

# Department News



## Department Head Welcome

Greetings! I can scarcely believe that this month marks the end of my third year at Mines. I have been having a great deal of fun and my satisfaction grows as we reach new achievement levels in size and level of enrollment and research activity. I have so much to tell you all about!

The Edgar Mine upgrade project is completed (thanks, Freeport McMoRan). Hooray!!!! And we have a new project starting which will develop the courses for an MS degree at Nazarbayev University in Kazakhstan, and which will serve as the core of a new Professional Masters degree at Mines—one that will also soon be offered

online! This project will allow us to expand our faculty community to include Professors of Practice—so if you are interested, let me know! We have also had meetings with delegations from Queensland and Curtin University (Australia), and several delegations from schools in China. We have research relationships on-going with CRCMining (Australia), Japan (in geothermal), Morocco, and Brazil, Peru and Chile.

Our plans for Mining Engineering are summarized in a “Case” statement as follows:

### The Plan for Mining Engineering

Global population expansion, rapid growth within the developing world, and heightened demand for mineral resources have converged to create unprecedented demand for skilled mining engineers. At the same time, the mining industry is aging and retirements will cause workforce losses that must be addressed. In addition, the skills and knowledge needed by the mining engineer of the future extend beyond the technical and financial, and mining engineers need to have an enhanced and integrated understanding of risk assessment and management, and the capability to lead and resolve in questions of social license and sustainability. The future success of the industry requires a new kind of engineer – agile in management of business and technology, strategic in controlling the flow of information, and astutely aware of the cross-culture, cross-sector and cross-disciplinary issues to be confronted in the complex environments of mining.

Since 1874, Colorado School of Mines has been dedicated to serving the earth resource needs of industry and society. Mines will take on these challenges as an opportunity that we are uniquely qualified for, and we will partner with industry to develop the knowledge, technology and mining engineers needed for the future.

#### Aspiration

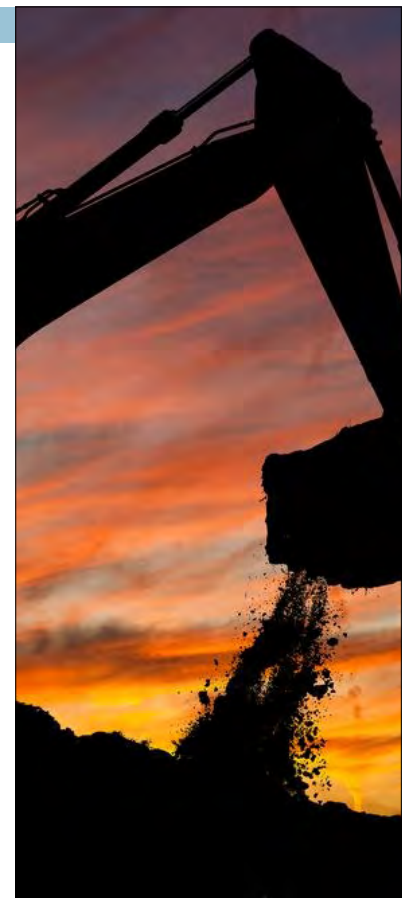
The Department of Mining Engineering at the Colorado School of Mines aspires to provide the premiere mining engineering education, advanced knowledge and technology that will underpin the transformative changes that will guarantee economic, environmental and social success for the global mining industry in the 21<sup>st</sup> century.

#### Goals

- Create a unique and differentiated educational experience that will develop and prepare graduates who will add significant value to the mining industry and who will ultimately be able to influence change.
- Serve the industry through collaborative partnerships and programs.
- Utilize a multi-disciplinary approach for curriculum development and research programming that will help to solve current and future mining problems, in a comprehensive and holistic manner.

#### Our Strategies

- Proactively recruit students who can handle the academic rigors at Mines, have a passion for mining, and also have the ability or potential to be problem solvers, innovators and even to think entrepreneurially.
- Provide rich hands-on learning opportunities throughout the curriculum that develop critical thinking and problem solving skills in real-world contexts.
- Enhance course and degree options to prepare students for career success.
- Create a unique and transformative four-plus-one program (BS-MS) that would provide incentive and opportunity for excellent undergraduate students to complete MS work in one additional year. Find the best and give them the best.



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## Special Points of Interest

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## Department Head Welcome, cont.

### Research and Adjunct Faculty

We want to thank and recognize our research and adjunct faculty for all they do for our students:

Carl Brackpool, Research Associate  
Dr. -Ing Jürgen Brune, Research Professor and Research Director at Edgar Mine  
Larry Clark, Research Associate  
Dr. Ryan Garvey, Research Assistant Professor  
Dr. Vilem Petr, Research Associate Professor  
David White, Research Associate  
Dr. R. Karl Zipf, Research Professor  
Dr. John Grubb, Adjunct Professor  
Dr. Mark Hart, Adjunct Professor  
Dr. Ray Henn, Adjunct Professor  
Paul Jones, Adjunct Professor  
Dr. Andrew Schissler, Adjunct Professor  
D. Erik Spiller, Adjunct Professor  
William Wilson, Adjunct Professor

### Mining Engineering Staff

Special thanks go to our hardworking Mining Engineering Staff:

Mandi Myers, Program Assistant  
Emilia Clayton, Research Support  
Bruce Yoshioka, Lab Coordinator  
Brian Asbury, EMI Manager  
Matt Schreiner, Edgar Mine Manager  
Clinton Dattel, Edgar Mine Superintendent  
Robert Ferriter, Senior Mine Safety Specialist-EMCIS  
Michelle Reiher, Manager of Training- EMCIS  
Kirk McDaniel, Director-EMCIS  
Collin Smith, Director-EMCIS  
Katherine Jennings, Staff Engineer- EMCIS  
Ray Johnson, ERL Lab Manager, AXPRO

- Develop cutting-edge professional educational programs, including on-line offerings.
- Enhance the capabilities of our unique research facilities (Edgar, EMI, ERL) to be among the best in the world.
  - Redesign the Earth Mechanics Institute (EMI) to support cutting-edge research and development, and laboratories for student-focused education and innovation. The new EMI facility will include fab-labs for new equipment concepts and prototype development, and specialized facilities for projects in laser drilling, microwave/thermal rock damage, water jet drilling and linear cutter testing and fracture mechanics of rock. A new construction materials lab will serve student instruction and their independent projects, and will also be a focus for shotcrete and grouting research and soil improvement technologies. Faculty from Mining Engineering, Mineral Processing, Underground Construction and Tunneling and Petroleum Engineering will be actively involved in design of the new EMI.
  - Reconceive the Edgar Mine to operate both as an amazing place for hands-on student learning, as a well-equipped facility for safety training, and as a superior testbed and proving ground for technologies and methods developed at EMI and in industry. This will involve enlarging existing adits and drifts, and designing additional mined openings to efficiently support many projects at once. Active research will extend from explosives and blasting (for mining and underground civil works, especially urban), and innovations in excavation equipment to underground information systems and ventilation and fire safety and management.



Priscilla Nelson, , Dr. Mohamed Benkamoun, and Ramona Graves at Jorf in Morocco

We invite your input and thoughts about our strategic directions, and we invite you to come visit and to continue to be a part of this grand future that we envision. We cannot do any of this without you!

