



# News from Holden Hall

Virginia Tech Department of Mining and Minerals Engineering

## Department To Host Alumni Reception, Honor Distinguished Alumni at 2017 SME Conference and Expo in Denver

The Department of Mining and Minerals Engineering is once again hosting its annual alumni reception during this year's SME Conference and Expo. The gathering is a great opportunity for friends and alumni to catch up with former classmates and faculty, as well as honoring two new Distinguished Alumni.



This year's reception will take place in conjunction with the WAAIME 100th Anniversary Celebration & Alumni Reception. WAAIME has been serving the global mining community for a century with philanthropic work aimed at helping students secure their educations.



Festivities begin at 5:30 p.m., Tuesday February 21st in Mineral Hall F-G of the Hyatt Regency, Denver, where we will announce and recognize the department's 2017 Distinguished Alumni. Afterwards, we will move to the WAAIME Celebration & Alumni Reception in the Centennial Ballroom of the Hyatt Regency.

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## Mine Rescue Team Wins First and Second Place at Competition

Virginia Tech's Mine Rescue Team won first and second place in two events at the Fall 2016 SME Eastern Collegiate Mine Rescue Organization Event in Grundy, VA, on 29 October 2016.

The event was hosted at Coronado Coal's Mine Rescue Training facility, where teams from the University of Kentucky, West Virginia, and Virginia Tech competed in two separate tasks: a rescue mission and a smoke-out mission.

The smoke-out event took place in an enclosed room-and-pillar mine where movie set style "smoke" was released to severely decrease the range of vision. Teams had to map the area and record all objects and/or persons encountered and relay that information by radio back to the base outside the mine.

The rescue mission was similar to the smoke-out but covered a larger area without smoke. In this task, competitors were



required to assess conditions and solve complex problems such as ventilation changes and timbering, and conduct gas, rib and roof checks. Maroon Team 1 earned both wins at the event, taking first place in the smoke-out and 2nd place in the rescue mission.

## Nikhil Gupta Recipient of SME J.W. Woomer Award

Department research associate, Nikhil Gupta, is the recipient of this year's J.W. Woomer Award for outstanding "Young Engineer" by the Society for Mining, Metallurgy and Exploration. He is recognized for his "professional contributions as a young engineer to advanced separation technology within the field of coal preparation."

Gupta is a Postdoc Research Associate at the Virginia Tech Department of Mining and Minerals Engineering, from where he received his Ph.D. (2014) and M.S. (2011) degrees. Prior to Virginia Tech, he received his B.Tech. degree in Minerals Engineering (2008) with first-class honors from the Indian School of Mines (ISM), Dhanbad, India. Prior to joining Virginia Tech, Gupta gained significant industrial experience working with companies such as Eriez Magnetics India Ltd., Hindustan Zinc Ltd., and M/s Fomento (Greater Ferromet).

Dr. Gupta has played a key role in the development, design and demonstration

of the hydrophobic-hydrophilic separation (HHS) technology, a process developed by a research team at the Center for Advanced Separation Technologies (CAST) at Virginia Tech and licensed to the Minerals Refining Company (MRC) based in Richmond, Virginia. Nikhil Gupta is directly involved with MRC's 3-tph HHS pilot plant, fulfilling various roles including process improvement, troubleshooting, day-to-day operations, and managing field test programs. The plant is currently operating at a major coal preparation facility in southwest Virginia.

In addition to his work on HHS technology, Gupta successfully completed several pilot-scale demonstration on-field test programs for technologies including FGX vibrating air-tables and RE roll magnetic separators. He has one patent pending, and he has authored several research articles published in international peer-reviewed journals. He has given presentations on his research at national and international



technical conferences. A member of the Society for Mining, Metallurgy and Exploration (SME) since 2011, Gupta is actively involved with the Coal & Energy division, having chaired sessions at national SME meetings.

The J. W. Woomer Award (formerly the Young Engineer Award) was established in 1976 to recognize engineering professionalism of young people working in the coal industry. Election to this honor is by made by the Coal & Energy Division Officers with notification to the SME Executive Committee.

## Ellen Gilliland Appointed Assistant Professor Mining and Minerals Engineering

Ellen Gilliland has been appointed assistant professor in the Department of Mining & Minerals Engineering at Virginia Tech.

