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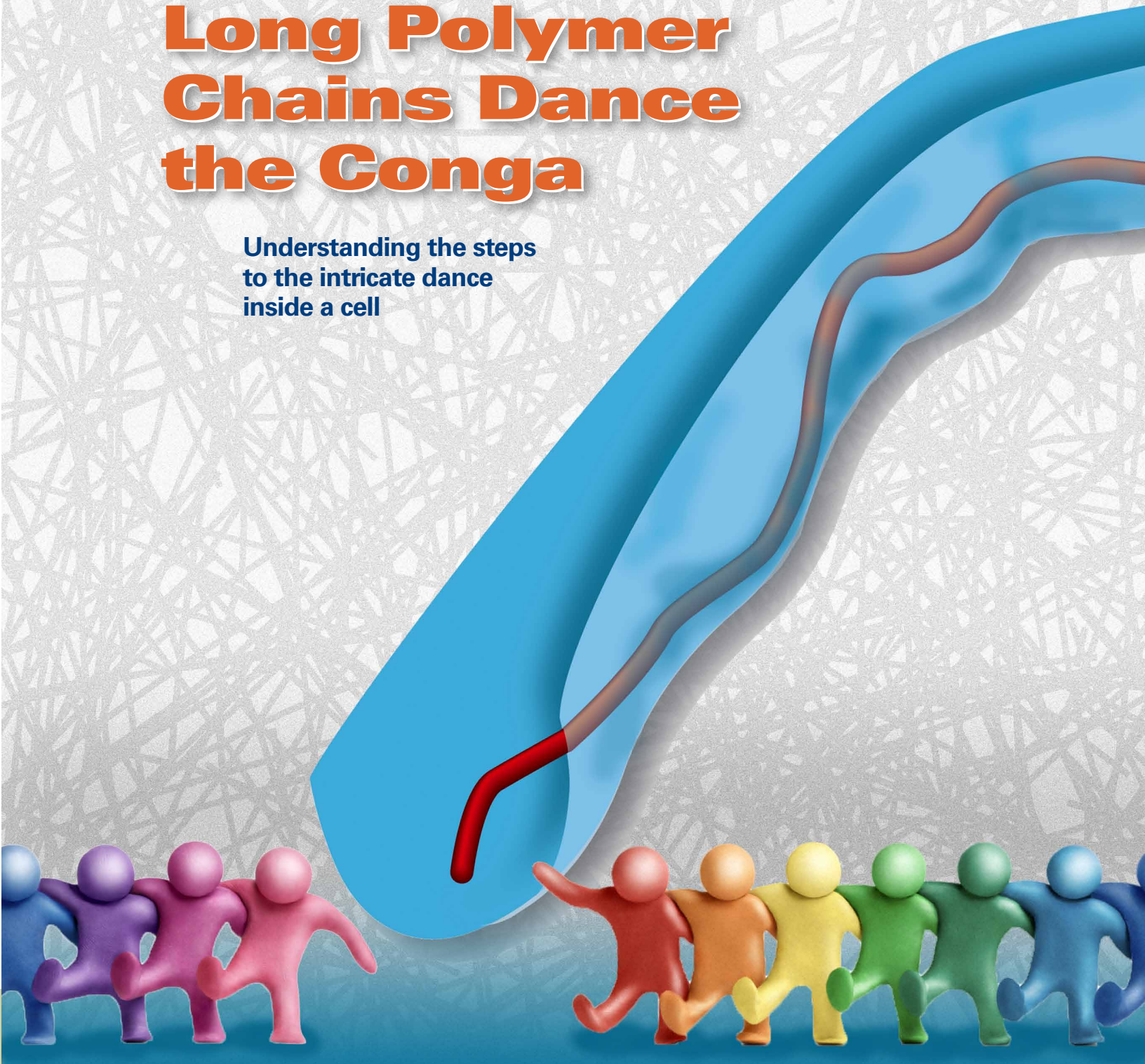
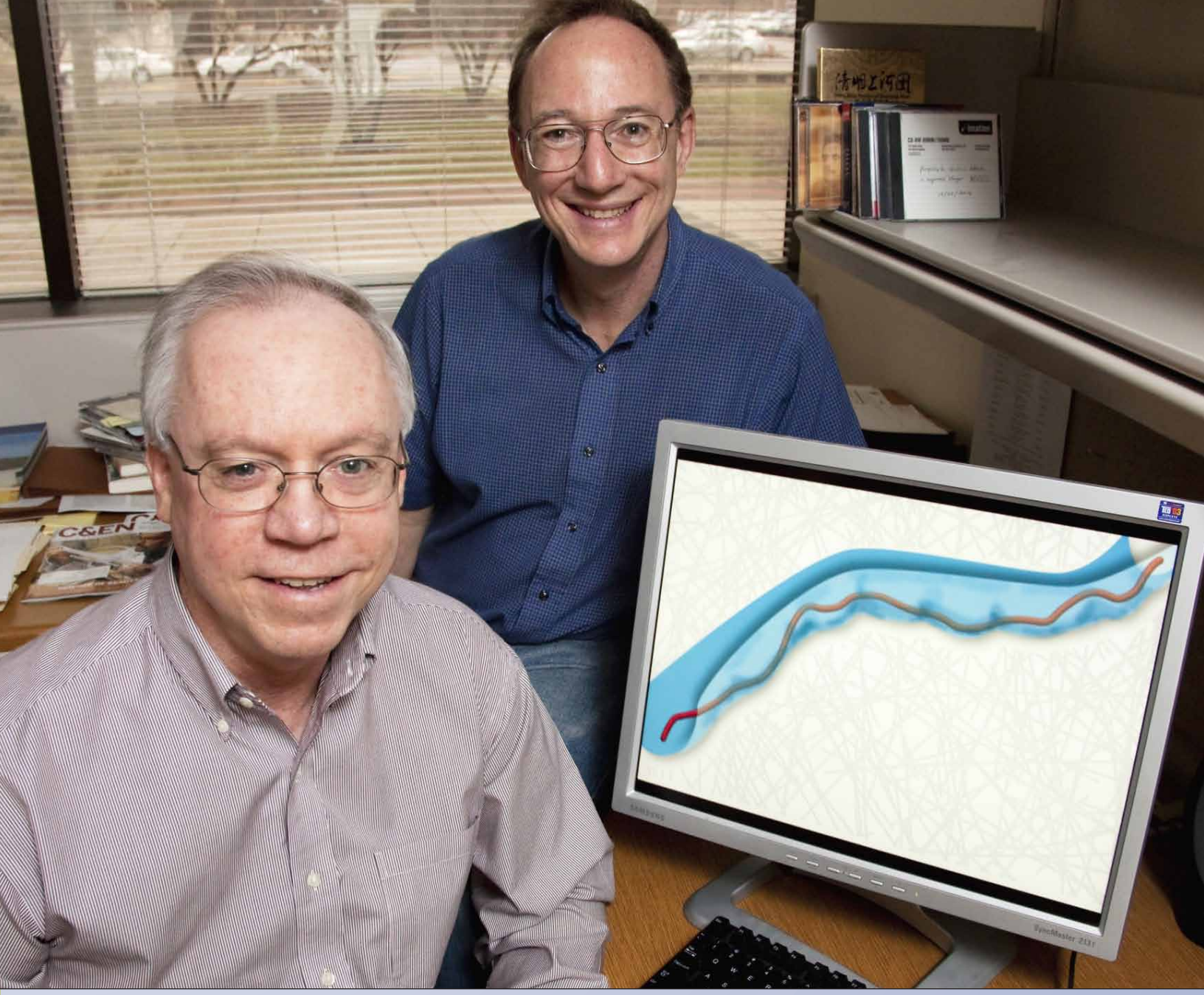
Department of Materials Science and Engineering **News**

University of Illinois at Urbana-Champaign | Summer 2010

Long Polymer Chains Dance the Conga

Understanding the steps to the intricate dance inside a cell





Ken Schweizer and Steve Granick Photo: L. Brian Stauffer, University of Illinois at Urbana-Champaign