## Meet the New Faculty



### Dr. Jamal Rostami, Endowed Alacer Gold/ Hadden Chair and Associate Faculty

Our newest Mining Engineering Faculty member joined us in June 2016—Dr. Jamal Rostami. Dr. Rostami was born in Tehran and was admitted to university of Tehran (UT), Faculty of Engineering (Fanni) in 1983 and started his studies towards Mining Engineering and graduated first in his class in 1987. He subsequently started his graduate degree at Colorado School of Mines (CSM) in 1989 and received his MSc and PhD in mining engineering in '92 and '97, respectively. He was hired as a research faculty at CSM immediately after his graduation and

continued at this position until 2000. Simultaneously, he was a faculty member at the Univ. of Tehran from 1998 through 2002. Dr. Rostami was a full time consultant with major A&E companies from 2002 till 2007 when he joined the Pennsylvania State University (PSU), as Centennial Chair of Carrier Development in Mining at the department of Energy and Mineral Engineering. He has over 26 years of experience in design, management, research, and teaching in the field of mining, tunneling, and underground construction. Dr. Rostami is a registered Professional Engineering (PE) in Maryland, Pennsylvania, and Virginia. He has published over 50 peer reviewed journal publication and 150 conference papers and many technical reports. He is a member of SME, ASCE, ARMA, ISEE, IRSME, IRRMS, and TRB AFF-60 tunneling committee. He has chaired the professional engineering (PE) exam committee for SME, and has been a member of the structure and governance (S&G) as well as Education and professional development strategic committee of the society of mining engineers (SME). Dr. Rostami was named the recipient 2014 of the Pittsburgh Coal Mining Institute of America (PCMIA) 2014 Stephen McCann Memorial Educational Excellence Award. He is one of the editors of Tunneling and Underground Space Technology, and member of editorial board of Mining Engineering and Rock Mechanics and Rock Engineering journals. He is also the founder of Professors Without Borders (PWOB) and a founding member of Iranian American Academics and Professionals (IAAP), and member of the board of directors of the Child Foundation.

### By the Numbers

#### Enrolled Students AY 2016

PhD	30
MSc	23
BS	88

#### Graduates AY 2016

PhD	9
MSc	22
BS	35

Scholarships Awarded 38

Fellowships Awarded 7

Tenured and

Tenure Track Faculty 9

Recruitment for Faculty 6



## Faculty Perspectives



### **Dr.-Ing Jürgen Brune, Research Professor**

Dr. Jürgen Brune has collaborated with his long-time NIOSH colleague, Dr. Karl Zipf (new Research Professor) to conduct a NIOSH-funded research project to test dispersibility of rock dust using explosive testing in the Edgar Mine. This research will be conducted in the Orica drift which has been prepared with a concrete floor and instrumentation to measure the pressure wave from a blast of detonation cord. The pressure wave disperses the rock dust, simulating a coal dust explosion. Coal dust explosions cannot propagate where there is sufficient rock dust dispersed in air. The blasting facility was successfully tested during the summer 2016. Dr. Brune also gave the Keynote Address at the Mine Ventilation Symposium in Freiberg, Germany with a presentation on "Distilling Data into Information". The conference was attended by ~120 mining and mine ventilation professionals from Germany and other European countries. Dr. Brune also gave a second presentation "What can go wrong with Mine Refuge Chambers?" and co-authored a third presentation on "Airflow Resistance Testing of Auxiliary Ventilation Tubing" together with CSM sophomore Joseph Lee and Dr. Jürgen Weyer from Technical University Bergakademie

Freiberg. Joseph also completed a research internship at Freiberg this Summer where he conducted a large series of air flow and resistance measurements in different size and quality auxiliary ventilation tubing. Joseph is preparing a technical paper for the Society for Mining, Metallurgy and Exploration (SME) conference in Denver, February 2017. Mining Engineering Senior Tyler Rockley did a research internship at the Technical University "Georg Agricola" in Bochum, Germany. Tyler conducted research on novel mining methods for narrow vein deposits. He is also preparing a technical paper for the SME conference.



### **Dr. Hugh Miller, Associate Professor**

As it seems every year, it's been a very busy several months since the last departmental newsletter. Last spring, I had the pleasure of co-teaching an innovative project-based course sponsored by Caterpillar with John Steele, a CSM Mechanical Engineering Professor. While the focus of the course was on developing technical strategies to overcome major operating challenges facing the mining industry over the next 30 years, the highlight had to be a trip to Cat's Proving Grounds where the students had a chance to operate equipment and tours of FMI facilities in southern Arizona. Much thanks goes out to Cat, FMI, the guest speakers, and everyone that made this course possible. Newmont also hosted a technology challenge on campus which was a big hit among the students. I had the opportunity to travel with Drs. Graves and Nelson to visit OCP in Morocco during the summer in hopes of forging an educational and research collaboration. The potential of this venture is significant and represents an exciting opportunity for Mines. Among the long list of other activities keeping me busy include course and curriculum development, graduate research, the CSM Mine Safety Training Program, several SME

initiatives, and the writing of a mining text book with Bill and Andrew Hustrulid. I want to extend my sincere thanks to everyone who graciously supports the department and our students. It is very much appreciated. Please stay in touch!



### **Dr. Kadri Dagdelen, Professor**

I celebrated my graduation in 1976 from CSM as part of the 40th reunion during this year's CSM Homecoming activities. I enjoyed getting together with my old classmates and showing them around campus. Much at Mines has changed and was a wonderful experience to see some of the friends that I have not seen for 40 years. This Fall, I'm teaching Surface Mine Design and Geostatistics, and supervising two PhD students who are working on two interesting research projects funded by Newmont Mining involving mine planning optimization by considering grade uncertainties. One student recently visited Kibali open pit and underground gold mines in North Eastern DRC, Africa. Kibali underground mine is one of the largest underground mines using long hole open stoping method with paste fill in Africa with 10K/day production capacity, once the mine is fully built.



### **Dr. Masami Nakagawa, Associate Professor**

This was a busy year with several projects running simultaneously. I was quite happy that we could start a new project with the Navajo Transitional Energy Company, LLC (NTEC) of the Navajo Nation to build a GeoPark in a small community Tohatchi. The vision for the Tohatchi GeoPark was jointly built with the Tohatchi community, NTEC and my geothermal research group. The first step towards our ultimate goal for the dedicated 700 acres of Navajo Nation's land is to design an energy efficient greenhouse for Tohatchi using hot water from an abandoned oil well. We conducted a series of resistivity studies to understand the hydrology of the area. We now have a better understanding about the existence of underground water in the area and plan to conduct a magnetotelluric study to look into resistivity of the deep geologic structures. NTEC owns and operates coalmines and supplies coal to power plants, with a focus on developing renewable energy and alternative energy projects. In addition, we successfully completed another geothermal exploration project in Rico, Colorado this summer. We have a preliminary geothermal reservoir model in the area and plan to do a magnetotelluric study in Rico next year. My geothermal team is becoming quite competent with both types of geophysical measurements and this

expands our capability to extend to deeper geothermal exploration for the upcoming years.

