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MatSE

Department of Materials Science and Engineering **News**

University of Illinois at Urbana-Champaign | Spring 2008

Going Green

Sustainable Energy at Forefront of Materials Science Research

It has been more than six months since I last had the opportunity to tell you about the developments and advances in your department. Our decision to delay the fall publication to you was to give us time to look for a new format – I hope you like the new design. This will be my fifth year as Head of the Department. The time has passed very quickly and I am happy to report that we have seen sustained growth in research funding, faculty and student awards, undergraduate student numbers and alumni donations. Inside you will learn about the incredible start of the 2007-2008 academic year. We began with another record undergraduate intake and our current number is 240. We are approaching capacity in our undergraduate laboratories and may need to limit future enrollment. What is impressive is that with the increase in numbers, the quality remains exceptionally high. I look forward to introducing this new class to you.

From the Department Head

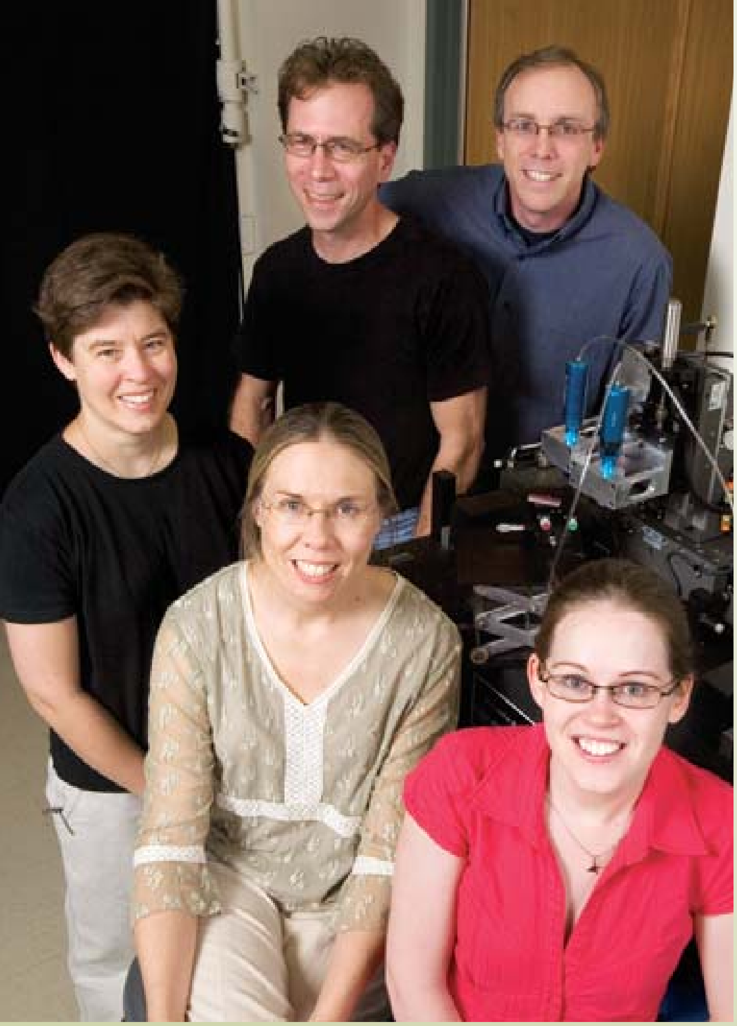
We continue to renovate the Metallurgy and Mining Building and are hoping to have a new first-floor by the end of the summer. The faculty continues to secure new research funding and this has resulted in a significant growth in our research expenditures with a major effort in materials for energy technologies (see article on page 6). To enable our research excellence, we continue to build on the already impressive characterization tools in the Center for Microanalysis of Materials in the Materials Research Laboratory. The latest acquisition is an aberration corrected transmission electron microscope (see article on page 10). Faculty, along with their graduate students, continue to make breakthroughs: Rogers and Shim have made a radio with carbon nanotubes; Rogers' flexible electronics with the latest being a hemispherical 'eye;' Braun's photonic crystals for near-infrared light; Wong and Luijten's suggested pathway for curing cystic fibrosis; Sottos' work on self-healing materials (see the January 2008 issue of *Scientific American*); Averback and Bellon's molecular dynamics computer simulations to explain the mechanical properties of nano-grain sized metals; to name a few… Faculty and students continue to garner awards – Rogers named to the class of fellows of the Materials Research Society; Schweizer presented with the Tau Beta Pi Daniel C. Drucker Eminent faculty award, which makes it two in a row for MatSE; Cheng awarded a NSF CAREER award; Zuo recognized by the Chinese National Science Foundation.

The department is undergoing some changes on the administrative side – Judy Brewer has accepted the position as the secretary to the Head and as expected, she is making a difference. We will say goodbye to Raju Perechela at the end of this semester, as he wants to pursue and expand his family business. As you know, Raju has been a tremendous asset to the department and has worked with many of you in the undergraduate laboratory. We will miss having Raju around, and I hope you will join me in thanking him for his dedicated service to the department and wish him well in his new venture.

I am excited about the future of the department, with all our indicators being extremely positive. Our students, undergraduate and graduate, like the ones that went before them, continue to excel in and out of the classroom. We strive to continue to improve and evolve our program so that we provide future classes of MatSE alumni with the basis for launching their career. We have introduced new courses on materials sustainability and photovoltaics. This year we will participate in a nationwide discussion of the future of materials science and engineering education and how to best prepare for the future. We have ideas on what we think is needed but we would like to hear your opinion. I encourage you to think about this issue and to send me your thoughts/comments (matse-head@uiuc.edu).

Lastly, a brief note about your contribution and how you can help. Well, really there cannot be a more loyal group of alumni than those from the old Metals and Ceramic Engineering Departments and the new Department of Materials Science and Engineering. Your enthusiasm and support for the program just continues to grow. Since the start of the new academic fiscal year you have surpassed all of our expectations and have set a new record in giving to the department – Thank you. We will be announcing new undergraduate scholarships later this spring, but we will wait to tell you about them until we can show the donors along with the recipients. We also have a number of you volunteering your time to come back to the department and give talks to our students. You have also helped with job and internship placement. Again, thank you for your efforts. Without your continued support and encouragement, we would not be where we are today.

Ian Robertson



Self-healing materials research group includes (clockwise from front) graduate student Katie Toohey; Professors Nancy Sottos, Jennifer Lewis, Scott White and Jeffrey Moore. Photo credit: L. Brian Stauffer, University of Illinois at Urbana-Champaign News Bureau

UI researchers named to *Scientific American* 50

A materials research group at the University of Illinois at Urbana-Champaign was among the SciAM 50 for 2007, announced in *Scientific American* magazine. The awards list, which appeared in the magazine's January 2008 issue, honors 50 individuals, teams, companies and other organizations whose accomplishments in research, business or policymaking during 2006-2007 demonstrate outstanding technological leadership.

Scott R. White, a Willett Professor of Aerospace Engineering, and Nancy R. Sottos, a Willett Professor of Materials Science and Engineering, were recognized for their development of self-healing materials. Together with their colleagues Jeffrey Moore, Chemistry, Jennifer Lewis, Thurnauer Professor of Materials Science and former Ph.D. student Katie Toohey, Theoretical and Applied Mechanics, they recently demonstrated a new material that mimics human skin by healing itself time after time using an embedded, three-dimensional microvascular supply network.

"In the same manner that a cut in the skin triggers blood flow to promote healing, a crack in these new materials will trigger the flow of healing agent to repair the damage," Sottos explained. In the researchers' original approach, self-healing materials consisted of a microencapsulated healing agent and a catalyst distributed throughout a composite matrix. When the material cracked, microcapsules would rupture and release the healing agent. The healing agent then reacted with the embedded catalyst to repair the damage.

"With repeated damage in the same location, however, the supply of healing agent would become exhausted," White added. "In our new circulation-based approach, there is a continuous supply of healing agent, so the material could heal itself indefinitely."

White, Sottos, Moore and Aerospace Engineering professor Philippe Geubelle co-invented self-healing plastic; Lewis and White pioneered direct ink writing of three-dimensional microvascular networks.

-Engineering Communications Office

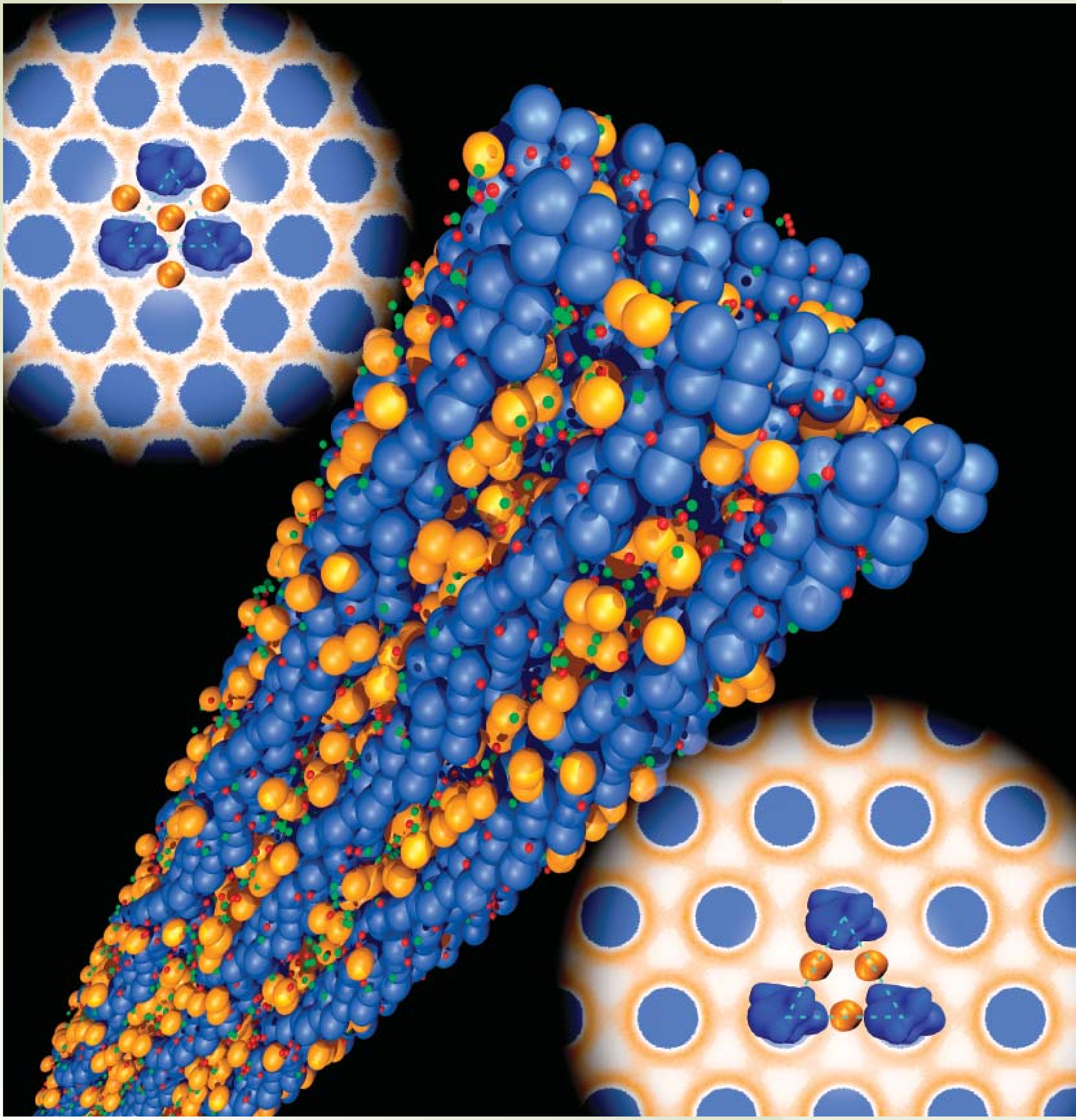
Professor Clarence Marvin Wayman Remembered