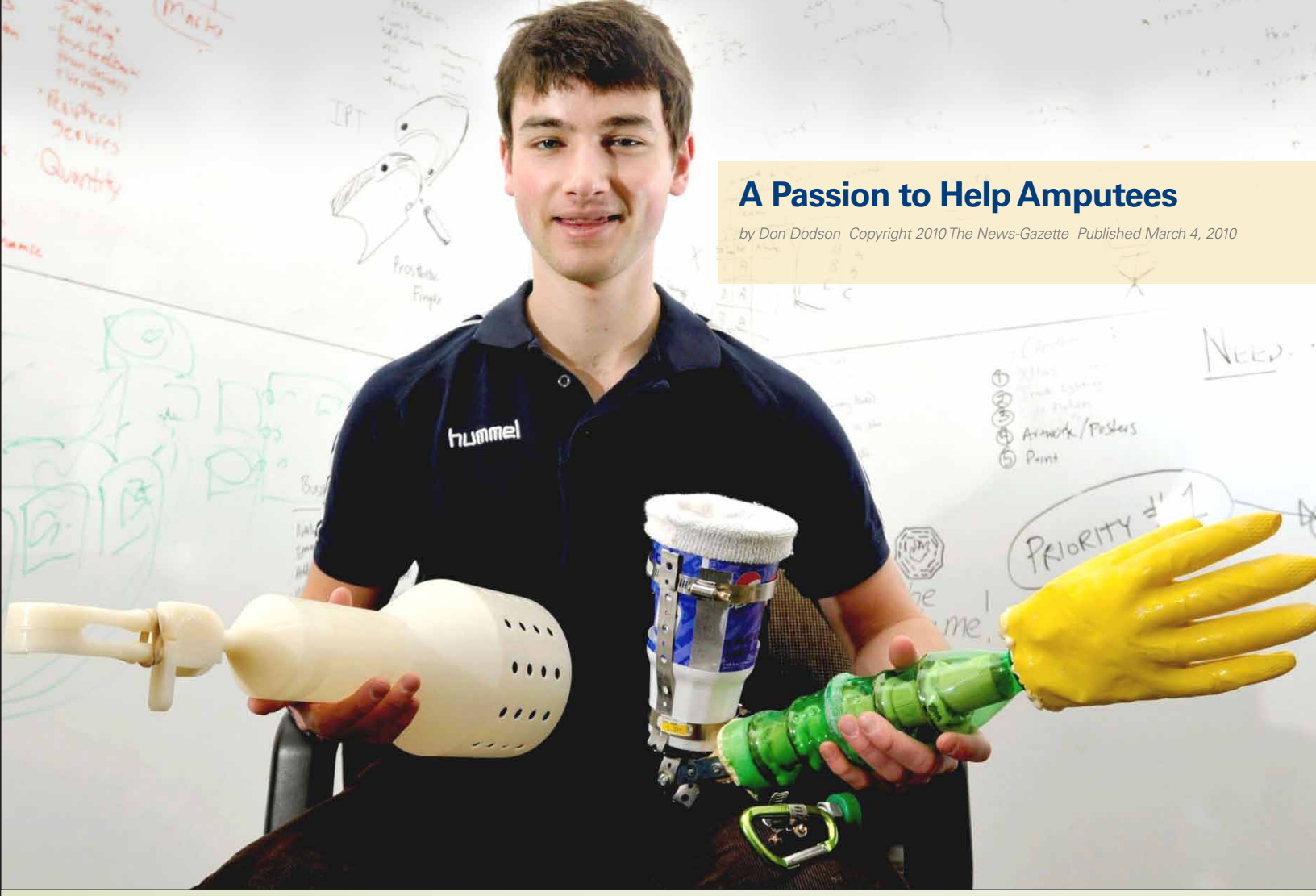
Long Polymer Chains Dance the Conga

Understanding the steps to the intricate dance inside a cell is essential to one day choreographing the show. By studying the molecules that give a cell its structure, University of Illinois researchers are moving closer to understanding one of those steps: the conga line. Led by Steve Granick, Founder Professor of Engineering, the team will publish its findings in the journal *Physical Review Letters.*

Long chains of the molecule actin form filaments that are a key component of the matrix that give cells structure. They play a role in numerous cellular processes, including signaling and transport. Similar polymers are used in applications from tires to contact lenses to the gels used for DNA and protein analyses.

Long actin filaments display snakelike movement, but their serpentine wriggling is limited by crowding from other filaments in the

continued on page 4



A Passion to Help Amputees

by Don Dodson Copyright 2010 The News-Gazette Published March 4, 2010

University of Illinois junior Jonathan Naber poses with two of his arm prosthetic prototypes at the Ceramics Building in Urbana, Illinois on Friday, Feb. 26, 2010. The prototype on the right was made of recycled materials, and the one on the left made of prototyping plastic. Naber, six engineers and five business consultants have worked on the Illini Prosthetics Team project.

A desire to make prosthetic arms available and affordable to people in developing countries has earned University of Illinois junior Jonathan Naber a $30,000 prize.

Naber, a 20-year-old major in materials science and engineering, won the Lemelson-MIT Illinois Student Prize on Wednesday.

Over the last year-and-a-half, Naber has led a team of UI engineering students in designing arms that millions of amputees around the world could afford.

Upon receiving the award, he vowed to "keep going until we hit every hot spot" where people are missing limbs due to land mines, violence, natural disaster or other factors.

Naber's aim is to provide prosthetic arms that cost less than $25, compared with the hundreds of dollars that arms in those parts of the world now cost.

His team "the Illini Prosthetics Team" has gone through five prototypes to find one practical for the needs of people in developing countries, many of whom work in fields or factories.

Ilesami Adesida, dean of the College of Engineering, called Naber "passionate and caring" and predicted his work is "going to be life-changing in underdeveloped countries."

One of Naber´s advisers, Ray Price, described him as "persistent, inventive and talented" and said his enthusiasm is contagious.

"He listens, he learns, he adjusts and he improves," Price said.

Naber, from Waterloo, Ill., was one of four students vying for the Lemelson-MIT Illinois prize, given annually to a student who has shown "remarkable inventiveness."

`"We don't have a final product yet," Naber said. But his team hopes to have a product to distribute within a year-and-a-half, when they expect to receive their degrees.

Naber said there are 25 million amputees around the world, 80 percent of them in countries with little access to modern health care.

Look for Jonathan Naber's report on his experience in Guatemala in the Winter 2010 *MatSE Alumni News.*

continued on page 7

Johnson Named Racheff Professor

On February 25, the University of Illinois celebrated the investiture of the first Ivan Racheff Professor of Materials Science and Engineering, Duane Johnson. The Racheff Professorship is made possible through an endowment from the estate of Ivan Racheff, innovative industrialist and dedicated conservationist.

Duane Johnson joined the University of Illinois faculty in 1997, with a primary appointment in Materials Science and Engineering, and faculty affiliations with Physics and Mechanical Engineering. Following his Ph.D. in Physics in 1985 from the University of Cincinnati, with thesis work performed in the Metals and Ceramics Division at Oak Ridge National Laboratory, Johnson received a Post-Doctoral Fellowship at the University of Bristol, England (1985-1986) and a National Research Council Post-Doctoral Fellowship at the Naval Research Laboratory (1987-1988). Prior to coming to Illinois, he was a Senior Research Scientist at Sandia National Laboratories in Livermore, California (1988-1997).

Presently, Johnson serves as Director of the Materials Computation Center at the Frederick Seitz Materials Research Laboratory, and as co-theme leader for the Petascale Applications for Blue Waters (expected to be the most powerful supercomputer in the world for open scientific research) for the National Center for Supercomputing Applications new Institute of Advanced Computing Application and Technologies.

Johnson is an internationally recognized leader in the areas of materials theory and computational materials science, with more than 150 invited and peer-reviewed publications and about 100 invited presentations. His research melds modern theoretical methods and their computational solution to predict properties and interpret characterization experiments. By developing new theoretical methods and computational algorithms, he addresses materials design in important classes of materials, while explaining many phenomena and predicting accurately new phenomena. He combines electronic-structure methods and statistical thermodynamics to predict reliably the structural and thermodynamic behavior of alloys and molecular solids, catalytic nanoparticles, hydrogen-storage and other energy-related materials, and multiscale mechanical properties of materials, including structural nuclear materials, so that they can be used effectively for societal needs.

He has been recognized as Fellow of the American Physical Society (2003), and elected Chair of the Division of Computational Physics (2008-2010). He shared the 2006 Genetic and Evolutionary Computation Conference Silver "Humie" Award, a machine-versus-human-competitive award. His faculty honors have included being named the NCSA Faculty Fellow (2008-2009), Bliss Faculty Scholar (2005-2009), and Collins Scholar (2000). He is a recipient of the Xerox Award for Faculty Research (2004) from the College of Engineering and the Award for Excellence (1993) from Sandia National Laboratories.

Engineering Dean Ilesanmi Adesida congratulates Racheff Professor Duane Johnson.

Duane Johnson with his wife, Cindy, and children Conor, and Francesca.

Ivan Racheff

An immigrant from Bulgaria, Ivan Racheff came to the University of Illinois in 1914. He studied first engineering then chemistry, ultimately graduating in 1917 with a bachelor's degree in liberal arts. After graduation, Racheff worked as an apprentice metallurgist with the Illinois Steel Company of Chicago until he was drafted for military service in World War I. After the war, he traveled around the country working at a variety of jobs in the tradition of Edgar Allen Poe, whose writings first inspired him to come to the United States.

In 1923, Racheff returned to Chicago and established the Racheff Metallurgical Laboeratory and a consulting practice. A pioneer in the field of metallurgy, he designed his own laboratory equipment and developed many new techniques. He wrote and compiled more than 70 volumes of the Racheff Metallurgical Studies.