**Congratulations to our PhD students who successfully defended their dissertations this year! We congratulate Eric Poeck, Saki Saqib, Lisa Mori, Ady Van Dunem, Amin Azhari, Collin Stewart, and Mahmood Arshad.**

## Faculty Perspectives, cont.



### Dr. Elizabeth Holley, Assistant Professor

This has been a productive and happy year for me. My students are wrapping up industry-funded research projects at Cripple Creek in Colorado, Wharf in South Dakota, and Lone Tree in Nevada. We have a brand new microscope in my lab dedicated to the characterization of microfractures and ore mineralogy for a range of applications. My newest project is funded by the National Science Foundation, testing the utility of a new thermochronology method for Carlin-type gold exploration in Nevada. So far this year my students and I have already published two peer-reviewed journal articles and 12 conference abstracts. We have three more journal articles coming out shortly, including an invited contribution for a reviews volume on Carlin-type gold: stay tuned! I have several new and exciting research collaborations here on campus. I'm pleased to be a senior advisor for an NSF-funded workshop on science, society and technology for underground resources. I'm also working with a team of social scientists and engineers on a new project on artisanal gold mining and mercury contamination in South America that we hope will be funded by NSF. I've enjoyed collaborating with Rennie Kaunda and Priscilla Nelson on our NSF-funded project examining thermal damage of rock as a possible pre-treatment for excavation and comminution. I'm a proud member of the team that has recently been awarded a NIOSH Capacity Building grant focused on ground control, so I look forward to working with Gabe Walton (Geological Engineering), Rennie Kaunda and Eunhye Kim, and we plan to recruit several top-tier PhD students for the project. On the teaching front, we're nearing implementation of the new geology curriculum for mining engineers. The goal is to deliver more mining-focused content in the same number of credit hours, better empowering our students to address the complex geological problems they may encounter in mining. I spent part of the summer working on this curriculum revision with CSM's new Trefny Institute for Innovative Teaching and Learning, and I look forward to employing cutting-edge pedagogical techniques in the classroom. As part of the Mining Geology graduate course last spring, I took a group of graduate students on another fantastic field trip to Northern Nevada, including underground and open pit site visits at Comstock, Turquoise Ridge, Marigold and Twin Creeks. I continue to serve as the Education and Training Program coordinator for the Society of Economic Geologists and have organized more than 75 professional development short courses to date. On a personal note, Evan and I welcomed the arrival of baby James in June. I look forward to new adventures in teaching and research in 2016; stay in touch!

### Dr. Rennie Kaunda, Assistant Professor



Greetings, friends and Alumni. During the spring of 2016, I taught Rock Slope Engineering and co-taught Introduction to Mining, where students had the privilege of being hosted by Cripple Creek mine near Victor, Colorado. I also travelled to Morocco to teach a short course in Applied Rock Mechanics. In February before SME in Phoenix, Hugh, Priscilla and I took a tour of Freeport's Morenci mine in Arizona. The World Tunneling Congress in San Francisco was a wonderful opportunity for networking and seeing old friends. In addition to teaching during spring, I supervised two CSM undergraduate students working on their REU research on underground construction and tunneling. During the summer I had a student intern from Brazil working on rock mechanics projects. My students and I presented three papers at the American Rock Mechanics Association conference in Houston, where I also sponsored and chaired a session on rock slope stability. Along with Ray Henn, I helped coordinate the Underground Grouting and Ground Improvement short course in Golden,

which had a remarkable turn out. The short course program included a field trip to Baski Inc yard in Denver, where students had an opportunity to observe and participate in field demos. I also participated in the tunneling short course put up by the center for underground construction and tunneling. In September, I gave two papers at AEG in Kona-Kalua, and attended the engineering division of GSA in Denver. My three graduate students are moving along on all cylinders, balancing classes and research. Our NSF work on microwave rock fragmentation is going well, and I was part of the CSM team that recently got awarded a NIOSH research grant (along with Gabe Walton (PI), Eunhye Kim, Elizabeth Holley, Jürgen Brune, Ugur Ozbay). I'm co-teaching Mine Plant Design with Andy Schissler this fall, and we recently took a class of about 35 seniors to the Martin Marietta quarry operation near campus. Until next time, best wish-

### Industry Advisory Council

In the spring of 2016, CSM convened the Department of Mining Engineering Industrial Advisory Committee (IAC) with a mission to assist the department in working closer with industry. The objective of the IAC is to learn, deliberate and supply guidance and advice for the benefit of the students, faculty and the Colorado School of Mines. The IAC consists of 20 to 25 members from industry, public institutions and academia. Each member of the IAC is a recognized professional with many years of relevant experience in mining related fields.

On November 18<sup>th</sup>, the IAC was on campus for its second meeting of 2016 and the members of the IAC met with President Johnson, Dean Graves and members of the faculty. The discussions included an update on the department's project to establish an engineering program with Nazarbayev University in Kazakhstan, the recruitment of Professors of Practice to complement the efforts of the existing faculty, potential curriculum enhancement for the department, facility upgrades and many other relevant departmental matters. The IAC and faculty exchanged ideas and asked questions that were constructive and critical to the education of our mining engineering students.

All in all, it was a great day to be engaged on campus with a wonderful group of people. It is always a welcome opportunity to meet the students and faculty from the Colorado School of Mines. Speaking for the IAC, we look forward to our work in the next six months before our next meeting in May of 2017. <http://mining.mines.edu/Mining-Industry-Advisory-Council>



Industry Advisory Council, May 2016 in front of the new Starzer Welcome Center



Dr. Kaunda and students tour the Cripple Creek and Victor mines owned by Newmont Mining



## Faculty Perspectives, cont.



### Dr. Eunhye Kim, Assistant Professor

During the summer, I performed cutting tool research regarding cutting tool wear and excavation performance with undergraduate research interns. Two research internship students presented their work and results to more than 50 people during the tunneling short course held in May. The manuscript is under preparation to submit to a journal. Also, Gabe Walton and I received research grant (~\$60k) from Hecla regarding analysis of their shaft project with me as the lead principal investigator. I as a first and corresponding author, my paper was published in the prestigious International Journal of Rock Mechanics and Mining Sciences (*Kim and Changani (2016) Effect of water saturation and loading rate on the mechanical properties of Red and Buff Sandstones. 88:23-28*). Another paper submitted to Rock Mechanics and Rock Engineering with me



as a co-author is under minor revision. In addition, I (as first and corresponding author) submitted three papers to SCI(E) journals (Mechanics of Materials, Journal of Mining Science, and Geomechanics and Engineering, An International Journal). This May, I organized and delivered my new rock abrasivity and rock cutting lab successfully during the CSM tunneling short course, contributing significantly to the success of the short course. Also, I served on the future leader committee of the American Rock Mechanics Association (ARMA) conference in June (judged posters and mentored students). To understand industry challenges in the construction workplace and build potential research collaboration with industry, I also completed two internships at Kiewit job sites in New York and Chicago. The internships were very useful to improve class instruction and laboratory assignments.



