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MSE Matters Newsletter Fall 2010

Department of Materials Science & Engineering

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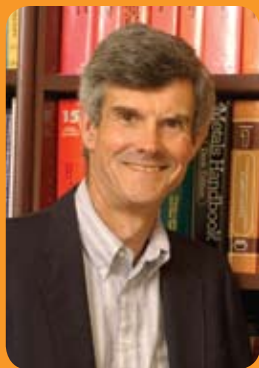
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Department Head Message



Dr. George Pharr

Welcome to another edition of the Department of Materials Science and Engineering (MSE) newsletter. We are extremely pleased to have this opportunity to communicate with you regarding progress in our department in the last year,

including several noteworthy items. The MSE department recently added a new Governor's Chair position along with a related faculty in the area of radiation damage of materials. In addition, the department is poised to initiate a new collaboration with Oak Ridge National Laboratory (ORNL) and the State of Tennessee by establishing academic programs that would educate and train new scientists/engineers to meet future energy needs.

This past summer, the MSE department successfully hosted its first high school teachers Materials Summer Camp. A total of 25 teachers from Tennessee were exposed to the fundamentals and increasing importance of the materials in our society. The MSE department plans to host future camps for both high school students and teachers from a wider geographical area.

In this issue, we also highlight a number of faculty that have received international recognition, faculty and student awards, two new concentrations in the department and a new collaboration between our department and the Laboratory of Regenerative Medicine at the University of Tennessee Medical Center, Knoxville.

We hope you enjoy this issue of the MSE newsletter. If you have questions, don't hesitate to contact us at mse@utk.edu.

Sincerely,

George Pharr
Department Head

Governor's Chair and Associate Professor Join the Department of Materials Science and Engineering

Dr. William Weber, in March 2010, was named the eighth University of Tennessee - Oak Ridge National Laboratory (ORNL) Governor's Chair for radiation effects on materials. He earned his B.S. in physics from the University of Wisconsin, Oshkosh, in 1971, and his M.S. and Ph.D. in Nuclear Engineering from the University of Wisconsin, Madison, in 1972 and 1977, respectively.

Dr. Weber is leading a multidisciplinary research team that synergistically integrates experimental and computational effort to understand radiation effects in advanced materials. As part of this effort, Dr. Weber and Dr. Zhang, a joint faculty associate professor who joined the department in June 2010, have been working with other faculty members at UT and scientists at ORNL to establish an advanced ion laboratory at UT that will be operational at the beginning of 2012.

Dr. Zhang earned her Ph.D. in Engineering Physics from Lund University in Sweden and a Ph.D. in Science from Beijing Normal University in China.

The new UT-ORNL Multifunctional Ion-Beam Materials Laboratory (MIBML) will be used to study irradiation effects in materials; to implant ions to change electrical, optical and mechanical properties or to form nanostructures; to modify surface topologies and properties; and to characterize materials using a suite of ion-beam analysis methods. The laboratory will be equipped with several unique ion beam analysis capabilities, as well as capabilities for in situ electron

irradiation and fast optical spectroscopy analysis. In addition to high efficiency in routine ion beam experiments, MIBML will have the versatility to cater to needs of individual researchers. MIBML will provide students, faculty, scientists and off-campus users with the necessary resources for state-of-the-art research and development using ion-accelerator techniques and methodologies.

Dr. Weber and Dr. Zhang recently developed an experimental approach that measures the energy lost to the electrons as single ions pass through a solid, a vital step in understanding energy loss mechanisms and the response of the material that is hit. Their research work also provides insights into how materials give off light, or scintillate, when exposed to radiation, which is helping to identify materials that might be candidates for new gamma radiation detectors.

What's next for Dr. Weber and Dr. Zhang? They are working with colleagues to understand the whole picture of ion-solid interactions, including atomic collision cascades and how energy transferred to electrons is dissipated through electron-phonon coupling and the radioactive decay of electronic excitations.



Dr. William Weber



Dr. Yanwen Zhang

MSE Faculty Adds Two New Concentrations, Program

In a recent meeting, the MSE faculty approved changes in the curriculum leading to the offering of two new concentrations at the graduate level: one in Biomaterials and another in Energy Science. In addition, the faculty approved a new five-year B.S./M.S. program. Qualified undergraduate students with a GPA of 3.4 or better will be allowed to take up to nine hours of graduate credit their senior year. This has always been possible under senior privilege, but the difference is these hours can count toward the requirements for both the B.S. and M.S. degrees, making it possible to complete a non-thesis M.S. degree with one additional year of coursework.

