SPIRAL RAMP DESCENDS TO NEW LEVELS

Thirty feet below ground, the Experimental Mine’s spiral ramp is about to get deeper.

After 100 years of use, and with the mining program’s expansion and the scheduling of additional blasting classes, we’re running short of development space underground.

Led by professor Paul Worsey, expansion plans are under way to add more levels with modern-sized openings.

The ramp has a 14 percent grade with a minimum 14 foot x 10 foot cross-section extending down from the Kennedy portal. The deeper ramp will provide 25 feet between the second and main level, extending the mine’s life by another 50 years. A third level will allow mining of the whole property without daylighting, Worsey explains, providing unlimited mine life.
DEAR ALUMNI, COLLEAGUES AND FRIENDS

Strengthened industry partnerships, solid academic programs and growing research capabilities are driving the mining and explosives engineering programs to continued success. We’ve implemented many changes to the mining engineering curriculum for 2017 based on input from industry, students and faculty alike. We produced 52 graduates in the 2016–17 academic year, making us the largest undergraduate mining engineering program in the U.S., according to the latest Society for Mining, Metallurgy & Exploration survey of department chairs. Enrollment is expected to soften a bit this year with the completion of the Botswana 2-2 program, even as recruiting efforts are stepping up to meet the growing needs of industry. Our student teams continue to dominate their disciplines. The mucking teams brought home plenty of hardware from Kentucky as the Men’s B-Team won the overall competition and The Lady Muckers won the overall event for the fourth consecutive year. Our mine rescue team also performed well, taking first place in first aid and fourth in the field at our September invitational (see page 2). The explosives engineering program is taking bold new steps to create an M.S. program in explosives technology targeted towards potential students who are currently involved in the industry and have science or technical backgrounds but are not engineers. The program has already garnered much interest from potential students (see page 8). I have been busy working with faculty to enhance the programs’ reputation abroad. Samuel Frimpong and I traveled to Ecuador in September to advance negotiations with the University of San Francisco De Quito to assist with establishing a mining program (see page 9). Missouri S&T’s role will be to act as a resource for a 2+2 program in which students from Ecuador will complete a degree in mining engineering in Rolla after completing two years at USFQ. During the visit, it was obvious that the burgeoning Ecuadoran mining industry will support these graduates with career opportunities upon their return. The explosives engineering faculty also welcomed representatives from China for explosives training at the Kennedy Experimental Mine Building (see page 7). I traveled to China in October to negotiate a five-year agreement to provide industry training to approximately 100 trainees per year. Closer to home, Shirley Hall retired this year, and we will miss her services immensely. I know she was a key resource for many of you through the 10 years she was part of our family. Also, Stewart Gillies, who retired in the spring of 2016, will be recognized at winter commencement for his designation as professor emeritus in mining engineering. My goal over the next year is to develop a plan to raise funds and endow our mining engineering program. Academic pressures for research and cyclical industries have driven many U.S. mining engineering programs into closure over the past 20 years. This trend continued with Southern Illinois University announcing the closure of its mining engineering program earlier this year. University administrations driving further focus on research and scholarly output in high-impact-factor journals have posed a challenge in attracting and retaining quality mining faculty who don’t traditionally publish in these venues. For this reason, endowments are critically important. Look for me to be asking you for advice on how to proceed with this endeavor. In the interim, we are recruiting the best talent available and succeeding to meet the needs of university administration while staying true to our reputation for producing quality undergraduate mining engineers. We must embrace what the academic world values in maintaining our stature at the university. The administration will be looking at return on investment with faculty hires, so strength in this area allows us to keep the faculty positions we need to manage our curriculum. Research expenditures are trending up and faculty are focused on increasing research output. For those of you with research needs of your own, I encourage you to investigate working with S&T to meet these needs through our faculty and graduate students. The coming year will be a great success thanks to the hard work of our faculty, students and staff. They are accomplishing great things.

Warm Regards,

Braden Lusk, Ph.D., P.E.
MinE’00, Ph.D. MinE’06
Chair, Mining and Nuclear Engineering

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South American partnership grows in Quito.
As a doctoral student in mining engineering, Kenneth Bansah works, learns and lives nearly 10,000 miles from his boyhood home of Tarkwa, Ghana, a gold mining hub in western Africa.