### Bill Wilson, Adjunct Professor

I was in Morocco for two weeks following the end of the Spring Semester 2016. I taught the last of ten modules, on Project Feasibility and Resources economics as part of a series of ten one-week mining courses for the phosphate company, OCP. The second week was devoted to reviewing the course topics and content with OCP management and Training Center staff. The feedback on the course success has been positive and OPC is now scheduling a second similar mining course to start in early 2017. The course is sponsored by the Special Project and Continuing Education center at Mines. The faculty included several CSM faculty as well as industry specialists and professors from other mining schools. We see an increasing interest from students and corporations for teaching and recruitment of graduates interested in an industrial mineral career. The Department is working with several aggregates and cement companies to enhance internships, recruiting dynamics and industrial mineral courses.



### Dr. Vilem Petr, Research Associate Professor

This past year, my research group, Advanced Explosives Processing Research Group (AXPRO) and I continued advancing our research and education activities at the Colorado School of Mines. I'm very excited to continue 12 years of our explosives engineering program. My MSc Student, Eduardo Lozano, finished his thesis on Blast Shield For Avalanches used by the Colorado Department of Transportation (CDOT). This new improved explosive charge will be used in Winter season 2016/2017 by CDOT, and also with Departments of Transportation in Alaska, Washington, and Utah. Our AXPRO team also submitted a paper and poster to the International Snow Science Workshop (ISSW) Proceedings in October 2016. Eduardo and I also presented our research to the 42nd IPS Seminar Proceedings, in July 2016. In addition, I began offering a new series of courses at the Missouri University of Science and Technology's (MS&T) Explosive Engineering program in Spring 2016, called the Special Explosives Applications and High-Speed Imaging Methods in Explosives Engineering. I started collaboration

with the Departments of Labor and State on explosive permit and improving public safety - a course offered two times per year (the two-day Practical Explosive Training School (PETS) in February and November 2016) to blasters and explosive-end users. I'm also working with my students to develop new research initiation systems and new optical tools (shadow graph method) to characterize initiation systems as well as explosives characterization. We presented our results in the Proceedings of the XIII SEM International Congress. I'm also developing new research opportunities with private industries and government agencies.

## In Review

- ♦ Newmont hosted a technology innovation challenge on campus which was a big hit among the students.
- ♦ Mining Engineering Sophomore Joseph Lee did a research internship at Freiberg this Summer where he conducted a large series of air flow and resistance measurements in different size and quality auxiliary ventilation tubing. Joseph is preparing a technical paper for the Society for Mining, Metallurgy and Exploration (SME) conference in Denver, February 2017.
- ♦ Mining Engineering Senior Tyler Rockley did a research internship at the Technical University "Georg Agricola" in Bochum, Germany. Tyler conducted research on novel mining methods for narrow vein deposits. He is also preparing a technical paper for the SME conference.
- ♦ Mining Engineering Graduate Kevin Moran, Alight Mining Solutions Professional Services Consultant, has been elected Chairperson for the Northern California Section of the Society for Mining, Metallurgy and Exploration.
- ♦ Erik Spiller, Mining Engineering adjunct, is being named a distinguished member at the 2017 SME event.
- ♦ NTTi3 interviewed Dr. Priscilla Nelson about innovation. You can view her at 2:28 [www.youtube.com/watch?v=2ZXlfcf7bPE](http://www.youtube.com/watch?v=2ZXlfcf7bPE)

## Student Activities

### CSM Mine Rescue Team Activities

This past year has been a busy one for the CSM Mine Rescue Team. This past spring break, the team sent two different competition teams to the Northern Nevada Mine Rescue Competition. Mines students competed against nine other competition teams, eight corporate mine rescue teams and one other collegiate team. Overall, the all-women's silver team and all-men's blue team ranked 10<sup>th</sup> and 11<sup>th</sup> respectively. Not only were students able to practice their skills in first response scenarios, they were also challenged with a first aid and technician competition. Overall, the blue team's technician team placed 1<sup>st</sup>, beating out all of the professional teams. This past summer, the team also sent a group of students to compete in Reno for the National Mine Rescue Competition. Students showed their grit against some of the top professional teams in the country.

Throughout the year, the mine rescue team is busy training on a wide variety of topics such as firefighting, first response scenarios, underground search and rescue techniques, and patient loading. This upcoming year, the mine rescue team is excited to be holding the Intercollegiate Mine Emergency Response Exercise (MERD) at the Edgar Mine. Mine rescue teams from other national and international universities will meet to test their skills and learn valuable emergency response skills. The team is excited to be working with both Newmont and Barrick, as they will help supervise the competition.



*A group photo of the competition team at Winnemucca, Nevada taken during the awards ceremony.*



*Emiley Lopez (right) helps fellow Mine Rescue Students practice first aid on Erica Holswade (practice victim) underground at the Edgar Mine in Idaho Springs*

### CSM SME Student Chapter Activities

The SME Chapter at Mines went to beautiful Las Vegas, NV for the "Daddy of Them All" mining conferences, MINExpo. This quite massive conference is put on every four years by the National Mining Association and boasts equipment manufacturers from the U.S., China, Canada, Germany, and many other places. For most students, there is only one time to go to this conference during their academic career, which is why it



was such a privilege for some of the students of SME to attend. The largest booth this year was put

together by Caterpillar, where they were debuting machinery so large, that it had to be deconstructed before moving it into the convention center. Beyond the manufacturers were the employers that were walking around, which the students could talk to about work at mine sites all over the U.S. This was truly a once in a life time networking event for many students. After the second day of the MINExpo conference in Las Vegas, CSM students from today and many years ago all met at the Gordon Biersch Brewery to kick back and enjoy some fresh food and good beverages. The CSM Alumni Association graciously sponsored the meal. Students were able to meet graduates from the 1950's and 60's who are now retired, but also graduates from the 1990's and 2000's who are becoming division managers and executive employees for their respective companies. It was quite

easy to see that the Mines culture lives on many years after college is finished – Once an Oredigger, always an Oredigger. There were even members from the Board of Trustees at the event who were walking around gauging students' opinions about Mines. It is remarkable to see that much dedication of the Mines Board members, to get face to face with students and alumnus to put a bearing on the direction CSM is headed.

### Scholarships and Fellowships

We continue to support our students through scholarships and fellowships. This year we awarded 38 scholarships and 7 fellowships. We are thankful for the generous contributions from our partners that make these awards possible.

The following scholarships were awarded:

Bowie, Goldcorp, Mulryan, Martin Marietta, Agapito, ATLAS COPCO/Fronapfel, McCormack, Pegasus Gold, James, Ensign Bickford, Bruce Carlson, Grosvenor, Harris, Johns Family, Murchison, Barrick Gold, C. Pillar, Thompson, Annadale-James, Stuart, John C. Wilson, P&H Mining, Provost, Joy Global, WAAIME

The following fellowships were awarded:

Resource Capital Fund, McQuiston, Cooper Hansen, Poate

Are you interested in setting up a scholarship in your name or your company's name? Please contact James Abbott at [wjabbott@mines.edu](mailto:wjabbott@mines.edu) or (303) 273-3516.



## Student Activities, cont.

### CSM International Mining Competition Team Activities

Engineering schools from all over the world met in Butte, MT in April this year for the 38<sup>th</sup> annual intercollegiate mining competition. Albert Frei & Sons, Hecla Mining, and Wood Source generously sponsored two teams, one men's and one co-ed to attend the competition of over 20 teams from other mining schools across the United States, Australia, Great Britain, and Brazil.



