

MINES MAGAZINE

For Colorado School of Mines Alumni and Friends • Fall 2021



THE OREDIGGER *Experience*

Mines alumni share their stories about the experiences that supported and shaped their journey as an Oredigger.

Plus:

Mines football retakes the field after a canceled 2020 season.

The nation's largest fleet of autonomous vehicles comes to campus—with Mines alumni leading the deployment team.

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After a year hiatus due to the COVID-19 pandemic, the M Climb was back this fall and bigger than ever. Joining this year's first-year students were members from last year's incoming class, who had placed their rocks on a temporary M on campus following a revised M Climb in August 2020.

- ▶ Follow Mines on social media for more great shots of the Mines community and Golden and to keep up with everything happening with your fellow Orediggers.





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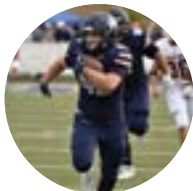


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ON THE COVER: While there are many experiences that all Orediggers share during their time at Mines, one of the first is grabbing a rock, spray painting a hard hat and heading up Mt. Zion on the M Climb.



The making of an **OreGiver**

Fran Vallejo '87 was raised to be the best at whatever she decided to be. She grew up surrounded by role models, including her father, a PhD-educated school administrator, and her grandmother, a political activist. These influences helped her become one of Mines' most decorated students and alumni.

Fran has been a role model for the Mines community by volunteering her time and supporting the Mines mission as an OreGiver. She and her husband, Scott Irvine '87, recently created the **Vallejo Irvine Program for Professional Development** to give Mines students even more of a leg up in career readiness when they graduate.

Fran and Scott noticed that engineers and scientists coming into the workplace had top-notch technical skills but needed more communication and professional skills to excel and progress professionally, so they created the Vallejo Irvine Program for Professional Development.

Learn more at mines.edu/vip



Read about Fran's remarkable life and what she and Scott are doing to help Mines.



EDITOR'S LETTER

The Oredigger experience centers around connection and community

In the years I've been at Mines and sharing its stories in *Mines Magazine*, I've talked to so many Mines alumni, hearing about their professional accomplishments, exciting projects, favorite memories and more. But what I hear about the most are the common experiences that leave a lasting impression on all Orediggers. These experiences are typically centered around finding a sense of community, whether it's making friends on the M Climb, the camaraderie built in a classroom, lab or study group, discovering new interests with like-minded people as part of a campus organization, connecting with other Orediggers at a job or internship and more.

When putting this issue together, I found those connections within nearly every story. The alumni in our cover story shared details about their journeys through Mines and what made their Oredigger experience unlike anything else. Two Mines alumni returned to campus this year to launch a fleet

of autonomous electric vehicles and shared how the knowledge they gained and experiences at Mines helped them through the challenges of the project. Other alumni shared the connections they've made with fellow Orediggers in their professional lives that have allowed for exciting opportunities. The bonds forged at Mines are everlasting, and it's evident in nearly every conversation and story an Oredigger shares.

After a particularly challenging year for so many, it's been refreshing to welcome students and alumni back to campus and see all these experiences happen once again in person on a day-to-day basis. I look forward to continuing to hear all about your experiences, both on and off campus, and all the connections you make along the way.



Ashley Spurgeon



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OREDIGGERS ARE IN DEMAND

Employers know what they want—and Mines graduates fit the bill

I'm writing this letter after watching Orediggers and industry recruiters meet to share resumes and information on job opportunities during our Fall Career Days. It's always a week that stands out as campus is transformed by the number of unusually well-dressed students and many recent alumni who have returned to represent the companies they work for.

It was great to see a return to pre-pandemic participation levels. Orediggers are in demand. Each semester, I ask the recruiters why, and their answers don't change.

They say Orediggers get things done. They have that unusual combination of technical depth and practical experience that is hard to find. They are humble, hard workers, figure things out, and not afraid of failure. Most of all, they are great team players.

Usually that last sentence is followed by a pause and "Don't ever change that." You see, being a great team player is a highly valued attribute in the engineering

profession. Graduates of most selective and elite schools are educated in a competitive learning environment. They bring that competitiveness, rather than collaboration, to the companies that hire them, so Orediggers really stand out in the workplace.

Hanover Research recently polled employers to learn what skills they value most in recent graduates. Not surprisingly, they said they wanted team players with critical thinking skills who can analyze and interpret data and apply their knowledge in real-world settings. A similar survey in April 2021 by the National Association of Colleges and Employers returned nearly the same results.

Employers know what they want. But finding graduates possessed of such skills can be difficult. In the Hanover study, employers identified wide gaps between what was most desperately needed and what new graduates often brought to the workplace.

So what is it that makes our graduates so different and appealing to the 300-plus businesses at Fall Career Days? It's the entirety of what we refer to as the "Signature Student Experience"—essentially everything that happens between Oredigger Camp and graduation day. If I had to write it as a recipe, it might have equal parts formal course work + practical experiences (field sessions, Capstone Design classes, internships, etc.) + extracurriculars (athletics, fraternities/sororities, clubs/organizations, professional societies) + study groups + blowing off steam (hiking, skiing, Coors Lab, etc.).

Through this, Orediggers build bonds and trust with one another. In classrooms, labs and club meetings, they crunch numbers, collaborate and solve problems. They build relationships and technical muscle, shoulder to shoulder, in residence halls, honors and scholars communities, study lounges, the foundry and on the international stage.

As evidenced by this issue of *Mines Magazine*, each student's path through Mines is a little different, but there are common traditions, practices and opportunities—new and old—that ensure each student that earns a silver diploma is well-suited and prepared for the challenges ahead.

The Hanover study calls these powerful, important experiences "high-impact practices." But for us, they're simply how we do things—and the reason our alumni, and a Mines degree, are so highly prized.

Go Orediggers!

Paul C. Johnson
President and Professor



RETAKING THE FIELD BY TIM FLYNN

Oredigger football makes a triumphant return after a canceled 2020 season

By the time Mines football started its 2021 season, it had been 642 days since the Orediggers last took the field. After the COVID-19 pandemic forced the cancellation of the 2020 season, student-athletes and coaches in the program couldn't wait to make their return to Marv Kay Stadium.

"I think about it a lot," said senior co-captain Kobe Brewster a few weeks before the Orediggers' scheduled season opener against Western Oregon on September 2, 2021. "We're reminded of it when we come in every day. There's the beautiful picture of the first game here, and you see pictures of the packed stadium on Twitter and the website—it's chills thinking about having my family back and the alumni back."

The only other time Mines football paused was during World War II, as did many of the nation's college teams. The Orediggers played a single game in September 1943 before a lack of opponents shut the season down, and the 1944 and 1945 seasons never happened during the height of the war. Mines finally returned to the field in 1946 and played every season until last year.

In March 2020, Mines was riding high. The Oredigger football team had just tied the program record for wins with a 12-1 season, an undefeated RMAC championship and an NCAA Second Round appearance under their belts. The team began spring practice with a talented core returning, thinking about a repeat performance that fall. That was, until the world came screeching to a halt.

"It seems like light-years ago, but it also seems like yesterday," said head coach Gregg Brandon. "I've watched that [final game of 2019] probably 3,000 times all

through last fall and this spring. Now we get to start game planning for this season. It's nice to be back in that mode. This is going to be the most anticipated season in college football history, and it certainly is for Mines."

Mines eventually got back on the field in fall 2020 for limited practice, then had a relatively normal spring 2021 practice season that included two unofficial scrimmages against Washburn and Fort Hays State. Now, in the fall 2021 season, the Orediggers have managed to retain much of that veteran group that led them to success in 2019, including several sixth-year "COVID shirt" returners who are utilizing an extra year of eligibility granted to them by the NCAA. Eleven members of this year's team are playing while in graduate school, with three student-athletes using a sixth year.

"I think with the COVID year, a lot of leaders have stepped up," said quarterback John Matocha, who started as a first-year student on the 2019 team. "We have a lot of 'COVID seniors' coming back, and I'm excited to play with them again. There's nothing better than winning on a Saturday—or a Thursday. I can't wait."

But how is the team after such a long layoff? Brandon doesn't seem worried. "We're tremendously excited to play football again. Our guys are chomping at the bit," he said. "I can't wait to turn them loose."

The Orediggers won their season opening game, beating Western Oregon 42 to 3.

► For more on Mines Athletics, visit minesathletics.com.



○ A STUDENT-LED PROJECT GOES TO SPACE

■ Mines' RockSat-X team launched a project into space aimed at helping to de-orbit space debris. The technology was sent on a Terrier-Improved Malemute suborbital sounding rocket from NASA's Wallops Flight Facility on Aug. 19, 2021. Fifteen minutes after launch and after flying to around 91 miles altitude, the payload with the Mines project and experiments from seven other community college and university teams descended by parachute, landing in the Atlantic Ocean about 64 miles off the Virginia coast. The experiments and any stored data will be provided to the students following the payload's recovery.

"The RockOn and RockSat programs provide the opportunity for undergraduate students to increase their science, technology, engineering and mathematics skills through hands-on projects," said Chris Koehler, director of the Colorado Space Grant Consortium. "This enables these students to obtain the qualifications needed to obtain positions in the aerospace industry, government and academics when they graduate."

○ A NEW PROGRAM TO SUPPORT THE GROWING FIELD OF CARBON DIOXIDE MITIGATION

■ This fall, Mines launched a new graduate certificate in Carbon Capture, Utilization and Storage (CCUS) to help working professionals make an impact in the growing field of carbon dioxide mitigation, one of the key strategies for achieving the ambitious goals for reducing CO₂ levels in the atmosphere. The program has a fully online curriculum designed specifically for those who want to strengthen and expand their breadth of knowledge in CCUS strategies, technologies and policy decisions.

"With our world-renowned graduate programs in earth sciences, engineering, and economics and business, Mines

○ A NEW FACE (AND TAIL) ON THE FIELD

■ After 17 years of service, the burro that frequented Mines' home football games, stood by for photo ops and represented the grit, resilience and hard-working spirit of the Mines community retired this fall. That meant Mines had to find a nimble replacement—or two.

After a series of "tryouts" to find the right replacement for Blaster, two local burros were selected to fill the important role. One burro, whose real name is Pepsi, will serve as Blaster for social occasions—and happily receive some nose rubs or even a hug or two. The other burro, named Winkie, will represent Mines at all home football games, running the field after every Oredigger touchdown.



is the natural place to launch this first-of-its-kind graduate certificate in CCUS technologies and the CCUS economy," said John Bradford, vice president for global initiatives at Mines. "Ultimately, our goal is to be the premier institution on research and education on CCUS—we have the expertise, the ties with industry and the solution-focused mindset needed to take the lead on this grand societal challenge."

▶ To learn more about this program, visit online.mines.edu/ccus.

CONNECTIONS

- ▶ Have you run into a fellow Oredigger in an unusual place? Gone on a trip with classmates? Visited campus to share your expertise? We want to know all about it! Send us your connections at minesmagazine.com/connection. •



◉ A BREAKDOWN OF THE CLASS OF 2025

- 1,580** first-year and transfer students
- 32.2** percent women
- 27.7** percent underrepresented domestic ethnic or racial groups
- 17.6** percent first-generation college students
- 2.5** percent international students
- 3.72** to **3.98** middle 50 percent high school GPA (on an unweighted 4.0 scale)
- 1340** to **1470** middle 50 percent SAT composite score
- 48** states and U.S. territories represented
- 14** countries represented
- Top 3 U.S. states outside Colorado:
Texas, California, Washington
- Top 3 countries outside the U.S.:
Saudi Arabia, United Kingdom, China



Lunch & Life - serving Mines students a homemade meal and hope every week of the semester for 20 years.

For a video about *Lunch & Life*, please visit our website:
calvarygolden.net/young-adults

To contribute, please scan this code on your smartphone



Calvary Church - 1320 Arapahoe Street Golden, Colorado 80401

- ▶ Loren Lasky MS '80 ran into Jay Horvath on a tour of the Princeton Plasma Physics Lab and realized they first met at a Mines reunion picnic. The two now see each other frequently at professional events. •



GETTING FROM POINT A TO POINT B—AUTONOMOUSLY

The nation’s largest fleet of driverless, electric shuttles launches at Mines

Mines welcomed a new addition to campus this fall—a fleet of nine driverless, zero-emission shuttles to connect the school’s central campus, athletics complex, student housing and downtown Golden.

