RENEWED & READY

THE NANOSCALE MATERIALS CHARACTERIZATION FACILITY PREPARES FOR “THE NEXT 50 YEARS”

New scanning electron microscopes, additional staff, renewed metallography & sample preparation facilities - all housed under a new roof.
Greetings alumni and friends! Last year marked the 50th anniversary of the department’s founding and this year has been a year not only of continued growth, but also of renewal. Research expenditures, acquisition of new equipment and research infrastructure, undergraduate enrollment in the Engineering Science Program, graduate student accomplishments, and alumni connections are all thriving. In addition, two faculty searches are underway at this time: One search is in the area of fatigue and fracture in collaboration with gift money from Alcoa, and a second search is in the area of nanomaterials. We expect to fill both positions this academic year.

Congratulations are due to Sean Agnew on his promotion to full professor, and to James Burns on his reappointment as research assistant professor.

Aided by support from the engineering school, department friends, and our alumni, renovations are ongoing to the Nanoscale Materials Characterization Facility. In addition to hiring new NMCF staff member Joe Thompson this past summer, there is an on-going search for an Alcoa Research Scientist using research gift funds from Alcoa. Recently upgraded instrumentation within the NMCF has already impacted utilization. Demands on the NMCF have returned to peak level. In fact, the past fiscal year saw the highest usage of instrumentation in the history of the NMCF.

As we look forward to “the next fifty years of MSE,” we want to celebrate our students and prepare for the exciting future ahead of us. We will be hosting an ALL-alumni reunion of our Engineering Science, Engineering Physics, and MSE alumni over the weekend of March 27-28, 2015. Chaired by EAB member and MSE alumnus Tom Moore, the organizing committee of students, staff and alumni is actively planning the agenda and venues. Look for more information in the not-too-distant future.

In particular, we invite you to mark your calendars and plan to join us for a celebratory dinner on Saturday evening, March 28, 2015. You will have the opportunity to pay tribute to our retiring faculty members, to honor our faculty and staff emeriti, to meet our MSE and Engineering Physics graduate students and Engineering Science undergraduates, and to enjoy reconnecting with fellow departmental alumni. We hope to welcome you on Grounds.

William C. Johnson
Department Chair
Characterization Facility Revitalization

Built in 1986, the original materials science building has never undergone a major renovation. Beginning this summer with scaffolding covering the exterior, crews replaced the 30 year-old roof. Infrastructure upgrades are scheduled over the next two years that include new exhaust systems and fume hood renovations.

Recent characterization equipment upgrades include a new FEI Quanta 650 and a Quanta 250. These new pieces include FEI-ESEM instrumentation that allows Nanoscale Materials Characterization Facility to provide nondestructive materials characterization without the need for conductive coatings, and elemental analysis of areas of interest by acquiring elemental maps and/or elemental line scans via a sensitive light element energy dispersive spectrometer. Advanced electron backscatter diffraction (EBSD) capabilities allow for analysis of crystallographic grain orientation to understand the microstructure and materials processing.

Laboratory renovations include a new nanomedicine laboratory and major overhaul to the sample preparation equipment space. The nanomedicine students now have a dedicated state-of-the-art nanomedicine engineering laboratory in Wilsdorf Hall, giving them hands-on experience synthesizing, fabricating, characterizing and testing nanoparticles and nanotextured surfaces. The revitalized sample preparation laboratory included a near total replacement of equipment: slow and high speed saws, the installation of an automatic high-precision wet cut-off saw, new polishing wheels, and upgraded metallographic grinding stations. Not only do reductions in sample preparation time translate to increases in research time and characterization time for students, but better quality samples yield better quality micrographs.

None of the improvements to the MSE building, NMCF laboratories, and characterization equipment would be possible without recent changes to equipment recovery fees and the generous support of alumni.
Engineering Science student Elise Poerschke (Eng Sci ’15) is the inaugural recipient of a new scholarship for students with a concentration in Materials Science. Elise is an undergraduate researcher of high-temperature reactions in the lab of Professor Beth Opila. She will present her research at the Materials Science and Technology conference in Pittsburgh this fall and is preparing a manuscript for the Journal of the American Ceramic Society. In the summer of 2014, Elise interned in Washington with the Congressional Committee on Science, Space, and Technology.

