Northwestern | McCORMICK SCHOOL OF ENGINEERING

FALL 2015

MATERIALS SCIENCE AND ENGINEERING

BIOELECTRONICS PIONEER TO JOIN NORTHWESTERN

John Rogers will hold the inaugural Louis Simpson and Kimberly Querrey Professorship

John A. Rogers, a materials scientist and pioneer in the field of bio-integrated electronic devices, will join Northwestern as the Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering and Medicine, in September 2016.

Rogers, currently the Swanlund Chair at the University of Illinois Urbana-Champaign, is internationally renowned for designing and developing classes of electronic devices that can bend, stretch and twist, be integrated with the human body, and have diverse diagnostic and therapeutic function. His research spans disciplines and exploits novel approaches to problems with the potential to change the fields of industrial, consumer, and biocompatible electronics.

At Northwestern, Rogers will lead the new Center for Bio-Integrated Electronics, which will be housed in the Simpson Querrey Institute for BioNanotechnology in the new Louis A. Simpson and Kimberly K. Querrey Biomedical Research Center on Northwestern's Chicago campus.

"Invention requires expertise and creative thinking from many areas, and Northwestern really fosters this type of interdisciplinary work," Rogers said. "I already have several active collaborations with colleagues in the McCormick School of Engineering and the Feinberg School of Medicine. I very much look forward to building on these interactions and making a broader contribution to Northwestern's strong community of researchers in materials science, engineering, and medicine."

With collaborators from across these fields, Rogers has employed state-of-the-art nanotechnology tools and novel design techniques to change the way we think about traditional, rigid silicon circuits. Rogers' current research also includes bio-inspired and bio-integrated nano-photonic structures, microfluidic devices, photovoltaic technologies and microelectromechanical systems.

"John's research is so innovative that it is establishing new fields — its breadth cannot be captured by existing names," said Northwestern Engineering dean Julio M. Ottino. "His work strengthens the critical and creative interface between engineering and medicine. We are thrilled to have him as a member of our community."

Rogers has published more than 530 papers. He is an inventor on more than 80 patents and patent applications and has started several companies based on his research. Rogers has received many awards, including the Lemelson-MIT Prize, a MacArthur "Genius" Fellowship, and the Smithsonian Award for American Ingenuity in the Physical Sciences, among many others. He is also a fellow of the National Academy of Engineering, the National Academy of Sciences, and the American Academy of Arts and Sciences.

John Rogers

> "INVENTION REQUIRES EXPERTISE AND CREATIVE THINKING FROM MANY AREAS, AND NORTHWESTERN REALLY FOSTERS THIS TYPE OF INTERDISCIPLINARY WORK."
>
> JOHN ROGERS

FROM THE CHAIR

Dear Friends,

The weather in Evanston is momentarily spectacular. Campus is buzzing with the return of students and MSE is welcoming a record-breaking number of incoming graduate students: 53 PhD and 19 masters students. It's a busy time here! The lab renovations in Cook Hall for Sossina Haile and Jeff Snyder have been completed. Their arrival is aptly timed with the growing interests of students in energy materials.

Things are looking pretty good — and not just because Northwestern won its first five football games. We are very pleased that John Rogers will join us in 2016. He will add a new dimension to our department in the area of bio-electronics.

Our shared facilities recently received a boost with a five-year, $5 million grant from the National Science Foundation to ensure the integration of soft (biological) nanostructures with the backbone of enabling hard materials for applications such as microfluidic modules for bio-sensors and synthetic scaffolds for tissue regeneration, among others. The **Soft and Hybrid Nanotechnology Experimental (SHyNE) Resource**, directed by Professor Vinayak P. Dravid will establish, in collaboration with the University of Chicago, a new national resource that provides academic, small business, and industry researchers access to cutting-edge nanotechnology facilities and expertise.

With the development of our **Energy Materials Lab** a couple of years ago, we introduced a new format for more effectively using lab space in a way that benefits individual research groups together with the research experience of our undergraduates. This **shared lab space concept**, which received generous donations from alumni and supporters, is working so well that we have decided to develop another such space that we are calling the **Materials Innovation Lab**. It will focus on advanced materials deposition methods, starting with 3-D and 2-D printing, ion sputtering, and atomic-layer epitaxy. 3-D printing may best be known for its use in prototyping, but our interests are more aimed at developing functionalized inks for applications in electronics, energy, structural materials, and medical transplant-surgery. More details can be found in the article on page 3.