Senior Kevin Moran with the 1<sup>st</sup> place travelling surveying trophy

While in Butte, the competition teams were able to tour the town and learn about Butte's rich mining history. Moreover, the students were able to see the experimental mine that the Montana Tech is building, such that they may have something comparable to the Edgar Experimental Mine. Each team had the opportunity to participate in the seven different events. Some of the most competitive events in Butte were mucking against the Australians, sawing dry wood with wet wood saw blades, and working around the dense iron minerals that Montana was adding to their gold panning matrix. Despite these difficulties, both the men's and co-ed teams took 3<sup>rd</sup> place in some events, with two seniors, Jordan Oxborrow and Kevin Moran, taking 1<sup>st</sup> place in the men's surveying event. The duo measured the location to within 3/10<sup>th</sup>s of a foot. This magnificent measurement was all completed with a theodolite, a much more difficult tool to use compared to modern day total stations. These two definitely had what it took to do the job, even with outdated technology, which just goes to show how dedicated Mines students are to persisting through the problem. As a result, the team was given the travelling trophy for surveying for the 2016-2017 school year. The Mine's mining competition team will go to Kentucky this spring to compete again in the 39<sup>th</sup> annual intercollegiate mining competition.



2016 Mine Competition Team with President Johnson (Left-Right) Scott Fedel, President Johnson, Kevin Moran, Jordan Oxborrow, Michael Tinney, (Back) Donald Ross, Evan McCombs

### Boy Scouts come to Mines for Mining in Society Merit Badge

Back by popular demand was the joint SME and MEC Boy Scout Mining in Society Merit Badge day. On October 22<sup>nd</sup>, 45 boy scouts from many different troops in the Denver Area Council met at Mines to learn about economic minerals, mine safety, environmental stewardship, and the mining industry in Colorado. This was the largest class of scouts taking the Mining in Society Merit Badge from an SME Student Chapter ever. Throughout the day, nearly a dozen SME members at Mines along with several MEC members informed scouters of why mining is important today and forever. The day included a trip to CSM's geology museum where the scouts could see minerals from many of the mining districts in Colorado and gems from all over the world. To give the scouters an even better experience, SME brought the scouts to the Edgar Mine the following weekend, where they could see all of the elements of a working mine, and discover how mining has developed from the 1860's to today. Each of the scouts earned another Merit Badge after these exciting weekends. SME expects to see double the number of scouts next year for this event and is working on setting up a date in the spring to do this Merit Badge class again, depending on the demand. Colorado's rich mining history is simply fascinating to these youngsters, just as it is to the students of SME.



SME chapter officers from left to right: Clancy Harman, Jacob Milleville, Katherine Jennings, Nicole DeMontingy, and Hanna Steadman

### Students Tour the Specialty Aggregates Quarry

On Friday afternoon, December 2, 2016, the students from Surface Mine Design (Dr. Kadri Dagdelen's class) and Industrial Minerals (Prof. William Wilson's class) toured the Specialty Aggregates Quarry and the plant operations owned by Martin Marietta located near the Heritage Square Park outside of Golden. The Specialty Aggregates mines 4 million tons of granite rock per year from the quarry to produce approximately 20 different aggregate products in their primary and secondary plants to be sold in the greater Denver area.

### Navajo Nation Visit

This was the second summer that Dr. Nakagawa's Geothermal Group at Mines teamed up with a group of graduate students from Tohoku University, Hokkaido University and Stanford to return to Rico, Colorado to further delineate the Geothermal Reservoir there. More geochemistry and geophysics were completed in addition to a novel application of thermoluminescence technology that can detect plane contours of heat flow. The team also verified the annual consistency of data collected from 2015 as well as defined a northern extent to the Rico Reservoir. The Geothermal Team compiled geophysical resistivity, geologic and geochemical data from the site to present a rudimentary resource model to the community and Chapter Council of Tohatchi. The team was also invited to meet with the President and Dean of Navajo Technical University (NTU) in order to enhance the research and management aspects of the GeoPark, as well as to foster future collaboration between NTU and Colorado School of Mines.



## Department Updates

### Edgar Mine

With over 300 miners receiving mine rescue training between August 1<sup>st</sup> and September 30<sup>th</sup>, the Edgar Experimental Mine continues to be a busy place, vital in education and training.



Funded by a generous donation of \$1 million by the Freeport McMoRan Foundation, power, water and compressed air utilities received a major upgrade. Construction and contracting meetings started in January 2016. Harrison Western of Lakewood, Colorado has been chosen as the lead contractor for this infrastructure improvement. Work included removal and new installation of underground compressed air lines, water lines, power supply lines and electrical switchgear as well as new lighting for the public tour route inside the mine. The electrical upgrade increases the amperage available at several locations underground and standardizes electrical installations throughout, making them fully compliant with federal regulations. The new LED lighting on the tour route provides a well-lit and safer walking area. Air and water lines have been rerouted through the facility away from the tour route to enhance safety for visitors.

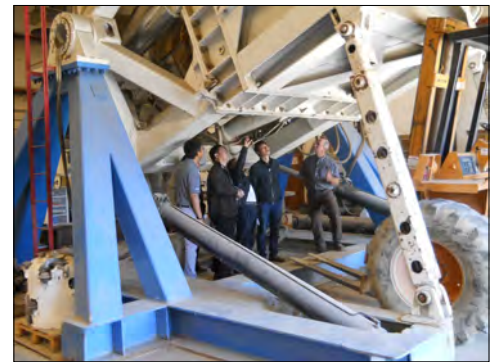
In cooperation with the Petroleum Engineering Department and through a generous donation from Apache Corporation, a new core drill rig has been purchased. This factory remanufactured drill from ROCKTech USA is a Sandvik model DE130. Its primary purpose is for practical drilling instruction in Petroleum Engineering courses but the drill is also available for use by all departments that have interest in core drilling, drill instrumentation, core study, well profiling, and any other uses.

Dr. Jürgen Brune, Research Professor, has been named the Director of Research for the Edgar Mine. Currently, the following research projects are carried out at the Edgar Mine:

- Propagation of methane-air explosions and detonations through rock rubble. PIs Drs. Jürgen Brune and Greg Bogin, funded by CDC NIOSH with \$1.25 million 2014-2019. Primary research objective is the prevention of methane air explosions in coal mines. Researchers have installed a 30-in. diameter, 20-ft. long explosion test tube at the mine where they can observe flame propagation through rock rubble.
- Dispersibility of rock dust in mine explosions. PIs Drs. Jürgen Brune and Karl Zipf, funded by CDC NIOSH with \$623,000 2016-2017. Rock dust is used in coal mines as an inert substance that prevents coal dust explosions. Primary objective is to test the dispersibility of rock dust and alternative products under varying atmospheric conditions. Researchers constructed an underground explosion test drift in the Edgar mine where they can initiate controlled explosions and measure the dispersibility of rock dust products.
- Testing of new underground mine communications systems. PI Carl Brackpool and Matt Schreiner, in-kind funding from various industry sources. Researchers are testing wireless and wired systems that permit voice and data communication in underground environments. Such systems are critical not only for day-to-day mine and equipment management but also during mine emergencies when outside electric power may be cut off. Systems tested include WiFi, through-the-earth and broadband-over-power