Professor **Clarence Marvin Wayman** died July 29, 2007, after a protracted illness. Professor Wayman was born August 12, 1930, in Wheeling, West Virginia. He married Patricia Louise Smith on January 28, 1956, who survives him. He studied metallurgical engineering at Purdue University, receiving the degrees of B.S. with distinction in 1952 and M.S. in 1955. From 1952-1954 he served as an officer in the U.S. Air Force Materials Laboratory at Wright Patterson Air Force Base and was honorably discharged. He entered Lehigh University, Bethlehem, Pennsylvania in 1955 and received a Ph.D. degree in metallurgy in 1957, following which he joined the University of Illinois. He served a term as acting head of the department, among other administrative assignments. He retired from the University in 1995.

Professor Wayman researched the field of martensitic transformations for 30 years during which he published more than 400 papers, 100 of those deal with shape memory materials. He edited numerous books on martensitic transformations and authored a seminal book on crystallography of martensitic transformations, which has been translated into Japanese and Chinese. His work on martensitic transformations was recognized by the AIME Mathewson Gold Medal, Eminent Faculty Award of the College of Engineering at the University of Illinois, Honorary Professorships at two Chinese universities and Fellowships in ASM International, the Metallurgical Society of AIME, the Institution of Metallurgists, the Japan Society for Promotion of Science, the Guggenheim Foundation and Churchill College at the University of Cambridge. He was chairman of several international conferences and a keynote speaker, and was an international consultant in the field for many years, traveling to Japan, China and Europe numerous times.

Memorials may be made to the University of Illinois Department of Materials Science and Engineering for a scholarship in his name.

Cystic fibrosis patients may breathe easier, thanks to bioengineered antimicrobials



A bundle of actin filaments (blue) held together by lysozyme proteins (orange). Such molecular complexes can contribute to airway infections in cystic fibrosis patients, as they bind antimicrobials. Combined molecular dynamics simulations and synchrotron X-ray diffraction experiments have demonstrated that the complex formation can be prevented through modification of the electrostatic charge on the lysozyme. Image courtesy of C. Guaqueta

By better understanding how antimicrobials bind and thereby get inactivated in the mucus of air passages, researchers at the University of Illinois may have found a way to help cystic fibrosis patients fight off deadly infections.

"While not a cure, this work has potential as a therapeutic strategy against bacterial infections in cystic fibrosis," said Gerard Wong, and a corresponding author of a paper accepted for publication in the *Proceedings of the National Academy of Sciences* (PNAS).

Ordinarily, pulmonary passages are lined with a thin layer of mucus that traps bacteria and other pathogens. Moved along by the motions of countless cilia, the mucus also acts as a conveyor belt that disposes of the debris.

In patients with cystic fibrosis, however, the mucus is more like molasses – thick and viscous. Because the cilia can no longer move the mucus, the layer becomes stuck, and the bacteria grow, multiply and colonize. Long-term bacterial infections are the primary cause of death in cystic fibrosis.

Using synchrotron X-ray scattering and molecular dynamics simulations, the researchers took a closer look at the mu-

"While not a cure, this work has potential as a therapeutic strategy against bacterial infections in cystic fibrosis."

cous mess. Debris in the infected mucus includes negatively charged, long-chained molecules such as mucin, DNA and actin (from dead white blood cells). It turns out most of the body's antimicrobials, such as lysozyme, are positively charged.

"We found that actin and lysozyme – two of the most common components in infected mucus – form ordered bundles of aligned molecules, which is something you don't expect in something as messy as mucus," said Wong. "Held together tightly by the attraction of opposite charge, these bundles basically lock up the antimicrobials so that they are unable to kill bacteria."

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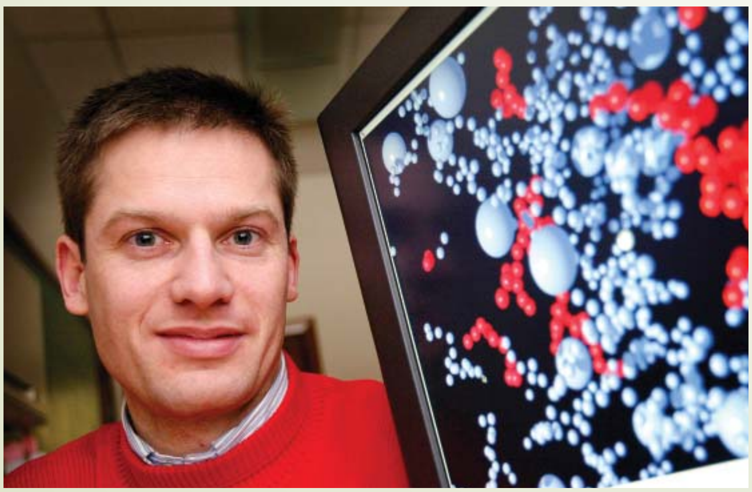
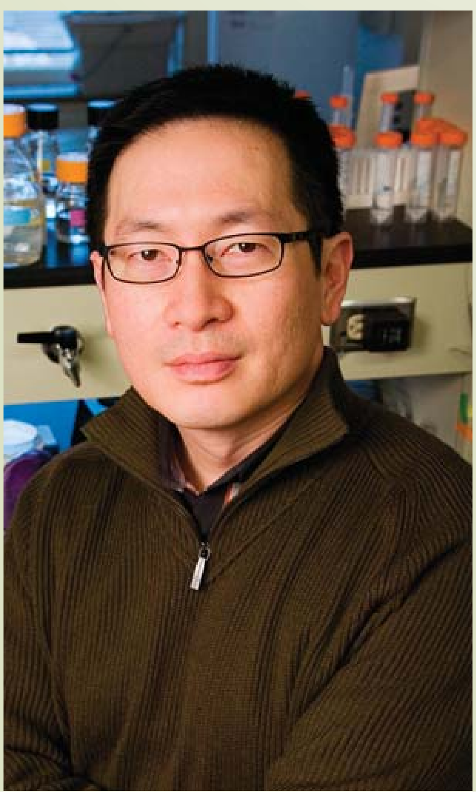
The researchers then developed a computational model to mimic the biological system. "The model accurately predicted the structure of the actin-lysozyme bundles, and agreed quantitatively with the small-angle X-ray scattering experiments," said Erik Luijten, corresponding author of the PNAS paper.

The next step was to find a way to liberate the lysozyme, or prevent it from binding in the first place. Using their model, the researchers explored the consequences of varying the positive charge on the lysozyme.

"When we reduced the charge, we found a huge effect in our model," Luijten said. "The lysozyme would not bind to the actin. It floated around independently in the mucus."





Illinois researchers Erik Luijten, above, and Gerard Wong, may have found a way to help cystic fibrosis patients fight deadly infections.

Then, through genetic engineering, the researchers made lysozyme with roughly half the normal charge. Experiments confirmed the simulations; the reduced charge prevented lysozyme from sticking to actin, without significantly reducing the all-important antimicrobial activity.

Although much work remains, future cystic fibrosis patients might use an inhaler to deliver genetically modified charge-reduced antimicrobials to upper airways. There, these 'non-stick' antimicrobials would go to work killing bacteria, and mitigate against long-term infection.

The implications of this research extend into other areas as well. In water purification, for example, one of the steps involves putting positively charged molecules in the water to grab negatively charged pollutants. The resulting aggregates settle to the bottom of holding tanks and are removed from the water supply.

"A better understanding of how oppositely charged molecules bind in aqueous environments could lead to ways of removing emerging pathogens in water purification," Wong said.

Besides Wong and Luijten, co-authors of the paper are post-doctoral research associate and lead author Lori Sanders, lecturer Wujing Xian, graduate student Camilo Guáqueta and undergraduate students Michael Strohman and Chuck Vrasich.

Funding was provided by the National Institutes of Health, the Cystic Fibrosis Foundation, the National Science Foundation and the U of I WaterCAMPWS Science and Technology Center. Portions of the work were carried out at the Stanford Synchrotron Radiation Laboratory and at the Advanced Photon Source.

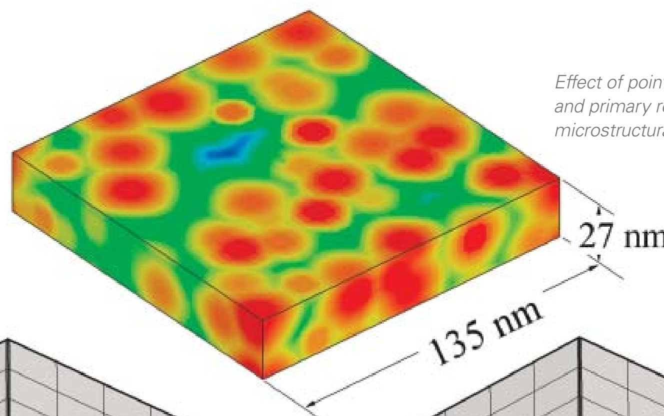
-University of Illinois News Bureau

Materials for Energy Technologies

The need for the United States to import energy began in the late 1950s and today we import more than 30 percent of our energy. The rapid economic growth seen in emerging countries is placing additional demands on the world energy supply and has led the Bush Administration to issue a challenge to the U.S. science and engineering communities to develop domestic energy supplies to meet the projected growth demand and to decrease the reliance on imports. Ensuring sufficient future energy supplies in a sustainable and environmentally benign manner will require not only technological advances in generation but also higher efficiency products and promotion of conservation and other societal changes. Any new energy generation technology faces the additional challenge of reducing release of carbon into the atmosphere, which is widely accepted as a cause of global climate change.

