

MATERIALS

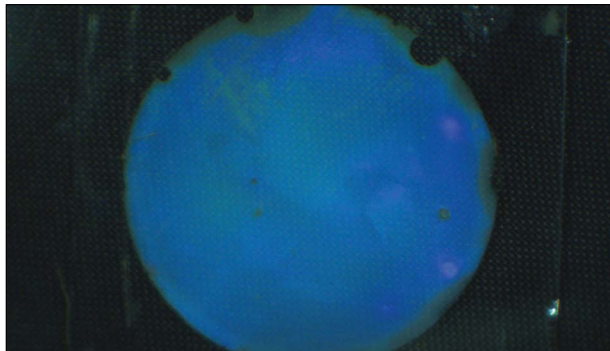
for glucose monitoring

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to our donors

ALUMNI
award winners

KERAMOS
turns 100



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New glucose monitoring material may lead to improved insulin monitoring

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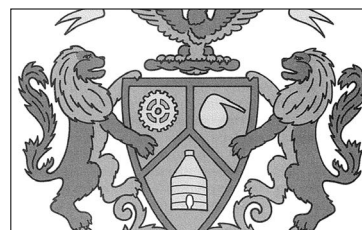
Your gift today is an investment in the future



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MatSE Alumni News

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and newsletter submissions

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Greetings from Urbana



At our fall meeting of the alumni board in September, a board member asked me, "What is the mission of the MatSE Department?" We have a mission statement that was crafted in 2006:

The mission of the Department of Materials Science and Engineering is to meet the needs of society and our profession through excellence in education, research and service; to educate scientists and engineers who will become leaders in solving important materials problems; to design new materials and processing techniques with transformational value; and to generate new science-based knowledge for the benefit of society and the profession.

We will make sure to give this statement a prominent place on our newly designed website when it launches in 2015. Our focus on service to society is aligned with the founding mission of land-grant universities, "to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." We grant more bachelor's degrees in Materials Science and Engineering than any other department in the country and have a responsibility to be leaders in materials education. The faculty is currently discussing revisions to the senior-year curriculum to provide more flexibility for internships, to accommodate the varying interests of our students, and to strengthen our offerings of open-ended instructional labs. Feel free to contact me at matse-head@illinois.edu with your thoughts and ideas on how we can best achieve those goals.

Our B.S., M.S., and Ph.D. graduates become leaders in many professions that have a focus on materials but also in the many professions that are critically dependent on advances in materials to help solve society's most pressing problems in healthcare, energy, security, water, food, the environment, and economic development. We are confident that the rigorous education in science and engineering we provide serves our graduates well, no matter where their careers take them.

Likewise, the success of our undergraduate and graduate educational programs depends on the knowledge and skills of our outstanding faculty. Leadership in materials research is essential for attracting the very best faculty to Urbana, and, in turn, we depend on the creativity of our world-class faculty to keep our department in the forefront of science and engineering, defining the topics of materials research for the coming decades. Alumni have been extraordinarily supportive of our faculty by providing flexible research funding through endowed professorships and by endowing graduate fellowships that we use to recruit the world's most accomplished students to study for their doctoral degrees in our department.

As 2014 comes to a close, I would like to thank our donors for their support over the past year. Your gifts help us achieve our educational mission and contribute to our reputation as one of the premiere materials science and engineering departments in the nation.

Sincerely,

A handwritten signature in blue ink that reads "David Cahill".

David Cahill
Willett Professor and Head

A GLUCOSE METER OF A DIFFERENT COLOR PROVIDES CONTINUOUS MONITORING

University of Illinois engineers are bringing a touch of color to glucose monitoring.

The researchers developed a new continuous glucose monitoring material that changes color as glucose levels fluctuate, and the wavelength shift is so precise that doctors and patients may be able to use it for automatic insulin dosing – something not possible using current point measurements like test strips.

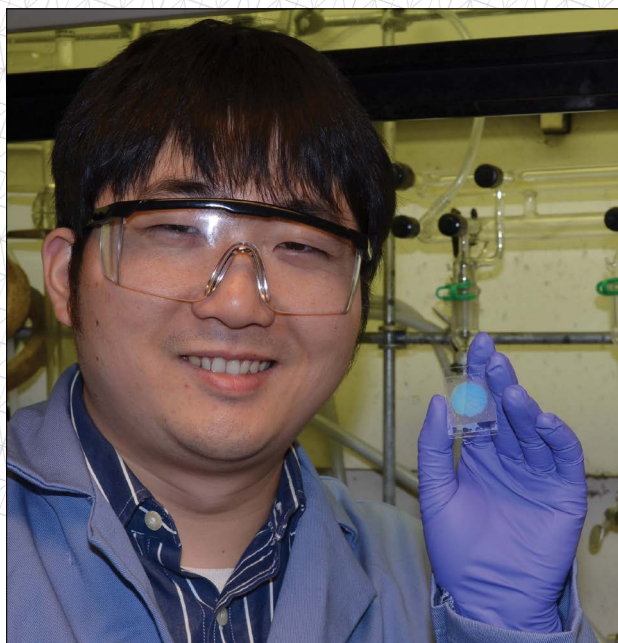
“There are significant limitations to current continuous glucose monitoring technologies,” said study leader Paul Braun. “The systems available today all have some combination of limited sensitivity, limited precision and frequent recalibration. Using today’s systems, you can determine trends in glucose levels, but without frequent recalibration, you don’t have the accuracy or reliability to use that to make insulin dosing decisions or to drive autonomous dosing.”

The Illinois sensor is made of hydrogel, a soft elastic jelly-like material, laced with boronic acid compounds. Boronic acid binds to glucose, causing the gel to swell and expand as the glucose concentration rises. Embedded within the hydrogel is a photonic crystal made of tiny, carefully arranged beads. A photonic crystal is like a mirror that only reflects one wavelength of light while the rest of the spectrum passes through. As the hydrogel expands, the reflected color shifts from blue to green to red.

Researchers have previously explored the possibility of using boronic acid hydrogels for glucose detection, because they are not prone to interference from most factors in the bloodstream. However, they have been met with a specific challenge inherent to the chemistry: Boronic acid likes glucose so much that, if there isn’t enough glucose to go around, two boronic acids will bind to one glucose. This causes the hydrogel to shrink before the glucose concentration gets high enough for it to expand again.

“It’s like people each using two arms to pull together two ropes of the polymer network, so the hydrogel shrinks,” said Chunjie Zhang, a graduate student and first author of the paper. “When more glucose comes in, each boronic acid can have its own glucose. Now, each person only grabs one rope, so the hydrogel expands.”

The Illinois researchers devised a solution to this problem by introducing a third chemical, called a “volume resetting agent,” to bind up the boronic acid



Chunjie Zhang, Ph.D. student in the Braun research group, holds a sample of the hydrogel glucose meter before glucose is added.

before the glucose is added, pre-shrinking the gel and giving a baseline for measurements. This development enabled the Illinois researchers to capitalize on the advantages of a boronic acid system without the limitation of shrinking at lower concentrations.

“When we introduce the volume resetting agent, it grabs all the ropes and makes the hydrogel shrink,” said Zhang. “Then when glucose comes in, it releases the volume resetting agent from the ropes and expands the hydrogel.”

The color-changing material is simple and low-cost to manufacture, and according to Braun, a square inch of hydrogel could be enough for up to 25 patients.

