in 1945, preceded him in death. He is survived by his son, Peter; daughter, Gayle; and three grandchildren.

Lawrence Vincent Gaglin (BS Cer '42) passed away on March 26, 2013. He worked 30 years as a manager of research at the Johns Manville and was widely recognized as one of the world's top glass technology experts. He retired in 1982. His wife, Marion, preceded him in death. He is survived by his children, Jean, Paul, Larry, and Jim.

Harold "Hal" Sowman (BS Cer '48, MS Cer '49, PhD Cer '51) died November 29, 2012. He was a retired corporate scientist who once held the top technical post at 3M. Before joining 3M, he was with the National Lead Co. and General Electric Co. He was an innovative leader in the development of new ceramic and fibrous materials. He directed 3M's development of transparent ceramic materials sol-gel technology. He received many awards and honors, among them selection as Fellow of the American Ceramic Society; election to the Carlton Society, the top honor at 3M for technical achievement; recognition by the Minnesota Society of Professional Engineers in 1973 for his contributions to the development of "retrospective identification" materials; and the College of Engineering Alumni Award for Distinguished Service from the University of Illinois in 1983. He held twenty patents and was a member of the National Institute of Ceramic Engineers, Sigma Xi, and Keramos. He is survived by his daughter, Letty, and son, Dan. He was preceded in death by his wife Gladys "Timmie."

Stephen "Steve" Stoddard (BS Cer '50) died May 24, 2013. He served in WWII under General George Patton and fought in the "Battle of the Bulge." He received the Purple Heart, Bronze Star and Combat Infantry badge. He met and wed Joann Burt, his first wife, in 1949. His first job was with the Coors Porcelain Co. in Golden, CO. He spent 61 years at Los Alamos National Laboratory (LANL). He received seven U.S. and international patents and was the author of 35 technical papers. He served the American Ceramics Society as its President from 1976-77 and received the Society's Distinguished Life Member award. He was elected Vice President of the Young Republicans in New Mexico in 1952. He was invited to join Kiwanis at the same time and was a 61-year member, serving as Club President and Lieutenant Governor. A member of Trinity-on-the-Hill, he served on the vestry a number of times. He took great pride in being a Mason and Shriner for over 60 years. After retirement from the LANL in 1980, he was persuaded by longtime friend Senator Pete Domenici to run for the State Senate District 23. He was successful in his first attempt and served the people of Los Alamos and surrounding counties for three consecutive terms, retiring from the Senate in 1992. He was the principal sponsor of 42 bills. He was appointed by President Clinton to be one of the first Trustees of the Valles Caldera National Preserve and served as Vice Chair on that board from 2000-2003. He was preceded in death by first wife. He is survived by his wife, Barbara; daughters, Dorcas and Stephanie; stepchildren, Carolyn, Diana, and Stephen; seven grandchildren; and four great-grandchildren.

Gary Edward Winter (BS Cer '57) died June 22, 2012. He worked for Ford Motor Company as a ceramic engineer and later began his second career as a real estate broker in Boyne City, MI. He was known for his friendliness and laid-

back attitude. He was an excellent furniture maker and enjoyed renovating and reselling homes. In the 90's, he moved to warmer climes in Florida. He had four sons with his first wife, Joyce, and two daughters with his second wife, Susie.

Henry "Hank" Oberle, Jr. (BS Met '59) passed away on March 10, 2013. He married Doris Kneer on May 17, 1974; she survives. In 1985, he retired as a metallurgical engineer from Caterpillar's Mossville facility after thirty years of service. He was a parishioner at St. Philomena Parish in Peoria, IL.

Doris M. Maroney Krumwiede (MS Cer '60) passed away on April 25, 2013. She was the beloved wife of John F. "Jack" Krumwiede, whom she married on June 11, 1960; loving mother of Laura K. (James) Hartwell of Maryland, Lisa M. (Michael) Brown of Maryland, and Linda B. (Ray) Piedt of South Carolina; and grandmother of Elizabeth, Andrew, Jack, Thomas and Joseph Brown of Maryland, and Lindsey, Jared and Zachary Piedt of South Carolina.