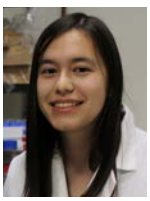
We were very pleased that so many of our alumni, faculty, and students could join us in May for our annual alumni celebration, which this year marked a 60th anniversary for the department. But we are saddened by the passing of the department's co-founder and first chair, Morris Fine, on Sept. 30. He was still coming into the office and generating new research ideas at 97. We were fortunate to have such a wonderful role model, teacher, and mentor with us for so many years. We will celebrate Morrie's life and influence with a tribute on Thursday, Nov. 12 on campus, and all are welcome.

Michael Bedyzk
Department Chair

Materials Science Undergraduate Leanne Friedrich Wins Gotaas Award

Winning paper explains the unique materials in mollusk eyes

Materials science undergraduate **Leanne Friedrich** spent her junior and senior years studying the unique biominerals found in chitons' eyes, which have the only lenses in the animal kingdom composed of aragonite. Her work in this area, titled "Seeing through the Eyes of a Chiton: Lessons from the Crystalline Lens," received Northwestern's 2015 Harold B. Gotaas Undergraduate Research Award.



Friedrich

The prestigious award, named in honor of McCormick's third dean, is given annually to the senior who presents the best research paper in the competition as judged by a panel of faculty members. Friedrich conducted her work in the laboratory of **Derk Joester**, an associate professor of materials science and engineering.

Friedrich's winning paper explained the biological structure of the lenses in the chiton's eye, an area that has been largely unstudied by materials scientists. She posits that insight into the eye's processing, structure, properties, and performance could open new doors for designing bio-inspired materials.

"It's usually difficult to convince engineers that studying weird mollusk eyes has direct engineering applications," Friedrich said. "This award is exciting because it means that McCormick sees that this research is both interesting and useful."

CONTRIBUTIONS

MATERIALS SCIENCE AND ENGINEERING

Coleen Gee
Kristen Erica Pappacena
Brian Thomas Regan
Todd Eugene Steyer, PhD
Tao Sun, PhD
Lynn B. Vea

