

Exploring Materials

at Virginia Tech



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News from the Department of Materials Science and Engineering
Virginia Polytechnic Institute and State University

Research Spotlight



Alex Aning's current research group is a diverse mix of undergraduates and graduates. From left: Derek Gordon (MSE '08), Olisa Pinto (MSE '07), graduate student Niven Monsegue, Alex Aning, graduate student Kai Zhang, and Elsa Mekonnen (MSE '08).

Mechanical Alloying for Materials Synthesis and Processing

Alex O. Aning

Mechanical alloying (MA) is a high-energy powder milling process first developed by John Benjamin and coworkers at INCO Alloys, Ltd, as a means to produce oxide dispersion strengthened superalloys. It has since been used as a versatile technique for the production of other unique microstructures. In particular, it can be used to generate nanostructures and to synthesize both stable and metastable intermetallic compounds. Additionally, a large number of alloy systems can be processed into amorphous form using MA.

In the Materials Processing Laboratory in Holden Hall, MA has been used to process and/or synthesize materials of almost all material groups including metals, ceramics, polymers, composites, and electronic materials. One major area of work performed in this lab has been to use MA to address some of

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Research Corner

Meet Professor Alex Aning

LeeAnn Ellis

From an early age, Alex Aning knew he wanted to be an engineer. "I spent a lot of time with my grandfather," Alex recalls. "He kept telling me I was to be an engineer." Even in elementary school, Alex remembers he was skilled at fixing children's toys and other broken things.

Following his high school graduation, Aning left his home in Ghana to study physics at Morgan State University in Maryland. "My interest has always been engineering, but I couldn't afford to go to a university that offered engineering." Living in the U.S. at such a young age was not lonely because two older brothers were nearby in New York, and there were cousins in Baltimore. "But it was very hard because I worked to go to school." He both worked and attended school full time, doubling up on jobs in the summers to earn tuition money. His brothers pitched in, supplementing his finances to ensure that he completed his college degree.

He did graduate work at the University of Missouri at Rolla, following a brother's footsteps into metallurgical engineering. After completing a doctorate and post-doc, Aning returned to Morgan State to teach in the physics department. When the State of Maryland granted permission for Morgan State to establish an engineering program in 1984, Aning was tapped to help develop the program. "I was the only one there who knew anything about engineering." Aning eventually became head of the electrical engineering department.

"Usually, you earn a Ph.D. and you spend time conducting research in a laboratory or academia, then eventually you may go into administration," Aning reflected. "But my

situation was reversed. I spent several early years of my career in administration, but I really wanted to get back and do research and teach." To prepare for this goal, he took a year's leave of absence from Morgan State and served as a visiting professor in the MSE department at the University of



Virginia (UVA). While at UVA, Alex worked with Professor Thomas Courtney, who introduced him to the mechanical alloying (MA) process. Through this collaboration, Dr. Courtney became a close friend, and his mentorship proved very influential in establishing Alex's continuing interest in MA and other materials processes. Upon his return to Morgan State a year later, he was able to develop a research relationship with faculty at Johns Hopkins University. Then in 1992, Aning joined the MSE faculty at Virginia Tech.

Since 1998, Aning has worked in both MSE and in Engineering Education (EngE). In the fall of 2005, with the support of COE Dean Hassan Aref, Alex returned full time to MSE. While serving in the EngE department, Alex maintained ties with MSE, and in 2004 he became chairman of the newly-formed undergraduate MSE recruitment committee. Its goal is to increase new enrollment to approximately 30 students per year, leading to an eventual total undergraduate enrollment (sophomores through seniors) in the department of around 90. In just his first year, sophomore enrollment has increased to 29, up from values of approximately 20 or less in recent years. Alex attributes this rise to individual attention. Both Alex and David Clark, MSE department head, make a point of personally contacting potential students. "We do a lot of one-on-one contacts through email or taking

students out to lunch. I think that was a major key." According to Dr. Clark, Aning's approach to recruiting "is multifaceted, focusing not only on numbers but also on student quality, diversity, and character."

Clark also praised Aning's involvement with the MSE weekly graduate seminar program, which is designed to provide faculty and students with access to prominent colleagues from the materials science and engineering profession. The program also gives graduate students valuable speaking and presentation experience. Through Dr. Aning's efforts, "the seminar series has been highly successful in all of its objectives," said Dr. Clark. "Plus, it has provided excellent visibility for MSE, giving external colleagues the opportunity to learn more about our program and the successes that it has recently enjoyed."

Alex is interested in increasing diversity in the undergraduate and graduate programs. "Basically, I use all kinds of matrices to study this." For example, "we have a relationship with Morgan State, a historically black university, through collaborative research and for recruiting minority engineering students into the graduate program." Toward this end, there is now one student from Morgan State in the graduate program. In 2001, Aning traveled to Ghana, and as a result of that visit, Ted Asare entered the MSE graduate program.



Currently, Aning is rebuilding his research program with the help of graduate students Niven Monsegue and Kai Zhang. "My first four years here were difficult," Aning said, recalling the lack of research facilities for metals. "I had to go to UVA to do certain very simple things and it made it very difficult to get research proposals sponsored." When David Clark came on board as the department head, he encouraged Aning to return full time

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New Laboratories Will Benefit Researchers Across the University

MOCVD Laboratory

The ECE/MSE metal-organic chemical vapor deposition (MOCVD) laboratory, located in Hancock Hall, will soon be operational. This \$2.5 million facility will enable researchers to build semiconductor materials with precise control of thickness and composition at the atomic level. "We can build very complex structures out of individual layers," said Associate Professor Louis Guido, director of the new lab.

The Aixtron MOCVD system, the centerpiece of this new laboratory, can be used to synthesize semiconductor alloys and heterostructures containing elements from columns III and V of the periodic table. These semiconductor materials can be used to construct a variety of devices including electronic amplifiers operating at high power and high frequency and lasers and photodetectors covering the ultraviolet-to-infrared portion of the electromagnetic spectrum.

The MOCVD laboratory is the newest addition in the College of Engineering microelectronics capabilities. "The capabilities of this laboratory, combined with the upgrade of our cleanroom micro-



Profs. Louis Guido & Guo-Quan Lu, both jointly appointed in MSE & ECE, in MOCVD lab.

fabrication facility, will put Virginia Tech researchers in a position to compete and do research at a new level," Guido said. These experimental facilities will enable research from molecules-to-devices in important areas such as chemical and biological sensing, electronics and photonics, and energy and environmental systems.

Electron Microscopy Laboratory

An electron microscopy lab (EML) is under construction as part of the Advanced Materials Characterization Facility (AMCF), which is one component of the Institute for Critical Technology and Applied Science (ICTAS) initiative. Scientists and researchers across several departments and colleges will benefit from this new lab. The key piece of equipment for the lab is a state-of-the-art

Department News

FEI Titan 80-200, Virginia Tech's new High-Resolution Analytical Field-Emission Scanning/Transmission Electron Microscope. "Recent technological advances in the field of electron microscopy have increased the spatial resolution into the sub-Ångstrom range, the energy resolution in the sub-eV range, and the sensitivity to resolve single atoms," said Dr. Joerg Jinschek, manager of the new lab. The Titan S/TEM has been designed to provide the ultimate in stability, performance, and flexibility for corrector and monochromator technology and applications.

