News from Holden Hall

Department of Mining and Minerals Engineering
Virginia Polytechnic Institute and State University

Volume 6, Issue 2 **Fall 2014**

The Mill Report —*Dr. Greg Adel, Professor and Department Head*

The students are preparing for final exams and Fall Semester 2014 is rapidly drawing to a close. That means it is time to welcome all of you to the twelfth edition of *News from Holden Hall*. This is an exciting time to be at Virginia Tech. Our new president, Dr. Timothy Sands, has presented a bold vision of growth and innovation for the future. We are currently searching for a new faculty member to expand our tenured and tenure-track ranks to a total of ten. And Holden Hall has become the top priority on the University's renovation list, with the hiring of an architecture firm and pre-planning activities slated for 2015.

The Department continues to experience a large enrollment (currently at 183 undergraduates and 35 graduate students); although, the enrollment management plan initiated by the College of Engineering in 2013-14 has provided us with a bit of relief. Nevertheless, we are on track to graduate 56 seniors in the Class of 2015, tying our recent record established by the Class of 2014. Our graduate program has grown to the point where every office cubicle is filled, and we have been averaging roughly ten graduate degrees (6 M.S. and 4 Ph.D.) per year over the past seven years. Space is certainly at a premium, and we are happy to be renovating 5400 square feet of space in Randolph Hall, formerly occupied by Chemical Engineering. This newly acquired space will be used to house laboratory facilities for our newest faculty members and office space for the Virginia Center for Coal and Energy Research.

Critical renovations are under way at our new Randolph Hall lab facilities.

Of course, all of this recent growth and success is a direct result of the hard-working and talented students, faculty, and staff who ***are*** the Department of Mining and Minerals Engineering. In this issue of *News from Holden Hall*, you will find out about the latest student organizations, including the newly-formed *Bevlee Watford Society for Diversity in Mining* and the rapidly-growing *Student Mine Rescue Team*. You will also hear about the latest in a long line of senior design teams to win a national award. Our faculty members continue to lead the way in research, with Dr. Emily Sarver and Dr. Kray Luxbacher recently becoming the recipients of very competitive research grants from the National Institute of Occupational Safety and Health (NIOSH). You will also learn about Dr. Luxbacher's lead role in organizing the *15th North American Mine*

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Inside this Issue

The Mill Report *(continued)*

Ventilation Symposium, which will be held in Blacksburg this summer. Faculty honors featured include our most recent SME Henry Krumb Lecturer, Dr. Steve Schafrik, who is actually being recognized for a second time in this capacity. Finally, we recognize Dr. Roe-Hoan Yoon who became only the second U.S. citizen to receive a Lifetime Achievement Award from the International Mineral Processing Congress (IMPC). Last but not least, don't forget to take a look at a very rare *"Blast from the Past"* featuring a student field trip from the late 1940's.

Of course, none of our successes would be possible without the loyal support of our alumni, friends, and corporate donors. Thanks so much for all you do to help keep this department strong. Please enjoy this latest issue of *News from Holden Hall*.

Dr. Greg Adel
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Virginia Tech

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Mine Rescue Team Update

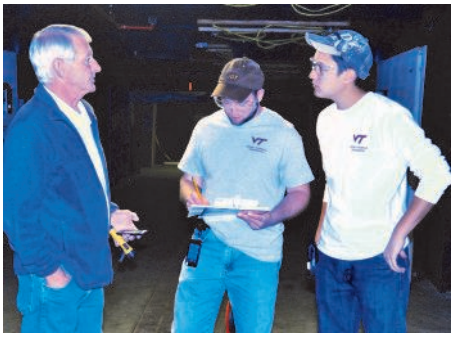
—by Carolyn Kosloski, Team Co-Captain

Last spring our readers were introduced to the department's new Mine Rescue Team. Since that time, and thanks to the hard work of our students, faculty and trainers, as well as the growing list of generous supporters, our team has made great progress.

Students check out the latest in mine rescue technology during the Holmes Mine Rescue meeting

This past October, five team members were invited to attend the annual meeting of the *Holmes Mine Rescue Association*, accompanied by department research assistant professor Steven Schafrik. This was a great experience for our mine rescue team because we were able to network with people in the industry who are involved in improving mine rescue.

