

MINES MAGAZINE

For Colorado School of Mines Alumni and Friends • Fall 2024

mechanical engineering

computer science

materials science

electrical engineering

physics

THE SKY'S THE LIMIT

To succeed in aerospace careers, Mines graduates don't need an aerospace engineering degree—they need skills in a variety of disciplines to drive innovation.

PLUS:

Geothermal energy research and technology can help support a balanced energy equation.

Younger generations of Orediggers are becoming entrepreneurs by buying existing businesses from retirees.

MINES.EDU

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Over the last several decades of Mines history, Homecoming events have included a burro race, a parade featuring the Mines Marching Band, a soap box race, annual tug-of-war contest, formal dances and even a raft race (which later would be replaced with the E-Days cardboard boat race). The bonfire and 5K race remain Homecoming traditions and have been taking place for more than 50 years.

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

 @COLORADOSCHOOLOFMINES



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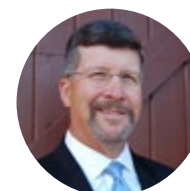


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On the cover: Innovation in aerospace technology often requires skills from a variety of disciplines, such as mechanical and electrical engineering, materials and computer science and more.



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THE MINES SIGNATURE STUDENT EXPERIENCE

\$46M IN SUPPORT HELPS STUDENTS FIND COMMUNITY, BUILD LEADERSHIP SKILLS



Hayden Cooreman '23 could never settle on just one passion. At Mines, he didn't have to.

"Orediggers value holistic learning and making sure you're never just an engineer," said Cooreman, who is now pursuing his master's in computer science. "Despite my heavy workload, I was as involved as I wanted to be with my favorite clubs and organizations, undergraduate research, community service and my creative passions."

Cooreman is talking about The Mines Signature Student Experience, which gives every Oredigger opportunities outside of class to find community, have fun and grow as leaders while developing skills that will serve them in their future careers. A few examples:

- Mines' VIP professional development program
- Honors programs like The McBride Honors Program in Public Affairs
- Traditions like Oredigger Camp, the M Climb and E-Days
- Student clubs and organizations
- Varsity, club and intramural sports
- Music and creative arts programs

These activities also promote overall health and well-being in a rigorous academic environment. What's more, decades of research prove that participating in non-academic pursuits improves academic performance.

IN 2023-2024

172
STUDENT ORGANIZATIONS

37
CHAPTERS OF PROFESSIONAL ORGANIZATIONS

500
VARSITY ATHLETES IN 16 SPORTS

25%
OF STUDENTS PARTICIPATED IN INTRAMURALS

NEW FACES, NEW YEAR

A breakdown of the Class of 2028

1,774 NEW FIRST-YEAR AND TRANSFER STUDENTS

49 U.S. STATES REPRESENTED
(South Dakota is the only state not represented)

21 COUNTRIES REPRESENTED
53% FROM COLORADO

TOP 5 U.S. STATES OUTSIDE COLORADO:
Texas (204), California (119), Washington (41), Oregon (27) and Virginia (23)

TOP 5 COUNTRIES OUTSIDE THE U.S.:
Saudi Arabia (19), Oman (4), China (4), Kazakhstan (2), Spain (2).

18 percent first-generation students

33 students are veterans or have veteran family members

5 sets of twins in the incoming class

516 incoming women

➔ What's it like to do the M Climb? Hear what the newest Orediggers had to say as they climbed Mt. Zion this year.



THE CAMPAIGN FOR

MINES

@150

During the Campaign for MINES@150, Mines supporters have made unprecedented investments in the Signature Student Experience: \$49 million to help Mines create a place for every student to enjoy their college experience and to prepare for the rest of their lives. Read more about the impact here.



CLOSING OUT MINES' 150TH YEAR



Alumni are critical to Mines' success—past, present and future

As we approach the end of Mines' 150th anniversary year, it's a great time to look back and reflect on the many things we celebrated this year. This includes Mines' legacy, the openings of the new Labriola Innovation Hub and Beck Venture Center, the launch of new student housing projects, the graduation of more than 1,000 students who entered Mines during the peak of the COVID-19 pandemic, the big win in the national quantum tech hub competition and the pride that we all share in being connected to Mines.

We have also celebrated the impact that you, our alumni, have had on the world and industry. Your achievements are a testament to the quality of education and experience Mines provides. As you'll see in this issue, alumni are leading innovation in influential areas like geothermal research and technology, creatively applying the skill sets you gained on campus to the businesses you've started and more. We continue to be inspired by your accomplishments, and Mines' programs, student experiences, research and connections continue to build on the reputation you've built across the globe.

As we look forward to the next 150 years, one of our goals is to be the exemplar university for alumni engagement and affinity. We would love to have more of you making in-person or virtual appearances in our classrooms, mentoring current students, advising our programs, teaching some of our professional development courses, collaborating on research projects and new startups or contributing in other ways to our strategic initiatives. We have ambitious plans to further our progress toward being the top-of-mind and first-choice university we aspire to be, and you are an important part of that.

Thank you for your unwavering support and commitment to Mines. Together, we will continue to build an even brighter future for the university and the world.