Advances in materials science and materials engineering are inherent to all of the technological advances in generation and application of energy envisioned to secure the nation's future. Faculty members in Materials Science and Engineering along with colleagues from across the University of Illinois campus are leading research activities aimed at providing the materials for tomorrow's energy technologies. In addition, new courses are being taught to introduce the materials science and materials engineering challenges of creating advanced energy technologies and

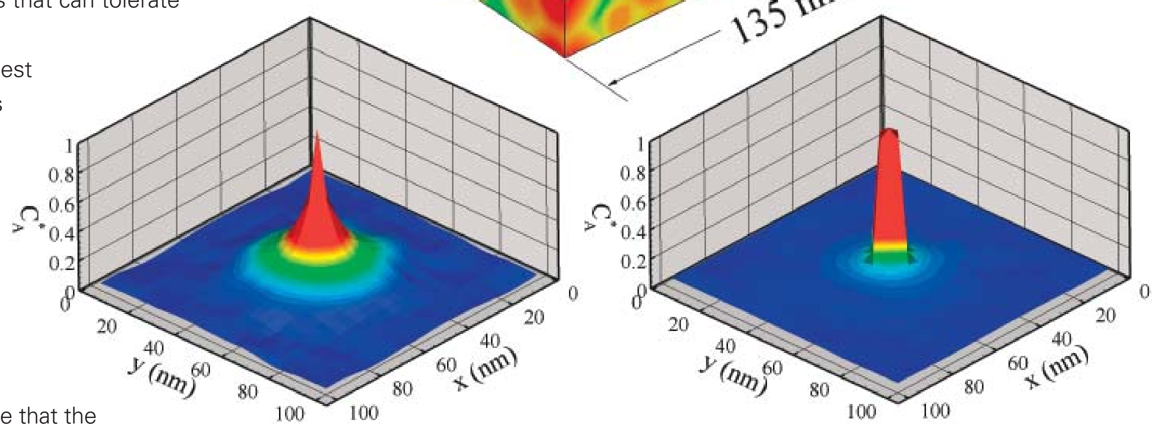
Nuclear Power



Effect of point defect distribution and primary recoil spectrum on microstructural evolution

Robert Averback and Pascal Bellon are developing a new mechanism-based phase field model for crystalline solids. By using real space methods, large volumes can be tracked with nm resolutions for years. Such models will enhance our understanding of microstructure evolution to irradiation at higher temperatures and accelerate the development of alloy systems that can tolerate such harsh environments.

Nuclear power is the single largest source of electric power that does not produce greenhouse gases. No nuclear plant has been constructed in the U.S. since the incident at Three-Mile Island in 1979. Existing plants are showing higher generation capacity and many plants have been granted extensions in their operating lives. Projections indicate that the percentage of electricity generation from nuclear plants will increase by 2030 from a level of 789 billion kilowatthours in 2004 to 896 billion kilowatthours in 2030. To meet this demand, new plants will have to be built. Currently there are only three requests pending for planning permission but major growth in the nuclear power industry are forecast and indeed will be essential to meet future energy demand.

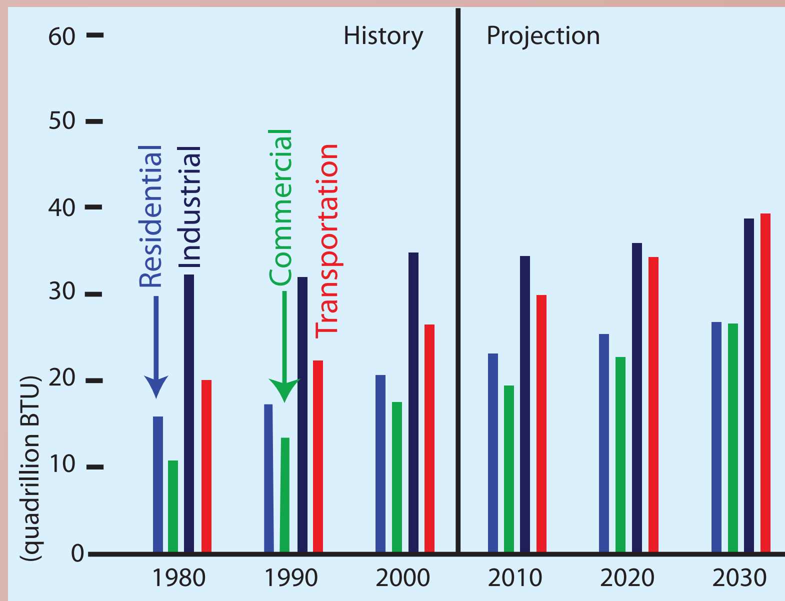


The model makes it possible to study radiation-induced segregation (left) and radiation-induced precipitation (right) on defect clusters.

Industry estimates forecast that fissible uranium supplies will expire in less than a century suggesting that next generation systems will need to have a closed fuel-cycle in which the transuranics (e.g. plutonium) are used and the long-lived waste products are eliminated. The designs for next generation reactors require higher operating temperatures, more corrosive environments and longer lifetimes. One of these advanced designs, the Very-high Temperature Reactor, will have reactor outlet temperatures between 850 and 950 °C. Such a facility might be coupled, via a heat exchanger, to a hydrogen production facility or to a gas turbine. Developing this and other advanced design systems present a myriad of materials challenges that demands materials with superior properties. Several faculty in the Materials Science and Engineering department including Averback, Bellon, and Ian Robertson along with colleagues Jim Stubbins and to educate the next generations of materials engineers who will be faced with solving the energy challenges that are just becoming apparent today.

Analyses of the potential alternatives to conventional fossil fuels suggests that the options are limited, especially if global warming is factored into the equation. The primary sources are nuclear power, solar electric, wind, biomass, and cleaner versions of conventional hydrocarbons.

The historical and projected energy demand for the U.S. based on population growth and similar per capita energy demand.



Primary energy consumption by sector, 1980-2030

Brent Heuser in Nuclear, Plasma, and Radioloigical Engineering; Petros Sofronis and Huseyin Sehitoglu in Mechanical Science and Engineering, and Andrew Gewirth in Chemistry are looking to understand how to create a microstructure that is radiation tolerant or resistant, and to understand the fundamental processes controlling the high temperature mechanical strength and corrosion resistance.

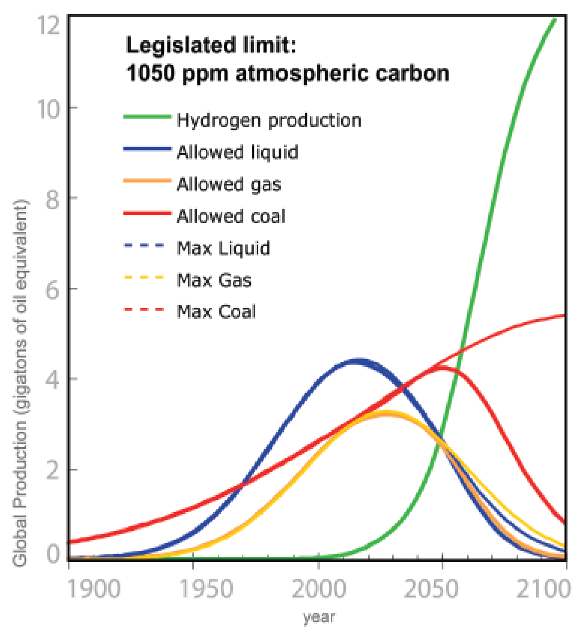
Solar Cells

The single largest source of renewable energy is the sun and the most efficient method to convert solar energy to electric power is through solar cells. It has been estimated that the entire U.S. energy needs can be met through solar cells covering a small fraction of the total U.S. land area. These devices are clean, produce no greenhouse gases, provide a distributed power source that is less vulnerable to sabotage or weather damage. Solar electric power generation has every desirable aspect of an energy source except one – it is too expensive currently.

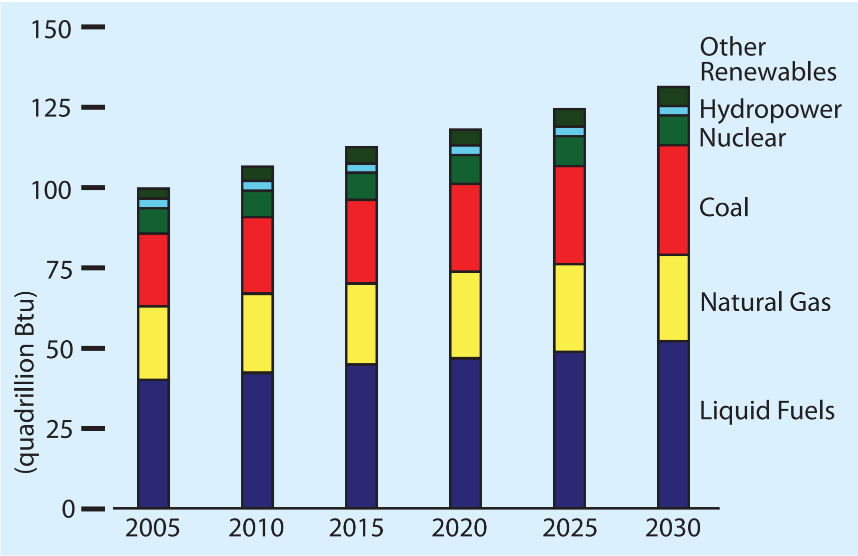
To solve this, researchers at the University of Illinois including Angus Rockett, John Abelson, John Rogers, Paul Braun, and others are developing novel solar conversion systems based on nanoparticles and organic materials. They are exploring ways of producing flexible arrays of highly efficient devices (current flexible devices are relatively low-performance). Rogers has demonstrated how flexible solar cells can be made from high-performance Si devices by transfer printing the devices onto flexible polymer membranes. Braun is developing methods to produce colloidal optical waveguides that could act as selective filters for side-by-side multijunction solar cells. Rockett and co-workers are conducting fundamental investigations of the science of inorganic polycrystalline solar cell materials to learn how to make better devices. Research such as this has led to the recent announcement of solar cells produced at one-third of the price typical of standard silicon devices. New materials are being adapted to produce complete devices that can provide similar improvements over time. With progress like this, it is only a matter of time before solar cells are a dominant form of energy generation.

Hope in Hydrogen

It has been proposed that we use hydrogen as an energy carrier rather than carbon-based fossil fuels for either production of electricity or for fueling the transportation sector. Successful transition to a hydrogen economy would reduce emission of greenhouse gases and would decrease the nation's reliance on other countries for energy supplies.



