

The World of Materials

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

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Greetings From the Department Head Ronald S. Gordon

It is my pleasure to greet alumni and friends of the Materials Science and Engineering (MSE) Department with this inaugural issue of *A World of Materials*. Budget permitting, we plan to issue this newsletter at least twice a year. Many changes are occurring in higher education in Virginia and also in the programs of the Materials Science and Engineering Department at Virginia Tech. In this first issue of the MSE newsletter, I would like to review with you some of the changes that have taken place in the department over the past six and a half years since I became the department head.

Current MSE Snapshot

Approximately 65 students are currently enrolled in the ABET accredited undergraduate B.S. degree program covering the sophomore, junior, and senior classes. As you may recall, the freshman program is common to all departments in the College of Engineering. We expect to grant 20 B.S. degrees in the 95/96 calendar year. Our graduate enrollment is comprised of approximately 53 students (29 M.S. and 24 Ph.D.). The Ph.D. students are enrolled in the interdisciplinary MEng program at Virginia Tech which has a total enrollment of approximately 50 students. In the 95/96 calendar year, MSE expects to grant approximately 20 M.S. and 12 Ph.D. degrees, respectively. Over the past five years MSE has produced on average 21 B.S., 10 M.S. (M.Eng.), and 4 Ph.D. (MEng) degrees per year. MSE faculty currently generate sponsored research programs from government agencies and industry at a level of approximately two million dollars annually.

The MSE Department, currently composed of 20 faculty members in 15.5 FTE positions, conducts interdisciplinary,

generic teaching and research programs in undergraduate and graduate education in materials science and engineering. Nine faculty members are jointly appointed with other academic departments in the University (seven with Engineering Science and Mechanics, one with Geological Sciences and one with Chemistry). A cost-effective approach to materials education is pursued in that the separate disciplines of ceramic, metallurgical, and polymer engineering have been combined into the single field of materials science and engineering consistent with national trends outlined by the National Research Council. Undergraduate and graduate curricula are under development in which a generic core of classes, including all material types (ceramics, metals, polymers, electronic/optical materials, composites, and biomaterials), forms the basic

***MSE faculty represent over 100 man
years of industrial experience in the
engineering application of materials***

underpinning of the undergraduate and graduate programs of study. Faculty in the department have broad industrial backgrounds in the engineering application of materials and come from interdisciplinary educational backgrounds in engineering and science with degrees from major universities.

During a period of severe economic constraint and budget reductions, which have been encountered almost continuously since 1990 in the Commonwealth of Virginia, the

MSE Department has been able to increase the size of faculty by 40% by recruiting six new faculty members and securing nine joint faculty appointments with other academic units at Virginia Tech. Our faculty are very productive both in teaching and research. Over the last three years, Professors Kander (1993), Kampe (1994), and Lu (1995), three junior members of the MSE faculty, have been awarded the prestigious Sporn Award for the teaching of introductory subjects in engineering. This award is based entirely on student input and relates to excellence in undergraduate teaching as assessed by the student body in the College of Engineering. Professor Jesse J. Brown was named the Newport News Shipbuilding/Tenneco Professor of Engineering. Professor Diana Farkas received a Fullbright Scholar Award under the American Republics Program and a grant under the Faculty Awards for Women Program of the National Science Foundation. Professor Guo-Quan Lu is the recipient of a distinguished CAREER Award from the National Science Foundation. Professor Gerald Gibbs was named one of two outstanding scientists in the Commonwealth of Virginia in 1993. Professor D.P.H. Hasselman, a member of the International Academy of Ceramics, was elected Fellow of the International Thermal Conductivity Conferences. Another indication of faculty productivity is the fact that the MSE Department has been ranked third in the University by the Vice Provost for Research and Graduate Studies for its activity and accomplishments in patent disclosures, patents issued, and licenses.

The undergraduate program has undergone many changes and innovations over the last six years including: (1) the creation of a menu consisting of some fifty courses covering many important areas of study in materials science and engineering; (2) an increase in course offerings in biomaterials, polymers, ceramics, composites, and electronic materials; (3) a cross-listing of sixteen courses with nine academic departments in two colleges in the University; (4) classification of approximately 20 course offerings which can be co-enrolled by advanced undergraduate and beginning graduate students; (5) establishment of a "Writing and Communications Program Across the Curriculum," described in this issue of the newsletter; (6) development of a core undergraduate teaching laboratory in electronic and optical materials; (7) development of a core undergraduate laboratory course to parallel the newly created lecture course in polymer engineering; (8) joint development with the Engineering Science and Mechanics Department of a core undergraduate lecture and laboratory course sequence in the mechanical behavior of materials; and (9) upgrading of the undergraduate course in analytical methods which is devoted to the application of computer software packages in solving MSE problems and which includes instruction in statistics, numerical modeling, scientific visualization, and world-wide-web courseware development.

