The World of Materials

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

Fall 1999, Vol. 4, No. 2

Hiking the Appalachian Trail. Keith Knipling stands atop McAfee's Knob, which overlooks the Catawba Valley near Virginia Tech. (See story, page 2)

A New Era Begins for MSE

Prof. Norman Dowling
Interim Department Head

The fall semester ushered in a new era for the Materials Science and Engineering Department at Virginia Tech. In August, Dr. Ronald Gordon left Blacksburg to become Dean of the School of Ceramic Engineering and Materials Science (CEMS) at the New York State College of Ceramics at Alfred University in Alfred, New York. Dr. Norm Dowling, a professor in both MSE and ESM at Virginia Tech, has been appointed the Interim Department Head for MSE. "Ron has gone out of his way to ensure a smooth transition," Dowling said. "I very much appreciate his continuing dedication to the department. We will certainly miss him."

Dowling joined Virginia Tech's ESM Department in 1983, and in 1992 he accepted a joint appointment in the MSE Department. His area of research interest is fatigue, fracture, and deformation of materials, specifically from the materials testing and engineering applications perspectives. This work is related to the philosophies and goals of both departments. In 1998, he completed the second edition of *Mechanical Behavior of Materials: Engineering Methods for Deformation, Fracture, and Fatigue*, a textbook that has been adopted for primarily undergraduate instruction at more than 50 colleges in the United States and at several other colleges overseas.

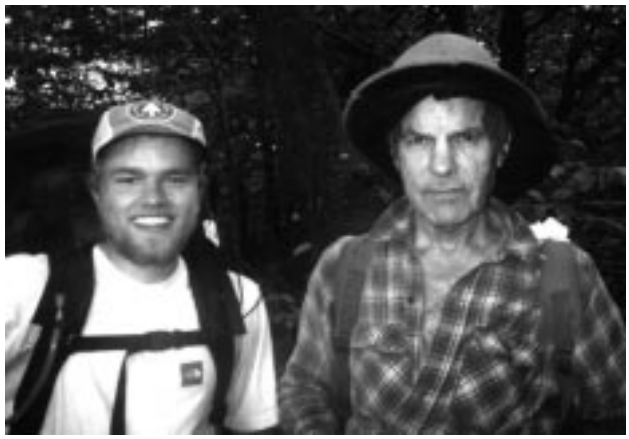
New Era continued page 5

Keith Knipling (MSE '98) Fulfills a Dream

For many students at Virginia Tech, access to the Appalachian Trail is one perk of attending college in this small, out of the way town. For Keith Knipling, hiking the entire 2,160 miles of the trail has been an ambition since childhood and one he set out to fulfill shortly after graduating in May 1998. Keith's first introduction to the Appalachian Trail, or the AT, came through Boy Scouts in elementary school. He remembers reading a *National Geographic* article written in 1987 and deciding he would like to hike the whole trail one day.

The AT closely follows the ridge line of the Appalachian Mountain chain in the eastern United States, running from Maine to Georgia. It was originally designed and blazed between 1922 and 1937 by volunteers who worked in cooperation with federal parks and forest agencies. For many years, most people believed it would be impossible to hike the AT from beginning to end in one continuous journey. However, in 1948, a young man named Earl Shaffer proved that it was indeed possible to walk the entire trail.

Keith owns a dog-eared copy of Earl's book, *Walking with Spring: the First Thru-Hike of the Appalachian Trail*, and while Keith was making his way south along the trail in 1998, Mr. Shaffer, at age 79, was heading north, making a third pilgrimage 50 years after his first thru-hike. Earl received a lot of publicity during this hike, and some of you may recall seeing him on the *Today Show* or reading about him in the newspaper last year. Keith had the privilege of meeting Earl on August 27 just north of the Vermont/Massachusetts border, about 500 miles into his hike and 1,600 miles into Mr. Shaffer's hike.



Keith with Earl Shaffer, August 27, 1998

Statistically," Keith says, "about 3,000 people start in Georgia and about 5 to 10% finish." About 300 hikers will start in Maine and head south. A thru-hiker must consider the timing carefully, because it generally takes four to six months to complete. Keith began his hike on July 1, 1998 in Maine's Baxter State Park at Mt. Katahdin, which he describes as a 5,267-foot granite monolith. He reached Springer Mountain in Georgia on December 15, five and a half months later, which is slightly better than average speed for a thru-hike. Springer Mountain is 3,782 feet above sea level and is located in the Chattahoochee National Forest in North Georgia.

What sort of people are thru-hikers? People like Keith, who are in some sort of transitional period in life, will take on the challenge of hiking the entire Appalachian Trail. Recent high school and college graduates, men and women in between jobs, retirees, and people facing a mid-life crisis can all be found along the AT. There are also those who are taking time off from a busy professional life. Some people, referred to as section hikers, will hike the trail in stages, taking several weeks at a time to hike a section and then returning later to hike the next section.