The scholarship was made possible thanks to the generous support of Belinda and Chip Blankenship. Chip is a 1992 MSE Ph.D. graduate who serves as president and CEO of GE Appliances in Louisville, Ky. The scholarship was established to advance engineering education and support the United States’ manufacturing, R&D and competitive capability. The award assists U.Va. undergraduate students and encourages them to pursue graduate studies in the Department of Materials Science and Engineering.

Congratulations to Elise who was an excellent candidate for the first award.

The annual poster symposium for fourth-years in the Engineering Science degree program was held on April 2, and the winners were presented with their awards at the MSE teatime. A total of 40 students competed in the symposium, as individuals or in small groups.

From among the groups that competed, the first place award winners were Nanomedicine students Cassandra Mankus and Shruti Paskar (both Engr Sci ’14).

The second place group winners included Michael Closs, William Reinagel, Philipp Sloan, and Bryon Spayde.

Robert Klein (Engr Sci ’14), now a MSE graduate student advised by Professor Sean Agnew, won first place in the Engineering Science poster symposium (individual category) and followed that accomplishment by winning first place in the SEAS-wide URDS (Undergraduate Research and Design Symposium).

Cheng-Yu Shih (Engr Sci’14) received a second-place award in the Engineering Science poster symposium, individual category.
Andrew Kouri (Engr Sci ’14), who is now employed by Elon Musk of Tesla Motors and SpaceX, received the 2014 Engineering Science Distinguished Undergraduate Award. During his time at the University of Virginia, Andrew was a Rodman and a Jefferson Scholar, and he lived on the Lawn his fourth year. For his Engineering Science degree program, Andrew combined minors in Systems Engineering and Computer Science.

In his nomination of Andrew for this award, Professor Dana Elzey said, “Even among such a select group as the Rodman Scholars, Andrew has always stood out. He is a very independent and entrepreneurial thinker. He chooses his own path, which is certainly partly responsible for his having chosen Engineering Science as his undergraduate degree program. He is passionate about computer science, but his interests and talents are wide-ranging.

“Working together with a fellow fourth year [on his capstone project], Andrew has successfully designed and developed a unique app for the iPhone called ‘TwoSense’. This program allows a user to get the public’s help when making simple, but often difficult choices, such as between two pairs of eyeglasses. Using the app, the user can upload a quick photo of the two (or three) options, select which audience (just friends, just male friends, etc.) to contact for opinions, then analyze the results, all within a minute. The pair recently submitted the completed (and tested) app to Apple for review and approval.”

Cheng-Yu Shih (Engr Sci ’14), who is continuing his work as a graduate student with Professor Leo Zhigilei, was awarded the 2014 Materials Science and Engineering Distinguished Undergraduate Award. Shortly before the awards ceremony, Cheng-Yu presented his poster at the International High Power Laser Ablation Conference in Santa Fe, and won first place. This is especially notable since Cheng-Yu’s competitors for the prize included both graduate students and faculty from a number of other institutions.

According to Professor Zhigilei, “The research work of Cheng-Yu is of direct relevance to an ongoing experimental study in the group of Dr. David Geohegan at the Oak Ridge National Laboratory, and Cheng-Yu is coordinating his simulations with ORNL researchers. In February, 2013, at an international conference (Photonics West), Dr. Rouleau from ORNL used some of the results obtained by Cheng-Yu to explain his experimental observations. I expect that collaboration with ORNL will strengthen as Cheng-Yu makes further progress in his project. The first results obtained by Cheng-Yu in this collaborative project were accepted for publication in Applied Physics Letters, with an ‘excellent’ rating, and the only comment stating that, ‘This manuscript is an excellent blend of experiment and modeling that provides significant insights into the physics of ultrafast ablation of thin metal film targets.’ Cheng-Yu was largely responsible for the modeling component in the ‘blend.’”
STUDENT SPOTLIGHT:
DASHA TYSHLEK

Fourth year Engineering Science student Dasha Tyshlek could be considered the perfect exemplar of an Engineering Science major: comfortable with pondering disparate complex ideas and finding points of intersection among them. Both a Rodman and a Jefferson scholar, Dasha Tyshlek is a woman who wears many hats: honors student, entrepreneur, non-profit organizer, creative hacker. Some hats she wears quite literally: as a model on her fashion blog.