The shuttle service—dubbed The Mines Rover—is the nation’s largest fleet of low-speed, autonomous electric vehicles that will safely navigate complex environments across three different routes using advanced sensors, cameras and lidar, or light detection and ranging. The shuttles are also integrated with regular traffic, signaling a major step forward for the industry and the largest opportunity yet for the public to experience an autonomous public transit service.

We talked to Abraham Eng ’14 and Alauden Lazkani ’14, who were both part of the deployment team at EasyMile—the company that provided the shuttle technology—about bringing the shuttles to campus and the future of autonomous vehicles.

Mines Magazine: What has it been like coming back to campus and being part of the shuttle implementation team at Mines?

Eng: When I interviewed for my original position at EasyMile, I brought up the idea that Mines would be a great site for this. When I was finishing my degree, I was taking the train to campus, and

THE MINES ROVER QUICK FACTS

9 autonomous shuttles operating on campus

100% electric, driverless vehicles

6 seated passengers in each shuttle at a time

3 fixed routes connecting campus and downtown Golden

18 designated shuttle stops

12 mph maximum speed for each vehicle

How the technology works

Each driverless vehicle is designed around a suite of instruments that constantly and completely monitor the vehicle’s environment and orientation within that environment. These instruments include lidar sensors, finely adjusted GPS data and measurements of vehicle accelerations and distances. All shuttles operate with a customer service ambassador—a trained Mines student—who engages with riders and can take manual control of the shuttle if necessary.

CONNECTIONS

- ▶ Several Mines alumni volunteered at the M Climb this year, weighing students’ rocks to make sure they met the 10-pound minimum standard. •

anyone who takes the train into Golden knows you're kind of stuck at the Golden station without a good way to get to central campus. And as the campus gets bigger and getting across campus is going to be a pain for everybody, I knew Mines was going to be a great site for this kind of technology, and I've been pushing for it ever since.

Lazkani: As somebody who went to the school, it's nice to be able to come back and now bring this new technology to the school. It's an honor to have that opportunity to come back and contribute in this way after getting so much from the school as a student.

MM: How did your background knowledge of Mines help you on this project?

Eng: Just knowing the kind of layout and the end uses people need was helpful. I used to live at Mines Park, and it's fine getting to campus in the morning, but in the afternoon it's a lot harder walking up that hill.

Lazkani: Knowing the routes,

knowing the quickest ways to get from point A to point B and knowing how busy certain areas of campus can be and just being familiar with campus helped us get the vehicles on the right routes and optimize the efficiencies.

MM: What have been the challenges of deploying this service at Mines?

Eng: Nine vehicles is a challenge just in itself, because the more moving parts you have, the more there is to balance. And then there are things like making sure the network bandwidth from cell providers is sufficient for us. Also, like everyone knows, Mines' campus is quite hilly, so we wanted to make sure an electric vehicle is going to put out the right amount of juice to go up and down hills, and we had to make sure we're balancing what's reasonable locally to be a good, achievable service versus having to really tackle those steep slopes. Plus, we had to make sure we are fitting into the existing Mines ecosystem.

MM: What excites you about the future of this technology?

Eng: For me, I really think the idea of a shared, autonomous vehicle is going to be a real boon for environmental issues. It's one thing to have a personal autonomous vehicle, but that doesn't really reduce the number of vehicles on the road. If we can make this kind of smaller but shared autonomous vehicle that can help connect people to other public transportation or shopping centers, we can fill in what they call the "first mile/last mile problem" in public transit.

Lazkani: It's always fun. It's always interesting. It's never boring. And I'm excited to see where we're going to be in the next five years or the next 10 years, because at the rate of growth that we're at, who knows what we'll be doing and how fast or how much further we can get with this technology and through learning more about different lidars and different sensors. There's really only room to grow.

► Learn more about The Mines Rover at mines.edu/rover.

A simple change to your will can support those you care about and the areas at Mines that spark your passions.

Visit plannedgiving.mines.edu/wills-and-living-trusts for more information on the one sentence you can use to complete your gift.



BUILDING BLOCKS FOR THE GLOBAL ENERGY FUTURE

BY JENN FIELDS

Solving concrete's carbon problem—with carbon-capturing concrete

Concrete is the world's most-used building material and one of its most carbon-intensive. In the technological race to reduce emissions, solving the problem of concrete's massive carbon footprint is a question that some engineers are tackling by experimenting with methods that will turn a major carbon emitter into a material that sequesters carbon.

The production of concrete accounts for about 8 percent of CO₂ emissions globally, and the demand for concrete is increasing. "It's already the most popular building material and the second most consumed material,"

said Lori Tunstall, an assistant professor of civil and environmental engineering who is an expert in concrete. "The first is water."

Tunstall, who is one of dozens of researchers involved in Mines' Carbon Capture, Utilization and Storage Initiative, is working with National Renewable Energy Laboratory researcher Brennan Pecha to develop an innovative way of sequestering carbon in concrete that emits less carbon dioxide as the cement is made and, in their preliminary research, has properties that even improve upon the industry-standard Portland cement.

"What I really like about it as far as potential for innovation is, we're not using a new material," she said. "That's huge in a conservative industry."

Why is concrete so carbon-intensive?

Concrete is made by mixing three components: cement, an aggregate and water. The cement is what makes it a carbon hog: carbon dioxide is emitted twice in the production of cement, said Michael McGuirk, assistant professor of chemistry. The first comes from the fuel needed to heat the raw materials, but the

CONNECTIONS

- ▶ Mickey Wilson '11 returned to campus this fall to teach the new slackline class students can take as a physical education credit. •

second is the result of a chemical process. “Every single molecule, when you produce the raw material for cement, releases a molecule of CO₂,” he said.

The process of mining and transporting materials for concrete also comes with emissions, but the cement itself is the biggest chunk of concrete’s overall carbon footprint.

“We heat up the calcium carbonate to really high temperatures to get rid of the CO₂, so we’re just left with the lime, the calcium oxide,” Tunstall said. “But that means the process itself releases a lot of CO₂. The heat involved, the grinding process—it’s a high-energy process. Cement is the heavy hitter.”

Around the globe, researchers are working on lower-emissions alternatives, such as hydrogen power, to generate the heat needed for cement and other high-temperature industrial applications.

“We are as a society so dependent on upstream and downstream processes that require the burning of fossil fuels and the immense energy they can provide in an instantaneous fashion,” McGuirk said. “You can’t just flip a switch and change the way we produce energy in our entire society. The development of these technologies is necessary to offset the inevitable energy transition—it’s a gradual transition.”

But for cement, a lower-emissions heat source will only solve part of the carbon equation, since the chemical process of creating lime also releases carbon dioxide. “We can’t really optimize that any further, because it’s the chemistry involved in making calcium carbonate into lime,” Tunstall said.

“It’s an extremely simple chemical process, and in theory, it’s a process you could reverse,” McGuirk said. For chemists, this makes it an intriguing problem. So far, no one has figured out how to make this reversible process efficient and fast enough for industrial application. The alternatives, Tunstall said, are to come up with different materials or capture or sequester carbon in the ones they’re using. The construction industry prefers to forge ahead with materials that they know how to work with to make safe structures.

Sequestering carbon in cement

In her research with NREL’s Pecha, who is a biochar expert, Tunstall is mixing biochar into cement to sequester carbon. With biochar, the tree has already

done the work of capturing the carbon: it’s made from the pyrolysis of wood, in which the wood is heated in a low- to no-oxygen environment. Biochar is one of many additives researchers have tried adding to concrete to sequester carbon. “Other biomass sources can also be used, which is something we will be exploring further in the future, but so far, we have focused on pine,” Tunstall said.

“In this case, we still use Portland cement, but we use this biochar material that has really high carbon sequestration power, and we use that as an additive in the mix,” she said. “Instead of it being a totally different material, it’s an additive, and that’s an area where the concrete industry has been open to change.”

So far, their research into concrete with added biochar is promising. “What we’ve found so far from initial testing is that not only are we able to replace about 10 percent of the cement, which is huge, because the cement is high-carbon, and the char itself holds carbon in a really stable form,” she said.

Tunstall said their goal was to make a concrete that didn’t lose any of the properties engineers and builders count on in the building material. In their initial tests, the opposite is happening—they’re improving it.

“From initial testing, we have been able to replace at least 15 percent of the cement with biochar, all while improving the strength of the mix,” Tunstall said. “This is a huge win, because not only are we replacing the ingredient associated with the most CO₂ emissions, but we are also replacing it with a carbon-rich material that holds CO₂ in a stable form. If the wood were left to decompose, it would release this CO₂, but the biochar carbon is stable for centuries.

“And on top of that, considering only carbon sequestration and the reduction in cement usage, we estimate a nearly 50 percent reduction in the carbon emissions associated with concrete. This doesn’t even consider other potential benefits, like the cogeneration of biofuels during pyrolysis of the biomass.”

One of the most exciting things about this, Tunstall said, is that she can realistically see biochar sequestering carbon in concrete in the near future.

“A lot of research efforts are so far out, so the fact that this seems like it could be implemented in a few years is exciting,” she said. “We already have a viable solution—it’s just a matter of making it as cheap as possible.”

“A LOT OF RESEARCH EFFORTS ARE SO FAR OUT, SO THE FACT THAT THIS SEEMS LIKE IT COULD BE IMPLEMENTED IN A FEW YEARS IS EXCITING.”

- ▶ Alumni tailgates were back on Saturdays this fall at home football games and select away games to celebrate and cheer on the Orediggers in addition to catching up with fellow alumni. •

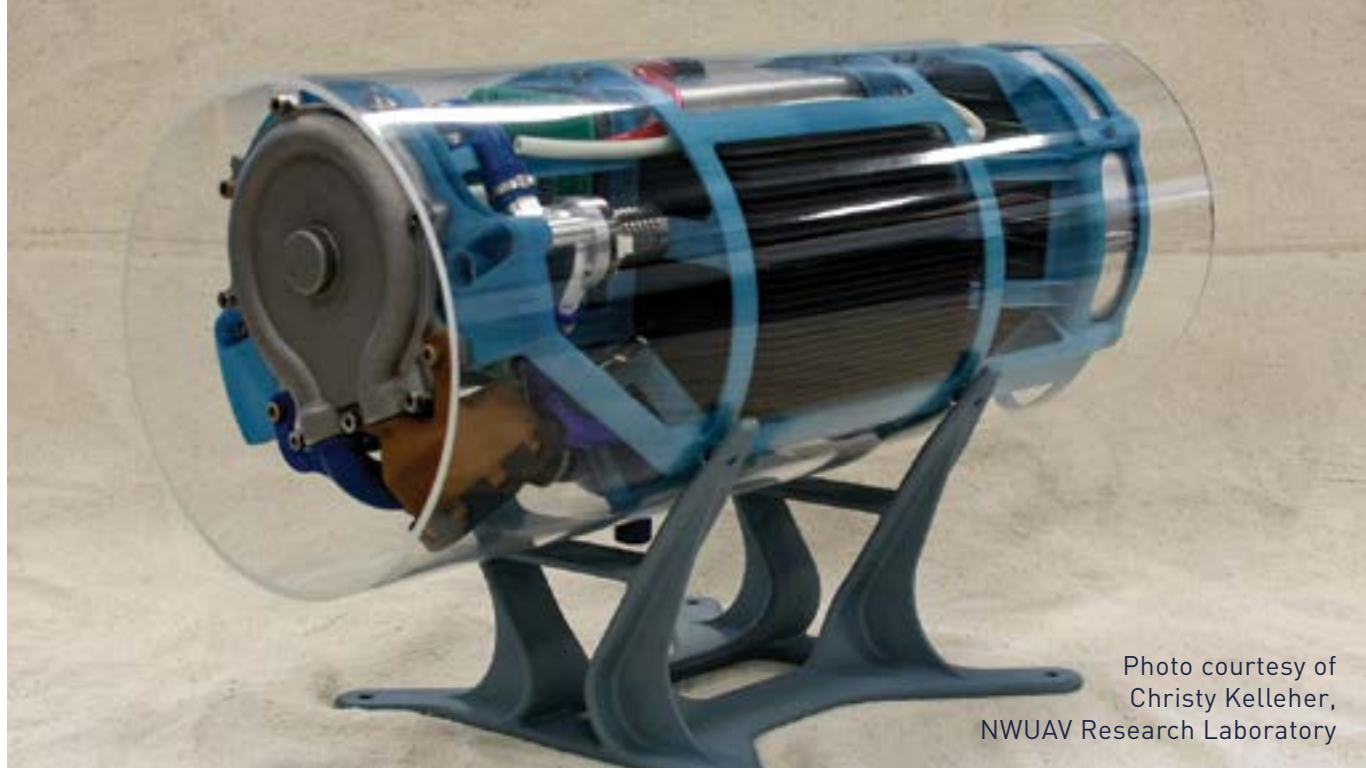


Photo courtesy of
Christy Kelleher,
NWUAV Research Laboratory

A LONGER LASTING EYE IN THE SKY

Hydrogen fuel cells can take unmanned aerial vehicles further and farther

BY JEN A. MILLER

About a decade ago, the U.S. Navy was working on a way to fuel their warships on zero-emission power and wanted to share that technology with other kinds of vehicle manufacturers. And Northwest UAV, the largest unmanned aerial vehicle propulsion systems manufacturer in the U.S, was looking for a cleaner and more efficient way to power their drones—and help them stay in the air on longer missions.