Under the joint appointment, she will also serve as an affiliated assistant professor at the GeoEnergy Research Centre at the University of Nottingham, United Kingdom. The joint appointment is part of the Virginia Tech and University of Nottingham's initiative, Best with Best Alliance, designed to enable high-impact research aimed at addressing the security, supply, affordability and sustainability of global energy resources.

Gilliland earned her bachelor's degree in geophysics from the University of Oklahoma (2006), her master's degree in

geosciences from Virginia Tech (2009), and her doctoral degree in mining and minerals engineering from Virginia Tech (2016).

Gilliland joins the department after having served as a geophysics research associate at the Virginia Center for Coal and Energy Research from 2011 to 2016. In that role, she led the monitoring program for a \$12 million carbon storage / enhanced gas recovery field project funded by the U.S. Department of Energy. Previously, Gilliland served as an associate geophysicist for Chesapeake Energy Corporation, a natural gas exploration and production company, from 2009 to 2011.

Her research and professional interests



include geophysical monitoring and design, seismology, carbon management (including geologic sequestration and utilization for enhanced oil/gas recovery), reservoir characterization, hydraulic fracturing, domestic and global energy policy, environmental and societal implications of energy development, and diversity in STEM fields and academia.

# Thank You to Our Donors

Each year the department faces the challenge of securing sufficient funds to operate. Our annual budget allocation covers most of the faculty salaries and some of the staff salaries, but little is provided for the 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, gifts from our alumni, friends and corporate sponsors are so important to us. We would like to take this opportunity to extend a heartfelt "thank you" to the following donors for supporting our department and mission during the 2016 calendar year.

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If you donated to the Department during Calendar Year 2016 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 to ensure that your donation goes directly to this department. If you donated directly to the Burkhardt Mining Society or one of our other student organizations, note that these donations do not come through the department. Nevertheless, these contributions are very important to us and we thank you for helping our student activities. Finally, if you prefer to give on-line, use the link on our website to make a donation via credit card and be sure to follow the instructions to ensure that your gift goes directly to Mining and Minerals Engineering:

<http://www.mining.vt.edu/sponsors/giving.htm>

## Emily Sarver Recipient of SME Research and Educational Excellence Award

Emily Sarver, department assistant professor, has been awarded the SME Health and Safety Division's Research and Educational Excellence Award "for her excellence in mine health education and research, particularly in the monitoring and characterization of particulate matter."

Established in 2012, the Health & Safety Research & Educational Excellence Award is presented to an individual or a research or educational institution exemplifying exceptional innovation and dedication toward technological or educational advancements aimed at the protection and well-being of miners. Recipients of the award are active SME members or research or educational organizations who are actively engaged in research or

education for mining-related activities.

Sarver, who joined the Virginia Tech faculty in spring 2011, has already been involved in more than \$2.8 million in sponsored research, with her personal share exceeding \$2 million. Her research and teaching focuses on mine-generated environmental contaminants and the responsible development of mineral and energy resources.

Sarver received her bachelor's degree in mining and minerals engineering and her master's degree from Virginia Tech. In 2004 she was named the outstanding senior in Virginia Tech's College of Engineering. She also serves as adjunct faculty with Virginia Tech's Via Department of Civil and Environmental



Engineering, where she obtained her Ph.D. in 2010.

Sarver is a member of the Association of Environmental Engineering and Science Professors, the American Water Works Association, the Society of Mining Professors, and the Society for Mining, Metallurgy and Exploration.

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## Faculty Aim to Improve Mine Safety while Increasing Expertise in Ground Control

Nino Ripepi and Cheng Chen, assistant professors in the department of mining and minerals engineering, have received a \$1.25 million grant from the National Institute of Occupational Safety and Health (NIOSH) for a proposed research project, "Ground Control Research for Improving Safety Performance in Underground Stone and Other Large Opening Mines: Design, Monitoring, and Risk Management."

The project will address important ground control safety issues, with an emphasis on room and pillar stone mines. Some of the important ground control safety issues identified in this research include: opening design and support; pillar design; secondary recovery by mining old works or retreat pillaring; time-dependent instability and failures; impacts of water hazards and subsequent deterioration on stability; skin support; roof bolting and supplementary support; monitoring for instability; and risk management approaches to hazard mitigation. Ripepi serves as principal investigator for the project.

A fundamental goal of the work is to develop a new cohort of ground control experts specializing in underground mine stability to ensure the future health and safety of mine workers in this sector. Additionally, the project will also develop science-based designs and best practices that can supplement or, where appropriate, replace current empirical approaches to ground control and mine design in underground stone mines and other large opening hard rock mines.

