

Message from the Department Head



Dr. George Pharr

Welcome to another edition of the Department of Materials Science and Engineering (MSE) newsletter. We are very pleased to have this opportunity to communicate with you about the exciting progress taking place in our department.

The MSE department recently added two new faculty members. Both have impressive research backgrounds, one in laser surface modification and the other in electron microscopy respectively. These new members will strengthen and broaden ongoing research activities in these areas.

It is with great pleasure and pride that we have included a special feature on the outstanding performance by two of our undergraduates in winning the Materials Bowl Competition at the 2008 TMS meeting in New Orleans. In addition, this past summer the MSE department hosted another group of high school students from the surrounding area at the Materials Science Summer Camp.

In this issue we are also highlighting the activities of the newly formed UT Nonwoven Materials Research Laboratory. This facility is accessible to university, industry or government scientist/engineers for research and product development.

We hope you enjoy this issue of the MSE newsletter and welcome your feedback.

We look forward to hearing from you.

Sincerely,

George Pharr, Department Head

Materials Science and Engineering Students, Faculty and Staff Receive Awards

The Department of Materials Science and Engineering held its annual departmental Honors Banquet on Tuesday, April 1, 2008, at Calhoun's on the River Restaurant. The evening began with a special recognition of David Stansberry, an accounting specialist with the department, who had just returned from assignment in Iraq. Stansberry was NCOIC of the 3rd Civil Affairs Battalion Operations and was deployed on January 16, 2007.

Student awards during the evening included: Graduate Student Award for Excellence in Teaching – Fengxiao Liu; Graduate Student Award for Excellence in Research – Dongchun Mary Qiao; Raymond Buchanan Award for Outstanding Junior – George Miller Moore; E. Eugene Stansberry award for Outstanding Senior – Cong Zhou.

MSE students Paul Cutler and Brandon Goodwin were also recognized for winning the 2nd Annual Materials Bowl Competition at the TMS Conference. The two received a \$1,500 grant for the UT Material Advantage Chapter and \$1,000 in prize money to split among the contestants.

Faculty and staff awards at the event included: Outstanding Staff Award – Carolyn Nelson; Faculty Award for Excellence in Teaching – Dr. Kevin Kit; Faculty Award for Excellence in Research – Dr. Bin Hu; Faculty Award for Excellence in Service – Drs. Carl McHargue and Narendra B. Dahotre.

MSE faculty also received awards at the College of Engineering's 2007-2008 Honors Banquet on April 18, 2008. Dr. Claudia Rawn received the Outstanding Faculty Advisor recognition, and Dr. Peter Liaw received the Moses E. and Mayme Brooks Award.

Two MSE faculty were also named as 2008 College of Engineering Research Fellows – Dr. Hahn Choo and Dr. Bin Hu.



Dr. Bin Hu



Dr. Hahn Choo



Dr. Claudia Rawn



Dr. Peter Liaw

MSE Graduate Ononye Receives National Recognition



Elsevier, world-leading publisher of scientific, technical and medical information products and services, has

announced the winners of the first awards for Electronic Theses and Dissertations (ETD) with the NDLTD-ETD Awards Powered by Scirus. Elsevier Journals Publishing and Scirus, the most comprehensive science-specific search engine, conducted the awards competition in partnership with the NDLTD (Networked Digital Library of Theses and Dissertations), the international organization dedicated to promoting the dissemination and preservation of electronic theses and dissertations, to sponsor this year's first-ever NDLTD-ETD Awards, which seek to recognize outstanding contributions to the body of electronically available ETD research.

Lawretta Chineze Leaticia Ononye, a graduate of the MSE department, was one of ten winners in the physical and life sciences category for her publication **The Effect of Implantation Temperature and Ionizing Radiation on the Microstructure of Ion Implanted Sapphire** (<http://etd.utk.edu/2002/OnonyeLawretta.pdf>). Dr. Ononye's advisor was Dr. Carl McHargue, and she received her Ph.D. in 2002. She is currently an assistant professor at State University of New York in Canton.

Materials Camp '08 is a Big Success!



Materials Camp '08, sponsored by the Oak Ridge Chapter of ASM (ORCASM), Oak Ridge National Laboratory, (ORNL), Y-12 National Security Complex, the

University of Tennessee, Knoxville (UTK), the Materials Science and Engineering Department (MSE), MS Technologies, Inc. and Keyence Corporation of America, took place during the week of July 16th.