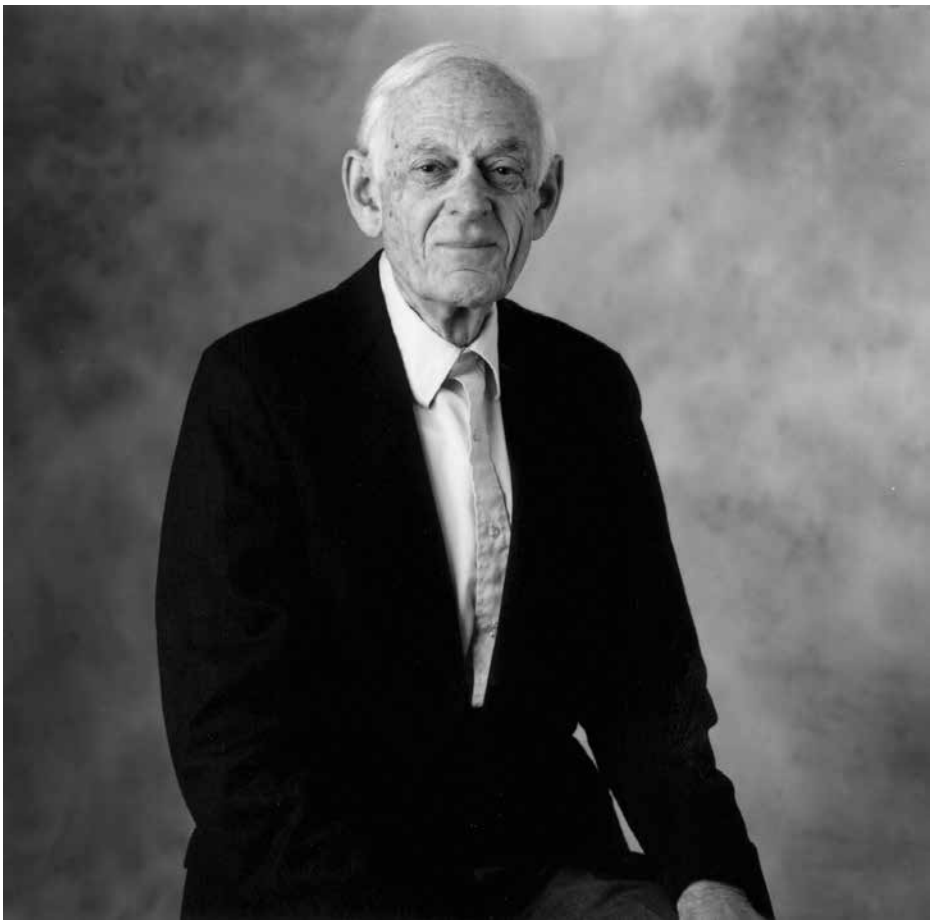
JOHANNES AND JULIA RANDALL WEERTMAN GRADUATE FELLOWSHIP FUND

Carolyn Rubin Aita, PhD
Rong-Tsang Chen, PhD
Prof. Katherine T. Faber and Thomas F. Rosenbaum
Brent Alan Fiedler, PhD
Prof. Morris Eugene Fine
Jeffery T. Gotro, PhD and Elaine M. Grossman-Gotro
Joanna H. and Donald G. Gwinn, PhD
Todd Eugene Steyer, PhD
Anil V. Virkar, PhD

Donations made between April 3 and October 5, 2015. If you would like to contribute to MSE funds, please contact Ben Porter at b-porter@northwestern.edu.

Morris E. Fine, Materials Science Pioneer, Passes Away

Fine co-founded the world's first department of materials science



Morris E. Fine, the Walter P. Murphy Professor Emeritus of Materials Science and Engineering and Technological Institute Professor Emeritus of Materials Science and Engineering, passed away Sept. 30 at age 97.

A member of Northwestern's faculty since 1954, he was well regarded in the Northwestern Engineering community and in the field of materials science at both the national and international level.

Fine came to Northwestern with a range of experiences that included work with the Manhattan Project in Chicago and Los Alamos and later with Bell Labs in New Jersey. Along with Northwestern colleague Don Whitmore, Fine co-created the University's Department of Metallurgy and became its first chair. As new faculty members joined, the department broadened its scope to include ceramics, polymers, and electronic materials. The new profile inspired a new name: in 1958, the world's first-ever Department of Materials Science was born.

"Morrie was at the very foundation of the history of the Department of Materials Science and Engineering and a major contributor to the excellent reputation it has today," said **Julio M. Ottino**, dean of Northwestern's McCormick School of Engineering. "He cofounded a department that was ahead of its time and dedicated his life to its success. Though Morrie retired before many of our current faculty joined Northwestern, he remained an active, engaged, and highly respected member of our community."

A member of the National Academy of Engineering, Fine was dedicated to discovering new materials with the potential of improving society. Although he received his PhD in metallurgy from the University of Minnesota in 1943, he explored everything from physical chemistry to mechanical behavior and enjoyed studying alloys, ceramics, and composite materials. His 1964 book *Introduction to Phase Transformations in Condensed Systems* remains a classic text in the field.

Fine was well known for bridging the divide between basic research and practical, industrial application. The Illinois Department of Transportation used Fine's copper-hardened, high-performance steel, called NUCu in two Illinois bridges.

Although he retired from Northwestern in 1988, Fine inspired his colleagues by coming to work nearly every day and continuing to write proposals and publish his research, resulting in more than 300 papers to his credit.

Fine will be remembered as an inspiring mentor, selfless collaborator, and valued friend. He was known for his patience, inventive personality, and excitement for new ideas. He enjoyed an extensive list of honors, including the ASM Gold Medal and Mathewson Gold Medal of the Metallurgical Society from the AIME. But for all of his life's successes, he experienced the most pride in his students and the 70 PhD students he advised throughout his career. He was eager to share his knowledge with the next generation of scientists and learn from their experiences and insights.

Tribute to Morris Fine

Thursday, Nov. 12

9:30 a.m.–12:30 p.m. • Chambers Hall
600 Foster St. • Evanston, IL

A luncheon will follow.

For details, contact Molli Connell (mbconnell@northwestern.edu)

PRINTING GRAPHENE IN 3-D

A new ink formulation allows for the 3-D printing to graphene structures

Ever since single-layer graphene burst onto the science scene in 2004, the possibilities for the promising material have seemed nearly endless. With its high electrical conductivity, ability to store energy, and ultra-strong and lightweight structure, graphene has potential for many applications in electronics, energy, the environment, and even medicine.

