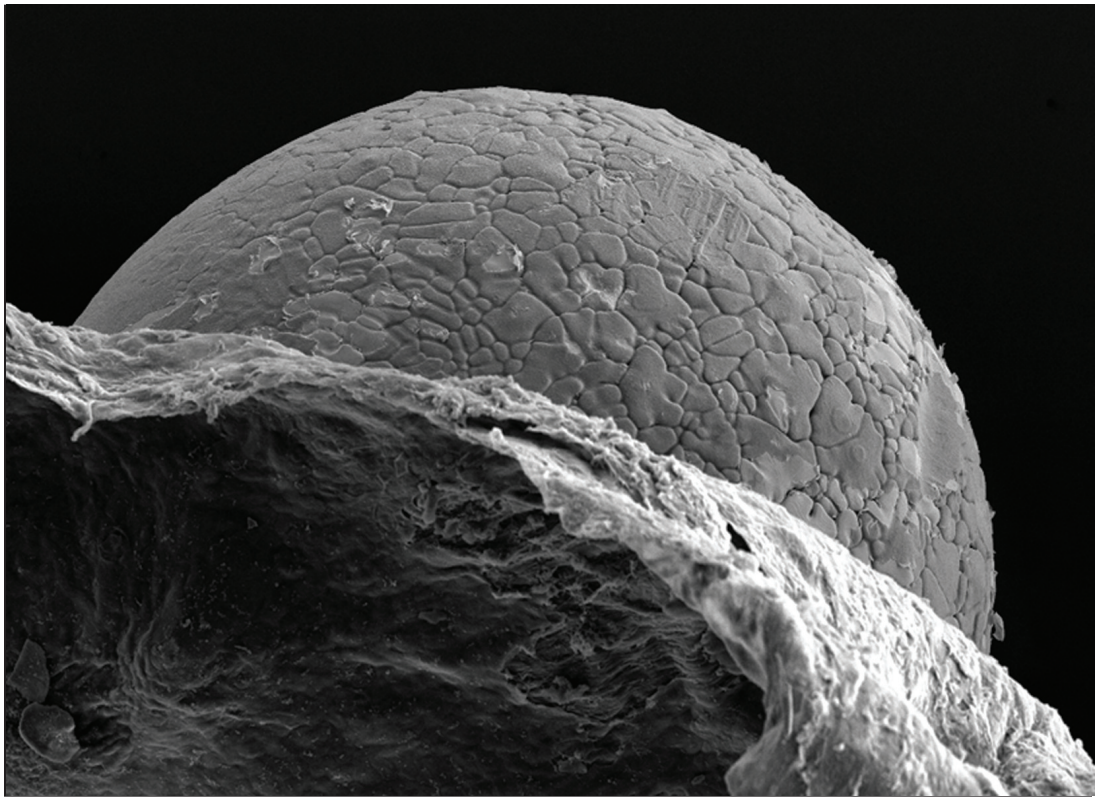
MichiganEngineering
Materials Science and Engineering
University of Michigan
College of Engineering

MSE News

WINTER 2009

The Newsletter of the Department of Materials Science and Engineering

Imaging Microstructure Contest Winners



A platinum-iridium cochlear ball electrode was coated with PEDOT-PSS and alginate hydrogel. It was preserved with paraformaldehyde, dried overnight, sputtered with gold, and imaged in the FEI NOVA SEM at 10 kV. The image levels were adjusted with Adobe Photoshop CS3. Image by Jeff Hendricks, Grand Prize Winner, Artistic Merit.

The department is pleased to announce the winners of the 2008 Imaging Microstructure Contest. The Grand Prize winners are Wen Tu (Scientific Merit) and Jeff Hendricks (Artistic Merit) Thirty-three individuals entered up to a maximum of three images for consideration. The panel of judges: Justin Scanlon, MSE; John Mansfield, MSE and Richard Hackel, Director of Ophthalmic Photography, UMHHC Ophthalmology, are sincerely thanked for their efforts. All winning entries and an exhibit of the images can be viewed on the department website at http://www.mse.engin.umich.edu/about/news/2008-imaging-microstructure-contest-winners. The complete list of winners is on page 4.

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INSIDE

Letter to the Alumni

Much has happened since my last letter from nearly a year ago. I am pleased to begin by mentioning that the Materials Science and Engineering undergraduate program was recently ranked 2nd in the nation by *US News and World Report*. The enrollments in our graduate and undergraduate programs remain strong. Moreover, our external research support continues to grow; industrial contracts and grants for energy research account for the growth. This year the Department of Defense awarded the University a multi-million dollar multi disciplinary university research initiative (MURI) program for Thermal Transport in Materials; several MSE faculty play a central role in this program. In this letter I will summarize significant accomplishments of junior faculty, share some changes in the current MSE faculty composition and describe our immediate and future faculty hiring plans.

It is noteworthy that all assistant professors were recognized as outstanding young researchers, showing exceptional promise as scholars and researchers. Max Shtein was awarded the 2007 Presidential Early Career Awards for Scientists and Engineers (PECASE) in a ceremony in the White House on December 19, 2008. This is "the Nation's highest honor for professionals at the outset of their independent scientific research careers." He will receive five years of support for his research. Katsuyo Thornton was awarded the National Science Foundation (NSF) Early Faculty Career Development (CAREER) Award for her proposal entitled "Integrated Research and Education Program in Three-Dimensional Materials Science and Visualization." Anton Van der Ven won an NSF CAREER award for "First-Principles Thermodynamics and Kinetics of Multi-Component Solids." Earlier last year, Jinsang Kim won an NSF CAREER award for "Self-signaling and Signal Amplifying Conjugated Polymer Biosensors and Sensor Arrays (PI)." They will each receive four years of support for their research program from the NSF CAREER program. It is unusual for all assistant professors in a single department to have received such significant recognition.

