Formerly **The World of Materials**

Exploring Materials

at Virginia Tech

Spring 2001, Volume 6, Number 1

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

In this issue...

Patricia Dolez

Barnacles present unique challenges for submerged surface preparation

Marine Adhesives Research Expands to Evaluate Submerged Surface Preparation Methods

Brian Love

Brian Love, Associate Professor in MSE, has been working with several graduate students and staff over the last 5 years to develop acrylic adhesive resins for the Office of Naval Research (ONR) that have use for marine surfaces. These photo-activated systems have strong potential to work faster and more effectively to fixture materials and structures together in marine environments. These resins can cure over a range of temperatures, including polar conditions. Armed with functional resins that crosslink and gel within minutes between 0 and 40°C, members of Brian's research group are working to identify suitable cleaning methods that can prepare surfaces underwater for subsequent adhesive bonding. Most submerged marine surfaces are fouled with bacterial growth, slime and barnacles. To fixture to a submerged surface, calcified residues and biomass must be removed to allow for subsequent adhe-

Continued page 2

A New Look for MSE

With this edition, we are introducing the new and improved Materials Science and Engineering newsletter. **The World of Materials** is now **Exploring Materials at Virginia Tech.** Let us know what you think of the new format. *mse@vt.edu*

Virginia Tech

Discover what we're made of

Research

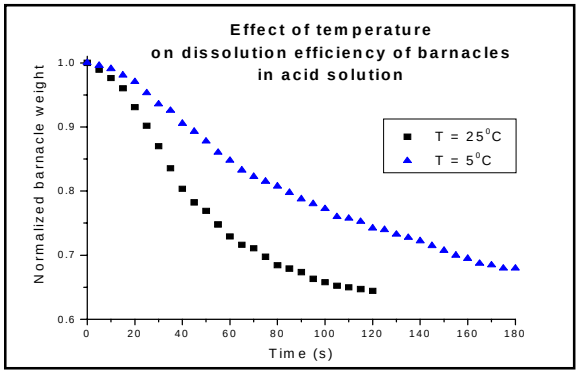


Figure 1. Barnacle dissolution weight loss as a function of time at two temperatures

Marine Adhesives continued

sive attachment. Dr. Patricia Dolez, in conjunction with Adam Goff, a graduating senior in MSE, has identified several acid cleaner mixtures that can rapidly dissolve the inorganic component in barnacles leaving the bioadhesive proteins that can be removed with a brush or other scraping tool. Drs. Love and Dolez have been performing a series of barnacle dissolution experiments to gauge acidic activity as a function of temperature (Figure 1) with the hope of being able to dispense these acids into a viscous fluid that will remain attached to a submerged surface. Assessments of how much impact these cleaners will have on inorganic substrates will be required to fully understand how selective these are for marine surface preparation procedures.

Brian Love joined MSE in 1993. He has published more than 20 papers relating to structure/property relationships in polymers, adhesion science, and crystallization and has applied this to structural, electronic, and biomedical applications. Originally from Wisconsin, he earned his B.S. and M.S. from the Universityof Illinois at Urbana, and, and he received his Ph.D. at Southern Methodist University.

"Fuel cell technology could lead to the next industrial revolution."

This quote by Ron Kander introduces an article in the magazine, *Research Virginia Tech*, published this semester. Featured in the article is a discussion of fuel cell research in which Ron Kander, Sean Corcoran, and graduate student Julie Dvorkin are participating, along with several other students and faculty across the university community. Julie is one of five Virginia Tech students to receive a fellowship from GATE, the Graduate Automotive Technology Education center, a U.S. Department of Energy grant which funds the Virginia Tech Center for Automotive Fuel Cell Systems, as well as funding the fellowships. Kander and Dvorkin are working to evaluate polymer material performance in fuel cells, and Kander is involved in several other areas of fuel cell research. For more details, you can read the article at: *www.research.vt.edu/framed/framedresmag.html*; choose "Current Edition," then select "The little cell that could power an energy revolution." ◆

New MSE Research

Commonwealth Technology Research (State of Virginia) has agreed to fund a grant to establish a Center for High Performance Manufacturing. The grant begins July 2001, totalling $4.3 million over three years. Principal Investigators are R. Kander, F. Chen (ISE), and A. Loos (ESM).

Optimization of Photocurable Adhesives for Underwater Applications/Development of Fieldable Underwater Surface Preparation Systems; Principal Investigator: B. Love; Sponsor, Analysis and Technology, Inc., $67K, 12/20/00 - 9/28/01

Photocurable Adhesive Packaging and Compositional Stability; Principal Investigator: B. Love; Sponsor: Analysis and Technology, Incc; $32K, 8/2/00 - 3/30/01

Multimedia Courseware for Microelectronics; Principal Investigators: R. W. Hendricks, J.R. Heflin, J.A.N. Lee; Sponsor: National Science Foundation, $20K, 5/15/00 - 9/30/02

Thermomechanical Processing of Advanced Alloys; Principal Investigator: S. Kampe; Sponsor: Office of Naval Research; $82K, 5/1/00 - 4/30/03

Acquisition of Computation/Visualization for the Atomistic Simulation Laboratory; Principal Investigator: D. Farkas; Sponsor: Office of Naval Research, $104K, 4/1/01 - 3/31/02

Composite Powders for the Selective Laser Sintering Process; Principal Investigators: R. Kander, C. Suchicital, Sponsor: DTM Corp., $50K, 8/1/00 - 7/31/01

Materials Compatibility and Processing Protocol Determination; Principal Investigators: G.Q. Lu, C. Suchicital; Sponsor: Maida Development Co., $25K, 7/1/00 - 1/31/01