At the meeting, several people spoke on different mine disasters. They explained the different problems that occurred which led to the disasters and how they could have been prevented. Speakers used drawings of the mine to give the audience a clear picture of where in the mine the disaster occurred and what mine rescue teams did to get the miners out safely.



Joseph Bright (center) and Kevin Pan (right) work through a mine rescue problem with an MSHA trainer.

Our team was also able to see first-hand the new wireless communication systems being tested for mine rescue teams and new ways to work competition problems. We got to see different vehicles used for mine disaster operations, such as the portable command center—a seismic truck that helps locate lost miners—and a vehicle for transporting mine rescuers and their equipment into the mine.

Attending this conference was an eye-opening experience for the Virginia Tech Mine Rescue Team members, and it made us more excited to compete against industry and collegiate teams in the near future! We are hoping to raise additional funds to help us purchase needed competition equipment as well as cover our travel expenses to upcoming competitions and events.

Yoon Receives IMPC Lifetime Achievement Award

Dr. Roe-Hoan Yoon

Achievements in fine particle recovery and associated environmental benefits, representing decades of work led by Roe-Hoan Yoon of Virginia Tech, a National Academy of Engineering (NAE) member, has garnered him the *2014 Lifetime Achievement Award* from the 27th International Mineral Processing Congress (IMPC). The award was announced at its meeting held in Santiago, which is only held once every three years.

Since the 1980s, Yoon and his colleagues at Virginia Tech have developed various advanced separation processes for the minerals and coal industries, including microbubble flotation, dewatering aids, hyberbaric centrifuge, and hydrophobic-hydrophilic separation (HHS).

The first three have been commercialized, and the last will soon be tested at a pilot scale. "With this new technology, with a patent pending, industry will be able to recover the ultrafine coal that has previously thought to be unrecoverable," Yoon asserted. The new advanced technology is becoming available at a time when the public is increasingly concerned about the environmental impacts associated with developing and accessing new energy resources, such as gas pipelines, fracking, and off-shore drilling.

For Yoon, his life's work started after he learned in a high school chemistry class how detergents remove dirt from clothes. He took this fascination with bubbles and in the 1980s developed the microbubble flotation process, a term he coined to advocate the use of small air bubbles to separate fine coal from mineral matter. He secured research funding from the U.S. Department of Energy and the Virginia Center for Innovative Technology (CIT) to develop and patent the microbubble flotation process, which has been marketed commercially under the name Microcel. The coal industry regards it as one of the best technologies separating fine particles.

His primary collaborators in the 1980s remain his colleagues today. Jerry Luttrell, at one time his Ph.D. student, is now a chaired professor of mining and minerals engineering. He is also a member of the NAE. Greg Adel is the current department head, and all three have sent myriads of highly-trained graduates out into the professional world. Many of them have become industry leaders.

Over the last 15 years Yoon and his colleagues have been developing advanced technologies for separating water from fine coal. "This was a missing link, and we took this on as a challenge," Yoon explained. As he described it, since coal fines dispersed in water are cleaned with Microcel, the clean coal product obviously becomes wet. Therefore, it is important to remove the water before shipping and utilization.

One of the advanced dewatering technologies developed at Virginia Tech involves the use of specialty chemicals that can be used to help reduce the moisture associated with fine coal. This technology has been licensed to Nalco, a subsidiary of Ecolab, a $12 billion company, for worldwide distribution. To facilitate the marketing and sales of the specialty chemicals and others, Nalco opened a laboratory at Virginia Tech's Corporate Research Center and hired two of Yoon's former Ph.D. students

It appears that advanced separation technologies developed by Yoon and his colleagues at Virginia Tech will also be used in developing countries like India and China to reduce the emission of CO_2, the major green house gas (GHG). Burning cleaner coal produces less greenhouse gas. "In developing countries, they will continue to use coal – the cheapest energy source – for a while. Helping them burn cleaner coal should help them in more ways than one," Yoon said.