### Earth Mechanics Institute

EMI is under new leadership of recently hired Dr. Jamal Rostami as the director of EMI, who is charged to develop a new vision and mission for EMI and to expand to new research areas by involving faculty from various departments to advocate interdisciplinary research. EMI is an established brand in the fields of rock excavation in the world and is a leader in the field of tunneling in the US, and EMI is well recognized on a global basis in underground construction. The faculty and staff working at EMI are the leaders in these fields and possess the know-how to design project specific tests and understand / interpret the results of testing and work with the clients to solve operational issues and develop new methods/machines. EMI offers students the opportunity to learn and excel in these areas by providing a unique combination of educational excellence, expertise, and research capabilities in rock mechanics, mechanical rock fragmentation, and full scale testing of rock excavation systems that are unparalleled globally. The primary goal for EMI moving forward is to expand on the core competency in excavation and drilling, and develop capabilities that allow an all-encompassing understanding of Earth Mechanics and related processes. This will complement and support the mission of the recently established Underground Construction and Tunneling (UCT) program, while involving other research centers on campus.



*The delegation from Changsha admiring EMI's Tunnel Boring Machine*

The new **Vision** of the EMI is to *lead the world in education, technology development, and research on mechanics of earth materials, excavation, and drilling systems*. EMI **Mission** statement reads: *To create an environment that attracts the best talent for interdisciplinary collaboration on intellectual discoveries and development of highly innovative engineering solutions to challenges facing excavation, drilling, and support of earth materials for mining, civil, and energy industries. This includes fundamental and applied research in collaboration with industry, developments in both equipment and testing methods, and the introduction of new materials, tools, and systems to enhance current practices towards safer, more efficient, and environmental friendly operations. Our work will deeply involve students and will engage new faculty in multi-disciplinary collaborative teams.* To fulfill its vision/mission, EMI would like to engage CSM alums in these activities and would welcome any feedback and input to allow us achieve our strategic goals.



## Department Updates, cont.



Fire attack during live fire training at the Edgar Mine using the new Fireblast system.

### Energy, Mining and Construction Industry Safety

The Energy Mining & Construction Industry Safety Program (EMCIS) has seen many changes and developments over the past 6 months. Collin Smith and Kirk McDaniel, both CSM graduates, were hired to the program as Director of Operations and Director of Program Development, respectively. Their tasks are to streamline the current operation and to explore alternatives to expand and diversify the programs training service offering and revenue streams. Lee Martinez joined EMCIS in October. Lee is a 34-year veteran of the South Metro Fire Rescue district with expertise in technical training, incident command, fire and technical rescue.

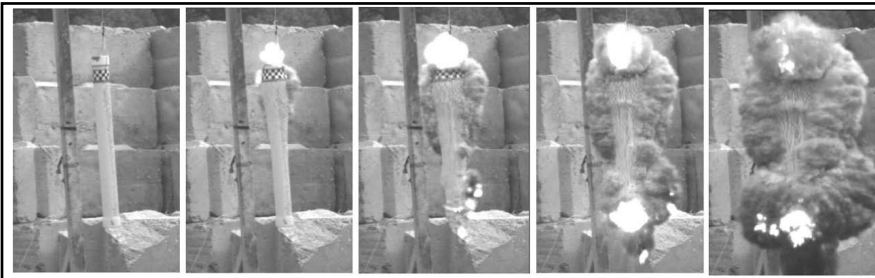
The cornerstone of the program remains grant funding from the National Institute of Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) to provide Part 48 Training for both Surface and Underground as well as highly specialized training for underground mine rescue. Both grants were successfully re-awarded to the program.

EMCIS has engaged with NIOSH on preliminary discussions of developing and delivering a training program similar to what is required for the mining industry into the oil and gas industry.

EMCIS is developing a relationship with the City of Seattle Fire Department Heavy Rescue 1 Technical Rescue Team and the Seattle Fire Marshal's Office. The intent is to jointly develop a training and certification program that focuses on the unique environments covered by National Fire Protection Association standards 1670 and 1006.

EMCIS has entered into an Interagency Agreement with the Red Rocks Community College Rocky Mountain Education Center (RRCC RMEC) to establish and conduct a joint certification program that focuses on OSHA required training. In addition, EMCIS is entering into a partnership with the West Metro Fire Training Academy which will give EMCIS access to a world-class training facility. Both relationships significantly enhance the program's ability to teach technical rescue, fire evolution, confined space, trench rescue etc. EMCIS is seeking to develop a joint Tunnel Training program with the Laborers International Union of North America. The program would comprise of class room instruction hand-on training in topics such as ground control, ventilation, communications, timbering, etc. as well as general underground safety awareness and practices.

### Advanced Explosives Processing Research Group



High-speed images of a detonating case charge.

This past year, Dr. Petr and his Advanced Explosives Processing Research Group (AXPRO) continued advancing their research and education activities at the Colorado School of Mines and are very excited to continue 12 years of their explosives engineering program. Master's Student Eduardo Lozano finished his thesis on Blast Shield For Avalauncher used by the Colorado Department of Transportation (CDOT). Eduardo and Dr. Petr finished and submitted the technical report, "Case Charge for Avalanche Control," to the Colorado Department of Transportation. This new improved explosive charge will be used in the 2016-2017 winter season by CDOT but also with the Department

of Transportation in Alaska, Washington, and Utah. Dr. Petr and the AXPRO team expanded research on avalanche control using explosives (case charges). The AXPRO team submitted a paper, "Design and Testing of Blast Shield for Avalanche Control used by the Colorado Department of Transportation," and poster to the International Snow Science Workshop (ISSW) Proceedings. Graduate student E. Lozano and V. Petr, presented their research, "Characterization of ANFO using Aquarium Test and Numerical Modeling Methods," to 42nd IPS Seminar Proceedings. Dr. Petr offered a new series of courses at the Missouri University of Science and Technology's (MS&T) Explosive Engineering department in Spring 2016 the Special Explosives Applications and High-Speed Imaging Methods in Explosives Engineering. Collaboration with Department Of Labor and Employment on State explosive permit and improving public safety will be offered two times per year. This two-day Practical Explosive Training School (PETS) was offered to blasters and explosive-end users. The CSM SPACE program is continuing education into ultra high-speed imaging and Law Enforcement class for Improvising Explosive Devices and commercial explosives recognition. Dr. Petr and his students continue to develop new researching initiation systems by developing the new optical tool (shadowgraph method) to characterized initiation systems as well as explosives characterization. They presented their results, "Shadowgraph Optical Technique for Measuring The Shock Hugoniot From Standard Electric Detonators," in the XIII SEM International Congress Proceedings.