This will be a service lab that will benefit researchers across the university in such areas as biological sciences, geosciences, even veterinary medicine, as well as the engineering disciplines. MSE Professor Bill Reynolds was instrumental in making this Electron Microscopy Lab a reality and in bringing Dr. Jinschek to Virginia Tech to set up and manage the lab. "Atomic scale analysis plays a unique role in discovering how structures function on the nanoscale," said Jinschek. The EML lab will include a sample preparation facility and a computer room for image analysis, processing, and simulation.

Engineers Design Composite Bracing System for the Virginia Tech Athletic Department

Brian Love

Just three weeks after fracturing a bone in his forearm, the football Hokies' star tailback, Cedric Humes, was able to return to the line-up in time to play Boston College.

Last October, the first prototype composite braces for ulna fractures were constructed by a unique alliance that included Virginia Tech's Athletics and Training Departments, Virginia Tech's College of Engineering, and the Virginia Tech/Wake Forest University School for Biomedical Engineering and Sciences. After Humes was injured during the Marshall football game on October 8, Mike Goforth, team trainer for the

Tech football team met several times with the MSE/ESM 4574 Biomaterials class being taught on campus through Tech's College of Engineering and the linked VT/WFU School of Biomedical Engineering and Sciences (SBES). Brian Love, professor of Materials Science and Engineering and instructor of the class, challenged the students in the class to design an alternate bracing system that was much stiffer than the current polypropylene molded structures. Their findings were organized and distributed to the Athletic Department for future evaluations. Among the suggestions was a



Virginia Tech's Cedric Humes (32) stiff-arms Boston College's Taji Morris (29) during the first quarter in Blacksburg, Va., Thursday, Oct. 27, 2005 (AP Photo/Chuck Burton).

uniaxial polypropylene/carbon fiber composite sheeting made by the Fillauer Company of Chattanooga, Tennessee. Since this sheet was made from the same matrix as the original bracing materials and

Humes continued next page

Department News Continued

Humes continued

sample materials sent from the company, it was feasible to mold prototypes from conventional molding equipment. Two prototypes were made, one as a bi-directional laminate and a second as a uniaxial laminated composite. The resulting stiffness and strength of the laminated structures had not been fully evaluated by game time, but qualitative testing had shown that these structures were demonstrably stiffer than the current commercial devices already available.

With this project being taken up within SBES, the goal is to share the results with trainers at our sister school at Wake Forest. Further bracing enhancements may eventually evolve from the efforts of these students. ❖

The Virginia Tech **Materials Science and Engineering Department** was ranked 14th among U.S. materials programs in the 2006 *US News & World Report* rankings published in August. Earlier, *US News* ranked the MSE graduate program 26th among U.S. materials graduate programs. ❖

MSE assistant professor **Peizhen Kathy Lu** has been awarded a Ralph E. Powe Junior Faculty Enhancement Award from Oak Ridge Associated Universities. The award will advance Dr. Lu's research to add electrical conductivity to ceramic materials by incorporating carbon nanotubes. ❖



Dr. Joerg Jinschek (MSE and GEOS) has coauthored a paper selected as the "Editor's choice" in the January issue of *Physical Status Solidi (a)*, and a figure from the article was selected for the cover of that issue. To read more, visit: www3.interscience.wiley.com/cgi-bin/abstract/112224133/ABSTRACT ❖

The Materials Science and Engineering Department Welcomes New Faculty this Fall

Sean McGinnis
Senior Research Scientist



Specialization: *Green engineering, sustainable manufacturing processes, design for environment, thin film deposition and characterization, and optical thin films.*

Dr. Sean McGinnis joins the MSE and the Biological Systems Engineering (BSE) departments as a jointly appointed Senior Research Scientist. He will direct the Green Engineering program, which is now administered by the two departments for the College of Engineering. For the past seven years he has worked in Roanoke, Virginia, at Johnson & Johnson's Spectacle Lens Group as a research scientist and R&D coating group manager. Prior to this, he worked as a process engineer in the area of sputtered magnetic thin films at Intevac, Inc, in Santa Clara, California. He also held a

postdoctoral appointment at Uppsala University, Sweden, in the Department of Inorganic Chemistry with research on fullerene and metal carbide thin films.

Dr. McGinnis received bachelor's degrees in both chemical engineering and MSE from the University of Minnesota and master's and doctorate degrees in MSE from Stanford University. His expertise is in thin film deposition methods and characterization with a research focus on sustainable manufacturing processes, green engineering, and design for the environment.

Joerg Jinschek
Research Assistant Professor



Specialization: *Advanced transmission electron microscopy (TEM) techniques, phase contrast microscopy, Z-contrast microscopy, electron beam spectroscopy, focused ion beam techniques, solid state lighting, and thin film deposition.*

Dr. Joerg Jinschek will be the manager for the new Electron Microscopy Laboratory, part of the planned Advanced Materials Characterization Facility within the Institute for Critical Technology. Jinschek spent the last few months prior to coming to Tech as a guest scientist at the Collaborative Research Center of the German Research Society and at the University of Ulm, Germany. During the four years prior to this invitation, Jinschek was a postdoctoral researcher at the National Center for Electron Microscopy (NCEM) at the Lawrence Berkeley National Laboratory and at the MSE Department at the University of California, Ber-

keley. During part of that time, he was also the Feodor-Lynen Fellow of the Alexander von Humboldt-Foundation of Bonn, Germany.

Jinschek received his master's and his Ph.D. in physics from the Friedrich-Schiller University of Jena, Germany, in 1997 and in 2001, respectively. Included in his professional service activities, he was a co-organizer of the "First German-Japanese School for Convergent Beam Electron Diffraction" meeting at the Institute for Solid State Physics of the Friedrich-Schiller University. Publication credits include 15 invited presentations, 40 conference papers, and over 20 papers in peer-reviewed publications.

Last November, **Langley Professor Kathryn Logan** was invited to give a lecture as part of the NASA Langley Colloquium and Sigma Series Lectures. She is the first



Langley professor honored with an invitation to speak, joining the distinguished ranks of lecturers that have included Jacques Cousteau, Carl Sagan, Isaac Asimov, and Alex Haley, to name a few. Logan's lecture, entitled "Nature, Fireworks and Multifunctional Aerospace Materials," was well received by the NASA audience as well as an evening public audience co-sponsored by the Virginia Air and Space Museum, held at their 400-seat IMAX auditorium. To read more about the lecture series or to review Dr. Logan's talk, visit

<http://shemesh.larc.nasa.gov/Lectures/>

<http://shemesh.larc.nasa.gov/Lectures/OldColloq/c-051103.htm> ❖

The 2005 TMS Champion H. Mathewson Award for best paper was presented to **Dr. Bill Reynolds**, along with his co-authors James M. Howe of the University of Virginia, and Vijay K. Vasudevan of the University of Cincinnati. The authors were recognized for "Static and In-Situ High-Resolution Transmission Electron Microscopy Investigations of the Atomic Structure and Dynamics of Massive Transformation Interfaces in a Ti-Al Alloy," *Metallurgical & Materials Transactions*, vol. 33A. Reynolds has recently been appointed Founding Director of the Advanced Materials Characterization Facility. ❖