Yoon said he "is most excited about the recent development of the HHS process." It has been licensed to Minerals Refining Company (MRC), Richmond, Virginia, for worldwide distribution. The process was tested successfully last year in Blacksburg. Based on the test results, MRC is in the process of building a pilot-scale demonstration plant in Lee County, Virginia. If the tests are successful, construction of full-scale commercial plants will follow. Yoon added he "is proud of the fact that the new technology has been developed on the basis of his basic research in hydrophobic interaction."

Thank You to Our Donors

One of the biggest challenges we face each year is finding sufficient funds to operate the department. Our annual budget allocation is enough to cover most of the faculty salaries and some of the staff salaries, but there is virtually nothing provided for day-to-day operations (telephones, copying machine, supplies, etc.). Nearly all of our operating revenues come from research overhead, interest on our endowment, and gifts from our alumni and friends. In fact, as our student body grows, it is becoming increasingly difficult to provide sufficient funding to support scholarships and student organizations. That is why your gifts are so important to us. We would like to take this opportunity to extend a heartfelt thank you to the following donors for their support during fiscal year 2014.

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If you donated to the Department during Fiscal Year 2014 and your name is not listed above, please contact us. We strive to ensure that our information is accurate, and we want to know if a mistake has been made. It is also helpful if you specify "Mining Engineering" on your check so that your donation goes directly to this department. Likewise, if you donated directly to the Burkhart Mining Society, or one of our other student organizations, these donations do not come through the department. Nevertheless, these contributions are important to us, and we thank you for helping with student activities. Finally, if you prefer to donate online, we have established a link on our website for giving to the department. Go to **http://www.mining.vt.edu/sponsors/giving.htm** where you can donate online via a credit card. Please follow the instructions provided to ensure that your gift goes to the Department of Mining and Minerals Engineering.

Department Faculty Lead Two Underground Mine Safety and Health Studies

Associate professor, Kray Luxbacher, and assistant professor, Emily Sarver, both of the mining and minerals engineering department, are leading two NIOSH projects to improve mine safety and health for underground miners, including bettering both firefighting techniques and the monitoring and abatement of particulate matter. The projects are funded at $1.25 million each for five years, for a total of $2.5 million, and will involve collaboration among other academic institutions and the private sector.

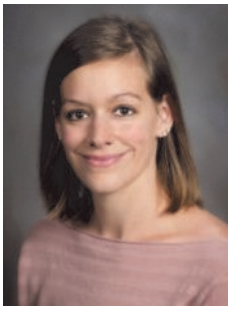
In addition to worker safety, the projects seek to reverse a decline of expertise in both academia and industry by recruiting master's and doctoral students who can enter the professional mining community upon graduation. "We have a vast shortage of people with technical expertise in mine health and safety," said Sarver.

Luxbacher's efforts will focus on computational modeling, taking data from an existing mine and using the virtual model to predict where potential fires could start and how those fires could affect mine ventilation systems. Scenarios such as conveyor belt fires, fires along the mine's exterior face caused by ignition of methane, and fires from collapsed or abandoned areas that spontaneously ignite will be studied. "Modeling and characterization of mine fire behavior is critical for effective fire monitoring and early warning, evacuation of personnel, rapid response, and successful firefighting," Luxbacher said, adding that finding and eliminating high-risk fire areas is paramount.

Dr. Kray Luxbacher

Luxbacher also will team with Steven Schafrik, a research assistant professor with the Virginia Center for Coal and Energy Research, and Jeffrey Borggarard and Serkan Gugercin, professors in the Department of Mathematics who will handle the computational figures in the study. The project also will involve a coal industry partner and the Pennsylvania-based United Mine Workers of America Mine Training and Technology Center.

Sarver's work into monitoring and abating particulates from diesel exhaust in underground mines will include field work in an underground stone mine. In her study, laser sensors will measure light reflected from air filters in different areas of the mine. Cleaner filters, which reflect more light, can indicate that diesel particulate is being adequately removed. While this sensor technology already is in wide use, it is only used in handheld devices which operate using a battery pack. Sarver's team will test the technology for longevity in autonomous monitoring units that remain stationary, testing their ability to track long-term trends in particulate concentrations. If successful, research will turn to using the monitors to evaluate different ventilation practices.