Evaluation of Interconnect Technologies for Power Devices; Principal Investigator: G.Q. Lu; Sponsor: Orthodyne Electronics; $72K, 9/8/00 - 11/30/01

Low-Voltage GaAs-Based Hetero-junction Bipolar Transistors; Principal Investigator: L.J. Guido; Sponsor: Kopin Corp.; $150K, 1/01/00 - 12/31/01

Processing and Integration of Magneto-optic Current Sensors in Power Electronic Modules; Principal Investigator: G.Q. Lu; Sponsor: Airak, Inc.; $80K, 10/01/00 - 4/30/02

Appreciating the Skills that MSE Offers

Stephen Kampe

I have often expressed my belief that students of MSE, at Virginia Tech and elsewhere, are traditionally provided an extraordinarily large amount of knowledge as they move through their curriculum but are given relatively limited opportunities to utilize this knowledge in a way that would demonstrate the skills this knowledge affords. As faculty, we tend to utilize the traditional approach to teaching MSE subjects; that is, lots of "why" materials behave as they do, with little of "how" to implement this knowledge in a detailed manner in a realistic engineering environment.

The hypothetical example I often state is that of a conversation within a job interview, where the interviewer (likely not to be degreed in MSE) asks (often genuinely) the student and prospective employee how a graduate of MSE can help his/her organization. The MSE student responds that he/she is an authority on materials, having just spent the previous three years rigorously learning the fine details of metals, ceramics, and polymers. The attentive recruiter might follow-up, "We use A573 steel for application *xyz*; do you think that is an appropriate use for that material?" I'd like to think that our students, as the authority on materials they just claimed to be, could and would offer an immediate opinion. More likely, however, they will have no idea what A573 steel is and would say as much. In the discomforting environment of the job interview or perhaps later with their boss, it is difficult to predict the impressions that are created in such a situation. One might also be inclined at this moment to envy the students of our colleague departments who could state tangible-sounding skills such as, "I specialize in design," or "I am an expert in Finite Element Analysis." The unapologetic reality for MSE students, however, is that while they may not know exactly what A573 is at that moment, they do indeed know a lot about it, about how it works, and about how it should be used.

MSE instruction traditionally focuses on the "why" of material behavior.

Within the MSE curriculum at Virginia Tech, I attempt to address the "phantom-skill" dilemma through a concept-plus-skills approach to the subjects that I instruct. I currently have the opportunity to teach three subjects to our MSE students, all during their senior year.

In Materials Selection and Design (MSE 4054), I purposely avoid the more common "general knowledge" approach to this subject, relying instead on a selection-index-based method, which can be quantifiably used to guide the selection of materials for applications with stated requirements and constraints. While quantitative and tangible, the technique nonetheless delineates how a detailed knowledge of materials (which a student of MSE offers) is necessary and invaluable within the interdisciplinary nature of the design experience.

Detailed knowledge of materials is invaluable in the design experience.

In Strength and Fracture (MSE 4354), students learn, for example, how alloy strength is derived from the fundamental, or first-principle, mechanisms involving dislocation motion. Constitutive equations that predict a magnitude of strengthening, given certain microstructural and alloy characteristics, are taught which can be utilized as a tool, or skill, to guide alloy design or to facilitate a working appreciation for alloy use. While the students may not recognize (or appreciate) it at the time, the use of these equations provides a direct quantifiable link between their science-based knowledge of the submicroscopic structure of materials (e.g., the magnitude of the Burgers vector – a perennial favorite) and the macroscopic properties that their colleagues require and utilize in design.

Similarly, in an elective Composite Materials course, students learn how the identity and geometric details of the constituents can be quantified to guide the conception and/or understanding of a composite system being envisioned for a stated purpose or application. In each of these examples, I attempt to link broad-based, science-derived concepts traditionally unique to the MSE curriculum to specific and tangible engineering-relevant constitutive *skills*.

If our students can leave Virginia Tech with an ability to associate what they know is present at high magnifications to whatever images or situations they are asked to view at lower (or without) magnification, then they will have indeed grasped a skill that will make them a valuable and versatile contributor on any engineering team.

For those of you who have read this entire article and are still curious (or insecure), A573 steel refers to an ASTM-specified carbon steel in plate form requiring toughness at atmospheric temperatures. But you already knew that, right?

Stephen Kampe is an Associate Professor in the MSE Department at Virginia Tech. He joined the department in 1992 following several years as a Scientist and Principal Investigator at Martin Marietta's (now Lockheed Martin) Corporate Research Laboratories near Baltimore, Maryland. Dr. Kampe maintains an active research program in the areas of advanced processing methods, metal matrix composite synthesis, and the mechanical characterization of primarily metallic-based materials. During his eight years at Virginia Tech, he has taught 11 different courses. In 1994, he received the Sporn Award for excellence in teaching undergraduate engineering subjects. Dr. Kampe received his B.S., M.S., and Ph.D. degrees in Metallurgical Engineering from Michigan Technological University.

Department News

New Facilities and Offices for Materials Science and Engineering

New MSE Space in Collegiate Square

In March, several MSE faculty and graduate students moved into 6000 square feet of office space being leased in Collegiate Square, a new building located at the corner of Prices' Fork Road and Turner Street. MSE Professor Sean Corcoran explained that the biggest reason for the move was the need for space to enhance growth. The MSE Department currently maintains labs in Holden Hall and also in Hancock Hall. By leasing this new space, Corcoran explained, the department has been able to consolidate some labs while freeing up other space.

A full-sized conference room has also been included in the new facility, thus filling a need for the entire department. "The idea is that we aren't just an outpost," Corcoran said. The entire department can gather at the Collegiate Square facility for faculty meetings and department seminars. Partitions were installed to allow for smaller meeting rooms as well. Graduate student space was another growing necessity for the department. Now, new graduate students have a clearly defined space to move into, rather than having to make room in a research lab for them to sit.