Finally, substantial investments, funded from the Commonwealth Equipment Trust Fund, special equipment grants from the University, and research overhead which is returned to the Department, have been made in recent years in start-up packages for new faculty, upgrading equipment in the undergraduate teaching and graduate student research laboratories, and in the development of an electronic classroom in Holden Hall.

Future Direction

While enrollments and degree productivity of the MSE Department are comparable and competitive on average with peer MSE Departments around the country, they are still low on a per faculty FTE comparison with the larger departments in the College of Engineering. MSE's productivity in research and overhead dollars generated per faculty FTE ranks in the top 50% of departments in the College of Engineering. However, in a time of severe budget constraints and reductions as we are currently experiencing, smaller units in the University are coming under increasing pressure to either reorganize or consolidate with larger units in the University. It is also becoming apparent that the bulk of new resources from the Commonwealth coming to the College of Engineering will be directed to the larger academic units in the College and unless smaller units such as MSE can affiliate in some fashion with one or more of these departments, Commonwealth resources to support their programs can be expected to shrink over the foreseeable future. Departments are under increasing pressure to secure alternative sources of funding including gifts and endowments, increased research overhead, and funds generated from activities in outreach and short courses.

Merger may be key to growth for MSE

The University, under a directive from the State Council of Higher Education in Virginia (SCHEV), is conducting a review of all academic programs in the coming year to determine their relative strength and centrality to the mission of the University. In addition to these reviews, MSE graduate programs will also be reviewed and an assessment of both its undergraduate and graduate degree programs will be performed under the Commonwealth's Student Outcomes Assessment Program. MSE successfully completed an ABET review of its undergraduate degree program last fall.

With all of this scrutiny on review and assessment and the apparent emphasis on enrollment and degree productivity, it is becoming clear that for the MSE Department to make further progress and to grow in this constrained economic climate, it should seriously consider merging with one of the larger units in the College of Engineering. Consequently, I have initiated this year exploratory discussions

with the Electrical Engineering Department on a possible merger with the MSE Department. It is becoming readily apparent that the Commonwealth of Virginia is attracting new companies (Motorola, IBM, Toshiba, others) who will be expanding the industrial base of electronics and electronic materials. This is expected to be a significant area of growth and one which the EE and MSE Departments can mutually exploit. Significant opportunities in curriculum development, graduate education, short course development, outreach, and research are anticipated.

Should such a merger occur, it is anticipated at this time that the MSE Department would become a Division of Materials Science and Engineering in the Electrical Engineering Department. All degree programs (B.S., M.S., M.Eng., and Ph.D.) in MSE would be maintained and expanded. It is anticipated that the number of faculty in the new division concentrating in the electronic materials area would increase by affiliation of existing EE faculty with this new division and the hiring of new faculty to take advantage of the expanding economic activity in the Commonwealth. I believe that this new arrangement will expand the opportunity for MSE to maintain its current programs and, at the same time, undergo significant growth with the EE Department in areas of electronics, optics, and computers. It is not uncommon for MSE programs to be part of larger departments. The most common examples are merged departments with either mechanical or chemical engineering. While examples of combinations with electrical engineering departments are fewer in number, there are many large electrical engineering departments in the country with substantial numbers of faculty engaged in materials teaching and research. In a time of limited resources, it is not realistic to assume that materials at Virginia Tech can grow both as a stand-alone MSE department and also as a major component of an expanding EE department.

The MSE Department is increasingly at a disadvantage when trying to compete with materials activities supported by the larger departments in the College of Engineering who have access to larger resources. Merger of the EE and MSE Departments at Virginia Tech will make maximum use of the available resources. It is also believed that this merger will lead to an increase in undergraduate and graduate enrollments in the materials programs and also provide increasing job opportunities for students. Currently, the largest and fastest growing businesses in the materials areas are those related to the electronics, optics, telecommunications, and computer industries.

I realize that this is a controversial proposal and I would welcome your comments and suggestions. What is being proposed for consideration is not a dissolution of the MSE program but a reorganization which will maintain the integrity of the MSE undergraduate and graduate degree programs but also significantly expand the opportunities for growth of the MSE Program with increased access to resources.

In this newsletter, we will be profiling one of our distinguished faculty members, Professor Seshu Desu, and one of our very accomplished students, Bryan Dickerson. In future issues we will profile additional faculty and students in the program. In the next issue we plan to publish the results of an alumni survey of our undergraduate curriculum sent to B.S. alumni who graduated during the last five years.