This year we are proud to announce that Brian Love joined our faculty; he has additional appointments in the Department of Biomedical Engineering and the Department of Dentistry. He was formally Professor of Materials Science and Engineering at Virginia Tech., where he earned outstanding recognition for teaching. Brian's spouse, Nancy, joined the College of Engineering as Chair of the Civil Engineering Department. Brian will be an important addition to our research efforts in the area of soft materials, and to our undergraduate program. In fact he is the new chair of our undergraduate committee.

The department has formed a search committee and is conducting a search for three, possibly four, new faculty this year. In light of the current financial situation, this may appear to be surprising, but a series of unexpected events have proven to be favorable for our department. Two of these hires are the result of University-wide, or joint-college, initiatives established some time ago. In collaboration with the Department of Chemistry, we are currently trying to recruit a senior faculty member in the area of energy. The second hire is from a University wide interdisciplinary initiative, established by President Coleman, to hire a cluster of assistant professors in areas of national need. The third person is part of the regular hiring process conducted by the College of Engineering. We hope to hire a fourth, but with the current financial situation, we may have to wait until next year.

The most significant event in the department this year is the passing of our friend, teacher and colleague Frank Filisko, after a battle with leukemia. Frank came to the U–M after completing his doctorate. He was largely responsible for introducing polymers to our department. One of his most important technical achievements was his discovery of a new class of electrorheological fluid materials, for which he was awarded patents. A scholarship has been established in Frank's name. Dick Robertson has written an obituary, which is included in this newsletter.

The newsletter describes a range of exciting things that happened this year in Materials Science and Engineering. I hope that you find it informative.

Researchers Identify a New Mechanism for Grain Boundary Diffusion

Metal alloys can fail unexpectedly in a wide range of applications–from jet engines to satellites to cell phones–and new research from the University of Michigan helps to explain why.

Metal alloys are solids made from at least two different metallic elements. The elements are often mixed together as liquid, and when they "freeze," into solids, tiny grains of crystal form to create a polycrystalline material. A polycrystalline material is made of multiple crystals.

Within each of the grains of crystal, atoms are arranged in a periodic pattern. This pattern isn't perfect, though. For example, some of the places atoms should be are empty. These empty spaces are called vacancies. Atoms of each element in the alloy take advantage of these holes in the lattice. In a process called diffusion, atoms hop through the material, changing its structure.

"It's kind of like musical chairs," said Katsuyo Thornton, assistant professor in the U-M Department of Materials Science and Engineering. "Diffusion happens in nearly every material, and materials can degrade because diffusion causes certain changes in the structure of the material."

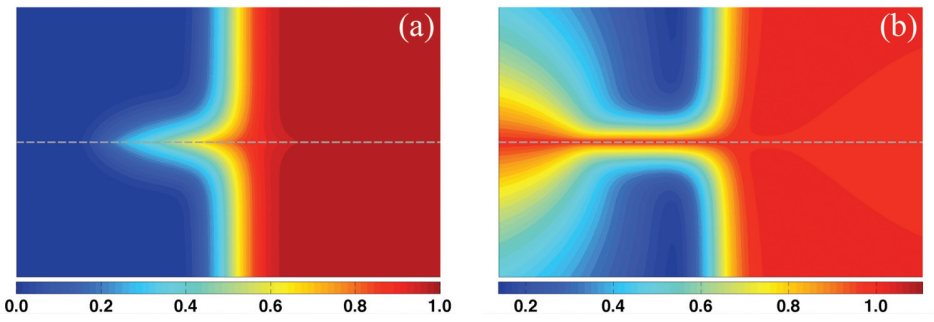
Atoms of different elements tend to hop at different rates because they are bound to their surrounding atoms with varying strength. Thornton and her colleagues have demonstrated that when there's a greater discrepancy in the hop rates in the different elements in the alloy, there's a more pronounced diffusion along grain boundaries. This possibly leads to a faster degradation. Thornton's collaborators on this project are Materials Science and Engineering doctoral student Hui-Chia Yu, and Anton Van der Ven, an assistant professor in the same department.

"In some cases, the grain-boundary diffusion is 100 times higher than what was commonly expected," Thornton said.

"This is a very generic finding," she said. "That's why it's important. It applies to a wide variety of materials. It applies to polycrystalline materials including electronic materials like solder."

Conventional solder, made of tin and lead, is a common alloy that connects electronic components in computer circuit boards and gadgets. Because lead is toxic, engineers are working to design new kinds of solder without lead. But they haven't found a substitute that works as well. The team's findings may help explain why "tin whiskers" form in some of these new solders. Tin whiskers have caused damage to satellites, for example. "We are trying to apply this theory to whisker growth in solder," Thornton said.

This finding suggests that materials scientists could make longer-lasting alloys if they use metals with similar atomic hop rates, or manipulate the intrinsic hop rates by other mechanisms.



CAPTION HERE?

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Heat Transfer Between Materials Focus of New AFOSR-MURI Grant

By Nicole Casal Moore

MSE Faculty are members of a multi-university team that will receive nearly $7 million over the next five years to support interdisciplinary research on heat transfer at interfaces. This group of materials scientists, mechanical engineers, electrical engineers, and physicists from three universities will explore the processes by which heat is transferred at interfaces between different materials.

Managing heat is a major challenge for engineers who work on devices from jet engines to personal electronics to nanoscale transistors. The ability to either efficiently transfer or block heat flow from one material to another is critically important to performance and reliability.

For example, efficient heat flow is a main roadblock in the development of lasers and transistors that can attain higher powers. On the other hand, blocking heat exchange can dramatically improve the efficiency of thermoelectric energy conversion for compact power sources.

The team will use ultrafast lasers in a special x-ray technique that allows researchers to actually watch the vibrations of atoms that carry heat energy across an interfaces. Using advanced molecular dynamics simulations to interpret these results and guide nanofabrication efforts, the team will reengineer the surfaces of materials to regulate the flow of heat.

The program began in May 2009. The Michigan MSE participants include Professors Rachel Goldman, John Kieffer, and Max Shtein.