Some smaller lab equipment has been moved to the new building. Professors Love and Kander have moved their characterization and polymer equipment over so that it is consolidated into one lab, thus enhancing efficiency. In addition, Dr. Corcoran's Scanning Probe Microscopy (SPM) and Nanomechanics lab was moved to Collegiate Square. This lab includes an atomic force microcope, a scanning tunneling microscope, and a nanoindentor.

Collegiate Square

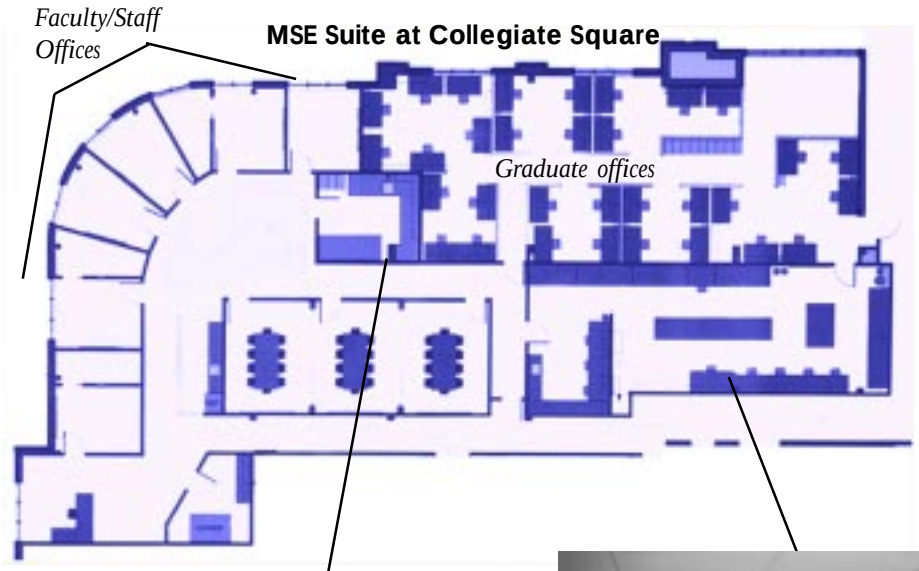
Faculty who made the move, along with Sean Corcoran, were Ron Kander, Brian Love, and Bill Reynolds. Susette Sowers, program support technician for Kander, and Love's postdoctoral research associate, Patricia Dolez, also moved.

Cleanroom Operational

The cooperative efforts of the MSE Department, the ECpE Department, and the Virginia Microprocessor Consortium have resulted in the creation of an 1800 square foot cleanroom at Virginia Tech. Located in 636 Whittemore, the cleanroom will host about 500 students each year from various disciplines. Students will learn the basic unit operations of microchip fabrication as well safety and cleanroom protocols.

The facility, while designed as a Class 10,000 cleanroom, will operate as a higher level, Class 1000, facility to prepare students for the transition to an advanced research facility or to the semiconductor industry where more rigorous standards are followed.

Professor Robert Hendricks played a leading role in bringing this project to fruition. To read more about this new fa-



Matt Gordon works with the AFM in the SPM lab.

New polymer lab at Collegiate Square

cility, as well as the newly developed microelectronics curriculum, visit Dr. Hendricks' publications webpage: *www.mse.vt.edu/faculty/hendricks/publications/publications.html*. This new facility was recently featured in the February issue of CleanRoom. To view this article online, go to the Archives section at *cr.pennet.com/home.cfm* and search for the February 2001 issue. ◆

Bunny-suited students and faculty work inside new cleanroom (photo courtesy Bob Hendricks)

David Clark Honored as National Institute of Ceramic Engineers Fellow

This spring, Dr. David Clark was named a Fellow in the National Institute of Ceramic Engineers (NICE), an honor bestowed upon "individuals who have shaped the future of ceramic engineering and of the National Institute of Ceramic Engineers through broad and productive scholarship and by notable achievements and service to the Institute." Dr. Clark was inducted at the Annual Meeting of the American Ceramic Society, held in Indianapolis in April. He was recognized as being a co-founder of the NICE Student Congress (1989); having served two consecutive terms as NICE Trustee on the American Ceramic Society Board (1995-2001); renewing NICE participation in the American Association of Engineering Societies; and for bringing national recognition to the Institute through a nomination of Dr. Bonnie Dunbar, NASA astronaut and ceramic engineer, for the National Engineering Award in 1992 which she subsequently won. Clark was responsible for the "change" in NICE's level of activity over the past ten years to make it into the Institute of today, an active, vital organization with expanding roles in professional licensing, accreditation, national organizations, and student activities.

Dr. Clark is one of only seven NICE members to be honored as a Fellow, joining Warren Wolf (Owens Corning, Inc.), John Buckley (NASA Langley), Thomas McGee (Iowa State University), Diane Folz (Virginia Tech), Harold Stetson (Consultant) and Winston Duckworth (Battelle). ◆

Dr. Robert Hendricks was honored this spring with the 2001 Dean's Award for Excellence in Service, an award that he also received in 1996, making him one of a select few to receive two such awards. Dr. Hendricks played a key role in establishing the MSE/ESM Writing and Communications Program, and more recently he has been heavily involved in expanding the microelectronics program at Tech. Most notably, he headed up the effort to create a cleanroom for undergraduate instruction in Whittemore Hall, with plans for a larger cleanroom to be added in Hancock Hall. ◆

Prof. Rick Claus received Virginia's Outstanding Scientist Award for 2001. Claus holds joint appointments in ECpE and in MSE. He is the Director of the Fiber and Electro-Optics Research Laboratory (FEORC) at Virginia Tech. ◆

Prof. Ron Kander will leave Virginia Tech this summer to become the department head for the Integrated Science and Technology Department (ISAT) at James Madison University in Harrisonburg, Virginia. The MSE Department wishes him well in this new and exciting endeavor.