Dr. Norm Dowling received the Fatigue Achievement Award for 2005, presented by the ASTM International Committee E08 on Fatigue and Fracture. Dowling was recognized for his

contributions to the field of fatigue of materials. Dowling has also recently completed the 3rd edition of his eminently popular *Mechanical Behavior of Materials* text (Prentice Hall, 2005, ISBN 0-13-186312-6). The text is used by over 50 departments nationally and many more internationally. ❖

During the 2005 AAES Banquet (American Association of Engineering Societies), **Dr. George G. Wicks**, MSE department Advisory Board member, received the "Joan Hodges Queaneau Palladium Medal." He was recognized for "playing a crucial role in designing the engineering solution to nuclear waste containment in the U.S. and globally through his work as a senior level researcher at the Savannah River National Laboratory." ❖

Dr. Celine Mahieux (Ph.D. MSc, 1999) has recently completed and published *Environmental Degradation in Industrial Composites* (Elsevier, 2006). Celine is the Director for Change Management of the Power Sector of ALSTOM Power Systems. Her husband, Jon Medding (BS MSE, 1994; MS MSE, 1996) is with ABB High Voltage Products in Wettingen, Switzerland. ❖

Dr. Steve Kampe was recently appointed associate department head for the MSE department. He will provide oversight for both the undergraduate and graduate programs. ❖



Dr. Rick Claus, associate director of the Applied Biomedical Center at Virginia Tech and director of the Fiber and Electro-Optics Research Center, was one of three Virginia Tech professors to receive a 2005 Virginia Outstanding Faculty Award (OFA). This award program is administered by the State Council of Higher Education in Virginia (SCHEV). An OFA award is the Commonwealth's highest honor for faculty at Virginia's

public colleges and universities. The award "recognizes the finest among Virginia's faculty at our institutions of higher education for their superior accomplishments in teaching, research and public service," said SCHEV Executive Director Daniel J. LaVista. ❖



Last fall, **Paul Huffman**, on behalf of the American Foundry Society, Piedmont Chapter, presented College of Engineering Dean Dick Benson with a check for \$10,000 in seed money for the proposed Virginia Tech FIRE (Foundry Institute for Research and Education) program. The program includes plans for a research and teaching facility to increase awareness of the metal castings industry. VT FIRE will be administered by the Materials Science and Engineering Department. To learn more, visit



<http://www.mse.vt.edu/VTFire.html> ❖

David Clark's research group has been busy attending to the business of editing conference proceedings. *Microwave Solutions for Ceramic Engineers* (American Ceramic Society, March 2006) was edited by Clark, Senior Research Associate **Diane Folz**, and MSE graduate students **Carlos Folgar** and **Morsi Mahmoud**. The book is a multi-author compilation that discusses the uses of microwave energy as a tool for processing ceramic materials. ❖

Diane Folz (MSE, VT) and R.L. Schultz (Corning, Inc.) served as co-editors of *Microwave and Radio Frequency Applications* (Microwave Working Group, March 2006), comprised of the invited contributions to the Fourth World Congress on Microwave and Radio Frequency Applications, November 2005, Austin, Texas. ❖

MSE is OUTSTANDING in 2006

Students of MSE have accomplished something rare and remarkable this spring--a near-sweep of the student recognitions that are awarded annually by the college, graduate school, and alumni association. Mike Willemann (MSE '06) has been named the 2006 Outstanding Senior in the College of Engineering, awarded by the Virginia Tech Alumni Association. Andrea Hill, a 2003 MSE grad and a project engineer for NanoSonic, Inc., has received the 2006 Outstanding Young Alumna Award, also presented by the Alumni Association. Ben Poquette received the 2006 Outstanding Graduate Student Service Excellence Award given by the Virginia Tech Graduate School. Finally, Navin Manjooran has received the 2006 Outstanding Graduate Student Award from the College of Engineering and the Virginia Tech Graduate School, as well as a 2006 Outstanding Graduate Student Commendation Award, also from the graduate school.

Obviously, when it comes to department size, smaller just might be outstanding!

Andrea Hill Named Outstanding Young Alumna



When Andrea (Byrnside) Hill was a sophomore in high school, her algebra/trigonometry teacher announced that Andrea wasn't smart enough to become an engineer. Undeterred, Andrea resolved to excel in the advanced math course, and when the final exam grades were posted, she claimed the top score.

Today, at age 27, Andrea has once again claimed a top score by garnering Virginia Tech's Outstanding Young Engineering Alumnus Award for 2005-06. Since graduating from Virginia Tech in 2003 with a degree in materials science and engineering, Andrea's name has appeared on 20 technical papers and 5 patents.

The patents cover a new process for manufacturing in nanotechnology and a groundbreaking material called Metal Rubber™. While not the primary inventor, Andrea's efforts in the lab have furthered the identification of a family of materials that optimize the unique qualities of Metal Rubber™, which is a highly electrically conductive and flexible elastomer. It can be strained mechanically to greater than 1000 percent of its original dimensions while remaining electrically conductive. Metal Rubber™ is a smart material, which means it will return to

its original shape and nominal conductivity. Andrea, who is the administrator for fabrication, development, and sales of Metal Rubber™ at NanoSonic, Inc., believes the material will find a niche in high technology applications in both defense and commercial ventures.

Andrea grew up in the countryside of Bedford County, Virginia, and attended Staunton River High School in Moneta. This meant a 90-minute bus ride to and from school each day. "I spent many years of my life on that bus," she recalls. "It gave me a lot of time to think, and sometimes I even did homework."

Andrea entered Virginia Tech in 1996 with a long list of accomplishments already to her credit, including a first place prize in engineering at the Bedford County Science Fair and third place in engineering at the Regional Science Fair. In addition, as a flutist, she was selected to participate in the All County and All Regional Concert Band, and she was also Drum Major for her high school marching band.

Halfway through her junior year at Tech, Andrea took a hiatus from college when she married Keith Hill and

accompanied him to Ft. Hood, Texas, where he fulfilled his term of duty in the U.S. Army. The couple returned to Tech in 2001, and Andrea completed her degree in 2003. Husband Keith is pursuing a degree in mechanical engineering and will graduate this spring.

With a resume that includes work as a research assistant and a variety of experiences in materials experimentation, Andrea was promptly hired by NanoSonic, Inc., in Blacksburg. "If anyone early on had told me I would be working in nanotechnology, I would have laughed," Andrea said. "But now I can't imagine doing anything else."



At NanoSonic, in addition to her work with Metal Rubber™, Andrea serves as the sensors group leader, where her responsibilities include managing a number of Small Business Innovation Research (SBIR) awards, Independent Research

and Development (IRAD), and non-SBIR government programs.

Aside from her engineering interests, Andrea enjoys playing her flute and designing jewelry. Andrea and Keith are building a house in the Blacksburg area.

(Article adapted from news release by Lynn Nystrom.)

MSE Grads Earn International Scholarships

For the second time in four years, an MSE senior has been awarded a Fulbright Scholarship for graduate study in Germany. **Michael Willemann** will pursue a doctorate in materials science at the Technische Hochschule Aachen, where he will research gallium nitride, a material that could be used to replace fluorescent or incandescent bulbs, creating much more efficient and reliable lighting.



Willemann credits his relationship with MSE department head David Clark with giving him an edge in his research work. "A lot of my habits as far as analytical investigation and just a general approach to research and engineering could be most attributed to [Dr. Clark]," Willemann told *Collegiate Times* campus editor, David Grant.