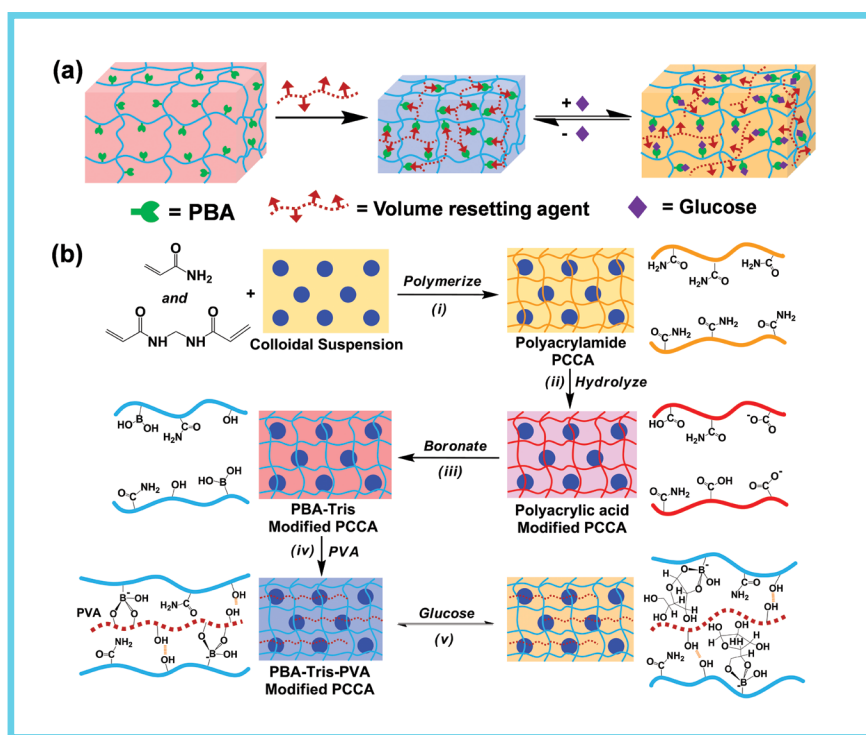
The researchers envision the hydrogel as part of a subcutaneous system or a sophisticated device that taps into the bloodstream – an

insulin pump, for example. However, the application they are most excited about is in short-term continuous monitoring of patients hospitalized or in intensive care units, when patients are most critically in need of continuous monitoring – diabetic or not.

“The sensor would be put on the end of a fiber optic cable, for example, and threaded into the bloodstream along with IVs or other monitors,” said Braun. “You could just slide it into an open port. Then you can monitor the patient for several days or longer.”

The Defense Threat Reduction Agency and the University of Illinois supported this work. Gerry Cano of the Vytrac Corporation in Pittsburgh is a co-author of the paper.

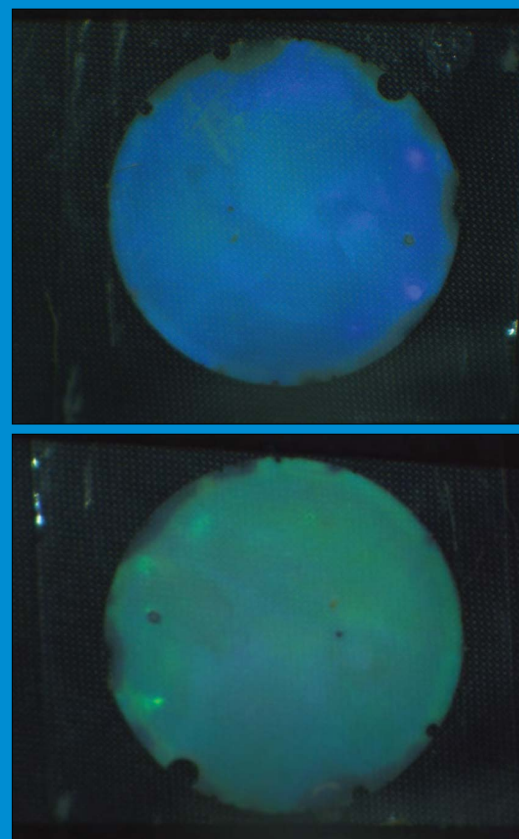
-University of Illinois News Bureau



Design and synthesis of the volume resetting agent-loaded photonic hydrogel glucose sensor materials.

(a) General design protocol of the glucose responsive hydrogel. (b) Synthetic steps for forming the glucose responsive polymerized crystalline colloidal array (PCCA). i, Photopolymerization for the polyacrylamide PCCA. ii, Hydrolysis to generate carboxylates on polyacrylamide hydrogel matrix. iii, Coupling PBA and Tris onto the hydrogel matrix. iv, Crosslinking PBA moieties by the volume resetting agent PVA. v, Reversible volume response to glucose via dissociation and association of the PBA-PVA-PBA complexes.

COLOR CHANGE IN ACTION



See a video of the glucose monitoring material:
<http://youtu.be/pXK1-He6leA>

Atomic-level research could lead to advances in photovoltaics

Renewable energy is an increasingly competitive way of generating the huge amount of energy that operates our society. The most exciting



Angus Rockett

progress in recent years has been in solar cells (photovoltaics) that make power directly from the sun.

Three technologies have record conversion efficiencies over 20% and have been produced as commercial products. These three technologies are based on: the element Si, the compound CdTe, and the alloy of compounds Cu(In,Ga)Se₂ [“CIGS”]. Solar modules are now routinely manufactured for less than \$0.60 per Watt of generating capacity under standard conditions, which is less

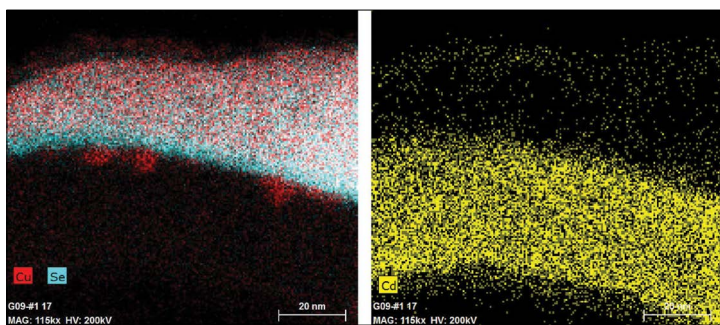
than one-tenth the cost of these devices 15 years ago.

Of the three technologies, CIGS holds the most promise for ultimate performance and reliability but lags behind in manufacturing. Additional research is needed to understand and optimize the devices and minimize manufacturing costs.

Angus Rockett’s research group has discovered some remarkable features in materials made by a leading solar cell company, MiaSolé, in California. The solar cells consist of junctions of two semiconductors, the alloy CIGS and CdS.

Normally when these junctions are made, the CdS is very poor quality nanocrystalline material. However, Xiaoqing He, a researcher in the Rockett group, has found that the commercial device material includes large areas of single crystal CdS that grew directly on the CIGS crystallites. This holds the potential for greatly improving the performance of these already highly performing devices.

Specifically, the current that the devices produce is limited by light absorption in the CdS. Making better quality CdS may result in the ability to collect light from that material and could dramatically improve the output of the device.



Maps of the composition of the solar cell materials near the active junction. The colored images represent the distribution of different types of atoms and were obtained as energy dispersive x-ray emission maps in the transmission electron microscopes at the National Center for Electron Microscopy.