Go Orediggers!

Paul C. Johnson
President and Professor

OREDIGGER ALL-STARS

Mines athletes break records and make big moves in professional sports

Making cross country and track & field history

Earlier this year, cross country and track & field star and Academic All-American of the Year Zoe Baker '22 was named Academic All-America by the College Sports Communicators organization. Baker earned First-Team Academic All-America honors and was selected as the top overall student-athlete in NCAA Division II women's track & field for an historic third consecutive year, making her the first three-time recipient of the award in any sport in D-II history.

Baker concluded her career as a five-time Academic All-American, including four first-team selections, both of which are the most in Mines Athletics history. A 15-time All-American, Baker finished fourth in the outdoor 10,000m and was ninth in the 5,000m and was an NCAA indoors qualifier in the 3K and 5K, finishing 14th and 13th. The NCAA Elite 90 Award winner indoors, Baker won the RMAC title in the indoor 5K and medaled in the indoor 3K and outdoor 10K.

Three other cross country and track & field student-athletes were named Academic All-America alongside Baker: Margaux Basart and Hannah Miller both earned First-Team Academic All-America honors, and Molly Maksin appeared on the second team.

A Major League Baseball debut

Walter Pennington '20 made his Major League Baseball debut with the Kansas City Royals on Friday,

July 5, 2024, against the Colorado Rockies, his hometown team. The left-handed pitcher was called up from Triple-A Omaha at the bottom of the eighth inning, lasting for two-thirds of the frame and striking out one batter.

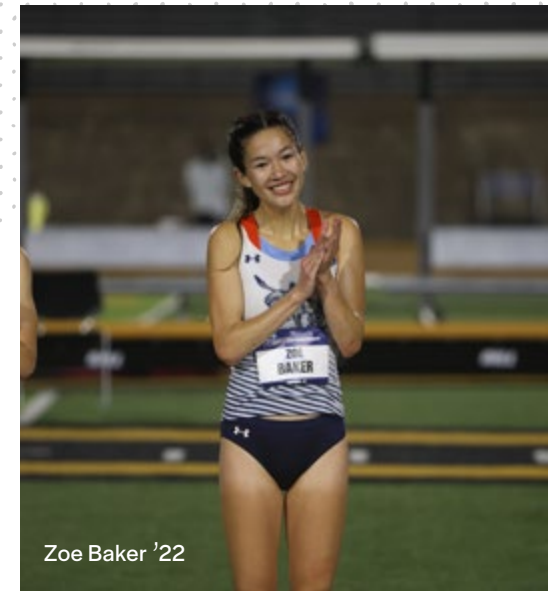
Pennington is currently in his fourth season of professional baseball after signing as an undrafted free agent with the Royals in August 2020. He is the first Oredigger to play in the MLB in more than a century.

U.S. Amateur qualifier

Oredigger golfer Lukas Taggart qualified for the 124th U.S. Amateur this year, winning co-medalist honors in the qualifier at Columbine Country Club on July 19, 2024. The U.S. Amateur was played from August 12 to 18 at Hazeltine National Golf Club in Chaska, Minnesota.

Taggart was given Third-Team Academic All-America honors as a member of the At-Large team from the College Sports Communicators organization this year. It is Taggart's first career honor, and he is Mines golf's first Academic All-American since Mark Vallee in 2007 and 2008.

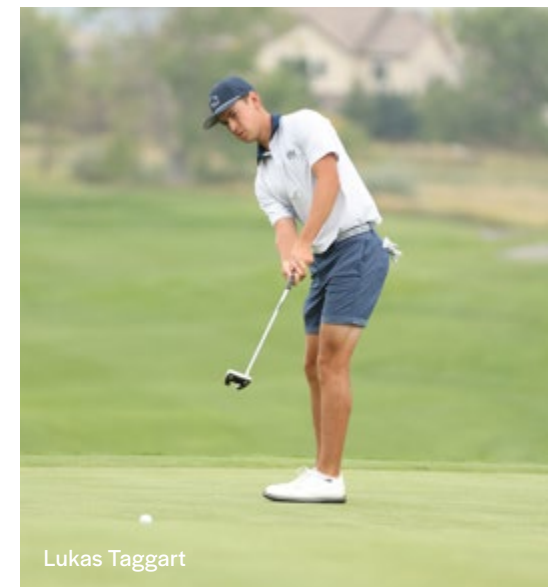
Taggart also earned First-Team All-RMAC and First-Team Academic All-RMAC honors, ending the season ranked No. 69 in Division II. He and his teammate, Max Lange, were named to the CSC Academic All-District team in June 2024.



Zoe Baker '22



Walter Pennington '20



Lukas Taggart



OREDIGGER OUTFITTERS

Mines made some changes to the on-campus store in summer 2024, naming Textbook Brokers as the new operator. The bookstore transitioned to a spirit and apparel-only store now called Oredigger Outfitters, with course materials offered through Textbook Brokers' online platform.