Shah's printed graphene lattice was on the cover of ACS Nano.

Now a team of Northwestern Engineering researchers has found a way to print three-dimensional structures with graphene nanoflakes. The fast and efficient method could open up new opportunities for using graphene printed scaffolds regenerative engineering and other electronic or medical applications.

Shah

Led by **Ramille Shah**, assistant professor of materials science and engineering at Northwestern Engineering and of surgery in the Feinberg School of Medicine, and her postdoctoral fellow **Adam Jakus**, the team developed a novel graphene-based ink that can be used to print large, robust 3-D structures.

"People have tried to print graphene before," Shah said. "But it's been a mostly polymer composite with graphene making up less than 20 percent of the volume."

With a volume so meager, those inks are unable to maintain many of graphene's celebrated properties. But adding higher volumes of graphene flakes to the mix in these ink systems typically results in printed structures too brittle and fragile to manipulate. Shah's ink is the best of both worlds. At 60–70 percent graphene, it preserves the material's unique properties, including its electrical conductivity. And it's flexible and robust enough to print robust macroscopic structures. The ink's secret lies in its formulation: the graphene flakes are mixed with a biocompatible elastomer and quickly evaporating solvents.

"It's a liquid ink," Shah explained. "After the ink is extruded, one of the solvents in the system evaporates right away, causing the structure to solidify nearly instantly. The presence of the other solvents and the interaction with the specific polymer binder chosen also has a significant contribution to its resulting flexibility and properties. Because it holds its shape, we are able to build larger, well-defined objects."

Supported by a Google Gift and a McCormick Research Catalyst Award, the research is described in a paper published in the April 2015 issue of *ACS Nano*. Jakus is the paper's first author. **Mark Hersam**, the Bette and Neison Harris Chair in Teaching Excellence, professor of materials science and engineering at Northwestern, served as coauthor.

SHAH'S TEAM POPULATED ONE OF THE SCAFFOLDS WITH STEM CELLS TO SURPRISING RESULTS. NOT ONLY DID THE CELLS SURVIVE, THEY DIVIDED, PROLIFERATED, AND MORPHED INTO NEURON-LIKE CELLS.

An expert in biomaterials, Shah said 3-D printed graphene scaffolds could play a role in tissue engineering and regenerative medicine as well as in electronic devices. Her team populated one of the scaffolds with stem cells to surprising results. Not only did the cells survive, they divided, proliferated, and morphed into neuron-like cells.

"That's without any additional growth factors or signaling that people usually have to use to induce differentiation into neuron-like cells," Shah said. "If we could just use a material without needing to incorporate other more expensive or complex agents, that would be ideal."

The printed graphene structure is also flexible and strong enough to be easily sutured to existing tissues, so it could be used for biodegradable sensors and medical implants. Shah said the biocompatible elastomer and graphene's electrical conductivity most likely contributed to the scaffold's biological success.

"Cells conduct electricity inherently—especially neurons," Shah said. "So if they're on a substrate that can help conduct that signal, they're able to communicate over wider distances."

CLAY SHEETS STACK TO FORM PROTON CONDUCTORS

Model system demonstrates a new material property emerging from the assembly of nanoscale building blocks

Professor **Jiaxing Huang** has developed a cheaper, more stable proton-conducting system. To find the key ingredient, he had to look no further than his own backyard.

Huang

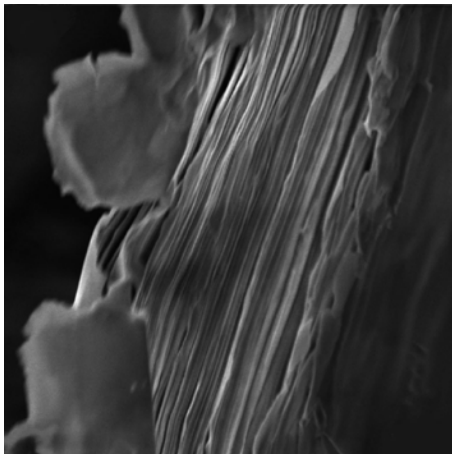
"We used a clay that you can buy at a gardening store," Huang said. "I like to call it a 'down-to-earth' material."

When a proton is transported, it generates an electrical current that plays a key role in both nature and technology. Engineers are particularly interested in harnessing proton conduction for catalysis, electrochemical sensors and reactors, and harvesting energy. In fuel cells, for example, a proton must be transported across a membrane in order to reach a cathode, completing the conversion of chemical energy into electricity.