The faculty, staff, and students of the MSE Department wish you a successful and prosperous 1996. We would be pleased to hear from you about your thoughts and concerns related to our department. We live in strenuous economic times, and growing and nurturing the department in these times require the hard work and imagination of many people, including our alumni and friends.

Attention MSE Graduates

Did you receive a B.S. between 1990 and 1995?

All Virginia Tech MSE alumni who graduated with a B.S. between 1990 and 1995 should have received an alumni survey last fall. To those of you who responded, thanks very much! Your responses will be very helpful as we continue to upgrade our educational efforts. While the response rate has been very good, we are still hoping to hear from the rest of you. If you still have that survey sitting around, please take a few minutes to fill it out and send it in. If you did not receive a survey, let us know and we will send one out to you immediately. You can e-mail us at mse@vt.edu, or send a note to LeeAnn Ellis, 301 Holden Hall, Blacksburg, VA 24061-0256.

We plan to compile the survey results in our next newsletter, so send in your responses soon.

Looking forward to hearing from you!

MSE Writing and Communications Program at Virginia Tech

Eric Pappas
Robert Hendricks

Introduction

In August 1992, the Materials Science and Engineering Department (MSE) initiated a comprehensive undergraduate writing- and communications-across-the-curriculum program to be integrated into eight required MSE courses over students' three years of study in the department. The student-centered program focuses mostly on the development of discipline-specific writing skills but also includes instruction in public speaking, interpersonal communications in the workplace, and computer graphic design. In addition, the program includes faculty training and support for integrating writing into technical course work, developing writing assignments, assisting students in revising their own writing, and grading written assignments.

Our efforts are student-centered and, in determining our students' needs, we consider their age, gender, educational and cultural background, professional ambitions, and the social and cultural climate in which they study and live.

*...learning effective professional
communications enhances one's quality
of life, not simply one's career*

Program Objectives

The primary objective of the program is to improve undergraduate student writing and communication skills to above the level expected by future employers. Students are required to understand well the intricacies, necessity, and importance of effective writing and communication skills in an increasingly complex and technological workplace. It is critical for each student to develop a "professional persona": a conscious, communicative, and ethical approach to everyday professional behavior and collegial relationships in the workplace.

Since engineering students at Virginia Tech have a well-advertised resistance to writing, we felt that to accomplish our objectives, we needed a marketing strategy, a way to demystify the act and process of drafting and revising a technical document. We have been marketing technical writing and communications as essential skills for any engineering professional working in industry or academia. We bring in speakers and circulate articles, MSE faculty discuss workplace issues in class, and we focus on teaching skills that will afford students a greater visibility among prospective employers and a higher degree of professional productivity and personal satisfaction.

We hope to impress upon our students that writing is an art, a process that can be improved with regular practice and moderate instruction, and that learning effective professional communications enhances one's quality of life, not simply one's career.

Program Design

The program is staffed by a director, a faculty member from the English Department experienced in teaching developmental and technical writing, interpersonal communications, public speaking, and career advising. Part-time English instructors and graduate students from both the English and the Materials Science and Engineering Departments provide support. A committee of five MSE faculty members teach the writing program courses and form the writing committee overseeing the program. We coordinate our efforts with the University Writing Center and continue to receive the full support of the department, college, and university.

Our writing and communications program is integrated into eight required MSE courses in such a way that the writing and communication tasks in each class seldom duplicate those addressed in subsequent program classes. Normally, students will take one, or sometimes two, program courses in a semester so that they will be enrolled in a writing- and communications-intensive class every semester during sophomore, junior, and senior years.

Integrating writing and communications into MSE courses has become the focus of much of our energy. Faculty members who teach program courses have found it necessary to restructure their classes so that they do not sacrifice course content to writing and communications instruction. Synthesizing these elements has been our greatest task, and we now understand well that writing and communications cannot successfully be "added on" to a class, that to be relevant, these skills are best learned in the context in which they are used in the workplace.

We are developing methods of teaching course content using writing and communications as learning tools. As well, we are using "workplace model" tasks as central components to several courses. For instance, our materials processing class requires students to work closely in small independent groups to conduct a realistic industry-type laboratory experiment and prepare two revised progress reports, a revised final lab report, and a group oral presentation for faculty. These methods allow us to prepare students for tasks they will soon encounter as professionals.

Curriculum Design

The major instructional components of the program include 1) in-class team-teaching writing and communications instruction, 2) regular 90-minute evening workshops, 3) individual and small group tutoring, 4) special topics presentations, and 5) faculty training and development.