In the late 1940s, Racheff purchased the Knoxville Iron Works in Tennessee, for which he had done consulting work during World War II, and began a 25-year program to establish a park-like garden on the grounds. The gardens, featuring flowering trees and plants, fishponds, and walking paths, reflected his belief that industry must exist in concert with the environment.

Racheff died in 1982, leaving a significant portion of his estate to the University of Illinois to be used for educational, scientific, and charitable purposes. His ashes were buried in the gardens he established.

Ivan Racheff

Long Polymer Chains, continued

matrix. Researchers have long assumed that actin filaments could move anywhere within a confined cylinder of space, like a snake slithering through a pipe.

However, Granick and his research group have created a new model showing that the filaments' track isn't a perfect cylinder after all. Rather than a snake in a pipe, a filament moves more like a conga line on a crowded dance floor: Sometimes it's a tight squeeze.

To track the filaments' motion, the Illinois team used a novel approach. In the past researchers have observed the entire large molecule, which was like trying to figure out a conga line's trajectory by watching the entire crowd writhing on the dance floor.

"But," Granick said, "if I'm able to follow just one person in the crowd, I know a lot more about how the conga line is moving."

Granick and his team tagged a few individual links in the molecular chain with a tiny fluorescent dye and monitored how those moved as the filament slithered along. In the conga line analogy, this approach would be like giving neon shirts to a few people at various points in the line, turning on black lights, and tracking the neon-clad dancers' motion to map out the conga line's path around the floor.

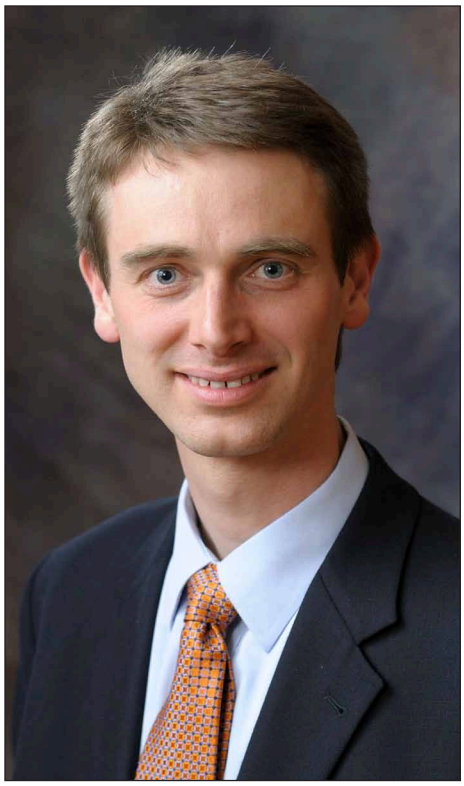
"What we found is that, as the filaments slither, sometimes they're more free and sometimes they're more tightly tangled up with each other," Granick said. "Just like in a crowded place, you can only move through the empty spaces."

Next, the team will focus on further improving their model to include a molecule's forward motion as well as its lateral wiggling. "So far we've been able to see the conga line bending, moving sideways, and now we want to see it move in the direction it's pointing," Granick said.

"That's the missing link in completing this picture, which will lead to improved understanding of mechanical properties for all the situations where these filaments appear."

The U.S. Department of Energy-funded team also included graduate students Bo Wang (lead author), Juan Guan and Stephen Anthony, research scientist Sung Chul Bae and Kenneth Schweizer, Morris Professor of Materials Science and Engineering.

University of Illinois News Bureau



Paul Braun

Braun Selected for Humbolt Foundation Award

Paul Braun has been selected for a Friedrich Wilhelm Bessel Research Award from the Alexander von Humboldt Foundation. The Humboldt Foundation grants up to 25 Friedrich Wilhelm Bessel Research Awards annually. Scientists and scholars, internationally renowned in their field, who completed their doctorates less than 18 years ago, and who in the future are expected to continue producing cutting-edge achievements which will have a seminal influence on their discipline beyond their immediate field of work, are eligible to be nominated for the award. Award winners are invited to spend a period of up to one year cooperating on a long-term research project with specialist colleagues at a research institution in Germany.

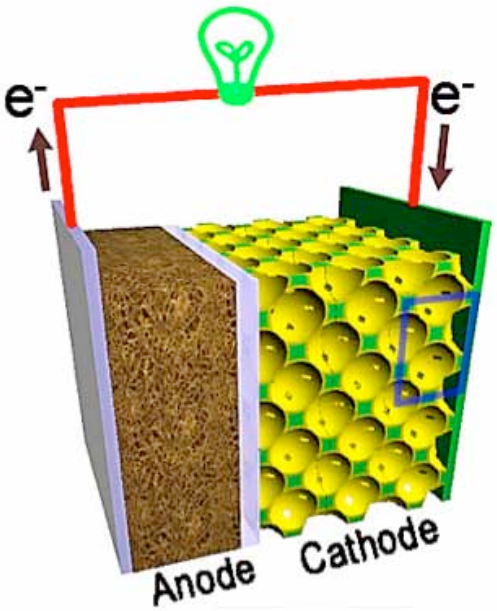
Braun's research focuses on understanding and exploiting self- and optically directed-assembly for the synthesis of highly functional nano and microstructures. Through this approach, he has created unique 3D optical devices, advanced rechargeable batteries, self-healing coatings, and 3-D biological scaffolds.

Braun's efforts crosscut many of the major subdisiplines of materials science and engineering, including polymers, ceramics, semiconductors, metals, and biomaterials. Some highlights of his work in the last few years include the first: demonstration of 3-D waveguiding in photonic band gap materials; self-healing polymer coatings; multiphoton fabrication of 3-D inorganic photonic crystals; and formation of ultra-high power density rechargable batteries.

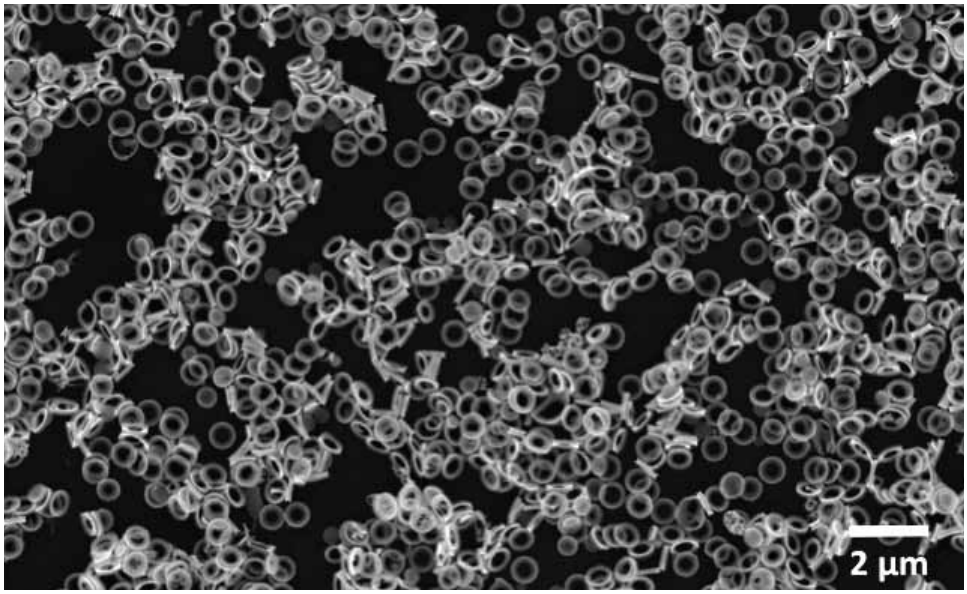
He has published more than 100 papers, and is co-inventor on 10 patents and patent applications, including several which are licensed by Autonomic Materials Inc., a company he co-founded with other faculty at Illinois to commercialize self-healing materials.

He is the recipient of a Beckman Young Investigator Award, 3M Nontenured Faculty Award, and Robert Lansing Hardy Award from TMS. His teaching has been recognized through numerous appearances on the Incomplete List of Teachers Ranked Excellent by Their Students, the Burnett Teaching Award, and the Accenture Engineering Council Award for Excellence in Advising. He has received the Willett Faculty Scholar Award and Xerox Award for Faculty Research from the College of Engineering and was named a University Scholar by the University of Illinois in 2006.