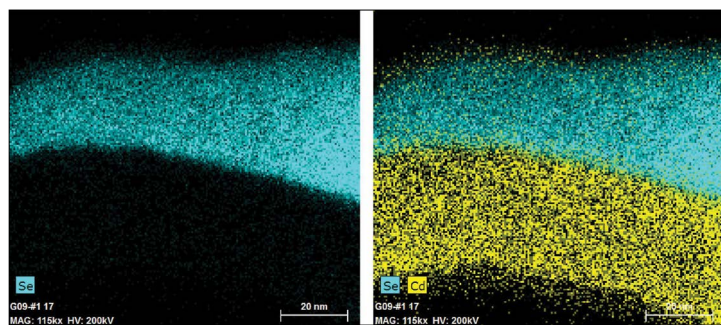
This project is supported by the U.S. Department of Energy BRIDGE program, jointly funded by the Energy Efficiency and Renewable Energy and Office of Science divisions of the DoE. The project is a collaborative research project with the Lawrence Livermore National Laboratory, led by Vincenzo Lordi, and the MiaSole Division of Hanergy.

Rockett is developing new photoelectron spectroscopy techniques and applying them to the solar cell materials he is studying. The determination of individual defect chemistries by the new photoemission techniques is nearly impossible to work out by traditional methods. However, with the new techniques, the defects observed in the electron microscope can be connected with specific atoms and the detailed mechanism limiting device performances can be shown. To develop the technique, the Rockett group has recently established international collaborations with groups in Ankara, Turkey, and Ekaterinburg, Russia.

The collaboration with the Ankara group, led by Sefik Suzer of the Bilkent University Department of Chemistry, concerns the development of a new way of seeing where charge is trapped in semiconductors using modulated light beams of a single wavelength and photoelectron spectrometry. When light shines on the semiconductor, it generates free charges that can later become trapped on defects associated with individual atoms. This changes the charge on those atoms, which is detected with the photoelectron spectrometer.

The approach is also providing a new way of mapping the material to show where specific regions will make good solar cells and where others will not. This can then be directly connected with the chemistry of the material through the use of the chemical species sensitivity of the photoelectron spectrometer.

More detailed photoemission studies are being connected at the same time through collaboration with Tatyana Kuznetsova of the Institute of Metal Physics in Ekaterinburg. The Kuznetsova group specializes in photoemission and growth of bulk single crystals of the materials under study. This complements the Rockett group capabilities and provides more details on the behavior of the materials.



Note the red regions in the far left image that denote Cu-rich areas of the CdS, the blue band above them that shows a Cu-deficient area near the junction in the CuInSe₂ (upper part of the image), and the greenish area at the interface in the far right image that shows how Cd dopes the CuInSe₂ (blue).

Welcome to MatSE

The MatSE Department welcomed a new faculty member and a lecturer in the 2014-15 academic year.

Jessica Krogstad is a new assistant professor and also an alumna, having received her bachelor's degree in MatSE from the University of Illinois in 2007. She received her Ph.D. in Materials Science and Engineering from the University of California, Santa Barbara, in 2012. Prior to joining the MatSE faculty at Illinois, Krogstad was a postdoc at Johns Hopkins University.

Her husband, Dan, is also an alumnus of both MatSE at Illinois and UC-Santa Barbara and has joined the Applied Research Institute at the University of Illinois as a research scientist.

This semester Krogstad is teaching MSE 440, Mechanical Behavior of Metals.

"I've really enjoyed the one-on-one interactions with the students," she said. "It's great to see that 'lightbulb' go off in their head when they finally get a new concept."

Her research group is interested in the relationships between mechanical properties and microstructure across a variety of length scales and time frames.

"We are working to capitalize on thermodynamic and kinetic driving forces that influence morphological and compositional changes in nonequilibrium materials and ultimately dictate material response. We are particularly interested in materials that must survive in extreme conditions—temperature, cyclic loading, corrosion, etc."

Krogstad is extremely happy to be back in the MatSE Department, where she finds the environment to be "collegial, collaborative and highly stimulating."



Jessica Krogstad



Matt Goodman

Matt Goodman joined MatSE as a new lecturer at the start of the fall semester. A second generation Illini, Goodman grew up in Champaign. He received his bachelor's and master's degrees in Materials Science and Engineering from Iowa State University and recently completed his Ph.D. in MatSE at the University of Illinois, in the Paul Braun research group. For his thesis, Goodman worked with unique colloids consisting of mesoporous carbon.

"By modifying the surface charge, the carbon colloids could be driven to self-assembly into a colloidal crystal," Goodman said. "This colloidal crystal was then utilized as a unique template due to the mesoporous structure and carbon's ease of removal. Specific applications I investigated included dye-sensitized solar cells (DSSC) and lithium-ion batteries."

Goodman taught a MatSE course for education majors at Iowa State and was a teaching assistant (TA) for the introductory freshman course, MSE 182/183 at Illinois. This semester he is teaching MSE 101, Materials in Today's World, and MSE 280, Engineering Materials, and next semester he will be teaching MSE 280 and MSE 395, Materials Design.

As for why he decided to become a lecturer, "I have always enjoyed teaching and felt this was a perfect avenue for my passion. The amazing support from the department enables some really innovated thinking and teaching styles."

FACULTY RANKED AS EXCELLENT

The following MatSE instructors ranked as excellent by their students in the spring 2014 semester: **Paul Braun, Andy Ferguson, Nate Gabrielson, Angus Rockett, and Ken Schweizer**, plus teaching assistants **Anna Czerepak, Nicole Jackson, Kaushik Sankar,** and **Emily Schiavone**.

DEPARTMENT NOTES

Allison Sutton is the new Business and Finance Coordinator for the MatSE Department. She will be assisting with grant proposals, post-award accounting, and other business office duties. She is from Paxton, IL, and received her degree in finance from Valparaiso University. Sutton has been at the University of Illinois since 2007, coming to MatSE from the Materials Research Laboratory (MRL).



MatSE grads receive Mavis Fellowships

Kaitlin Tyler and Jichuan Zhang, Ph.D. students in MatSE, are Mavis Future Faculty Fellows (MF3) in the College of Engineering.

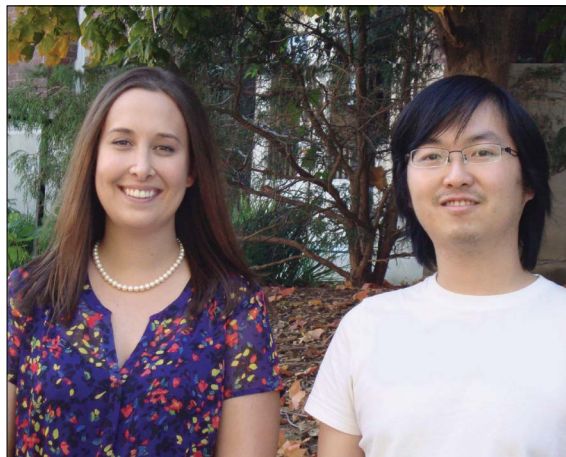
The MF3 program provides the opportunity for doctoral students interested in engineering teaching as a profession to gain experience in the areas of research, teaching and mentoring. MF3 participants have opportunities to attend a variety of workshops, activities, seminars, courses, and events to improve their knowledge of faculty responsibilities.

It was her past experiences with teachers and professors that influenced Tyler's decision to pursue an academic career.

"Growing up, I had teachers and professors who really made a difference in my education," Tyler explained. "They made me excited about learning and encouraged me to dig deeper into areas that interested me. They also indulged me by answering my questions and working with me outside of class so I could understand difficult topics."

Originally from Apple Valley, Minnesota, Tyler received her B.S. degree in Materials Science and Engineering with a concentration in biomaterials from Michigan State University in 2012. Last fall, Tyler was a teaching assistant (TA) for the introductory Materials Science course, MSE 182.