In-Class Team Teaching

During each semester, the director makes six or seven presentations in each program class and occasionally stops by program classes to talk with students as a group and maintain a presence in the classroom setting. In-class presentations address class-assigned laboratory reports and research papers as well as more general writing and thinking skills, such as the writing process, writing as thinking, brainstorming, revising, editing, and proofreading.

Evening Workshops

Some writing and communication skills that are an essential part of our program do not fit conveniently into any existing MSE course. Evening workshops are 90 minutes long and present topics in “clusters” of three sessions each; that is, each workplace-related topic is presented over a period of three weeks. This approach facilitates teaching such topics as résumé preparation, letters of application, job search strategies, business writing, public speaking, and interpersonal communications in the workplace in suitable depth.

Individual and Small Group Tutoring

Individual tutoring sessions and small group tutoring are available for any writing or communication tasks students face. Individual tutoring is available during scheduled walk-in hours and by appointment at the MSE Writing Center. Small group tutoring sessions are usually offered before class-assigned writing or speaking projects are due.

Special Topic Presentations

Special topic writing or communication presentations expand our offerings to include a greater variety of technical topics. Faculty members are encouraged to ask the writing director to design one-time presentations addressing their class’ needs for a specific writing or communications project.

Faculty Training and Development

Faculty training and development are central to the most important component of the program, our work in the classroom. The writing director works with four faculty members each year team-teaching the program classes, helping design lab report requirements, developing research paper guidelines, and establishing standards for grading. In addition, the writing director meets regularly with each of the program faculty members to evaluate multiple drafts and final revisions of lab reports and research papers, and to make recommendations for grading writing style, organization, and mechanics.

Evaluating Student Writing and Communications

Evaluating our students’ work, for their benefit and for our information, is central to the program. Individual faculty members have determined the best methods for evaluating their own students’ work, but the participation of the writing director in this process has helped set some specific criteria for what constitutes effective written communications. We use multiple revision as a primary tool for teaching writing, and we offer students instruction and support in revising, editing, and proofreading their own work. In some writing program courses, three rewrites are required, and some students revise continually until they reach a personal standard.

A typical scenario for grading a set of papers involves the writing director making an initial written evaluation of each student’s writing and then passing the paper on to the MSE professor to make a written evaluation of the technical content. Both the director and the MSE professor then meet to discuss the total evaluation of each student’s paper. During these meetings, the writing director discusses writing style and organization, grammatical correctness, and grading procedures with the MSE professor.

Setting standards for evaluating writing takes place in the following manner. As students move from sophomore to junior to senior status, their writing and communication skills play an increasingly formal role in their academic progress. As students complete a greater number of program courses, the evaluation standards increase, and we grade their assignments more critically. By the time students are working on their Senior Design Project, we expect their writing to be up to industry standards and, perhaps, of publishable quality.

We keep extensive writing portfolios on our students, and we can document significant writing improvement for many students, and some progress for virtually all the students.

The sophomore class entering in Fall 1994 was required to register for a recently established class, MSE 4084—Writing in Materials Science and Engineering. This is a 0 credit class in which each student must develop a portfolio of his or her writing in various styles from work performed in the eight program classes. This requirement meets the writing-intensive requirements of the new University Core Curriculum. The writing assigned to students over three years will exceed greatly the amount required to complete the portfolio checklist. Each student’s portfolio must contain the following revised and graded assignments:

- 1) one senior project or honors senior project final report (minimum 15 pages) or one manuscript on a scientific topic suitable for publication (minimum 15 pages);
- 2) one formal researched technical paper (minimum 10 pages);
- 3) three laboratory reports or technical memos (minimum 5 pages each);
- 4) two reports on research in progress (minimum 3 pages each);
- 5) one résumé (ungraded);
- 6) one letter of application (ungraded);
- 7) one graded oral presentation (minimum 8 minutes speaking time); and
- 8) one graded poster session of professional meeting quality.

The work in the portfolio must be graded “C” or above; any work not meeting this standard must be revised and regraded under the direction of the writing director.

Student Support/Faculty Participation

Many engineering students are convinced they cannot write well, and this may be true for some required Freshman English assignments. Technical writing is different, however, and students are less intimidated when they are shown well-established linear approaches to preparing certain documents. Students are often encouraged by their initial success preparing these structured documents (lab reports, progress reports, technical memos) and are willing to attempt more challenging assignments.

Many students, encouraged by the improvement in their work, have become increasingly self-motivated and are encouraging other students to increase their participation in the voluntary aspects of the program (especially the one-on-one tutoring).