Dr. Pharr Receives Materials Research Society Award



Dr. George Pharr

Dr. George Pharr, a UT Knoxville chancellor's professor and head of the Department of Materials Science and Engineering, received the Innovation in Materials Characterization Award (IMCA) at the 2010 Materials

Research Society (MRS) spring meeting in April 2010.

This first-time award honors an outstanding advance in materials characterization that

notably increases knowledge of the structure, composition, in situ behavior under outside stimulus, electronic behavior, or other characterization feature of materials. The impact of the advance on materials research is the primary consideration in making this award, which is not limited to the method of characterization or the class of materials observed.

The 2010 IMCA was presented to Warren C. Oliver from Nanomechanics Inc. and Dr. Pharr for their "seminal contributions to the development of the instrumentation and analysis methods of nanoindentation for characterizing the mechanical properties of materials at the micrometer- and nanometer-length scales."

MSE Collaborates with the Laboratory of Regenerative Medicine



Tommy Washington, Russell Hallman, Kaan Serpersu, Ryan Hammonds and Tiffany Flick

The Materials Science and Engineering Department has joined forces with the newly formed Laboratory of Regenerative Medicine (RegenMed) at the University of Tennessee Medical Center, Knoxville (UTMCK). RegenMed, formed in December 2009, is a highly multi-disciplinary (engineering, medicine, biology and chemistry) laboratory that develops unique and exciting solutions to difficult surgical problems with the desire

to improve patient quality of life. RegenMed is an expansion of the Vascular Research Laboratory of the Department of Surgery at UTMCK.

Regenerative medicine is the science of accelerating the healing of damaged or diseased organs and tissue. This includes research in the field of tissue engineering, development of artificial organs, development of medical implants and stem cells.

Dr. Roberto Benson and his research group of five students ~ Tiffany Flick, Russell Hallman, Ryan Hammonds, Kaan Serpersu and Tommy Washington ~ are currently involved with the development of venous valve and tissue stimulants. The development of venous valves has the potential to help approximately 500,000 patients in the U.S. currently suffering from chronic venous insufficiency. Development of tissue stimulants will allow

more accurate surgical models for surgeon training. The new approach involves the simulation of the tissue as individual nano- and micro-components instead of simply affecting the bulk properties of the tissue, since the bulk approach does not capture tissue details like the nanofibrous collagen and elastin layers in the subcutaneous tissue.

The relationship between RegenMed and Dr. Benson's research group is long-term; however two of its short-term goals include providing fundamental materials characterization and fabrication expertise to the applied tissue engineering and vascular prosthetic research being conducted and to develop the required preliminary results to acquire large funding from National Institutes of Health or the American Heart Association.

"We hope to have National Institutes of Health funding within two years," Dr. Benson said.

MSE Department Hosts Summer Teachers Camp



This past summer, the MSE department successfully hosted its first high school teachers Materials Summer Camp at Oak Ridge High School in Oak Ridge, Tenn. ASM International coordinates camps across the United States to introduce the field of Materials Science and Engineering to high school students and teachers. A total of 25 teachers from the surrounding area were exposed to the fundamentals and increasing importance of the materials in our society, including solids, metals, ceramics, polymers, composites and corrosion.

The camp instructors were Masters Teachers Debbie Goodwin and Brian Wright, assisted by Jim Endicott, a Master Teacher-in-Training, and Kurt Johanns, an MSE graduate student. Johanns was recognized by the Master Teachers, teachers attending the camp and co-organizers as an invaluable member of the team and part of the reason the camp was such a success.

"Helping with the Teachers Camp was an excellent experience that allowed me to interact with and learn from the people that

MSE New Faculty: Dr. David Mandrus



Dr. David Mandrus

1992 to 1995, Dr. Mandrus was a postdoctoral associate at Los Alamos National Laboratory, and in 2000, he established the Correlated

Dr. David Mandrus earned his Ph.D. in physics from Stony Brook University in 1992, following his dissertation research on infrared spectroscopy and break-junction tunneling studies of high-temperature superconductors. From

Electron Materials Group (CEMG) at ORNL. From 2000 to 2010, Dr. Mandrus served as a group leader of the CEMG, and in 2010, he joined the faculty here at the University of Tennessee.

He uses the experimental tools of materials synthesis and crystal growth to address cutting-edge issues in materials physics. Recent interests include the following: (1) discovery and characterization of new unconventional superconductors; (2) discovery and characterization of new collective phenomena in transition metal oxides, especially involving

slow dynamics; (3) neutron-scattering investigations of exotic magnets; and (4) new materials for thermoelectric refrigeration and power generation.