STUDENT:
To accommodate a breadth of interests as varied as Dasha’s, Engineering Science has been an academic all-purpose vehicle. Dasha harbors a desire to find simple, elegant solutions to global public health issues. Her Engineering Science program includes a biomedical engineering minor, a “Technology and the Environment” minor from Civil Engineering, and an area of concentration in chemical engineering. Public policy and sustainability are also of concern to Dasha, who says, “Sustainable is something you integrate into whatever you do.”

ENTREPRENEUR:
DameDestyle’s traffic has steadily picked up since 2012. Fashion-for-business tips, great finds on kick-starter, and interview suggestions abound on the blog she runs with architecture student and blog partner Aigul Kenzhegaliyeva. As observed by her blog partner: “Dasha would be talking about business non-stop wherever we are.” In summer 2014, Dasha’s relentless idea stream was at full flow at Bridgewater Associates, the largest hedge fund in the world, where she interned.

INNOVATOR:
An interdisciplinary exposure to environmental technology and policy informs Dasha’s vision. Her BME design professor, David Chin, suggested she go to a medical hack-a-thon in NYC where her leadership skills were fully tested. At MIT’s Hacking Medicine event in NYC this April, Dasha’s team not only won 1st place, they did it using the idea she pitched. The winning entry, prototyped in one weekend, hacked together an oscilloscope and RadioShack EKG assembly using an Arduino to send distension/extension data from their microcontroller to a HIPAA-compliant cloud server via a blue tooth application. In short, in a matter of hours they hacked together a novel system for the detection of seizures.

FACILITATOR:
From her participation in the ACC Green Energy challenge came the impetus for founding Bio-start, a non-profit intended to connect ideas and healthcare innovators. Growing out of participating in sessions like HackCville and Yale’s United for Sight Global Health Conference, Dasha gained valuable knowledge of what it takes to work rapidly, but effectively, on a problem.

“I want to create a small empire around lifestyle-entrepreneurship.”


“I’m glad there is an Engineering Science- if not, there would not be an exact place for me.”

**GRADUATE STUDENT HIGHLIGHTS**

**Rebecca Schaller** (MSE Ph.D. candidate) was awarded an Australian Endeavor Research Fellowship. Ms. Schaller worked directly with Ivan Cole and other researchers at Australia’s national science agency [CSIRO] within the Materials Science division of the Commonwealth Scientific and Industrial Research Organization over the spring. The internationally competitive award aims to foster better links between Australian research programs and organizations internationally.

The investigation, co-advised by Professor Nick Birbilis of Monash University, spanned a four-month residency. The research on atmospheric H2-embrittlement of ultra-high strength steels provided a parallel investigation to her Ph.D. thesis focus, which is hydrogen production and uptake in high performance alloys. Her research will be furthered by the atmospheric corrosion and general electrochemistry expertise of Drs. Cole and Birbilis.

On Wednesday, May 7, the annual MSE teatime celebration offered an opportunity to recognize and applaud the outstanding work of our students. **Lok-Kun Tsui** (Ph.D. candidate), advised by Professor Giovanni Zangari, received the 2014 Doris Kuhlmann Wilsdorf Outstanding Graduate Student award, in recognition of his significant accomplishments in research.

The 2014 Fred D. Rosi Outstanding Citizen award was given to two equally deserving students: **Andrew King** (Ph.D., ‘14), advised by Professor John Scully, and **Matthew Schneider** (M.S. ‘14), advised by Professor Jim Howe. Andrew and Matt were recognized for their “overall contributions to the academic, educational, and outreach goals of the department.”

On March 18, Engineering Physics graduate student **Micah Schaible** won first place in the 2014 Robert J. Huskey Exhibition sponsored by the University of Virginia Graduate School of Arts & Sciences with his talk “Squeezing Water from Rocks: Solar modification of the lunar surface.”