“The Northwest UAV chief technology officer had been watching our work for a long time,” said Ben Gould ’02, a research engineer at the U.S. Naval Research Laboratory. So when the Navy was testing out hydrogen fuel cells and reached out to NWUAV to see if they wanted to give the technology a shot, they were primed to come aboard.

What Gould didn’t know at the time was that his NWUAV counterpart would be fellow Mines graduate Karen Dennis ’99, a program management and engineering consultant for the company. “We had no idea until our first meeting,” said Dennis. Together, Gould and Dennis and their organizations set out to change how UAVs are flown.

Right now, most UAVs of the size NWUAV is working on—under 55 pounds—are powered by combustion engines or batteries. With combustion engines, missions are limited by the amount of fuel the UAV can carry, fuel that is itself heavy.



The Hybrid Tiger, an unmanned aerial vehicle developed by the U.S. Naval Research Laboratory, uses a combination of energy sources to fly, including solar energy, battery-electric and a hydrogen fuel cell.

Photo courtesy of
U.S. Naval Research Laboratory

CONNECTIONS

- ▶ All Mines football alumni were welcomed back to Golden and Marv Kay Stadium in September for a 1960s decade reunion weekend celebrating memories on the field and Oredigger pride. •

“The combustion engine is still more popular, but there’s starting to be a shift in the market with more people interested in being in electric systems,” Dennis said.

But batteries face similar limitations: UAVs can only fly for as long as the chemical energy source (usually a metal such as zinc or lithium) in the battery allows.

“Most toy drones you get from your local electronic store have a battery that lasts 30 minutes before it lands,” Gould said. “With fuel cells, we can potentially make that four to eight times longer.”

A typical battery stores all of its fuel and an oxidizer to make power inside its container. A hydrogen fuel cell is different, because while it carries hydrogen fuel, it also “harvests air from the environment to combine with hydrogen and make power,” Dennis said.

That means the fuel cell can keep making electric power for longer, because it can breathe air like a living creature, unlike a lifeless battery.

“A fuel cell has a higher energy density by weight, which makes them better for weight savings and for longer- range missions,” Dennis explained. “Fuel cells also offer rapid refill and recharge over batteries. It takes hours to recharge a battery. A fuel cell can be refilled in minutes.”

The benefits of this kind of power source include more energy efficiency, quick-start capability, lower maintenance requirements and lower operating costs. They’re also quieter, and because they’re not burning chemicals or gas, they are a zero-emissions product, too—the only byproducts are heat and water.

Hydrogen fuel cells have proven themselves effective and safe in real-world settings. There are now more than 20,000 hydrogen fuel-powered forklifts in operation in the U.S., according to the U.S. Department of Energy. The Toyota Mirai and Hyundai Nexo also run on hydrogen power. So implementing this kind of fuel source in UAVs seems like a natural step forward.

The U.S. Naval Research Laboratory and NWUAV hope to release the first product to military and defense contractors in the first or second quarter of 2022, and to the general market by summer 2022. “You can perform real work and real missions with UAVs powered by this, but you can still be all electric,” Dennis said.

“I’ve advocated for fuel cell technology for almost 15 years now,” Gould said. “It’s any scientists’ dream come true to see something from bench-level innovation translate into commercial industry.”



Professor Tzahi Cath works in a mobile direct potable reuse system developed at Mines.

YOU ASKED, OUR EXPERTS ANSWERED

What is direct potable water reuse, and what are the benefits of that kind of system?

Tzahi Cath, professor of civil and environmental engineering, explained:

There are different types of water reuse. The one that most people are familiar with is the non-potable reuse. This is cleaning wastewater and then sending it back to the environment, either discharging it to a river or reservoir. That’s been done for many years, and slowly people have been cleaning the water to higher qualities and using it for irrigation, for example.

Then we started with potable reuse. That means we can treat the water to an even higher quality and use it for drinking, and that’s where direct potable reuse and indirect potable reuse come into play. Indirect potable reuse is taking the water, treating it, blending it back into the environment through environmental buffering in groundwater or surface water, letting it mix with natural water and then pulling it back out, treating it in a drinking water treatment plant, and then putting it into a distribution system.

In direct potable reuse, it’s what we call “pipe to pipe.” We treat the wastewater and send it to another advanced water treatment plant and then we might directly drink this water or blend it with other clean water in the distribution system when it goes to customers. With direct, there’s fewer steps, and there’s less potential for contamination in the water.

▶ Learn more about this topic by listening to episode 109 of *The Conveyor*, Mines’ new podcast, at mines.edu/theconveyor or on your favorite podcast platform.

▶ After a successful 2021 Career Day on Sept. 14, 2021, Mines alumni were invited to happy hour at Mountain Toad Brewery to mingle and relax. •

EMPHASIZING TECHNICAL EXPERTISE WITH COMMUNITY AWARENESS

Humanitarian engineering skills help engineers problem-solve today's societal challenges

BY AND SCHUSTER

Engineering, by nature, is a problem-solving field. But with an increasing awareness of technology's inevitable impact on people and places, today's scientists and engineers want their work to do more. Enter humanitarian engineering, which integrates technical expertise with a deep understanding of society and the environment and seeks to consider the needs and values of all stakeholders to first define the problem before solving it.

Mines has a long history of integrating ethics and values into its general curriculum but has only recently made it a formalized emphasis, starting as a minor option in 2003. With the support of multiple donors, Kevin Moore, the program's executive director, worked with several key faculty members to expand the program in 2012. Today, Mines offers a graduate degree, and the undergraduate program has two separate tracks for students to choose from—community development and corporate social responsibility—with a third focusing on community wellness in the works.

Moore said it's important for engineers to look at real-world problems not only from a technical standpoint but also from a sociotechnical perspective because most problems facing the world today are not purely technical, and technology alone won't solve them. Issues such as poverty are "a societal challenge, and you need policy people, regulatory people, social workers, engineers and many others," Moore said. "They should all be working together to create these solutions within society."

"Humanitarian engineering is teaching engineers how to work with communities to co-create just solutions," Moore continued. He said today's students, who are old enough to remember their parents struggling in

A Mines team conducted research on more sustainable artisanal mining in Marmato, Colombia.

Photo courtesy of Jessica Smith



the economic crisis of the 2000s and who see communities in crisis worldwide, want jobs that are both stable and beneficial to the world around them—a combination humanitarian engineering can provide.

In the classroom, students study community engagement methods, including how to develop sound relationships with communities, listen well and define the problem from stakeholder perspectives. As cultural awareness is increasingly in demand in both corporations and nongovernmental organizations, students from this program find their training serves them well in almost any capacity.

Industry leaders see the appeal as well. Charles "Chuck" Shultz '61, a former CEO of Gulf Canada, and his wife, Louanne, have made significant gifts to the program, soon after its expansion in 2012 and again this year. In addition to providing both undergraduate and graduate scholarships for humanitarian engineering at Mines, their support includes funds for students who act as ambassadors for the program by showcasing their projects to expand the field's network. Students need a "broader background in community development and the responsibilities of industry to maintain society's acceptance," said Shultz. "We want the young people coming out of Colorado School of Mines to be able to set the right tone at the top."

CONNECTIONS

- ▶ Mines alumni were invited to attend the State of Mines webinar on Sept. 14, 2021, to hear updates on the MINES@150 Campaign, the fall academic and athletic programs and general campus activities. •

“ Without you, I probably would not have a Mines experience. My scholarship is making my education affordable so that one day I can design and test practical fuel cells for use in industry. ”

Jayvier Yanagisako
Class of 2023

100% of The Mines Fund supports scholarships for all students.

With state funding on the decline and the competition of losing students to other high-ranking institutions, Mines relies on the generosity of its community to assemble highly attractive scholarship packages. Thank you for helping us attract the best and brightest students regardless of family background.

SUPPORT THE UNIVERSITY'S AREA OF GREATEST NEED.

Create access - 87% of Mines students receive financial assistance in part from The Mines Fund. These invaluable awards remove financial barriers and provide a pathway for highly qualified students regardless of background.

Moderate student debt - Half of students graduate with an average debt of \$32,000. Help close the gap and keep a Mines education within reach.

Increase opportunity - Scholarships gift more time so students can fully immerse themselves in co- and extracurricular activities that develop entrepreneurial, innovative and leadership skills.



THE OREDIGGER *Experience*

By Ashley Spurgeon

**FIVE ALUMNI SHARE
THE SIGNATURE MINES
EXPERIENCES THAT
SUPPORTED AND SHAPED
THEIR JOURNEY AS
AN OREDIGGER**

The Mines experience is different for every student as they bring their own unique interests, backgrounds and skill sets to campus. But there are also common signature experiences that support and shape every student's journey, such as the connections formed between peers in the classroom, participating in Mines traditions, discovering new interests by joining or creating a club or organization on campus, finding support from others with similar backgrounds, being mentored by alumni and more. This time-tested framework supports and shapes every student who steps onto campus—and creates a signature student experience unlike any other.

We gathered five alumni to learn about their journeys through Mines and the experiences that helped shape them and made them proud to be an Oredigger. Here are their stories.



THE ONE WHO TRIED A LITTLE BIT OF EVERYTHING

Parker Bolstad '19 wasn't interested in having a straightforward Mines experience—he wanted to try out different interests, pursue experiences outside his comfort zone and gain skills beyond those learned in the classroom, all while gaining the rigorous education Mines is known for. But he also wasn't your typical Mines student with aspirations to become a professional engineer—he had dreams of pursuing law and politics instead. So, for him, that just meant doing a little extra work to set himself on that path.

From day one at Mines, Bolstad set out to join clubs and organizations that pushed him beyond his science and engineering interests, something he had to be proactive about but was readily available at Mines. "Mines is a science and engineering school in a very literal sense," Bolstad said. "That's what many of the students want to do—it's what they came to do, and it's what they plan on doing afterward. Many people do activities that are entirely in the wheelhouse of their degree, but that worried me. I needed to make sure I did things outside my classwork that expanded my opportunities. That's absolutely there at Mines—you just have to seek it out."

He started out by joining the Ethics Bowl team, because he had enjoyed debate in high school. He joined the Pre-Law Society to gain skills, experience and connections for when he applies to law school in the near future. He joined ROTC and became a peer mentor to learn about leadership and service. And he joined the McBride Honors Program to round out his STEM education with a liberal arts skillset. "Because what I wanted to do was beyond just science and math, the other experiences were quite unique to me," he said. "Even in high school, I did a lot of science and math, so things like Ethics Bowl and McBride opened up a world I hadn't explored much before."