In cells, protons can be transported through nanopores formed by membrane proteins. Engineers have been trying to mimic this by creating artificial proton nanochannels. For the past 20 years, they have used nanolithography to create nanochannels in silicon, glass, and other materials to enhance ionic transport and conductivity. Those nanochannels do result in higher conductivity, but there are two major problems: nanolithography is complex and expensive, and the final material is difficult to produce on a large scale.

Huang's new solution capitalizes on clay's natural properties. When two-dimensional sheets of the clay, called vermiculite, are exfoliated in water, they carry negative charges, attracting positively charged protons. After the sheets dry, they self-assemble into paper-like films. The near 1-nanometer spacing between the layers serves as the nanochannels that can concentrate protons for conduction.

Huang's research is described in a paper published on July 13 in *Nature Communications*.

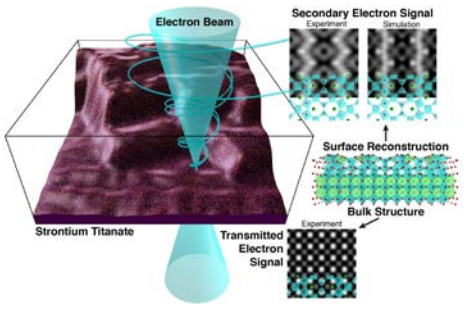


A scanning electron microscopy image of Huang's stacked clay sheets.

Compared to graphene-based sheets and other two-dimensional materials, clay layers have significant advantages for constructing ion conducting devices and materials. Clay is readily available and can be exfoliated in water by ionic exchange, which is much more benign than the chemical exfoliation needed for graphene and other materials. It also has extraordinary chemical and thermal stability, capable of withstanding temperatures higher than 500 degrees Celsius.

A New Way to Image Surfaces on the Nanoscale

Method could be useful in developing green energy and a better understanding of rust



A schematic graphic of the team's imaging technique.

A multi-institutional team of scientists has taken an important step in understanding where atoms are located on the surfaces of rough materials, information that could be very useful in diverse commercial applications.

The team has developed a new imaging technique that uses atomic resolution secondary electron images in a quantitative way to determine the arrangement of atoms on the surface.

Many important processes take place at surfaces, ranging from the catalysis used to generate energy-dense fuels from sunlight and carbon dioxide to how bridges and airplanes corrode, or rust. Every material interacts with the world through its surface, which is often different in both structure and chemistry from the bulk of the material.

The study is published was published June 17 by the journal *Nature Communications*.

"We are excited by the possibilities of applying our imaging technique to corrosion and catalysis problems," said **Laurence Marks**, professor of materials science and engineering. "The cost of corrosion to industry and the military is enormous, and we do not understand everything that is taking place. We must learn more, so we can produce materials that will last longer."

HILLIARD SYMPOSIUM 2015

The 28th annual Hilliard Symposium, organized by Professor James Rondinelli, was held May 20 at the Northwestern Transportation Center. **Jinlu Grace Wang** (PhD '01, Chung) delivered the keynote address, "Serendipity in Engineering: What did the Past Teach Us about the Future?" Wang is the deputy assistant director for engineering at the National Science Foundation.

Jinlu "Grace" Wang delivers the keynote address at the 28th annual Hilliard Symposium.

SPEAKERS

1ST PLACE AVS AWARD

Deep Jariwala
(Hersam)
"Anti-Ambipolar, Gate-Tunable, Heterojunctions from Low-Dimensional Semiconductors"

2ND PLACE

Muratahan Aykol
(Wolverton)
"High-throughput Thermochemistry for the Design of Energy Materials"

3RD PLACE

Elizabeth Miller
(Barnett)
"Novel Anodes for Low-Temperature Solid-Oxide Fuel Cells"

Taner Aytun
(Stupp)
"Improving Organic Solar-Cell Efficiency through Hydrogen Bonding"

Peter Girouard
(Wessels)
"Barium Titanate Photonic Crystal Electrooptical Modulators for Telecommunications and Data Networks"

Emily Hoffman
(L. Marks)
"Graphitic Carbon in Man and Machine"

Yi Hua
(T. Odom)
"Broadband Tunable Lattice Plasmon Resonances in One-Dimensional Nanogratings"