Dr. Nino Ripepi joined the MinE department as an assistant professor in 2012. Prior to this, he served as a Research Assistant

Professor for the VCCER. Ripepi has carried out research on coal mine degasification, coalbed methane, risk management for ground control, dust, carbon storage for enhanced gas recovery, and shale gas funded by US DOE, US EPA, NIOSH, the Alpha Foundation, and industry.

Dr. Cheng Chen, who serves as co-PI of the NIOSH funded project, joined the department as an assistant professor in 2015 after having worked as a reservoir engineer for Halliburton where he focused on geomechanics. Chen led the development of a core library of geomechanical and petrophysical properties, including an analysis of Young's Moduli and Poisson's Ratios; and the development of models for studying the anisotropic elastic moduli of rocks using static and dynamic geomechanical data. Chen has expertise in x-ray micro-tomography, scanning electron microscopy, and pore-scale simulation.



Dr. Nino Ripepi



Dr. Cheng Chen

## Students' Off-Earth Mining Robot in Final Stages of Design

Four students from the department of mining and minerals engineering are making preparations to participate in NASA's 2017 Robotic Mining Competition. This is the 7th year that mining students—working alongside other engineering students in Virginia Tech's Astrobotics Team—have designed, built, and sent a robotic miner to the internationally recognized event held at the Kennedy Space Center.

Members of this year's team, Robert Bennet, Austin Duvekot, Eric Warrell, and Greg Wright, have been working alongside peers in designing, building and testing a robotic mining device capable of recovering regolith-type material from the Martian surface.

The competition is open to university students from around the world who must design and build a robotic miner capable of operating on a simulated Martian terrain. The robots navigate obstacles while excavating simulated basaltic regolith and ice, and return the material to a dump area. Scoring is based on the amount of material collected as well as automation, weight, efficiency, and dust tolerance. In addition to the actual performance of the robot, teams are judged on the logistics of their designs and manufacturing processes, and public engagement during the project.

The VT team has been fine tuning its robot—a tracked vehicle which uses a bucket drum excavator design. Recently, the team attended a practice competition at Kent State University, Ohio, where the prototype was put through its early paces.



(Left-right) Team members Zach Fellone (Mechanical Engineering), Austin Duvekot and Greg Wright (both Mining Engineering) finalize the assembly before their robot's first test run at Kent State's practice competition

## Faculty Research Initiative Seeks to Understand Mining Operations on Mars

Dr. Michael Karmis, Stonie Barker Professor and director of the Virginia Center for Coal and Energy Research, and Dr. Mario Karfakis, Associate Professor in the Mining and Minerals Engineering department, are participating in a research initiative to better understand the extraction, recovery and processing of resources on the Martian surface. The project, sponsored by Ascentech Enterprises, Inc., is in response to NASA's SBIR and STTR program to fund the research, development, and demonstration of innovative technologies. Also working on the project are members of the University of New South Wales, Australia (UNSW).

As Mars colonization becomes an approaching reality, the problems associated with the multi-month duration and energy constraints of an Earth-Mars journey require significant advances in self-sufficiency and the ability of human crews to obtain critical resources from the Martian environment. The situation is similar to world exploration in early human history: explorers were limited

in resources by what their ships could carry, and their survival and return depended on the ability to acquire, adapt and use resources from the new environment as quickly as possible.

The project, titled *Comprehensive Modeling for Off-Earth Mining Optimization and Resource Processing*, aims to develop new knowledge on the recovery of materials on the Martian surface that will help support permanent off-Earth habitation. The investigation simulates a mining operation, from excavation to processing, of a regolith-based resource on Mars. The aim is to obtain water, which is critical in sustaining human life as well as manufacturing propellant for return journeys.

The research project will develop a set of modeling tools that can describe the mining and materials processing systems needed to develop the resource. The outcome also will provide comparative results that can be used to determine the best methods and technologies for executing such an operation.