### Internships

Our undergraduate and graduate students are serving internships all over the US and the world including at Westmoreland Coal Company, the San Miguel Lignite Mine, the House Subcommittee for Energy and Mineral Resources, IMERYS marble mine, J.F. Shea, Martin Marietta, Traylor Bros., Inc., Skanska USA, SNIM, Lhoist North America, Georg Agricola, Kiewit and Oldcastle Materials, (Picture at right taken at SNIM in Mauritania, North Africa)



## Department Updates, cont.

### Underground Construction and Tunneling

- Three UCT faculty (Drs. Eunhye Kim, Gabe Walton, and Reza Hedayat) experienced faculty summer internships at Kiewit construction work sites (Rondout NY, Chicago IL, and Salt Lake County UT) in 2016, which will help faculty introduce what students can learn at real workplaces in a more realistic way in classes.
- To provide cutting-edge knowledge and practice, UCT has offered a list of short courses: Geotechnical and Structural Instrumentation, Monitoring, and Information Engineering (TBA), Underground Grouting and Ground Improvement (TBA), Tunneling Foundations, Practice and Innovations (September 18-21, 2017), and Shotcrete Fundamentals and Applications (TBA). <http://csmspace.com/events/tunneling/>
- Also, UCT as an interdisciplinary group was awarded \$3.85M from 2014-2019 and \$1.25M from 2014-2018. The sponsors are government agencies and private industries including National Science Foundation, US DOT, CDC/NIOSH, Jay Dee, Robbins, BASF, Jay Dee, Dragados, Hecla Mine, and Kiewit. More importantly, 10 UCT faculty are heavily involved with UCT research, offering MS and Ph.D. degree in UCTE, and growing 13 undergraduate students and 20 graduate students in UCT field.
- Several undergraduate students participated in UCT sponsored research under the supervision of Drs Rennie Kaunda, Eunhye Kim, Gabe Walton (Geological Engineering), and Reza Hedayat (Civil).
- Several students were sponsored by the UCT to visit tunneling projects in Seattle including "Big Bertha."
- Also the UCT sponsored several students to attend the Word tunneling Congress in San Francisco in April 2016, organized by the International Tunneling and Underground Space Association (ITA), and the UCA Division of the Society for Mining, Metallurgy & Exploration (UCA of SME)

### Coming Soon...

- The 2017 SME Conference will be held in Denver this year. A number of our students and faculty will be presenting papers there. It is also the 100th anniversary celebration of WAAIME. The reception will be held in the Centennial Ballroom of the Hyatt Regency Hotel on Tuesday, February 21, 2017. Following the reception, the Mining Engineering department will host an alumni event to be held at the Rio Grande in downtown Denver.
- The Colorado School of Mines (CSM), along with the Underground Ventilation Committee (UVC) of the Society for Mining, Metallurgy and Exploration, Inc. (SME), is hosting the 16th North American Mine Ventilation Symposium at the Mines campus, June 17 to 22, 2017. This Symposium is expected to draw the foremost mine ventilation experts worldwide and is considered one of the premier, international forums for the discussion and exchange of ideas on mine ventilation, fans and automated controls, reducing dust and diesel particulate matter, diluting mine gases, preventing fires and explosions, and cooling and conditioning of mine air. Dr.-Ing. Jürgen Brune, Research Professor in Mining Engineering, is the conference organizer and chair.
- 36th Application of Computers and Operations Research (APCOM) International Conference is being organized by the Mining Department at CSM on August 9th to 11th, 2017". Dr. Kadri Dagdelen ([kdagdelen@mines.edu](mailto:kdagdelen@mines.edu)) is Chairman of the conference and invites every one who may be interested in the event to plan to attend.



### Thank you, Brian Asbury, for your 26 years of dedication to EMI!

I first joined EMI in 1990 and was appointed to the faculty as a Research Associate one year later. In 1995 I was promoted to laboratory manager. During this time I have participated in and overseen a wide variety of projects at EMI in the fields of mechanical excavation, tunneling, rock mechanics and waterjet technology. This has led to me authoring and co-authoring over 40 publications for various private companies, public agencies and peer review organizations. The work at EMI has taken me to some amazing locations such as the rain forest of Brazil for field testing and South Africa for presenting research papers. I am proud to have maintained EMI's self-supporting financial model, excellent safety record and exemplary reputation while expanding our public outreach and support to the Mining Engineering Department and Mines. It has been my honor work with the 100+ undergraduates, graduate students and post docs, from over a dozen different countries, that we have supported at EMI during my time here. Particular highlights for me include lecturing on mechanical excavation, teaching rock mechanics labs, hosting the mining completion practice field, and completing a research project that reduced respirable dust levels in underground coal mines by 30%. I feel very lucky to have become part of the Mining Engineering Department, which is a team filled with dedicated professionals across the board that share the common goal of helping our students become the next generation of leaders while providing technical excellence.



### Now Hiring! EMI Laboratory Manager

The Mining Engineering Department at Colorado School of Mines (Mines) is accepting applications for a staff position as the Laboratory Manager for the Earth Mechanics Institute (EMI). EMI is a unique research institute and one of the largest excavation and drilling laboratories in North America. The laboratory supports the educational mission of Mines and provides unparalleled research opportunities relative to the excavation and drilling of rock and soils using mechanical and novel excavation technologies. This highly acclaimed laboratory also serves as a testing facility for commercial and government activities. Please go to <http://jobs.mines.edu/cw/en-us/job/492615/laboratory-manager>



## Department Research

### New Research Grants Awarded to Faculty

Project Title	PI/Co-Pis	Sponsor	Amount	Project Start Dates
Enhanced Safety and Health Training for Western Mine Workers <b>YEAR 3</b>	Hugh Miller	NIOSH	576,160	9/1/16-8/31/17
Dispersibility testing of dried wet and foam rock dust	Jurgen Brune and Karl Zipf	NIOSH	623,150	9/15/16-9/14/18
Development of A New Stochastic Mine Production Scheduling Optimization Algorithm - Amendment	Kadri Dagdelen	Newmont USA	30,000	6/1/16-1/9/17
Advanced Mine Rescue Skills Training Using Multiple Training Modalities	Robert Ferriter	MSHA	240,024	9/30/16-9/29/17
2016 Community Grant Agreement - The Rico Center	Masami Nakagawa	RICO	18,000	8/1/16-9/1/17
Geothermal Energy Study on the Navajo Nation: Tohatchi and the Burnham Chapter Communities	Masami Nakagawa	Navajo Transitional Energy Company	85,000	5/16/16-12/31/16
Policy Alternatives for Capturing Vented and Fugitive Methane Emissions Associated with Fossil Fuel Extraction in the U.S.	Eunhye Kim and Gabriel Walton	Hecla Mining Company	50,000	6/1/16-8/31/17
Development of an Integrated Approach to Stress-Related Ground Hazards in Underground Mines	Eunhye Kim, Rennie Kaunda, Elizabeth Holley and Gabriel Walton	Centers for Disease Control and Prevention (CDC)	250,434	9/15/16-9/14/21
Rock Cut Perimeter Blasting BMP Study: Rock Excavation Best Management Practice	Vilem Petr	Colorado Department of Transportation (CDOT)	95,000	7/1/16-12/31/17
Total: \$				1,967,768