Also this spring, Mike was named the 2006 Outstanding Senior in the College of Engineering in recognition of his exemplary academic record, plus his participation in a wide range of extracurricular activities, including the Honors Program, CO-OP (GE), an International REU this past summer at the National Technical University in Donetsk (Ukraine), and as a student leader in the Hillcrest Honors community. Mike is the third MSE student to win this award in the last four years, following Ashley White (2005) and Erik Herz (2003). The award is sponsored by the Virginia Tech Alumni Association. ❖

Last fall, MSE 2005 graduate **Ashley White** arrived in England to begin graduate work at Cambridge University. Ashley was selected last spring to receive a British Marshall Scholarship for graduate study in materials engineering. Marshall scholars are chosen for their accomplishments as intellectually distinguished undergraduates who will become future leaders and decision makers.



From the selection of colleges at Cambridge, Ashley chose Claire College because of its strong historical musical background. Ashley is a gifted violinist as well as an accomplished materials engineer. She plans to specialize in biomaterials at Cambridge. "With biomaterials, there is a direct relationship between helping people and doing something more on the human side," which appeals to Ashley. "I like working with people. I'd like to be a professor, and biomaterials seems the most humanly compatible side of materials."

Prior to winning the Marshall Scholarship, Ashley was named to *USA Today's* All-USA College Academic First Team. She was one of 20 undergraduates selected from a field of more than 600 students nominated by colleges and universities throughout the United States. ❖

Ben Poquette is the recipient of the 2006 Graduate Student Service Excellence Award presented by the Virginia Tech Graduate School. Ben was recognized for his activities, many of which served to foster collaboration between the undergraduate and graduate student communities. Ben's role as the primary student visionary and editor-in-chief of the newly established and acclaimed *Journal of Undergraduate Research* (see article, page 13) was particularly influential in his selection for this award. ❖



Navin Manjooran received a 2006 Graduate Student Service Commendation Award from the Graduate School. Navin was cited for his numerous activities, including for his role as the Board of



Visitors student rep, and as a member of the founding board of JUMR. ❖

Fifteen MSE students and faculty representing MEPS and Materials Advantage traveled to Washington, D.C., on March 28-29 to participate in Congressional Visits Day. Sponsored by the Science, Engineering and Technology Working Group (SETWG) of which the Federation of Materials Societies (FMS) is a member, the Virginia Tech group joined hundreds of scientists and engineers representing dozens of professional societies from across the U.S. to meet with several senators and congressmen or their staffs to advocate federal support for fundamental research in sciences and technology.



The VT group visited Representatives Rick Boucher (D-VA, photo left); Jim Moran (D-VA), Frank Wolf, Virgil Goode, Eric Cantor (R-VA); Harold Ford (D-TN); Senators Jay Rockefeller (D-WV), Herbert Kohl and Russel Feingold (D-WI), Lamar Alexander (R-TN). ❖

In March, four MSE graduate students traveled to Jonesville, N.C., to conduct a series of gravity experiments--skydiving! Current students **Liz Jeffers** (B.S. MSE '05, shown right), **Scott Cardwell**, **Brian Scott**, and recent graduate **Dara Fleming** (M.S. MSE, '03) each took one big step and then floated the rest of the way. This was the first jump for Liz, Scott, and Dara; Brian has logged over 200 jumps to date.



More Department News

Robert Jebson Inducted into Academy of Engineering Excellence

Lynn A. Nystrom

Virginia Tech's College of Engineering bestowed its highest alumni honor on Robert Jebson, a 1956 metallurgical engineering graduate, inducting him into its Academy of Engineering Excellence. Jebson began his career with the U.S. Army Corps of Engineers and moved to Newport News Shipbuilding and Dry Dock Company. After that, he spent 16 years employed with Westinghouse Electric Corporation. During his employment with Westinghouse, he led the company's entry into the manufacturing of water quality equipment, moving the Infilco Division of Westinghouse to Culpeper, Va.

After relocating to Culpeper, Jebson saw the need for a professional service company with the ability to operate and maintain water and wastewater systems. So in 1973, Jebson's vision developed into his own company, Environmental Systems Service, a professional service company with a supporting environmental laboratory.

ESS soon expanded its operations by testing milk products for the dairy industry. Since the dairy industry is one of the most regulated, almost every ounce of milk produced is tested before it enters the food sup-

ply. When a customer enters almost any Safeway, Giant or 7-Eleven store in Maryland, Virginia or Pennsylvania, chances are that Jebson's company performed some of the testing that ensures the quality of the products.

Today, after more than 30 years, the company has remained privately owned and successful. Jebson opened a second facility in Bedford, Va., in 1978, followed by another in Maryland in 1979, and a fourth laboratory was opened in Winston-Salem, N.C., in 1992. Country Water Systems, another division of ESS, was established in 1987 to specifically serve customers with water quality issues. Its client association includes Fortune 500 companies, as well as the small independent producers and all business levels in between. Even though Jebson is semi-retired today, his son, Craig, and daughter, Karen, remain with the business, playing significant roles in the management of the company.

Over the years Jebson has assumed more than his share of civic responsibilities. He has served as the Rotary Club President, and on several community bank boards. He worked diligently with economic development personnel to bring in more industry



and expand the tax base. He chaired the hospital board on more than one occasion, and was instrumental in fostering a relationship between Culpeper Regional Hospital and the University of Virginia Health Services Center for certain aspects of quality care. He has also devoted time to the Culpeper County Chamber of Commerce and the Culpeper Presbyterian Church. In 1995, Jebson was awarded the distinguished L.B. Henretty Award for outstanding community service.

Jebson's wife, Chris, shares his enthusiasm for their community. She has volunteered for a variety of community-oriented projects, one of which has been helping to provide citizens with an outstanding library. She was also a leading force in developing the annual "Lights of Love" fundraiser at Culpeper Regional Hospital.

The Jebsons are supporters of the Virginia Tech College of Engineering, joining its Committee of 100 within a few years of its inception.

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to MSE and the transfer was eventually made last fall. Aning is excited about laboratory renovations within MSE and the new facilities that are planned, such as the new Advanced Materials Characterization lab. Aning remains particularly interested in mechanical alloying and how this

process can be used to address challenges associated with the processing and application of metal matrix composites (see Research Spotlight, page 1).

The MSE department is pleased to have Alex Aning back full time. "Alex approaches all of his activities from

the point of view that they should be done because they are good for the students, faculty, department, college, and university," said Dr. Clark. "He is exceedingly generous with his time, especially for activities that support the students' development as professionals."