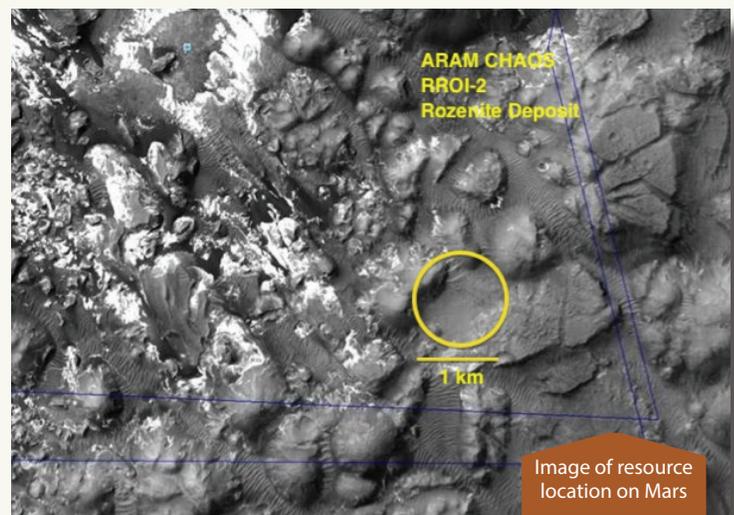


Image of resource location on Mars



## Department Hosts First Recruiter Fair

This fall, the department hosted its first recruiter fair, bringing together in one location several companies from a variety of mining and minerals industries to meet and interview students for summer and permanent jobs.

The department has always enjoyed an active in-house recruiting program. Each semester, company representatives visit the department on an almost weekly basis. But with a growing faculty, an increased demand for office and classroom space, as well as the impending renovations to Holden Hall, the department had been looking for ways to create a better recruitment experience for its students and the industry.

This year's inaugural Mining Engineering Recruiter Fair was a two-day event held on September 15 and 16, 2016, at the Inn at Virginia Tech. Booth space was limited, and the list of recruiters filled quickly. During the first day of the fair, representatives showcased their companies and handed out literature. Students had the opportunity to visit with different companies,

seek information, present resumes, and arrange interviews. The second day of the fair was devoted to conducting interviews set up the day before.

The new format proved to be a success for both the companies and the students. According to Jon Baggett, a senior in the department, "I felt I was able to better evaluate multiple industries immediately as well as pinpoint where my career interests lie." Baggett added that having recruiters in one place on the same day also helped save time with regard to his academic schedule.

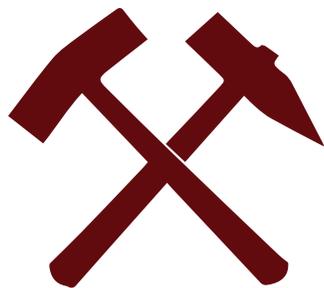
Twelve companies participated in this year's successful recruiter fair. While the department still maintains its in-house recruiter program, it plans to continue and grow the fair. Companies interested in participating in the next department recruiter fair should contact the Mining and Minerals Engineering Academic Advisor, Michelle Crotto, at [mcrotto@vt.edu](mailto:mcrotto@vt.edu).



## Mining Engineering Trivia

How well do you know your field? If you think you can identify the author of the following passage comparing the mining engineer's challenge over the other engineering disciplines, please let us know!

Contact Dr. Erik Westman, Professor and Department Head, Virginia Tech Department of Mining and Minerals Engineering, at [ewestman@vt.edu](mailto:ewestman@vt.edu)



### News from Holden Hall

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Our engineer cousins can, in a greater degree by study and investigation, marshal in advance the factors with which they have to deal. *The mining engineer's works, on the other hand, depend at all times on many elements which, from the nature of things, must remain unknown. No mine is laid bare to study and resolve in advance.* We have to deal with conditions buried in the earth. Especially in metal mines we cannot know, when our works are initiated, what the size, mineralization, or surroundings of the ore-bodies will be. We must plunge into them and learn,--and repent. Not only is the useful life of our mining works indeterminate, but the very character of them is uncertain in advance. All our works must be in a way doubly tentative, for they are subject to constant alterations as they proceed.

Not only does this apply to our initial plans, but to our daily amendment of them as we proceed into the unknown. *Mining engineering is, therefore, never ended with the initial determination of a method. It is called upon daily to replan and reconceive, coincidentally with the daily progress of the constructions and operation.* Weary with disappointment in his wisest conception, many a mining engineer looks jealously upon his happier engineering cousin, who, when he designs a bridge, can know its size, its strains, and its cost, and can wash his hands of it finally when the contractor steps in to its construction. And, above all, it is no concern of his whether it will pay. Did he start to build a bridge over a water, the width or depth or bottom of which he could not know in advance, and require to get its cost back in ten years, with a profit, his would be a task of similar harassments.