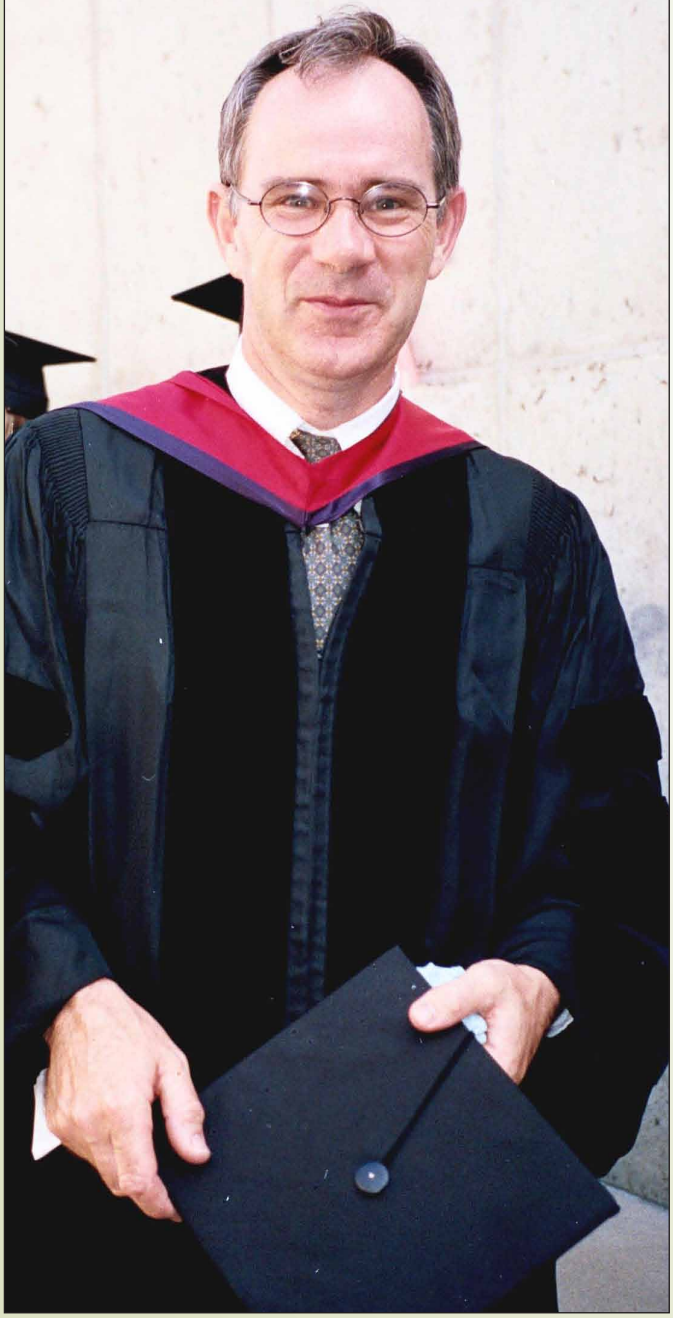
Most recently, Braun has received the Stanley H. Pierce Award from the College of Engineering. The Pierce Award recognizes faculty who foster cooperation and positive relationships between faculty and students. Through his Introduction to Materials Science and Engineering course (MSE 182), he instills excitement and interest in the field. He includes a number of undergraduate students in his research group, as many as 10 per year. He is actively involved in the department's outreach activities and chairs the undergraduate recruitment committee.



Schematic diagram of a new ultra-high energy density rechargeable lithium-ion battery containing a bicontinuous cathode. This design has the potential to produce a soda can sized battery with a peak power of thousands of watts.



Scanning electron microscopy of tungsten nanorings formed by a combination of tungsten deposition and etching in a self-assembled colloidal crystal. Millions of nanorings can be created in a single step.



Ian Robertson at one of the many commencements he attended over the years as department head.

Robertson Scholarship Fund Established

by Dan Lillig (BS Met '93, MatSE '00)

When the eraser hit my desk with a thud and puff of white smoke, I knew I had met my match. It was an early Friday morning mechanical metallurgy class early in the semester, and I had begun dozing off. Professor Robertson would have none of it. He was a dedicated instructor, well-prepared, excited about being there and demanding. He expected a lot and motivated us to participate and learn. That experience set me on the path I travel today.

Donations can be made online at **www.matse.illinois/support** or download the donation form on the page and mail your gift to the University. Don't forget to include a matching gift form if your company matches employee contributions.

Professor Robertson is among the best teachers I have ever had. So, when it came time to find a professor to work with me on a senior research project the next year, he was at the top of my list. With a little prodding, he agreed to let me work with one of his grad students. For a variety of reasons, I chose to stay on at Illinois for graduate school and found another opportunity to work with Robertson.

During graduate school, our relationship grew from teacher to mentor to colleague and friend. Ian taught me to work hard, plan ahead, think critically, search past knowledge, seek out interdisciplinary input and, most importantly, trust my instincts. These lessons have carried me much further than the details of any of the research we did together.

Ian's friendship has meant a lot to me over the years. Even with all the frustrations of doing research and the ribbing that was a constant part of his personality, it was always clear that he genuinely cared about each of his students. Vicky and Ian treated the entire research group like an extension of their family. Everyone appreciated the regular gatherings at their home, even though our significant others struggled to understand Ian's Scottish drawl. As graduate school wrapped up and my career progresses, I always turn to Ian as a sounding board and to get a bit of advice. We have had a few opportunities to work together on the alumni board and a little bit of technical work, which has been exciting.

I am proud to support the Ian and Victoria Robertson Scholarship Fund. I hope it creates opportunities for other students to work with faculty members like Ian and to benefit just as I have from that experience.

Ian enjoys the undergraduate picnic with Angela Gonzales (BS MatSE '07).

Ian with his graduate student Jamey Fenske.

Illini Prosthetics Making a Difference

Illini Prosthetics Team members: Front row—Ehsan Noursalehi (MatSE) and Jonathan Naber (MatSE). Back row—Hari Vigneswaran (MatSE), Luke Jungles (Mechanical Engineering), Richard Kesler (Bioengineering), and Adam Booher (Engineering Mechanics).

Photo: Kevin Hsia

Twenty-five million people around the world are missing one or more of their limbs due to landmines, violence, farming accidents, birth defects, disease, and other causes. 80% of these people live in developing nations, with high concentrations of amputation in Latin America, Southern and Western Africa, and Southeastern and Southwestern Asia. Furthermore, current prosthetic arms are extremely expensive and require a great deal of time for custom fitting and maintenance.

Clearly, there is a great need for an affordable and functional prosthetic device for these people. The Illini Prosthetics Team believes that every amputee around the world should be given a proper prosthetic arm replacement which is simple, innovative, and affordable.

Illini Prosthetics is a team of engineering and business students who are working on both the technical and economic sides of the problem of amputee empowerment.

Started by MatSE student Jonathan Naber in 2008, the Illini Prosthetics Team was given incubator space and seed funding by the UIUC Technology Entrepreneur Center and the Illinois Launch Program. Over the past two years, Naber has lead the team in developing prototypes and most recently, the launch of a social business centered around the vision of providing prosthetic limbs to the people of the developing world. This work will be rewarded as Illini Prosthetics travels to Guatemala this summer to field test the prototypes at the Range of Motion Project clinic.

A Passion to Help Amputees, continued

He said his work was inspired by a foundation in Jaipur, India, that provides prosthetic legs in developing countries for about $28 apiece.

Naber, who figures he devotes about 15 hours a week to the project, plans to go to Guatemala this summer to "field-test" some of the prototypes, working in partnership with the Range of Motion Project clinic run by UI alumnus David Krupa.

Naber said his team has already gotten feedback from prosthetists at the clinic, as well as from experts at the Rehabilitation Institute of Chicago.

The team hasn't disclosed many details about its latest prosthetic-arm design, in hopes of protecting intellectual property. But Naber said the design has three distinct features:

— It's relatively simple to mass-produce, which makes it low-cost.

— It comes in three sizes — child, adolescent and adult — and can adjust to fit a variety of people. Pieces can be moved around to make the arm shorter, longer, wider or narrower.

— The arm attaches to the body as an "exoskeleton," rather than using a socket. Sockets often have "overheating" issues, making use of that type of prosthesis sweaty and uncomfortable.

The team's most recent prototype is made of "very low-cost metals and plastics" that could be fashioned from either new or recycled materials, Naber said.

Naber said his interest in helping people stemmed in part from his grandmother, who was physically disabled from a car accident, and from working in high school with a student who had muscular dystrophy.

The summer before his sophomore year, Naber decided he wanted to use his engineering skills to help people with disabilities. He then recruited other students to work on the project.

Fellow team members include: Adam Booher, Luke Jungles, Richard Kesler, Hari Vigneswaran and Ehsan Noursalehi.

Naber said he foresees having the prosthetic arms mass-produced in China or Taiwan and distributing them in one region of the world before expanding to other regions.

He said he would like to provide the prosthetic arms through "some sort of microloan strategy," with people paying back the loans over time.

Naber is the fourth annual winner of the Illinois Student Prize, funded through a partnership with the Lemelson-MIT Program.

Separate Lemelson-MIT winners were named on Wednesday at the California Institute of Technology, the Massachusetts Institute of Technology and Rensselaer Polytechnic Institute.