Norman Howard Harris (PhD Cer '68) passed away January 7, 2013. He worked in the high-temperature ceramic lab at McDonnell Douglas labs in Santa Monica, and at Hughes Raytheon in El Segundo, CA. Products based on these kinds of materials became available in the early 1970s, including transducers, actuators, sensors, and coatings used with telescopes and precision optics, and a wide range of electronic devices. He invented a high-temperature material that would help stabilize telescopes to prevent distortions. He worked on developing the high-temperature tiles that cover the underbelly of the space shuttles, thus making it possible for the ships to re-enter the earth's atmosphere without burning up. He was awarded numerous patents for aerogels and porous tiles with microwave and broadband radiation-absorbing properties, infrared windows and domes, and methods of bonding polymeric parts without adhesives. He was a past president of the National Institute of Ceramic Engineers (NICE) and was elected to the honor of Fellow. He was past president of the Southern California branch of the American Ceramic Society. He created, wrote courses, and taught classes for the Ceramic Correspondence Institute (CCI) to train and educate students on how to manage a high-temperature ceramic lab. He is survived by his wife of 41 years, Cynthia, and his son, Howard Wayne Harris, a research scientist at USC.

Jeffrey L. Smith (BS Cer '74) died at Arbor Hospice in Ann Arbor on December 20, 2012, at the age of 60. He was diagnosed in 1999 with multiple sclerosis and died of complications of the disease. He was born in Danville, IL, and married Beverly Asquith on April 3, 1982, in South Lake Tahoe, CA. He was employed by Guardian Industries, Carleton, and then by Toledo Engineering Company and traveled all over the world repairing glass furnaces, the most memorable trip being three months in Inner Mongolia and a confrontation with the Chinese military police. He enjoyed fishing, skiing, camping, boating, and the Detroit Tigers. He is survived by his wife.

Michael Lloyd Capp (BS Met '80, MS Met '82) passed away September 6, 2012, at the age of 54.

He was a member of Christ Community Church in Zion, IL, and was recently attending Crossway Community Church in Bristol, WI. He was employed for 28 years at Laserage Technology Corporation in Waukegan, IL. He was an intentional man who was passionate about his God, his family, and inspiring other people to greatness. He is survived by his wife of 28 years, Jerrie, and six children.

Editor's Note: *In the obituary section of the Winter 2012 MatSE Alumni News, Don Gentry's degree was incorrectly listed as Metallurgy instead of Mining Engineering.*



An Illini family reunion

Members of the Klein family returned to campus last fall for Homecoming, bringing together three generations of Illinois graduates. Pictured: Jeff Klein (BS Cer '89); Lorraine Klein, Jeff's wife; Al Klein (BS Met '55); Jane, Al's wife; Ken Klein (MS Mechanical Engr. '85), Merle's father; Sue Klein (BS Biology '84, MD UI-Chicago '88), Ken's wife and Merle's mother; and Merle Klein (BS Computer Science '13). Al and Jane have 12 children and 28 grandchildren and live in Palatine, IL.

Seeking nominations for alumni awards

The MatSE Alumni Board is currently seeking nominations for the Distinguished Merit Alumni Award, Loyalty Award, and Young Alumnus Award. The Distinguished Merit Award is for an alumnus who has had an illustrious career or whose accomplishments reflect admirably on the Department of Materials Science and Engineering. The Loyalty Award is for time, talents, and services freely given by an alumnus who has displayed extraordinary interest in and loyalty to the MatSE Department. The Young Alumnus Award is for an alumnus under the age of 40 who has demonstrated unusual accomplishments in the early stages of his/her career. A listing of past award recipients is available on the Alumni Awards website (www.matse.illinois.edu/awards.html). Nomination consists of a paragraph stating why the nominee deserves the award, plus a copy of the nominee's C.V. or other supporting documents. The nomination deadline is September 20. The MatSE Alumni Board will vote on the 2014 Alumni Awards at its fall meeting. Awards will be presented at the departmental banquet in April. Nomination material should be sent to Cindy Brya, Executive Director of the MatSE Alumni Board, 201B MSEB, 1304 W. Green St., Urbana, IL 61801, or electronically to brya@illinois.edu.