"We are excited to partner with a new provider to provide a diverse array of Mines products that our community is proud to wear and display," said Braelin Pantel, vice president of student life at Mines. "Throughout the selection process, it was evident that Textbook Brokers is an organization that values creativity, innovation and authentic community partnerships. The campus community can expect to see new offerings and new ways to partner with the store in the near future."

The selection of Textbook Brokers will allow Mines to offer students a variety of affordable course materials, including a robust rental and inclusive access textbook program, as well as an extensive selection of used, new, digital and OER course materials. Textbook Brokers will also offer a retail store that reflects Mines' unique brand, including an expanded selection of logo apparel and gifts, school supplies, reference and reading materials, as well as products for alumni, friends and family.

"Our StudentFIRST initiative, together with Mines' dedication to academic excellence in engineering and applied science, presents a fantastic opportunity to enhance the Mines brand and strengthen school spirit within the community," said Jimmy Batcheller, president of Textbook Brokers. "By aligning with the esteemed standards of Colorado School of Mines, we aim to elevate the student experience and support the dynamic educational environment that this renowned university embodies."



A NEW DEPARTMENT HEAD FOR GEOLOGY AND GEOLOGICAL ENGINEERING

Alexis Navarre-Sitchler MS '03 was named department head for Geology and Geological Engineering at Mines on July 1, 2024.

Navarre-Sitchler is a professor of geology and geological engineering and has been part of the Mines faculty since 2012, but she's also seen how the university and the department's programs and curriculum have evolved from her time as a Mines graduate student.

"I've been in the department for 12 years, but I also have a master's degree from Mines in geochemistry," she said. "Over that time frame, especially going back to the early 2000s, I've seen the university as a whole transition into a premier research institution with new programs and a dedicated focus on the problems society will face in the future. I'm really excited about leading the department forward in education and research that supports the integration of the earth sciences across the board in energy, water, climate and critical materials."

One challenge Navarre-Sitchler plans to tackle right away is increasing undergraduate enrollment in the department and fostering a change in how students view their career prospects after graduation.

"We need to respond to the common perception that geologists only get jobs in oil and gas or mining," she said. "There is a shift in what our students want and the kind of problems they want to solve. We want students to know that geologists are trained to address grand challenges in water resources, to diversify and sustain the energy portfolio across the range of subsurface energy systems and to resource the mineral supply needed for renewable energy. We want to increase the scope of the way earth systems are viewed as integrated into the solutions to these grand challenges."



KICKING OFF A QUANTUM FUTURE

Elevate Quantum, a designated Tech Hub by the U.S. Department of Commerce Economic Development Administration (EDA), is working to make the Mountain West the global leader in quantum innovation—with Mines as a critical partner.

In 2023, Elevate Quantum Colorado was designated by the U.S. Department of Commerce as one of the 31 inaugural Tech Hubs in regions across the country that showed potential for rapid growth in key technology sectors. Today, the Mountain West consortium consists of 120 organizations, including Mines, and broke ground on Quantum CCommons at Arvada, a 70-acre site dedicated to advancing quantum technology.

"We're excited and eager to have this once-in-a-lifetime opportunity to work with and support our regional industry and university partners to advance the quantum technologies, companies and workforce that Colorado and the nation needs," said Mines President Paul C. Johnson. "Having launched one of the first-ever quantum engineering degree programs at Mines, we've seen how this topic and our region has attracted bright and creative students, faculty and innovators as well as entrepreneurs and startups, and we look forward to working with all the

partners to ensure that this Tech Hub is successful and accelerates the growth of quantum-related companies and the workforce they will need."

Currently, around 3,000 Colorado workers are employed in the quantum industry, supporting the growth of more than 30 companies leading advancements in quantum tech. This makes Colorado the largest cluster of quantum companies in the nation. Over the next decade, the number of quantum-related jobs is projected to grow by tens of thousands. These new jobs look more like the aviation sector—with 50-80 percent not requiring advanced degrees—than a PhD research lab.

In 2020, Mines launched a quantum engineering program to help address critical workforce shortages and currently offers quantum engineering graduate certificates and master's degrees, as well as an undergraduate minor.

"You don't need a PhD to make an impact in quantum engineering—you need quantum literacy, and this program is designed to bring students and working professionals up to speed on key concepts needed by industry today," said Eliot Kapit, associate professor of physics at Mines.



WRAPPING UP MINES' 150TH YEAR

Alumni have helped Mines achieve big goals and continue to push boundaries

Being a Mines graduate is a badge of honor that signifies more than academic achievements and professional success—it embodies the 150 years of resilience, creativity and determination that have become synonymous with a university known for tackling the world's toughest challenges. We are a community defined by a shared commitment to excellence, discovery and innovation. This has become most apparent as we've celebrated our 150th anniversary and reflected on the indelible impact alumni have made on the university that will propel Mines into the future.

Alumni support has enabled Mines to enhance the exceptional and distinctive experience for students. Through new scholarships and fellowships, a Mines

education is more affordable for more students. Investments in student scholarship communities, programs to help develop business acumen and professional development initiatives that include alumni volunteers have helped ensure Mines students continue to be highly sought after by industry. Private support has been the catalyst to launch an unprecedented entrepreneurship and innovation ecosystem at Mines, which includes new facilities like the Labriola Innovation Hub, Aramco xWorks Innovation Space and the Beck Venture Center, which complement the programming delivered by the McNeil Center for Entrepreneurship and Innovation. Alumni support and pride also helped Mines become one of the top Division II athletic programs in the country.