Exploring Materials at Virginia Tech

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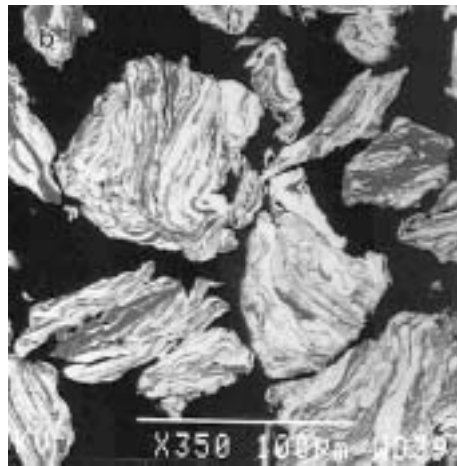
Cover design features a micrograph of a fracture surface of a MetPreg™ (Al + Al₂O₃) composite produced by Touchstone Research Labs (Tridelfia, WV); photo courtesy Jeff Schultz (Ph.D., MSE '04), MSE graduate student Joseph Butler, and former MSE students Daniel Durrbeck and Sarah Hix (both MSE '05).

the traditional challenges associated with the processing and application of metal matrix composites (MMCs). In most MMCs, high strength ceramic fibers or particles are typically incorporated as reinforcements within ductile matrices. The reinforcement imparts increased strength and stiffness, and the matrix holds the reinforcement together and provides some degree of ductility. This arrangement can create a good combination of mechanical properties; however, there are often problems associated with the close mixing of dissimilar and/or non-equilibrium phases. Primary problems typically include poor chemical bonding between the ceramic reinforcement and metal matrix; debonding which occurs between constituents due to vastly different thermal coefficients of expansion, and extensive chemical reactions which occur between the reinforcement and the matrix which lead to the deterioration/dissolution and/or the embrittlement of the matrix, reinforcement, or interface.

Many of the challenges described above can be partially alleviated if the chemical and/or physical properties of composite constituents are similar. Towards this end, we are producing composites comprised of amorphous reinforcement within chemically-similar crystalline forms of the metallic matrices. Many amorphous alloys, regardless of how they are synthesized, have unusual physical and mechanical properties including extremely high hardness, high strength, and excellent corrosion resistance. However, they also tend to exhibit poor ductility, workability, and thermal stability; these have limited the opportunities to successfully apply amorphous alloys as bulk structural materials. If incorporated as isolated particles, however, amorphous metallic alloys actually offer characteristics that are similar to those of typical ceramic

and intermetallic particulates traditionally used as reinforcements in MMCs, but with the additional benefit of improved compatibility if embedded within a chemically-similar matrix. Thus a ductile crystalline matrix containing a chemically similar amorphous reinforcement will likely feature a strong bond, alleviating many major problems associated with poor bonding and/or interfacial reactivity.

Former graduate student Michael Stawovy investigated the use of amorphous Fe-W alloys as reinforcement in elemental iron matrices. More recently, graduate student Alex Wensley extended the concept in his thesis investigation by studying the use of amorphous forms of Ni-W alloys to reinforce crystalline nickel matrices.



Evolution of lamella in mechanically-alloyed Ni-50at%Ti; from A.O. Aning, Z. Wang, and T.H. Courtney, "Tungsten Solution Kinetics and Amorphization of Nickel in Ni-W Alloys," Acta Metall. 41(1), 165-174 (1993).

Production of an amorphous phase can be achieved via a variety of processing methods including rapid solidification, annealing thin elemental multi-layers, and MA. The first two are elevated or high temperature processes. MA, by contrast, is a room temperature process and

thus circumvents the inconveniences and problems associated with higher temperature processing. As such, MA is an attractive processing technique for forming amorphous phases in high melting metals. In both Michael Stawovy's and Alex Wensley's work, a two-step MA processing technique is employed in which the amorphous reinforcement is first produced by MA and then, taking advantage of MA's ability to homogeneously disperse hard particles in ductile phases, milling the mixture of the amorphous particulates with the pure crystalline iron (or nickel) to form intrinsic composite powders. The composite powders are then bulk-compacted by traditional powder processes, e.g., hot isostatic pressing (HIP). Microscopy has shown that the amorphous reinforcement particles are uniformly distributed within the matrix phase. Most of these composites exhibit strong interfacial bonding between the components and mechanical properties that are significantly improved from those of the pure metals used for the matrix. For example, the yield strength of the Ni MMC comprised of 45 volume % amorphous Ni-W reinforcement exhibited a yield stress 284% higher than that of the unreinforced crystalline nickel matrix.

Other projects in the Materials Processing Laboratory include an investigation of the simultaneous synthesis and consolidation of amorphous alloys. In this study, lamella-structured MA powders of certain alloy systems, including Ni-Ti, are compacted in a way that bulk amorphous alloys form. This work is being performed by Ph.D. student Niven Monsegue.



More Student and Alumni News

MEPS Students Excel in 2005 Engineering Week Events

Students in **MEPS (Materials Engineering Professional Societies)** made a great showing in the 2005 E-Week event. Each spring, the Student Engineers' Council plans a series of activities to mark National Engineers' Week. According to the SEC website, "Engineers offer unique opportunities for the world to expand its horizons through innovative technology and progressive thinking." National Engineers' Week was established to recognize and celebrate the many contributions made by engineers toward enriching life and advancing society.



Events scheduled during E-Week include Penny Wars, Computer Bash, Duct Tape Competition, Hybrid CarPull, Kool Aid Pong, E-Olympics, to name a few.

MEPS members were enthusiastic participants in the events and finished in the top three in several events. Thanks to the year-long support and participation of the entire MSE department, MEPS finished way ahead of the competition in the Penny Wars with 90,413 points. Sec-



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ond place went to AOE with only 6,068 points. Money raised in the competition is combined with a matching contribution by SEC of up to \$500, donated to the winning department's chosen charity. MEPS has begun a tradition of donating their winnings to fund scholarships in the MSE department. ❖



MEPS members escort loads of pennies to be counted for the Penny Wars

The **Materials Engineering Professional Societies (MEPS)** was a 2005 recipient of an Outstanding Materials Advantage Chapter Award. The award was given based on the group's activities and accomplishments during the 2004-05 academic year. These included winning the SEC E-week competition, hosting the COE tailgates, and assisting MSE faculty during freshman open house activities in the fall. MEPS students accepted the award at the annual student mixer during the 2005 Materials Science & Technology (MS&T) Conference in Pittsburgh, Pa. This is the first time a VT student chapter has won this highly competitive award. ❖

Best wishes to **Todd Heil** (MSE '01, Ph.D. '05) and **Tara Vinton** (MSE '01), who were married on August 6, 2005. The couple resides in Maryland where Tara is teaching 3rd grade in Annapolis and Todd is working for the Naval Research Lab. ❖



VT STARS and MSE

In February, 21 MSE juniors and seniors participated in the VTSTARS Family Technology Awareness Week at the Institute for Advanced Learning and Research (IALR) in Danville. The entire Professional Development II class (MSE 3884), taught by Professor **Marie Paretti**, conducted interactive demonstrations to introduce concepts in MSE to middle school and high school students. The demos included materials response to variance in temperature (ice cream and liquid nitrogen), and applications for ceramics, metals, and polymers. This outreach activity was the culmination of the service-learning component of the course. VT STARS Family Technology Awareness Week will be an annual effort aimed at alerting students in the Danville area, and their parents, to the numerous technology-oriented degree opportunities available at Virginia Tech.



Last summer, the MSE Department participated in the VT STARS summer program. Faculty and industry representatives offered courses and lab demonstrations in a variety of materials related areas. Photos depict a few of the labs featured throughout the summer program, such as polishing, metal casting, and fuel cells. ❖



A Materials Engineer Joins the Virginia Tech Formula SAE Team

LeeAnn Ellis

The Formula SAE car is a scaled down Formula One-style race car. Each year, a team of 25 seniors and about as many volunteers designs, builds, and races a new car. In the fall of 2004, Matt Brantz became the first MSE student to join the team.