Bolstad also took the same approach with his internships—he never applied to the same place twice. "I always tried to pick experiences that were going to be at least a little different than the one before, and I think each one of them was really useful for me in terms of broadening my horizons and developing myself," he said.

Because of the wide range of experiences he had at Mines, Bolstad said he gained skills he still uses every day and can carry throughout the rest of his life. One of his most formative experiences was joining ROTC and being in charge of all operations for a battalion of 200 people in his senior year. "I was in charge of all the activities and all of the training exercises—it's a lot to manage on top of your college schedule," he said. "But the utility of that is I developed really strong time management skills, and I'm a lot more reliable and trustworthy. I'm a lot more confident and can approach new situations in better ways."

The experiences Bolstad had outside the classroom were just as important—if not more so—than his time in the classroom because of how they shaped him and prepared him for life beyond Mines, especially now as a U.S. Army Intelligence Officer. "I learned a lot, made really good friends and good connections," he said. "I grew a lot as a person and am far more confident in myself than I was when I first went to Mines. I think I excelled at the school in ways I never thought I could have. I don't have many regrets."

"I ALWAYS TRIED TO PICK EXPERIENCES THAT WERE GOING TO BE AT LEAST A LITTLE DIFFERENT THAN THE ONE BEFORE, AND I THINK EACH ONE OF THEM WAS REALLY USEFUL FOR ME IN TERMS OF BROADENING MY HORIZONS AND DEVELOPING MYSELF."



“I’D BEEN SUPER INVOLVED IN THINGS GROWING UP AND IN HIGH SCHOOL, AND I THOUGHT THAT I DIDN’T NEED TO DO THAT IN COLLEGE. BUT I REALIZED, NO, YOU REALLY DO—YOU HAVE TO BE PART OF SOMETHING THAT’S BIGGER THAN YOURSELF.”

branch out a bit and meet other people to get help through it. I’d been super involved in things growing up and in high school, and I thought that I didn’t need to do that in college. But I realized, no, you really do—you have to be part of something that’s bigger than yourself.”

She turned to organizations such as the Society of Women Engineers and the Multicultural Engineering Program for support and later had the opportunity to become one of the founding members of the Iota Zeta chapter of the Alpha Phi International Fraternity at Mines, all which helped her find her place within the Oredigger community and get the support she needed to thrive at Mines. “The leadership that was there was just amazing,” she said. “That was a really nice support group to have—to have a cheerleader to help you along the way.”

And joining those organizations was also a way for Falcon-Martinez to help others and make a positive impact on her community. “I also joined Alpha Phi Omega later on in my Mines years. Though the time was short, it was really special, because APO is based on providing service to others, which is something I hold dear,” she said. “Growing up, that’s something I’ve always done. Both of my parents taught me the importance of giving back to my community, whether that was spending Thanksgivings at different soup kitchens or my dad hosting a weekly radio show that was based on local Mexican music, a resource that wasn’t available in the town he lived in. Bringing people together and giving back is something that’s always been very important to me.”

Falcon-Martinez has been able to take the leadership skills and values learned through these experiences into her life beyond Mines as an environmental and regulatory manager at Antero Resources and still focuses daily on helping others succeed. “The lessons I learned and struggles that I went through cause me to pause and make sure that the people on my team or working on the projects I’m supporting are all on the same page. I’m helping everyone perform their best so we’re all working toward success,” she said. “Through college, I learned a lot of hard lessons but that really set me up to become a better leader because my goal is to not leave anyone or any details behind.”

THE ONE WHO WANTED TO MAKE THE WORLD A BETTER PLACE AND HELP OTHERS SUCCEED

When Luz Falcon-Martinez ’05, MS ’09 first set foot on the Mines campus as a first-year student, she didn’t know where her path was going to lead or the kind of career she wanted to pursue. But she did know the intention she wanted to set for herself. “I knew I wanted to help people, and I knew that I wanted to make an impact and do what I could to make the world a better place,” she said. And for her, Mines seemed like the place where she could make that happen.

But Falcon-Martinez soon realized those goals might not be easily achieved after the first round of exams in her first semester at Mines didn’t turn out as well as she had hoped. She recognized that this journey—regardless of which major or field she ended up pursuing—was going to require more than solo late-night study sessions and attending professors’ office hours. She needed a stronger support network to help her through.

“Everybody who goes to Mines is very smart and relatively successful, so when you have your first failure, that’s a really hard thing to take on,” she said. “I figured out that I couldn’t do it alone and needed to

THE ONE WHO WANTED TO ATTEND MINES BECAUSE OF THE M ON THE MOUNTAIN

For those who grew up in the Denver metropolitan area, the M on Mt. Zion is a familiar sight, and many don't give it a second thought as they drive through Golden. But for Elizabeth Kostiuik '85, the hillside letter signaled where she wanted to be long before applying to college.

As a first-generation college student, all Kostiuik knew about higher education and life as a professional engineer was based on short conversations she had with high school teachers and counselors who knew her aptitude for math and science. "I didn't even know what Mines was about," Kostiuik said. "I had no idea what I wanted to do, and I had no idea what an engineer was, but I knew I wanted to go to Mines because of the M on the mountain."

But her journey to Mines wasn't a direct path. "I always wanted to get to Mines straight away, but I grew up in a very poor family and didn't have the money to attend Mines, and I didn't get any scholarships," she said.

Fortunately, Fort Lewis College in Durango, Colorado, had a transfer partnership with Mines at the time, so her dream of studying under the M wasn't completely out of reach. Kostiuik attended Fort Lewis for a couple of years and then was able to transfer her credits to Mines for the last years of her undergraduate education. But by the time she finally set foot on the Mines campus in her junior year, she was still at a disadvantage.

As a nontraditional student, Kostiuik hadn't been able to participate in the same community-building experiences as other Mines students, such as the M Climb, going to sporting events or joining student organizations. She also had gotten married before transferring to Mines, which she felt limited the opportunities to get involved in many campus activities and take advantage of everything Mines had to offer.

It wasn't until her senior year after she got divorced and was able to participate in field session that she really felt connected to the Oredigger community. "Field session was probably the best memory, the days I enjoyed the most," she said. "I could have fun and just be me. I'm a geek at heart, and I was able to get into the chemistry and I loved it."

And although she missed out on many Oredigger experiences as a student, Kostiuik is determined to make up for that now by returning to Mines, getting involved



"I HAD NO IDEA WHAT I WANTED TO DO, AND I HAD NO IDEA WHAT AN ENGINEER WAS, BUT I KNEW I WANTED TO GO TO MINES BECAUSE OF THE M ON THE MOUNTAIN."

and giving back in any way she can. Over the course of her career, she was able to attend Career Day and help students with their resumes and interview skills, and now that she has retired and lives near campus, she frequently visits her alma mater as a volunteer and provides scholarship support for other first-generation students.

"I think I have a stronger affinity towards Mines in that I feel like I missed out on so much that maybe by staying engaged, I can make up for it," she said. "I now have that opportunity to try to get involved and hopefully have the experiences I really didn't get when I was an actual student."

And the experience she participated in this year? Helping weigh students' rocks at the start of the M Climb right under the M that always felt like home.



THE ONE WHO IS BUILDING A STRONGER NETWORK

Nahjee Maybin '18 came to Colorado after completing his first undergraduate degree at Fort Valley State University in Georgia. He was interning with the Bureau of Reclamation, and they offered to fully fund another bachelor's degree. He knew he wanted to pursue geophysics for his second degree, and with that opportunity on the table, it was a no-brainer for him to make that happen at Mines.

But going into Mines as a part-time transfer student instead of following the traditional path for most Orediggers meant that getting involved in campus life and taking advantage of the Oredigger experience took more of a conscious effort.

He first found a sense of being part of the Oredigger community within the Geophysics Department. "With the workload, you have to spend a lot of time on campus," Maybin said. "You're on campus into the late hours, so making connections within the Geophysics Department and building that community was key."

With a group of like-minded people pursuing the same interests and working through the rigor of Mines' academics together, Maybin was able to gain support and camaraderie that he hadn't been able to fully embrace when he first started at Mines. He really saw that come to the forefront when

"THE BEST PART OF GRADUATING FROM MINES WOULD BE THE NETWORK - YOU HAVE A LOT YOU CAN TAP INTO, AND I WANTED TO MAKE SURE THAT BLACK ALUMNI WERE STILL ACTIVE AND PRESENT WITHIN THE ALUMNI COMMUNITY AND USE THOSE RESOURCES."

participating in geophysics field session when he was around the same group of people for 12 hours a day for several weeks working in the field and in the lab and getting a sense of everyone's shared interests. "Field camp was a really good bonding experience," he said. "We're all just nerds that like to have fun at the end of the day."

But Maybin also wanted that sense of community to continue beyond graduation—particularly for Black alumni who typically don't return to Mines or utilize the resources available to Mines graduates as much as other alumni groups. The summer after he graduated, Maybin pitched the idea of a Black alumni network to the Mines Alumni Board to help give Black alumni a better way to tap into all the benefits that come with having a Mines degree.

"The best part of graduating from Mines would be the network—you have a lot you can tap into, and I wanted to make sure that Black alumni were still active and present within the alumni community and use those resources," he said.

And now as an entrepreneur, Maybin sees those opportunities as even more important for gaining better professional opportunities. "With entrepreneurship, you're always trying to tap into more resources and the value of your connections," he said. "You need to be able to tap into entrepreneurial resources at the school and you need to meet other alumni who do different things. It shows that those connections are actually tangible and not just talked about. Even on a job level, people get jobs because they know other alumni."

While the Mines Black Alumni Network is still in its early stages, Maybin hopes it grows and helps create a pipeline from high school students to alumni who can all reap the benefits of being part of the Mines community. "At the end of the day, I hope this leads to diversifying the Mines community even more, because that was my main goal when I brought this to the alumni board," Maybin said. "With different perspectives, you can get different outcomes, and by bouncing ideas off each other, you can actually get something that changes the status quo."



THE ONE WHO HELPS OTHER FIRST-GENERATION STUDENTS HAVE THE SAME OPPORTUNITIES

Ward Polzin '84 grew up in Colorado, not too far from the Mines campus, but a college education wasn't a given. Being from a blue-collar family, Polzin had limited savings to make any higher education dreams a reality. But with the skills and smarts to get into Mines and being an in-state resident, the university seemed attainable.

Luckily, Polzin was accepted into Mines on a full-ride scholarship, covering 100 percent of his tuition, and he received additional scholarships to cover his room and board expenses. "When I got accepted into Mines then got the scholarship, I was like, 'Wow, this is life-changing'—and it really was," he said.

But his Mines experience wasn't all smooth sailing from there. Being a first-generation college student and coming from an underperforming high school where he hadn't even taken a calculus class, Polzin was unprepared for the intensity and rigor expected from Orediggers. He had the skill to keep up in the classroom but felt underequipped as a first-year student to do as well as he knew he could. But that's where the Oredigger community came in.

Polzin recognized he wasn't going to be able to succeed at Mines without some help, and since he was taking the common courses all Mines students at the time took in their first year, there were many peers readily available to come together to support each other. "It was a shared experience of having to succeed here together," he said. "I remember college really being super collaborative in that people just helped each other—both students and faculty."

Those relationships formed in the classroom developed into some of Polzin's closest friendships that have lasted through the years, and it's all due to the small, unique community that comes together on the Mines campus. "Mines was just a small enough community," Polzin said. "That's why professors are here. That's why students are here. It's just a tight-knit community, and you find your own group of people one way or another. That still really resonates with me today."

Now, Polzin ensures those same opportunities are available to other first-generation students through the Polzin Family Endowed Scholarship, similar to the scholarship he received to help him through his Mines experience. He and his wife, Karen, currently support three Mines students with a full-tuition scholarship, but for him, the relationship building is the most important part. He frequently gets to engage with the students he supports, learning about their backgrounds and aspirations and helping guide them through college in a way he didn't experience when he was a student.

"I can still vividly remember being 18, and if I hadn't received a scholarship, I just couldn't have gone—it's just that simple," he said. "So knowing that if you can eliminate that insecurity and stress, then life can be a lot easier for the student. The ability to give that back to other people is just a thrill."