As we look to the possibilities beyond this anniversary year, Mines alumni will continue to play an important role in maintaining our vibrant and supportive community. Whether it's through mentorship, networking or making a gift to an area you are passionate about, Mines alumni have the power to inspire the next generation of Orediggers and support Mines' continued success.

We are proud of what we have accomplished together and look forward to continuing the momentum of our success. Here's to the enduring Oredigger spirit and the bright future that lies ahead for all of us.

Melanie K. Westergaard
Mines Alumni Board President

Brian Winkelbauer
President and CEO, Mines Foundation

HERE ARE JUST A FEW WAYS YOU CAN CONTINUE TO HELP PUSH THE BOUNDARIES OF WHAT'S POSSIBLE AT MINES:

- Attend or plan an M Club event in your city
- Judge a Capstone Showcase
- Attend an athletics event, the upcoming Arizona Road Shows or Denver or Houston holiday parties
- Attend a monthly virtual Lunch Bunch
- Check out the latest volunteer opportunities at weare.mines.edu/volunteer
- See and be a part of the Campaign for MINES@150 progress at campaign.mines.edu

WHO'S ON THE LINE?

"My experience at DiggerDial has allowed me to really appreciate the education that I am blessed to receive at Mines. The Oredigger community is strong, whether it be the student community or the alumni community, and it is something I am proud to be a part of!"

—Thomas Fischer, Class of 2025
Lead DiggerDial Caller | Harvey Scholar



DiggerDial Engagement Center is a dynamic team of Colorado School of Mines students connecting with alumni, parents and friends. We share engaging stories, campus updates, event news and opportunities to support new philanthropic initiatives.



Help today's students enjoy a well-rounded educational experience and sustain Mines' reputation of engineering excellence as a premier STEM university.



Connect and share stories with current Mines students and learn about campus events, communities and initiatives.





THE ART OF DISTILLING

The Block Distilling Co. blends technical skill with creativity

BY ASHLEY SPURGEON

Walking into The Block Distilling Co., a distillery in Denver’s RiNo Art District, you’re immediately greeted by a blend of craftsmanship and creativity. Behind the bar, neatly aligned rectangular bottles showcase the distillery’s range of whiskeys and spirits while vibrant street art, a remnant of the gallery that once occupied the building, decorates the walls.

Founded by brothers Kraig ’10 and Kameron Weaver ’12, along with Kraig’s wife, Michelle, The Block is more than a small business—it’s a culmination of passion, engineering know-how and a creative vision.

An engineer’s mindset

Kraig and Kameron didn’t just stumble into the distilling world—they engineered their way into it. Their dream to create whiskeys and other spirits took root before they graduated from Mines. Both had a passion for home brewing, and while the craft beer scene was surging at the time, the brothers were more interested in the challenge of creating whiskey and cocktails.

Although Kraig and Kameron’s degrees are in petroleum engineering and computer science respectively, their time at Mines equipped them with the skills to think critically and adapt quickly—skills that became essential when launching The Block. From mastering the intricacies of distillation chemistry to navigating the hurdles of business ownership, they relied on a problem-solving mindset to bring their vision to life.

“I like to joke that a degree in engineering is really just a degree in figuring out problems. I think that holds true in this setting,” Kraig said. “And I think Mines and the structure of an engineering degree really sets you up for that.”

Their engineering background continues to be a cornerstone of their approach. In fact, Kameron, with the help of fellow Mines alum Taylor Angle ’12, even built some of the distillery’s automation equipment. They designed a control panel to run critical components of the distillation process, such as

cooling and steam valves, agitators and temperature sensors.

“We had to figure out how different microcontrollers were able to talk to each other and go back into more of an electrical engineering side,” Kameron explained.

Ultimately, the Weavers make sure they have a hand in every part of the distillery and understand how the whole system works so they are able to diagnose problems and make sure everything runs safely and efficiently.

The engineering process applies to creating flavor profiles as well. With primarily grain-based products, The Block sources 70 percent of its grain from a family farm owned by another Mines alum, Doug Low ’10, with additional grain sourced from around Colorado.

“We get to have a say in the varieties of grain being grown and how those are going to affect the flavor of our products, as well as farming practices and storage methods,” Kraig said. “They are knobs of control and influence that a distillery of our size doesn’t typically have.”

The Block has also dipped into brandy production, which relies on fruit rather than grain, during harvest season in Colorado to create some pear and grape brandies. They have also created Italian-style liqueurs such as an apéritif, amaro and coffee liqueur.

“We’re constantly learning. We’re constantly trying to figure out how we can alter our process or change a small aspect of the end product to make it even better than it is now,” Kameron said.

A Mines collaboration

The Block partnered with Mines to offer a unique product to celebrate the university’s 150th anniversary: a small batch wheat whiskey. Crafted from a blend of red and white wheat with malted barley, the whiskey—aptly named “Helluva Whiskey” in a nod to Mines—made its debut at this year’s Homecoming.