Notwithstanding the issues of how to produce the required amount of hydrogen gas (it would probably be by nuclear, wind or solar power to be carbon free) and the impact and cost of the production technologies, the issues of transporting the gas from the production facility to the end-user distribution facility and to store it on the vehicle are major materials problems.



Primary energy use by fuel, 2005-2030

Biomass

An important source of transportation fuels is likely to be biomass. This term refers to the conversion of plant material (mostly cellulose polymer) to a liquid that would be a practical fuel for vehicles. In particular, airplanes require a very high energy density material such as kerosene. Hydrogen will not suffice unless an extremely low mass storage material is developed. An excellent option would be to convert biomass to a practical liquid fuel. A major research center for biomass conversion to fuels has been established in the College of Agricultural Consumer and Environmental Sciences (ACES). Phillip Geil is working with the College of ACES to develop improved biomass fuel sources. On a more personal note, Geil has installed both a wind turbine and a relatively large solar cell array at his home and is generating many thousands of kilowatt hours of renewable energy every year.

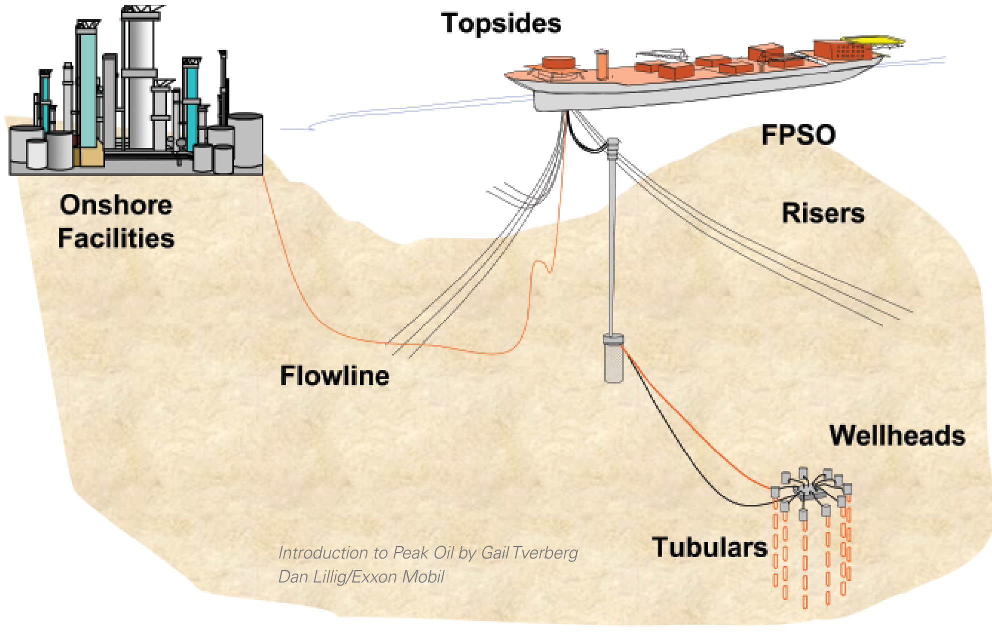
One scenario for transporting hydrogen to distribution sites is to use the existing infrastructure of the natural gas pipeline distribution system – the cost of establishing a new system is prohibitively expensive. A problem is that hydrogen embrittles metals to the extent that they can fail at a load below the design strength. This can result in catastrophic failure of a structure. Before the existing infrastructure can be used, it is essential to verify that the wide variety of pipeline steels in use is insensitive to hydrogen embrittlement. Robertson and Duane Johnson, along with Petros Sofronis in Mechanical Science and Engineering, are working to assess the susceptibility of these steels to hydrogen embrittlement and to develop physically-based models capable of predicting failure. At the same time, leakage of hydrogen from such pipeline systems as part of a hydrogen economy could modify the environment. Rockett, Robertson, and Sofronis are working with the Department of Atmospheric Sciences (Donald Wuebbles and others) to study the effect of a large increase in atmospheric hydrogen on the environment.

For use in automobiles it is possible to store hydrogen as a liquid, as a gas at high pressure, or incorporated into material, or to re-generate on-board. Toyota Motor Company has developed an experimental SUV that recently ran more than 300 miles on a tank of compressed hydrogen, which approaches the driving range for a conventional car. One approach being emphasized in the U.S. is storage in a light-weight material. Johnson and Robertson, as part of the Department of Energy Metal Hydrides Center for Excellence, are exploring candidate storage materials but to-date the challenge remains identifying a material that satisfies the design constraints.

Article contributors: Pascal Bellon, Robert Averback, Angus Rockett, Ian Robertson, Jim Economy

Oil

Although a reduction in the dependence on oil imports is desired, energy and products derived from oil and gas continue to be important. Materials challenges exist with the oil and gas industry as wells are drilled in more harsh and extreme environments and improved properties are needed to meet the higher performance requirements. For example, pipeline materials with a defined strain capacity are needed for Arctic and seismically active areas and higher strength steels are needed to transport natural gas at higher pressures to meet the growing demand. Understanding the corrosion resistance of the pipelines and the welds in aggressive conditions is needed to ensure pipeline reliability. Efforts in the MatSE Department are aimed at understanding corrosion behavior and hydrogen interactions with pipeline materials and with welds.



Introduction to Peak Oil by Gail Tverberg
Dan Lillig/Exxon Mobil

Carbon nanotubes have a sound future in the electronics industry, say researchers who built the world's first all-nanotube transistor radios to prove it.

New kind of transistor radios show capability of nanotube technology

The nanotube radios, in which nanotube devices provide all of the active functionality in the devices, represent "important first steps toward the practical implementation of carbon-nanotube materials into high-speed analog electronics and other related applications," said John Rogers. Rogers is a corresponding author of a paper that describes the design, fabrication and performance of the nanotube-transistor radios, which were achieved in a close collaboration with radio frequency electronics engineers at Northrop Grumman Electronics Systems in Linthicum, Maryland.

The paper has been accepted for publication in the *Proceedings of the National Academy of Sciences*. "These results indicate that nanotubes might have an important role to play in high-speed analog electronics, where benchmarking studies against silicon indicate significant advantages in comparably scaled devices, together with capabilities that might complement compound semiconductors," said Rogers.

Practical nanotube devices and circuits are now possible, thanks to a novel growth technique developed by Rogers and colleagues at the U. of I., Lehigh and Purdue universities, and described last year in the journal *Nature Nanotechnology.*

The growth technique produces linear, horizontally aligned arrays of hundreds of thousands of carbon nanotubes that function collectively as a thin-film semiconductor material in which charge moves independently through each of the nanotubes. The arrays can be integrated into electronic devices and circuits by conventional chip-processing techniques.

"The ability to grow these densely packed horizontal arrays of nanotubes to produce high current outputs, and the ability to manufacture the arrays reliably and in large quantities, allows us to build circuits and transistors with high performance and ask the next question," Rogers said. "That question is: 'What type of electronics is the most sensible place to explore applications of nanotubes?' Our results suggest that analog RF (radio frequency) represents one such area."

As a demonstration of the growth technique and today's nanotube analog potential, Rogers and collaborators at the U. of I. and Northrop Grumman fabricated nanotube transistor radios, in which nanotube devices provided all of the key functions.

The radios were based on a heterodyne receiver design consisting of four capacitively coupled stages: an active resonant antenna, two radio-frequency amplifiers, and an audio amplifier, all based on nanotube devices. Headphones plugged directly into the output of a nanotube transistor. In all, seven nanotube transistors were incorporated into the design of each radio.

In one test, the researchers tuned one of the nanotube-transistor radios to WBAL-AM (1090) in Baltimore, to pick up a traffic report.

"We were not trying to make the world's tiniest radios," Rogers said. "The nanotube radios are a demonstration, an important milestone toward building the technology into a form that ultimately would be commercially competitive with entrenched approaches."

The work was funded by the National Science Foundation and the U.S. Department of Energy

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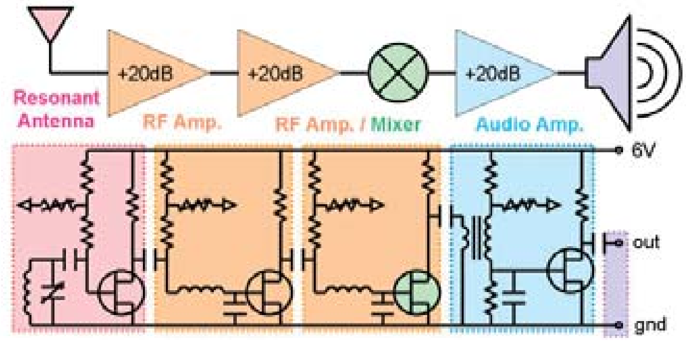
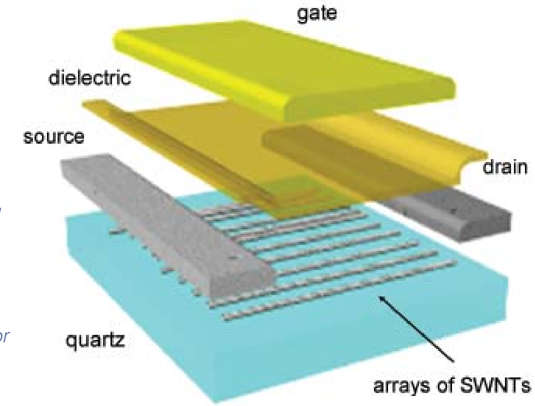


Block and circuit diagrams of a radio that uses carbon nanotubes for the resonant antenna, two radio-frequency amplifiers, radio-frequency mixer and an audio amplifier.



Schematic exploded view of a radio-frequency transistor that uses parallel, aligned arrays of carbon nanotubes for the semiconductor.