"IT'S JUST A TIGHT-KNIT COMMUNITY, AND YOU FIND YOUR OWN GROUP OF PEOPLE ONE WAY OR ANOTHER. THAT STILL REALLY RESONATES WITH ME TODAY."

► Learn more about the Oredigger Experience at mines.edu/oredigger-experience.



Photo by Sean Arsenault

SKY HIGH BY SARAH KUTA

An engineer climbs to new heights to support the US's 5G infrastructure

When she's hundreds of feet above the ground while climbing a cell tower, Kelsey Olson '07 always makes time to stop, check out the panoramic views and reflect on the unique experiences she's had as an engineer.

Olson is a Denver-based division manager for Tower Engineering Professionals, a position that requires Olson—and the team of 12 engineers she oversees—to

scale cell towers and evaluate their ability to support new 5G antennas.

"Not a lot of people get to do this," said Olson. "People ask me, 'Aren't you scared or nervous?' No, not at this point. It's mainly just a feeling of gratitude that I get to do this for work."

Olson's team plays a vital role in the country's transition to 5G, the next generation of wireless

technology that has the potential to transform the way people and businesses communicate through improved speed, responsiveness and bandwidth.

Though they don't install the new 5G antennas themselves, they do ensure that cell towers are structurally sound and maintained properly so they can hold upgraded antennas and withstand various external forces such as wind, ice

CONNECTIONS

- ▶ Mines alumni gathered with other Mines community members for the September Lunch Bunch virtual event to celebrate 95 years of geophysics at Mines and learn about what's next for the department. •

and earthquakes. They also ensure the towers comply with Telecommunications Industry Association standards, as well as state and local building codes.

“Right now, it’s a lot of upgrades with the 5G push—basically, every cell carrier wants to be on the forefront of that technology and to be able to put that technology on all of their towers,” she said. “There are tons of towers across the U.S., so it’s a very extensive project.”

Olson’s team does much of this work at their desks, evaluating the tower and its foundation using structural analysis software, hand calculations, finite element analysis (FEA) software and computer-aided design tools. But first, they sometimes need to head out into the field and climb towers so that they can gather measurements, take pictures and make other notes to help with their analyses. That’s why one of the first

interview questions Olson asks prospective new team members is: Are you afraid of heights?

Though climbing is a big perk of the job, Olson also loves the collaborative, problem-solving nature of her team and the company as a whole. She also finds fulfillment in helping advance the country’s network capabilities.

“It’s something we use every day—you go to a restaurant or go to the airport and everyone’s just on their phone,” she said. “So to see that up close and personal, the infrastructure that makes that possible, is

fascinating. When people use their phones, they don’t really think about everything that goes into it. To say I’m helping with the U.S. infrastructure and making communication and technology possible is pretty cool. I’m only one person in that huge equation, but I feel like I’m doing my part.”

“PEOPLE ASK ME, ‘AREN’T YOU SCARED OR NERVOUS?’ NO, NOT AT THIS POINT. IT’S MAINLY JUST A FEELING OF GRATITUDE THAT I GET TO DO THIS FOR WORK.”

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Patent Attorney,
Shareholder

B.S., Engineering, with honors, 2003; M.S., Engineering Technology Management, 2005 Top Graduating Electrical Engineer

Bruce Kugler
Patent Attorney,
Shareholder

B.S., Petroleum Engineering, 1981

Doug Swartz
Patent Attorney,
Shareholder

B.S., Mining Engineering, Minor in Metallurgical Engineering, 1982

Brad Knepper
Patent Attorney,
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B.S., Electrical Engineering, 1998

Kristen Gruber
Patent Attorney,
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B.S., Chemical and Petroleum Refining Engineering, 2000

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CHASING OLYMPIC DREAMS

A brief look at the Mines alumni who have competed in the Olympic Games

Orediggers often excel in their athletic activities in addition to their academic pursuits. After watching the Tokyo 2020 Olympic Games this summer and looking forward to the Beijing 2022 Winter Olympic Games in a few months, it made us wonder: How many Orediggers have competed in the legendary games over the years? Turns out, five Mines graduates have become Olympians, cementing themselves as some of the best athletes in history.

1 Leroy T. Brown '26

Brown competed for the United States in the men's high jump at the 1924 Paris Olympic Games. He won a silver medal in the event, jumping 1.95m.

2 Nils Adolph Isabello Christiansen '38, '41

Christiansen (pictured left, front row) represented the Philippines as part of the swim team at the 1936 Olympic Games in Berlin, swimming in the men's 4x200m freestyle relay and the men's 100m backstroke.

3 John W. "Jack" Liddle '39

Liddle (pictured second from right) represented the Canadian track and field team at the 1936 Olympic Games in Berlin, competing in the men's 800m run and the men's 1,500m run.

4 Michael H. Flater '74

Flater played both football and soccer at Mines but competed in the 1972 Olympic Games in Munich as a forward for the U.S. men's soccer team. The team tied once and lost twice, eliminating it from the Olympic tournament.

5 Michelle Roark '15

A freestyle skier, Roark competed for the United States in moguls at two separate Olympic Games—the 2006 Winter Olympic Games in Turin and the 2010 Winter Olympic Games in Vancouver.



CONNECTIONS

- ▶ Mines alumni headed out to the links for the 12th Annual Oklahoma Endowed Scholarship Golf Tournament on Sept. 24, 2021, to catch up with fellow Orediggers while supporting student opportunity at Mines. •

OUTSTANDING OREDIGGERS

Celebrating the 2021 Mines alumni award winners

Colorado School of Mines proudly honors exemplary alumni for their dedication to the university, the alumni community and their local areas. This year's alumni award winners include Orediggers who have helped support and strengthen the Mines community through a particularly challenging year.

Alum of the Future

Given to a student for his or her efforts in strengthening the Mines Alumni Board or one who embodies the spirit of the Mines Alumni Board.

Maxwell Silver



Class of 2022, graduate student in hydrologic science and engineering

Silver has served on the Graduate Student Government board and is the student representative to the Mines Alumni board. He is an active advocate for students and equity in his partnerships and roles.

Young Alum

Given to a young alum whose accomplishments have reflected favorably on Mines (the alum needs to have received his or her degree no more than 15 years prior to the date of the award and is not older than 40 years of age at the time of the award).

Santana Sanchez '17



Sanchez founded M Club Denver in 2018 and has worked hard to increase alumni involvement in the Denver community. She hosts inclusive, creative events that remind fellow alums of their Oredigger pride while creating a sense of community for Denver-area alumni.

Outstanding Alum

Recognizes an alum who has contributed meritorious service.

Mike Scherrer '83 and Lew Mologne '83

Scherrer and Mologne have been the volunteer chairs of the Houston Golf Tournament for the past seven years. They have helped raise more than \$200,000 for the tournament's endowed scholarship fund and continued a much-loved Houston tradition that celebrates Mines, its alumni and current students.



Melville Coolbaugh Award

Given to an individual who has made an outstanding contribution toward improving the image and enhancing the reputation of Mines.

Chuck Shultz '61



Shultz has many years of service to Mines in a variety of capacities, including as vice chair of the Foundation's Board of Governors. He and his wife, Louanne, generously support Mines' Humanitarian Engineering program.

Alumni Academic Involvement Award

Given to a member of the Mines community who goes above and beyond to support the rigor of a Mines education.

Patrick Taylor '74, PhD '78



Taylor, who has received three degrees from Mines, has made lasting contributions to the education of engineers in the extractive and process metallurgy fields. He is the George Ansell Distinguished Professor and is the director of the Kroll Institute for Extractive Metallurgy.

M Club Leader of the Year

Recognizes Mines alumni who are M Club leaders in their area and go above and beyond to support Mines and fellow Orediggers.

Santana Sanchez '17, Laurie Fisk '15 and Melinda Law '15, MS '16 M Club Denver

These three volunteer leaders are committed to engaging Denver-area alumni and connecting them back to Mines. They created networking opportunities, chances to highlight and celebrate fellow alumni and connections throughout a difficult year.



- ▶ After last year's hiatus, Orediggers returned to campus this fall to celebrate Homecoming with traditional events such as a football game, 5K, alumni party and awards ceremony and more. •

FACING THE CROSSROADS

A professional cyclist-turned-engineer-turned-entrepreneur knows learning is all about the journey

BY ANICA WONG

Ian MacGregor '12 was torn. It was 2002, and he was between semesters in his first year at Mines and found himself presented with a once-in-a-lifetime opportunity to race for a national team as a professional cyclist. In the year prior, MacGregor had a great cycling season and was proving to be competitive in his age bracket. He felt the pull to give cycling a try—to see how far he could go—but that meant dropping out of Mines.

He went to his advisor, Professor John Berger, for advice, which was simple. “I hope I don’t see you in the spring semester,” MacGregor remembers Berger telling him. And he didn’t.

MacGregor took up professional cycling, thriving under the pressure—the moments in competition that are crunch time, when you have to put it all on the line. He couldn’t get enough of the feeling of flow when everything clicks. He lived all over the world, competing in some of the biggest races, and was the U.S. Under 23 National Road Champion two years in a row.

But fast forward nine years, and MacGregor again faced a crossroads. An injury had ended his cycling career, and he felt cheated watching others go on to the Olympics or win stages of the Tour de France—dreams he had once hoped were within reach. He was depressed and felt just as lost as he had almost a decade prior.

So, again, he walked into Berger’s office for guidance. Again, Berger’s advice was simple. “I’ll see you in the spring semester,” is what MacGregor remembers



Photo by Travis J Photography

him saying.

Although MacGregor wasn’t quite sure what he wanted to do at that point in his life, he realized getting an undergraduate degree is a good opportunity to stretch what you think you can do and give everything a try. He

reenrolled at Mines to pursue a mechanical engineering degree, and even though his foray back into the rigor of Mines classes was difficult (he specifically remembers how hard Calc 3 was), he also knew that he was learning how to learn, and that was invaluable.

CONNECTIONS

► *Dataquest* magazine named Mines one of the top five global universities for robotics research in July 2021. •

“I think my experience at Mines helped me to find myself and my areas of interest,” he said.

MacGregor tried to experience as much as he could. His classes at Mines helped him build a strong foundational knowledge base, and during his junior year, he started a business with a colleague that took off during his last year at Mines. They wanted to make people better, which for their business meant making products and recipes that cyclists and other athletes could use to compete at their highest level—something that felt right at home with MacGregor’s experiences as a cyclist. But that doesn’t mean the path was easy.

“We probably had five to six employees, and here I was, married, still struggling to pay the mortgage and run a business,” he said. “That was really hard.”

Fortunately, he kept at it, and his hard work paid off. The business grew into one of the leading sports nutrition companies—Skratch Labs.

“WHEN I LOOK AT FORMAL EDUCATION, THAT’S WHAT I SEE IN IT—I DON’T SEE A CLEAR, STRAIGHT LINE. I SEE IT AS A STEP ALONG THE WAY, TO LEARN THINGS YOU DON’T KNOW YOU’RE GOING TO LEARN, THINGS THAT WILL OPEN YOUR MIND AND OPEN YOUR EYES.”

And although today MacGregor doesn’t rely as much on his technical engineering skills as the company’s CEO, he is grateful for the soft skills (or human skills, as he calls them) that he learned at Mines, such as teamwork and being uncomfortable but forging ahead anyway. He gained the confidence to launch into an industry and business he knew very little about, and he hopes that the emphasis

at Mines on entrepreneurial thinking will have the same effect on today’s students.

“What Mines has is a base of incredible faculty, a base of passionate students who want to learn, and by adding that creative element to the mix, I think we’ll find exciting and surprising emergence,” he said.

MacGregor believes that his educational and entrepreneurial journey will never end—he’s now pursuing an MBA—and he knows Mines was an incredibly important stop on that path. “I believed then that my injury was the worst thing that could happen, but it was quite possibly one of the best things because of the opportunity that it presented for me to attend Mines then,” he said. “When I look at formal education, that’s what I see in it—I don’t see a clear, straight line. I see it as a step along the way, to learn things you don’t know you’re going to learn, things that will open your mind and open your eyes.”



Will you answer the call?