However, the Weavers didn’t want to just create a commemorative whiskey—they wanted to give back to the university. For every bottle sold, \$10 goes toward scholarships and creative arts projects on campus—an area Kraig and Kameron both valued during their time at Mines.

Kraig was president of the Creative Arts Club when he was a student, and Kameron was involved in the student arts journal, *High Grade*. These creative opportunities helped provide balance to the highly technical focus of their classroom experiences.

“Having a way to turn off the engineering mind and think about things in a different way is something that’s invaluable,” Kameron said. “Then you can come back to that engineering mindset with a refreshed approach.”

“With such a heavy engineering focus, it was really those clubs that offered those releases,” Kraig said. “So when we started talking with Mines about doing something collaborative, our immediate thought was doing something that actually helped fund some of those programs and give other students more creative outlets.”

Ultimately, The Block represents more than just a business venture—it’s a testament to the application of engineering principles in a creative and highly technical field. The Weavers continue to apply their Mines education in unexpected ways, proving that engineering isn’t just a degree—it’s a toolkit for solving problems, no matter the industry.

MAKE A WHEAT WHISKEY OLD FASHIONED

- Pour 2 oz of Helluva Whiskey into a mixing glass
- Add ¼ oz of simple syrup
- Add 8 dashes of aromatic bitters (use only 2 dashes if purchased from a liquor store)
- Add ice to mixed ingredients
- Stir for 15 seconds
- Put a large ice cube into a rocks glass and strain mixture over the top
- Express orange peel (peel-side out) over the top of the cocktail to brighten up the drink

Alumni-owned **Mountain Toad Brewing** also created a special brew in celebration of Mines’ 150th anniversary year. The “Helles an Engineer” is a Helles Bock (a strong German-style lager) aged on whiskey oak as a nod to the Mines fight song. To tie the brew back to the university’s mining roots, they used a hop variety called Crystal and boiled the beet with a traditional hot stone method. The beer made its debut at Blaster’s Bash. A portion of the proceeds from Helles an Engineer go toward Mines’ general scholarship fund.

➔ Hear from The Block’s founders about how their engineering experiences helped them open and run their own distillery.



AREAS OF INFLUENCE

Mines launches new research pillars to highlight the university's expertise

Mines recently established new research pillars to highlight the university's expertise and showcase the many ways in which Mines researchers are driving innovation with impact. The pillars encompass Mines' legacy expertise across earth, energy and environment, reinforcing the university's strengths and leadership across these areas. Additional pillars include foundations, fundamentals and frontiers. These capture Mines' work to integrate social considerations into the foundations of ethical and impactful innovation, to probe the fundamentals of science and expand our understanding of the universe, and to push the frontiers of what's possible through use-inspired, cutting-edge research.

"The Mines ethos of use-inspired research and innovation is a significant part of what draws world-class faculty, students and industry and government partners to Mines," said Mines President Paul C. Johnson. "We have a combination of expertise, facilities and collaborations that uniquely positions us to tackle the key questions and challenges facing industry and society on topics like energy and water, natural resources and sustainability, infrastructure, manufacturing, computing, health and beyond."

Mines Vice President for Research and Technology Transfer Walter Copan added, "Capturing the spectrum of research and innovation across Mines, the pillars also represent the university's commitment to develop real-world solutions that incorporate social, economic, policy and environmental dimensions."



Earth Exploration

Mines researchers are building a better understanding of Earth's structure, natural processes and changing environments to predict and mitigate natural hazards, understand environmental cycles, address climate change and locate and access critical resources with minimal impact on the planet.



Integrated Energy Solutions

Balancing ever-growing demand for affordable, reliable and climate-conscious energy, Mines researchers are leaders in finding solutions that reduce emissions, boost energy efficiency and storage, use alternative and renewable sources and fuels and improve grid reliability.



Sustainable Environment and Climate

Environmental sustainability and climate change mitigation are central to research at Mines, where scientists advance projects aimed at purifying water, soil and air while driving cleaner energy production, resource extraction and manufacturing practices.



Foundations of Responsible Innovation

Mines scientists and engineers integrate social, cultural, ethical, economic, policy and environmental considerations into their work to improve our world through impactful and responsible research and innovation.



Fundamentals of Scientific Discovery

Researchers across Mines drive discovery and innovation by using advanced technology and computing to enhance our understanding of the matter, forces and interactions that govern our universe.



Science and Engineering Frontiers

Mines researchers explore new areas of science and push the boundaries of what's possible to accelerate breakthroughs in computing, robotics, space exploration, advanced materials and manufacturing, biotechnology and beyond.

LAYING THE GROUNDWORK FOR RESEARCH MILESTONES

Mines' research leaders discuss the university's legacy of innovation and societal value

For 150 years, Mines has been a beacon of innovation and research excellence. To celebrate and reflect on the university's research accomplishments during the institution's anniversary year, Vice President for Research and Technology Transfer Walter Copan brought together the three former VPRTTs for a discussion about how research at Mines has grown and evolved over the years.