Homecoming 2013 - Saturday, October 26.

For information on the Engineering Homecoming Celebration, go to <http://engineering.illinois.edu/alumni/events/engineering-homecoming-celebration>



Birnbaum Memorial Lecture

Steven Zinkle, Chief Scientist of the Nuclear and Engineering Directorate at Oak Ridge National Laboratory, presented the Howard K. Birnbaum Memorial Lecture on October 29. His talk was "Impact of Materials on the Future of Nuclear Energy." Following the lecture, faculty and students enjoyed a reception in the first floor hallway of the Materials Science and Engineering Building.



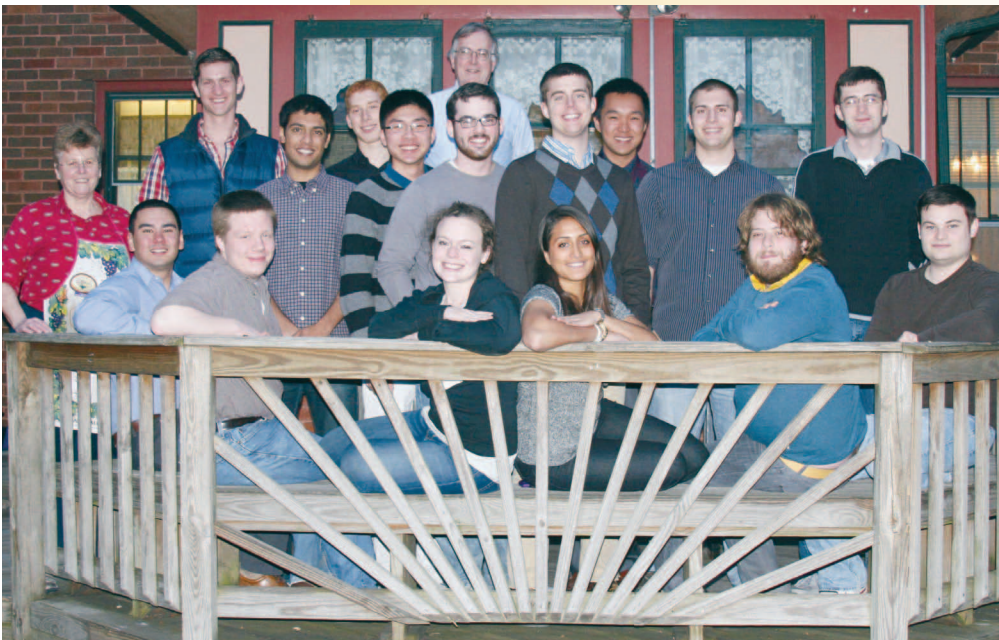
Students and professors relax after the volleyball game.

Auction raises funds for student society



Trudy Kriven prepares a meal for 15 students.

The 2013 MatSE Student-Faculty Auction raised \$1,250 for Material Advantage, the main undergraduate organization in the MatSE Department. Among the items on the auction block were gift cards, games of volleyball and basketball with professors, a wine tasting, baked goods, Illinois merchandise, and the legendary Kriven-Keane dinner. The auction has become a tradition in MatSE and is the largest fundraiser for Material Advantage.



Undergraduates at the Kriven-Keane dinner

Undergraduates who entered winning bids for the basketball game beat their professors three games to zero on April 20, but the professors rallied on May 8 and beat the students in the volleyball game. This year marked the 18th annual Kriven-Keane dinner. Fifteen students enjoyed an Austrian/Australian meal prepared by Professor Trudy Kriven.

The Kriven-Keane dinner alone brought in \$500 for Material Advantage. Matt Sherburne, a new lecturer in MatSE, offered up for auction a wine tasting featuring wines from Cypher, his sister-in-law's winery in Paso Robles, CA. Auction proceeds provide financial support for Material Advantage meetings and events throughout the year.