But even as he fine-tunes his dissertation on mitigating sinkhole hazards and other karst formations — and takes care of three children ages five and under while his wife completes her own graduate studies in Michigan — the subsistence gold miners of Ghana are never far from Bansah’s mind. Or his heart.

It’s known as “galamsey,” illegal mining by untrained workers who routinely brave dangerous conditions and toxic exposure to feed their families, in some cases using picks and shovels to sift through the leftovers ignored by industrialized mining operations. The term is derived from the English phrase, “gather them and sell.”

In Ghana, such small-scale, or artisanal mining (both legal and illegal) accounts for nearly one third of gold production in a nation that before gaining its independence...
60 years ago was known as the Gold Coast. Diamonds are also mined in Ghana, although on a much smaller scale.

Government regulations enacted in the late 1980s have failed to keep pace with the growth of the market — witness the arrest and expulsion of thousands of illegal Chinese miners in 2013. And the artisanal miners who remain often engage in those same harmful practices, albeit on a smaller scale, says Bansah. Many are women whose children are forced by economic necessity to work. Pulled from school at an early age, the children usually remain trapped in the cycle of poverty, he explains.

“I was fortunate,” says Bansah, a police officer’s son who taught at the University of Mines and Technology in his home country after earning an advanced degree there. “But there are many people in my country who have no source of income other than subsistence farming. They look at mining as a means of survival.”

In 2016, Bansah enlisted several colleagues, including former students, to create the nonprofit group Mining & Community Research. Its goal: using scientific rigor and technical expertise to promote sustainable development.

He returned to Ghana last winter to work on three projects: a series of “Getting Children Out of Galamsey” community workshops; skills training for female artisanal miners; and an infrastructure improvement effort to raise money for a village’s new clean water drinking system.

Bansah anticipates receiving his doctorate in December. He then plans to return to his home university, and continue working at both the nonprofit as well as a for-profit consulting firm he established in 2010.

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**AWUAH-OFFEI WORKS WITH GHANA UNIVERSITY AS CARNEGIE AFRICAN DIASPORAN FELLOW**

A philanthropic program that pairs African Diaspora scholars with higher education institutions back home allowed associate professor Kwame Awuah-Offei to spend six weeks collaborating with colleagues at the University of Mines and Technology in his native Ghana.

As part of the Carnegie African Diasporan Fellowship Program, Kwame spent this past summer teaching a graduate module at the university, delivered three seminars and met with many graduate students and early-career faculty for one-on-one mentoring sessions.

He was one of 70 native African scholars who were awarded fellowships this year to conduct a wide range of projects across disciplines, from agroforestry to e-learning modules for nursing, and from ethnomusicology to military mental health.

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**M.S. WITHOUT THESIS Approved FOR Distance Students**

We recently received approval to replace the M.E. degree for distance students with a Master of Science in mining engineering that does not require completion of a thesis.

The new degree option is only available for distance students and involves 30 credit hours (27 hours of courses and three hours of a project related to the student’s work experience). The vast majority of campus distance students receive an M.S. rather than a M.E. Current distance students have the opportunity to change to the new program or remain in the M.E. track.

This shift will better allow working professionals to receive additional education and training without taking time away from their careers. Students can build on what they learned as undergraduates and get the practical education they need to succeed in our industry.

We are also working on changes to the mining engineering graduate certificate to allow baccalaureate alumni to take courses that build upon their undergraduate degrees. The certificate can then be used for entrance into the M.S. program without having to take the GRE exam. Certificate credit may also be applied toward the M.S. degree.
The arrival of fall on the Missouri S&T campus heralds a succession of yearly rituals, from the Career Fair to Homecoming. For mining engineers, those traditions include the annual Mine Rescue Competition, now 35 years strong.

This year’s event, held over four days in September, attracted two dozen teams, most from private industry. The simulated mine emergency provides many of its industry participants with the opportunity to practice in a real-world setting they can’t replicate back home.

“With a rescue situation, the last thing you want to do is figure out what do in the midst of an emergency,” Anna Hui, director of the Missouri Department of Labor and Industrial Relations, told The Rolla Daily News while observing the event. “Competitions … like this allow for teams to drill, so that when an emergency comes, it’s just second nature on how to respond.”