On the Web: **www.illiniprosthetics.com or http://iptn.squarespace.com/**

Semiconductor Manufacturing Technique Holds Promise for Solar Energy

Thanks to a new semiconductor manufacturing method pioneered at the University of Illinois, the future of solar energy just got brighter.

Although silicon is the industry standard semiconductor in most electronic devices, including the photovoltaic cells that solar panels use to convert sunlight into energy, it is hardly the most efficient material available. For example, the semiconductor gallium arsenide and related compound semiconductors offer nearly twice the efficiency as silicon in solar devices, yet they are rarely used in utility-scale applications because of their high manufacturing cost.

U. of I. professors John Rogers and Xiuling Li explored lower-cost ways to manufacture thin films of gallium arsenide that also allowed versatility in the types of devices they could be incorporated into. "If you can reduce substantially the cost of gallium arsenide and other compound semiconductors, then you could expand their range of applications," said Rogers, the Lee J. Flory Founder Chair in Engineering Innovation, and a professor of materials science and engineering.

Typically, gallium arsenide is deposited in a single thin layer on a small wafer. Either the desired device is made directly on the wafer, or the semiconductor-coated wafer is cut up into chips of the desired size. The Illinois group decided to deposit multiple layers of the material on a single wafer, creating a layered, "pancake" stack of gallium arsenide thin films.

"If you grow 10 layers in one growth, you only have to load the wafer one time," said Li, a professor of electrical and computer engineering. "If you do this in 10 growths, loading and unloading with temperature ramp-up and ramp-down take a lot of time. If you consider what is required for each growth – the machine, the preparation, the time, the people – the overhead saving our approach offers is a significant cost reduction."

Next the researchers individually peel off the layers and transfer them. To accomplish this, the stacks alternate layers of aluminum arsenide with the gallium arsenide. Bathing the stacks in a solution of acid and an oxidizing agent dissolves the layers of aluminum arsenide, freeing the individual thin sheets of gallium arsenide. A soft stamp-like device picks up the layers, one at a time from the top down, for transfer to another substrate – glass, plastic or silicon, depending on the application. Then the wafer can be reused for another growth.

"By doing this we can generate much more material more rapidly and more cost effectively," Rogers said. "We're creating bulk quantities of material, as opposed to just the thin single-layer manner in which it is typically grown."

Freeing the material from the wafer also opens the possibility of flexible, thin-film electronics made with gallium arsenide or other high-speed semiconductors. "To make devices that can conform but still retain high performance, that's significant," Li said.

Another advantage of the multilayer technique is the release from area constraints, especially important for solar cells. As the layers are removed from the stack, they can be laid out side-by-side on another substrate to produce a much larger surface area, whereas the typical single-layer process limits area to the size of the wafer.

"For photovoltaics, you want large area coverage to catch as much sunlight as possible. In an extreme case we might grow enough layers to have 10 times the area of the conventional route," Rogers said.

"You really multiply the area coverage, and by a similar multiplier you reduce the cost, while at the same time eliminating the consumption of the wafer," he said.

Among the paper's co-authors are two scientists from Semprius Inc., a North Carolina-based startup company that is beginning to use this technique to manufacture solar cells. A shift from silicon-based panels to more efficient gallium arsenide models could make solar power a more cost-effective form of alternative energy.

Next, the group plans to explore more potential device applications and other semiconductor materials that could adapt to multilayer growth.

The Department of Energy and National Science Foundation-funded team also includes U. of I. postdoctoral researchers Jongseung Yoon, Sungjin Jo and Inhwa Jung; students Ik Su Chun and Hoon-Sik Kin; and electrical and computer engineering professor James Coleman, along with Ungyu Paik, of Hanyang University in Seoul, and Semprius scientists Matthew Meitl and Etienne Menard.

University of Illinois News Bureau

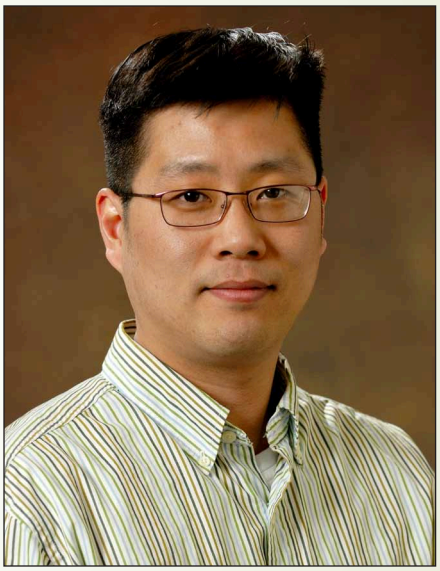
Department Notes

The graduate program in Materials Science and Engineering at the University of Illinois at Urbana-Champaign is ranked #2 by the *U.S. News and World Report* in its 2010 Best Graduate Schools rankings.

Moonsub Shim was awarded a Willett Faculty Scholar from the College of Engineering.

John Rogers, materials science and engineering–were named IEEE Fellows for the class of 2010.

Seven MatSE undergraduates were named 2010 Bronze Tablet Scholars. They are **William Chemelewski, Jonathan Bartelt, Jian Wei Cheng, Kang Jie Lim, Lisa Mazzocco, Stephen Menke,** and **Chuan Hui Moh**. The University of Illinois began the tradition of inscribing the Bronze Tablets with the names of students receiving University Honors in 1925. A new tablet is hung in the Main Library each year. Inscription on the Bronze Tablets recognizes sustained academic achievement by undergraduate students at Illinois. According to the Student Code, students must have at least a 3.5 cumulative grade point-average through the academic term prior to graduation, and rank in the top three percent of the students in their graduating class.



Moonsub Shim

Lisa Mazzocco, senior, was named a 2010 Knight of St. Patrick. The Knight of St. Patrick is an annual award given by the College of Engineering to approximately 10-15 students who represent leadership, excellence in character, and exceptional contribution to the College of Engineering and its students.

Jiong Zhang, Ph.D. student in Jim Zuo's group; **Hunter McDaniel**, Ph.D. student in Moonsub Shim's group; **Liang Hu**, Ph.D. student in Les Allen's group; and **Wenjun Cai**, Ph.D. student in Pascal Bellon's group received 2010 Racheff-Intel Awards for outstanding graduate research in Materials Science and Engineering. Winners receive a plaque and up to $1,000 in travel funds to present their research at a scientific conference in the next 18 months. The top winner (Jiong Zhang) also received a cash payment of $1,500 which can be used to purchase a computer.

Racheff-Intel Award winners Wenjun Cai, Jiong Zhang, Liang Hu, Hunter McDaniel

Yee Kan Koh, Ph.D. student in David Cahill's group, received the Ross Martin Award from the College of Engineering. This award was established by the College to recognize outstanding research achievement by a graduate student. He received a plaque and $2,000. Koh is studying the thermal management of materials and structures used in high-speed III-V devices.

Hua Lu, Ph.D. student in Prof. Cheng's group, will receive a 2010-2011 Yee Memorial Fellowship Award from the College of Engineering. The award recognizes graduate students who show outstanding academic performance and dedication to engineering research and education in China.

Bo Wang, Ph.D. student in Steve Granick's group, received the 2010 Frank J. Padden Award, given by the American Physical Society. This is a national award for excellence in polymer physics research.

Hunter McDaniel, Ph.D. student in Moonsub Shim's group, won a best poster award at the spring 2010 MRS meeting.

Simon Dunham, Ph.D. student in John Rogers' group, received a Mavis Memorial Fund Scholarship Award, worth $5,000 from the College of Engineering.

Christian Espinoza, Ph.D. student in Trudy Kriven's group, was selected to receive a 2010 National Science Foundation Graduate Research Fellowship, worth $30,000.

Yee Kan Koh with Charles Tucker III, Associate Dean, Undergraduate Programs

Karl Henize

David Moore

Jennifer (Wenthe) Weber

MatSE Announces New Alumni Board Members

Karl Henize (BS MatSE '07)

Karl Henize is the youngest member of the alumni board at age 23. He is currently employed at the ExxonMobil Development Company as a materials engineer, where he is consulting for oil and gas mega projects around the globe. His responsibilities include material selection, qualification, fitness-for-service assessment, failure analysis, and integrity management for a wide range of projects. These services allow ExxonMobil to safely push the limits of technology and produce hydrocarbons in extreme conditions. In his two-year career with ExxonMobil, he has traveled to Malaysia, England, Canada, Norway, Belgium, Denmark, Wyoming and Texas to support oil and gas projects. His hobbies include hiking, climbing, spelunking, kayaking, ultimate frisbee, tennis and reading.