Faculty support has been critical to the development and success of the program. All MSE faculty members support the program, discuss the value of effective writing and oral communications with their students, and encourage students to take our efforts seriously. Materials Science and Engineering Department Head, Dr. Ron Gordon, has enthusiastically supported our efforts in every way and has provided us with a graduate teaching assistant from the English Department.

Because any academic department is a workplace, we have encouraged faculty to become role models and to exemplify excellent professional writing and interpersonal communication skills. To support this goal, the writing director has established good communications with faculty members and updates them regularly in memos and during faculty meetings. In addition, the director visits faculty members individually to discuss how the writing program might address class-related writing and communication problems.

Program Philosophy

Underlying our activities is the belief that all writing and oral communications are creative activities—acts of thinking, conceptualizing, organizing, and drafting ideas in an accessible manner for a specific audience.

In our experience, individuals with good communication skills tend to live balanced lives and be more successful professionals because they have a greater awareness and understanding of human interaction. Human potential and creativity grow from balance; well-balanced and communicative individuals tend to be excellent colleagues, easy to understand and predictable, with which to work. Successful people communicate their ideas well and more easily gain support for their ideas.

Effective communication connects us with others and their thoughts, actions, and ideas, and we, in part, develop our own identities and ideas based upon how others perceive and interact with us. We find practicing effective writing, public speaking, and interpersonal communications to be central to success in one’s career and life; these skills provide students with a way to know the world and be known by the world. Developing and practicing communication skills increases an individual’s understanding and control of the events that shape his or her life.

Interpersonal communications are becoming more central to our program although they are often de-emphasized or ignored in other communication programs. Most important workplace communications are oral, at least in their conception, and without a firm foundation and regular practice in one-on-one and small group communication skills, creativity, productivity, and even writing ability are necessarily diminished. Our relationships with colleagues become a matter too important to relegate to the periphery of an academic curriculum.

Conclusion

As we begin our fourth year as a program in Materials Science and Engineering, and our second year as a joint program with Engineering Science and Mechanics (ESM), several structural components of the program have changed: 1) our staff now includes two part-time English writing instructors and an engineering graduate assistant, 2) we offer daytime workshops for students from both departments, 3) faculty from both departments are looking for opportunities for their students to collaborate on writing projects, and 4) we are developing interdisciplinary writing standards.

Considerable industrial support has allowed us to explore new communication topics. We are currently integrating ethics instruction into the communications curriculum and plan to introduce critical and conceptual thinking, and leadership skills during the next two years.

We are gaining expertise through our experiences, mostly due to the support and participation of the MSE faculty, the Provost's Office, the College of Engineering, and the College of Arts and Sciences. Most of all, the program is succeeding because a group of active MSE students participate regularly in the program and believe in its objectives.

Much of our task during the past four years has been to counter the belief among engineering students that writing and communications are not essential to a successful career. Most of our students are now convinced that their chances of having a successful and stimulating career are as much related to their ability to communicate the results of their work as it is to their ability to perform that same work.

Dr. Hendricks came to Virginia Tech in 1986 as Professor of Materials Science and Engineering. Prior to coming to Tech he was Senior Scientist and Associate Director of the National Center for Small-Angle Scattering at Oak Ridge National Laboratory (1964-1981) and the Chief Scientist at Technology for Energy Corporation (1981-1986). His research interests center on the role of residual stresses in the performance of metals, ceramics, and electronic materials.

Eric Pappas, Ed.D., is a faculty member in MSE and the Department of English. He has been the Director of the MSE Writing and Communications Program for three years.



During an MSE Awards Luncheon held in December, Dr. Gordon (right) presented scholarship checks to Jeff Glenning (gray sweater) and Howard Nordby (white sweater). Also pictured is Prof. Reynolds (left, who serves as Virginia Tech's contact with the Foundry Educational Foundation).

Scholarships awarded to MSE students in 1995/96 included:

Morgan Williams Scholarships \$2000 (Washington, D.C. chapter of ASM International)	Jeff Glenning
Iron and Steel Society Scholarship \$2000	Jeff Glenning
Foundry Education Foundation Scholarship \$500	Jeff Glenning
ASM Scholar \$500 (National)	Howard Nordby
	Jeff Glenning

The following scholarships were awarded by the College of Engineering:

Leivesley Scholarship \$2000	Harry Abernathy III
Seay Scholarship \$500	Richard Hudgins
Seay Scholarship \$1000	Joshua Luszc
Seay Scholarship \$1000	Elizabeth Oborn

Meet Professor Seshu Desu

If you were to ask Professor Seshu Desu about his teaching philosophy, he would tell you that he is not interested in how smart students are when they arrive on his doorstep. He believes that through hard work students will become smarter. Hence, he asks for a fair amount of work, requiring an average of ten papers from doctoral students during their tenure with him.