Matt worked on the rear assembly for the 2005 design.

"Historically it's been purely a mechanical engineering senior design project," Matt explained. "Due to harder competition at the events and interest shown by other departments, the team is allowing other majors in the project." When Matt spoke with the faculty advisor, Dr. Mary Kasarda, she agreed that a materials engineer would be an asset to the team.

"The goal is to create a car that is limited to a 600 cc (motorcycle) engine and a 20 mm restrictor on the intake," Matt said. The completed car is entered in a Society of Automotive Engineers (SAE) competition held in Detroit each spring. A series of static and dynamics events

is offered, including a one-lap autocross, an endurance race (22 km), acceleration, braking, lateral acceleration skid pad, cost analysis, design reviews, and a presentation.

Each student on the team is in charge of one section/part of the design. Matt was responsible for the rear drive assembly, which includes the half shafts, CV joints, stub axles, and rear hubs. In addition, he provided oversight of material selection and heat treatments for all parts.

In this capacity, he met with each team member during the year to discuss their specific part and help them choose the right material. Previous designs have been improved and mistakes from those earlier designs have been corrected. The team switched from heavy ATV/VW



CV joints to lighter weight joints designed specifically for Formula SAE cars. Matt also made the decision to implement heat treatments, which allowed the team to pur-



chase annealed steel rather than normalized steel. The annealed steel is less expensive and easier to machine. The heat treatment process results in a stronger material.

In May 2005, the team traveled to Detroit to compete with 111 teams from around the world. The Virginia Tech team successfully competed in each event, the car experienced no failures, and the team impressively finished in 11th place.

For 2005-06, Matt has been working specifically on materials related areas, including material selection and heat and surface treatment. "Suspension and suspension tuning and an effective, reliable package made this car succeed in the 2005 event," Matt concluded.

Matt Brantz is from Fairfax, Virginia. He became interested in materials engineering during an MSE open house. "I like materials a lot," Matt said. He is particularly interested in materials selection and hopes to continue working with race cars after graduation. "I've always been interested in cars, and open wheel racing is the pinnacle of automotive design."

2005 & 2006 Graduate Student Honors and Recognitions

2006 Outstanding Graduate Student

Navin Manjooran

2006 Graduate Service Excellence

Ben Poquette

Gary S. Clevinger Memorial

Davis (Ben) Eichelberger

Todd Heil

2006 Knobler Graduate Scholar

Ted Asare

Hu Cao

Niven Monsegue

Ben Poquette

Junyi Zhai

Pratt Fellowship

Christopher Kessler

2005 Citizen Scholar

Davis (Ben) Eichelberger

Morsi Mahmoud

Navin Manjooran

Ben Poquette

NSF Graduate Fellowship

Matt Lynch

Satenik Harutyunyeu

**2006 Materials Science and Engineering
Bachelor of Science Degrees (Expected)**

*Timothy A. Barnhart
Matthew L. Brantz
Amy K. Ducut
Megan D. Enzinna
Diane M. Fields
Jacob D. Franklin
Peter L. Gaudreau*

*Matthew L. Hubbard
Matthew P. Hunt
Gananand G. Kini
Steven A. Kyriakides
Ethan A. Lavery
Christina K. Lee
Michael A. Modica*

*Edward R. Parker
A. Ramsey Persing
Christopher B. Story
Molly R. Tinius
Graham T. Wasilition
Michael H. Willemann
Michael G. Wooddell*

**2005 Materials Science and Engineering
Bachelor of Science Degrees**

*Douglass R. Banerjee
Nicholas C. Bell
John S. Carpenter
James G. Collins
Allison R. DiLaura
Daniel P. Durrbeck*

*Chivonne L. Evans
Christopher P. Graham
Sarah E. Hix
Jonathan C. Langman
Matthew E. Lynch*

*Elizabeth A. Marier
Robert R. Mitchell
Seth T. Price
Ryan M. Turner
Michael B. Weston
Ashley A. White*

**2006 Materials Science and Engineering
Undergraduate Awards & Scholarships**

MSE Scholarships

Alfred E. Knobler

*Brian Costello
Erica Hartsell
Michael Hunt
Elsa Mekonnen
Jennifer Mueller
Kristine Obusek
Edward Parker
Kristin Patterson
Alexander Scott
Molly Tinius
Chelsey Zacherl*

John H. Kroehling

*Vincent Caluori
Daniel Etter
Matthew Fisher
Benjamin Gordon
Matthew Hubbard
Steven Kyriakides
A. Ramsey Persing
Christopher Story*

Ronald S. Gordon

*David Berry
Michael Willemann*

Thomas G. Stroyan

*Bradley Cline
Amy Ducut
Michael Wooddell*

MSE Faculty

Diane Fields

**College of Engineering
Scholarships & Awards**

College of Engineering

Outstanding Senior
Michael Willemann

**Presidential Campus Enrichment
Grant**

Alexander Scott

Wayne and Claire Horton

Michael Willemann

Dean's Scholarship

Chelsey L. Zacherl

Pulley-Louden

Erica Hartsell

Micron Foundation

*Megan Enzinna
Ethan Lavery*

Barnard Silverman

*Elsa Mekonnen
Molly Tinius*

William C. McAllister

Michael Willemann

Gilbert and Lucille Seay

*Steven Kyriakides
Kristine Obusek
Chelsey L. Zacherl*

William A. Hazel and Pruitt Corp.

*Diane Fields
Jennifer Mueller
Kristin Patterson
Alexander Scott
Christopher Story*

National Recognition

Fulbright Scholarship

Michael Willemann

JUMR: A Unique Cross-disciplinary Partnership of Undergraduates, Graduates, and Faculty

Sarah Lewis

In October the staff of the *Journal of Undergraduate Materials Research* (JUMR), a journal created for undergraduate student research in Materials Science and Engineering (MSE), unveiled the Alfred Knobler Inaugural Edition to the Virginia Tech Materials Science and Engineering Advisory Board.

The creation of this journal realizes Virginia Tech MSE alumnus Alfred Knobler's vision of increasing communication and cooperation between the English and MSE departments as well as among graduate and undergraduate students. This innovative concept provides an opportunity for exposing and publicizing the generally unacknowledged subject of undergraduate research.

This past year, the JUMR editorial board took on the responsibility of bringing the idea of a new research journal for undergraduate work, first proposed by research faculty, Materials Advantage Chapter Advisor Diane Folz, and Professor and Department Head Dr. David Clark, from concept to reality. In an interview for *The Knobler Review*, Ben Poquette, the editor-in-chief of JUMR remarked, "There aren't many forums for undergrads to publish their work." He also reflected, "Graduate students are gaining valuable experience, and the collaboration with the English department should serve to build a strong interdepartmental relationship while improving the quality and professionalism of the journal."