David Moore (BS Met '89)

After graduating from Illinois in 1989, David Moore went to work with GE Aircraft Engines in Cincinnati, Ohio. There he participated in their Engineering Development Program and eventually spent over two years as a Materials Applications Engineer working with high temperature alloys in the Fabrications & Repair group. While at GE, he completed a M.S. in Materials Engineering at the University of Dayton. Near the end of 1993, Moore left GE and started his present career as a consultant for Packer Engineering in Naperville, Illinois. At present he is a Vice President of the company and manages the Materials & Mechanics Center of Excellence. Moore lives in Batavia, Illinois, with his wife of 22 years, Amy, and their four kids. Aside from the typical variety of kids' sports and musical activities, the family likes to mountain bike, snow ski and travel.

Jennifer (Wenthe) Weber (BS MatSE '04)

Jennifer (Wenthe) Weber began at the Boeing Company in the Materials and Processing Technology group as an intern and was offered a position to work in the same group upon graduation. She moved into different positions within the company, supporting Interior Composite materials, direct production manufacturing, and Flammability Safety and Airworthiness. Currently, Weber is a Materials Engineer in the Boeing Research and Technology group for Boeing Commercial Airplanes (BCA) and is in the BCA Leadership Development and Excellence Program. She is an active Society of Women Engineer member, an intern instructor and involved in various community service activities. Since moving to the Pacific Northwest, Weber has learned to ski, hiked many trails and visited and camped on the coast. In her spare time, she enjoys spending time with her husband and friends, meeting new people and trying new adventures, Seattle Happy Hours, camping, white water rafting, traveling, eating, cooking, 24, country music and beach volleyball.

Engineering Dean Ilesanmi Adesida congratulates Charles Childers.

College Honors Charles Childers

Charles Childers (BS Mining '55) has received the Alumni Award for Distinguished Service from the College of Engineering at the University of Illinois. He received the award for significant contributions to the fertilizer industry in North America and worldwide. Childers began his career as a mine engineer at Duval Corporation. From 1963 to 1987, he worked for International Minerals and Chemicals Corporation in various leadership positions. In 1987, he accepted the position of president and CEO of the Potash Corporation of Saskatchewan and led the company through its privatization and to prominence as a globally competitive corporation. His successful leadership has garnered him the respect of his employees and collective praise from his peers. He has been ranked among North America's elite CEOs and earned the *Wall Street Transcript* Gold Award for CEOs in the fertilizer industry. He also received an award from Share Price Growth 11, the most respected stock-price improvement organization in North America. In November 1998, Childers was chosen by *Industry Week* magazine as one of the most respected CEOs in North America and, in 2005, he was named by Toronto's *Globe and Mail* as one of the ten greatest CEOs of all time. He received an honorary doctor of laws degree from the University of Saskatchewan in 1994 and a Distinguished Alumni Award from the University of Illinois Materials Science and Engineering Alumni Association in 2009. He has contributed to his industry as well as his company, serving as vice chair of the Fertilizer Industry Advisory Committee to the Food and Agriculture Organization of the United Nations. He is also past president of the International Fertilizer Association and has served on the board of directors of the Conference Board of Canada.

Illini Reception in Houston

MatSE is heading south to Texas this fall! Alumni and friends are invited to join us for the University of Illinois Alumni Reception on Monday, October 18, from 5:30-7:00 p.m. at the Hilton Americas-Houston. Complimentary hors d'oeuvres and beverages will be provided. Come for the evening and visit with Illinois alumni, faculty, and students attending the Materials Science & Technology Conference & Exhibition (MS&T'10). For more details and to register, go to **www.matse.illinois.edu/alumni/Houston.html.**

MS&T'10®

Celebrating 100 Years of Homecoming

Homecoming at the University of Illinois is the longest continuously running such collegiate event, beginning in 1909 and marking its 100th anniversary in 2010. The occasion has taken place in each of those 100 years, with the exception of 1918, when the event was canceled because of the great influenza epidemic.

Homecoming's original concept—designed by two University of Illinois students, Clarence Foss Williams, Class of 1910, and W. Elmer Ekblaw, Classes of 1910 and 1912—was to offer an annual event geared specifically to alumni and centered around a football game. Its inaugural launch was an unqualified success, drawing more than 10,000 participants.

Engineering at Illinois will be hosting a Homecoming Brunch before the Fighting Illini take on the Indiana Hoosiers at Memorial Stadium. Brunch will be held from 9:00-10:45 a.m. at the Activities and Recreation Center (ARC), conveniently located next to the stadium. Tickets for brunch only: $18/adults, $10/children under 10. Football tickets and brunch: $55/adults, $45/children under 10.

To register for the Engineering Homecoming, go to **http://engineering.illinois.edu/alumni/alumni-events**. Reservations will be taken until October 20, pending availability of space and football tickets. It is expected that football tickets will sell out prior to the reservation deadline.

Go Illini!

Alumni Speakers Needed

Keramos, the MatSE honor society, is looking for Illinois alumni to come to general meetings in the 2010-2011 academic year as part of a new speakers program. Alumni speakers will talk to undergraduates about their industry experiences and help Keramos members become more acquainted (and excited) with MatSE as an engineering field. Alumni interested in becoming speakers should contact Francis Yuen at fcyuen2@gmail.com.

Welcome New Alumni

May 2010 B.S. graduates and their families were invited to our annual MatSE Graduation Lunch on Sunday, May 16, at the Illini Union. A total of 62 students received their bachelor's degree in Materials Science and Engineering this spring. Around one-third of the graduating seniors will go to graduate school to continue their studies in materials, while the remainder will go into industry or professional school (law, medicine, business). We look forward to printing our new alumni members' accomplishments in future issues of our newsletter.

MatSE Scholar Leads Initiative

MatSE students are involved in a variety of clubs and organizations on campus, often in leadership roles. Arielle Gross, the Clifton Bergeron Scholar for 2009-2010, is the president of the Social Awareness Initiative. "Our goal is to help guide students in funneling their privileges, namely a top-notch education, toward a positive cause and thinking outside of themselves," Gross said. The group's mission is to raise awareness and challenge the student body to take a global perspective. On April 12, the Social Awareness Initiative held an event called "Binti Pamoja Center: Jumpstarting Leadership in Kenyan Girls." Emily Verellen, founder of the Binti Pamoja Center, told her story of creating the center in the Kibera slum of Nairobi at the age of 21. The Binti Pamoja Center reaches out to impoverished teenage girls in the area and brings them education, skills, creative outlets and overall confidence that they need to become future community leaders. "I read about Emily Verellen and her humanitarian efforts and knew that my campus would greatly benefit and be inspired by her story," Gross said. "Emily reversed the path of structural violence for hundreds of girls (and their families) in Nairobi, and that excellence has been applauded by President Obama and the United Nations." The Social Awareness Initiative has raised funds to send 18 girls to school in Kenya for the upcoming year.

Emily Verellen and Arielle Gross hold the book LightBox, *a compilation of photographs and essays created by the girls at the Binti Pamoja Center.*

Young visitors learn about photochromic materials at the Keramos exhibit. Photochromic materials change color in the presence of ultraviolet light.

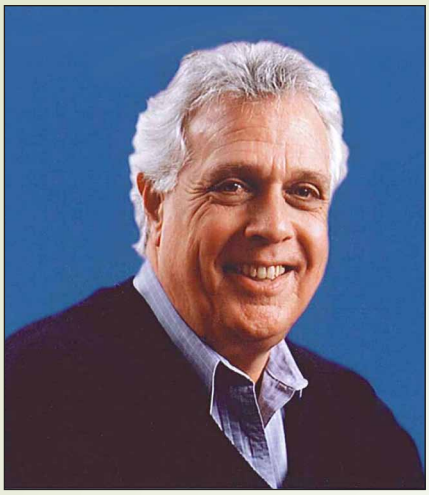
MatSE shines at EOH

The MatSE Department won the 2010 Spirit of Illini Engineering Award at this year's Engineering Open House (EOH), held at the University of Illinois on March 12-13. The Spirit of Illini Engineering Award is a yearly traveling award that is awarded just after EOH to the department that best demonstrates the ideals of the EOH mission of inspiring innovation, challenging what is and looking to what could be in the ways of the world while targeting all ages. This year's theme was "MatSE at the Movies."

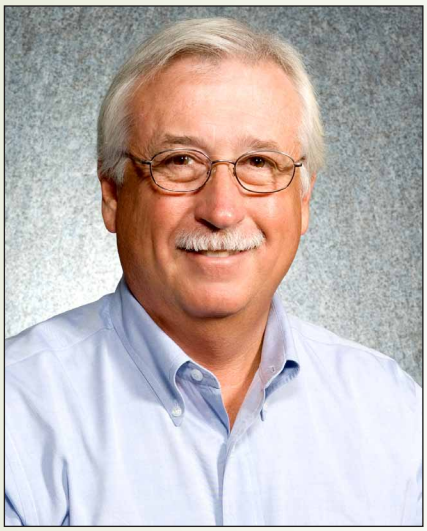
Scott Navel gives the thumbs up at EOH. His group's project was polymer processing and included samples of different everyday products that were created using a variety of polymer processes. The undergraduates used Play Doh to show kids the process of polymer extrusion.