Microstructure

CONTINUED FROM PAGE 1

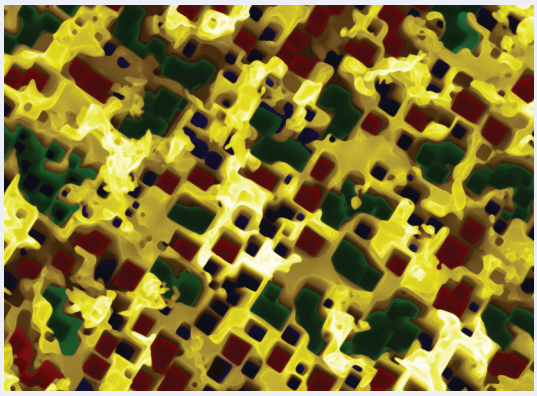


Image by Gerri Bernard

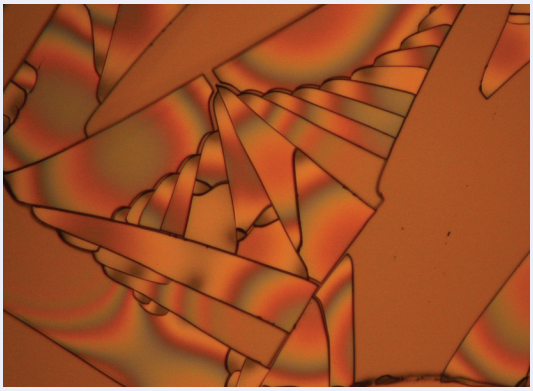


Image by Alex Perez-Bergquist

Category Winners

Optical and Scanning Electron Microscopy

1. Gerri Bernard
2. Charles Shaw
3. Steve Coryell

TEM, X-ray Imaging and Surface Probe Techniques

1. Kangwon Lee
2. Jessican Terbush
3. Lee Sears

Simulated Microstructures as Products of Computational Materials Science

1. Chloe Funkhouser

Digitally Enhanced or Colorized Images of Microstructures

1. Alex Perez-Bergquist
2. Kevin Grossklaus
3. Jessica Bickel

Fluorescent Organic Nanoparticles Help Illuminate Cellular Proteins

By Nicole Casal Moore

Like a smart highlighter, immunofluorescent labeling can zero in on a specific protein, helping scientists understand the structure of a cell and how diseases affect that structure. Current techniques have disadvantages, though.

University of Michigan scientists developed a non-toxic, organic nanoparticle for immunofluorescent labeling that makes a bright, longer-lasting glow without the drawbacks of today's popular methods. A paper on the research will be published in the March 18 edition of the journal *Advanced Materials*.

"We've demonstrated the promising application of organic nanoparticles for immunofluorescent labeling," said Jinsang Kim, assistant professor of materials science and engineering who is the principal investigator of this research.

"Our molecules show unique properties. When they clump together, they get brighter, which is the opposite of what normally happens. Normally, when fluorescent molecules clump together, they become much dimmer, which is called self-quenching. Self-quenching is not a problem for our molecules."

Immunofluorescent labeling works like this: Scientists join fluorescent particles with protein-seeking molecules and let the companions loose in cells to bind to the protein they want to locate and study. The scientists then radiate the mixture with ultraviolet light. The light causes the fluorescent particles to glow, giving away the location of the protein the scientists were looking for.

Certain diseases can change the amount of particular proteins in cells. Prostate tumors, for example, can increase the level of prostate-specific antigen, or PSA, which is a cellular protein.

For fluorescent particles, scientists can currently choose between organic fluorescent dyes and inorganic quantum dots, both of which have shortcomings. Organic fluorescent dyes wear out easily from the ultraviolet light and inorganic quantum dots are toxic.

Kim's nanoparticles bridge the gap between these methods. They're non-toxic, and the researchers' novel way of making the nanoparticles causes them to shine brightly without deteriorating as easily as organic dyes.

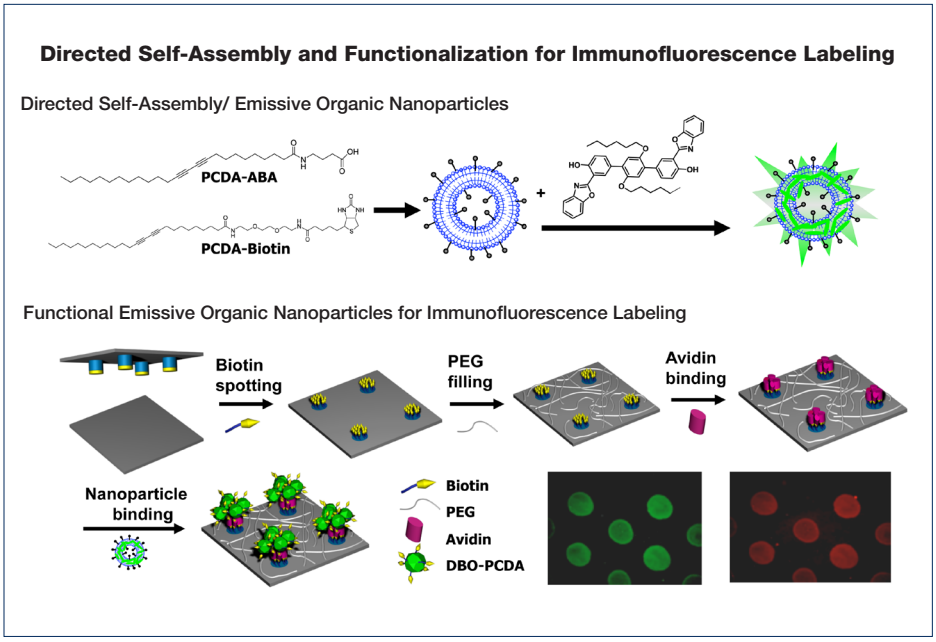
Kim and his colleagues started by directing the self-assembly of a new kind of green fluorescent organic molecule called DBO. They mixed the fluorescent organic molecules in water together with a molecule called diacetylene that formed multi-layered bubbles around the fluorescent molecules and formed polymers. The fluorescent molecules glowed more than 12 times brighter in the multi-layered bubbles than they did in plain solution because of a unique arrangement of the molecules inside the bubbles.