Keith undertook this project on his own, suggesting that hiking the trail is in many respects a solo operation. It's difficult to plan such a large undertaking with another person, unless you know them very well. People hike at different rates, and according to Keith, about 90% will set out alone. "You can pretty much count on meeting people," especially if you start in Georgia and head north. Even starting out in Maine, Keith hiked a good portion of the trail with one person or another that he met along the way. He covered about 500 miles (on and off) in the company of a computer science professor from Dartmouth, who decided to start from Katahdin and walk home to Hanover, New Hampshire. In Hanover, Keith

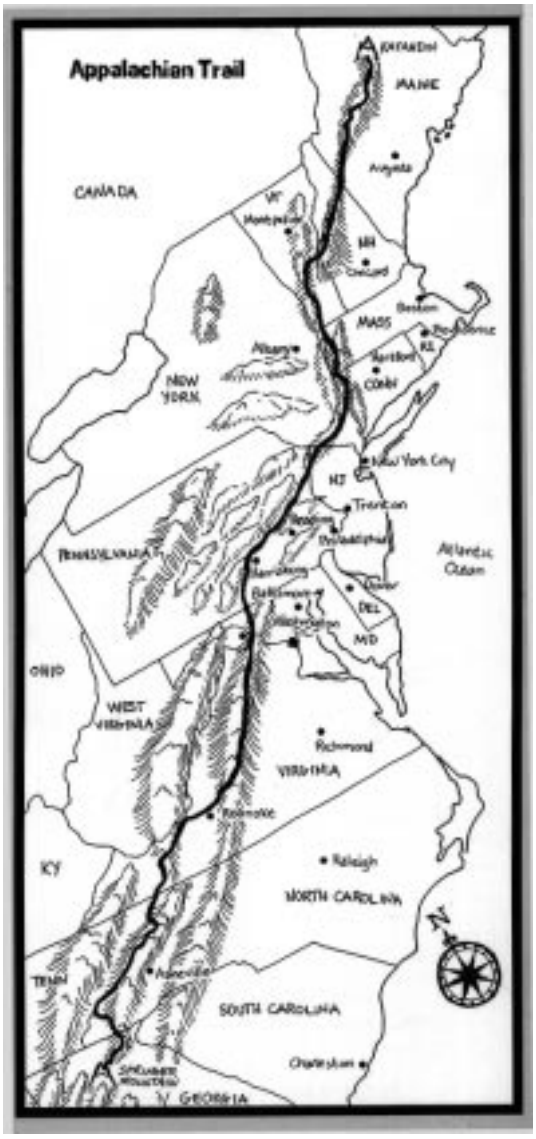
met up with a man from Nova Scotia who had recently retired. They hiked together all the way to Harper's Ferry in West Virginia, covering a distance of about 700 miles from August 15 to October 2. From mid-October onward, he hiked alone and saw few people.

Keith averaged 15-16 miles per day, but he did not hike every day of his five and a half months out. He took time out to visit with his family, who met him in Vermont and also in Harper's Ferry. He also took a few days off in Blacksburg, which he reached around Halloween. Days off are a necessary part of the schedule, generally one day every other week in a "trail town" along the way. Trail towns are situated near the AT or, in some cases, the trail runs right through the town. These towns are a highlight for hikers because they mean mail pickup, a hot shower, and a good meal. The Homeplace in Catawba is a favorite hiker restaurant for a home-cooked meal. Many churches along the trail will set up hostels for hikers and there are bed and breakfast establishments that cater to hikers for nominal fees.

Food is a major concern for thru-hikers. A common practice, known as a "mail drop," is to pack up food in several boxes and mail them to the different trail towns. "These towns know the hikers and they have stacks of boxes waiting for hikers to come into the post office to claim them." Keith's parents took care of mailing boxes for him. He would call when he reached one town and request that the next box be mailed to the next town. His diet consisted of lots of poptarts along the way, as well as peanut butter and crackers and a trail mix of peanuts, m&m's, and raisins. Dinner was usually cooked and usually noodles and water based. Dehydrated food is common because it's light. A hiker's pack will weigh between 40 and 55 pounds, so every ounce must be carefully considered.

During his travels, Keith was fortunate to have no major injuries that prevented him from hiking. He suffered the normal array of blisters, insect bites, bumps and bruises. "It's rare to have everything just right," he says. "There's always something swollen." But in general, he fared very well. "Along the way," Keith said, "I received unexpected help from perfect strangers who offered everything from encouragement to meals, rides, and lodging." Thru-hikers refer to these kindnesses as "trail magic," but Keith calls them "an expression of the goodness and generosity of so many people."

Keith completed his hike in December, and in February he returned to Virginia Tech to work as a research associate for Professor Steve Kampe in the MSE Department on metal-matrix composite research. In addition, he is an accomplished cellist, and he performs



Source: L. Luxenberg

with the New River Valley Symphony regularly. He is also a member of the Spring Quartet, made up of students who get together to perform for weddings, banquets, and other functions. Keith plans to continue his education at Tech and will enroll in the graduate program in January.

In closing, here are Keith's thoughts on this incredible journey:

> How do I describe a journey that took me over five months to complete; that wore out three pairs of hiking boots; that taught me a new appreciation for water and food (in that order); and permanently altered my feet by half a shoe size? How do I put into words the incredible beauty that I saw or the people I met who

continued

The beginning, Mt. Katahdin, Maine.

opened their doors to me—a stranger? How do I begin to relate the feelings stirred inside upon watching a bull moose gracefully swim across Crescent Pond in the Hundred Mile Wilderness, or the moon rise over Franconia Ridge? And how do I explain a journey that changed the way I feel, the way I look at things, and who I am?

I saw, and I met, small-town America. Places not easily reached by car or plane. Places that were sacred and safe, friendly and unassuming. I was quickly broken in on the brutal mountains of New England; grappled with boredom through the middle states; and rejoiced in the beauty of the southern crests. I saw sunrises and sunsets unimaginable, night skies so studded with stars that they were almost a blur, and mountains and valley vistas that took my breath away and brought tears to my eyes. Not every day was happy. I experienced the full range of emotions that human beings are capable of feeling. I felt angry at yet another "up and down" after an exhausting day; frustration of the black flies and mosquitoes in Maine; extreme exhaustion at different points along the way; and pure exhilaration and priceless joy. And every day was beautiful. The Appalachian Trail is not just a footpath—it's a journey. One of the spirit, the mind, and the body. To walk it is to grow, to stretch, and to learn.