"Working with the students during office hours and watching them understand concepts was really rewarding for me," Tyler said. "I am



Kaitlin Tyler and Jichuan Zhang

also one of the graduate coordinators for the Girls Learning About Materials (GLAM) summer camp held here at Illinois. Introducing high school girls to Materials Science and seeing their excitement about science and engineering is really awesome. One girl from camp last summer will begin her freshman year here in Materials Science in the fall and that makes the stress of teaching all worth it."

Tyler is a member of Paul Braun's research group where she works on controlling the periodicity of the microstructure of eutectic materials via directional solidification and 3D templating.

"The final goal of this project is to use this periodicity to modify the optical properties of different materials," she said. "Personally, I work with metallic materials and have gotten to learn quite a bit about electrochemistry so far in my research, a topic I did not know much about when I started."

She is excited about being named a Mavis Future Faculty Fellow and credits her former teachers for her success.

"They are a big part of the reason I am here, pursuing my Ph.D. I hope to be able to encourage students like that in the future," Tyler said.

Jichuan Zhang's "great curiosity on how biological systems evolve and function" brought him to Illinois for his Ph.D. study. He would like to pursue an academic career so that he can focus on research topics that really intrigue him.

Zhang is a member of Taekjip Ha's research group in the Physics Department. The Ha lab is interested in understanding the biological processes involved with nucleic acids and proteins and utilizes sophisticated physical techniques, especially fluorescence and force spectroscopy.

"My own research mainly focuses on development of fluorescence labeling and imaging method to visualize RNA molecules in live cells. RNA molecules play important roles in cells to help convey genetic information stored on DNA molecules and regulate the gene expression. By directly viewing RNA molecules in the cell we are able to know their expression level, distribution, and production and degradation process, which helps us understand how RNA functions



Students in the Girls Learning About Materials (GLAM) camp conduct experiments on shape memory alloys.

in the cell, and how it integrates itself in gene expression and metabolic pathways.”

Zhang has been a TA for the Biophysics Lab course, PHYS 598BP, and a TA for the Center for the Physics of Living Cells Summer School in the Physics Department.

“In academia, it is important to show your research to the whole world in a clear and vivid way,” Zhang said. “Therefore I enjoy and cherish every teaching experience of mine and regard it as a good opportunity to practice my presentation skills to convey my knowledge and scientific ideas to other people.”

Zhang received his bachelor’s degree in Polymer Science and Engineering from Zhejiang University in Hangzhou, Zhejiang Province, China, in 2010.

“Graduate students who are interested in an academic career are encouraged to spend time in the classroom as a teaching assistant,” said David Cahill, MatSE Department Head. “It not only prepares them for their future careers but also gives our undergraduates the opportunity to interact with graduate students and learn more about options available to them if they decide to continue their education.”

HAMER FELLOWS

The Hamer Fellowship was established by Donald Hamer (BS Cer ‘45) and is presented to exceptional students entering their first year of graduate study in the MatSE Department. The following graduate students were awarded Hamer Fellowships for the 2014-15 academic year

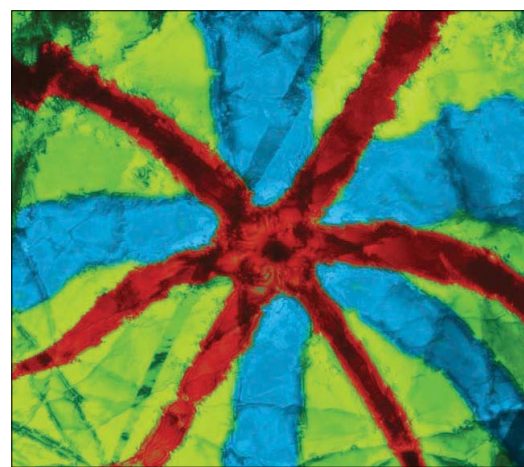
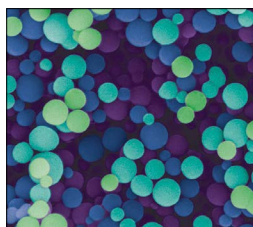
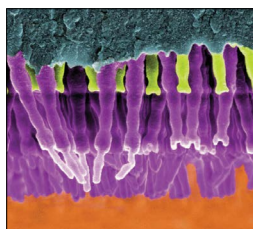
- Elizabeth Deutsch** (Purdue University)
- Kara Kearney** (University of Texas at Austin)
- Andrew Lauer** (Rensselaer Polytechnic Institute)
- Joshua Leveillee** (University of Connecticut)
- Michael Marvin** (Kent State University)
- Kewang Nan** (Rice University)
- Ella Pek** (University of California, Berkeley)
- Pralav Shetty** (University of Pennsylvania)
- Charles Smith** (University of Minnesota)
- Gregory Sparks** (Illinois Institute of Technology)
- Dylan Steer** (University of Alberta)
- John Vance** (University of California, Berkeley)
- William Wheeler** (Technische Universität München)



MATSE CALENDAR FOR SALE

Attractive 12-month calendar features artistic images from graduate student research in the MatSE Department at the University of Illinois. The price is \$18, including shipping (for calendars shipped in the United States; extra charge for shipping overseas). For more information on ordering a calendar, contact matse.calendar.uiuc@gmail.com.

The calendar was created by graduate students in the Materials Research Society (MRS) chapter at the University of Illinois. Proceeds will be donated to Project SYNCERE—an organization dedicated to teaching youth core principles of engineering and scientific research—and STEM-related educational projects on donorschore.org, a crowdsourcing-based online charity.



MATSE SCHOLARSHIPS AND AWARDS 2014-2015



A.I. ANDREWS SCHOLARSHIPS:

Michael Dimare, Kai Wells

PAUL A. BECK SCHOLARSHIP:

Jonathan Hestroffer

HARRY J. BECKEMEYER JR. SCHOLARSHIP:

Arjun Balwally

CLIFTON G. BERGERON SCHOLARSHIPS:

Katharine Mehan, Patrick Snyder

LOUIS R. BERNER SCHOLARSHIPS:

Nicholas Dunlap, Sean Murray

GERSON B. BILOW SCHOLARSHIP:

Michael Szymanski

ROBERT BOHL SCHOLARSHIPS:

Adam Brown, David Christianson, Timothy Lichtenstein, David Limberg, Renhan Wang, Xizhu Wang

OTTO SR. AND MILDRED CAPEK SCHOLARSHIP:

Ryan Thier

CATERPILLAR SCHOLARSHIP:

Derek Kwok

EARL J. ECKEL SCHOLARSHIPS:

Andrew Buhl, Brian Cabinian, Timothy Chiu, Seokhwan Chung, Janna Eaves, Victor Gofron, Seung Yun Heo, Min Su Kim, Kacper Lachowski, Austin Li, Palod Limsiri,

Jonathan Lin, Erwin Lin, Yanfu Lu, Anna Mast, John Miller, Akshay Murthy, Nicholas Palcheck, Vijay Rajendran, Arvind Ramaiah, Cameron Rosenthal, Adriana Schoenfeldt, Yuliya Semibratova, John Smith, Liwei Song, Brian Sorich, Samuel Srajer, Hannah Taylor, Alexander Trick, Zixing Wang, Hongyi Wu, Ming Xu, Qiujie Zhao

M. LAIRD AND CHARISANN FROBERG SCHOLARSHIPS:

Daniel Roper, Steven Simpkins

PHILLIP H. GEIL SCHOLARSHIP:

Daniel Li

HENRY E. GREIN JR. SCHOLARSHIP:

Brian McDonald

DONALD W. HAMER SCHOLARSHIP:

Olivia Rogers

DORIS MARONEY KRUMWIEDE SCHOLARSHIP:

Grace Pakeltis

JOSEPH AND WYVONA LANE SCHOLARSHIP:

Jason Fleischman

ROBERT E. AND KAREN MARTIN LUETJE

SCHOLARSHIP:

Martin Kim

KEVIN MOORE MEMORIAL SCHOLARSHIP:

Julia Hardy

G. RONALD AND MARGARET H. MORRIS SCHOLARSHIP:

Alex Kim

G. RONALD AND MARGARET H. MORRIS OPPORTUNITY SCHOLARSHIP:

Zachary Hoffman

JAMES A. NELSON SCHOLARSHIP:

Connor Bailey

CULLEN W. PARMELEE SCHOLARSHIPS:

Soham Ali, Matthew Cheng, Brendan Eng, Deepa Kote, Deepak Mani

CULLEN W. PARMELEE INTERNATIONAL RESEARCH SCHOLARSHIPS:

William Andrews III, Nicole Ernat, Grace Nelson, Nicholas Sherman, Andrew Zhao

FREDERICK A. PETERSEN SCHOLARSHIP:

Dennis Jones

NORMAN L. PETERSON SCHOLARSHIPS:

Joshua Ayers, Andrew Curtis

LARRY D. AND CAROL RAKERS SCHOLARSHIPS:

Douglas Hansel, Kenneth Jabon, Samuel Kaufman, Athena Lin, Samuel Mo, Charles Stovall

IAN AND VICTORIA ROBERTSON SCHOLARSHIP:

Nikolas Van Winkle

C. M. WAYMAN SCHOLARSHIP:

Eric Przybylski

WERT SCHOLARSHIPS:

Tara Cullerton, Fang Jiunn Ewe, Zih-Ning He, Anahita Kagti, Diane Kuai, Chia-Han Liu, Corinne Lopes, Hao Sheng, Samantha Tatar, Laura Ward, Carrington Watkins, Yuxiao Wu, Siyi Xu, Qinglin Yang, Yiyuan Yang, Aaron Zhao, Jinpeng Zhuo, Julia Zuo, Nicole Crosby, Siyi Zhang, Ruoyan Zhang

ALFRED W. ALLEN AWARDS:

Soham Ali, Brian Cabinian, Matthew Cheng, Brendan Eng, Guanhua Fang, Deepa Kote, Derek Kwok, Deepak Mani, Jiechen Wang, Jinpeng Zhuo

ARTHUR L. FRIEDBERG AWARD:

Steven Shewchuk

LAIRD FROBERG AWARD:

Luke Shi

MATERIALS SCIENCE AND ENGINEERING ALUMNI

BOARD AWARD:

Hui Lin Yang

SHERYL BLAIR TIPTON AWARD:

Stephanie Nemeč

UNDERGRADUATE NEWS

- Miss Possible co-founders **Supriya Hobbs** (BS ChemE '14) and **Janna Eaves**, MatSE senior, have surpassed their \$75,000 crowdfunding goal. The first Miss Possible doll, Marie Curie, will be coming out in January.
- MatSE undergraduate **Jay Fleischman** was selected for the 2014 Cargill Global Scholars program. The program provides scholarships and leadership development opportunities to undergraduates from around the world studying in a field relevant to food, agriculture, and risk management. Jay was the only student chosen from the University of Illinois.
- The MatSE at Illinois undergraduate program is ranked #2 in the nation by the *U.S. News & World Report* in its 2015 edition of Best Colleges.



First recipient of the Krumwiede Scholarship



Grace Pakeltis

The first recipient of the Doris Maroney Krumwiede Scholarship in Materials Science and Engineering is **Grace Pakeltis**, a sophomore from Villa Park, Illinois. Although she has been interested in majoring in engineering since her freshman year of high school, her interest was in Chemical Engineering until she attended a GLAM summer camp in MatSE.

"I was able to learn about optic materials, biomaterials, and my

personal favorite: materials used in sustainable energy," Pakeltis said about her experience at the GLAM camp. "Being able to build solar power cars that worked was one of the most rewarding projects I have ever completed."

She is happy to have chosen MatSE as her college major. "The classes and professors I have had so far have allowed me to learn more about what I am passionate about," Pakeltis said.

Her extracurricular activities include the Society of Women Engineers (SWE), Material Advantage, and Keramos. As co-director of SWE's outreach committee, she works with students locally and across the state to share her passion for engineering. An undergraduate research assistant, Pakeltis is working on the microfabrication of bioelectronics in John Rogers' lab. She is also a student missionary at the St. John's Catholic Newman Center on campus and helps out with masses. In her free time, Pakeltis enjoys watching and playing sports and running with friends.

Scholarships offer much needed financial relief to college students and their families. For Pakeltis, "Scholarships allow me to focus on my education rather than how I am paying for my education."

The Doris Maroney Krumwiede Scholarship was established in 2013 by Jack Krumwiede in memory of his wife, Doris, who sacrificed her scientific career for her family.

"Doris seemed like a spectacular woman, and I am truly flattered to receive a scholarship in her memory," Pakeltis said. "I would like to thank Mr. Krumwiede for his generosity in creating this scholarship."

Thank you for your support

The student awards highlighted in this issue would not be possible without your support. Gifts to the MatSE Department provide scholarships for outstanding and in-need students, allow us to continuously improve the quality of our instructional laboratories, and support special events such as our back-to-school picnic and annual awards banquet. Alumni gifts also support travel by undergraduate researchers to attend professional conferences and support materials outreach efforts such as our high school visit day and Engineering Open House.

This list of donors includes alumni and friends who have helped maintain MatSE's outstanding reputation. Included are individuals who have directed their gifts to MatSE between July 1, 2013, and June 30, 2014. We check the list carefully, but if we have overlooked you, please contact us so that we can correct our records. Individuals listed in boldface are first-time donors to MatSE.

Some MatSE alumni choose to support other units of the University of Illinois; those gifts are not listed here but will be acknowledged by

those units. Gifts to "Engineering at Illinois" are directed to the College of Engineering, not the MatSE Department. If you wish to direct gifts to MatSE, please indicate MatSE on your check and on the donor form. You can donate online at www.matse.illinois.edu/support or use the form included in this newsletter.

The Engineering Dean's Club recognizes individuals whose annual giving to engineering departments or the engineering fund is \$1,000 or more over the course of a year. Members receive a Dean's Club lapel pin to help them show their pride and commitment to Engineering at Illinois.

The President's Council is the University's highest donor recognition organization. Membership is extended to those who have made outright gifts of \$25,000 or more in their lifetimes, as well as those who have made deferred gifts of \$50,000 or more.

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"The Morris Scholarship has definitely helped with the financial burden that is paying for college. It is always nice to get some extra help from people who have been in my situation before, especially from those that know what it's like to be a first-generation college student. Plus, receiving this scholarship has also shown me what a great network of generous alumni the MatSE department has."

Zach Hoffman, *sophomore from Pesotum, IL, Morris Opportunity Scholar*

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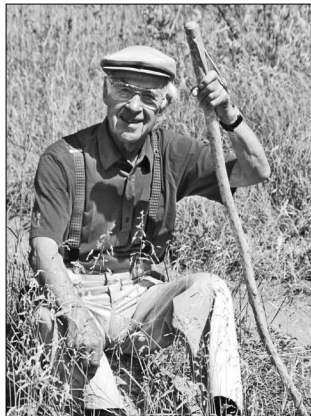
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"The Rakers Scholarship is an incredible gift that has helped me continue to explore my passion for materials science and engineering education. Through my volunteer work for Big Beacon, a movement to transform engineering education, and my work at the I-STEM Education Initiative, I hope to have a positive impact on students interested in engineering. I am planning to pursue a graduate degree in engineering education after college and a career in academia."