The researchers tested their new nanoparticles by attaching them to biotin, a molecule that binds readily with the protein avidin. The researchers released the nanoparticles with biotin on a glass slide containing spots of avidin. The biotin found the avidin and Kim's nanoparticles glowed.

"More interestingly," Kim said, "the pressure-sensitive polydiacetylene bilayer surrounding the fluorescent nanoparticles also produced its own red fluorescence induced by the pressure the nanoparticles experienced when they attached to the target area. Green can't be seen through skin, but red can. This suggests additional applications for these nanoparticles."

The paper is called "Highly Emissive Self-assembled Organic Nanoparticles having Dual Color Capacity for Targeted Immunofluorescent Labeling."

Other authors of the paper include: Hyong-Jun Kim, research fellow in MSE; Jiseok Lee, graduate student in Macromolecular Science and Engineering.



Shtein Receives Presidential Honor

By Nicole Casal Moore

Max Shtein received the Presidential Early Career Award for Scientists and Engineers (PECASE). Dr. Shtein is one of 67 researchers from across the nation to receive the award from the U.S. Office of Science and Technology Policy. It is the highest honor the federal government gives to early-career scientists and engineers.

He is an assistant professor in the departments of Materials Science and Engineering; Macromolecular Science and Engineering; and Chemical Engineering. He is also an assistant professor in the School of Art and Design.

Shtein was one of 15 nominated by the Department of Defense. He is honored for developing novel ways to make the next-generation of energy-efficient lighting devices, displays and solar cells. His mentoring of underrepresented minority students at the high school, undergraduate and graduate levels is also noted in the award citation.

Shtein made key contributions in developing commercially-viable techniques for manufacturing organic light-emitting diodes, transistors and solar cells, which hold tremendous promise for efficient and cost-effective energy and lighting, among other applications. The techniques he helped to develop include organic vapor phase deposition and organic vapor jet printing.

Organic vapor phase deposition uses a stream of gas to deposit organic semiconductors onto other materials in an even and orderly manner, which results in a better-performing device. Organic vapor jet printing actually prints organic semiconductors onto other materials with little waste.

At Michigan, Shtein has focused on developing novel kinds of devices such as multifunctional textiles for energy harvesting, lighting and sensing, and on understanding the fundamental physical properties of organic semiconductor materials and organic-inorganic interfaces.

"I'm very surprised and very honored to receive this award," Shtein said. "It is a carrot and a stick at once. I feel positive pressure from the award to think better and work harder." Shtein also shares credit with the graduate students who have worked in his lab.

Caption Here????

The students in the MSE 365 got some firsthand metal casting experience when they spent two weeks at working at Joyworks LLC studio foundry last winter. Joyworks is a scientific and artistic foundry outside of Ann Arbor owned by John (Chip) Keough (BSE '77). Students designed lost foam patterns, learned risering and gating practices, and had the opportunity to hand pour their parts inaluminum. In addition to working with lost foam, students learned about numerous casting methods including investment casting and cope and drag molding. These hands-on experiences received widespread praise from students. John Keough and Stephen Gladieux (**ALUMNUS??**). were guest lectures for the class.

Thornton and Van der Ven Receive NSF CAREER Awards

Katsuyo Thornton, an assistant professor in the Department of Materials Science and Engineering has been awarded the Early Faculty Career Development (CAREER) Award from the National Science Foundation for her research in three-dimensional (3D) materials science. Three-dimensional materials science is an emerging field in which complex structures within materials are fully examined in 3D rather than using the traditional approach of examining two-dimensional sections or surfaces. The 3D aspects are especially important in the investigation of energy storage and conversion materials, in which processes at interfaces and junctions of different phases as well as the connectivity of bulk domains play a significant role in the overall properties and performance. This approach provides a rich foundation upon which simulations and experiments can be synergistically combined.

The CAREER Award is bestowed to "junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research." Her proposal was titled "Integrated Research and Education Program in Three-Dimensional Materials Science and Visualization." She has received a five-year grant totaling $400,000 to support her research. Using the grant, she plans to develop new models to study colloidal assembly of materials for electrochemical energy storage, to identify key links between microstructures and efficient electrochemistry and transport, and to formulate new analysis and visualization methods for complex three-dimensional data. The funding will also be used to expand her current collaboration with the Ann Arbor Hands-On Museum by developing an outreach program in which 3D visualization is utilized to engage youngsters in science education. For further details, please visit Professor Thornton's website at http://www.mse.engin.umich.edu/people/faculty/thornton.

Assistant professor Anton Van der Ven has been awarded the Early Faculty Career Development (CAREER) Award from the National Science Foundation for research leading to the development of first-principles methods to predict thermodynamic and kinetic properties of alloys, oxides and semi-conducting compounds at finite temperature.

First-principles electronic structure methods have reached a level of accuracy and ease of use to make them an invaluable tool in materials research. They now frequently complement experiment, serving to uncover the electronic origins of observed solid-state phenomena. Their ability to predict fundamental properties at the atomic level, without any experimental input, is enabling the virtual design of new materials with desired properties. In spite of this success, however, major challenges remain in linking electronic structure to macroscopic properties that arise from thermally activated collective behavior in technologically important materials.

The CAREER Award, a five-year grant totaling $400,000, will allow Van der Ven to develop theoretical and computational tools that connect electronic structure with materials properties at finite temperature, with a focus on phase stability, diffusion and phase transformation kinetics in *multi-component* crystalline solids. The starting point will be a rigorous application of statistical mechanical principles, both to characterize equilibrium as well as kinetic properties. In parallel, the grant will allow the development of automated and user-friendly software that implements these statistical mechanical tools for any crystalline, multi-component solid. The software will not only serve research but will also be implemented in classroom settings to illustrate the statistical mechanical principles underlying thermally activated processes in materials of technological significance. For further details, please visit Professor Van der Ven's website at http://www.mse.engin.umich.edu/people/faculty/vanderven.

Faculty News

AWARDS AND HONORS

Steve Forrest was elected a 2008 Fellow of the American Physical Society, through the Division of Materials Physics.