The end, Springer Mountain, Georgia. Note rock in hand, which traveled all the way from Mt. Katahdin.

Books of Interest:

Shaffer, Earl V. *Walking with Spring: the First Thru-Hike of the Appalachian Trail*, Harpers Ferry, WV: Appalachian Trail Conference, 1983.

Bruce, Dan "Wingfoot". *The Thru-Hiker's Handbook, 199*6, Hot Springs, NC: Center for Appalachian Trail Studies, 1996.

Luxenberg, Larry. *Walking the Appalachian Trail*, Mechanicsburg, Pa.: Stackpole Books, 1994.

Chase, Jim. *Backpacker Magazine's Guide to the Appalachian Trail*, Harrisburg, Pa.: Stackpole Books, 1989.

Bryson, Bill. *A Walk in the Woods: Rediscovering America on the Appalachian Trail*, New York: Broadway Books, 1998.

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New Era continued

As Interim Department Head, Dowling plans to maintain and extend the progress made under Dr. Gordon. The gain of the new Ph.D. program needs to be consolidated by finalizing courses and programs of study, which effort is being led by Bill Reynolds and his Graduate Program Committee. Under the leadership of Ron Kander, the undergraduate program is finalizing recent curriculum improvements and gearing up for the next round of ABET accreditation during the 1999-2000 academic year. Increased numbers of students are being recruited at both the graduate and undergraduate levels. The faculty have worked very hard to make the MSE Department a welcome and friendly academic home for our students. It is noteworthy that our undergraduates are 40% women, compared to a College of Engineering average of 19%. Our innovative writing program continues under the leadership of Eric Pappas.

Another significant activity is the development of a major educational and research effort in materials applications to microelectronics, which is being led by Bob Hendricks as a joint effort with the Electrical and Computer Engineering Department. Newly hired Associate Professor Louis Guido also works in this area.

A committee chaired by Steve Kampe is conducting the search for a new department head. (Any suggestions of candidates from alumni and friends of the department are most welcome and will be followed up. Call Steve at 540-231-8688 or 6640.) We have two additional open positions, one at the professor or associate level, and another at the assistant or associate level, with Jess Brown chairing the search committee for these. Recognizing that it is essential for the department to maintain strength in all basic areas of materials, the first priority in these searches will be to fill a developing gap in the ceramics area, but strong candidates in any area of materials will be considered.

Areas of progress and achievement during the last ten years include:

- Promotion of a broad enhancement of the department image both within the university community and outside the university.
- Recruitment of ten faculty members.
- Establishment of thirteen joint faculty/instructor appointments with five academic departments.
- Improvement in and development of the undergraduate degree program (achieving full ABET accreditation on two occasions, establishing a stable and growing enrollment, initiating curriculum innovation including the writing and communications program, and establishing a scholarship program).
- Achievement of remarkable growth in sponsored research by about 400%.
- Improvements in the quality of laboratory facilities and air conditioning in Holden Hall.
- Acquisition of additional research space in Hancock Hall for MSE faculty members.
- Promotion and facilitation of the leadership of MSE faculty members in improving the MESc program and the establishment of the MSE Ph.D. degree effective August 15, 1999.
- Leadership and/or significant participation in the efforts and programs of Green Engineering, VCES, POMD, ARI, VMEC, and the University Cross-Cutting Materials Initiative.
- Establishment of an external advisory board and departmental newsletter.
- Recipient of a 1998 University Exemplary Department Award for interdisciplinary and cooperative programs across departmental lines.

The MSE Department, said exiting Head, Ron Gordon, "has made great strides through the efforts of its faculty, staff, and students. I am proud to have been of service to the department in a time of significant change."

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Accreditation and Assessment in Materials Science and Engineering at Virginia Tech

Behind the scenes of a good university, assessment is underway at any given time. The term "accreditation" is taken seriously, and conscientious schools across the country will have dozens of individuals making sure their educational programs meet certain criteria. Assessment plays a key role in keeping the standards high and providing a system of accountability so that the public can have confidence that a college degree will hold value. Assessment and accountability in higher education are

"ABET will provide world leadership to assure quality and stimulate innovation in engineering, technology and applied science education."

becoming more important as we move towards the 21st century. As the cost of education rises and as the skills necessary for successful employment shift, the need for assessment and for documented success in college programs has become crucial. For engineering education programs, accreditation procedures have been in place for nearly 65 years.

The Engineers' Council for Professional Development started out with a basic philosophy to encourage innovation in engineering education. This group, now known as the Accreditation Board for Engineering Technology (ABET), "is recognized as the sole agency responsible for the accreditation of U.S. educational programs that lead to engineering degrees."[1] From that basic initial philosophy, ABET evolved into a complex system of rules to be followed and criteria to be met in terms of concrete, quantitative data, such as the size of the library, number of degrees held by faculty, dollars spent on educational equipment.

When it became clear that a better system of evaluation was needed, ABET began making changes with the help and input of numerous representatives from academia, industry, and professional societies, all experienced in the practice and teaching of engineering. The result was a new system of evaluation and assessment called the Engineering Criteria 2000.

Accreditation Board for Engineering and Technology Mission[2]

The overriding goal for ABET reads: "ABET will provide world leadership to assure quality and stimulate innovation in engineering, technology and applied science education." Their mission as an assessment team is summarized in the box below.

How does ABET evaluate a program?

Three accreditation commissions operate out of ABET to carry out assessment and to determine actions needed to improve an educational program. The Engineering Accreditation Commission handles engineering programs, the Technology Accreditation Commission oversees engineering technology programs, and the Related Accreditation Commission takes care of engineering-related programs. Virginia Tech's College of Engineering falls under the auspices of the Engineering Accreditation Commission (EAC), and when the program has been evaluated and approved, it is identified as "accredited by the Engineering Accreditation Commission of ABET (EAC/ABET).