Dr. Emily Sarver

Sarver also will create an in-lab diesel particulate matter abatement experiment using water sprays to remove particles from the air. In most applications, sprays primarily work by wetting material so that particles cannot become airborne. "When diesel exhaust and water droplets combine, the particulate matter should fall out of the air," said Sarver, "the trick will be getting the collision to happen." For this latter work, Sarver will team with John R. Saylor, a mechanical engineering professor from Clemson University who specializes in interactions between water droplets and airborne particles.

Both projects include funding for several master's and doctoral student research positions, thereby addressing the growing shortage of expertise within the mining industry. During the next decade, more than half of the current industry and academic experts in mining are expected to retire.

The new federal projects follow several research endeavors already underway in the mining department. Last year, Luxbacher, Sarver, and Schafrik received awards from the Alpha Foundation for the Improvement of Mine Safety and Health to focus on risk management, respirable dust characterization and underground communications systems.

Steven Schafrik Named 2014-2015 Krumb Lecturer


Steven Schafrik

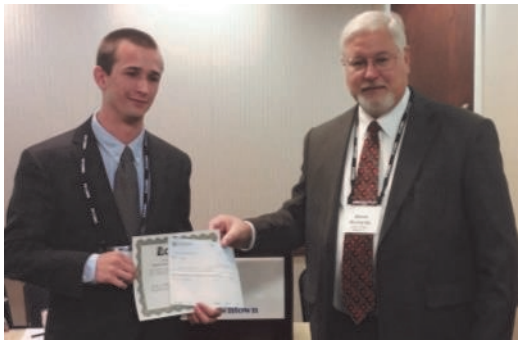
Steven Schafrik, research assistant professor for the Virginia Center for Coal and Energy Research (VCCER), was recently nominated a 2014-2015 Krumb Lecturer by the Society for Mining, Metallurgy and Exploration (SME). The Henry Krumb Lecture Series was established in 1966 with the purpose of providing local SME chapters with presentations and lectures on current knowledge and technologies given by wide ranging subject experts.

All US underground coal mines must use and operate wireless commination and electronic tracking systems, and Schafrik's presentation addresses the reliability and availability of such systems and the communications infrastructure that supports them. The presentation describes quantitative ways to assess system requirements through the use of available tools commonly used by the reliability, maintainability and availability community. The offered methodology has applications in other mining systems that rely on an understanding of their reliabilities and availabilities.

Schafrik has been a research assistant professor at VCCER since 2013 and has worked with the center in numerous roles since 1997. He earned his B.S., M.S. and Ph.D degrees in Mining Engineering from Virginia Tech and has been active in research on wireless communication systems, ventilation and risk management. Schafrik has carried out and managed research for the Virginia Department of Mines, Minerals and Energy, the U.S. Department of Energy, the National Institute for Occupational Safety and Health, the Office of Surface Mining, as well as corporations and foundations. He is responsible for the development of custom software and information systems for VCCER, and several of his applications have been licensed through Virginia Tech Intellectual Properties.

Virginia Tech Students Take First Place in the 17th Annual Carlson Software National Senior Design Competition

Carlson Software has presented its 2014 National Senior Mine Design Competition first place award to Kevin Douglas and Will Conrad, two 2014 graduates from Virginia Tech's Department of Mining and Minerals Engineering. Their winning project "Palmyra Industrial Minerals" develops a dolomite and high-calcium limestone surface mine operation that produces over 500,000 tons of aggregate product per year at a 380-acre site located outside Harrisburg, Pennsylvania.


Will Conrad (l) accepts the first place award from Steve Richards of Carlson Software

Virginia Tech's mining students have performed strongly in the annual competitions. In addition to winning first place for five straight years (2007-2011), they have ranked in the top three places fifteen out of the competition's seventeen years.

Carlson Software develops technically advanced software and integrated hardware for the land development and mining industries and sponsors the annual competition which is open to all ABET accredited mining engineering schools.