Sharon Glotzer received the 2008 Charles M. A. Stine Award from the American Institute of Chemical Engineers for her work in pioneering simulations of glass-forming liquids and self-assembled nanomaterials, and for her leadership and service to the materials community. She was also named one of six National 2009 Science Security and Engineering Fellows. Her research topic is "Reconfigurable Materials."

Rachel Goldman was elected Trustee of the American Vacuum Society.

Wayne Jones received the Alexander R. Scott Distinguished Service Award from TMS.

PROFESSIONAL SERVICE

John Halloran was appointed editor-in-chief for the *Journal of the American Ceramic Society.*

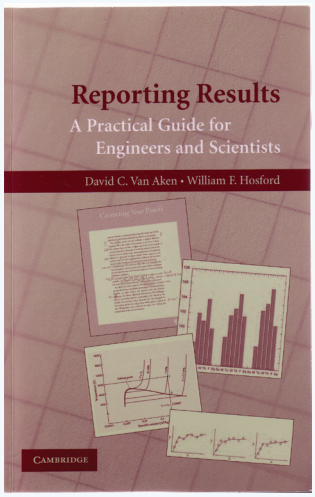
Rick Laine was reappointed for an additional 3-year term as the Macromolecular Science and Engineering Director.

In 2009, **John Mansfield** became microanalysis editor of the *Journal of Microscopy and Microanalysis*.

Faculty Publications

Jinsang Kim served as guest editor for the October 2008 issue of the *Materials Research Society Bulletin*, entitled "Negative Index Materials."

Katsuyo Thornton served as guest editor for the June 2008 issue of *Materials Research Society Bulletin* entitled, "Three Dimensional Materials Science."



William Hosford published "Reporting Results: A Practical Guide for Engineers and Scientists.

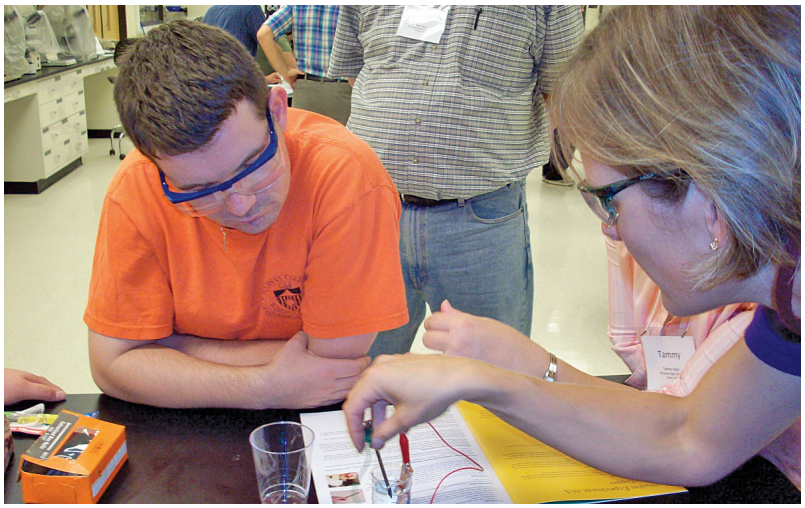
New Faculty–Brian Love

Professor Brian Love joined the U-M faculty with his primary appointment in MSE and with minority appointments in Biomedical Engineering and the Biologic and Materials Sciences Program in the School of Dentistry in January 2008. Prior to his arrival, he had been on the faculty at Virginia Polytechnic Institute and State University in Blacksburg since 1993. Professor Love's primary research interests are tied to measuring and modeling the kinetics and rheological advancement during polymerization, and tracking the stability of dispersions contained in reactive fluids. This type of research is important in a range of industrial polymerization operations as liquid monomers undergo solidification, as well as in tissue engineering where liquid constituents and cells, growth factors, and minerals are encapsulated in solidifying scaffolds. More commonly, paints and adhesives are also fluid dispersions that undergo solidification often with stratification and dynamic viscosity changes with drying. As the lab was being renovated this year, Love and his visiting French scholar, Fabien Teyssandier, focused on modeling other published research that has led to a number of new journal manuscripts in 2008 and several new world-wide collaborations.

Love hit the ground running by teaching the one hour biomedical satellite associated with MSE 250 last winter with Steve Yalisove and taught Polymeric Materials (MSE 412) in the Fall 2008 term, while learning more about the undergraduate program. He has taken over for Dr. Mirecki-Millunchick in overseeing the undergraduate program and will teach MSE 365 in the Van Vlack Lab in Winter 2009.

Love received his PhD in applied science in 1990 with a concentration in materials science from Southern Methodist University in Dallas TX, and was awarded an NIH post-doctoral fellowship which was completed at Georgia Tech prior to his move to Virginia in 1993. In addition to his normal teaching and research interests, he was awarded two visiting professorships at the Univeristé Claude Bernard in Lyon France in 1996 and 1999, was selected for the Dean's list for perceptions of teaching excellence four times and was nominated for the prestigious Wine Award for teaching excellence while at Virginia Tech.

2008 ASM Summer Teacher Camp



This was the seventh year MSE has hosted the ASM Summer Teacher Camp. This is an opportunity to promote materials science to high school and middle school teachers who then hopefully promote the field to their students. From casting using a microwave, to creating slime the teachers are immersed in materials science for the week. A special thanks to the professors who opened their labs and ASM members who opened their facilitates to the class for tours. Master teacher Debbie Goodwin has brought her unending energy to this event all seven years and is a true ambassador to the field. The camp will return again this summer July 13-17, 2009. Please mark your calendars and plan to attend, even if just for a short while.