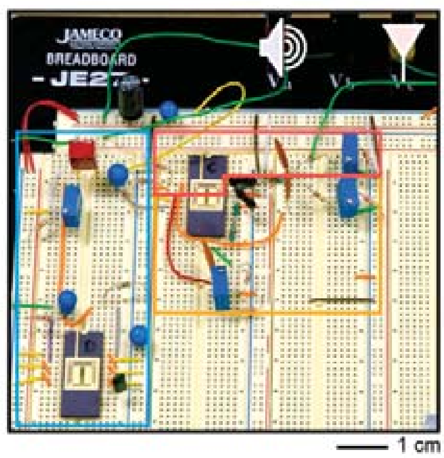
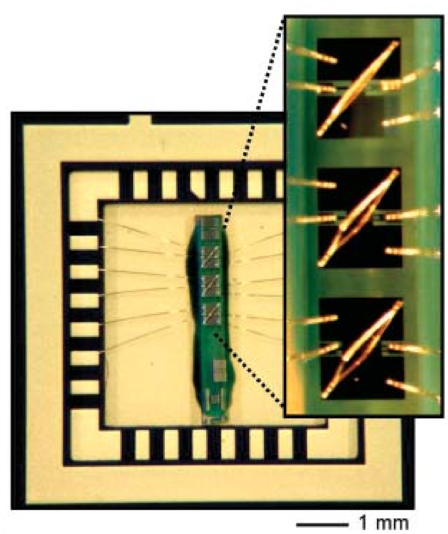
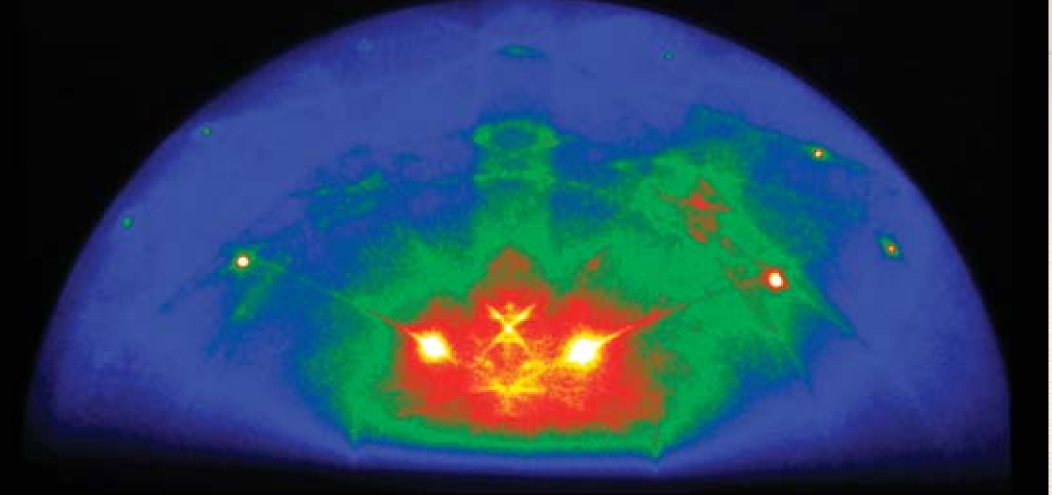


Image of the nanotube-transistor radio, with magnified views of carbon-nanotube transistors wire bonded into dual in-line packages.

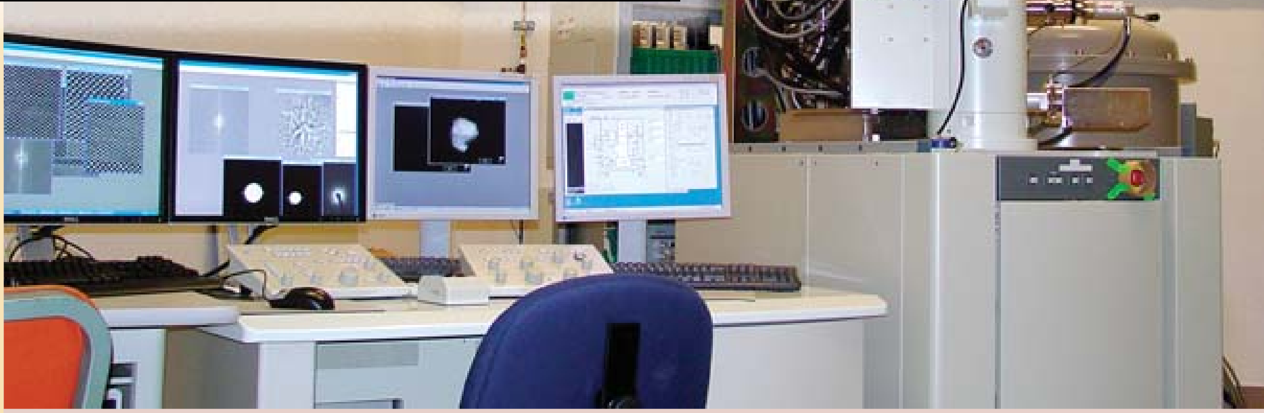
Images courtesy John Rogers



Optical micrograph of an array of devices on a quartz wafer. The inset provides a magnified view.



Electron diffraction pattern from a hydrogen terminated Si surface, shown above. Image recorded with the ultrafast camera.



Materials Characterization Facilities

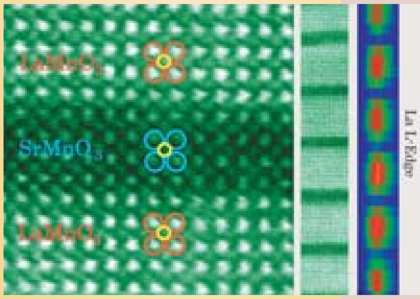
An update on the capabilities of the Center for Microanalysis of Materials in the Frederick Seitz Material Research Laboratory.

By Jennifer Lewis and Ian Robertson

The Center for Microanalysis of Materials in the Frederick Seitz Materials Research Laboratory (FSMRL) is one of the key campus facilities for the faculty and students in the Department of Materials Science and Engineering.

Many of you spent numerous hours working in the basement of the FSMRL gathering the data for your Ph.D. or for your undergraduate research project. The Center continues to excel; it has acquired several new instruments and continues to develop new capabilities and tools. The Center serves 680 people per year; with MatSE faculty and students making up 40 percent of the total.

Currently, the Center houses TEMs (CM12, JEOL 2010, 2010F (S)TEM, cryo-TEM, Aberration corrected STEM), SEMS, variable temperature AFM, laser facility, x-ray diffraction and surface analysis capabilities (XPS, Auger, SIMS); for a detailed list visit http://cmm.mrl.uiuc.edu. Our facility is unique because it continues to be staffed with highly talented scientists who train graduate students how to use the equipment, assist in experiments and interpretation of results, and develop new tools.

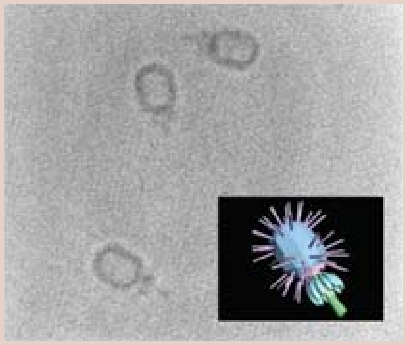


An example of the work being done with the aberration-corrected electron microscope is shown in the atomic resolution image of a $LaMnO_3$ – $SrMnO_3$ superlattice. The La concentration across the interface as determined by electron energy loss spectroscopy is shown on the right.

Our latest addition to the Center is an aberration-corrected scanning transmission electron microscope. The microscope is equipped with a CEOS probe corrector and an in-column energy-filter. The probe corrector improves the STEM resolution to less than 0.1 nm. The filter is capable of electron energy loss resolution less than 1 eV.

The CMM has also acquired a JEOL 2100 Cryo-TEM to serve the 'soft matter' community on our campus. An example of the work being conducted is shown in the electron micrograph of a phi29 Bacteriophage virus; shown in the inset is an illustration of the virus.

David Cahill and Robert Averback are working with Jim Zuo to develop a new capability to enable ultra-fast reactions to be studied dynamically. The idea is to synchronize a laser-pulse to trigger the electron beam with one that stimulates a reaction (melting, phase transformation, surface heating and heat transport) in the material and to capture a diffraction pattern of the actual transformation in the appropriate time scale. By combining optical and electron characterization, this group aims to get a clear picture of ultrafast phenomena in materials.



phi29 Bacteriopahge virus

The Center continues to thrive and to acquire new instruments that enable MatSE faculty and students to have ready access to the latest state-of-the-art characterization tools. If you are interested in using the facility or would like to visit, please contact Ian Robertson or Jennifer Lewis at mse@uiuc.edu or (217) 333-1440.

Faculty Honors

Robert Averback has been reappointed as the Donald W. Hamer Professor of Materials Science and Engineering.

JJ Cheng has been awarded an NSF CAREER award.

Jennifer Lewis has been elected a Fellow of the American Physical Society.

John Rogers has been elected a Fellow of the Materials Research Society.

Ken Schweizer is the 2008 recipient of the Polymer Physics Prize of the American Physical Society. The citation reads "For outstanding theoretical contributions to the fundamental understanding of the structure and dynamics in polymer melts, polymer blends, polymer-particle composites and glasses." Schweizer also is the 2008 recipient of the Tau Beta Pi Daniel C. Drucker Eminent faculty award presented by the University of Illinois College of Engineering.

Dallas Trinkle has received a 3M Untenured Faculty Award. He also has been chosen by TMS as one of two 2008 Young Leader International Scholars.

Gerard Wong is a recipient of a 2008 XEROX award for faculty research.

Jim Zuo has been recognized by the China National Science Foundation for Talented Professionals, Oversea Chinese Young Scholar Joint Research Fund, 2007. A total of 80 scientists in all science and engineering fields received this award for 2007.

Jennifer Lewis

John Rogers

Recent Research Highlights

Paul Braun's research group is the first to achieve optical waveguiding of near-infrared light through features embedded in self-assembled, three-dimensional photonic crystals. His research was featured on the cover of *Nature Photonics*.

John Abelson's collaboration with **Greg Girolami** (Chemistry), synthesis of new CVD precursors with the use of those precursors to grow films, was featured as a cover on *Inorganic Chemistry*.

An image from **Gerard Wong's** and **Erik Luijten's** research was on the cover of the January 2008 *MRS Bulletin*.

Ken Schweizer

MatSE News

The MatSE Department hosted 67 high school students plus their family members at the **MatSE High School Visit Day** on October 7, 2007. Visitors listened to an introduction to materials, took part in demonstrations, toured the student laboratories and enjoyed a pizza supper with MatSE faculty and undergraduates. MatSE Visit Day is an annual event which takes place the Sunday before Columbus Day.

An **ASM Materials Camp for High School Teachers** will be held the week of June 23-27 on the University of Illinois campus. During the week-long camp, teachers learn how to integrate simple labs and experiments using everyday materials into their existing lesson plans to actively engage students in applied science. Teachers work hands-on with metals, ceramics, polymers and composites, and develop a greater appreciation for the importance of these materials to modern life.

Michelle Malloch is a new secretary in the department office. Michelle is married and has two children, Tanner, 5 and Addi, 1 and a dog, Clyde. She lives in Savoy and grew up locally, attending Mahomet-Seymour schools and Parkland College. Previously, she worked in customer service and sales and was a stay-at-home mom. Michelle is active in the PTA at her son's school. Michelle and her family are all members of the American Legion and her father-in-law is the National Commander this year. They enjoy attending Illini football and basketball games.