Congratulations to Ron Kander, a poet in our midst! Ron was awarded an Honorable Mention in the 2001 poetry contest sponsored by the Poetry Society of Virginia for his "Groundhog Haiku":

Groundhog weatherman
Winter prognosticator
Shadow forecaster

◆

Claudia Rawn paid a visit Virginia Tech in April to participate in the MSE Seminar Series offered on Friday afternoons during regular semesters. Claudia earned a B.S. in MSE in 1986 from Tech. She continued her education at George Mason University and at the University of Arizona, completing a master's in 1991 and a doctorate in 1995. She has worked as a Materials Research Engineer in the Ceramics Division of the National Institute of Standards and Technology, and she also worked as a postdoctoral research associate in the ceramics department at the "Josef Stefan" Institute in Ljubljana, Slovenia. Currently, Claudia is a Research Staff Scientist in the Metals and Ceramics Division at Oak Ridge National Laboratories in Oak Ridge, Tennessee. Her seminar presentation was entitled "Neutron and Synchotron Diffraction Studies at ORNL: Potential Collaboration Between ORNL and Virginia Tech." ◆

Exploring Materials
at Virginia Tech

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On the Cover:
The cover design features a micrograph of individual crystals of titanium diboride (TiB_2) produced in-situ within a near-gamma titanium (Ti-47Al) matrix by reaction synthesis. Micrograph courtesy of Raphael Martin (M.S. '94) and Prof. Steve Kampe.

Student and Alumni News

2000-2001 MSE Scholarships

Alfred E. Knobler
Anthony G. Salamone
Sarah B. Smith
Elizabeth D. Hubbard
Grace M. Tran
Tara M. Vinton
Lisa A. Copley
Kelly Hales
April D. Williams

John H. Kroehling
Robin S. Farmer
Adam J. Maisano

American Foundry Society
Jacqueline N. Gerken
Stacey L. Sharp

Foundry Education Foundation
Christopher S. Kessler
Mark E. Zaun

Stroyan
Charles I. Beaudette
Adam C. Goff
Jeffrey D. Maciborski
Erik Herz
Shane B. Juhl
Craig R. Todd
Andrew W. Signor
Christopher Temple-Boyer

Thomas L. Leivesley, Jr.
Kelly Hales
Christopher S. Kessler

Charles W. Pryor
Adam C. Goff

MSE Faculty
Todd M. Heil

Paul E. Torgersen Leadership
Erik Herz

W. Thomas & Barbara Robertson
Lisa A. Copley

John B. Greiner
Elizabeth D. Hubbard
Adam J. Maisano

William C. McAllister
Shane B. Juhl
April D. Williams

Congratulations MSE 2001 Graduates

Charles I. Beaudette
David P. Belman
Christopher A. Boyce
Ronald G. Castle, II
Jason Dietz (12/2000)
Robin S. Farmer
Charles French
Adam C. Goff
Melinda S. Guinn
Todd M. Heil
William L. Hughes
Shane B. Juhl
David E. Kardes
Nicholas M. Katawczik
Robert P. Ladesic
Melanie B. Lashus
Benjamin S. Lepene
Anthony G. Salamone
Wesley S. Shaw
Brian C. Smith
Robert E. Smith, Jr.
Sarah B. Smith
Jason C. Snead
Christopher Temple-Boyer
Kevin S. Tingler
Craig R. Todd
Grace M. Tran
Robert E.A. Williams
Mark. E. Zaun

Shawn Kelly Receives Clevinger Scholarship

Shawn Kelly has been awarded the Dr. Gary S. Clevinger, Sr. Endowed Scholarship for 2001. This scholarship was established in honor of Dr. Clevinger in 1998 by his family. Gary Clevinger earned three materials degrees from Virginia Tech in the 1970's. The scholarship was designed to benefit graduate students pursuing materials-related disciplines who also received a B.S. in materials from Tech. In addition, each student is selected based on "scholastic achievement, good character, and demonstrated leadership potential."

Shawn completed a B.S. in MSE in 1999 and is currently in the master's program in MSE, with plans to pursue a doctorate as well. Shawn has compiled an impressive resume of service and leadership during his college career so far. As an undergraduate student, he was active in the American Society of Materials/The Minerals, Metals, and Materials Society (ASM/TMS) and the Materials Engineering Professional Societies (MEPS), holding executive positions in both. He was instrumental in starting up MEPS, which is an umbrella organization housing student chapters of ASM/TMS, ACerS, and MRS.

As a graduate student, Shawn continues to lead in MSE student activities as the president of MEPS. He has also been active in several department recruitment sessions, giving lab demonstrations and talks, as well as spending time meeting with parents and prospective students. Shawn's current research deals with heat treatment of a "laser-formed" titanium alloy. His research interests include laser processing of metals and bulk amorphous alloys. ◆

Marybeth Miceli successfully defended her master's thesis in December, and in January she joined Lucius Pitkin, Inc., in New York City as a materials engineer. She is involved in failure analysis, metallurgical testing, and nondestructive testing of civil structures. ◆

Continued on page 8

A Working Experience in Communication

The MSE Communications Program Service Project

Judy Robinson, MA

As you know, for eight years now, MSE has been home to the MSE Advanced Engineering Communications Program, which integrates instruction in writing, professional communications, and design into the curriculum. The Materials Science and Engineering Department has a deep belief in the importance of oral and written communications in the engineering profession and has developed a coordinated series of courses in which students' communication skills are carefully developed over the entire three-year curriculum beginning in the sophomore year. The program focuses on increasing students' marketability after graduation by preparing them for the discipline-specific writing and communicating they will encounter in the work place.