Esme Conkright
Chemical Engineering
Class of 2023



Nik Kadirisani
Petroleum Engineering
Class of 2022



Kayla Benson
Environmental Engineering
Class of 2023

See a number from Mines? It could be Esme, Nik, Kayla or one of their peers from our student calling program.

’DiggerDial is a group of 35 Mines students who connect with alumni, parents and friends of the university. They are looking forward to talking with you to swap Mines stories and discuss how you can get involved by sharing your time, talent and treasure.

This fall, answer the call to stay connected and chat with current Orediggers.



A HEAD START FOR THE WORKFORCE

Developing professional skills puts Mines graduates further ahead of the job competition

BY ASHLEY SPURGEON

Mines graduates are well known in industry for their sharp technical skills, outstanding work ethic and collaborative nature. Those qualities certainly stand out on a resume, but when first entering a competitive workforce, how can Mines graduates get that extra edge to make them the most desirable recruits and get hired right after graduation?

That's the question Mines aimed to answer in partnering with Fran Vallejo '87 and Scott Irvine '87 to establish the Vallejo Irvine Program for Professional Development. The program aims to supplement Mines students' technical skills with professional development opportunities that will teach them how to navigate their careers from the very first day of an internship or job. "If you have a better understanding of how to maneuver in the workplace, through these professional

development skills, you become more effective more quickly," Vallejo explained.

Vallejo and Irvine shared their thoughts on the inspiration behind the VIP Professional Development Program and how engineers can be better prepared when entering the workforce. These were our key takeaways.

Mines graduates have top-notch technical skills that make them highly qualified job candidates, but evidence of professional skills can take those qualifications a step further.

In today's increasingly competitive job market, the skills necessary to perform well in the workplace go beyond the knowledge and capability to carry out technical objectives. These include skills such as effective written and verbal communication and interpersonal interactions, which proof of being able to do well can set candidates apart when vying for new opportunities.

"From a technical perspective, we think the engineers and scientists graduating from Mines are the best, but there are also other schools graduating other engineers and scientists who are highly qualified. We thought this would be an extra skill set that Mines graduates could have as they entered the workforce that would set them apart," Vallejo said. "We believe that if graduates understand a little bit about professionalism, that would

CONNECTIONS

- ▶ Mines hosted 26 welcome parties this year in cities across the U.S. to introduce new Orediggers to the Mines community and kick off the new school year. •

give them a leg up compared to their peers and be able to get noticed more quickly and be viewed as a leader.”

In her own career, Vallejo recognized how critical communication was for collaborating with others, in addition to being able to advance professionally later. “The communication element for me is so important, especially for scientists and engineers,” she said. “When you can match an engineer who’s a great communicator, that is truly unique in the technical world, and those people get noticed right away.”

And by learning more about the professional side of the workplace, new employees can avoid conflicts and errors that could be detrimental to their career. “With just a little bit of understanding, a little bit of knowledge, a little bit of training, you can avoid a lot of mistakes,” Irvine added.

Through workshops and resources available through the VIP Professional Development Program, students will be able to gain these professional skills from their first day on campus and have time to develop them over their four years at Mines rather than learning them on the fly after being hired.

It was important to integrate professional development opportunities with the existing academic rigor to provide an enhanced learning experience.

Students often choose to attend Mines for the rich, high-quality technical education the school is known for, and it was essential that introducing new professional development opportunities wouldn’t take away from that signature academic experience, but rather enrich it. “We wanted to somehow do this without competing with the academic load, because you don’t want to denigrate the academics at all,” Irvine explained. “You still want Mines graduates coming out with the full-blown academic and technical prowess that they’ve always had.”

Through mentorship opportunities, guest lectures and other programming that can be easily added into classroom experiences—such as part of a CSMIOI course—extracurricular activities, Career Center services and more, the VIP Professional Development Program will provide more opportunities for students to prepare for life after Mines and head into the workforce with a better idea of what to expect—all without having to sacrifice time or resources dedicated to their academics.

While professional development opportunities can help someone get a job right after graduation, they also have long-term benefits.

The ultimate goal of the VIP Professional Development Program is to ensure new Mines graduates remain the

top candidates right after earning their degree, but the professional skills they learn through the program will continue to pay off long after. “We’re giving students a head start, but these skills are going to be skills that graduates will use and will evolve throughout their whole career, both professionally and privately,” Irvine said.

Ultimately, the skills gained through these new experiences will help prepare Mines graduates to take their place in the workforce and carry on the indelible reputation Mines has in industry and beyond. And a balance between technical knowledge and professionalism is the edge needed to make that happen and keep Mines graduates where they typically find themselves—ahead of the curve.

WHAT IS THE VIP PROFESSIONAL DEVELOPMENT PROGRAM?

The Vallejo Irvine Program for Professional Development is a first-of-its-kind program focused on the professional development of all Mines students by supplementing students’ rigorous technical education and experiences with professional skills and making students even more distinctive and prepared for the workforce upon graduation.

The VIP Professional Development curriculum prioritizes six core professional development competencies:

1. Communication
2. Career self-management
3. Professionalism
4. Successful thinking
5. Collaboration
6. Equity and inclusion

Opportunities currently available in the program include:

- Alumni and professional mentoring programming
 - Guest lectures
 - Workshops
 - Enhanced Career Services programming
 - VIP Professional Development internship
- Learn more about the VIP Professional Development Program and get involved at mines.edu/vip.

► John Trefny, the 15th president of Mines and professor emeritus of physics, was named a 2021 Sigma Xi Fellow in recognition for his contributions to STEM education and research and more than 50 years of service to Sigma Xi. •

BOLD DECISIONS

Staying ahead of the energy game through automation and technological innovation

BY ASHLEY SPURGEON

Oil and gas plays an important role in our global energy future, and innovation to improve well site safety and efficiency is paramount to that future. Just ask Brian Wiesner '95, president and chief operating officer of Downing, who is focused on designing and delivering new solutions for wellhead systems, frac equipment and more to take the energy industry forward. But that often means making tough calls to stay ahead of the game.

We sat down with Wiesner to talk about the innovation happening at Downing and what that could mean for the workforce and the future of energy innovation.

Mines Magazine: Downing has been at the forefront of oil and gas well innovation in recent years, often with innovative new products and improved manufacturing. How have innovation and technological advancements in these areas changed worksites or how the industry is approaching oil and gas operations?

Brian Wiesner: The technology that is being deployed on well sites has certainly changed over the last few years. Downing is on the forefront of this step change in technology. Our Freedom Series represents next-level automation and control. We have catalyzed a leap in efficiency by systematically eliminating common causes of nonproductive time on location. And we've done this with innovative products that are inherently safer than those previously available in the market. Practically, this means a safer, more efficient site with a smaller footprint where the surface systems are controlled, not just monitored, by a holistic system. The Freedom Series Completion System provides unparalleled visibility and control. We have edge devices collecting and streaming immense amounts of data. We have developed automated workflows that drive numerous operational sequences. We



have mechanical and software redundancies that prevent failures or human error. And the entire system can be run remotely from anywhere in the world.

MM: Could an argument be made that this automation is eliminating jobs by not having people on site performing these tasks, or do those employees now have the capability to perform that work remotely?

Wiesner: There is some consolidation at the margin, but we think of it in terms of high-grading positions. In the current environment, it's a difficult task to find people to fill open positions, particularly given the nature of some of the on-site positions, so we are taking jobs that previously were out on a well site and moving those to a

CONNECTIONS

- ▶ Matt Gallagher '05, in partnership with the Mines Global Energy Future Initiative and the Payne Institute for Public Policy, led a webinar on Oct. 1, 2021 discussing whether fossil fuel use will be obsolete by 2050. •

SAVE THE DATE

SPRING CAREER DAY

February 1, 2022

Employer registration will open in mid-November 2021.

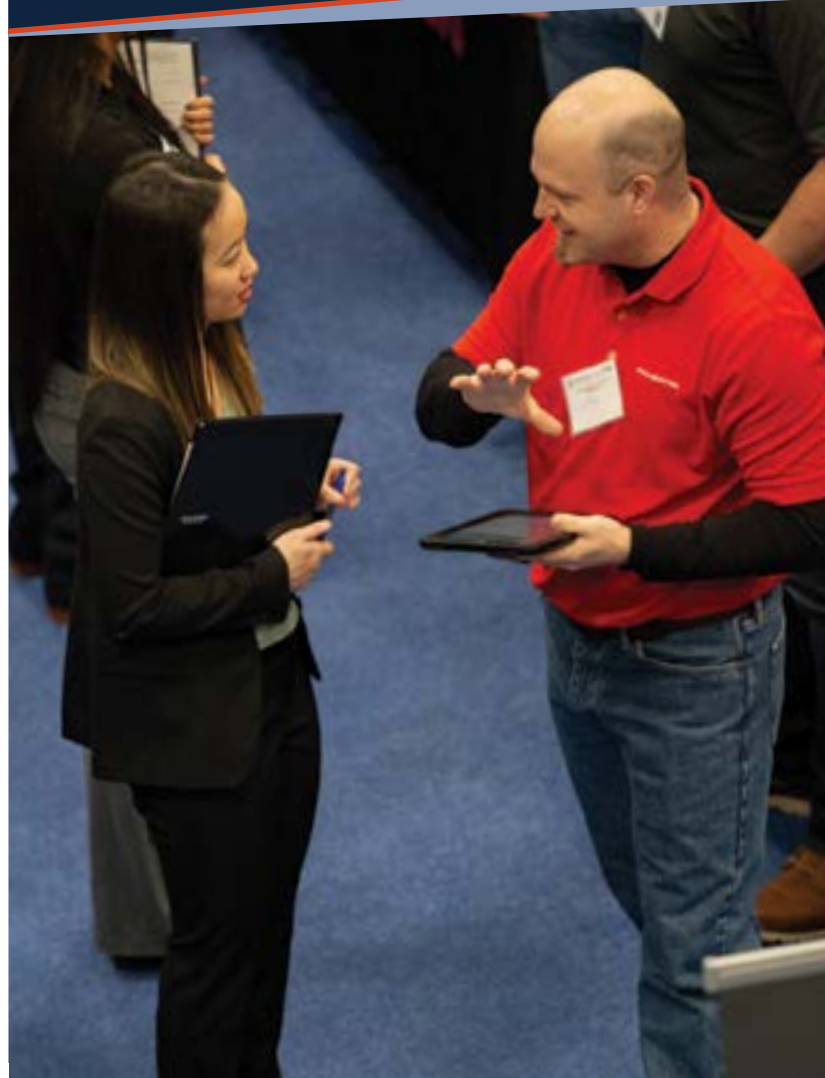
remote operations center. Because our system can be controlled remotely, our technicians can monitor and troubleshoot from a centralized location. As you might imagine, this has myriad advantages. A recent example would be a well control situation where a valve residing below our system failed. The operator needed to set a downhole plug, but it was a dangerous situation due to the pressure release. Historically, a person would be required to enter the red zone and manually operate equipment to contain pressure. With our system, we were able to operate the equipment from an ops center more than a thousand miles away, so we were able to mitigate the risk associated with this dangerous incident.

MM: As Downing's leader, how do you ensure your business stays at the forefront of the latest energy challenges while remaining true to the company's roots and values?

Wiesner: We have invested heavily in R&D and our people. We have created a culture of innovation, and our team is constantly thinking about solutions in response to our customers' challenges. We have also developed deep knowledge and expertise in manufacturing, automation, control and digitization that can be leveraged across a variety of industries or sectors of the economy. Our history is rooted in oil and gas, and we know that fossil fuels are going to be needed for decades to come. We also know that irrespective of what the future holds, we are nimble and have the capacity to play a role in the provision of energy to the world.

MM: What advice do you have for other business leaders, particularly other engineers?

Wiesner: My advice is to not be fearful to make decisions. My observation is that engineers tend to rely on thorough analysis before making most decisions. Unfortunately, the analytics aren't always sufficient, and there may be variables that can't be eliminated or fully controlled. Many decisions—often important ones—have to be made quickly and often without all the answers. That is the fundamental nature of business and a requirement if you want to lead.