ABET Mission for Assessment of Engineering Education

ABET will:

- Accredit engineering, technology and applied science programs.
- Promote quality and innovation in engineering, technology and applied science.
- Consult and assist in the development and advancement of education in engineering, technology and applied science.
- Inform the public of activities and accomplishments.
- Manage operations and resources to be responsive and relevant to the needs of the organization and its stakeholders.

Criteria for evaluation
ABET has developed the following criteria for general engineering programs. Students seeking an engineering degree should acquire the following skills by the time they graduate.

A. An ability to apply knowledge of mathematics, science, and engineering.

B. An ability to design and conduct experiments, as well as to analyze and interpret data.

C. An ability to design a system, component, or process to meet desired needs.

D. An ability to function on multi-disciplinary teams.

E. An ability to identify, formulate, and solve engineering problems.

F. An understanding of professional and ethical responsibility.

G. An ability to communicate effectively.

H. A broad education necessary to understand the impact of engineering solutions in a global and societal context.

I. A recognition of the need for, and an ability to engage in life-long learning.

J. A knowledge of contemporary issues.

K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

There are also four MSE-specific ABET criteria:

- Students will develop an ability to apply advanced science (such as chemistry and physics) and engineering principles to materials systems.
- Students will acquire an integrated understanding of the scientific and engineering principals underlying the four major elements of the field—structure, properties, processing, and performance—related to material systems appropriate to the field.
- Students will develop an ability to apply and integrate knowledge from each of the above four elements of the field to solve materials selection and design problems.
- Students will develop an ability to utilize experimental, statistical, and computational methods consistent with the goals of the program.

MSE Alumni, help MSE better serve future students.

What are you doing to continue learning? How do you keep up with what's new in your field? Short courses? College classes? Professional journals?

Send an e-mail to mse@vt.edu and share your thoughts.

Thank you!

When ABET moves in to evaluate and accredit an engineering program, they are looking for evidence that these criteria are being met. The challenge for educators is, first, to incorporate these goals into the coursework, and second, to record success in reaching each goal. For example, in the MSE Department, several of these criteria are covered in our required communications courses, one of which is the Senior Capstone Design series, which not only addresses instructional aspects of several of these criteria, but also acts as an evaluation tool to determine if students have developed these skills during their college career. A final project serves as a record of what the department is teaching.

MSE ABET Assessment Plan for 2000
The MSE Department has developed a set of Educational Objectives in compliance with ABET's new assessment guidelines. The new guidelines state that a department/college must set goals for its graduates and then evaluate if those goals are being met. Thus, the MSE Undergraduate Program will graduate professional, competent materials scientists and engineers who can:

1. Demonstrate basic proficiency in mathematics, physics, chemistry, and engineering science.
2. Demonstrate basic proficiency in generic materials science and engineering concepts covering all classes of materials, including ceramics, composites, electronic/optic/photonic materials, metals, and polymers.
3. Study the structure and composition of materials on scales ranging from the electronic and atomic through the microscopic to the macroscopic.
4. Develop new materials, improve traditional materials, and produce materials reliably and economically through a variety of synthesis and processing techniques.

Accreditation continued page 10

Bringing Engineering Skills to Bangladesh
Bryan Dickerson (MSE '95)

Editor's Note: Some of you may remember reading about Bryan Dickerson in an earlier issue of this newsletter (Winter 1996) shortly after he completed his undergraduate work in MSE. During that interview, Bryan described his role as an engineer as one of service.

Bryan Dickerson and his wife, Dorothea, share a deep concern for other people and a desire to serve overseas. This desire led them ultimately to Bangladesh where they have spent the last year and a half. After researching various service organizations, they settled on the Mennonite Central Committee (MCC), an organization whose primary goal is to do relief work in areas hit by floods, hurricanes, and other disasters. The organization has expanded to include development work as well, and this is where Bryan and Dorothea were able to fit in.

Bryan, Darrah, Dorothea, and Philip take a break from studying Bangla, the language of Bangladesh and part of India.

In Bangladesh, MCC's program operates in the areas of agriculture extension and craft manufacturing and sales. Bryan was looking for a group where his engineering skills would be of use, and the MCC needed a person with Bryan's education and skills in the craft manufacturing program. "This was a rare opportunity," Bryan said, "a nice match for both of us." Bryan worked as the engineering service leader for a paper processing industry in Bangladesh. "MCC is trying to show that you can run a business that's profitable, environmentally friendly, and safe for workers." In Bangladesh, MCC focuses on helping women who have been deserted or widowed. Through this craft industry, they are able to earn a decent income. "The whole idea of the program is to have the people earning their own way," and MCC concentrates on creating viable jobs.

Low-tech papermaking equipment. Haridash demonstrates hoisting digested pulp from his new efficient woodstove (lower left) using his new overhead trolley system.

Worker safety and environmental issues were two major concerns for Bryan in his new position. His first hurtle was convincing the workers that their papermaking processes were dangerous to themselves and to the environment. In a land where education is minimal, and feeding a family is an overriding concern, concepts of environmentalism and personal safety just don't register. So the role of MCC's Engineering Services is to monitor production and change practices where needed to create a safe working area and to minimize harm to the environment.

During Bryan's tenure, the biggest success for his group was the introduction of safe dyes. The dyes that were locally available contained potential carcinogens and they weren't colorfast. Under Bryan's direction, Zyhid, a chemist with Engineering Services, investigated dying processes that were being used by the clothing industry and adapted those processes to paper. Zyhid found three families of dyes for three classifications of fiber that are used in the craft industry. Direct dyes

worked well for paper, reactive dyes worked well for rope, and cationic-basic dyes could penetrate the resin in leaves.