In March over 6,000 students and industry leaders from government, business, and academia gathered for the 69th annual NACE (National Association of Corrosion Engineers) convention. In the student poster sessions, our Center for Electrochemical Science and Engineering (CESE) students continued their run of earning top honors among their colleagues in all categories:

- **Jay Srinivasan**
  1st Place: Corrosion Science

- **Cindy Shi**
  2nd Place: Corrosion Science

- **Leslie Bland**
  3rd Place: Applied Corrosion Technology
FACULTY SPOTLIGHT:
STU WOLF

Professor Stuart A. Wolf is a quantum tamer. Featured in a documentary film of that same name, Stu Wolf is an acknowledged leader in the field of condensed matter physics and the coiner of the term, “spintronics.” Having arrived at the University of Virginia in 2003 to conduct research, in 2004 he received a joint appointment as full professor in Materials Science and Engineering and Physics. Wolf was named the director of nanoSTAR [the Institute for Nanoscale and Quantum Scientific and Technological Advanced Research] in 2008. When he was introduced as the director, Wolf said, “NanoSTAR will push the frontiers of science, technology, and medicine, using the best people, tools, and ideas.” Having largely fulfilled that promise, Wolf will step down as director of nanoSTAR. Although Stu will be retiring from the department in January, he will continue in multiple research collaborations with the department.

Lisa Friedersdorf (NSF, MSE principal scientist), a former colleague of Wolf’s in nanoSTAR, had this to say upon learning of his imminent departure: “I treasure the time I worked with Stu Wolf and truly believe he is one of the great scientists of our time. It was great fun when Stu would get excited about a new idea, and a group of us would brainstorm as he sketched his thoughts on a whiteboard. It was incredible to watch him work. Stu is also remarkably kind. His untiring support and mentorship has had a tremendously positive impact on the careers of many of his students and colleagues, including my own.”

Wolf worked as a civilian for the U.S. Naval Research Laboratory in Washington, D.C., for 31 years, until retiring in 2003. For 10 years, he was also assigned to the Defense Advanced Research Projects Agency (DARPA) as a program manager, a job he resumed in 2011 while continuing his duties at the University. He supervised a number of programs there, including some in “spintronics,” (SPIN-TRansport-electronICS), a term he coined while at DARPA. Wolf also advised several students at the University.

One of those students, Ryan Comes (EP Ph.D. ‘13), offered these comments about his professor: “Stu was a wonderful mentor for our entire group while I was at Virginia. His guidance and support enables each of his students to further their career goals and fulfill their aspirations. His informal mentorship and friendship in group meetings, lunches at Thai 99 and the annual trip to the American Physical Society conference made us a very cohesive group that supported one another.”

Under Wolf’s leadership, in 2011 the University of Virginia, in partnership with the College of William & Mary and Old Dominion University, launched the Virginia Nanoelectronics Center, or ViNC, to advance research aimed at developing next-generation electronics. Research conducted at the center will serve as the foundation for producing faster, smaller and more affordable computer applications in everything from mobile devices and computers to automobiles and energy-efficient homes. “This new center is positioning Virginia at the heart of the development of a new nanoscale technology,” said Wolf. ViNC “could establish the commonwealth as the ‘Oxide Hills’ rather than a new ‘Silicon Valley.’” (His term “Oxide Hills” may very well follow Wolf’s “spintronics” into the nano lexicon.)

Another nanoSTAR colleague, Jeff Fox, beautifully articulated Stu Wolf’s accomplishments in this way: “Stu is a world-class scientist, and an even better human being. His scientific achievements, from his research in superconductivity to his work in spintronics, speak for themselves. On top of that, Stu is a kind, generous, and very funny person. He is a marvelous story-teller. He knows backstories and personalities behind many scientific discoveries and achievements, and he really enjoys sharing those stories with students and colleagues. He brings out the human side of science, which is a rare and important skill.”

With contributions from Charlotte Crystal, Zak Richards, and other University of Virginia news staff reporters.
The American Ceramic Society has announced its slate of nominees who will be elevated to Fellow status and Professor Beth Opila is among the 2014 inductees. Fellowship within the American Ceramic Society recognizes individuals who have shown “outstanding contributions to the ceramic arts or sciences, broad and productive scholarship in ceramic science and technology, conspicuous achievement in ceramic industry, or by outstanding service to the Society.”

The 2014 class will be inducted at the annual honors and awards banquet on Monday, October 13, 2014, in Pittsburgh, Pa. Having been inducted last fall as a Fellow of the Electrochemical Society, Professor Opila is garnering well-deserved recognition for her many achievements.