In the spring semester Advanced Engineering Communications II class, students are encouraged, as part of the development of their workplace interpersonal communication skills, to interact with people of a social or economic background different from their own. To meet this goal, students spend a minimum of 15 hours during the course of the semester working with a community service organization with the intent of gaining an understanding for people different from themselves and insight into some of the more subtle aspects of communication.

Students are urged to select a service project that, along with meeting the criteria of the assignment, caters to their individual interest. In addition to the hours spent working, a progress report during the course of the project and an oral presentation at its culmination are required.

The spring of 2000 was the first semester that the project was assigned, and although it met with some resistance, most students, at its completion, expressed that it was a worthwhile and fulfilling experience. Four students undertook one of the more notable projects during that first year: Melanie Lashus, Sarah Smith, Jason Snead, and Mark Zaun. During their spring break, these students went to the Appalachian town of Ivanhoe, Virginia, as part of the YMCA Alternative Spring Break Program to provide aid and hope to the members of a deteriorating mining town. The volunteers worked side-by-side with the residents of the community performing an array of tasks designed to clean up, beautify, and revitalize the aging town.

This spring, students devoted their time and energy to a wide range of interesting projects. Stacey Sharp, Pamela Tomlin, and Valerie Binetti worked at enhancing their communications skills by visiting and having conversations with the elderly at Heritage Hall Nursing Home in Blacksburg. About the project they report, "Overall, it has been rewarding to bring a little happiness and variety into the lives of some very lonely people while expanding the spectrum of our communications skills."

Kwang Han performed his service duties during spring break volunteering his time to a number of organizations and shelters in Washington, D.C.: The Washington Home and Hospice, Unity Health, Harbor Lights Center, Reading Connection, National Coalition for the Homeless, Dinner Program for Women, and Food and Friends. Kwang says of his experience: "Visiting all of these organizations and understanding the causes they represent revealed the large problems that we as a society face on a daily basis. It can become so easy to turn a deaf ear or to close our eyes, but it's still there whether we want to look or not…This spring break is over and the volunteer work is over, but the effect on my views and thoughts remains."

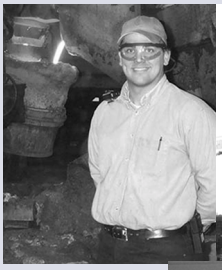
Kevin Tingler, a senior, has worked warehousing, proportioning, and distributing food for the local chapter of World SHARE, an international organization that distributes food and provides services to aid low income families in an effort to reduce poverty in our communities. Kevin reports, "My experience thus far is very beneficial to my understanding of the overall operation of a typical volunteer program. I found that the program means so much to the individuals of the community…I feel that I can and will make a difference, and I enjoy the feeling I get from these types of contributions."

Other projects include working with Project Home Repair, Headstart, the Montgomery County Department of Health and Human Services, the YMCA After School Program, and the Radford Women's Shelter.

Judy Robinson is the Associate Director for the MSE Advanced Engineering Communications Program at Virginia Tech. She holds a B.A. in architecture and an M.A. in education.

Alumni at Work

Paul Eichenlaub (MSE '97)



Chris Bouthiette (MSE '99)

Marybeth Miceli (M.S. '00)

The MSE Department has started a new project to help introduce high school students and engineering freshmen to materials science and engineering. We have been working with alumni to create posters describing their materials-related jobs. These posters will be displayed in the Holden foyer as well as in the Engineering Fundamentals classrooms. Profiles have also been featured in the new student magazine, *It's a Materials World*. Thanks very much to those who have participated so far: Christopher Bouthiette, Paul Eichenlaub, Martin Swan, Mike and Becky Stawovy, and Marybeth Miceli.

We hope to profile more of our graduates in this way. To find out how you can be part of this on-going project, send a note to LeeAnn Ellis, MSE Dept., 213 Holden Hall (0239), Virginia Tech, Blacksburg, VA 24061, or e-mail: *mse@vt.edu.*

Student and Alumni News Continued

Congratulations to **Xingsheng (Victor) Liu**, who received first place for the 2001 Paul E. Torgersen Graduate Student Research Excellence Award. This award was established in 1990 in recognition of Dr. Torgersen's many years of service both as dean of the College of Engineering and president of Virginia Tech. The award recognizes distinguished graduate research in engineering disciplines.

Victor completed his Ph.D. defense February 2001. He is now working as a Senior Research Scientist for Corning at their Science and Technology Center in Corning, New York. He is in the Optoelectronic Packaging and Assembly group under the Electro-Optic Component Products Division. His responsibilities include research and development of new optoelectronic packaging technologies, especially on laser packaging and optical amplifier packaging for telecommunication applications. ◆

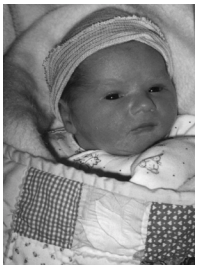
David Stafford (B.S. '82, M.S. '84) is the Director of Truck Tire Research at Michelin Research Corp. in South Carolina. He and his family have spent six of the last ten years living and working in France with Michelin. ◆

Gary Pickrell (MESc '94) and **Russell May** (MESc '98)are among the principal investigators on a project involving self-calibrating temperature and pressure sensors. This work is part of a grant awarded to Virginia Tech's Photonics Lab (VTPL) by the U.S. Department of Energy. The project is detailed in the Feb. 2, 2001 issue of *Spectrum (www.unirel.vt.edu/spectrum/01-02-02/index.html*. ◆