Desu joined the Virginia Tech faculty at in 1988 as an assistant professor in the MSE department, bringing to his teaching and research style the advantage of an industrial background, along with his belief that hard work will lead to success.

Desu received a B.S. in Mathematics, Physics, and Chemistry in 1974 and an M.S. in Inorganic Chemistry in 1976, both at Andhra University in India. After earning a Master of Technology degree in Materials Science at the Indian Institute of Technology in Kanpur in 1979, he came to the U.S. to pursue advanced research in Ceramic Engineering.

While working toward a Ph.D. at the University of Illinois, Urbana, he attended informal interviews with major U.S. companies, though he planned to return to India upon completion of his degree. When AT&T Bell Laboratories offered him a position, he felt it was an opportunity worth pursuing. Among the many projects he was involved with at Bell Labs, Desu worked on semiconductor processes for random access memory. He also developed a new method for processing borophosphorus silicate glass (BPSG) using benign compounds, thus eliminating the use of dangerous chemicals.

In 1986, Desu accepted a position with General Electric as the leader of the Optical Filters Group, where he was responsible for developing a filter that would reflect infrared light back to the filament of a light bulb such that energy would not be required to keep the filament hot. This successfully developed product is now being used in commercial display cases.

Desu's research interests include electronic materials for advanced semiconductor devices, novel processes for sub-micron devices, and structure-property relations in thin films. Since his arrival at Virginia Tech, Desu has participated in 26 research contracts with research funding totaling more than \$4 million. He has authored or co-authored more than 70 technical papers, and he has been granted 2 patents and has submitted numerous intellectual properties for evaluation.



Desu currently serves as the director of the Center for Advanced Ceramic Materials (CACM). Under his direction, CACM researchers focus on environmentally benign manufacturing processes and ceramic materials applications. Along these lines, faculty working with CACM have been developing technologies for processing ceramic materials with a vision toward environmental impact. Examples include environmentally benign dry etching processes, applicable to various ceramic materials, and the development of fine titanium oxide powders with applications in waste detoxification.

Desu also directs the Thin Films Laboratory in the MSE department. He views this group of 20 post-doctorates, research associates, visiting scientists, and students as a leader in the field of ferroelectric thin films applied to advanced memories. An important work in progress in the Thin Films Laboratory, under the auspices of CACM and sponsorship of CERAM, Inc. and SHARP Corp., is the development of ferroelectric random access memories (FRAM), which possess the physical and electronic properties to provide dense, fast, nonvolatile memories for applications in artificial intelligence systems, solid-state disk systems, and consumer electronic devices. The Thin Films Laboratory group maintains an impressive record in rooting out problems and stumbling blocks in the area of ferroelectric thin films.

Meet Bryan Dickerson

Bryan Dickerson began his Virginia Tech career as a non-traditional student, one of many who have returned to school after a leave of absence spent in the “real world” pursuing various careers, perhaps starting families. The decision to return to school results from different circumstances, such as a desire or need for further education or a decision to explore new career possibilities.

For Bryan, entering Virginia Tech has meant not only changing direction, but also seizing the opportunity to once again enter a college atmosphere and enjoy “being young again.” He returned to school after an eight-year hiatus during which he enjoyed a diverse career as an artist, an English instructor, and a laboratory technologist.

As an undergraduate at the University of Colorado, Dickerson pursued his dual interest in art and science by working in various scientific laboratories while completing the requirements for a degree in Fine Arts. Following graduation in 1985, he set up shop in a small Colorado town as an artist, where he created and sold artwork, taught painting classes, designed space-saving easels, and presented his work in solo shows, including an exhibit at the National Arboretum in Washington, D.C.

In discussing his art, Dickerson describes himself as an “old style artist.” Much of his work, done in oils, consists of realistic landscapes and portraits, though he likes abstract art as well. He describes his abstract work as something abstracted from nature that he has zoomed in on or viewed from an unusual angle so that, while the work is realistic, the composition becomes more important. “You can funnel the subconscious or unspoken power of abstract expression through a lens of realism to give punch to the clarity of ideas that realism allows.”

Added to his love of art is a lifelong interest in Japan. He recalls fond childhood memories of Japan, where his father worked as a doctor for the U.S. Army. Hence, Dickerson seized an opportunity to visit Japan to attend the wedding of a friend. While there, he toured the Mito English Center and signed a one-year contract to teach conversational English.