Here are some highlights from the conversation.

Walter Copan: John, without your work to establish a formalized office of research and tech transfer (RTT) at Mines, none of us would be here today. Can you tell us about how the RTT office's initial goals have helped to lay the groundwork for research at Mines today?

John Poate: I came to Mines in 2006, and the goal was to enhance research and tech transfer at Mines. I had a really enjoyable time getting to know the faculty and trying to analyze the school and where we were going. The goal of the office was to work with the faculty and identify the areas where we could play in the major leagues. We had our first big win in 2008 with a National Science Foundation materials science award. In 2012, we won the DOE hub for the Critical Materials Institute. In many ways, that put us on the national research map, but to my mind, the very important thing there was that it was proof to the faculty that we could play in the major leagues and win.

Walter Copan: Stefanie, a significant area of focus when you were VPRTT at Mines was

the push toward greater external recognition for Mines as a top-choice partner for solving real-world problems. Can you give us some insight on your efforts to bring this message to a broader audience?

Stefanie Tompkins: I spent a lot of time talking to faculty and asking what the barriers were for them to be able to take on much bigger projects, which is effectively the best way to communicate what Mines is capable of doing. We spent a lot of time concentrating on breaking down those barriers.

We also spent a lot of time talking to Congress. There are some really interesting rules in places like the Department of Energy that demand that universities provide cost share for federal funding that they win. We had to work with Congress and said this is fundamentally going against what the United States wants—you're actually discouraging people from trying to do their best work because they can't afford to, and that seemed like a fatal flaw in the system. We were able to get Colorado's delegation to work together to actually suspend that requirement for universities and for nonprofit institute organizations.

Walter Copan: In addition to our very strong ties to industry

and to other collaborators, we are dramatically growing our entrepreneurial and innovation ecosystem at the university. Tony, I'm curious for your thoughts on how building a cohesive research community enables advancement and how we cultivate the idea of innovation with impact at Mines.

Tony Dean: Most of us, when we think of scientists and researchers, want to do two things: we want to understand things in a better way, but more importantly, we want to make an impact. I think that's why we're finding the growth of entrepreneurial things now—on some level, it's just kind of a natural outgrowth of being in a position to improve society in one way, shape or form. I think that's one of the critical roles of your office right now, having the luxury of being in the position where it's become a well-oiled machine, and what better way to attract young faculty members and see they can come to a place to favorably impact society. It's an absolute win-win situation.

* Responses have been edited for length and clarity.



WALTER COPAN
2021-current



TONY DEAN
2015-2017



STEFANIE TOMPKINS
2018-2021



JOHN POATE
2006-2014



➔ Watch the full discussion on Mines' YouTube channel.

HARNESSING THE HEAT BENEATH OUR FEET

Mines alumni are leading geothermal energy research and technology projects to support a balanced energy equation

BY LORI FERGUSON

The desire to realize greater energy independence is an ongoing topic of conversation in the United States and a goal that demands a diverse portfolio of secure and sustainable energy resources. While traditional sources such as oil and gas dominate the energy production market, alternative sources such as wind and solar are increasingly viable. Also in the running: geothermal, a resource the U.S. Department of Energy has characterized as “America’s untapped energy giant.” Research and development initiatives in this sector are surging, and Mines alumni are playing a critical role.

Earth scientist Hunter Knox ’05 is among those who believe deeply in geothermal energy’s potential. A specialist in subsurface investigations, she currently works with the Energy and Environment Directorate of the Department of Energy’s Pacific Northwest National Laboratory (PNNL).

“Geothermal is a 24/7/365 power resource,” Knox said. “Everywhere on earth, the subsurface can provide heat that can be used to generate energy—the sun doesn’t have to shine, and the wind doesn’t have to blow.”

Geothermal energy is also carbon-free—a characteristic that’s increasingly important with efforts to reach a net-zero carbon future—and offers a host of flexible energy solutions. For example, Knox said, a direct-use application of geothermal energy is the installation of heat pumps in homes to reduce energy needs. “By circulating air through the ground, you can keep a home’s air

at a certain temperature and make up the temperature difference with conventional heating and cooling methods. This offsets the energy required to keep homes cool in the summer and warm in the winter.”

A second important application of geothermal energy is in power generation. One area of exploration focuses on hydrothermal resources. “In these areas, the trifecta for geothermal naturally exists—heat, water and permeability. This makes it relatively straightforward to extract steam to power turbines,” Knox explained. The other area is enhanced geothermal systems where there is hot rock but no water or natural fractures in the rock. It is here that Knox has focused her research.

“We’re exploring the viability of creating sustainable fractures and running long-term circulation tests that will be vital for successful energy production,” she said.

Knox has spent the last ten years collaborating with colleagues in the Department of Energy’s national laboratory complex on ways to generate these fractures and circulate fluids without triggering a significant earthquake.

“We conduct studies in which we make fractures and then image and monitor them using state-of-the-art hydro-geophysical techniques. In a sense, I’m the doctor who does the CT scan of the geothermal system to make sure all is in order,” she said.