The Illinois MakerLab, which opened in spring 2013, provides a unique resource for students and professors to gain a hands-on learning experience with 3D modeling and printing. Based in the College of Business, the lab has a partnership with Matt Sherburne, a MatSE lecturer, and encourages interdisciplinary projects. The lab has six MakerBot Replicator2 3D printers plus workspace for student collaboration. Winnie Yang is one of the MatSE undergraduates affiliated with the Illinois MakerLab.



3D printing lab on campus offers students a unique experience

By Winnie Yang, undergraduate

My first experience with 3D printing came from working with Prof. Lewis' group on one of her conductive ink projects. That was really cool because I got to print with copper oxide ink on a microscale level, and that's not something you would usually do in a class. The summer after my freshman year, I stayed on campus and worked with her group, and they had recently bought a Makerbot, the Replicator 1.

Since I was able to work with the printer, I was able to get a feel for how it worked. When I received an email after the fall semester of my sophomore year about a new 3D printing lab opening with 6 Replicator 2's, I knew I had to get involved, so I applied to be a "Guru," which is similar to a lab tech position. For the most part, I help visitors to the lab get acclimated to the printers, the software, and the overall experience of 3D printing. In addition, I help keep the software and the machines up-to-date and ready for use. To help draw more attention to the lab, we stay connected with all the social media outlets and advertise what is happening around the Lab. One of my favorite posts that

we include is called, "Meet the Maker" which showcases a Maker and their project. All the projects were designed by the Maker and printed in the Lab.

The 3D printing experience is awe-aspiring. Everyone has at least a basic understanding of how mass manufacturing works, but 3D printing allows you to watch the manufacturing happen. So many people come to the Lab with an idea, either created using a software program, or just in their minds, and they get to see the creation process from start to finish. The greatest thing about the 3D printers is that they allow you to fail. The process of printing is cheap enough that it's worth your time to test print an idea, acknowledge the disadvantages, and then redesign your idea to better fit your needs. There's not much else out there that gives you that flexibility to flourish, and I think that's what allows 3D printing to take off in a big way. I think it's incredible to be able to say, "I did it again, but better this time!" and have the physical proof, especially for MatSE because it's such a hands-on major.

Many advantages to 3D printing

By Matt Sherburne, MatSE lecturer & MakerLab partner

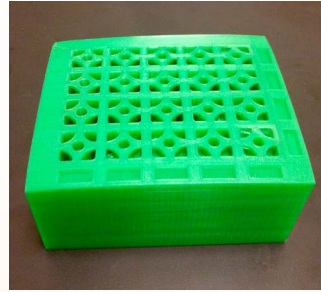
3D printing, also known as additive manufacturing, offers several key advantages over traditional manufacturing approaches. Fast prototyping and redesign of a product accelerates the design process. Additive manufacturing also allows for green manufacturing, as there is little waste material in production. Additive manufacturing also allows for the design of what would normally be solid part with a honeycomb interior, allowing less material to be used. The combination of increased speed with which you can design and the lowering of materials used ultimately leads to a smaller environmental footprint.

The inexpensive nature of the Makerbot makes it an ideal teaching tool. Next year we are teaching a class through the Illinois MakerLab, which will group 1 design, 1 engineering and 1 business student together. Each group will design, produce and market a product. This will allow the students in MatSE to work directly with students from other disciplines on product design, taking it from start to finish. The goal is to give students a better understanding of the complete process of taking a product to market.