He continued his work as an artist while teaching English, selling 25 paintings to his Japanese students and acquaintances. He also met and married Dorothea, another instructor at the Mito English Center,

Back in the States, Dickerson decided that, while he was able to support himself as an artist, the addition of a family meant it was time for a career change. Since science had always been of interest, the switch to science and technology was an easy choice. He accepted a laboratory position with Cordec Corporation in Lorton, Virginia, where he worked as a materials technologist, and discovered a new interest, materials engineering, and new talents as well.



He eventually became the quality control manager and as such, he had the opportunity to diagnose problems, then design, build, and implement the solutions. His artistic ability to view the world from different perspectives served him well in problem solving. He found the work stimulating and challenging felt limited by his lack of an engineering degree. Because his fine arts degree did not provide the necessary foundation for an engineer, Dickerson entered Virginia Tech in 1993 as an undergraduate student.

Since his arrival, Dickerson has garnered many awards and scholarships, including the ASM Undergraduate Scholarship, three TMS scholarships, a U.S. Army scholarship, and an undergraduate engineering scholarship presented by the Society for the Advancement of Material and Process Engineering (SAMPE).

Following graduation in Spring 1995, Dickerson began work on a doctorate in Materials Engineering Science under Professor Seshu Desu. His research focuses on the optical and electrical properties of ferroelectric thin films for memory devices, where he sees a bottleneck in computers caused by materials limitations.

Dickerson sees his engineering role as one of service. In view of his Christian beliefs, he strives to find a balance in bringing Christianity into science. “In leadership roles, it involves being a peacemaker, an encourager, trying to bring out the best performance, seeking some kind of unity in the group to help people aspire to be their best.” He maintains that an engineer’s primary goal is “to serve people through developing a product or process, applying knowledge or gaining new knowledge, but always with the emphasis on how it will help someone down the line.”

Exceptional Students, Parents Participate in MSE Program

Liz Crumbley

About 115 eighth and ninth graders from throughout the Southeast and an equivalent number of their parents participated in a Materials Science and Engineering Days program at Virginia Tech on October 21.

The program was one of several coordinated by the Center for Talented Youth (CTY) of Johns Hopkins University for students who received high scores on Scholastic aptitude Tests taken in the seventh grade. The event at Tech was co-sponsored by the University Honors Program and the Department of Materials Science and Engineering (MSE).

M.R. Louthan, a Virginia Tech alumnus and former faculty member who is currently a senior advisory engineer for the Westinghouse Savannah River Co., gave the keynote address on "Why Things Fall Apart."

The students and parents attended different sessions, said MSE professor Robert Hendricks, who helped organize the program. During their sessions, the students conducted hands-on experiments and observed demonstrations in atomic visualization, electrical properties, microscopy, and mechanical properties. These sessions were led by 18 faculty members from MSE and other engineering departments and more than 40 undergraduate and graduate Tech students, including members of the national engineering honorary society Tau Beta Pi and the honors program.

Parents attended sessions on smart materials, college admissions and financial aid, computers in education, and honors programs, presented by [ESM, ME, and] MSE faculty members and university administrative staff members.

"The parents were ecstatic about the program," reported Jack Dudley, director of the Tech honors program.

During the past four years, Tech has hosted Environmental Days and Biotechnology Days, but this year's program drew the largest audience, Dudley said.

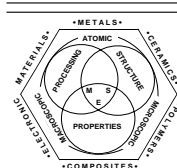
"The engineering faculty conducted nine labs for the students, and the level of enthusiasm shown by faculty members and graduate students made this a major success," Dudley said. "They demonstrated the combination of teaching and research that make Tech a desirable university for students who qualify for the CTY programs."

College of Engineering Dean F. William Stephenson, who gave the opening address, said of the event, "At a time when we are competing for talented students, programs of this sort do help enormously."

Dudley said Tech also offers CTY College Days and Career Days each year for qualifying high-school students.

Other schools participating in the CTY program are the Massachusetts Institute of Technology, State University of New York, Johns Hopkins, University of California at Los Angeles and University of Washington. The program was established in 1979 to identify young people with exceptional intellectual abilities and offer them accelerated academic opportunities in the humanities, mathematics, engineering, and sciences.

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MSE Research News

Triad Investors has granted \$80,000 to **Prof. Guo-Quan Lu** for the development of a material-processing technology for coating ceramic films onto metal substrates. These coated substrates will function as electrostatic chucks to secure semiconductor wafers during integrated-circuit chip production. These chucks will eliminate problems experienced with mechanical chucks, such as wafer bowing, contamination, waste, and nonuniform temperature distribution. Working with Prof. Lu are **Prof. Ave Amith**, MESC students **JaeCheol Bang** and **Jess Calata**, MSE graduate student **Thomas Kuhr**, and MSE undergraduate **Allen Matthys**.