Dr. Mandrus is a fellow of the American Physical Society and has authored or co-authored more than 250 technical papers that have been cited more than 6,000 times. His research areas include growth, discovery and materials physics of new electronic and magnetic materials (superconductors, thermoelectrics, multiferroics and itinerant magnets) as well as oxide electronics.

The MSE Honors Banquet Presents Awards



The Department of Materials Science and Engineering Honors Banquet was held on April 6, 2010.

The following awards were presented:

Graduate Student Award for Excellence in Teaching:

Changli Wang

Graduate Student Award for Excellence in Research:

Lujian Peng, Changli Wang, Sameer Paital and Li Li

Raymond A. Buchanan Award for Outstanding Junior:

Katherine Strader

E. Eugene Stansbury Award for Outstanding Senior:

William Brandon Goodwin and John Bohling

Outstanding Alumnus Award:

Dr. Elena Garlea

Outstanding Staff Award:

Carla Lawrence

Faculty Award for Excellence in Teaching:

Dr. Hahn Choo

Faculty Award for Excellence in Research:

Dr. Yanfei Gao

Faculty Award for Excellence in Service:

Dr. Kevin Kit

Dr. Takeshi Egami Recognized for Excellence in X-Ray Powder Diffraction



Dr. Takeshi Egami

Department of Physics and Astronomy, is the 2010 winner

Dr. Takeshi Egami, a distinguished professor in the Department of Materials Science and Engineering and the

of the J.D. Hanawalt Award for excellence in the field of X-Ray powder diffraction. He received the award, along with co-recipient Simon Billinge of Columbia University, from the International Union of Crystallography for important contributions to the field of X-Ray powder diffractions. The award is given every three years.

International Institute of Welding Recognizes Dr. Carl D. Lundin



Dr. Carl D. Lundin

the Evgeny Paton Prize by the International Institute of Welding. The Paton Prize is awarded to an individual who has made a significant contribution to science and

Dr. Carl D. Lundin, a professor in the Department of Materials Science and Engineering, has been awarded

technology through his or her lifetime dedication to "applied research and development in the field of advanced technologies, materials and equipment for welding and allied processes." The Evgeny Paton Prize consists of a medal and diploma given by the National Welding Committee of the Ukraine and the E.O. Paton Electric Welding Institute. The award also includes a visit by the winner to the E.O. Paton Electric Welding Institute in Kiev, Ukraine.

Three MSE Department Professors Win COE Awards

2010 Research Fellow Awards:

Dr. Yanfei Gao, Assistant Professor, Materials Science and Engineering

Dr. Bin Hu, Associate Professor, Materials Science and Engineering

Charles Edward Ferris Faculty Award:

Dr. Carl McHargue, Professor, Materials Science and Engineering, Director CMP



Dr. Yanfei Gao



Dr. Bin Hu



Dr. Carl McHargue

Teachers camp continued from page 2

directly influence children,” Johanns said. “I am amazed at how one small contribution can lead to big changes in a kid’s education. I am definitely looking forward to helping beyond my tenure here at UT.”

At the conclusion of camp, the teachers were challenged to go back and bring Materials Science and Engineering into their classrooms. The MSE department plans to host future camps for both high school students and teachers from a wider geographical area.

Department of Materials Science and Engineering Faculty

Roberto Benson Associate Head & Professor
Gajanan Bhat..... Professor
Hahn Choo.....Associate Professor
Gerd Duscher Associate Professor
Takeshi Egami.....Distinguished Scientist & Professor
Yanfei Gao..... Assistant Professor
Easo George..... Professor
Wei He..... Assistant Professor
Bin HuAssociate Professor
David Joy.....Distinguished Scientist & Professor
Ramki KalyanaramanAssociate Professor
Veerle Keppens Associate Head & Associate Professor
Kevin Kit..... Associate Head & Associate Professor

Peter Liaw Professor, Ivan Racheff Chair of Excellence
Carl Lundin..... Professor
David Mandrus Professor
Carl McHargue Professor
Thomas MeekAssociate Professor
Chuck Melcher Research Professor
James Morris.....Associate Professor
T. G. Nieh Professor
George Pharr Department Head & Professor
Philip Rack.....Associate Professor
Claudia Rawn Assistant Professor
Mike Simpson Professor
Joseph Spruiell.....Professor Emeritus
Larry Wadsworth.....Professor Emeritus
Shanfeng Wang Assistant Professor
William Weber.... Governor’s Chair Professor
Yanwen ZhangAssociate Professor

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