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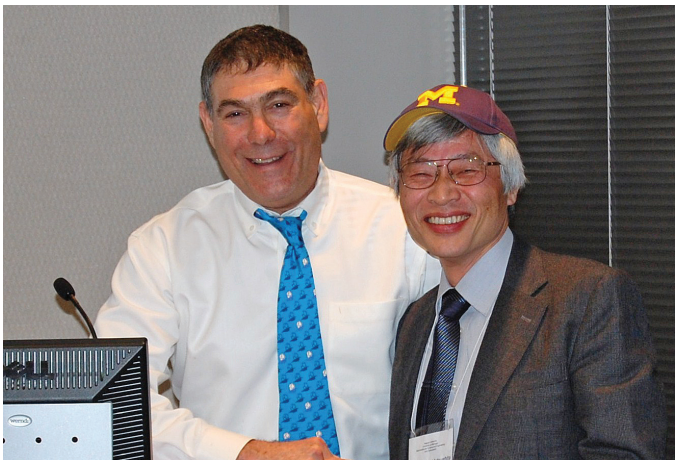
Joint Workshops with Nagoya University



Professor Rick Laine and Yushu Matsushita, Vice President, Nagoya University

In March 2008, faculty and graduate students from MSE and Macro participated in a Nagoya University and University of Michigan Symposium on "Supramolecular Materials Science and Engineering in the 21st Century" in Nagoya, Japan. The intent of this meeting was to renew the U–M CoE and University of Nagoya cooperative exchange agreement originally signed in 1980 and supported at that time by Toyota. All of the U–M faculty, which included professors Richard M. Laine, David C. Martin, Jinsang Kim (MSE and Macro), and Kenichi Kuroda (Macro and Dental School) found the quality of the science to be exceptional.

The Nagoya University group was interested in coming to Michigan for the second meeting. So, in November 2008, a group of faculty and students from Nagoya University attended visited our campus. The research workshop included lecture presentations and poster sessions. Professors Richard Laine and Kenichi Kuroda were the chairs for the workshop. Another meeting is planned for November 2009 in Nagoya.

Workshop Speakers:

November 24, 2008
Hiroyuki Asanuma (NU)
Sharon Glotzer (UM)
Eiji Yashima (NU)
Shuichi Takauama (UM)
Peter Green (UM)
Adam Matzger (UM)

November 25, 2008
James R. Baker (UM)
Theodore G. Goodson III (UM)
Mark M. Banaszak Holl (UM)
Masami Kamigaito (NU)
Siti Sarah A.R. (NU)
Santy Sulaiman (UM)

SEM Visits Local Fifth Graders

Professor Steve Yalisove and Dr. John Mansfield, director of the Electron Microanalysis Laboratory (on the laptop screen in photo below), presented a Scanning Electron Microscope (SEM) demonstration in the 5th grade classrooms of Mrs. Dutcher and Mrs. Webby at the Creekside Intermediate School in the Dexter Community School District. John was present via iChat and the outside of the microscope could be seen in the video chat window displayed on the laptop. The live video feed from the microscope was projected on the front screen. John demonstrated how to load the microscope and showed the students the different parts of the SEM with the web cam.

The students looked at a penny, John's beard hair, Oliver's fur (the class bunny in the arms of the student in the back left side of the picture), different kinds of paper, a MEMS device, a butterfly wing, a feather and shark skin. They learned about different length scales, how an electron microscope works, and why it can magnify things much more than an optical microscope. The students were asked if they could tell the difference between the paper samples and the hair samples. Most of them figured it out based on how they knew the objects felt---the rabbit hair was much smoother in the SEM than John's beard hair for instance. The students asked lots of questions and did not seem to lose interest over the one and a half hour demonstration. One student wanted to know what color the electrons were. Another student was concerned that there was a nuclear reactor in the microscope when he noticed the radiation warning on the instrument.

The Scanning Electron Microscope (SEM) is demonstrated in the 5th grade classrooms at the Creekside Intermediate School in Dexter, MI. Dr. John Mansfield, director of the Electron Microanalysis Laboratory is on the laptop screen in the center of the photo.

2008 Van Vlack Lecture

Professor Arthur H. Heuer of Case Western Reserve University was the 2008 Van Vlack lecturer. This major annual event in the department, now held during the fall term, honors an outstanding materials scientist and educator. This annual lectureship was established by the Van Vlack family in memory of Professor Larry Van Vlack and his outstanding educational and research contributions to MSE at Michigan. We are pleased that the Van Vlack family continues to participate in this event, with an annual visit to campus.

Arthur H. Heuer is University Professor, Kyocera Professor of Ceramics in the Department of Materials Science and Engineering, Director of the Swagelok Center for Surface Analysis of Materials, and Director of the Case Center for Surface Engineering at Case Western Reserve University. He is a member of the National Academy of Engineering. He earned a BS in chemistry from City College (1956) and PhD (1966) and DSc (1977) degrees in applied science and physical ceramics, respectively, from the University of Leeds, England. During his two-day visit on September 11 and 12, Professor Heuer presented two lectures entitled "Paraequilibrium Carburization of Austenitic Stainless Steels: Interstitial Hardening Taken to a New Level" and "Materials Science of Silicon MEMS: A Two-Way Street."

Alumni Society Merit Award Winner

Dr. Kevin Hann Chang received the 2008 Alumni Society Merit Award. Dr. Chang serves as regional general manager of Varian Semiconductor Equipment Associates in Taiwan, a leading technological company in the semiconductor equipment industry.

In a career spanning nearly two decades, he has devoted his efforts to research and development, semiconductor device integration, IC manufacturing (six sigma implementation), technical marketing, sales, and operational general management.

From 2000 to 2004, Dr. Chang managed the process organization at Novellus Systems in Taiwan, and led the team to co-develop the first Cu electro-plating process and LowK dielectric technology for the 0.18 um IC production at UMC Foundry. From 1989-2000, He served as project manager for the Motorola Semiconductor Product Sector.

In earlier years he co-led the international research and development team from Motorola Semiconductor Product Sector, ASM International, and IHP Research Institute in Germany.

Dr. Chang earned a master of science in engineering degree in metallurgical engineering from the University of Michigan, a master of science degree in mineral and energy resources from West Virginia University and a diploma in mining engineering from the National Taipei Institute of Technology in Taiwan. He earned an executive MBA from the National Chengchi University in Taipei and a doctoral degree in materials science and engineering from the University of Michigan.