The Engineering Services Team
Front: Haridash, Liaquot, Zyhid, Deepa, Alaka
Back: Bryan, Dave, Rafige, Andrew

Bryan was able to engage in a fair amount of research and experimentation through his work with this craft industry. One experiment focused on finding the saturation curve for each of the three dye families; in other words, his group was looking for the point where adding a small amount of dye would yield a deep color with nothing left over. "By operating at or just under that saturation level, we made sure that our safe dye process would have almost clear water coming out of it," which meant that environmental problems were alleviated. "The most difficult challenge in all changes in processes is they're not accepted by the small factory management unless they're more economical as well." Making a profit and paying a fair wage are the main concerns for small businesses. Bryan's group was able to design a dying process that required fewer steps, eliminated a time-consuming clean up procedure, and produced a better product. Prices to the consumer remained constant and the factory saw a slightly higher profit.

Another accomplishment for Bryan was the design of a high-efficiency woodstove for cooking the ingredients that are turned into paper. When he arrived, an open fire with billowing smoke was the standard cooking device. Bryan trained Haridash, a paper-making technician, to use some fairly basic concepts to design a woodstove that carried smoke away from the work area. The new design burned fuel more completely, resulting in less smoke and higher efficiency.

The result of all of this effort is a line of craft papers with interesting textures created through different combinations of plant materials, dyed cloth, and other fibers to create photo albums, picture frames, baskets, and other craft items that are sold locally and worldwide. While Bryan spent his days traveling to different factory sites, Dorothea kept the local craft store running. Their two children, Philip and Dharra, ages 8 and 6, spent their days in school.

The Dickerson family faced some major cultural adjustments upon arriving in Bangladesh, many of which dealt with traffic and driving. Bryan describes daily driving between villages as a big game of "Chicken." A main road, while it is two lanes wide, is constructed so that the sides slope outward for drainage. For this reason, everyone wants to drive down the center of the road so they're not driving at a slant. Two vehicles will cruise directly toward each other at about 40 mph until they are within inches of a collision. If one driver relinquishes the center too soon, he will end up driving off the road along rough terrain because the other driver will maintain his center position. Bryan explains that you have to wait until the last minute so that both cars veer equally and pass side by side on the road. "You're within five inches of your life every five minutes!"

City driving is just as tense. Pedestrians, rickshaws, and animals are constantly darting in front of whatever vehicle happens to be in the way. "No one looks behind them. So you have to honk every time you pass any person or object" to announce your intention of passing. If you don't honk and someone veers into your path, you are responsible for the consequences. Added to the stress of this situation is the constant noise of honking horns. The Dickersons lived in the city of Dhaka along a busy road, where the roar of traffic never ceased. Upon returning to the States, Bryan was struck by how quiet it is here, even around a busy city like Washington, D.C.

Bryan and his family returned to Blacksburg this past summer. He is currently working in the MSE Department as a teaching assistant for Professor Robert Hendricks, and he plans to complete a doctorate in the department over the next few years.

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Accreditation continued

5. Characterize material properties of all kinds using modern measurement techniques.
6. Predict and evaluate the performance of real materials as functional elements of engineering systems.
7. Select, specify, and design materials that are appropriate for applications in various use environments.
8. Express thoughts and ideas through oral, written and computer communications.
9. Demonstrate an appreciation for the humanities and the responsible role of technology in society including the environment and the utilization of natural resources.
10. Demonstrate an appreciation for other cultures and for international events.
11. Work effectively in interdisciplinary teams and demonstrate problem solving, leadership, and organizational skills.

How is this plan being implemented?
Virginia Tech's MSE Department has created several tools to help evaluate and record program compliance with both ABET criteria and department educational objectives. These tools are listed below.

- *Student portfolios*:
  These include samples of student work from the communications intensive courses, reflective essays that will target specific ABET criteria, etc.

- *Senior Capstone Design Sequence*:
  This course series has been expanded from two to four courses, totaling ten credits. The course content has been modified to incorporate the departmental educational objectives.

- *Communications Program Courses*:
  Integrated communications program courses will be used to help in overall assessment of MSE graduates. Various communications lectures will target ABET criteria, especially D through I. Reflective essays will be given as assignments, and written surveys will be administered and incorporated into other assessments tools.

- *Oral Exit Interviews*:
  MSE's practice of individual exit interviews with graduating seniors will continue with plans for expansion in the questions so that they line up with departmental objectives and ABET criteria.

- *Written Surveys*:
  The department plans to expand its efforts in written alumni surveys as well as written exit surveys. Entrance surveys are also in the planning stage.

- *Existing Assessment Tools*:
  Assessment information currently available includes performance in specific courses, performance on standardized professional examinations, job and graduate school placement data, and college/university survey results.

The MSE Department has organized a team of four MSE faculty and staff members to keep the assessment process moving forward during the next two years. These people are making sure department goals are being met through coursework as well as keeping track of the ABET assessment list. The team includes Professors Ron Kander and Eric Pappas, Jessamyn Franks, an Instructor in the Communications Program, and LeeAnn Ellis, a research associate.

Help Outside the Department
The American Society for Engineering Education (ASEE) is committed to helping engineering schools meet the accreditation standards. To this end, they offer seminars and publications such as *How do you measure success: defining effective processes for assessing engineering education*, which is a collection of articles dealing with assessment that appeared in ASEE's PRISM magazine. Also, the Southeastern University and College Coalition for Engineering Education (SUCCEED) offers assistance in preparing for ABET review. This NSF-sponsored coalition is comprised of engineering colleges in nine southern universities "committed to a comprehensive revitalization of undergraduate engineering education for the 21st Century."[3]

References
1. *How Do You Measure Success? Designing Effective Processes for Assessing Engineering Education*, the American Society for Engineering Education, Washington, DC, 1998.
2. ABET Website, http://www.abet.org/ Copyright © 1999.
3. Virginia Tech SUCCEED Website, http://www.succeed.vt.edu/, July 20, 1998.