Michelle Malloch

Student Honors

James Carroll, Ph.D. student in David Payne's group, has received the Diamond Award from the Basic Science Division of the American Ceramic Society for Graduate Excellence in Materials Science (GEMS). The GEMS Awards recognize the outstanding achievements of graduate students in materials science and engineering based on an oral presentation in a symposium or session at MS&T '07 in Detroit, Michigan in September 2007.

Abhishek Agrawal, Ph.D. student in John Weaver's group, received a 2007 AVS Graduate Research Award.

Jacob Palmer, Ph.D. student in John Weaver's group, won the best student paper award of the Nanometer Science and Technology Division of the American Vacuum Society. Palmer's paper was titled, "Interactions of Nanoparticles with a Dewetting Solid Film."

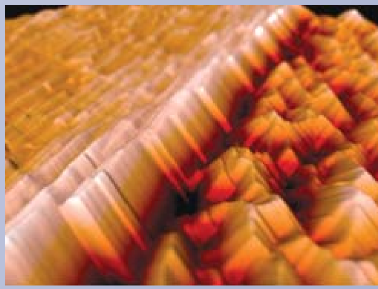
Martin Bettge won the Best Poster Award of the Vacuum Technology Division for Collaborative work of FS-MRL and ANL.

Allen Hall won second place in the AVS International Symposium's "The Art-Zone competition."

The research of **Jim Carroll**, Ph.D. student in David Payne's group, was featured on the cover of the journal IEEE Transaction for Ultrasonics, Ferroelectrics and Frequency Control.

MatSE undergrad **Jill Franke** was selected to participate in the SWE Collegiate Poster competition at the national meeting in October. The research for her poster was sponsored by the Intel program last year.

Jacob Palmer with John Randall, the chair of the executive committee for the Nanometer-scale Science and Technology Division of AVS.



Award winning Allen Hall image

2007-08 Student Awards

3M Polymer Materials Scholar: Jason Jewell

Paul A. Beck Scholar: Calvin Gudeman

Harry J. Beckemeyer Jr. Scholar: Ting-Kai Chang

Clifton G. Bergeron Scholar: Ruoshi Sun

Louis R. Berner Scholars: Patrick Coyle, Joseph Kao

Robert Bohl Scholars: Jonathan Bartelt, Michael Brendel, Steve Golembieski, Felix Hotama, Po Shan Hsu, Steven Richlak, Eric Tolar

Caterpillar Scholars: Stephen House, James Young

Earl J. Eckel Scholars: Samik Basu, Robert Bierman

M. Laird & Charisann Froberg Scholars: Tracey Brommer, Caitlin Tribout

Phillip H. Geil Scholar: Pamela Wojtulewicz

Henry E. Grein Jr. Scholar: Jonathan Lelah

Kimberly Clark Scholars: Will Chemelewski, Lisa Mazzocco

Merck Scholar: Varun Nayini

Kevin Moore Memorial Scholar: Courtney Skinner

James A. Nelson Scholar: Varistha Chobpattana

Cullen W. Parmelee Scholars: Amanda Homce, Sibel Leblebici, Brian Lin, Meghan McKelvey, Stephen Menke, Kevin Spencer, Donald To

Norman L. Peterson Scholar: Michael Odlyzko

Ivan Racheff Scholars: David Baker, Kevin Dammann, Jillian Franke, Gerald Marchand, Daniel Widing

Larry D. and Carol Rakers Scholars: Stephen Kaun, Robert Ronald

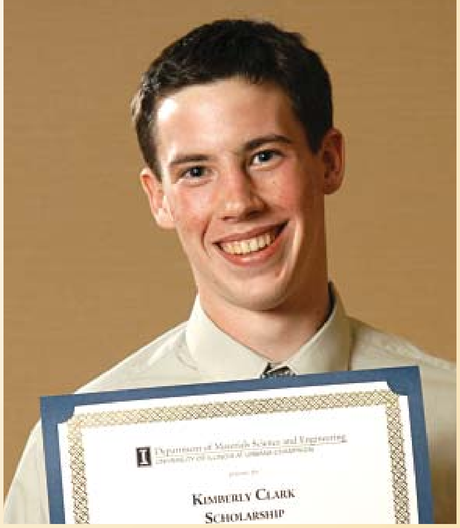
Lucille and Charles Wert Scholars: Sofiane Boukhalfa, Clarabelle DeVries, Jennifer Gaddis, Nyrene Haque, Evelyn Huang, Timothy Huang, Ameena Husain, Matthew Montgomery, Emily Pinheiro, Arya Tedjasaputra, Nicholas Vito, Kyle Wallenberg

Alfred W. Allen Awards: Tracey Brommer, Will Chemelewski, Sibel Leblebici, Jonathan Lelah, Brian Lin, Lisa Mazzocco, Jonathan McDaniel, Stephen Menke, Kevin Spencer, Donald To, Caitlin Tribout

Arthur L. Friedberg Awards: Jessica Koschmeder, Marie Mayer

Materials Science and Engineering Alumni Board Award: Angela Gonzales

MatSE Awards Help Students Continue Education



Will Chemelewski—
I have learned a great deal in all of my classes at the University and also have started research as an undergraduate, getting hands-on experience with real world problems and how to solve them.

Last summer I worked at Heliovolt, a start-up CIGS (Copper Indium Gallium diSelenide) solar panel company in Austin, Texas. It was a great experience and gave me a great deal of insight into working in industry. Last fall I started working as an undergraduate research assistant for Professor Rockett on a project to increase the scientific knowledge and understanding of CIGS. After I finish college, I plan to attend graduate school to obtain a Ph.D., likely with research on CIGS, but if not, then definitely in dealing with photovoltaic materials. Following graduate school, I am not sure if I will go into industry or academia.

I am a member of the Office of Technical and Consulting Resources, which works with companies from local start-ups to Fortune 100 businesses. It has provided me with invaluable experience on dealing with clients and performing more business-oriented work, such as market research and financial analysis.

Don To—
The University of Illinois has a great reputation as one of the best engineering schools in the nation. I chose Materials Science and Engineering primarily because I wanted to choose a field that would combine chemistry and physics along with some biomedical applications. I am doing a co-op for Kimberly Clark this semester. I am the sophomore representative to the Undergraduate Materials Organization (UMO) and a member of Keramos. I have received a couple of scholarships from the MatSE department that have helped tremendously. The less money that I have to take up in loans, the less I have to worry about paying back once I graduate from college.

I could see myself going into industry for a few years after I finish college and then possibly going back to school to get my MBA to get a job that would be more managerial than engineering.

Tracey Brommer—
I chose materials science and engineering at the University of Illinois because when I visited I was very impressed by the research activity and the graciousness of the faculty. I chose materials science and engineering in particular because I was interested in nanotechnology and chemistry. The University has opportunities that I could not find anywhere else. I have interned two summers at BAE Systems, and I did an REU with Professor Shim. I learned a lot about research and have been prompted to pursue graduate school as a result of these experiences I am grateful to the Materials Science and Engineering Department's generosity in providing scholarships. They have helped significantly with financing my education.

The Racheff/Intel Award winners proudly display their plaques. From left to right: Abhijit Mishra, Xuan Zheng, Nikhil Ganesh and Shan Jiang.

Graduate students recognized for research

Four graduate students received laptop computers and up to $1,000 financial support to attend a conference at which their research will be presented, as recipients of the MatSE Department's Racheff/Intel Awards.

2008 Award Winners and their Research:

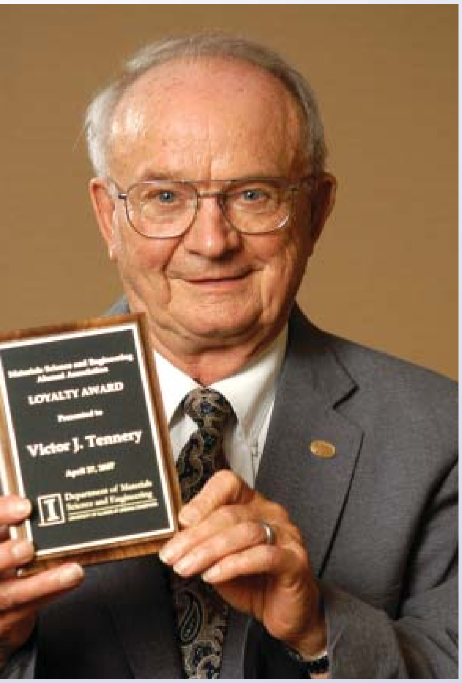
Nikhil Ganesh (Brian Cunningham and John Rogers, advisors): Resonant Enhancement of Quantum Dot Fluorescence Using Photon Crystals

Shan Jiang (Steve Granick, advisor): Janus Colloidal Particles–From Synthesis to Self-Assembly

Abhijit Mishra (Gerard Wong, advisor): HIV TAT Forms Pores in Membranes by Inducing Saddle-Splay Curvature: General Mechanism for Cell-Penetrating Peptides

Xuan Zheng (David Cahill, advisor): Micron-Scale Measurements of the Coefficient of Thermal Expansion by Time-Domain Probe Beam Deflection

Alumni Awards



Victor Tennery

Loyalty Award:

Victor Tennery (BS Cer '54, MS Cer '55, PhD Cer '59) worked at Oak Ridge National Laboratory, TN, from 1969-1994. During his 25 years there, he held various positions including Research Ceramist, Group Leader and Section Head in the Metals and Ceramics Division. He retired in 1994 after serving for 12 years as the Director of the High Temperature Materials Laboratory, a national materials user facility. Prior to joining ORNL, he was on the faculty of Ceramic Engineering at the University of Illinois for nine years and organized and taught courses and conducted research in ferroelectric and piezoelectric ceramics and X-ray diffraction. He has served as an ABET visitor for the National Institute of Ceramic Engineers since 1985. He is an emeritus member of the American Ceramic Society and a member of both the Basic Science and Engineering Ceramics Divisions. He served as Vice President of the Society from 1989-1990. He is an active member of the American Society for Testing and Materials (ASTM), a Charter Member of Committee C-28 and active on many subcommittees. Tennery is the author or co-author of more than 135 papers and technical reports and one book. He is a Fellow of the National Institute of Ceramic Engineers (NICE) and ACerS and his honors include the Arthur Frederick Greaves-Walker Award from NICE and Appreciation Award from ASTM.

Homayoun Talieh

Distinguished Alumnus Award:

Homayoun Talieh (MS Met '89) is a founder of SoloPower, a technology leader in the field of thin film photovoltaics (PV) for low-cost module manufacturing and delivery of solar electricity for a variety of uses including grid-connected commercial, residential and distributed power applications. Prior to SoloPower, Homayoun was a founder, president and CEO of NuTool, a semiconductor electroplating and polishing equipment company. NuTool was acquired by ASM International in 2004, and Talieh served as general manager of the new company. His other business affiliations include: general manager of Applied Materials' Track division, where he designed new products, and vice president and general manager of the CMP division at OnTrak Systems, developing innovative semiconductor equipment that enabled the company to tap a new multi-billion dollar market. Talieh began his career in the 1980s at Monosolar Inc., which pioneered a revolutionary new electroplating technique for the deposition of CdTe solar cells on glass. This emerging company was acquired by British Petroleum (BP), which used the acquisition to create BP Solar, enabling it to enter the solar energy market. Talieh holds more than 63 patents in the areas of Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD), Chemical Mechanical Planarization (CMP) and photolithography.