Knox also designs field experiments to validate the Thermal-Hydrological-

Mechanical-Chemical (THMC) codes used by modelers to predict the creation of fractures and measure the long-term performance of geothermal reservoirs. “In a nutshell, we execute these experiments to collect data so modelers can improve their codes, making the advancements transferrable to other locations,” she explained.

The research is having an impact, and the technology is advancing at an inspiring pace. In 2023, for example, Houston-based geothermal company Fervo Energy demonstrated that power generation through this process is a viable alternative.

Aleksei Titov ’22 is a senior geophysicist at Fervo and shares Knox’s enthusiasm about the opportunities inherent to this energy source. “Geothermal energy can provide electricity 24/7, it’s renewable and its surface footprint is small,” he said.

An expert in the fields of strain and temperature, Titov focuses his efforts on applying technology to guide reservoir engineering. “In geothermal energy, heat is the resource, and the optimal way to produce this heat is to rely on the stimulation and placement of wells. My research involves using fiber-optic sensing to determine the best models for reservoirs. I listen to the reservoir and translate my findings to the engineering department so that they can optimize reservoir performance across our project portfolio.”

Much research remains to be done, but Knox and Titov assert that Mines alumni are, and will continue to be, key contributors to geothermal energy development, both nationally and internationally.

“It’s an incredibly applied problem, just the type that Mines alumni excel in solving,” Knox said. “As students we’re given lots of opportunities to tackle real-world problems, and in my experience, that increases our passion for research.”

“Mines is one of the best universities in this field,” Titov said. “Nine percent of Fervo’s employees were educated there, including our co-founder and chief technology officer Jack Norbeck MS ’11. We recruit there regularly and enjoy a close working relationship with the university’s faculty and students.”



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This photo shows Fervo Energy’s Cape Station geothermal energy project in southwest Utah that aims to deliver around-the-clock carbon-free electricity when it reaches full-scale production in 2028.

Photo courtesy of Fervo Energy

THE SKY'S THE LIMIT

BY SARAH KUTA

Mines graduates succeed in aerospace careers—without an aerospace engineering degree

Visit nearly any aerospace company across the country and you'll probably bump into a Mines graduate—or, more likely, several.

Orediggers are thriving in this fast-growing industry, even though the university doesn't offer a dedicated aerospace engineering bachelor's degree. Mines graduates are still highly sought after and regularly recruited by leading aerospace companies and organizations, from NASA to Lockheed Martin to Sierra Space. They're building spaceplanes to ferry astronauts and supplies to the International Space Station, enhancing satellites to improve global communication and pioneering innovations to make flying more sustainable, among other important projects.

As the aerospace industry continues to expand, it needs even more skilled engineers in a variety of fields, including mechanical, electrical, materials and computer science. Mines is stepping up to the challenge, preparing the next generation of aerospace professionals to shoot for the stars.



Mines students in Capstone Design showcase the mining robot they created to take part in NASA's Lunabotics competition. Capstone Design—the year-long creative, client-driven design experience that many Mines students participate in before graduation—regularly features aerospace projects among the options students can choose from.

A growing aerospace industry

The global aerospace industry is a major economic engine, estimated at \$321.5 billion in 2022. And, by 2032, it's projected to reach \$678.17 billion.

The industry's expansion is being driven by several factors, including the privatization of space travel, advancements in electrification, new and evolving threats to national security and ongoing global competition in aviation and space.

"It's an exciting, multidisciplinary field with many opportunities that have great national importance," said Ivar E. Reimanis, a Mines professor of metallurgical and materials engineering. "Mines students are excited to make a difference. It also presents job security—aerospace needs will be here for many decades."

All that growth means there are ample opportunities for Mines graduates to make their mark—no aerospace engineering degree required.

"A standalone aerospace engineering degree may help identify you to potential employers, but it is not at all necessary for getting a job in this area," said Iris Bahar, who leads the Computer Science Department at Mines. "Employers need people with broad sets of skills."

Reimanis echoed that sentiment, adding that Mines provides students with engineering fundamentals they can use to solve problems in a wide array of industries, including aerospace.

"The high-quality education and training that Mines students get gives them the ability to apply their creativity and problem-solving skills to disciplines outside their major," he said.

The value of interdisciplinary knowledge

The industry needs metallurgical and materials engineers, for instance, because aircraft and spacecraft need to be built with components that can hold up in challenging environments and conditions.

Hypersonic aircraft and weapons might one day be able to travel at five times the speed of sound. But building them with off-the-shelf materials simply won't cut it, Reimanis said. Instead, metallurgical and materials engineers will need to innovate.

"The aerospace industry, just like many others, is so complex that no one person or discipline can master all of the components at a sufficient depth to push progress," said Reimanis. "These industries need engineers with deep and ever-growing technical knowledge in at least one area, enabling them to

connect with experts in other areas to appropriately balance innovation and risk."

Similarly, the industry also relies heavily on electrical engineers, who are responsible for all the electronic and electrical systems in aircraft and spacecraft. The expertise of these professionals is becoming even more important amid the push for "greener aviation," said Omid Beik, a Mines assistant professor of electrical engineering.