Athena Lin, sophomore from Urbana, IL, Rakers Scholar

Lead gift received for the new MatSE Visionary Scholarship Fund



Hans Thurnauer

The Engineering Visionary Scholarship Initiative at the University of Illinois will raise a \$100 million endowment to bring the nation's best students to Engineering at Illinois by making college more affordable. Likewise, the Materials Science and Engineering (MatSE) Visionary Scholarship will ensure that these top students can enroll in MatSE at the University of Illinois, regardless of their financial situation.

Thanks to a lead gift from the Noris Foundation, the MatSE Visionary

Scholarship is one step closer to becoming a reality. The Noris Foundation, established by alumnus Hans Thurnauer (MS Cer '32) in 2000, supports charitable, scientific, literary, and educational purposes.

"With the announcement of the University of Illinois Engineering Visionary Scholarship Initiative, it was appropriate for the Noris Foundation to make the lead gift to establish the MatSE Engineering Visionary Scholarship Fund," said Marion Thurnauer, Hans' daughter. The University of Illinois meant a lot to Hans Thurnauer. "He often commented that he not only gained an education in ceramics, but

his experience at U of I taught him about the 'American way of life,'" Marion said.

Indeed, Hans Thurnauer's experience at the University of Illinois had a profound impact on his professional and personal life. Hans came to Illinois as an exchange master's degree student from Germany in 1930, during a period when Germany was experiencing great turmoil between the two World Wars. Professor Parmalee, Head of the Department of Ceramic Engineering at Illinois, invited him following a guest lecture Parmalee presented in Berlin, where Hans was a student of Ceramic Engineering. When Hans arrived in the U.S., Professor Parmalee provided significant assistance to Hans. He lent money to Hans because of the temporary difficulties with the U.S. banks and invited Hans to stay with him and his wife until Hans could find his own place.

Hans had a successful career in the ceramics industry and was able to assist a number of people, including his former professor, to emigrate from Germany to the United States. He gave back to his alma mater, establishing a professorship and scholarships in Materials Science and Engineering at the University of Illinois. He passed away in 2007. In September 2014, two Stolpersteine or "stumbling blocks," monuments commemorating victims of the Holocaust, were placed in front of Hans' former ceramic firm in Germany to honor Hans and his cousin Martin.

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Alumni awards

DISTINGUISHED MERIT AWARD: Richard Mah (MS Met '70)



Richard Mah entered college at the age of 16, receiving a B.S. in Engineering Mechanics and an M.S. in metallurgical engineering. He worked seven years in the petrochemical industry, at Dow Chemical and C.F. Braun. The majority of his career, 30 years, was spent at Los Alamos National Laboratory. As the Associate Laboratory Director for Weapons Engineering and Manufacturing, he was responsible for overseeing the

engineering and manufacturing aspects of the nuclear weapons program to fulfill the stockpile stewardship mission at LANL. He led two materials technology research groups in metallurgy and in polymers and coatings and had management responsibility for large

research facilities at Los Alamos. From 2006 to 2010, Mah was the Vice President and General Manager for Science and Technology at TMC, Inc. In October 2012, he retired as the CEO and Director of Sigma Labs, Inc. Mah is credited with founding this corporation through arranging the purchase of this company and taking it public. He has received the Federal Laboratory Consortium special award for excellence, the LANL Distinguished Performance Award, the DOE Award of Excellence, and an award from the University of California. He has been recognized for his commitment to employees with a Diversity Award and an Outstanding Mentor Award. He has served as a director on the Board of Directors of Sigma Labs Inc., B-6 Sigma Inc., and Sumner Associates, and is presently a Director on the Board of the Community Bank in Santa Fe. Mah is a registered professional engineer through the state of California and has authored and co-authored over 100 articles, papers, reports and presentations. He is pictured with his faculty advisor Fred Lawrence.

DISTINGUISHED MERIT AWARD: William Fahrenholtz (BS Cer '87, MS Cer '89)

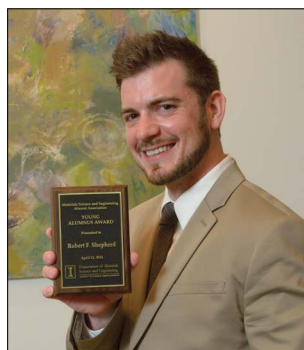


William Fahrenholtz is a Curators' Professor of Ceramic Engineering in the Department of Materials Science and Engineering at the Missouri University of Science and Technology (formerly University of Missouri-Rolla). He earned B.S. and M.S. degrees in Ceramic Engineering at the University of Illinois in 1987 and 1989, respectively. He completed his Ph.D. in Chemical Engineering at the University of New Mexico (UNM) in

1992. From 1993 to 1999, he was a research assistant professor in the Department of Chemical and Nuclear Engineering at UNM. Since starting at Missouri S&T in 1999, Fahrenholtz has received several

awards including seven campus-wide faculty excellence awards, two teaching awards, and a prestigious CAREER award from the National Science Foundation. He was elected a Fellow of the American Ceramic Society in 2007. He teaches undergraduate and graduate courses on thermodynamics. His current research focuses on the processing, characterization, and mechanical testing of advanced structural ceramics for use in environments with extreme thermal loads, mechanical forces, and/or chemical reactivities. Fahrenholtz has published over 100 papers in peer-reviewed journals and given over 30 invited presentations on his research. He has been Principal Investigator or Co-Principal Investigator on nearly 50 grants from sources including industry, the National Science Foundation, and the Air Force Office of Scientific Research.

YOUNG ALUMNUS AWARD: Robert Shepherd (BS MatSE '02, PhD MatSE '10)



Robert Shepherd is an assistant professor at Cornell University in the Department of Mechanical and Aerospace Engineering with a Field Appointment in Material Science and Engineering. He received both his B.S. and Ph.D. in Material Science and Engineering from the University of Illinois (studying under Dr. Jennifer Lewis) where he developed polymeric and colloidal inks for 3D printers,

as well as microfluidic devices that generate granular material via

photolithography. Following his Ph.D., Shepherd was a Postdoctoral Fellow in the Department of Chemistry and Chemical Biology at Harvard University (studying under Dr. George M. Whitesides) where he developed pneumatically powered soft machines composed of silicone elastomers. These machines took the form of grippers that require no sensors, and mobile robots that can change their shape to navigate underneath obstacle or jump over them. At Cornell, he is pursuing the 3D printing of actuators and sensors, increasing the toughness of soft actuators, and using granular material as reconfigurable architecture. Shepherd has been featured in *Time* magazine's top 50 inventions of 2011, the *Wall Street Journal* (print edition), BBC News, C&E News, and a variety of other media outlets.