From the College of Engineering

David Munson, the Robert J. Vlasic Dean of Engineering, and Kevin Hann Chang, the 2008 MSE Alumni Society Merit Award Winner.

2008 Scholarships and Awards

Undergraduate

Richard Flinn Scholarship
Mark Hendryx

Fontana-Leslie Scholarship
Conlan Hsu and Joseph Tucker

James Freeman Memorial Scholarship
Bradley Frieberg and Denar Van Drasek

John Grennan Scholarship
David Bilby and William Sharp

Jack Heller Scholarship
Hailey Foco and Kaitlyn Scott

Schwartzwalder Scholarship
Sarah Behling, Samson Lai, Katharina Maisel, Claudia Ng, Michael O'Brien Christopher VanDeusen, Mary Whalen, Paul Wolcott, Douglas Yeung, and Chen Zhang

William Hosford Scholarship
Taylor Blair and Robert Rhein

Clarence Siebert Scholarship
Young-Do Kim, Charles Moceri, Samanthule Nola, Mark Noordhoek, and Mit Shah

Alfred White Scholarship
Tamir Arbel and Amanda Sall

Brian Worth Prize
Stephen Coryell

MMS Anvil Award
Caroline Dove

Distinguished Achievement Award
Stephen Coryell and Kaitlin Gallup

EGL Honors ???
David Heiser

Graduate

Department Awards

Recruiting Visits Poster Session
Jessica Bickel and Michael Katz

Graduate Service Award for Recruiting
Jennifer Dibbern, Kevin Grossklaus, Michael Katz, Norman Meznarich, and Michael Warren

Best Overall Teaching Assistant
Min Kim

Best Overall GPA
Jonathan Miller

Best Overall Written Exam Score
Robert Nidetz

CoE/University Awards

CoE Distinguished Achievement Award in MSE
Obi Ezekoye

2008-2009 Rackham Predoctoral Fellowship
Brian Puchala

Outstanding GSI award, sponsored by ASEE
Kristin Tebo

Poster Award, MMPEI Energy Day
Leon Webster (AP)

External Awards

Outstanding Poster Award, International Conference on the Application of Accelerators in Research & Industry
Rachel Collino (ME)

Poster Award, AVS Michigan Chapter
Vaishno Dasika (EECS)

Best Poster Award American Vacuum Society
Myung-Su Kim

NSBE Golden Torch Awards, Graduate Student of the Year
Jonathan Madison

MRS Silver Medal Award
Jessica Bickel and Brendan O'Connor (ME)

Distinguished Scholar Award, Microbeam Analysis Society
Qiangmin Wei

Graduate Student of the Year, The National Society of Black Engineers
Jonathan Madison

James P. Lettieri Undergraduate Award Fund
Friends, classmates, and colleagues of the late James P. Lettieri (BSE '97) recently created an endowment in his honor that will fund an annual award given to a MSE undergraduate with the highest cumulative grade point average. We are pleased to report that the endowment goal has been reached thanks to your generosity. If you are interested in more information about this endowment and award, please contact Jim Yurko at yurko@alum.mit.edu. Donations can be made using the form on the back page of this newsletter.

Michigan Materials Society

Fall 2008 was an exciting semester in MMS! We have had great meetings with speakers from Applied Process, Caterpillar, and US Steel. This semester has been unique, since we have the opportunity to have professors come in to give special lectures. Our goal for the remainder of the year is to get more students involved in professional societies to allow for growth and knowledge within the department. We are fortunate enough to have many professors who are active in these societies who were able to come in and encourage the students to join!

Outside of meetings, we had a few social events. As in past years, the MMS picnic was a huge hit! Professor Hosford graciously opened his home to us once again. As always, the dogs were ever present and everyone had a great time! We also had a trip to Spicer's Apple Orchard where the donuts were fresh and so were the apples. We attempted a softball team through IM sports and we are hopeful that next year will be more successful. We look forward to finishing the year and seeing more exciting events from MMS!

MMS Speakers

Fall 2008

John (Chip) Keough
Applied Processes

Joy Allen
Caterpillar

Thomas Cayia
Arcelor Mittal

Scott Strongman
U.S. Steel

Max Shtein
MSE Department

Winter 2009

Ray Decker and Steve LeBeau
Thixomat

Kathy Hayrynen
Applied Process

Courtney Martin
Adaptive Materials

Sheila Ryzyi
Ford Motor Company

Tom Brady
Plastics Technology Inc.

Gary Was
NERS Department

Alpha Sigma Mu

ASM hosted tutoring sessions throughout the school year for MSE courses, as well as mentoring newly declared MSE students. The group's other volunteer activities include participating in the College's Engineering Advising Center event "Clearing the Fog: How to Declare Your Engineering Major," as well as NanoCamp, which provides an opportunity for middle and high school students to learn about science, to inspire them to pursue a science-related field. This year's topics included nanotechnology and microelectronics.

New members will be inducted at the Annual MSE banquet on April 10.

Alumni Notes

John (Chip) Keough, PE, FASM (BSMSE, BSME '77) and wife Nancy (BA '05) would like to announce the births of TWO maize and blue granddaughters. Evelyn Clare Keough (Evie) born to son Josh (BSArch '97, MSArch '99) and daughter-in-law Carrie (BA '96, MEd '03) in Shanghai, China on May 6, 2008. Isla Jean Keough born to son Ian (BFA '99, MArch New University '04) and daughter-in-law Melinda (BFA '99) in New York City on June 13, 2008. Parents and grandparents are busily saving up for anticipated U–M tuition bills in the years 2026-2030. Significant frequent flyer miles are being accumulated. Meanwhile Grandpa Chip has become an Adjunct Professor to MSE and STILL (happily) doesn't get paid for doing what he loves to do–get young engineering students excited about engineering, metals and metal casting.

Dr. Ron Radzilowski (PhD '77) has accepted the newly created position within Severstal North America of Manager, Manufacturing Technology. His doctoral advisor was Robert Pehlke. Ron is currently chair of ASM International- Detroit Chapter, and chair of the Association of Iron & Steel Technology- Division 6- Technical Paper Awards.