“This is the real thing,” added Paul Boutte, a member of the team from Compass Minerals of Lake Iberia, La. “Back home we do not have a real mine we can actually drill and practice in.”

The competition consists of a written skills test; two hands-on simulated mine disasters (both underground); a first-aid portion with a written test, hands-on CPR and a first-responder scenario; and a team technician portion with a written test and technical troubleshooting of breathing apparatuses and gas instruments.

A pair of student teams from Rolla competed alongside the pros. Missouri S&T Gold finished at the top of the first-aid portion of the even, fourth in the competition’s field portion and 18th in team tech. Missouri S&T Black finished 10th in the field portion, 18th in first aid and 14th in team tech.

The industry teams consisted of Barrick Coretz Goldstrike and Barrick Turquoise Ridge; Carmeuse Lime and Stone; Central Plains Cement/Talon; Compass Minerals; Doe Run Gray and Doe Run Maroon; Eastwood Fire Dogs; Gateway; Hecla-Greens Creek Mine; Lafarge POWC; Lunding Mining; Martin Marietta; Mississippi Lime; Morton Salt and Morton Salt Weeks Island; Mosaic White; Nyrstar Tennessee Mines; Tronox; Vulcan Materials Blue; and Waste Isolation Pilot Project (Wipp) Blue. A team from South Dakota School of Mines and Technology also participated.
The following S&T students participated on the Black team:

Caroline Dziak, fresh air base assistant, a senior in mining engineering from Bridgewater, New Jersey
Zach Griffie, cable puller, a sophomore in mining engineering from St. Louis
Dan Heidrick, co-captain and first aid, a junior in mining engineering from Fenton, Missouri
Ethan Kerr, team captain and first aid, a junior in mining engineering from Union, Missouri
Botlhe Masedi, first aid, a senior in economics and mining engineering from Maun, Botswana
Jared Proctor, map and team technician, a senior in mining engineering from Collinsville, Illinois
Adam Reiter, gas, a senior in mining engineering from Fenton, Missouri

The following S&T students participated on the Gold team:

Kevin Cahill, fresh air base, a senior in mining engineering from St. Louis
Tanner Eliuk, gas and first aid, a senior in mining engineering from Fulton, Missouri
Will Hoover, team captain and team technician, a senior in mining engineering from St. Charles, Missouri
Holden McComb, first aid, a senior in mining engineering from Littleton, Colorado
Creighton Miles, cable puller, a sophomore in mining engineering from Advance, Missouri
Josh Miller, co-captain and first aid, a senior in mining engineering from Smithville, Missouri
James Nash, map and team technician, a senior in mining engineering from Bunker, Missouri
Suzanne Taylor, fresh air base assistant and first aid, a senior in mining engineering from Maryland Heights, Missouri

DEWAYNE PHELPS
Mine rescue team adviser
INDUSTRY FELLOWSHIP PROVIDES AOUAD WITH INSIDE LOOK AT TOP COPPER PRODUCER

Nassib Aouad got an insider’s look this summer at the operations of one of the world’s largest copper producers through a program that links academia with Freeport-McMoRan.

The company’s Academic-Industry Mining (AIM) fellowship provided the assistant professor with an in-depth understanding of the challenges and opportunities a mining company encounters. He split his time between the Phoenix headquarters and the company’s largest surface mine in Morenci, Arizona.

Aouad had the opportunity to engage with various high-level teams working on integrating big data technology into the mining environment. These projects aim to optimize the mine output and monitor mine fleet health and safety to create a highly efficient work environment.

He worked with the big data team and the mine maintenance division to investigate haul trucks’ failure modes in order to extend the components’ life and thus reduce idle equipment time.

Aouad was also exposed to Freeport-McMoRan’s state-of-the-art technologies used to monitor machine performance and health in real time to improve fleet reliability. He also attended management meetings.

Overall, the program provided a wealth of knowledge that can be brought back to S&T and passed on to future miners.

MINING AND EXPLOSIVES STUDENTS FIND HOME AT KENNEDY EXPERIMENTAL MINE BUILDING

Graduate student Chance Moore doesn’t hesitate when asked how the new Kennedy Experimental Mine Building compares to the less-than-modern facilities the explosives engineering program used to call home.

“This is wonderful,” he says on a late October tour of the building, which debuted at Homecoming 2016 and is now fully operational. “It’s 10 steps up.”