To plan and create the innovative journal, students from the departments of English and MSE formed the student editorial board. The student board members are graduate students Ben Poquette, Davis Eichelberger, Susan Holt, and Navin Manjooran along with undergraduate students Steven Kyriakides, Sarah Lewis, and Seth Price. Six Virginia Tech faculty members—English pro-

fessor Eva Brumberger and MSE faculty Christine Burgoyne, Diane Folz, Stephen Kampe, Marie Paretti, and Gary Pickrell—form the faculty editorial board, providing review and advice to the student editors. Working together, the two editorial boards shared ideas and expertise to publish the 'Alfred Knobler Inaugural Edition' of JUMR. The editorial board also worked with Dr. Brumberger's class, "Designing Documents for Print," which took on the task of designing the layout for the journal as a service project. Not only does the journal "[bridge] arts and engineering" as Alfred Knobler envisioned, but it also brings graduate students, undergraduate students, and faculty together for a common project.

The JUMR student editorial board outlined their primary goals for the journal in the inaugural issue as, "We hope that this annual publication will provide a venue for undergraduates to showcase their research, improve their technical writing skills, and be exposed to the rigors of peer-reviewed [graduate student and faculty] publishing... [and] that this periodical will be a strong voice of the research achievements of undergraduates in the field of MSE."

The inaugural edition of JUMR emphasizes the journal's connection to the Virginia Tech MSE department. However, inclusion of papers in future issues will not be limited to Virginia Tech or its MSE department. If you are working, or have recently worked, on a materials research-related project as an undergraduate, please submit a self-contained abstract, consisting of no more than 200 words, which outlines the aims,



scope, and conclusions of your work. Based on these abstracts, selected authors will be contacted and asked to provide a 2-5 page manuscript to be reviewed for publication in the next edition of JUMR. Abstracts are due each February 17. Send to: JUMR, 213 Holden Hall, Virginia Tech, Blacksburg, VA 24061 Or jumr@mse.vt.edu

For more information or to request a copy of the journal, send an email to jumr@mse.vt.edu or log onto the JUMR website at

<http://www.jumr.mse.vt.edu>

Four Named Citizen Scholars

Four MSE graduate students were named "Citizen Scholars" by the Virginia Tech Graduate School in a ceremony held in December. The Citizen Scholars Program is part of the Transformative Graduate Education (TGE) initiative introduced by the graduate school to modernize and expand the graduate experience.



The Citizen-Scholar Experience (CSE) is designed to provide opportunities for graduate students to use their knowledge and skills in real-world settings. The hope is that students will gain scholarship in service to the community, state, nation, and the world. MSE students were honored for their work on the new JUMR. They are (clockwise from top left) **Morsi Mahmoud**, **Navin Manjooran**, **Ben Poquette**, and **Davis Eichelberger**.

2004/2005 Graduate Degrees

| Student/Advisor | Thesis/Dissertation Title | Current Location |
|--|---|---|
| Doctorates Guofeng Bai/G-Q Lu | <i>Low-Temperature Sintered Silver Interconnection</i> | Post-Doc, ISE Dept. Virginia Tech |
| Jesus Calata/G-Q Lu | <i>Densification Behavior of Ceramic and Crystallizable Glass Materials Constrained on a Rigid Substrate</i> | Post-Doc, MSE Dept. Virginia Tech |
| Bryan Dickerson/Claus | <i>Organometallic Synthesis Kinetics of CdSe Quantum Dots</i> | Physics Dept., Virginia Tech |
| Todd Heil/Reynolds | <i>An Investigation of the Structural and Magnetic Transitions in Ni-Fe-Ga Ferromagnetic Shape Memory Alloys</i> | Naval Research Labs Washington, D.C. |
| Brian Hyde/Farkas | <i>Effects of Carbon on Fracture Mechanisms in Nanocrystalline BCC Iron - Atomistic Simulation</i> | Ball Aerospace Albuquerque, NM |
| Shawn Kelly/Kampe | <i>Thermal and Microstructure Modeling of Metal Deposition Processes with Application to Ti-6Al-4V</i> | Applied Res. Lab, PSU State College, Pa. |
| Daniel Kominsky/Stolen | <i>Development of Random Hole Optical Fibers and Crucible Technique Hybrid Fibers</i> | Prime Research Blacksburg, Va. |
| Martha McCann/Corcoran | <i>Effects of Surface Manipulation on the Nanomechanical Response of Gold Single Crystals</i> | Bose Products Boston, Mass. |
| Brian Okerberg/Marand | <i>Morphological Studies of Crystallization in Thin Films of PEO/PMMA Blends</i> | NIST, Gaithersburg, Md. |
| Nurdan Sankir/Claus | <i>Flexible Electronics: Materials and Device Fabrication</i> | NanoSonic, Inc., Blacksburg, Va. |
| Julie Uan-Zo-Li/Marand | <i>Morphology, Crystallization and Melting Behavior of Propylene/Ethylene Statistical Copolymers</i> | Intel Corp. Hillsboro, Oregon |
| Master of Science Ted Asare/Kampe | <i>Fabrication and Damping Behaviour of Particulate BaTiO₃ Ceramic Reinforced Copper Matrix Composites</i> | Ph.D. Program, MSE Virginia Tech |
| Yeuk Kit Cheng/Claus | <i>Hemocompatible Thin Films Fabricated by Electrostatic Self-Assembly</i> | Hong Kong |
| Zorana Dacic/Pickrell | <i>High Temperature Corrosion of Single Crystal Sapphire and Zirconia in Coal Gasification and Commercial Glass Environments</i> | Phelps Dodge Safford, Arizona |
| Frederick Ellis/Pickrell | <i>Fabrication of Random Holed Optical Fiber Preforms by Silica Sol-Gel Processing</i> | Micron Technologies Manassas, Virginia |
| Dara Fleming/Love | <i>Evaluating Bacterial Cell Immobilization Matrices for Use in a Biosensor Designed to Detect Electrophilic Toxins</i> | Rolm and Haas Christiansburg, Va. |
| David Gray/Guido | <i>Optimization of the Process for Semiconductor Device Fabrication in the Micron 636 Whittemore Cleanroom Facility</i> | Ph.D. Program Virginia Tech |
| Brian Grimsley/Loos | <i>Characterization of the Vacuum Assisted Resin Transfer Molding Process for Fabrication of Aerospace Composites</i> | Intel Corporation Hillsboro, Oregon |
| Emilio Lobato/Yoon | <i>Determination of Surface Free Energies and Aspect Ratio of Talc</i> | Magnesita, S.A., Brazil |
| Ben Poquette/Kampe | <i>Improvements in the Damping Behavior of Ferroelectric Reinforced Metal Matrix Composites</i> | Ph.D. Program Virginia Tech |
| Naigang Wang/Viehland | <i>Multiferroic Bismuth Ferrite-Lead Titanate and Iron Gallium Crystalline Solutions: Structure and Property Investigations</i> | |
| Charles Wensley/ Aning & Kampe | <i>Processing and Properties of Amorphous NiW Reinforced Crystalline Ni Matrix Composites</i> | AEGI Jacksonville, Fla. |
| Master of Engineering Yong-Seung Moon/Reynolds | <i>Micro-Electro-Mechanical Systems (MEMS): Application of a Secondary Microactuator for Hard Disk Drive and Fabrication Technology</i> | |

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tion this spring as a world class microelectronics processing facility. This was a 5-year joint initiative between MSE and ECE and was completed with a generous gift from Micron Technologies of Virginia. The lab will enable researchers to build complex nanoscale semiconductor structures with precise control. Dr. Lou Guido, Associate Professor of MSE/ECE, will be the director of the \$2.5 million lab.