John Rowley (MSE '94) is moving away from Ann Arbor for the second time. He has recently accepted a position as director of Cell Therapy R&D at Lonza in Walkersville, MD, and is leaving his current position at Aastrom Biosciences. Jon started his biomaterials career in David Martin's lab as an undergraduate MSE student, and graduated from Michigan with a PhD in biomedical engineering in 2001. Jon has also recently started a regenerative medicine industry blog (http://regeneration-station.com) that provides insight into the business and technology of regenerative medicine, as well as offers career and job searching advice to new graduates. John is moving to Maryland with his beautiful wife, Patricia, and wonderful 19-month-old son, Oden.

Jim Yurko (BSE '97), his wife, Joanie, and son, Jake, recently welcomed home the next member of the Yurko family, Juliana. Jim and his family relocated to the Boston area in early 2008 after Jim co-founded Electrolytic Research Corporation, a start-up dedicated to the commercialization of titanium electrowinning technology. Jim's firm recently won a Small Business Innovation Research award from NASA for work related to this effort. Jim is enjoying life as an entrepreneur and as a father, and hopes to end up back in Michigan before his children start speaking with Boston accents.

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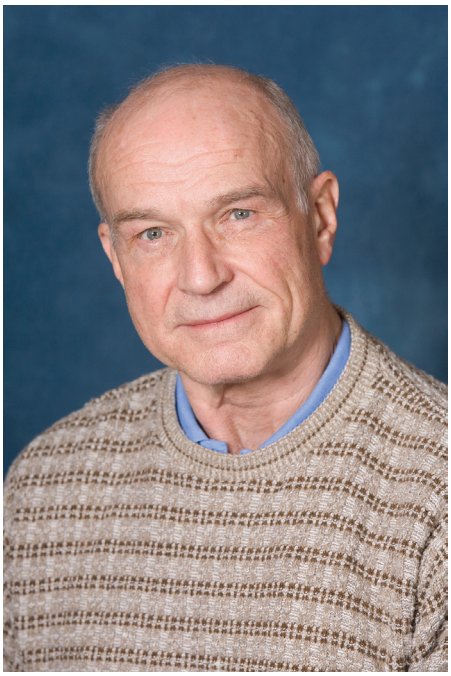
Thank you for your generous gifts to our department or to the College of Engineering for the benefit of the department. If we have missed someone, please accept our sincere apology, and let us know so that we can correct our records.

Materials Science and Engineering Fellowship Challenge Fund

With your generous donations we have established a fellowship fund to support first-year graduate students. Although President Coleman's one-to-one match has ended, we are continuing to accept donations for this important initiative. Donations can be made using the form on the back page of this newsletter.

One of the photos running on kiosk

Frank E. Filisko, 1942–2008



Memorial Tribute to Frank Edward Filisko by Richard E. Robertson

Our friend and colleague, Frank Edward Filisko, died on November 11, 2008, at age 66, after a two-year battle with leukemia.

Frank was born in Loraine, OH, and lived there until he entered Colgate University (in Hamilton, NY) to study physics, and to play football. Frank graduated from Colgate with a BA degree in 1964. Following this, he went to Purdue University to study solid state physics, where he received an MS degree in 1966 and this is where he met his wife, Doris. He then returned to Ohio to attend Case Western Reserve University and to study polymer physics.

Frank's advisor at Case was S. H. Maron, the co-author of a well-known textbook on thermodynamics. Indeed, Frank did involve himself with thermodynamics, making measurements for his thesis on the heats of solution of several polymers in selected solvents. Based on their relatively large numbers of citations, the papers from his thesis seemed to have been well-received. Frank received his PhD degree from Case in 1969 but stayed on as a post-doctoral fellow, working with Phillip Geil, studying native (rat tail tendon) collagen.

In 1970, Frank joined the University of Michigan and the Department of Chemical and Metallurgical Engineering as an assistant professor. When the department split in two soon after, into chemical and metallurgical branches, Frank went with the metallurgical branch, which is now known as the Department of Materials Science and Engineering. Frank was promoted to full professor in 1984.

Frank was also active in the Macromolecular Science & Engineering Program since its founding in 1978. He became its director in 1987 and continued until 1995, though his title remained acting director. At the time, there was some thought that the Macro Program might cease to exist, but if any one person kept it alive, it was Frank, through very strenuous efforts.

Frank loved teaching, and he loved research. Frank taught a broad range of courses. He excelled at teaching the introductory materials science and engineering course (MSE 220), but he had also taught the polymers course, the kinetics course, a senior design course, and during his last term of teaching, a junior-level lab. A popular course was his applied polymer processing, and Frank also initiated the biomaterials course (MSE 410/BioMed 410), which has become very popular with students in both the MSE and Biomedical Engineering departments.

For his research, he always liked to work directly with his students. He felt that as a mentor he would be most successful when he was in the lab working alongside them, experiencing their successes, and maybe having periodically to fix their instruments. Besides the thermodynamic measurements on polymers early in his career, Frank received even greater notice for his work on electrorheological fluids (fluids that change their flow properties, mainly viscosity, in the presence of electric fields). This work was highly enough regarded that Frank was invited for research and for conferences all around the world.

Frank also had a long and productive association with the School of Dentistry and the Department of Biologic and Materials Science. Papers from that collaboration involved typical biomaterial concerns, like cytotoxicity, protein adsorption, thrombogenesis, and hemocompatibility.

As his children (Theresa, Andrew, and Edward) were growing up, Frank also participated in their activities, including being a football coach and also being a scoutmaster.

Frank will be greatly missed, by faculty, students, and staff.

You make the difference

Every year we strive to offer our students in Materials Science and Engineering the best possible educational and research opportunities. Your annual gifts to the department provide the funding for that margin of excellence which prepares our graduates to compete successfully in today's world and to contribute substantially to society. We count on you to help us continue our offering of exceptional educational opportunities in our department. Please use this form to send your gift or give online at http://www.mse.engin.umich.edu/about/giving

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