The 15,000-square-foot, two-story metal building features three modern classrooms on the top floor and multiple labs on the ground level. There’s ample space to store equipment, meeting and storage space for S&T’s award-winning mine rescue and mucking teams, a break room and a dedicated computer lab for mining and explosives engineering students. The lower level labs are divided into “clean” and “dirty” spaces, the latter intended as self-contained spaces for rescue and mucking teams who can go straight outside to the underground mine through garage bay-style doors.

Moore, who is pursuing his master’s degree in explosives engineering, recalls having to hold classes in overflow areas where “we would just set up tables next to a drill press.” The native of Palmyra in northeast Missouri received a bachelor of science in mining engineering in May.

Now, he says, “it’s like night and day.”

The building is named for Bill Kennedy, president and CEO of Jack Kennedy Metal Products and Building Inc. of Taylorsville, Illinois, which provided the structure, an in-kind gift valued at nearly $1 million. Additional gifts came from The Doe Run Co., for whom the three first-floor classrooms are named; Mississippi Lime Co.; Newmont Mining Corp.; Peabody Energy Corp.; and Dianna Tickner, MinE’79.
CHINESE PROFESSORS, MINING INDUSTRY OFFICIALS TRAIN IN ROLLA

Department chair Braden Lusk, MinE’00, Ph.D. MinE’06, is heading up a civil explosives training program with the China Explosives Materials Trade Association in accordance with a new research and service agreement between Missouri S&T and CEMTA.

The relationship is the first of its kind and provides expertise and training to help with safety and productivity in blasting operations in China. The trainees come from many regions in China and have varying levels of experience with explosives.

This past summer, the program hosted the first offering to 18 trainees over 10 days of extensive classroom and lab instruction. Training sessions were conducted by the chair as well as Kyle Perry, Paul Worsey, Catherine Johnson and Jhon Silva-Castro from the University of Kentucky.

The trainees participated in field trips to the Bushy Creek Mine at Doe Run, the Fred Weber Mine in New Melle and Capital Quarries in Rolla. In addition, the trainees were exposed to the unique capabilities of our experimental mine, with faculty demos utilizing the underground mine and surface quarry with an extensive inventory of explosive products.

Lusk recently visited the organization in China to negotiate a long-term agreement under which the course will occur twice a year and train over 40 students annually. The companies represented by CEMTA have invited Braden and other faculty to visit operations in China to allow for creating specialized custom training designed to improve specific operations there.

The initial training course included academic personnel from multiple universities in China who expressed interest in partnering with exchange programs between Missouri S&T and academic institutions in China. We hope the early efforts on this front are just the start of more great things to come.

NSSGA RECOGNIZES S&T STUDENT CHAPTER AS FIRST CAMPUS AFFILIATE

The National Stone, Sand and Gravel Association has recognized the Missouri S&T chapter as its first official affiliate on a college campus.

The recognition allows student members to take advantage of scholarship opportunities and attend networking events, field trips and professional conferences. It is our goal to help bring more students into the aggregates industry.

The affiliation further strengthens our program’s strong ties to industry. Many students find work through internships and co-ops, experiences that often lead to full-time positions upon graduation. In turn, those connections, alongside student involvement in the department’s various clubs and organizations, also help the mining industry.

With restoration of the nation’s aging infrastructure of utmost importance, we hope that the founding of our student chapter will lead to more chapters opening at other mining schools, resulting in a new workforce possessing real-world skills.

GREG GALECKI
Associate Professor, NNSGA adviser

KYLE PERRY
Assistant Professor of Explosives Engineering
EXCHANGE PROGRAM WITH MINING PROGRAM IN ECUADOR ADVANCES

Four years ago, Marshall Koval, president and CEO of Lumina Gold in Quito, Ecuador, discussed with the then-chair of the Department of Mining and Nuclear Engineering, Samuel Frimpong, his vision of mining engineering education in the South American nation. The discussions culminated in Frimpong’s first visit to Ecuador and the University of San Francisco at Quito in August 2016 to lay the groundwork for a future mining engineering program.

Early this year, a high-level USFQ delegation led by Vice Rector Ximena Cordova visited Missouri S&T to continue discussions on the future program. In early September, department chair Braden Lusk joined Frimpong in Ecuador to expand on the vision and strengthen the foundation for developing a strong partnership.