Virginie Vaubert (M.S. '97) has moved to Brazil where she is working for Saint-Gobain in their Sao Paulo plant. ◆

Best Wishes to **Christopher Bouthiette** (MSE '99) and Kimberly Shanley, who were married April 21 in Warwick, Rhode Island. Chris is an associate engineer with Newport News Shipbuilding. Kimberly works as a cost accountant at United States Gypsum. She is a graduate of Northeastern University in Boston. Members of the wedding included MSE alumni Jeff Schultz ('99) and Kevin Cherry ('99). ◆

Beth Robinson (MSE '98) joined Bostik Inc. in February as a Research Chemist. Located near Philadelphia, Bostik's primary products are hardwood floor adhesives and polyurethane sealants used in busses. ◆



Carl Louis Butsch 4/13/01, 7 lbs.,1 oz.

Susan Butsch (M.S. '93) is home raising Alicia (4), Brittany (2) and Carl, born April 13. Susan is taking time off after working for Hexcel as a Quality Control Manager for the last three years. Hexcel manufactures polyester, epoxy, polyimide-based composite material (glass, kevlar, carbon-based fabrics) used in applications ranging from aircraft to fishing poles and bikes. Her husband, Mike, also a Tech graduate, is a Global Systems Support Engineer with Sun Microsystems. They reside in Pickerington, Ohio. ◆

We are in the process of updating our department website. If you would like for your contact information to be posted in our alumni section, please send an e-mail to *mse@vt.edu* or send a note to LeeAnn Ellis, MSE Dept. (0239), 213 Holden Hall, Blacksburg, VA 24061. Please provide any information you would like included: e-mail address, regular mailing address, phone, current position, company name, city, state, etc. ◆

Recent MSE Publications

J. Cotton, J.W. Grant, M.K. Jensen, **B.J. Love**, "Analytical solutions to the shear strength of interfaces failing under flexure loading conditions," *International Journal of Adhesion & Adhesives*, **21** [1] 65-70 (2001).

S. Haque, K. Siddabattula, M. Craven, S. Wen, X. Liu, D. Boroyevich, **G-Q. Lu**, "Design issues of a three-dimensional packaging scheme for power modules," *Microelectronics & Reliability*, **41** [2] 295-305 (2001).

D. Seifu, A. Kebede, F.W. Oliver, E. Hoffman, E. Hammond, C. Wynter, **A. Aning,** L. Takacs, l-L. Siu, J.C. Walker, G. Tessema, M.S. Seehra, "Evidence of ferrimagnetic ordering in $FeMnO_3$ produced by mechanical alloying," *Journal of Magnetism & Magnetic Materials*, **212** [1] 178-182 (2000).

W. Gu, H.F. Wu, **S.L. Kampe**, **G-Q. Lu**, "Volume fraction effects on interfacial adhesion strength of glass-fiber-reinforced polymer composites," *Materials Science & Engineering A: Structural Materials: Properties, Microstructure & Processing*, **277** [1-2] 237-243 (Jan. 31, 2000).

S. Haque, **G-Q. Lu**, J. Goings, J. Sigmund, "Characterization of interfacial thermal resistance by acoustic micrography imaging," *Microelectronics & Reliability*, **40** [3] 465-476 (2000).

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College of Engineering Holds Annual Open House for High School Students

Shawn Kelly

On April 9, the College of Engineering held its annual recruiting open house for rising high school seniors and their parents. The Department of Materials Science and Engineering, under the direction of David Clark and Diane Folz, put forth a major outreach and recruiting effort at this event. Families were given three opportunities to speak with professors and students. Current students talked with families as they passed through Squires Commonwealth Ballroom. Parents and students were then invited to "Discover What We're Made Of" by visiting our demonstration room or participating in discussions with faculty members.

D. Folz

One young visitor takes a closer look at superconductor magnets

The demonstration room contained eye-catching and informative posters and demonstrations, such as an underwater adhesives demonstration presented by Professor Brian Love and his post-doctoral assistant, Patricia Dolez; a poster by Dr. Hendricks' senior design students illustrating semiconductor fabrication; demonstrations on superconductivity and space shuttle tiles by Dr. Clark and Diane Folz; and displays of various ceramics, metals, and polymer samples. In the discussion room, students and their parents listened to talks given by faculty members and graduate students introducing them to our department and educating them about materials science and engineering as a viable career choice with many opportunities for success.

The day's events proved successful in that we were able to introduce many people to the field of materials science and engineering, and about 30 students indicated interest in the department by filling out information cards.

MSE participation in the open house was organized by Diane Folz, who commented afterwards, "There are a lot more people out there who know that MSE is a viable engineering field." Diane headed up a committee that included Eric Pappas, Judy Robinson, LeeAnn Ellis, and Shawn Kelly, who worked to create displays and to recruit faculty and students to give talks, perform demonstrations, and be available to answer questions.

Patricia Dolez demonstrates formation of photo-polymerizable adhesives using tonic water and a black light

Shawn Kelly discusses materials science with visitors

Speakers for the day included Ron Kander, David Clark, Bob Hendricks, Shawn Kelly, Kathy Rohr, Stephen Kampe, and Eric Pappas. Jan Doran was also on hand to answer questions concerning the curriculum. Students who helped out included Martha McCann, Brendon Wells, Leslie Flowers, Corey Love, Eric Payton, David Gray, and Jason Snead.