Young Alumnus Award:

David Teter (BS Met '90, PhD Met '96) has been employed with Los Alamos National Lab since his graduation from the University of Illinois. He served as Technical Staff Member in the Metallurgy Technology group (MST-6) from 1997-2002, then Weapons Project Leader for Metals Issues from 2002-2006. He is the Project Leader for the Enhanced Surveillance CSA/Case effort. The main focus of this program is to understand and quantitatively predict lifetimes of materials, components and assemblies. Teter has been part of teams that have received Awards of Excellence for the Nuclear Weapons Program and Stockpile Stewardship Program in 1999, 2000, 2001 and 2004. Since 2005, he has been the Deputy Group Leader of MST-6 where he leads a diverse technical organization which uses materials technology to support national security. Teter is a member of TMS and ASM. He serves on the Technical Book Committee of ASM and on the ASM/TMS Nuclear Materials Committee.

Class Notes

Frederick (Pete) Petersen (BS Cer '37) and his daughter, Karen, enjoyed a visit by MatSE Department Head Ian Robertson on November 27, 2007, at Pete's home in Lexington, Massachusetts. They viewed the slideshow that was created for the department's 20th anniversary celebration last fall.

Haraldur Asgeirsson (BS Cer '44, MS Cer '45) visited campus on October 8, 2007, with his son and daughter. A prominent engineer and scientist in his home country of Iceland, he was the head of The Icelandic Building Research Institute and has, among other things, studied alkali reactions in concrete. This photo was taken in the Ceramics Building.

Alvin Shulman (BS Met '52) visited campus on January 9, 2008, for the first time in 20 years. He said that as a patent lawyer representing Inland Steel for more than 30 years, he was able to use his metallurgy background quite a bit. He and his wife reside in Highland Park, Illinois.

Bob Luetje (BS Met '59) visited campus with his wife, Karen, on July 14, 2007. This was their first time back on campus in more than 30 years. They reside in Northville, Michigan.

Mark Morse (BS Cer '77) is President of Selee Corporation in Hendersonville, North Carolina. Selee is a recognized high-quality producer of ceramic foam filters in the Americas iron and steel foundry market. Morse served as the 2007 Campaign Chair for the United Way of Henderson County.

Steven Gorbatkin (BS Met '81, PhD Met '87) is a physician with Nephrology Medical Associates of Georgia, LLC. Prior to his medical training, he spent nine years as a scientist at Oak Ridge National Laboratory. He earned his medical degree from Emory University.

Marty Paisner (MS Met E '81) recently joined Polyvel Inc. in Hammonton, New Jersey, as director of technical service and product development.

David Lahrman (MS Met '86) visited campus with his daughter, Elisabeth, in October. He is director of business development for LSP Technologies, Inc., in Dublin, Ohio.

Michael Conlon (BS Met '90) recruited on campus last fall. He is an engineer at I/N Tek and I/N Kote in New Carlisle, Indiana. He is working in hot dip galvanizing. I/N is a joint venture of Arcelor Mittal and Nippon Steel Corporation. Michael and his wife Beth have two boys, Drew, 8 and Lucas, 6.

Eric Ng (BS Cer '93) lives in the Chicagoland area with his wife, Regina, and four children, Ethan, 8; Riley, 6; Emma, 4; and Roman, 2. He received his MBA from DePaul University in March 2007. In August 2007 he left his quality manager position at Avon Products, Inc. and joined the U.S. Department of Treasury as an engineer field specialist.

Ian Robertson visits Petersens

Haraldsur Asgeirsson

Bob and Karen Luetje

Class Notes

Joseph Curcio (BS Met '95) married Leigh Hetherington on August 4, 2007. Curcio earned a master's degree in traditional oriental medicine and has his own practice where he works as a licensed acupuncturist. The couple lives in Culver City, California.

Ben Lagow (PhD MatSE '99) and his wife, Cindy, welcomed the birth of their daughter, Anneke Romey Lagow, on January 2, 2008, in Indianapolis, Indiana.

Craig Gowin (BS MatSE '00) recruited on campus last fall for QTG–Quaker, Tropicana, Gatorade. He is near east cell leader for the company in Bridgeview, Illinois.

Katy MacGregor (BS MatSE '02) celebrated the birth of her son, Jack, on December 10, 2007, in Peoria, Illinois.

Pamela Roley (BS MatSE '05) married Adam Rosenberger on June 23, 2007, in Urbana. She is a process engineer at Alcoa in Evansville, Indiana.

Bong-Sub Lee (PhD MatSE '06) received an award from the conference "European Phase Change and Ovonics Symposium (E*PCOS)" held at Zermatt, Switzerland in September 2007. He received the E*PCOS 07 Presentation Award, also called the Impressive Award. He is a postdoc at the University of Illinois.

Blythe Gore (PhD MatSE '06) has been named a Humboldt Fellow. She is a postdoc at the Max Plank Institute in Stugart, Germany.

MatSE Alumni Board Welcomes New Member

Peter Tortorelli (PhD Met '78) is the newest member of the Materials Science and Engineering Alumni Board. Tortorelli is employed at Oak Ridge National Lab (ORNL) as the Distinguished Staff Member and Acting Director of the Basic Energy Sciences–Materials Science and Engineering Program. He has extensive research experience in areas related to corrosion and degradation of properties of materials in high-temperature, aggressive environments, including gases, molten salts and liquid metals and in materials development of high-temperature alloys, ceramics and ceramic composites for applications in fossil energy systems, gas turbines, fusion reactors and energy-intensive industries. Since October 2006, he has been managing the Basic Energy Sciences–Materials Science and Engineering research portfolio at Oak Ridge National Laboratory, involving projects in Condensed Matter Physics, Materials Physics and Materials Chemistry. He served as the Group Leader for the Corrosion Science and Technology Group at ORNL from June 1999-March 2007.

Hands-on Engineering

Engineering Open House is a two-day event held at the University of Illinois at Urbana-Champaign to showcase the latest in science and technology from the university's professors, students, and sponsoring corporations. This year's open house took place March 7 and 8. The open house annually attracts more than 20,000 visitors to learn, experiment, and play with science. Many schools use the Engineering Open House as a field trip to show their students how science is important in everything around them. All MatSE freshmen participate in open house projects as part of their introductory materials science and engineering course, MSE 182. The freshmen worked in teams on the projects, learning more about MatSE and making new friends in the process.

Brianna Benson (right with black jacket) and Alyssa Harder use science and technology to demonstrate how to make ice cream while students watch at the Materials Science of Candy and Food station.

Blake Stevens (left) and Ethan Kessler, show visitors how to make goop at the Non-Newtonian Fluids and Ferrofluids station.

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 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:

brilliant futures

THE CAMPAIGN FOR THE UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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 **www.brilliantfutures.uiuc.edu**

Department of Materials Science & Engineering Fund

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

❐ I have enclosed my check in the above amount made payable to: UIF/MatSE Dept. Please direct my gift to:

❐ MatSE general fund [3-32845]
❐ Bob Bohl Scholarship Fund [3-71507]
❐ Ceramic Engineering [3-75740]
❐ Earl Eckel Scholarship Fund [3-72479]
❐ Clifton Bergeron Scholarship Fund [3-72728]
❐ Howard Birnbaum Lecture Series Fund [7-70282]
❐ SILC project/Kiln House (MatSE labs) [3-32331]
❐ Charlie Wert Scholarship Fund [3-73848]
❐ Metallurgy & Mining Engineering [3-77904]
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In Memoriam

Frederick Matson (BS Cer '33) died March 27, 2007, in Baltimore, Maryland. He earned his master's and doctorate degrees in anthropology and ceramic archaeology at the University of Michigan. He worked three years as curator of ceramics at the University of Michigan Museum of Anthropology before moving to Washington to serve as a ceramic engineer for the National Bureau of Standards (1942-44). He married Margaret Hart Benson in 1944 and for the next four years he was head of the glass section at the Research Laboratories of the Armstrong Cork Company in Lancaster, Pennsylvania. In 1948 he took a position as professor of ceramics at Penn State University. He moved to a position as professor of archaeology in 1953. In 1968 he helped form the Department of Anthropology. The Matson Museum of Anthropology was founded in the same year. He published 89 articles and monographs and was a Fellow of the Society of Antiquaries in London, the American Association for the Advancement of Science and the American Ceramic Society. He served as president of the Archaeological Institute of America from 1975-76. He retired and became professor emeritus of archaeology in 1978. In 1995 he was presented with the Award for Excellence in Ceramic Studies by the Society for American Archaeology.

Burnett "Bud" Bruce (BS Cer '41) died July 30, 2007. After graduating from the University of Illinois, he served in the Navy during WWII in the Pacific Theater. He worked for Chicago Vitreous Corporation in Cicero, and lived most of his adult life in Wheaton, Illinois. His first marriage was to Ann Denaco, which brought a son, Ian. He later married Ruth Liska, adding four stepdaughters to the family. After his retirement, the couple moved to Winfield, Illinois. Ruth died in 1989 and several years later he married Helen Creamer. In October 2005, a few years after Helen died, he moved to Sister Bay, Wisconsin, where he resided at Scandia Village. He is survived by his brother, stepdaughters, daughter-in-law, eight grandchildren and two great-grandchildren.

Jack Martin Lepp (BS Cer '41) died July 18, 2007, in West Chester, Pennsylvania. He was employed as a ceramic engineer for 35 years. He was a member of SCORE and Phi Gamma Delta fraternity, obtaining the office of Purple Legionnaire. He was a member of First United Methodist Church in Cookeville. His wife Martha passed away in 1996. He is survived by two children, a daughter, Jane and son, Andrew and four grandchildren.

Olaf Paasche (BS Met '43) died January 3, 2008, in Corvallis, Oregon. After graduation from the University of Illinois, he served in the Army in Europe. In 1946, he joined Oregon State University as an assistant professor; he was made full professor in 1957. During this time he also was associated with the Bureau of Mines in Albany on a part-time basis. He retired from OSU in 1976. He made many contributions to the science of metals and was active in such professional societies as the American Institute of Mining, Metallurgical and Petroleum Engineers and ASM International. For these services, he was made an ASM Fellow and was given the Distinguished Merit Award by the University of Illinois. In 1948 he married Bette Johnson; she died in 1980. He married Catherine Beavin in 1982; she died in 1995. He married Clara McCormick in 1999; she survives him. He was a volunteer for the Meals on Wheels program and was an active member of the Kiwanis club and the Sons of Norway lodge. Survivors also include two sons; a daughter; six grandchildren and four great-grandchildren. Memorials may be made to the Olaf G. Paasche Fund at the Oregon State University Foundation.