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For more information, contact Associate Director of Employer Relations **James Saulsbury** at **303-273-3205** or **jsaulsbury@mines.edu**.

CAREERS.MINES.EDU

IS CLUBHOUSE THE NEW WAY TO NETWORK?

The new social networking craze might just be the new LinkedIn

What is Clubhouse?

An audio-only social networking app that is making waves, especially among tech insiders in Silicon Valley, Clubhouse presented a new way for people to connect at the height of pandemic lockdowns in 2020 when many were looking for new ways to share and consume information.

Through the app, users enter audio chat rooms to gather and discuss a variety of topics and trends, explore conversations or simply listen as experts and amateurs alike talk about particular topics or promote their latest project.



How do you join?

Clubhouse started out as an invitation-only platform while it was in its beta phase, but the company ended its waitlist and invite system in July 2021, opening up to all interested users who want to follow Clubhouse links, hop into a creator's community or join a public event. All you have to do is download the app, create an account and follow any topics or users that interest you.

What's the big deal?

Clubhouse's exclusivity was a major draw during the app's rise to viral status. Tech titans such as Elon Musk and Mark Zuckerberg and influential celebrities such as Oprah Winfrey held conversations that only those with an "in" had access to and inspired FOMO in those who were late to the game. Silicon Valley insiders in particular saw it as a safe space to engage with their most devoted followers. But now that the app is open to all, the sharing of ideas is seemingly limitless.

How can Clubhouse be leveraged for networking purposes?

In some ways, joining a conversation in Clubhouse is like being in the ultimate insider network and attending a 24-hour conference, with sessions happening any time you log into the app. Users can pop into discussions that resonate with their brand, contribute to conversations and connect with others, even if they live on the other side of the world. There are opportunities to make professional connections and learn about new ideas all on the same platform, at any time of day.

TECH TIP

Protect your personal information on social media

With much of our lives existing online these days, it's important to be aware of the information you're sharing that could be used by others who may not have your best interests in mind. Fortunately, there are things you can do to keep your social media accounts secure so you can stay connected with classmates, keep up with family and friends and, of course, share a cute cat video every now and then.

Keep an eye on your privacy settings.

Social media companies have made it a lot easier to control the content that gets shared publicly or is only visible to your friends. Visit your privacy settings fairly often to make sure you're sharing only what you want to with the right people.

Limit the identifying details you share about yourself.

Sharing your birthday, employer, personal relationships and more can give hackers key information needed to access your private information elsewhere on the internet—such as the answers to security questions. Keep those details off your profile or, at minimum, only have that information visible to people you know.

Don't use your social profiles to log into other websites.

While it's convenient to use the "log in with Facebook" option instead of creating a new account on another site, this could be a security risk if the third-party site gets hacked. Shut down accounts you're not using.

Haven't used your Facebook account in a while? Downloaded Twitter but found it wasn't for you? Limit access to the information and activity on your devices by deleting your unused accounts and the apps themselves.

- ▶ Have a useful tech tip you'd like to share, or want to know more about an everyday technology? Let us know at minesmagazine.com/contact-us.

CONNECTIONS

- ▶ Andrea Wescott Passman '98 and Christine Staples MS '96 participated in a CEO roundtable at Mines on Oct. 1, 2021, discussing building a career, growing leadership skills and being resilient through challenges. •



Congratulations, **2021 Mines Philanthropy Awardees**

Thank you for your generosity and dedication to Mines



Tourmaline Award

**Frank '52 and
Mary Labriola**



Volunteer of the Year Award

Melanie Westergaard '87



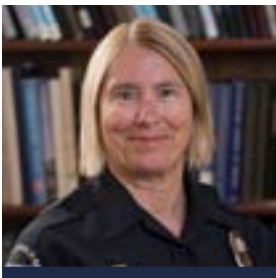
Young Philanthropist Award

**Evan '13 and
Kyle '13, MS '14 Rowland**



Student Philanthropy Award

**Hayden Cooreman,
Class of 2023**



Faculty and Staff Philanthropy Award

**Bryann Lynch,
Mines Police**



Corporate Partner Award

Newmont

Read more about the awardees at weare.mines.edu/philanthropyawards

Stu Bennett '66, Melanie Westergaard '87, Catherine Smith '14 and Elizabeth Kostiuk '85 were just some of the Mines alumni who returned to campus to volunteer at the M Climb this year, ensuring students' rocks weighed a minimum 10 pounds.



We're proud of Mines alumni. We want to cheer you on and celebrate your accomplishments. Tell us about your recent wedding, a new baby or your new job. Share a personal or professional accomplishment, volunteer activity or your favorite Mines memories. Stay connected to the Oredigger family.

▶ Submit a class note at minesmagazine.com/classnote.

1980s

Loren Lasky MS '80 retired in June 2021 from a 35-year career as an environmental consultant and geologist with the New Jersey Department of Environmental Protection and now serves as a director of the Association of Engineering Geologists Foundation.

Christopher Herald MS '81 was appointed as director of Adamera Minerals Corp. in March 2021.

Dean Thomas '82 received the Institute for Defense Analysis' 2020 Goodpaster Award for Excellence in Research in May 2021 in recognition of his intellectual leadership within the IDA community.

Carrie Manfrino MS '84 joined the University College of the Cayman Islands as a research professor and visiting scholar to help build Cayman's capacity and talents in STEM in February 2021.

Kirk McDaniel '84, '89, PhD '17 became a confinement ventilation engineer at the U.S. Department of Energy's Waste Isolation Pilot Plant in April 2021.

1990s

Bradley Wallin '92 was named Lawrence National Laboratory's principal associate director for weapons and complex integration in August 2021.

Quinton Hennigh MS '93, PhD '96 was appointed as a geological advisor for Altamira Gold Corp. in April 2021.

Michael Carter MS '93 joined E Source as the new president of research and advisory in June 2021.

John Hulme MS '93 was appointed chief operating officer of Noreco in March 2021.



Col. David G. Ray '91 was awarded the Colonel Wendell Fertig Award from Mines in May 2021. After graduating from Mines, he accepted a commission in the U.S. Army Corps of Engineers. His military career took him around the world as commander, combat engineer and trainer, as well as curriculum developer for the U.S. Army Engineer School.

Most recently, he served as the commander of the Sacramento District, United States Army Corps of Engineers, providing leadership and guidance to more than 1,000 civilian and military personnel. His work was critical in leading the district's support to California and the Federal Emergency Management Agency following the floods and wildfires in northern California in 2017 and 2018.

He retired from the U.S. Army in 2019 and currently works as a program manager and U.S. Army Corps of Engineers client development leader for HDR.

Andy Sabin PhD '94 was appointed to GreenFire Energy Inc.'s advisory board in May 2021.

Joseph Adams MS '95 was installed as a fellow of the Military Operations Research Society at the Institute for Defense Analysis' 89th Symposium, the highest honor bestowed by the organization. Joseph is a researcher at IDA.

Mauricio Gutierrez MS '99 joined Chipotle Mexican Grill's board of directors in March 2021.

Jack Unrau '99 was granted a patent on April 6, 2021, for "system and methods for transaction-based process management."



■ **Lt. Col. Gregory Steeger PhD '14** retired from the U.S. Air Force on June 24, 2021, after 21 years of service. To honor his service to the U.S. military, the Air Force requested a flag flown at each unit he has been stationed, including Mines, Vandenberg Air Force Base, Wright-Patterson Air Force Base, the Air Force Academy and more. Mines ROTC cadets raised a flag in his honor at the flagpole outside Guggenheim Hall.

2000s

Matthew Lengerich '00 joined Jervios Mining Limited as executive general manager for mining in July 2021.

David Londono MS '00 was appointed as general manager for Calibre Mining Corp.'s Limon Mine Complex in June 2021.

Mike Watkins '00 was elected RMH Group's company president in May 2021.

Matt Nichols '09 and Mikayla Nichols '09 welcomed Joseph Eric Nichols to their family on Jan. 25, 2021. He joins big sister Claire (2).

2010s

Ryan Phillips '13 and Gretchen Phillips '13 welcomed a baby girl into their family. Reagan arrived on Feb. 7, 2021, joining big brother Samson (2).

Evan Halpern '18 and Hannah Thomas '18 were married in Morrison, Colo., on June 19, 2021. Evan was Hannah's rock properties lab teaching assistant in 2016, and they started dating in 2017. Professor Emeritus Ramona Graves PhD '82 attended the wedding and takes full credit for the relationship since Evan and Hannah met in her class. Hannah's dad, Scott Thomas '91, officiated the wedding. Ten of the 16 wedding party members were also Mines graduates.

Following their proposal on the bridge over Clear Creek in Golden, Colo., **Adam Huff '18, MS '20** and **Allison Miller '18** were married on April 17, 2021 in Houston, Texas. More than 20 alumni were in attendance, and Blaster's friends also made an appearance. The couple met at Mines during their senior year.

2020s

Sydney Marchando '21 was named the 2020-21 Rocky Mountain Athletic Conference Woman of the Year in July 2021.

Zhenyu Zhang PhD '21 was appointed AmmPower Corp.'s chief technologist in July 2021.



**ADAM HUFF '18 MS '20
AND ALLISON MILLER '18**



JOSEPH NICHOLS



**EVAN HALPERN '18 AND
HANNAH THOMAS '18**

Ten new members joined the Mines Alumni Board this year, volunteering their time and ideas to the Mines community to help create opportunities for all Orediggers to make an impact on the university. These new members join the current directors to strengthen connections and service among Orediggers.

Amber Brusak '17, MS '19
Geotechnical engineer, U.S. Bureau of Reclamation

Angelique D. Diaz '98, MS '03, PhD '08
Section chief, U.S. Environmental Protection Agency

Luz C. Falcón-Martínez '05, MS '09
Environmental and regulatory manager, Antero Resources

Jaime Harris '94
Founder and president/CEO, Hydra-Flex, Inc.

Jordan Hopper '14
Reservoir engineer, EnerVest, Ltd.

Shawn Kobylinski '15
Senior business development analyst for commercial and military space, Lockheed Martin Space

Nahjee Maybin '18
CEO, Kenyatta Computer Services

Sevy Swift '19
Junior mechanical engineer, Labrador Systems

Joey V. Tucker '77
Senior environmental advisor, ExxonMobil Global Products Company

Christina Volpi '12
Project engineer, Boston Government Services



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IN MEMORIAM

Remembering Orediggers who have passed away but will always remain part of the Mines community

John F. Abel, Jr. '56, MS '59, PhD '66 died May 11, 2021. John started his career working all over the world before teaching rock mechanics at the University of Arizona for eight years. He returned to Mines in 1974 to teach in the Mining Department until his retirement in 1992 as an emeritus professor. He also served as a sponsor of Mines' Society for Mining, Metallurgy & Exploration student chapter.

Joseph R. Anzman '59 died Oct. 6, 2019. Born in 1934, Joseph spent most of his career as a geophysicist for the U.S. Bureau of Reclamation, Houston Oil and Minerals and later as a consultant for domestic and international projects. He remained active at Mines throughout his life.

Robert "Rob" G. Benson PhD '97 died Sept. 20, 2020. Rob started his career as a geologist before landing a teaching position at Adams State University, where he taught geosciences for more than 20 years.

Ernest L. Bradley '65 died Feb. 15, 2021. After fulfilling his ROTC commitment at Mines, Ernest served as a first lieutenant in Vietnam. He later began a career as a petroleum engineer with Humble Oil, which later became Exxon. Ernest eventually transferred to the company's minerals department, spending the rest of his career in the mining sector before retiring in 1998.

George L. Brinkworth '64 died May 30, 2021. As a Mines student, George was a member of Alpha Tau Omega and was the recipient of the Cecil H. Green Award. George was also presented with the outstanding senior athlete award for football and track. He spent his career working for exploration and production companies and retired after more than 50 years in the oil and gas industry.

E. Eugene "Gene" Cox '62 died Feb. 8, 2021. Gene began his career working for Westinghouse before accepting a position with National Zinc, spending

the rest of his professional life in Bartlesville, Okla. Gene was also an entrepreneur, founding his own executive recruiting firm and an independent insurance brokerage firm and owning an ice cream store franchise.