Co-Organizers were Steve Dekanich from Y-12 and Dr. Claudia Rawn, an assistant professor in the MSE department and a UT joint professor with Oak Ridge National Laboratory (ORNL).

Speakers for the event included Bryan P. Tucker (NASA), Graham Walford (Walford Technologies, Inc.), Jeanine Williamson (UTK Library), John Simpson (ORNL), Paul Cutler (UTK), Kevin Kit (UT-MSE), Jaret Frafjord (Y12) and Stephanie Drumheller (University of Iowa).

The Materials Camp hosted 28 participants. The group was primarily from the surrounding area (Oak Ridge and Knoxville), but campers

from Virginia, Alabama, Florida, and Washington State also attended. This year, the camp was opened to rising 8th graders in addition to rising 9th to 12th graders and the 8th graders made up 25% of the campers with the remaining distribution almost equal between the other four grades.

The camp ran from 9:00 a.m. to 4:00 p.m. daily with the exception of Wednesday afternoon, when the group left at 5:00 to accommodate a tour of the ORNL facilities and on Friday when the activities took place only in the morning. During the camp, the students examine retrieved parts from the Space Shuttle Columbia. Bryan P. Tucker, a Materials Engineer who works with failure analysis and materials evaluation for NASA, joined the group for the week.



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MSE Welcomes Two New Faculty Members

The Department of Materials Science and Engineering (MSE) welcomes two new faculty members: **Dr. Gerd Duscher** and **Dr. Ramki Kalyanaraman**.



Dr. Gerd Duscher

Dr. Gerd Duscher is a new associate professor in the Department of Materials Science and Engineering. Duscher received his doctorate in Materials Science from the Max-Planck Institut in Germany. He was also awarded both his M.S. and B.S. in physics from the University of Regensburg in Germany. He is a recipient of the 2004 Nano Technology Industrial Impact Award. Duscher has been awarded

grants for a wide variety of research areas in materials science, including interface and materials defects, electromigrations of interconnects, dislocations structure, structure property relationship of semiconductor heterostructures and structure property relationships of quantum dots and quantum wells.



Dr. Ramki Kalyanaraman

Dr. Ramki Kalyanaraman is a new joint associate professor in the Department of Materials Science and Engineering and the Department of Chemical and Biomolecular Engineering. Kalyanaraman was awarded a Ph.D. in materials science and engineering in 1998 from North Carolina State University, Raleigh, and received his M.Tech. and M.Sc. from Indian Institute of Technology, Kanpur. Kalyanaraman's current research interests include self-organization and pattern formation, non-equilibrium processing under fast laser-phase,

nanomaterials for plasmonics and nanophotonics and nanocomposites for ultrafast and ultrahigh density optical information processing. Kalyanaraman was previously an assistant professor at Washington University in St. Louis.

Research Feature: Narendra Dahotre



Dr. Narendra Dahotre

The unique capabilities of lasers can be harnessed to engineer the surfaces of a variety of materials, and that is exactly what MSE professor Narendra Dahotre has done for the past 25 years since his days as a graduate student. Surface engineering means the design and physical and chemical modifications of a surface to enhance hardness, wear and heat resistance or some other property. Although most laser

surface engineering processes appear expensive compared to other technologies, in many cases they are actually more cost effective because of their precision and speed and especially so when the recent developments are providing more efficient, reliable and cheaper lasers for this purpose.

Dahotre's efforts in surface engineering are based on both experimental and theoretical approaches for a broad understanding of interactions of lasers with materials and engineering aspects of the interactions. His research has ranged from addressing fundamental issues in laser surface engineering of materials to the application of this knowledge in development of new corrosion/oxidation and wear/erosion resistant surfaces in challenging and extreme chemical and mechanical environments.

Dahotre's dedication to the understanding and development of laser based surface engineering of materials has been reflected in his 15 U.S. patents, 1 U.S. patent pending, 169 publications (123 refereed journal papers, 32 reviewed proceedings papers, 14 proceedings papers) and 4 book chapters. He has organized 15 national and international symposia/conferences/congresses in the field of surface engineering and edited/coedited their proceedings. He has also recently authored two books including **Laser Fabrication** and **Machining of Materials** (Springer 2008). His distinguished contributions to the field have also been recognized many awards and honors that include The University of Tennessee Chancellor's 2006 Research and Creativity Achievement Award, The University of Tennessee College of Engineering 2006 Research Fellow Award and election to the Class of 2004 Fellows of American Society for Materials (ASM) International and the Class of 2008 Fellows of American Society of Mechanical Engineers (ASME).