Professor Dana Elzey received one of four Hartfield-Jefferson Scholars Teaching Awards given to School of Engineering faculty this spring. Nominated and selected by students, recipients of these prizes can be assured that their teaching has made a significant impact on developing engineers.

Professor Petra Reinke was one of four University of Virginia faculty members comprising the first cohort of recipients of an ADVANCE fellowship. The program aims to support the representation and advancement of the careers of women in academic science, technology, engineering and math – referred to as “STEM” fields – and social, behavioral and economic science, or SBE. The four professors, at critical junctures in their mid-careers, will be able to pursue specific career-enhancing activities with the one-year fellowships, worth up to $5,000.

Professor Stu Wolf published the text Superconducting State Mechanisms and Properties with co-authors Vladimir Kresin and Hans Morawitz. The text is a comprehensive but concise review of the current theories related to superconductivity, the current state of experimentation, and the mechanisms and physics of superconducting materials.
Led by Brian Stoner (MSE M.S. ‘89), the Better Toilet project showcased full scale prototypes of its new integrated toilet system earlier this year at a project fair in Delhi, India.

The RPI International collaborative project was previously awarded one of the largest grants given to participants in the international "Reinvent the Toilet Challenge," an initiative of the Bill and Melinda Gates Foundation. The challenge seeks to improve the lives of the 2.5 billion people who live without safe and sustainable waste processing.

In addition to Stoner, other MSE alumni involved include Jeff Glass (MSE Ph.D. ’86), who serves as the project’s electrochemical disinfection and materials development lead, and Paul Natishan (MSE Ph.D. ‘84) who serves as one of two of the project’s technical advisors.

Congratulations are due to Paul Natishan (MSE Ph.D. ‘84) who has been selected as the Electrochemical Society’s 2014 H.H. Uhlig Award winner. This is the highest technical award from the Corrosion Division of the Electrochemical Society.

Natishan previously served as president of E.C.S from 2009-2010; he was on the board for eight years and has been active in E.C.S. in many other roles. He has been an E.C.S. fellow since 2005.

Natishan is a leader in the field of marine corrosion and heads up the activities of the Naval Research Laboratories’ Corrosion Science Section. As well as holding seven U.S. patents, he has published extensively in corrosion resistance, pitting, electrodeposited coatings, ion beam surface modification, and diamond-coated materials.

Paul E. Cantonwine (MSE Ph.D. ‘99) published The Never-Ending Challenge of Engineering: Admiral H.G. Rickover in His Own Words. Cantonwine, a practicing engineer, covers in his biography of Rickover the admiral’s experiences in founding the nuclear navy in the 1950s and 60s as well as discusses effective leadership in engineering.
This spring, the department enjoyed a productive return of the MSE External Advisory Board. The materials science external advisory board members are Bill Cassada, Ignatius Chan, Jeff Glass, Tom Moore, Elsa Olivetti, and Greg Olsen. This group of six alumni provides a set of perspectives and experiences from across industry and academia that help shape new department initiatives and energize our existing efforts. Their constructive feedback and unwavering enthusiasm for the future of the department are infectious.

First convened in 2013, this was the second meeting of the MSE external advisory board. In addition to constructive dialogues with faculty, staff, students, and faculty emeriti, they brainstormed ideas for new initiatives. Plans for a 50th reunion, ideas for faculty and student recruitment, suggestions for a new equipment drive and greater alumni engagement were all generated during the EAB discussions.

SAVE THE DATE!
MSE Alumni Celebration

FRIDAY
MARCH 27, 2015
Plenary Talks | Discussion Panels
Reception | Honored Guests

SATURDAY
MARCH 28, 2015
Student and Alumni Outings
Grand Gala Banquet

Mark your calendars and plan to join us for a celebration across generations of the materials science family.

This is an ALL-alumni reunion; a wonderful chance to kick off “the next 50 years” of Engineering Science, Engineering Physics, and Materials Science

http://www.virginia.edu/ms/50thgala.html

Register Now!
DOES YOUR COMPANY NEED A SUMMER INTERN?

As our undergraduate numbers continue to grow, so does the pool of excellent young engineering science and materials science students looking for summer internships. If you are interested in publicizing a summer internship, contact Susan Bagby (sh7h@virginia.edu), MSE undergraduate coordinator.