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Other MSE outreach activities:

Throughout the year, various faculty members have been involved in teaching short courses and offering consulting services to industry. One such course was offered at Volvo Trucks North America in Greensboro, North Carolina. Professors Norman Dowling and Stephen Kampe taught "Fatigue Life Analysis" during May and June, 2000. Taught in nine three-hour sessions, the course covered methods of analyzing fatigue failures to aid in troubleshooting service problems and redesigning parts. It emphasized the mechanical aspects of predicting the life and strength of components. The three major approaches currently applied in industry to such analysis were covered; namely, the stress-based (S-N) approach, the crack growth (fracture mechanics) approach, and the strain-based approach. ◆

Brian Love has begun consulting for Line Power in Bristol, Virginia. He is helping them with materials issues dealing with polymeric dielectric seals. ◆

People in Materials

LeeAnn Ellis

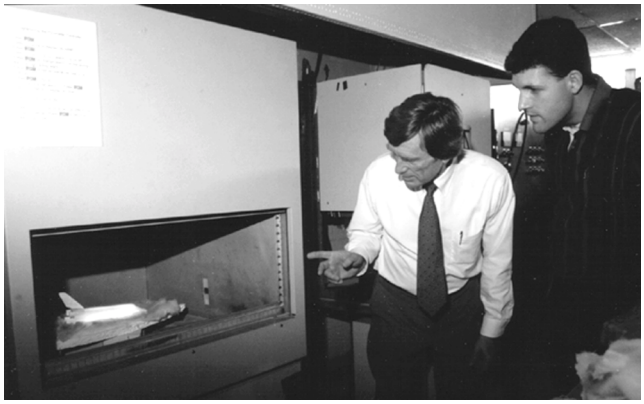
Introducing David Clark, MSE Department Head

The newest faculty member in Virginia Tech's Materials Science and Engineering Department is Professor David Clark, who assumed the role of department head this past January. A native of Florida, Clark is the youngest of seven and the only engineer among his four sisters and two brothers.

David Clark can trace his interest in materials science and engineering back to the beginning of his college career when he took a job working for Prof. Larry Hench in the newly formed Department of Metallurgical Engineering (later renamed MSE) at the University of Florida. He found the work so interesting that he quickly switched his major from aerospace engineering to metallurgical engineering. After completing a B.S., he stayed on to pursue a growing interest in ceramics, earning a master's and a doctorate in MSE. His research since that time has focused mainly on ceramics.

Most recently, Dr. Clark's research has been in the area of microwave processing of materials. "I think we're really just at the tip of the iceberg right now in what we can do with the technology." He is studying microwave energy as "an alternative source of heating materials, of causing reactions to occur in materials." If a piece of ceramic is placed in a conventional oven, the outside surface will heat up before the inside. If that same piece of ceramic material is placed in a microwave oven, it will heat from the inside out. Since this heating process occurs almost instantaneously, "the entire piece of material experiences essentially the same thermal history," as opposed to the material heated in a conventional oven, where the outside and inside will have differing thermal histories. In his research, Dr. Clark is applying microwave technology to materials processing to form better materials, materials that are cheaper and materials that couldn't be created using conventional methods. "That's where I intend to go with research; how to take a regular old microwave oven and get something good out of it."

As a professor, Dr. Clark sees education as a lifelong journey, not as an endproduct to strive towards during a few years spent in college classrooms. "We're always going to be learning," Clark said. "That's why continuing education is so important. What you actually graduate with from the university may not be what you end up practicing five or ten years down the road."



Prof. David Clark discusses a microwave project in progress.

As department head, he has adopted the motto, "10 x 10." He envisions this department expanding and continually improving to become a top ten MSE department by 2010. This will involve growth, but not too much. He stresses the importance of preserving the current close-knit environment of the department. "One of the good things about this department is that students know the faculty and they feel comfortable talking to the faculty. We don't want to have so many students that the faculty don't know who the students are." Efforts will focus on growing the graduate program and expanding MSE's research program. "I'm not going to be the one that's going to make this department number ten," Clark said. "We as a group will make it happen if that's what the faculty, staff, and students want to do."

Joining Dr. Clark in the move northward are his wife, Sue, and beloved cat, Stripa, who shares his name with a striped ceramic cat from Sweden, purchased during a 1982 sabbatical. "I'm really happy to be here," Clark says, "really pleased with the faculty, staff, students and all that we have here. We're very fortunate to have been able to come here."

Meet Graduating Senior, Melanie Lashus

When Melanie Lashus decided she wanted to go to college and major in engineering, she started visiting colleges in her home state of North Carolina. "Why are you here?" asked one engineering professor, "you're a girl."

Melanie found a warmer welcome while visiting Virginia Tech during a College of Engineering Open House. There, she met representatives from Women in Engineering and others who encourage women to give engineering a try.

Growing up in rural North Carolina, the standard in Melanie's hometown was for girls to finish high school and find a husband. "That wasn't going to be for me," Melanie said. "I am the first person in my entire family to ever come to college." And she is proud that her younger sister followed her lead and is also attending college.

Melanie was one of those fortunate few to whom grades came easily in high school. She did well in math and science, and when it came time to think about her future she chose engineering for practical reasons. "I figured that if I did engineering, if I could do it, then I'd always be provided for, I would have a good solid education that would get me a job and take care of me." On another level, she felt that with an engineering degree, she would be more capable of giving something back.

continued

Her decision to major in materials science and engineering resulted from attending an MSE open house as a freshman. She remembers Professor Ron Kander's excitement about the department. Also, she says, "It was a lot more personal than a lot of the other open houses that I went to. Being from a small town I was used to knowing everybody, and here at Tech I didn't want to be just a number." She appreciated being able to join a smaller department in the midst of a large university. "We have the best of both worlds here."