Industry Advisory Board

An Open Letter to MSE Alumni

Dear Fellow MSE Alumni:

In 1996, the MSE Department, at the request of the Dean of Engineering, established an advisory board of industry representatives with the purpose of establishing a link with businesses that benefit from the activities of the department. The members were invited by the department based upon their previous involvement in student recruitment, support via scholarship donations or because they represent areas of future development for MSE. The members serve voluntarily and at the pleasure of the department. Currently there are thirteen board members of which seven are Virginia Tech alumni.

The board has assisted in two activities since its inception. First was to help the department in a detailed review of the MSE curriculum and organization in preparation for the most recent accreditation review by the Foundry Education Foundation. Second was to communicate to the College of Engineering the need for a distinct Ph.D. program for Materials Science and Engineering. This served to support the fine efforts of the faculty and administration to secure what will be a valuable undergraduate and graduate student recruitment tool.

These efforts have been aimed at improvement in the MSE program in general and in development of the graduate program in particular. The next project that the board has selected will be in support of the undergraduate program. Growth in undergraduate enrollment is a vital need for the MSE program to grow as a whole.

If you have visited the MSE Department since you graduated, you may have noticed that the facilities looked very much as they did when you attended. While this is fine for nostalgia's sake, it has become apparent that the undergraduate facilities will not attract, nor will they support, a growing student population.

The Commonwealth of Virginia is progressively reducing the amount of support that it will budget for state universities. However, Virginia Tech is growing, so necessary improvements can only happen in the near term by seeking sources outside the university.

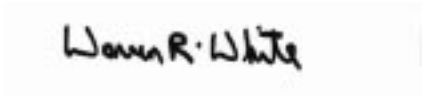
While we cannot expect to fund all of the needs identified by the MSE Department, the board has decided that we will seek to provide funds for a very focused project to see if we can make a contribution to the undergraduate program. The laboratories for materials preparation and characterization, a basic fundamental for training in material science, need $200,000 for purchasing a microscope, cut-off saw, polishing equipment and support furniture.

To date, the faculty has succeeded in obtaining at-cost quotes for the polishing equipment from a leading manufacturer. Three companies have donated $30,000 to begin the support fund. The board will continue to seek corporate donations for this effort. I am asking you to consider helping with this project.

The most convenient way for an alumnus to contribute to this is through the Virginia Tech Annual Fund. The fund allows one to direct the destination of their contribution. If it is not directed, it will go towards general funds to support the university as a whole.

The Annual Fund Drive for 1999 has started. If you receive a request in the mail, and you choose to contribute, please consider directing your contribution to the Department of Materials Science and Engineering. If you get a telephone solicitation, you can still direct the destination when you pledge.

Please join the board and me by placing your support behind the growth and development of the MSE Department. The progress of this activity and other board efforts will be reported in this newsletter.



Warren White
Chair, Industry Advisory Board

Department News

MSE Searches for New Department Head

The search for a new department head to lead MSE in the post-Ron Gordon era and into the new millennium is underway. Advertisements for the position have been placed in the monthly news bulletins of each of the major materials societies (*JOM*, *Ceramic Bulletin*, and *MRS Bulletin*). The search committee (Professors Kampe, Reynolds, Hendricks, Farkas, Corcoran, and Karmis) welcomes any assistance from MSE alumni and friends in identifying qualified and motivated candidates for the position. The committee expects to begin the evaluation process in December towards the goal of having the new head in place by the start of the 2000 academic year. A copy of the advertisement is included below.

Department Head
Materials Science and Engineering
Virginia Polytechnic Institute and State University

Applications are invited for the position of Head of the Materials Science and Engineering Department at Virginia Tech. The department has approximately 75 undergraduate students, 45 graduate students, and offers a broad curriculum covering metallic, ceramic, polymeric, electronic, and composite materials. It is the only department in Virginia offering a baccalaureate degree in MSE. The department has 18 faculty (9 jointly appointed with other departments), participates in roughly ten research centers, and has research activity at the university's Alexandria Research Institute (a graduate research facility in the Washington, D.C. area). The department's annual research budget is $2 million. Virginia Tech is located 45 miles west of Roanoke in the scenic foothills of the Blue Ridge Mountains. A growing corporate research center is located adjacent to the campus. Additional details are available through the department's web page: http://www.mse.vt.edu.

Qualified candidates for the position must have outstanding leadership and administrative skills; a strong record of research performance; dedication to education; and credentials commensurate with appointment as Full Professor with tenure. The successful candidate will be expected to: (1) effectively advocate the department to the university administration, industry, and government; (2) encourage faculty development and creativity; and (3) lead fund-raising efforts by promoting sponsored research and cultivating corporate and private support. Candidates are asked to submit a curriculum vita detailing their qualifications and experience, the names and addresses of five references, and a statement describing their approach to meeting the challenges of the position.

Screening of candidates will begin December 1, 1999 and continue until the position is filled. Applications and inquiries should be directed to the MSE Department Head Search Chair:

Associate Professor Stephen L. Kampe
Virginia Tech
Department of Materials Science & Engineering
213 Holden Hall, Mail Code 0237
Blacksburg, Virginia 24061
Email: *kampe@vt.edu*

Virginia Tech has a strong commitment to the principle of diversity and, in that spirit, seeks a broad spectrum of candidates including women, minorities, and people with disabilities. Individuals with disabilities desiring accommodations in the application process should notify Tracey Keister, Materials Science & Engineering, 1-540-231-9469, Virginia Telecommunications Relay Service 1-800-828-1120.