The delegation from Missouri S&T is grateful to USFQ Chancellor Santiago Gangotena, Cordova, Dean César Zambrano, Associate Dean Fabrício Yépez and Program Head Gustavo Munoz, Koval and the staff of Lumina Gold, the Honorable Minister of Mines of Ecuador, Javier Cordova, and the president of Chamber of Mines of Ecuador, Santiago Yépez, for making this visit possible.

EXPLOSIVES RESEARCHER STUDIES BLAST-INDUCED BRAIN INJURIES

Military personnel involved in both military actions and combat training are frequently exposed to blasts generated by explosive weaponry. Injuries caused by explosions include blast-induced mild traumatic brain injury, which has shown an increasing frequency among military personnel, so much that blast-induced mTBI has been dubbed as a “signature wound” of recent military conflicts.

With such brain trauma extremely difficult to diagnose, experimental models could be useful tools to provide insights into the basic mechanisms underlying this ‘invisible’ injury. Studying mTBI will enable earlier diagnosis as well as treatment or prevention of these injuries in the military.

Using our experimental mine, we have developed an open-field blast setting that mimics that of the battlefield for mTBI studies. Studies on this type of trauma have been carried out at the quarry location of the Experimental Mine for almost three years now, working with collaborators from the University of Missouri School Of Medicine in Columbia.

The experimental setting utilizes 350g of the common military explosive Composition C-4, which generates an incident blast wave with a peak overpressure of 6.4 PSI at a 3-meter distance from the center of the explosion. Instrumented stands are placed at varying distances from the blast to alter the intensity and duration of the blast pressures. Instrumentation including two high-speed cameras capable of up to 22,000 frames per second at full resolution and a data acquisition system recording pressures from the blast wave recorded at 2 million samples per second are used to monitor each blast.

A team of graduate students and technicians working alongside assistant professor Catherine Johnson carry out this research. This investigation has already and can continue to open doors for additional funding sources and collaborations in the medical field. The ability to invite new people and show off our world-class facilities and Kennedy Experimental Mine Building has been a highlight to this new direction for research and collaboration.

Catherine Johnson
Assistant Professor of Explosives Engineering
CURATORS APPROVE NEW M.S. DEGREE IN EXPLOSIVES TECHNOLOGY

Growing interest in explosives technology among both federal investigators and military personnel is prompting Missouri S&T to further expand its graduate programs in the field.

University of Missouri System Board of Curators in September approved a new master of science degree in explosives technology. The proposal now awaits final approval by the state Coordinating Board of Higher Education.

The new degree follows the 2013 addition of the nation’s first Ph.D. in explosives engineering. Missouri S&T was also the first university in the nation to offer undergraduate and post-graduate minors in the field in 2005, with a master’s degree in explosives engineering added in 2010. Faculty members Kyle Perry and Gillian Worsey, an adjunct assistant professor, led the department’s efforts on this project.

GILLIAN WORSEY
Adjunct Assistant Professor, Explosives Engineering

ICONIC HAUNTED MINE A SCREAMING SUCCESS

Mining engineering students at Missouri S&T have been “haunting” the university’s Experimental Mine every Halloween for 20 years, and this one was no different.

In 1997 student volunteers from the S&T mining engineering department began transforming the experimental mine into a Haunted Mine to earn funds to send student members to competitions and conferences throughout the year.

This year, Paige Cochran, a senior in mining engineering from Dardenne Prairie, Mo., and captain of the Missouri S&T Woman’s Mucking Team, said the goal was to let “people’s imaginations run wild.” They focused making the different areas similar to create a more terrifying experience and use sound to fill out some of the dead space.

Students from the Society for Mining, Metallurgy and Exploration; the Society of Women in Mining; the International Society of Explosives Engineers; the National Stone, Sand, and Gravel Association; the Mine Rescue Team; the Mine Design Team; and the Mucking Teams all took part in what has become the department’s largest fundraiser.
GRADUATION DOESN’T MEAN GOODBYE.

It’s easy to stay in touch with your department. Just say hello when a student representative calls from Phonathon or drop us a note at tinaa@mst.edu. Tell us how you’re doing with a degree in mining or nuclear engineering so we can feature your accomplishments among our alumni achievement stories.

With your support, there’s no limit to what we can achieve.