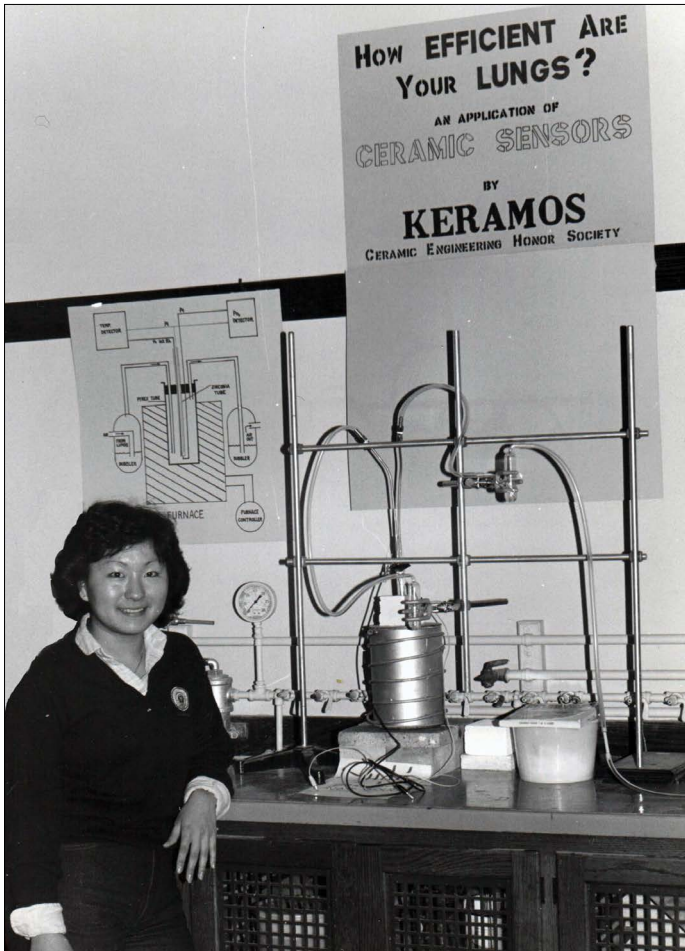
LOYALTY AWARD: Joe and Casey Harmon (BS MatSE '99)



Joe and Casey Harmon both graduated from the University of Illinois in December 1999 with bachelors' degrees in Materials Science and Engineering. They have been very involved with the MatSE Department since graduation, returning several times to give talks to students about the medical device industry. Joe works as a Group Product Director at DePuy Synthes Joint Reconstruction, a division of

Johnson & Johnson. He has been with DePuy Synthes for 7 years and leads the U.S. Shoulder Arthroplasty marketing team. Prior to his role in marketing, he completed his MBA at the Kellogg School

of Business at Northwestern University where he was a part of the MMM program, a dual degree program for individuals seeking to focus on product-driven companies. Joe has served two terms on the MatSE Alumni Board. Casey works as a Principal Engineer at Zimmer Orthopaedics in the Research and Development. In her position, she serves as an expert on ceramic and powdered metal manufacturing, process development and implementation. She previously worked at Centerpulse Orthopaedics; it was acquired by Zimmer in 2003. Casey served on a high profile process transfer team that transitioned key technology from Centerpulse to Zimmer.



Joyce Yamamoto (BS Cer '84) shows off a Keramos EOH exhibit from the '80s.

KERAMOS:

Save the date

Celebrate 100 years on February 21

On February 15, 1915, the University of Illinois at Urbana-Champaign was nationally recognized as the Keramos-Alpha Chapter. Since then, our chapter has grown to nearly 150 members as a professional society.

To celebrate 100 years of growth, please join us on Saturday, February 21, at the I Hotel and Conference Center in Champaign, IL. Banquet tickets are \$15 until January 16, and then \$20 until February 6. Please RSVP on our website, www.keramosillinois.org, and purchase your ticket online or send a check payable to "Keramos Illinois Chapter" to: Keramos, MatSE Department, University of Illinois, 1304 W. Green Street, Urbana, IL, 61801.

More information about the weekend is available on the Keramos website. The deadline to RSVP and purchase tickets is January 16 for early bird pricing and February 6 for regular pricing. If you have any questions, please contact Keramos president Mike Sarantos (saranto2@illinois.edu).

CLASS Notes



Eileen De Guire (BS Cer '81, MS Cer '82) was promoted to the position of Director of Communications and Marketing at The American Ceramic Society, which includes being the editor of the ACerS Bulletin magazine. "It is a great honor—and a lot of fun—to be the global voice promoting the engineered ceramics and glass community and its successes," she said.



Robert Schwartz (PhD Cer '89) is the Interim Dean of the College of Engineering at the University of Missouri. Prior to joining the University of Missouri System in April 2012 as an administrator, Schwartz was the interim provost and executive vice chancellor for academic affairs at Missouri S&T. He also served as a professor of ceramic engineering, the department's associate chair and as the faculty senate president at

Missouri S&T. He is a fellow of The American Ceramic Society, serving on the society's Board of Directors from 2010 to 2013.



David Watson (BS Cer '89) is the Vice President of Pariveda Solutions in Bellevue, WA. He returned to campus in October to talk to undergraduates about his career. In his talk, he mentioned some of the composite design programs he was involved with: Boeing's 787, Space X's Dragon, Goodrich's composite nacelles, and Northrop Grumman's F35 program.

Anthony DiGiovanni (BS Cer '93) is a Research Manager-Diamond Projects for Baker Hughes Inc. in Houston, TX.



Phillip Messersmith (PhD Cer '93) is the Class of 1942 Professor in the Departments of Bioengineering and Materials Science and Engineering at the University of California, Berkeley. He was a faculty member at the University of Illinois at Chicago from 1994-1997 and at Northwestern University from 1997-2014. Messersmith is a fellow of the

American Institute for Medical and Biological Engineering, the Royal Society of Chemistry, and the International Union of Societies of Biomaterials Science and Engineering. His research interests include studies of biological adhesives, biointerfacial strategies for surface modification, bioinspired polymers and polymer composites, and design of novel biomaterials for regenerative medicine.

Ken Rotunno (BS MatSE '96) is employed with Northrop Grumman Aerospace Systems in Redondo Beach, CA. He is a member of the International Microelectronics Assembly and Packaging Association (IMAPS) Angel chapter in Los Angeles.

Ulas Sevim (BS MatSE '01, MS MatSE '03) is Senior Lab Manager for Global Quality and Compliance at the Master Lock Company in Oak Creek, WI.

Joshua Robach (PhD MatSE '03) is Mill Products and Metallurgy Manager at Tenaris in Houston.

Jaime Benson (BS MatSE '06) is the Finance Manager-Planning and Ops Analysis for Red Robin in Denver, CO.



Geoff Brennecka (PhD MatSE '06) joined the faculty at Colorado School of Mines as an assistant professor at CSM's Colorado Center for Advanced Ceramics. His work will focus on the area of electrical ceramics, particularly ferroelectrics and piezoelectrics. He was formerly a principal member of the technical staff at Sandia National Laboratories. At the conclusion of MS&T14

in October, he will begin a three-year term as a member of The American Ceramic Society Board of Directors and a one-year term as vice chair of the Electronics Division.

Kristiann Rushton (BS MatSE '07) visited campus in September to recruit for Chevron. She also spoke to the MSE 401 (Thermodynamics) class. She is a Risk Based Inspection Engineer for Chevron's Reliability and Integrity Unit in Houston.

Alissa and Ben Pierce (both BS MatSE '10) welcomed their first child, Owen John Pierce, on September 13.

FALL HIGHLIGHTS



Dean Andreas Cangellaris met Glenn (BS Cer '73) and Kristine Pfendt at the Homecoming tailgate hosted by the College of Engineering on October 25.



Chicago-area alumni gathered at Maggiano's Little Italy in Schaumburg for a MatSE reception on November 13.

OBITUARIES

Paul Ziegler (BS Met '52) died February 4, 2014, in Sedona, AZ. He was a first lieutenant in the U.S. Air Force. He married Dona Marie Lotka on December 1, 1956. He worked for many years at the Fansteel Corporation as a metallurgist, eventually reaching the level of Vice President. He developed alloys for the aerospace industry, including the Apollo 11 moon-landing mission. After his time at Fansteel, he served as a consultant for foreign governments and businesses and travelled extensively to the Far East. Paul and Dona moved to Sedona in 1999 to spend their retirement years. He was an excellent golfer, avid reader, and a master of the Weber grill. He is survived by his wife, daughter, son, and four grandchildren.