Junior/Senior Faculty
Materials Science and Engineering
Virginia Polytechnic Institute and State University

Applications are invited for junior and senior faculty positions in the Materials Science and Engineering Department at Virginia Tech. Candidates must have a dedication to education and a strong record of research performance for the senior position, or a commensurate record of research for the junior position.

The department is especially interested in persons with ceramic engineering or science backgrounds, however, strong candidates with any other materials background will be seriously considered. The successful candidate will be expected to: 1) effectively teach students at both the undergraduate and graduate levels; 2) implement and maintain a major contract research program; (3) attract, advise, and fund graduate students; and 4) assist and advise related materials efforts at the university and throughout the State of Virginia.

The department has approximately 75 undergraduate students, 45 graduate students, and offers a broad curriculum covering metallic, ceramic, polymeric, electronic, and composite materials. It is the only department in Virginia offering a baccalaureate degree in MSE. The department has 18 faculty (9 jointly appointed with other departments), participates in roughly ten research centers, and has research activity at the university's Alexandria Research Institute (a graduate research facility in the Washington, DC area). The department's annual research budget is $2 million. Virginia Tech is located 45 miles west of Roanoke in the scenic foothills of the Blue Ridge Mountains. A growing corporate research center is located adjacent to the campus. Additional details are available through the department's web page: http://www.mse.vt.edu.

Screening of candidates will begin February 15, 2000 and continue until the position(s) is(are) filled. Applications and inquiries should be directed to:

Prof. J. J. Brown, Faculty Search Chair
c/o Ms. Tracey Keister, Executive Secretary
Virginia Tech
Department of Materials Science and Engineering
213 Holden Hall, Mail Code 0237
Blacksburg, Virginia 24061
Email: *jjbrown@vt.edu*

Virginia Tech has a strong commitment to the principle of diversity and, in that spirit, seeks a broad spectrum of candidates including women, minorities, and people with disabilities. Individuals with disabilities desiring accommodations in the application process should notify Tracey Keister, Materials Science and Engineering, 1-540-231-9469, Virginia Telecommunications Relay Service 1-800-828-1120.

Department News continued

Stephen L. Kampe, in conjunction with Leonitis Christodoulou, has received a set of patents describing a new class of *in situ* metal-matrix composites. The patents, issued April 28 and Dec. 29, 1998, were obtained for the method of producing the composites and for a series of composite compositions that have been produced at Virginia Tech using the technique. (*Spectrum*) ❖

Prof. Brian Love and Prof. Kim Forsten (ChemE) wrote an invited journal article, "A Particle Adhesion Perspective on Metastasis," which has been accepted for publication in the *Journal of Adhesion.* Brian also presented a Biomaterials short course at 3M Corporation in Minneapolis in October.

Brian Love co-chaired the 2nd Conference on the Development of Technology in Medicine in Virginia, held in Charlottesville, Virginia, on November 1 and 2, 1999. Approximately 70 papers were presented with a contingent of 12 students and faculty from Virginia Tech among the 120+ attendees. Scott Trenor, a first year graduate student in MSE, gave a presentation on a group project dealing with protein aggregation using a Coulter Counter. Faculty from the Center for Biomedical Engineering and the Virginia/Maryland Regional College of Veterinary Medicine also gave presentations at the conference. Among the amenities at the conference was a dinner at the Rotunda on the grounds at The University of Virginia.

In other department news Prof. Love reports, "We have been rapidly expanding the capability of the laboratory affiliated with the Center for Biomedical Engineering in Room 106 Hancock. Included now is a Beckman Coulter Counter, which we resurrected from the Virginia-Maryland Regional College of Veterinary Medicine for Cell Blood Count analyses and for other particle aggregation measurements. We also recently took possession of a Hewlett Packard 1050 High Pressure Liquid Chromatograph (HPLC) equipped with two detectors and a new data acquisition system. We have also repaired other instrumentation including a PE TGA-7 thermogravimetric analyzer and another PE DSC-7 Differential Scanning Calorimeter (DSC)." ❖

The MSE/ESM Advanced Engineering Communications Program has hired an instructor, **Jessamyn Franks**. Jessamyn has been a GTA in the program over the last two years and has been given a joint appointment in MSE and ESM. **Dana Swartz** has also joined the program as a jointly-appointed GTA. ❖

The MSE Department welcomes **Louis J. Guido**, who joined the Virginia Tech faculty this fall as an associate professor with the Materials Engineering and the Electrical and Computer Engineering Departments. Professor Guido served on the technical staff at AT&T Bell Laboratories from 1982 until 1984, during which time he earned his M.S. degree in electrical engineering from the University of Illinois.

He received his Ph.D. degree in electrical engineering during the spring of 1989 at the University of Illinois. Later that year, Dr. Guido joined Yale University as an assistant professor in the Department of Electrical Engineering.

In 1992, he was one of 15 engineers nationwide to be awarded a five-year National Science Foundation Presidential Faculty Fellowship. In 1993, he was promoted to associate professor in the Departments of Electrical Engineering and Applied Physics and held the John J. Lee Junior Faculty Endowed Chair in Electrical Engineering.

In 1998, Dr. Guido received the Marconi Award by UNICO National for outstanding contributions to science and engineering by a person of Italian descent. Professor Guido's research interests include nucleation phenomena and kinetics of crystal growth; self-diffusion, inter-diffusion, and impurity diffusion in semiconductors; compound semiconductor alloys, heterostructures, and quantum wells; and the physics of photonic devices operating at extremely short (UV) and long (FIR) wavelengths.