### Ongoing Faculty Research Projects

Project Title	PI/Co-PIs	Sponsor	Project Dates
Combustion Modeling and Spon Com Prevention in Longwall Gobs	Jürgen Brune, Gregory Bogin, John Grubb	NIOSH	9/1/14-8/31/19
Development of a New Rock Dust Sampling Instrument	Jürgen Brune, Gregory Bogin	Alpha Foundation	11/1/13—12/31/16
Fire Prevention and Emergency Response at the Eisenhower and Johnson Memorial Tunnels	Jürgen Brune	CDOT	11/3/15-9/30/17
Establish coal dust explosion prevention test facility at the Edgar Mine	Jurgen Brune	NIOSH	9/1/15-8/31/16
Development of a New Stochastic Mine Production Scheduling Optimization Algorithm	Kadri Dagdelen	Newmont USA	6/1/16-1/9/17
Advanced Mine Rescue Skills Training Using Multiple Training Modalities	Robert Ferriter	MSHA	9/30/15-9/29/16
EAGER: Collaborative Research: Dating Mineralization in a Carlin-type Gold Deposit: A Test of the Fe-oxide (U-Th)/He chronometer	Elizabeth Holley	National Science Foundation - NSF	6/1/16-5/31/17
Ore Characterization at the Wharf Mine, South Dakota	Elizabeth Holley	Coeur Mining, Inc.	6/1/15-5/31/17
New Exploration Model for Sediment-Hosted Gold Deposits, Nevada	Elizabeth Holley	Newmont USA	8/1/14-7/31/17
Sequestration of Acid-Generating Mill Concentrates: Cripple Creek	Elizabeth Holley	Cripple Creek and Victor Gold Mining Co	9/1/14-8/31/16
Analysis of stability of the Lucky Friday No.4 shaft	Eunhye Kim, Gabriel Walton	Hecla Mining Company	6/1/15-12/31/16
Enhanced Safety and Health Training for Western Mine Workers <b>YEAR 2</b>	Hugh Miller	CDC NIOSH	9/1/15-8/31/16
EAGER: Exploratory Research on Rock Damage from Geologic and Induced Thermal Loading	Priscilla Nelson, Rennie Kaunda, Elizabeth Holley	National Science Foundation - NSF	8/1/15-7/31/17
Sustainable Energy Development Exchange in Indigenous Communities	Masami Nakagawa	US Department of State	9/30/14-5/31/17
Explosive Safety Training with Colorado School of Mines	Vilem Petr	Colorado Department of Transportation (CDOT)	6/24/15-6/23/20
Helicopter Avalanche Control Research Agreement	Vilem Petr	Colorado Department of Transportation (CDOT)	4/1/14-7/31/17
Coal Safety and Performance	Jurgen Brune, John Grubb and Ian Lange (E&B)	Earth Resources Institute (ERI)	TBD
Policy Alternatives for Capturing Vented and Fugitive Methane Emissions Associated with Fossil Fuel Extraction in the U.S.	Graham Davis (EB) and Mark Hart (MN)	ERI	TBD

## Publications

2016 has been a prolific year for Mining Engineering. For a list of Faculty and student publications for 2016 please go to <http://mining.mines.edu/MN-Publications-2016>.

## In Other News...

### MINExpo

From September 24-28, students and faculty from the Mining Engineering Department participated in seminars, demonstrations, tours, and a wide range of activities associated with Mine Expo in Las Vegas, NV. Besides being able to get close to big trucks and other types of equipment, highlights of the trip included Stan Dempsey's induction into the Mining Hall of Fame, a Caterpillar VIP tour and student reception with senior managers and executives, the CSM Alumni Reception, and a tour of Barnhart's Lake Mead Tunnel project. It was great seeing everyone at the Alumni Reception which hosted more than 200 people. For the students, this trip wouldn't have been possible without the generous contributions of alums and sponsors. We truly appreciate all your support in providing an excellent learning experience for the students.



*Atlas Copco machine at the MINExpo exhibit*

### Cripple Creek Mine Visit

Dr. Kadri Dagdelen took 20 students from the undergraduate MNGN 312 Surface Mine Design Class to Newmont Mining's Cripple Creek Gold Mine on November 17, 2016 to show how the mine planning and design as well as unit operations are done in the real world. The Cripple Creek Gold mine will produce 490K ounces of gold from 25Mton heap leach and 1.7M ton of ore for milling operation in 2016 while maintaining 1.2 to 1.0 Strip ratio. They were very curious and asked many questions. We thank Newmont Mining for their generosity to host our students particularly Mr. Ben Scholz, Newmont's Chief Engineer at Cripple Creek for organizing an excellent tour for our students.



## NEWS FLASH

On December 4, 2015, President Obama signed the Fixing America's Surface Transportation (FAST) Act (Pub. L. No. 114-94) into law making it the first federal law in over a decade to provide long-term funding for surface transportation infrastructure planning and investment. As part of its efforts to fulfill the FAST Act federal mandate, DOT hosted a grant competition which resulted in the announcement of 32 new UTC Centers. Among those Centers established in December 2016 was one led by Colorado School of Mines—involving faculty from Civil, Mining, and Geological Engineering, and the Underground Construction and Tunnel Engineering Program. This is the new Tier 1 University Transportation Center the "University Transportation Center for Underground Transportation Infrastructure (UTC-UTI), funded At \$1.4 million per year. Go Mines!!!!!!!

CONTRIBUTERS: MN faculty, staff, and students

EDITORS: Rennie Kaunda, Eunhye Kim, Priscilla Nelson, and Mandi Myers

## Mine Closure Summit



Colorado School of Mines recently hosted the "Summit on Reasonable Expectations for Mine Closure" focused on historic and abandoned mines. The summit was held on November 17, 2016, and brought together non-governmental organizations, members of industry, local community members and other stakeholders from throughout the world to discuss what it takes to have a successful mine closure and generate expectations for future stakeholders. The Payne Institute for Earth Resources sponsored the summit, with organizational support from the Humanitarian Engineering Program and the Department of Mining Engineering at Mines and the Keystone Policy Center. The summit included panel discussions with stakeholders from multiple fields, mapping expectations for successful closures and creating a framework to guide better life-cycle management of active mines by learning from previous experiences. "The summit discussions extended across stakeholder groups to include a broad set of concerns about the evaluation and management of the risks of mineral development, lack of consensus concerning reasonable expectations and goals for abandoned mine closure, and the assignment of responsibility for risks and actions," said Priscilla Nelson, department head of Mines' Department of Mining Engineering. "Attendees brought perspectives from well beyond the bounds of Colorado and North America." The four panels focused on mine closure expectations with environment and community sustainability concerns in mind. In many cases, historic mines were operated before the current laws and regulations were in place, and stakeholders are now faced with issues that need further refinement in order to have a successful closure. Ultimately, the goal of the summit was to generate tangible actions to begin systematic remediation of existing abandoned mines prevalent in the western United States. Overall, the summit provided the opportunity to discuss what the future of mine remediation and successful mine closures.

## Now Hiring!

The Department invites applications for several new faculty positions in Mining Engineering. These positions are anticipated to be filled at the rank of Professor of Practice. Desirable candidates are those who are excited to share in our mission to address the challenges of creating a sustainable global society through educating the next generation of leading scientists and engineers and expanding the frontiers of Mining Engineering knowledge through research. Please visit <http://jobs.mines.edu/cw/en-us/job/492620/professor-of-practice> for instructions on how to apply, or contact Dr. Priscilla Nelson (pnelson@mines.edu, 303-384-2606) to discuss further!!!!