Joseph Gaines (BS Met '44, MS Met '49) died October 30, 2007, in Des Plaines, Illinois. In 1944 he was recruited to work with other engineers in Decatur. There he had a role in one of the biggest developments of the 20th century—working on the testing and development of parts for the Manhattan Project, which resulted in the first atomic bomb. After the war, he worked for Signode International before joining the Frederick Post Co. as a vice president of manufacturing and engineering. He also worked for Knoll International in Allentown, Pennsylvania, before returning to the Chicago area to work for Vance Industries as its vice president of manufacturing and engineering, a position he held for 20 years. Having grown up in Chicago near the lakefront, he developed a love of sailing at an early age and mastered the art of navigation. He is survived by his wife, Bette; a daughter; a son and two grandchildren.

Arthur Prater (BS Cer '46) died October 4, 2007, in Merriam, Kansas. He served in the U.S. Foreign Service in Northern Africa and the U.S. Army Air Corps from 1943-45. He was a production manager for Owens Corning Fiberglass from 1946-51. He was assistant plant manager for Gustin-Bacon Manufacturing Company from 1951-54. He entered the University of Missouri-Kansas City Dental School and graduated in 1958. He practiced dentistry for 30 years in Johnson County, Kansas. He was an avid golfer and enjoyed jazz, playing bridge and reading. He married Rosemary McDonald in 1952. Survivors include his wife and son, Frederic.

Edwin Jacobson (BS Cer '52) died September 12, 2007, at his ranch in Goliad, Texas. In his accomplished career he served as the president and chief executive officer of Milwaukee Land Company, Heartland Partners, L.P. and CMC Heartland Partners, L.P., and in those capacities was responsible for managing and selling a large array of properties across the United States, previously owned by the Milwaukee Railroad. He also led Heartland Technology, Inc., an investor in technology, as its president and CEO. In addition, he served as president, CEO and chairman of the Executive Committee of the Board of Avatar Holdings, Inc., a real estate development company located in Florida, and as president of UV Industries, Inc., a conglomerate with interests in copper and gold mining, steel manufacturing and electric products. He is survived by his wife, Sara, three daughters and five grandchildren.

Richard Spriggs (MS Cer '56, PhD Cer '58) died July 21, 2007. He joined the Alfred University faculty in 1987, charged with establishing the New York State Center for Advanced Ceramic Technology (CACT). He served as executive director of the CACT for 10 years until his retirement in 1997. He also was director of the Office of Sponsored Research for the New York State College of Ceramics. He was a Fellow, Distinguished Life Member and past president of the American Ceramic Society. Prior to coming to joining Alfred University, he was senior staff officer and staff director of the National Research Council at the National Academy of Sciences. He also had been a professor and then vice president for administration at Lehigh University. He had earlier industrial experience with AVCO and Ferro Corporations and had served as a lieutenant in the U.S. Navy.

J. Arthur Ytterhus (PhD Met '64) died August 9, 2007. He worked as a principal engineer for Textron Defense Systems in Wilmington, Massachusetts. He is survived by his wife, Vivian and daughter, Kari.

Albert Heinrich Bremser (MS Cer '64, PhD Cer '67) died June 21, 2007, in Lynchburg, Virginia. He was employed for 30 years at Babcock & Wilcox in the research division. He is survived by his wife, Shirley, of 45 years and his two sons.

Paul Andrew Knoke (BS Met '86) died November 19, 2007, in West Bend, Wisconsin. He married Merry Hedstrom of Green Bay, Wisconsin, in 1988. She survives with their son Patrick, age 10. Memorials may be made to the Patrick Knoke Education Fund.

Julia L. Bjerke (BS Met '89) died November 30, 2007. Julia married Ron A. Bjerke on October 20, 1990. Ron survives, along with their three sons, Nathan, Nicholas and Jack. In 1986, Julia began working at Caterpillar Inc, where she spent most of her career as a Metallurgical Engineer in the Advance Materials Technology division at the Mossville Technical Center. She received a master's degree in engineering from Bradley University in 1999. She was a member of the American Society of Metallurgists. She was very active in following all her kids sporting events, where she met some of her dearest friends and their great kids. She was a member of Prospect United Methodist Church, where she was a former member of the Board of Trustees, taught Sunday school for several years and, recently, accepted an appointment to the Pastor Parish Committee. Memorial contributions may be made to the Julia Bjerke Memorial Scholarship in the ASM Peoria Chapter.

Dr. Ae-Gyeong Cheong, a former postdoc in Erik Luijten's group, passed away on January 30, 2008, in a car accident near Paw Paw, Michigan. She received her B.S. and M.S. from Sogang University, Korea, received her Ph. D. from McGill University, Canada and conducted postdoctoral research at Clemson University and the University of Illinois. She was a caring friend, lover of classical music and faithful daughter of God. A blog http://aegyeong.blogspot.com is open in loving memory of her.

John Wert Remembered Through Awards Fund Memorial

On July 23, 2007, John Wert died while hiking in Norway. Wert received his B.Sc. degree in Physics from Cornell University and his Ph.D. in Physics from UC-Berkeley. Following work at Rockwell International (1979-1985), John joined the faculty of the Department of Materials Science and Engineering at the University of Virginia (1985-1999), and then joined the National Laboratory in Denmark (1999).

John's research emphasized experimental investigation and modeling of thermomechanical processing treatments for aluminum alloys, superplasticity of aerospace alloys, intermetallic alloys for elevated temperature applications and deformation and fracture behavior of crystalline and amorphous metals. His research in these areas focused on revealing the fundamental concepts of phase transformations and deformation in alloys that are of technological importance. John was recognized by his students as an exceptional mentor and teacher, instilling in them the drive and passion for materials science and engineering. Beyond placing the interest of the student ahead of his own, he was quick to seek understanding and learn from the student's experience and abilities. In so doing, John served well the materials science community with continuously evolving capability and curiosity. He will be missed dearly by those that had the pleasure of knowing him and by the community in general for his contributions and teachings.

Memorials may be made to the Lucille and Charles Wert Undergraduate Awards Fund in Materials Science and Engineering at the University of Illinois, 1304 W. Green St., Urbana, IL 61801, or to the John Wert Fund of Friends of Chaco, Box 220, Nageezi, NM 87037.

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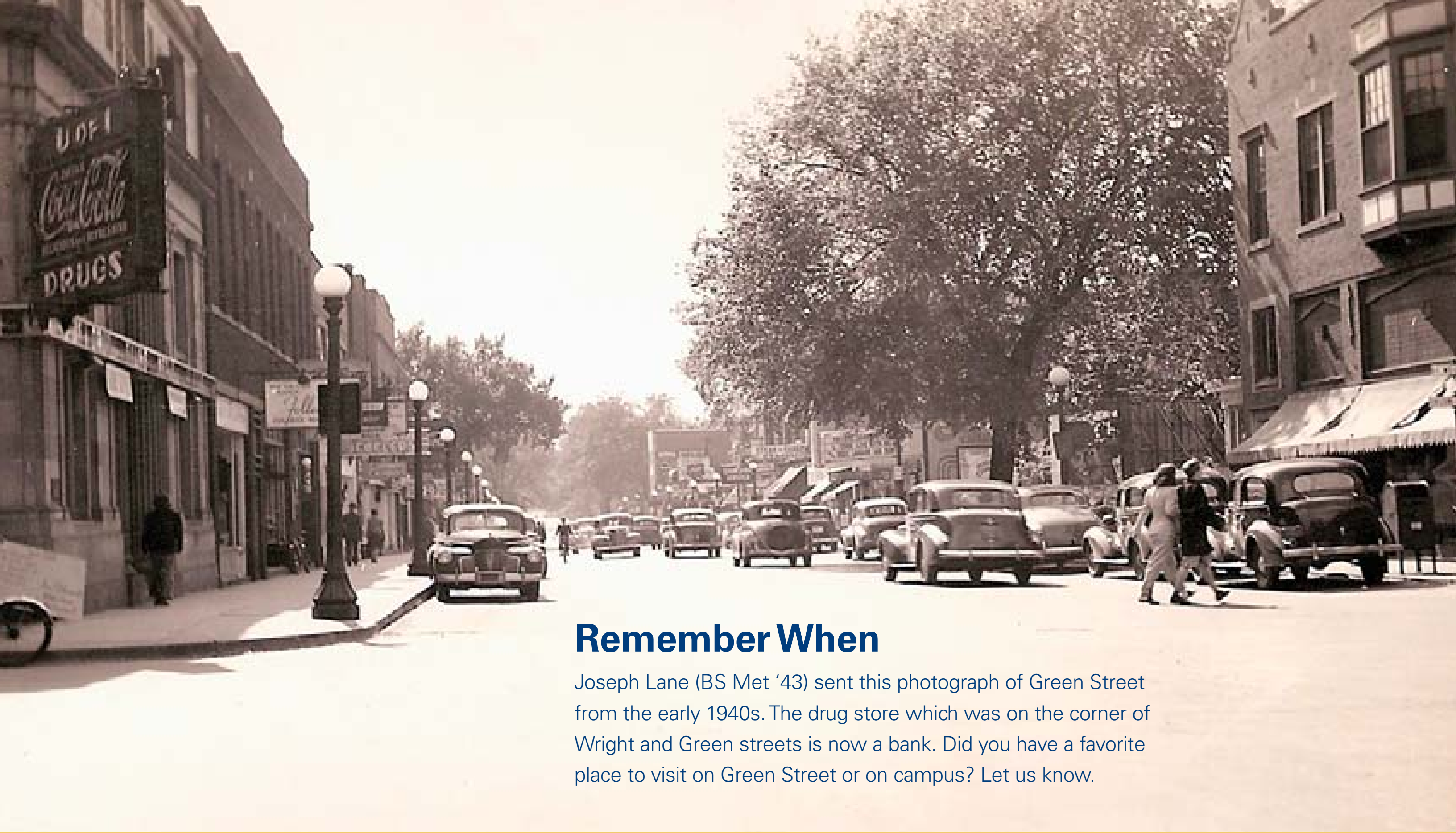

Remember When

Joseph Lane (BS Met '43) sent this photograph of Green Street from the early 1940s. The drug store which was on the corner of Wright and Green streets is now a bank. Did you have a favorite place to visit on Green Street or on campus? Let us know.

We want to hear from you!

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