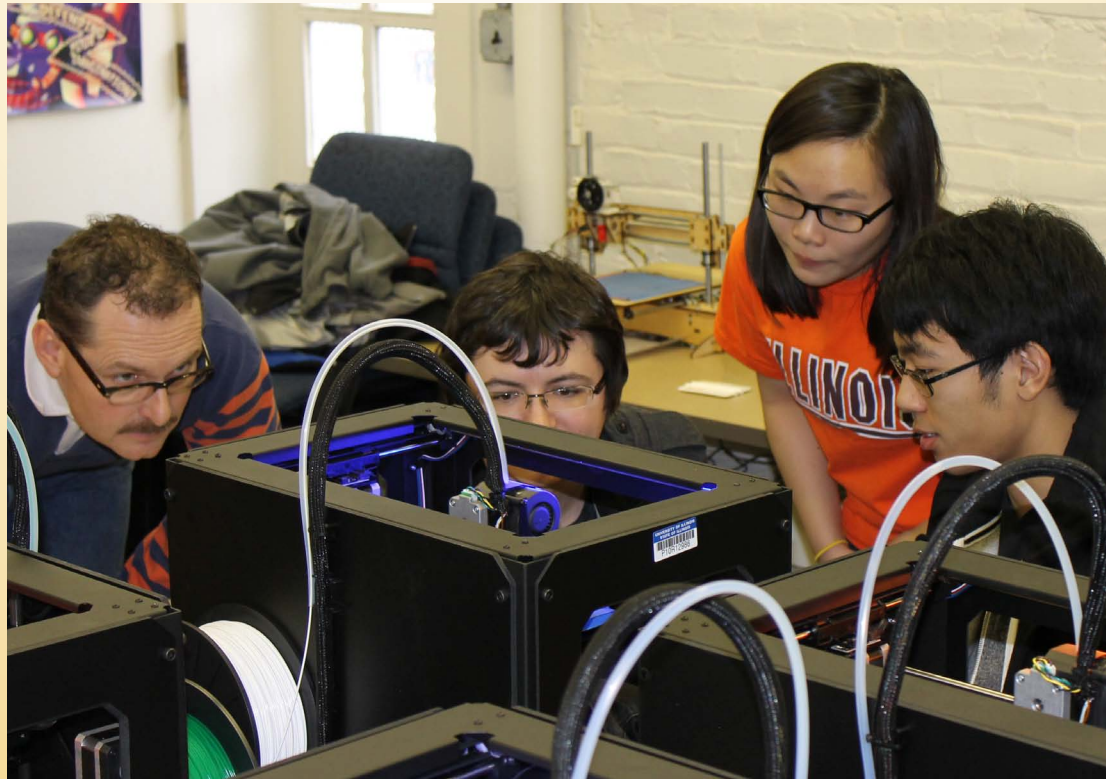
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Bio-scaffolding developed for a senior design project. This is used to allow cells to migrate into the structure and study how different chemical, physical and biological cues and influence cellular identity. Photo by Jacqueline Handley.



Syringe holder developed by Samuel Mo, an undergraduate who works in the Kilian lab. This was designed so that a syringe loaded with stem cells could be set down without being disturbed. The structure also allows for the preparation of many syringes at one time.



Winnie Yang with fellow undergraduates, Seth Cazzell and Aaron Zhao, at the Illinois MakerLab open house

Researchers strain to improve electrical material, continued

of the paper. "Otherwise you have to engineer similar effects using features not native to the materials to have the same thing happen, but it is much more difficult and less easily controlled. Here, it's grown into the material to begin with."

For example, ferroelectric materials widely have been used in memory applications that rely on spontaneous polarization. However, to read a bit of data in computer memories made with a traditional ferroelectric material, its polarity is switched. This means that every time the bit is read, it has to be re-written and compared to a reference bit. But if the material had a built-in electric potential, engineers could make bits that would not need to have their polarity switched to be read, so computer components made with the new material could be smaller, faster and longer lasting.

Now the Illinois team plans to further explore potential applications, as well as apply their gradient film technique to other types of ferroelectric materials in search of even more novel and unexpected properties.

"This is just the beginning," Martin said. "There are an infinite number of varieties of gradients that you could think about. This is a smooth gradient, but we could skew it, or change what the end members are. Each one of these is going to give its own set of structures and potential properties that we haven't even begun to scratch the surface of. I think the capacity for finding new types of materials and properties is really open here."

The Defense Advanced Research Projects Agency, the Office of Naval Research, the Army Research Office and the Air Force Office of Scientific Research supported this work.

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Flashback

Metallurgical Engineering students and professors, Fall 1964. Professor Carl Altstetter taught MSE 445 (Corrosion of Metals) in the Spring 2013 semester. Can you identify him in this photo?