Stephen "Steve" R. Daniel '65, MS '66, PhD '71 died April 15, 2021. Steve taught in the Mines Chemistry Department, becoming department head in 1988. In addition to teaching chemistry courses and advising graduate students, Steve taught in the McBride Honors Program, serving as interim director in 2001. He served as the faculty advisor for Mines Little Theatre for more than 40 years, sang in the Mines chorus and participated in the Faculty Follies. He received numerous awards throughout his career recognizing his teaching and service.

John "Jae" A. Edwards '66 died Dec. 2, 2020. Jae was a member of the Theta Tau and Sigma Alpha Epsilon fraternities as a Mines student and was the first Oredigger basketball player to score more than 1,000 points. Jae served in the U.S. Navy before starting his engineering career with Ingersoll Rand. He later owned his own video and health food stores.

Willard "Bill" C. Gekler '54 died Aug. 4, 2020. After serving as a second lieutenant in the U.S. Army, Bill spent his career with numerous oil companies and served as a National Academy of Sciences committee member.

Ellis "Red" B. Herrington Jr. '57 died Feb. 9, 2021. Red served in the U.S. Air Force before going on to have a varied career in engineering and geology. He retired at age 82.

Alan G. Hite '65 died Nov. 8, 2020.

Robert J. Hohne '55 died March 2, 2021. Robert was a member of the

Sigma Nu fraternity, and served as student body vice president at Mines. He spent two years in the U.S. Army Corps of Engineers before working for Southern California Gas Company for 37 years. He retired as senior vice president and started a consulting firm.

Lee L. Landkamer MS '96, PhD '03 died April 4, 2021. Lee worked for Schlumberger International for 10 years before returning to Mines to earn his master's and doctoral degrees. He became an associate professor in 2014 and taught at Mines until his retirement in 2020.

Evans G. Nash '62 died May 29, 2020. Evans was a member of the Tau Beta Pi fraternity as a Mines student. He served in the U.S. Army and primarily spent his career working for Amoco.

Ronald "Ron" C. Schutz '59 died March 31, 2021. Ron served in the U.S. Army before spending the rest of his career with Kaiser Aluminum and Chemicals Corporation, working all over the world.

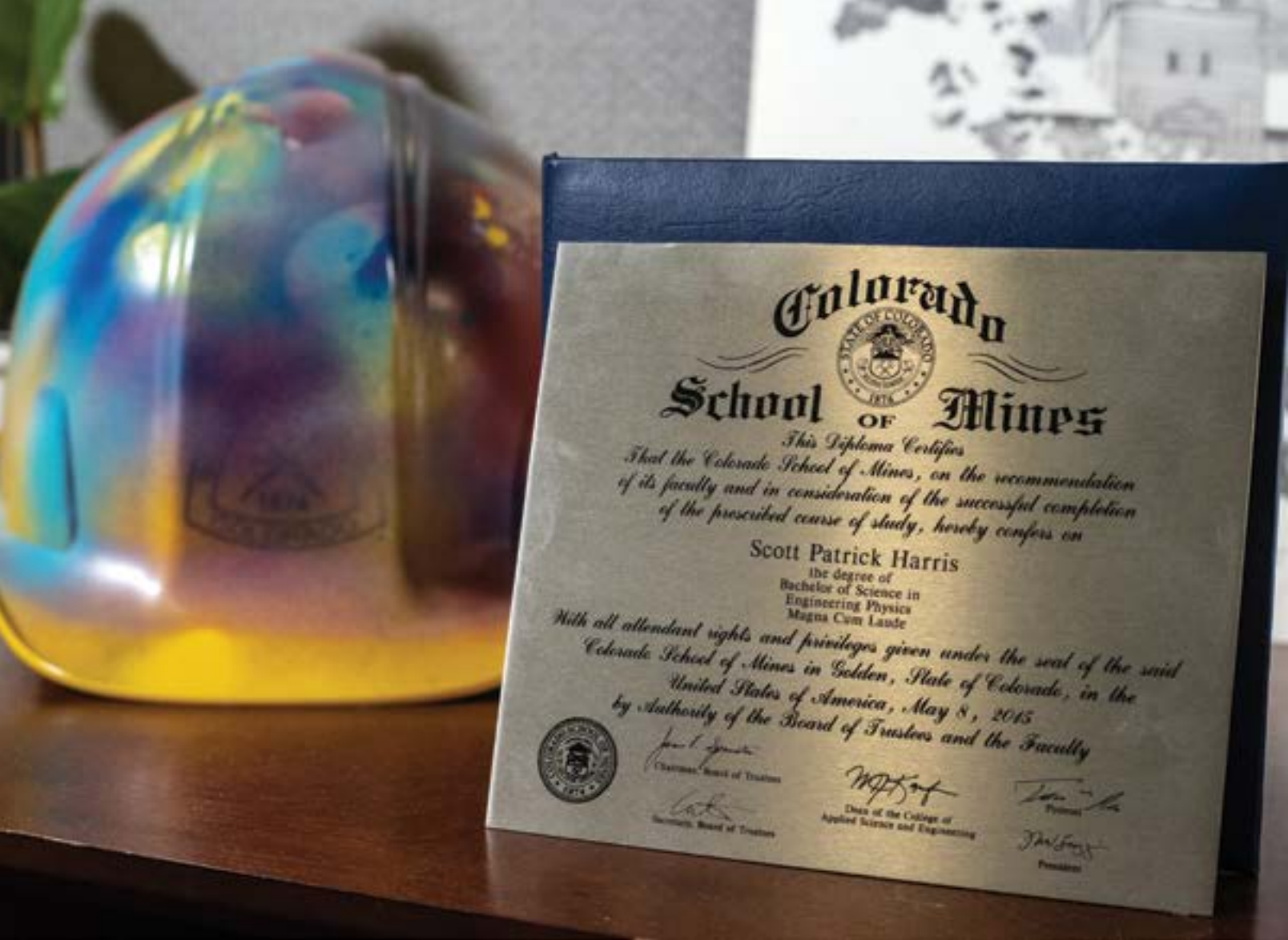
Channing W. Welin '58 died Oct. 19, 2020. He started his career with Gates Rubber Company in Denver, Colo., and later helped develop Vail Ski Resort.

Roger H. Witte '66 died Feb. 1, 2021. Roger spent his career as a chemical engineer salesman for a petroleum company.

► To submit an obituary for publication in *Mines Magazine*, visit minesmagazine.com/obituary.

Memorial gifts to the Colorado School of Mines Foundation are a meaningful way to honor the legacy of friends and colleagues while communicating your support to survivors. For more information, call **303-273-3275** or visit weare.mines.edu/givingguide.





ENGRAVED IN SILVER

A peek into the process behind a time-honored tradition

Mines degrees are hard-earned and highly valued, so it makes sense that the diplomas graduates receive to represent their experience are just as unique.

Measuring 5 inches by 6 inches and etched in metal, the silver diploma has been a tradition at Mines since 1934 after Charles A. Hull, the father of a Mines graduate, engraved a silver diploma to commemorate his son's achievement. The diploma caught the eye of then-president Melville F. Coolbaugh, who asked that silver diplomas be issued for all Mines graduates, kicking off a decades-long tradition.

This year, we visited Forum Engraving to get an inside look into the diploma engraving process.

The making of a silver diploma:

Step 1: Diplomas are cut to size.

Step 2: Diplomas are pre-finished to get the perfect sheen and a fine grain. Any imperfections in the metal make each diploma unique.

Step 3: Forum Engraving uses a special printing process to apply text to each diploma.

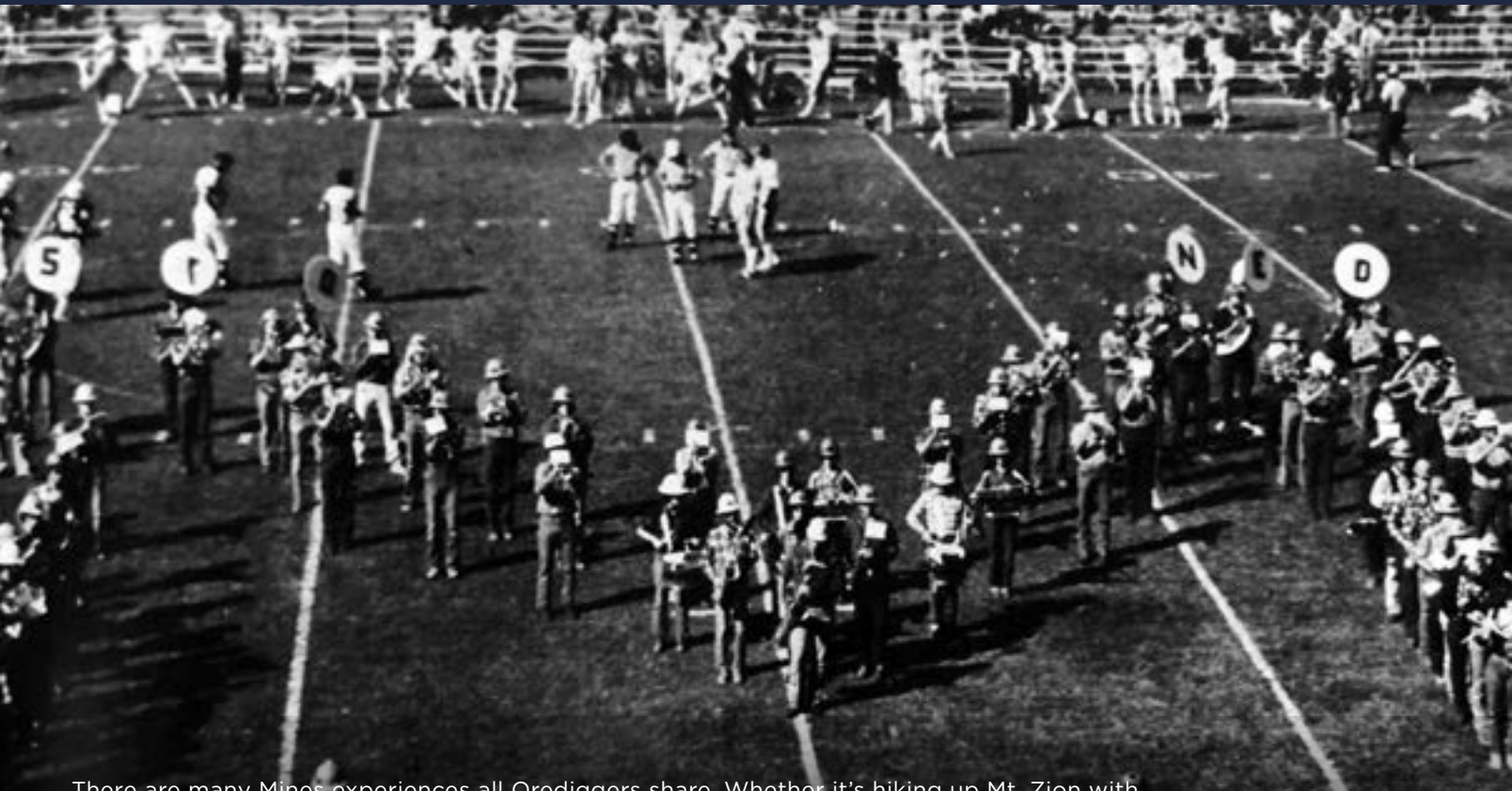
Step 4: Diplomas are dried and sent out to all new Mines alumni.



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Tell us more about Mines This fall, Mines is launching a strategic branding initiative aimed at making Mines even better known, better understood and more appealing to students, partners and, yes, even alumni and friends. This process starts with you. Around the time this magazine lands in your mailbox, you'll see an email from Mines Alumni inviting you to take 10 minutes to share your opinion of Mines, your thoughts on how we measure up to other leading STEM institutions and more. Thanks in advance.



There are many Mines experiences all Orediggers share. Whether it's hiking up Mt. Zion with a 10-pound rock, studying for final exams with friends or watching the Mines marching band perform at home football games, there are many time-tested, signature moments that bring the Oredigger community together and create an experience unlike any other.

▶ Learn more about the Oredigger Experience at mines.edu/oredigger-experience.