Carlson honored this year's winners during the Joint Fall Meeting of the Kentucky Coal Association (KCA) and the Central Appalachian Section of SME (CAS) in October. The first place team received an award of $2,000, and each student was given a certificate documenting the achievement, and the department's running plaque was updated by Carlson Software. Kevin Douglas is currently working as an engineer in the oil and gas industry with Schlumberger. Will Conrad is pursuing his M.S. in Mining Engineering at Virginia Tech, focusing on ground control in underground coal.

New Bevlee Watford Society

The Bevlee Watford Society hosted its first field trip to Virginia Vermiculite's Lo

The department is pleased to announce the formation of a new student organization whose mission is to recruit and educate future mining engineers. The *Bevlee Watford Society for Diversity in Mining* seeks to "promote diversity and inclusion through professional development in the mining industry and educational outreach to prospective mining engineering students and surrounding communities."

The society is named for Dr. Bevlee Watford, director of the Center for Enhancement of Engineering Diversity (CEED) at Virginia Tech. Watford is a department alumnus, and also holds her M.S. and PhD degrees from Virginia Tech. "We named this society after Dr. Watford due to her many accomplishments in promoting diversity and inclusion in engineering," explained Victoria Johann, a student officer in the newly formed society. "She was the first African American woman to graduate from the Mining and Minerals Engineering Department, and she has held many honorable positions, including Associate Dean of Academic Affairs for the College of Engineering, Director of CEED, as well as her current position with the National Science Foundation."

The society plans to achieve its goals by organizing guest lectures, teaching at regional schools, and sponsoring field trips, the first of which took place this past November at Virginia Vermiculite in Louisa, Virginia.

The tour exposed students to the inner workings of the site's processing facilities, quality control lab, as well as an active pit and reclaimed site. "We were allowed to feel the different sizes of vermiculite being separated as well as watch the heating process for 'popping' it," described department senior Katie Pair, a society officer who helped organize the trip, "and our tour of their reclaimed site brought us to a pasture that had cows grazing everywhere. We were all very impressed with the amount of reclamation that had taken place." Most of the 12 students attending the trip were undeclared freshmen and sophomores. By the end of the day, said Pair, "most had jumped off the fence on the side of mining, and they were pretty excited!"

The society has several educational events planned as well. "This spring we will invite several mining industry professionals to speak to current and prospective students about their experiences," said Johann, "and the GEM program will continue as our main outreach initiative for secondary schools, where we teach local K-12 about natural resource development and mining." Eventually the society hopes to organize a conference series that brings together mining engineering students from Virginia Tech as well as regional college mining programs.

Department to Host 15th North American Mine Ventilation Symposium

The Department of Mining and Minerals Engineering is proud to host the upcoming 15th North American Mine Ventilation Symposium. Dr. Kray Luxbacher, department associate professor, serves as the symposium's planning committee chair and is helping organize the event.

The North American Mine Ventilation Symposium series is one of the most exciting gatherings of professionals in the field and brings together experts from industry, government, academia and the supply sector to exchange knowledge, experience and the latest in research and development. Technical sessions, exhibits and workshops focus on a variety of ventilation-related topics, including diesel emissions and control, occupational health, mine fires and emergency response, numerical modeling and tunnel ventilation planning and design. The itinerary also includes site fieldtrips.

The Symposium will be held from June 20th to 24th, 2015, at The Inn at Virginia Tech and Skelton Conference Center in Blacksburg, Virginia. More information on important dates and a schedule of events can be found online at ***http://www.energy.vt.edu/NAMVS2015/***.

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"Blast from the Past"

Our Fall 2014 *"Blast from the Past"* comes to us from Irving M. (Jack) Craig, Class of 1949 and member of the Old Guard. We don't expect a lot of help in identifying the individuals in the picture. Nevertheless, it is an interesting photo of a mine surveying field trip (circa. 1948 or 1949) to a mine operated by Clinchfield Coal Company in southwest Virginia. Professor Charles Holland is in the front row, third from the left, and Jack Craig is right next to Professor Holland, second from the left.

If there is anyone out there who can help us identify the other individuals, we would love to know more. Please send your responses to:

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or e-mail: adel@vt.edu

As always, if any of you have photos from your days in the Department (particularly group shots) that you would be willing to share, we would be happy to scan them and return them to you. Any photos that are more than twenty years old would be greatly appreciated.