Elizabeth Martin
(Shull)
"Electrochemical Gelation of Proteins at Metal Surfaces"

KunHo Yoon
(Lauhon)
"Barrier Heights of Metal Contacts to Silicon Nanowires: From Spectroscopy to Device Models"

POSTER PRESENTERS

BEST POSTER

Zhao Liu
(Faber)
"Three-Phase 3D Reconstruction of Li-Ion Battery Electrodes via FIB-SEM Tomography"

Ricardo Komai
(Olson)
"BioMartensite: Martensitic Phase Transformations of Bacterial Flagella"

Cameron Gross
(Y. Chung)
"Design and Initial Development of Lightly Alloyed Ferritic Fire-Resistant Steels"

Lingxuan Peng
(L. Marks)
"Segregation in Bimetallic Nanoparticles"

Museum of Science and Industry Exhibits Materials Science Research

The culmination of three years of planning by Chicago's Museum of Science and Industry (MSI) and Northwestern's Materials Research Science and Engineering Center (MRSEC), the Materials Science exhibit opened on March 19.

"It's amazing to walk through the exhibit on a Saturday afternoon and hear the public engaging in conversations about materials science," said Mark Hersam, MRSEC director. "The fact that a fifth-grader or 50-year-old can interact with and learn from the information presented is a testament to the quality of MSI and the hard work that faculty, students, and staff at Northwestern contributed to the finished product."

The exhibit features research from materials science and engineering faculty, including Hersam, Lincoln Lauhon, Gregory Olson, and David Seidman.

"MRSEC's longevity speaks to our ability to constantly ask new research questions and thus advance the field of materials science and engineering," Hersam said. "Funded by the National Science Foundation, it's integral that the center also combine research and education in a way that is accessible to the public. The exhibit at MSI is a terrific example of how successful that process can be."

From medieval armor to Barbie and Ken, items showcased in the exhibit prove that materials can shape our lives.

FACULTY NEWS

Zdenek Bazant was elected foreign member of the Royal Society of London. He was one of 10 foreign members and 47 fellows elected this year from a pool of approximately 700 candidates.

Two affiliated faculty members have been promoted to the senior McCormick leadership team. Effective September 1, **Cate Brinson** become associate dean, to manage an ever-growing list of new initiatives and focus on Northwestern Engineering's professional master's programs. **Wesley Burghardt** will succeed Stephen Carr as associate dean of undergraduate engineering.

Stephen Carr is closing out his tenure as senior associate dean of undergraduate engineering after 23 years. Carr oversaw implementation of Engineering First, a major overhaul of the undergraduate curriculum and the emergence of a culture of whole-brain engineering. After retiring from the dean's office, Carr will continue to teach materials selection and Design, Thinking and Communication, as well as continue to serve on many university committees.

David Dunand was name MSE Teacher of the Year. Dunand taught the core graduate course 406: Symmetry and Mechanical Properties of Materials.

Mercouri Kanatzidis now has a courtesy appointment in the Department of Materials Science and Engineering. He recently received the ENI Renewable Energy Prize, which is awarded to the researcher or group of scientists that achieved internationally significant results in research and innovation, in the field of renewable energy sources; the award includes a specially struck gold medal of the Italian State Mint and €200,000.

Tobin Marks received the Luigi Sacconi Foundation Award from the Inorganic Chemistry Division of the Italian Chemical Society and named the Materials for Industry — Derek Birchall Award winner for 2015 by the Royal Society of Chemistry in May for his "creativity and excellence in the application of materials chemistry in industry."

Chad Mirkin was awarded the inaugural $400,000 Raymond and Beverly Sackler Prize in Convergence Research from the National Academy of Sciences.

Samuel I. Stupp was elected as a foreign member of the Royal Academy of Engineering in Spain.

David Seidman will present the 2015 Edward DeMille Campbell Memorial Lecture at the fall ASM meeting.

STUDENT NEWS

Graduate student **Tejas Shastry** (Hersam group) was honored by his hometown of Washington, Illinois as the youngest Washington Roots Award recipient. Tejas presented a talk about science, invention, and entrepreneurship, his start-up company AMPY and being named to *Forbes* magazine's "30 under 30" list. He also rode in the Washington homecoming parade.

Shannon Taylor was named Teaching Assistant of the Year for her efforts as TA of 406, including developing new lab exercises.