Class Notes

Donald Kraft



Richard Siegel



Gary Biltgen

Bruce Gilbert (BS Mining '52) is retired after working 41 years with a public utility and 5 years as a consultant. He is currently writing a paper in which he purports to explain "witching-dowsing-divining" as a matter of cutting the earth's magnetic lines of force with conductors such as L-shaped metal rods.

Donald Kraft (BS Cer '52) and his wife Frances live in Springfield, VA. He works part-time as a historic interpreter at George Washington's Mount Vernon Estate and Gardens, where he enjoys operating and interpreting the estate's water-powered gristmill. Following graduation from Illinois, Kraft served in the Army. He received his master's degree in Physics from the University of Virginia in 1958 and worked at the Lawrence Radiation Laboratory (now Lawrence Livermore Laboratory). In 1972, he retired from the Army as a Lieutenant Colonel. After retirement from the Army, his work was mostly in telecommunications policy, particularly in relation to national security and emergency plans. This included assignments in the Office of Telecommunication Policy in the Executive Office of the President, in the National Telecommunications and Information Administration, the National Communications System, the U.S. Mission to NATO, and the Defense Information Systems Agency from which he retired in 1996. He received his law degree from Catholic University in 1982. Donald and Frances have been married almost 57 years and have three sons and one daughter.

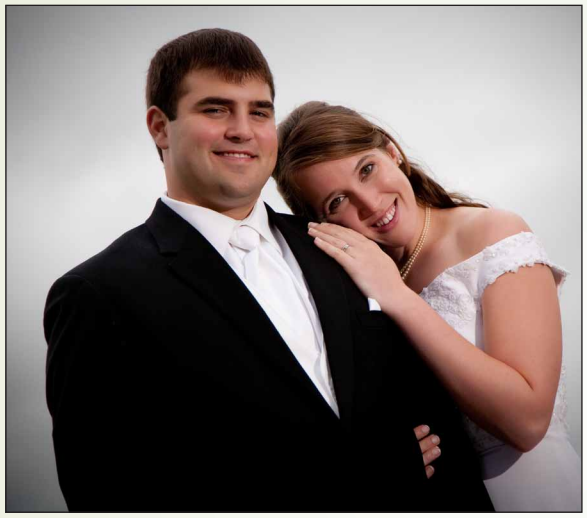
Richard Siegel (PhD Met '65) was named a 2010 Fellow of the Materials Research Society. He was cited for his seminal contributions and leadership in developing the field of nanomaterials and for outstanding professional and public service. Siegel is the Robert W. Hunt Professor of Materials Science and Engineering at Rensselaer Polytechnic Institute and director of the Rensselaer Nanotechnology Center. He is the author of more than 265 publications and 11 issued patents. His research efforts over the past 25 years focus on the synthesis and processing, characterization, properties, and applications of nanostructured materials including ceramics, metals, composites, and biomaterials. Siegel is also an executive producer of the Imax animated movie Molecules to the MAXI, a 40-minute 3-D adventure that follows Oxy, Hydro, Hydra, Carbon and other atom characters as they navigate the colorful world of atoms and molecules in search of life. The movie, distributed by SK Films, is playing in select educational Imax theaters across the U.S. and around the world. Prior to joining Rensselaer, Siegel was on the faculty at the State University of New York at Stony Brook (1966-1976) and was a research scientist and group leader at Argonne National Lab (1974-1995). He serves on the board of directors of Nanophase Technologies Corporation, a publicly held manufacturing firm, which he founded in 1989.

Les Kramer (BS Met '66) retired from Lockheed Martin Corporation on January 31, 2010. He plans to start up an LLC for consulting/CRAD/SBIR activities.

Gary Biltgen (BS Met '73) recently retired from Caterpillar Inc. after 36 years of service. He devoted the first half of his career developing and implementing new materials technologies while working in manufacturing and quality positions throughout Caterpillar's East Peoria facility. Technically, Biltgen is most well known for his accomplishments in the fields of powder metallurgy and surface engineering, where he was awarded 7 U.S. patents. He then took on various management roles in machine and component design and development, leading to his final position of Manager of Global Materials Technology for Caterpillar. There, he was responsible for all Materials R&D at the Mossville Technical Center as well as worldwide facility materials technology process and product development, metallurgical labs and materials-related services. He and his wife Cheryl live in Peoria. He can be reached at biltgen@comcast.net. Their daughter Jocelyn works in marketing for Caterpillar and son Eric (MA Accounting '09) works for Baker Tilly in Chicago. Biltgen credits Professors Robert Bohl and Earl Eckel for giving him the practical know-how, work ethic and fundamentals required to be a successful ferrous metallurgist and engineer, and regards the University of Illinois as "the greatest public university in the U.S."

Robert Shull with Sudhansu Chakravorty (left) and Sanak Mishra (right)]

Neal Berke



Jessica and Dan Krogstad

Class Notes, continued

Robert Shull (MS Met '73, PhD Met '76) was awarded Honorary Membership in the Indian Institute of Metals (IIM) at the National Metallurgist's Day Celebration in Kolkata, India in 2009. This is the highest honor given by the Institute, to "truly outstanding individuals who have carried out work of significance to metallurgical industry, research or education." The number of living Honorary Members worldwide is limited to 60. Shull was the 2007 President of TMS and is well known for his extensive technical work in nanomaterials and magnetics. He is a pioneer of nanotechnology, having helped assemble the Interagency Working Group on Nanotechnology (IWGN) in 1996 which laid the groundwork for the subsequent nanotechnology revolution. He subsequently helped write the US National Nanotechnology Initiative (NNI) in 2001 and is a member of the NSET Subcommittee of the White House NSTC. He is currently a group leader in the Metallurgy Divison of the National Institute of Standards and Technology (NIST). Shull was joined at this event by 2009 IIM President **Sanak Mishra** (PhD Met '70) and **Sudhansu Chakravorty** (PhD Met '77).

Neal Berke (PhD Met '80) received the L. LaQue Memorial Award from ASTM International for contributions to the corrosion committee. Berke is a research and development fellow at Grace Construction Products, W.R. Grace & Co., in Cambridge, MA. He has conducted groundbreaking research over the course of his professional career on products to improve the durability of concrete by reducing reinforcing bar corrosion and improving concrete's resistance to aggressive chemicals and cracking. He received the Grace Prolific Inventor Award in 2007 for holding 33 patent families. Berke is a Fellow of ASTM and the American Concrete Institute.

Tracy Dawson (BS Cer '81) is shift supervisor for Pentair's Fairbanks Morse manufacturing plant in Kansas City. In his current role, he is responsible for all aspects and all operations of the four-building plant including safety, quality, and productivity. He directs the activities of about 40 union employees. For over a century, the Fairbanks Morse manufacturing plant has been making a wide range of pumps for applications in public works and industrial installations throughout the world.

Thad Edwards (BS Met '93) is manger of metallurgical services with Steel Dynamics Engineered Bar Products Division in Pittsboro, IN.

Rhonda Houston (BS Cer '98) has been a substitute teacher for Physics and Astronomy classes at Grand Prairie High School in Grand Prairie, TX. She is in an accelerated teaching program and will become certified after a year of teaching and passing some standardized tests.

Tom Cass (BS Met '99) and his wife Karalyn have a daughter Camryn (2 yrs.) and son Carter (7 months). The family resides in Fairfax, Virginia. Cass is employed with ExxonMobil.

Jinfeng Wang (PhD MatSE '04) is a senior chemist for Nalco Company in Naperville, IL.

Jessica Koschmeder (BS MatSE '07) married **Dan Krogstad** (BS MatSE '06) in July 2009. Both are graduate students at the University of California, Santa Barbara.

Amanda Pirih (BS MatSE '07) is the team director for Focus (Fellowship of Catholic University Students) at New York University. She is leading a group of four missionaries.

Support the Future of MatSE and the University of Illinois

Brilliant Futures, the Campaign for the University of Illinois, is an ambitious undertaking to raise $1.5 billion. The resources generated through the Campaign will ensure that Illinois continues to create a better world through our teaching, research and public engagement. Gifts to the campaign will provide more scholarships and fellowships, endow more faculty positions, improve programs and research and update facilities across the campus.

brilliant futures

THE CAMPAIGN FOR THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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

Leadership for the 21st Century

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

Enhance Academic Excellence

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

Pursue Knowledge and Breakthrough Innovation

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

Foster a Transformative Learning Environment

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

Ensure Greater Access to the Illinois Experience

We seek to improve access to the Illinois experience by increasing the diversity of the student population, providing additional merit- and need-based aid, and increasing the use of online learning alternatives.
To learn more about the Brilliant Futures campaign, visit **brilliantfutures.illinois.edu**

Department of Materials Science & Engineering Fund

Yes, I want to support MatSE with my gift of: ❒ $1,000 ❒ $500 ❒ $250 ❒ $100 ❒ Other:_____

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Materials Science and Engineering Outreach

The MatSE Department at Illinois remains committed to spreading the word about the exciting field of Materials Science and Engineering.