One of the ways Melanie financed her education was through cooperative education, where a student alternates semesters of work and school. She is now a strong advocate for cooperative education, viewing it as a great opportunity to find out about the real world and also to explore engineering on the job. She spent her three co-op semesters working for Acadia Polymers in both their design facility in Roanoke and their manufacturing and R&D plant in Clifton Forge. "I thought it was really neat to see both ends of the spectrum," Melanie explained. Her first semester was spent in Roanoke, where Acadia designs automotive transmission pistons.

"I got to design two of the pistons, and Ford actually bought one of my designs." Then, when she moved over to the manufacturing facility for her next co-op semester, her designs were in the process of being prototyped and tested.

Overall, Melanie believes her co-op experience went a long way toward preparing her not only to enter the working world but to face real life, taking responsibility and making financial decisions. Because of her experiences in finding an apartment and living on her own while working, she feels that she knows more of what to expect once she's working full time.

Melanie has accepted a position with Advanced Technology and Research (ATR) in Dahlgren, Virginia, where she will work as a consultant for the United States Navy at the Naval Surface Weapons Center. She'll help Navy personnel in preparing presentations, grant proposals, and other communications-related projects, all skills Melanie has honed in her work with Prof. Eric Pappas as a program assistant in the MSE/ESM Writing and Communications Program.

Melanie graduated this May and has already purchased 2.5 acres of land halfway between Fredericksburg and Dahlgren where she is building a house. The MSE Department wishes Melanie all the best and looks forward to hearing more from her in the future.

Meet Dylan Pugh, MSE Doctoral Student

Born in Quito, Ecuador, and spending his early life in Rio de Janeiro, Brazil, Dylan Pugh's first language was Portuguese. He didn't learn English until age six when his family moved to New Jersey. Just a few years later, he found himself living in Granada, Spain, where he spent the next twelve years or so learning to speak fluent Spanish and generally becoming acclimated to Spanish culture.

Dylan attended college at the University of Granada majoring in physics, which he chose because it offered a broad base covering math, chemistry, the basics. He also played lots of rugby, and by his third year in college, he felt his devotion to the sport was interfering with his schoolwork. In addition, there were few areas of specialization in physics at Granada, so he felt it was time to move on.

He transferred to Virginia Tech, a move he terms the best thing he ever did. He spent a year and a half completing a major in physics and a minor in math and graduated in 1999, magna cum laude. And, of course, he continued to play rugby, joining the Virginia Tech team and traveling with them all the way to national competition.

In the fall of 1999 Dylan entered Tech's graduate program with plans to pursue a doctorate in materials science and engineering. Why the switch from physics to materials? "I didn't like engineering," Dylan said, "as in mechanical or electrical. It's too applied and I've always been interested in fundamentals—in what's behind everything." Conversations with Amy Corcoran in Physics lead him to talk with Sean Corcoran in MSE. The two connected, and Sean's work in biomaterials caught Dylan's interest. His physics department head offered sound counsel, telling Dylan that his choice of an advisor for graduate work was an important one. "He is going to guide you through your years of graduate school. He can make it a wonderful experience or not." So far, Dylan says, "It's been great."

Dylan's research focuses on two separate projects. First, he is working on creating a high surface area electrode nanoporous platinum. Such a material could be used in increasing the sensitivity of a biosensor, which is platinum and can be implanted in the body. For example, this electrode could be used to provide voltages in pacemakers.

His other project involves trying to set up a corrosion system that will render bombs inactive after a certain period of time. This technology could be valuable in disabling bombs that never detonated and are no longer in active use, such as land mines.

When he's not working on his research, Dylan still plays rugby, now with the Blacksburg league. He and his wife, Chris, also enjoy playing pick-up soccer in the afternoons out on Virginia Tech's drillfield.

Head's Up!

David Clark

These are exciting and challenging times for the department. Although our undergraduate and graduate programs are healthy, we are working to make them even better. Enrollments for the spring semester were 79 undergraduate and 48 graduate students. In May, 32 received degrees from the department; 20 B.S., 8 M.S. and 4 Ph.D. We expect the number of graduates to increase in the future based on our increased recruitment activities.

The faculty has had a productive year with respect to new research initiatives and professional activities, in spite of the heavy teaching loads imposed on them due to several vacancies. One of these vacancies has been filled by Dr. Dwight Viehland. Dwight has a strong background in materials science and engineering, an excellent teaching history and a strong track record in research. We look forward to his arrival in August and we anticipate adding several additional faculty members over the next year.

We have been preparing diligently over the last two years for the ABET visit that will occur in the fall semester. With a few corrections and additions to the self-assessment document and some modifications to the undergraduate labs in Holden Hall, we should be ready for the visit.

The students have made significant contributions to the department this year. They published their own news magazine, *It's a Materials World*, participated in recruitment activities, such as the College of Engineering Open House for high school juniors, and represented us in various professional activities, such as the National Institute of Ceramic Engineers/American Ceramic Society Student Congress.

The department is fortunate to have a staff that is both capable and caring. They provide the continuity and long-term stability needed for a strong infrastructure.

Space continues to be an issue, even with the acquisition of 6000 ft^2 in Collegiate Square. One of our major goals to be discussed at the May departmental retreat will be a new building that will house ALL of our faculty, staff and graduate students. Meanwhile, allocations are being adjusted in Holden Hall to provide more research laboratories for new faculty.

The faculty, staff and students in MSE are committed to building a nationally ranked materials program. Our department has a long history at Virginia Tech and I know that we have hundreds of alumni. I would like to hear your comments and opinions (dclark@vt.edu or 540-231-6640) on how we can best shape the future of the department.

On a final note, I wish to thank Professor Norman Dowling for his leadership as interim department head prior to my arrival in January. Norm steered the department through some very challenging times and left us on solid ground when he stepped down. He will continue to be active in department administration as chair of the undergraduate curriculum committee.

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