Our student groups have likewise brought unprecedented recognition to MSE over the past year. Last September, the Materials Engineering Professional Society (MEPS) was awarded an Outstanding Materials Advantage Chapter Award, a first-time accomplishment by Virginia Tech. This spring, the MEPS group won overall 1st place in 2006 Engineering Week activities, the third in as many years. MEPS continued to host the college's tailgating celebrations for home football games in the fall, and sponsored a student field trip to Oak Ridge National Laboratories this February.

Particularly noteworthy this year has been the inaugural release of the *Journal of Undergraduate Research (JUMR)* by a collaborative team of MSE graduates and undergraduates and students of the English Department. The JUMR is an excellent example of faculty, graduate students, and undergraduate students successfully working together across disciplinary boundaries to create a quality product. Several professional societies, including ASM, TMS, ACerS, and MRS have featured the project in their bulletins. The inaugural issue was dedicated to Alf Knobler, whose generous and long-standing interest in the Departments of MSE and English served to nucleate the collaborative spirit from which JUMR was created.

Our faculty continue to receive recognition for the quality of their teaching and research efforts. Last spring, Dwight Viehland received the 2005 Dean's Award for Research in the college, and Gary Pickrell the Outstanding New Assistant Professor

Award. Norm Dowling received the 2005 Fatigue Award from ASTM, and Richard Claus was presented with the State Council for Higher Education in Virginia (SCHEV) Outstanding Faculty Award. Kathryn Logan, the Virginia Tech NIA Professor, was selected to present the NASA Langley Colloquium and Sigma Series Lecture entitled "Nature, Fireworks and Multifunctional Aerospace Materials" sponsored by the NASA Langley Research Center and Virginia Air and Space Center. Bill Reynolds received the 2005 TMS Champion H. Mathewson Award for best paper in *Metallurgical and Materials Transactions*.

It has been a particularly impressive year for awards presented to our students. Last spring, Ashley White was named a *USA Today* Academic All-American, a Phi Kappa Phi Scholar, and British Marshall Scholar (now pursuing graduate studies at Cambridge University in England). Mike Willemann was named Outstanding Senior in the College of Engineering for 2006, the third MSE student to receive this recognition in the last four years. Michael has received a Fulbright Scholarship to pursue graduate study in Germany next year. Andrea Hill, a 2003 MSE graduate, received the Outstanding Young Alumna Award for 2006. Ben Poquette received the Graduate School's 2006 Outstanding Graduate Student Excellence Award, and Navin Manjooran was named the 2006 Outstanding Graduate Student in the College of Engineering.

While our record of achievement over the past year has been exceptional, there are many more exciting changes and opportunities on the horizon. Bill Reynolds has been appointed Founding Director of the new Advanced Materials Characterization Facility (AMCF). He will also work with Paul Huffman (President, Dominion Metallurgical, Inc.) and Carlos Suchicital on the VT FIRE (Virginia Tech Foundry Institute for Research and Education) Initiative. You'll be hearing much more about VT FIRE in the future. The 15,000 ft² Advanced Materials Characterization Facility (AMCF) is scheduled to

open in spring 2007. Steve Kampe has been appointed Associate Department Head and will oversee both the graduate and undergraduate programs.

MSE is a participant in a new cross-disciplinary initiative underway in the area of bioprocessing. The departments of MSE, Biological Systems Engineering (BSE), Wood Science, and Chemical Engineering (CheE) have joined forces to hire nine faculty to build a research program to synthesize biofuels and hi-tech materials from agricultural crops and forest products. We anticipate that two of these positions will reside in MSE (one will be shared with CheE) and will have a strong focus in polymers and bio/nano materials.

Finally, it is with mixed emotions that we wish LeeAnn Ellis our best as she leaves MSE and the editorship of this newsletter. LeeAnn has been with MSE since 1993; first, as editor of the *CIT Ceramic News*, later as editor of *The World of Materials*, and finally as the editor of the present newsletter. She has done a terrific job over the years; I can think of few newsletters of comparable quality and readability. LeeAnn additionally produced a variety of informative materials of exceptional quality for MSE – *The Skipper Story*, *The Knobler Review*, and *New Faculty* announcements. I have observed that everyone really likes LeeAnn; she has been a valued colleague and friend to MSE. We will miss her. Christine Burgoyne, assistant director for the MSE Communications Program, has agreed to assume editorial duties for the newsletter.

In closing, I want to state that MSE is in excellent health. With outstanding faculty, staff, and students, and state-of-the-art facilities coming on line, we are positioned to "Invent the Future." Thank you for your continued support. I also remind you that contributions can make a difference between a good program and an excellent program. When you make gifts to Virginia Tech, consider earmarking them for MSE. Thanks!

Head's Up!

David Clark

It's a good time to be an MSE Hokie!

The MSE Department has had a banner year, by any measure. It has been a year of accomplishment and high recognition for our students, faculty, and the department. The department continues to grow in terms of the number of students and faculty, as well as in the quality and innovativeness of its programs and activities. I hope that you are as proud of your association with MSE as I continue to be.

Our academic programs are receiving unprecedented recognition from peer faculty and administrators. In August, *U.S. News and World Report* ranked MSE 14th among materials programs in the U.S. based on surveys submitted by deans and faculty at peer institutions. This represents the first time MSE has appeared within the *U.S. News* ranking since the mid-1990s. Earlier in the year, *U.S. News* ranked the MSE graduate program 26th in the country. This is consistent with the high praise the department continues to receive from former students and their employers in



alumni surveys administered yearly and from our advisory board who most recently met in October. We continue to be extremely grateful to our board of distinguished program stakeholders for their time and invaluable guidance, advice, and advocacy on our behalf. The increased recognition of our academic programs is a testament to the outstanding efforts of our faculty and advisory board, and to the quality of our students and alumni.

Like many materials programs nationally, undergraduate enrollment in MSE experienced a slight decline in the early years of the decade. After a fair bit of thought and efforts to better define to prospective students what makes our discipline unique and special, I am pleased to report record enrollment in our present sophomore class. Thanks to the recruiting leadership of Professor Alex Aning, a class of 29 sophomores enrolled in the introductory materials course in the fall, a whopping 50% increase over recent classes. A single class of 29 students is certainly a modern-day record, and likely close to an all-time high. Presently, MSE has over 70 students in its undergraduate program, well above the national median for materials programs.

The department also continues to grow in terms of its faculty. In October, Dr. Sean McGinnis joined MSE in a joint appointment with Biological Systems Engineering (BSE) to administer and lead the Green Engineering Program on behalf of the college. In his first year, he has been busy and productive in his attempts to update and reinvigorate Tech's nationally-recognized green engineering program. His efforts have included establishing collaborations with the numerous other activities on campus that are complementary to the goals of the college's program; for example, with the solar decathlon team in the College of Architecture and the sustainability core curriculum initiative. Dr. Joerg Jinschek joined Virginia Tech as a Research Assistant Professor within the interdisciplinary Institute for Applied Technology and Sciences (ICTAS), with a joint appointment in MSE and Geosciences. Joerg has supervised the installation and certification of the recently acquired FEI Titan 80-200 transmission electron microscope that will serve as the centerpiece of the Advanced Materials Characterization Facility (ACMF).

I am also pleased to report that the MOCVD laboratory has been completed and will begin opera-

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