This year marks our 4th annual **ASM Teachers Camp**, to be held the week of July 12-16, 2010. Teachers are coming from Illinois, Iowa, Missouri, Nebraska, Tennessee, and Wisconsin to participate in the camp. The workshops will be conducted by master teachers, and participants will leave the camp with classroom ready activities. The camp is free for teachers, plus they can receive continuing education units (CEUs) or graduate credit for their participation. The ASM Teachers Camp at the University of Illinois is residential; out-of-town participants receive free room and board for the week. Our camp is sponsored by the ASM Foundation, ASM Peoria Chapter, Caterpillar Foundation, and the MatSE Department.

Do you have a high school student in your household who is interested in Materials Science and Engineering? If so, you and your family are invited to join us for the **MatSE High School Visit Day** on Sunday, October 10, from 3:00-6:00 p.m. During your visit, you will learn about the different types of materials, tour undergraduate laboratories, and enjoy a free pizza supper with students and professors. Go to **www.matse.illinois.edu/academics/undergrad/high_school.html** for registration information.

The Material Advantage University of Illinois Student Chapter recently received a grant worth $800 for **MatSE Mobile**. MatSE Mobile is an outreach program in which Material Advantage members travel to high schools in the Champaign-Urbana and Chicagoland areas to promote Materials Science and Engineering. The goal of the program is to inspire high school aged youth to pursue an undergraduate career in MatSE. The Material Advantage members hope that through their presentations and demonstrations, they can increase awareness of the field and promote the excellence of the MatSE Department at the University of Illinois.

AVS Chapter at Illinois

On February 26, the University of Illinois student chapter of the American Vacuum Society (AVS) treated its student members to a visit to Argonne National Laboratory. The AVS chapter visited the vacuum chamber machine-shop and preparation area,the Li-Ion battery project, the Advanced Photon Source, and the Center for Nanoscale Materials. According to AVS member Allen Hall, "The workers at Argonne National Lab went above and beyond to give an excellent tour and shared job opportunities with students. The AVS chapter is looking forward to a return trip in the fall."

In addition to trips to national labs such as Argonne and Fermilab, the AVS chapter brings well-known researchers to the University of Illinois to give lectures. The chapter also provides financial support to students attending the AVS annual symposium. Every March, chapter members teach visitors about vacuum science at their "Vacuum and Plasma Science" exhibit during Engineering Open House. Children and adults enjoy watching members blow up marshmallow peeps and balloons in their vacuum chamber, as well as learning lessons in vacuum technology and physical sciences.

In Memoriam

Paul Talbott (BS Cer '36) died February 22, 2010. He held a variety of positions in ceramics, including three years in Peru as a foreman in a copper smelter and as a research engineer at Batelle Memorial Institute in Columbus, OH. He served in the U.S. Army and rose to the rank of captain in the field artillery. He spent many years with the McLain Fire Brick Co. in Wellsville, OH, as plant superintendent and district works manager. From 1963-1965 he served as a ceramic engineering advisor for the U.S. Agency for International Development in Karachi, Pakistan. Upon his return to the U.S., he was employed as a special projects engineer for the Swindell-Dressler Co. of Pittsburgh. He retired in 1979 and served as a consultant. He was interested in genealogy, history and archaeology. His wife of 65 years, Mary Robinson, passed away in 2008.

Jack Bates (BS Met '40) passed away April 12, 2010. He was retired from Union Carbide with 30 years of service. He was a member of the First Presbyterian Church, South Charleston, WV. He and his wife, Janet, were married in 1942 for 66 years until she passed away in February 2009.

William Simmons (BS Met '40) passed away on April 22, 2008, in Houston, Texas. He joined the space effort at NASA after spending several years at the Franklin Arsenal in Philadelphia. Prior to that, he had served in the Army for over 17 years. He spent his years at NASA in the Manned Space Program designing and developing pyrotechnic devices from 1962-1978. He was involved in the Apollo missions and the Lunar Landing program. He and his wife Jo were deeply involved in community theatre during their life together.

Edward Buchholz (BS Cer '41) passed away January 17, 2010. He served in the U.S. Navy from 1942-1946, as an ordnance specialist. After 45 years he retired from a successful career with PPG Industries. In recent years he relocated from Pittsburgh to Ponte Vedra Beach, FL, to be closer to family. He formed many friendships at Sawgrass Country Club and the American Legion outpost. He was preceded in death by his wife, Shirley.

LeRoy Gippert (BS Met '41) died March 18, 2010. He worked in the steel business and moved to Florida in 1982. He is survived by his wife, Doris, of Bradenton, FL.

Maurice Murphy (BS Met '41) died January 28, 2010, in Arlington Heights, IL. He was an Air Force veteran, retiring as a lieutenant colonel. He served in World War II in the China-Burma Theatre; during the Korean War he was in England; and during the Vietnam War he was assigned to Defense Intelligence in Washington, D.C. He was retired from the San Bernadino County, CA, Highway Department, where he worked as a supervisor of road maintenance for 10 years. He was a member of the Elks Club of Des Plaines, the Shriners, and the Order of the Scottish Rite at Aloha Temple of Honolulu and Medinah of Chicago. He was a model railroad enthusiast and an avid knitter.

John Mendenhall Sr. (BS Met '42) passed away on November 16, 2009. He was employed at Olin Brass as a metallurgical engineer for more than 40 years, being a brass alloys expert, retiring in 1985. He was a member of the American Society for Testing and Materials (ASTM), which he joined in 1961 and became a fellow in their society. He loved to golf, was an avid reader, worked as a volunteer at the Crisis Food Center for 20 years, and was a loyal White Sox fan. He is survived by his wife of 67 years, Alice, and family members.

Lee Fuller (BS Cer '44) passed away January 11, 2010. He served in the U.S. Navy as a communications officer aboard a destroyer. He earned his master's degree in ceramic engineering from Ohio State University. He was a member of Sigma Pi fraternity, Keramos, society of the Sigma Xi, The Ohio Society of Professional Engineers, and a life member of the National Society of Professional Engineers. He worked in several porcelain enamel, ceramic tile, porcelain frit and high temperature refractory companies in Maryland, Indiana, and Ohio. He enjoyed boating, family camping and gardening, and was a Cubmaster for Cub Scouts. After his retirement, he moved to Port Charlotte, FL, in 1985 and began volunteering at the library and Master Gardeners. He is survived by his wife of 65 years, Marjorie, and family members.

James Ubben (BS Met '46) died April 16, 2010, in Dallas, TX. He worked as a metallurgical engineer, traveling the world for American Petroleum Institute. He served in the U.S. Navy during WWII. He married Sue Boyd in 1946; she preceded him in death.

Edgar Hack (BS Met '50) passed away May 9, 2010, in Alton, IL. He served his country in the U.S. Army during WWII. He worked at Olin Corporation as a metallurgical engineer retiring in 1979. He was a lifelong enthusiast of sailing on the Alton Lake and enjoyed traveling. He received the Loyalty Alumni Award from the University of Illinois Materials Science and Engineering Alumni Association in 1998. He is survived by a daughter, Susan, and son, Eugene.

Frank Padavic (BS Mining '50) died May 9, 2010, in Benton, IL. He was a retired mining engineer and a World War II U.S. Air Force veteran. He was a member of the St. Joseph Catholic Church, Knights of Columbus, Benton Elks, Boneyard Boccie Club, and served on the St. Joseph Catholic Church Council. He is survived by his wife of 57 years, Ann (Spinello) Padavic.

Ralph Kraft (BS Cer '49, MS Cer '53) passed away October 8, 2009, in Tullahoma, TN. He was a retired ceramic engineer and U.S. military veteran. He had many interests, which included reading, politics, painting, travel and photography. He is survived by his wife, Virginia, and family members.

Norbert Tagge (BS Cer '77) passed away on March 7, 2010. Following graduation from Illinois, he worked at Wright-Patterson Air Force Base. In 1981, he moved to Eglin Air Force Base. From 1986-1990, he served at Andrews Air Force Base. He was employed at the Pentagon from 1990-1993. He served at Fort Belvoir from 1993-1995 and worked at Answer from 1995-2000. He was a volunteer firefighter for the Burke Volunteer Fire Department. His hobbies included beer brewing and woodworking.

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We want to hear from you!

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

Class of 1996—where are they now?

This photo was taken in May 1996 at the MatSE Graduation Lunch. If you are pictured or if you are a 1996 graduate, we'd like to hear from you and find out how you have used your degree these past 14 years. Contact Cindy Brya at brya@illinois.edu or 217-333-8312. We look forward to hearing from you!