His research accomplishments include the discovery of impurity-free layer disordering, which is a widely used method for fabricating photonic integrated circuits; the demonstration of the first semiconductor device using carbon as an active p-type dopant, which is now commonplace in GaAs-based heterojunction bipolar transistors; the first comprehensive study of the piezoelectric effect in pseudomorphic quantum well structures, which established the case for a novel class of optoelectronic switching devices; the discovery of a new selective-area semiconductor growth process, which provides a means to register nanoclusters in user defined patterns; and the invention of a new light emitting diode with a 15-fold increase in power conversion efficiency, for which he was awarded a U.S. patent. Dr. Guido's overall work on the materials synthesis and device physics of semiconductor alloys and quantum well heterostructures has contributed to 45 journal articles and 15 invited seminars at leading research universities, industrial laboratories, and international conferences. ❖

Student and Alumni News

Virginia Tech faculty and students attended the 18th Annual Southern Biomedical Engineering Conference at Clemson University last May. From left to right: Kristen Droesch (MSE), Kim Forsten (ChemE), Brian Love (MSE), Charley French (MSE), Matt Thompson (ME), Patricia Dolez (MSE), Joanie Foy (ESM), Scott Trenor (MSE), Kelly Renshaw (MSE), David Moorcroft (ESM), John Cotton (ESM).

David Teter (MSE '93, M.S. '95, Ph.D. MESc '98) is now in New Mexico working in the Geochemistry Dept. Sandia National Laboratories in Albuquerque. ❖

Tiffany Brunetti (MSE '99) is in Columbus, Ohio, working for the Battelle Memorial Institute in Life Cycle Management. She has worked on projects with GM, Hill Air Force Base, the U.S. Army, and 3M and thinks she has landed the perfect job for her. ❖

Robert W. Ellis, Jr. (METE '62) retired from Lawrence Technological University, where he had served as the dean of engineering and as the provost. ❖

John R. Christman (CERE '75) is the survey manager with Anderson and Associates, Inc., in Blacksburg. He recently coordinated the Trig-Star Contest in two local high schools. ❖

Gary Pickrell (MESc '94) has joined the Virginia Tech faculty as a senior research scientist in the ECpE Dept. He is working on materials issues related to fiberoptic sensors in the Photonics lab. Prior to returning to Tech, Gary served as the Director of Porvair Advanced Materials in Hendersonville, NC. ❖

Mark V. Finch (MATE '83) has been promoted to Manager, Materials Technology for Silgan Containers Manufacturing Corp. in Wisconsin. ❖

Best wishes to **Brandon Hutcherson** (MSE '97) and Virginia Tech alumnus Kristin Astheimer ('94), who were married on April 10, 1999. ❖

Matt McMurtry (MSE '99) is working for BBN in the Sensor Systems and Technologies Division in Northern Virginia. ❖

Ben Hailer (MSE '98), **Shawn Kelly** (MSE '99), and **Jeff Schultz** (MSE '99) are pursuing graduate studies at Virginia Tech in the MSE Department. ❖

James Myers (MSE '99) is working for Brenco in Colonial Heights, Virginia. ❖

Jireh Yue (MSE '99) is attending graduate school at Georgia Tech. ❖

Prof. Larry Dooley, Biomedical Eng. at Clemson Univ. awards a 1st place certificate to Kelly Renshaw for undergraduate research presented at the Biomedical Eng. conference in May. Kelly received a $200 prize for her entry.

Kevin Cherry (MSE '99) is a graduate student in the MSE Department at Carnegie Mellon in Pittsburgh, Pennsylvania. ❖

Chris Bouthiette (MSE '99) works for Newport News Shipbuilding, Newport News, Virginia. ❖

Ken Jennings (MSE '99) is working for Electro-Tec in Blacksburg, Virginia. ❖

Congratulations to **Dana Hamly de Jager** (MSE '91) and Rene de Jager, who recently became the parents of triplets, born March 16, 1999. Elizabeth, Mitchell, and Matthew are doing well, along with 2-year-old sister, Caroline. Dana and Rene are living in The Netherlands where Dana reports she's writing a book....*How to Survive Without Sleep*! ❖

The Society for the Advancement of Materials and Process Engineering (SAMPE) holds an annual Ph.D. paper/presentation contest at its national conference. Five national Ph.D. finalists were selected from student-submitted papers and from regional presentation competitions. Two finalists this year were from MSE. **Julie Martin** and **Jennifer McPeak** attended the SAMPE Long Beach conference in May to present papers in the national student competition, where they tied for first place. First prize was a trip to either Tokyo or Paris to present at an international conference. Since they tied for first place, SAMPE sent Jennifer to Tokyo and Julie to Paris. ❖

CONGRATULATIONS MSE '99 GRADS!

Back, l to r: Kevin Cherry, Brian Seal, Ty Schmierer, Tim Evans
Front, l to r: Jeff Schultz, Christopher Bouthiette, Ron Halahan

Back, l to r: Shawn Kelly, James Myers, Matt McMurtry, Christopher Meyer;
Front, l to r: Sean Grealis, Jefferson Kim, Ben Liptak, Tiffany Brunetti, Susan Holt.
Not pictured: Jireh Yue, Janelle Combs, and Ken Jennings.

Stephen Stucklin and Eva Jud (not pictured) participated in the MSE program as exchange students from Switzerland.

We always enjoy hearing from you. Let us know what you've been up to. Please send news and updates to LeeAnn Ellis, MSE Dept., 213 Holden Hall, Mail Code 0237, Blacksburg, VA 24061. E-mail: mse@vt.edu

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