William Scott (BS Cer '54) passed away on April 6, 2014. He received his Ph.D. from the University of California, Berkeley in 1961. He taught in the Department of Materials Science and Engineering at the University of Washington for 32 years.

Lucas Pfeifferberger (BS Cer '50, MS Cer '57) died July 10, 2014, in Alpena, MI. Upon completion of his service in World War II, he entered the University of Illinois. In 1957, he moved to Alpena as Executive Director of the Expanded Clay and Shale Association. In 1958, he began employment at Besser Company, retiring after 30 years as Manager of Research and Training. After retirement, he remained active in the community, teaching Concrete Technology at Alpena Community College, serving as Executive Director of the Community Foundation for Northeast Michigan, and in his later years serving the Besser Museum for Northeast Michigan as a Trustee and volunteer. He was very active with the local Boy Scouts of America. He was a member of the Alpena Rotary Club serving as president in 1967. He received a number of awards for his volunteerism and philanthropy. He is survived by his wife, Janet, two children, and grandchildren.

Om Prakash Arora (PhD Met '65) died August 29, 2014, in Silver Spring, MD. He came to the U.S. as a student in 1950, to attend

the Colorado School of Mines to complete his master's degree and then obtained his Ph.D. from the University of Illinois. He joined the David Taylor Research Center of the Naval Sea Systems Command at Annapolis, MD. He retired from the institution in 1995. During the more than 30 years of service, he acquired many patents. He published many technical papers and report, and co-edited three volumes of proceedings on titanium alloy development for marine applications. He was one of the principal organizers for many Indo-US conferences and workshops supported by the U.S. State Department to promote research collaborations between the two countries. He established, in honor of his father, the Shri Ram Arora International Award for Materials Science and Engineering Education, awarded annually by The Materials Society (TMS). In 1964, he returned to India and married Manmohini Sarin and had two daughters. He was involved in many local charities and founded, along with his brother, a trust to provide medical care and education for the village community of Atrauli, India.

Mattison "Matt" Ferber (BS Cer '76, MS Cer '78, PhD Cer '81) died June 29, 2014, in Oak Ridge, TN. He received his education from the University of Illinois, spending his summers working for the Ferber family Fairmount ReadyMix plant. He was a distinguished researcher in material sciences at Oak Ridge National Laboratory as well as Ceramtec in Salt Lake City. He started the MTIC LLC and served as a consultant, professor, group leader, and mentor throughout his career. His honorary and technical societies include Tau Beta Pi, Phi Kappa Phi, Keramos, the American Ceramic Society, ASME, and ASM. He received the Bronze Tablet from the University of Illinois and other awards through his work with ORNL. He enjoyed building and working with his hands and always had an affinity for problem solving. He had an effortless sense of humor and greatly enjoyed time spent on the lakes of East Tennessee or the Fairmount quarry. He is survived by his wife, Verda, four children, and one grandchild.



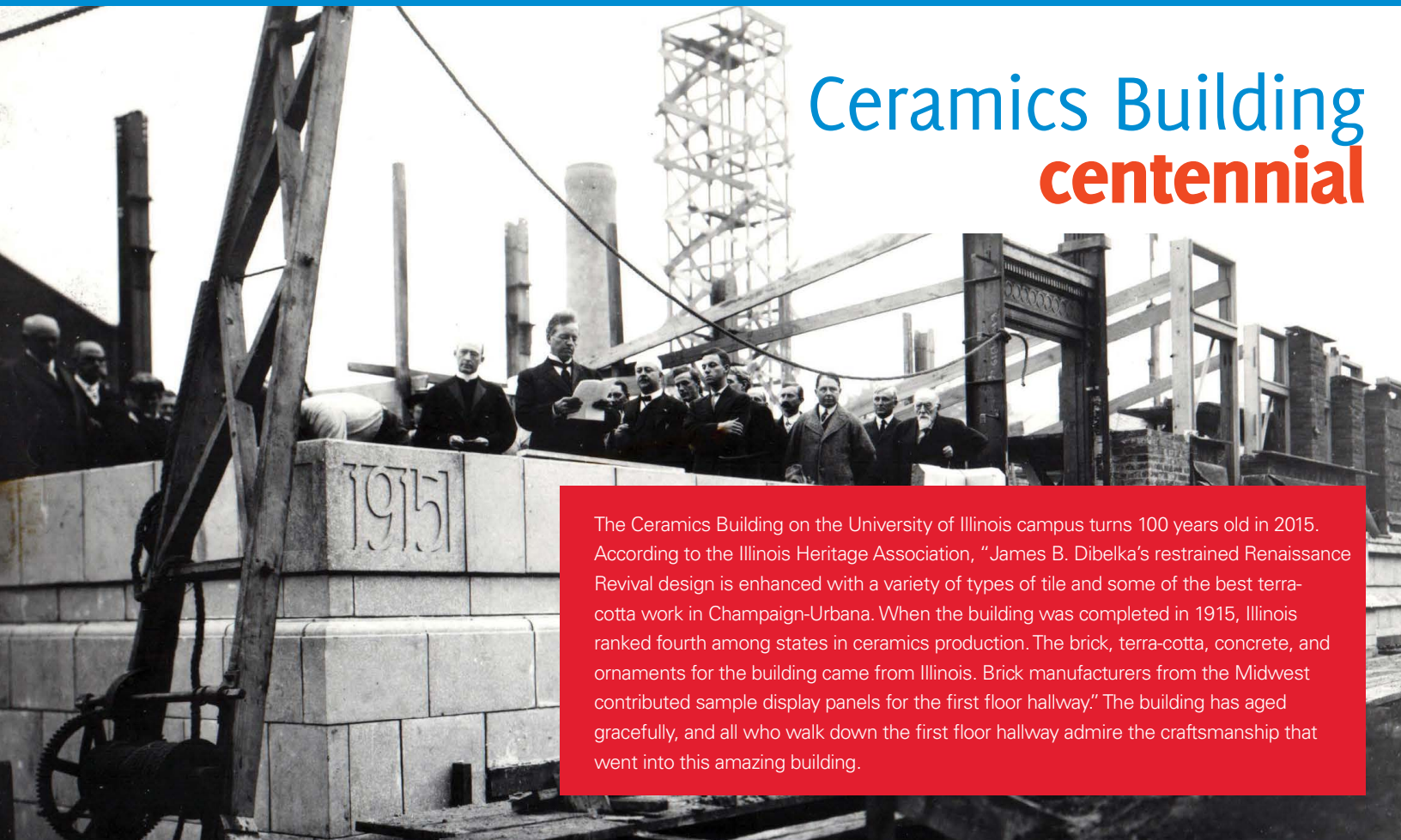
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Ceramics Building centennial



The Ceramics Building on the University of Illinois campus turns 100 years old in 2015. According to the Illinois Heritage Association, "James B. Dibelka's restrained Renaissance Revival design is enhanced with a variety of types of tile and some of the best terra-cotta work in Champaign-Urbana. When the building was completed in 1915, Illinois ranked fourth among states in ceramics production. The brick, terra-cotta, concrete, and ornaments for the building came from Illinois. Brick manufacturers from the Midwest contributed sample display panels for the first floor hallway." The building has aged gracefully, and all who walk down the first floor hallway admire the craftsmanship that went into this amazing building.