Lu is also working on an NSF CAREER Program entitled "A Fundamental Study of Constitutive Behavior of Powder Compacts."

Profs. Robert Hendricks, Norm Dowling, and Ron Landgraf (ESM) are involved in research with Ford, GE, Landis, and the NSF for the study of the role of grinding protocol on the service life of automotive cams. This work is sponsored by an NSF strategic manufacturing (STRAT MAN) initiative.

Prof. John Duke (MSE & ESM) is working on developing a system (hardware and software) for nondestructive evaluation of phosphate bonded silicon nitride ceramic radomes. The project is part of a subcontract from Materials Sciences Corp. for the Naval Surface Warfare Center. MSE student **John Medding** is assisting Duke.

MESC student **Mike Horne** is working with Duke on a Virginia Transportation Research Council project exploring the use of acoustic emission monitoring to support engineering decision making with regard to steel bridge deteriorations.

Other research that Duke is involved with includes a study of the cyclic load behavior of spotwelded structural components, sponsored by the Ford Motor Company; a study of the high temperature (1500°C) performance of ceramic/ceramic composite materials, sponsored by G.E. Aircraft Engine Company; and a project sponsored by the U.S. Dept. of Agriculture to develop a procedure for nondestructively assessing the quality of wood used for pallets.

❖ Alumni News ❖

Paul W. Holsberg (METE '62), employed with the Annapolis Detachment of the Carderock Division's Naval Surface Warfare Center, recently received a Silver Award for Outstanding Supervisor. ❖

David Teter (MSE '93) recently gave a presentation as part of MSE's ongoing seminar series. His talk was entitled "The New Alchemy: High Pressure Synthesis of Metastable Materials." Teter is currently pursuing a Master's degree in MSE under Prof. Gibbs. ❖

Charles Collins (MSE '91) received a Master's degree from Georgia Tech in March 1995. ❖

Min Kang (MSE '94) is working in the R&D department at Thiele Kaolin corp. in Sandersville, Georgia. ❖

Timothy Haeberle (METE '76) received certification as a registered professional engineer in Texas. He is the manager of materials engineering and process technology for ABB Vetco Gray in Houston, Texas. ❖

Donald By. Morse (MATE '79) is quality assurance manager at RAMCO Manufacturing Co., a subsidiary of Reynolds Metals Co. in Auburn, Indiana. ❖

Christine Burke Roberts (MATE '83) received an M.B.A. from the University of Chicago. ❖

Charles P. Blankenship, Jr. (MATE '88) is the manager of structural and refractory alloys at the G.E. Research and Development Center in New York. He recently received certification as a registered professional engineer in Virginia. ❖

Michael P. Brady (MATE '86) received a Ph.D. in Materials Science & Engineering from the University of Florida. He is a National Research Council resident research associate for NASA's Lewis Research Center in Cleveland, Ohio. ❖

Bill Russ (MSE '94) is working as a Production Supervisor for Elan Technology in Belleville, New Jersey. ❖

Alumni Notes Continued

D. Bret Gaskins (MSE '91) is a programmer/analyst with American Management Systems in Fairfax, Virginia. ❖

Deborah K. Fourney (MATE '87) has joined the Land Systems Division of General Dynamics as a senior engineer in the Failure Analysis Lab in Tallahassee, Florida. ❖

John D. Hildebran (METE '68) is president of New England Castings in Hiram, Maine. ❖

Patrick H. Diron, Jr. (METE '51) retired after 42 years with Intermet Foundries as manager of quality administration. He resides in Lynchburg, Virginia. ❖

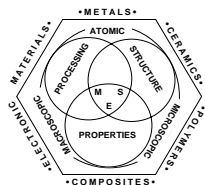
Gary R. Pickrell (MESc'94) is employed as a Senior Research Scientist with Selee Corp. in Hendersonville, North Carolina. ❖

Missing Alumni

Help! We're having trouble tracking down a few graduates. If you know where any of these folks are presently located, please let us know, or let them know we'd like to find them so we can keep them up to date on department news. Thank you!

Charlie Collins	90/91
Elizabeth Guynn	91/92
Kelle Houser	91/92
Sherry Mings	90/91
Kouroush Salehi	90/91
Travis Smith	90/91
David Tu	90/91
Glenn Vanlandingham	91/92
Jerome Hromiak	92/93
Lee-Chuang Lau	92/93
Lee Rice	92/93

Please address information requests and alumni updates to LeeAnn Ellis, 301 Holden Hall, Blacksburg, VA 24061-0256.
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