Over a dozen materials science and engineering graduate and undergraduate students were part of the team presenting STEM outreach at the Chicago Google Geek Street Fair in July. Organized by the Materials Research Center, the team helped attendees learn how to employ Scotch tape to exfoliate graphene and showed models of carbon-based structures, as well as measuring electrical properties.

Three students were recognized with school-wide awards at the McCormick Convocation. **Ryan DeBlock** was named McCormick Co-op Student of the Year, **Leanne Freidrich** (profiled on page 1) was awarded the Harold A. Gotaas Undergraduate Research Award for Undergraduate Research, and **Edward Pang** received the Ovid A. Eschbach Award Recipient.

Senior **Yang Yu** (Wolverton group) was awarded the Chicago-Area ASM Carl Samans Undergraduate Scholarship.

ALUMNI NEWS

Sean Agnew (PhD '98, J.R. Weertman) professor of materials science and engineering at the University of Virginia, has been named to the ASM 2015 Class of Fellows.

Peter Bocchini (PhD '15, Dunand and Seidman) has joined the Metals, Ceramics, and Extreme Environment Group in the Boeing Research and Technology Division.

In May, class of 2009 PhD alumni **Lesley Chow**, **Amber Genau**, and **Tommy Pashuck** gathered for a mini-reunion at the Cambridge, UK apartment of **Peter Voorhees**, who was enjoying sabbatical there. Lesley is an assistant professor at Lehigh University; Amber is an assistant professor at the University of Alabama at Birmingham; and Tommy is a post-doc at Imperial College London.

Zack Feinberg (PhD '12, Olson) and **Jim Wright** (PhD '03, Olson) were named as inventors on the recently published Apple patent for the high strength gold alloy of the Apple Watch.

Brian Flucht (BS '98) was profiled in the spring 2015 Northwestern Engineering magazine. Flucht began his career with the National Security Agency and now serves as director of global corporate business development for Nike.

Adam Jakus (PhD '15, Shah) received a Hartwell Post-Doctoral Fellowship. Adam and fellow Shah group member **Alex Rutz** both received Baxter Young Investigator Awards.

Matt Krug (PhD '11, Dunand and Seidman) is leading alloy development programs at Alcoa.

Pao Tai Lin (PhD '10, Wessels), currently a post-doctoral fellow at MIT, will join Texas A&M as an assistant professor of the electrical and computer engineering and materials science and engineering departments.

Antonio Ramírez de Arellano López (visiting scholar '97, Eshbach Visiting Scholar '99, Faber), former Rector of the University of Seville, has been appointed Minister of Economy of the Andalusian Regional Government of Spain.

Steven May (PhD '07, Wessels), assistant professor of materials science and engineering at Drexel University, will receive the ASM International Bradley Stoughton Award for Young Teachers.

Jennifer Su Saak (PhD '01, Faber) founded Traliance, a consulting company that provides export controls compliance services.

Anil Virkar (PhD '73, Johnson) has been appointed the H. Kent Bowen Professor in Materials Science and Engineering at the University of Utah. Anil was awarded the NU MSE Distinguished Career Achievement Award in May. He is a member of the National Academy of Engineering.

IN MEMORIAM

George Bodeen (MS '70) passed away May 21 at age 91. Bodeen was the former president, chairman, and CEO of Lindberg Corp. and founding president of the ASM Heat Treating Society. He was also former president of the Metal Treating Institute and a distinguished life member and fellow of ASM International. A member of Northwestern's McCormick Advisory Council, Bodeen and his wife Nancy donated funds to renovate what became the Bodeen-Lindberg Design Studio, the departmental computer lab. He received two Northwestern Alumni Awards, one for merit and one for service.

Former Northwestern professor **Hamlin M. Jennings** passed away on July 8 at age 68 after a battle with cancer. Jennings was widely recognized as a preeminent researcher in the field of cement chemistry. During his time at Northwestern, he helped establish the University's Center for Advanced Cement-based Materials, a National Science Foundation-sponsored multi-institutional, multi-disciplinary research hub aimed at expanding and improving the application of cement and concrete.

BACK PAGE

Museum of Science and Industry Exhibits Materials Science Research

Inhabiting a gateway space on the museum's lower level, the exhibit has the potential of being viewed by more than 1 million visitors before closing January 31.

For full story, see page 6.

Northwestern | McCormick School of Engineering
Materials Science and Engineering
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