Pharr Receives Honor

Dr. George Pharr, professor and head, Department of Materials Science and Engineering, was recently named to the inaugural class of the University of Tennessee's Chancellor's Professors. This recognition is the highest honor that can be accorded a member of the faculty at the University of Tennessee-Knoxville, and recognizes extraordinary nationally or internationally recognized scholarly attainment in an individual discipline or field as well as a record of excellence in teaching and service to the campus. Pharr received his award at a ceremony that took place at the University Center on October 21, 2008.

The Nonwoven Materials Research Lab Expands UT Materials Efforts

The Nonwoven Materials Research Lab (NRL) is located on campus on White Avenue. The facility features several advance melt blown pilot lines and many other processing and test facilities designed to make a fully equipped nonwovens research lab. The nonwovens facilities are under the direction of Gajanan Bhat, fellow of the Textile Institute, a professor in the MSE department, and the vice president of the Fiber Society. Dr. Bhat has been conducting research in the area of nonwovens for over 18 years and has coordinated research with several corporations, military research laboratories, non-profit organizations and NASA.

At NRL, university professors, students and engineers from

several departments come together to support nonwovens studies, research and applications. The research meltblowing lines are available to private industry as well as government through research grants. trained individuals are available on-site to operate the machinery and help troubleshoot any problems with the processing of materials. Expertise is also available to help companies determine the viability of their product, how to improve it and how to acquire the properties that they desire.

Current research projects are funded by corporations, government agencies and non-profit organizations.

Material Science Students Take First Place in the Materials Bowl



Paul Cutler, graduate student in Materials Science, and Brandon Goodwin, sophomore in Materials Science, competed and took first place in the 2nd Annual Materials Bowl, Sunday, March 9, 2008, during The Minerals, Metals & Materials Society's (TMS) 137th Annual Meeting and Exposition that took place the week of March 7, 2008, in New Orleans.

The Materials Bowl is a "Jeopardy" style match with questions selected from five different categories including questions related to the TMS organization, questions from items appearing in the 2007/08 JOM (the Member Journal of TMS), questions from Material-Technology@TMS (a website that contains databases, discussion boards, research articles, etc. related to materials), questions naming ele-

ments from the periodic table and random questions involving any thing materials related (materials potpourri).

Teams were from Boise State, Colorado School of Mines, Florida International University (2007 Materials Bowl Champs), Georgia Tech, Illinois Institute of Technology, the University of Alabama, the University of Tennessee and the University of Wisconsin at Madison. The UT team beat the University of Wisconsin at Madison during the first round, the University of Alabama in the second round and Boise State in the final round to become champs. By winning, the UT students have become local celebrities at the TMS Annual Meeting and will be bringing back \$1,500 for the UT Materials Advantage Student Chapter, a monetary prize to be split between the team members and the Materials Bowl Trophy which will be displayed at UTK for the year.

On the last day, MS Technologies provided breakfast for campers and parents. Afterwards, five groups made presentations on various aspects of what they had learned during the week. Presentation judges included George Pharr; Elena Garlea, the chair of the Oak Ridge Chapter of ASM; and Edward Ripley from the Y-12 National Security Complex. First place was awarded

to the team of Alex McLean, Rick Schulte, R.J. Johnson, Evan Lohrey, Kyle Winter and Sean Zhong. This team gave their presentation again at the September Technical Meeting of the Oak Ridge Chapter of ASM.



Department of Materials Science and Engineering Faculty

Roberto Benson Associate Head & Professor
Gajanan Bhat..... Professor
Hahn Choo..... Associate Professor
Narendra Dahotre..... Professor
Gerd Duschler Associate Professor
Takeshi Egami..... Distinguished Scientist & Professor
Yanfei Gao..... Assistant Professor
Easo George..... Professor
Wei He Assistant Professor
Bin Hu Assistant Professor
David Joy..... Distinguished Scientist & Professor
Ramki Kalyanaraman Associate Professor
Veerle Keppens Associate Professor
Kevin Kit..... Associate Professor

Peter Liaw Professor, Ivan Racheff Chair of Excellence
C.T. Liu..... Distinguished Research Professor
Carl Lundin..... Professor
Carl McHargue..... Professor
Thomas Meek Associate 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

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