Smaller aircraft, like drones, are already electrified. And aerospace companies are hard at work developing larger, hybrid and fully electric aircraft. Electrical engineers are also working on new propulsion technologies for satellites, as well as electric vertical take-off and landing aircraft (eVTOL) that can take off, hover and land vertically, Beik added.

"As the industry has advanced and continues to advance, we need more and more people with specific degrees like electrical engineering," he said. "We need specific expertise within that aerospace umbrella."

The same is true for computer science, data science, physics, robotics, math and statistics, operations research, space resources and numerous other fields that contribute to the industry.

The Mines difference

Students interested in aerospace have many colleges and universities to choose from. So, why do so many aviation- and space-minded undergraduates pick Mines, even though the university doesn't offer an aerospace engineering-specific degree option?

Often, they want to take advantage of the proximity to Colorado's aerospace prowess. The state is home to more than 2,000 aerospace companies, both large and small, that directly employ more than 55,000 people and indirectly employ another 184,000. Colorado's aerospace companies are involved in—and, often, leading—significant projects, from the James Webb Space Telescope to NASA's Artemis program that will land the first woman and the first person of color on the Moon.

"We are strategically located in an aerospace and space hub," Beik added. "If you come to our career fair, you will see lots of aerospace companies. Mines has a great reputation."

Mines is well-connected within the aerospace industry and continues to cultivate new alliances and relationships. These collaborations not only strengthen the university's curriculum but also help students land internships and jobs. Mines' close connections to professional organizations, like the American Institute of Aeronautics and Astronautics (AIAA) and the Women of Aeronautics and Astronautics (WOAA), also provide networking opportunities and help students develop their leadership skills.

During their time on campus, students not only get the technical know-how they need to thrive in aerospace but also build a strong foundation in collaboration, leadership and innovation. Moreover, Mines faculty members care deeply about students and go out of their way to provide support and guidance.

Undergraduates are also increasingly recognizing that it's not necessary to have a degree in aerospace

A team of Mines students, in collaboration with aerospace company Lunar Outpost, was a finalist in NASA's Break the Ice Lunar Challenge in early 2024. They were one of six teams that built a prototype lunar rover that could excavate under reduced gravity—using gravity off-loading—and navigate over complex terrain, including rocks, craters, turns and loose granular soil. Launched in November 2020, the Break the Ice Lunar Challenge tasked competitors with creating robotic systems that can traverse the volatile terrain of the Lunar South Pole.





Research Associate Professor Johan Vanneste and Mines graduate students Alexandre Bray and Alexander Schwiebert developed a bioreactor that incorporates gas exchange technology to create plastic feedstock for 3D printing—with the intention of the technology being used in space. The research team, along with three colleagues from bioplastic producer startup Mango Materials, participated in parabolic flights earlier this year to simulate space’s low-gravity environment while running multiple simulations—10 that recreated lunar gravity, 10 that recreated gravity on Mars and 10 with microgravity.

Photo by Steve Boxall

engineering to succeed in the industry and that, in fact, specializing in another field offers them greater flexibility in the long run.

“Mines trains engineers who can think, solve problems and work with people—all attributes that are transferable across disciplines,” said Reimanis. “You don’t have to be peg-holed with your degree.”

Aerospace is an inherently interdisciplinary field. To drive innovation and come up with solutions to complex problems, companies need to bring together creative, outside-the-box thinkers who aren’t afraid to challenge the status quo. A team made up entirely of aerospace engineers, or any single engineering

discipline, likely won’t produce the best solution, said Bahar.

“Having a diverse team with diverse skills and perspectives often leads to better designs and solutions when solving problems,” said Bahar. “Aerospace is no exception.”

Aerospace opportunities at Mines

Orediggers have no shortage of opportunities to explore and prepare for careers in the aerospace field during their time on campus.

For example, the university’s aerospace engineering minor, which launched in fall 2021, gives students a taste of aviation and space exploration in addition to their primary field of study. The six courses, developed in collaboration with industry partners, cover topics ranging from orbital mechanics to space operations and mission design. Having an aerospace engineering minor on their transcript helps Mines students stand out even more during the hiring process.

Mines undergraduates who pursue a mechanical engineering degree can also explore aerospace through “tracks” offered within the program. These tracks give Orediggers an opportunity to focus on a specific area—such as aerospace—while still getting a broad, versatile education.

Mechanical engineering students—in collaboration with those in electrical, civil, environmental and design engineering—often can also get hands-on experience in aerospace through their year-long Capstone Design project. Through the client-driven experience with real-world companies, Orediggers have designed fully autonomous lunar rovers and built tools that could one day help humans establish a long-term presence on the Moon, among other aerospace-related projects.

In recent years, the department has also created new aerospace engineering courses to help meet student demand: Each year, more than 75 Mines mechanical engineering graduates take jobs in the aerospace industry. But, because of their broad education at Mines, they still have “flexibility

down the road,” said Daniel Blood, director of undergraduate studies in the department.

“You have the skill sets to move to different roles and you have more options as you go forward,” Blood added. “The industry can change, and your priorities could as well. Your skill sets won’t become obsolete.”

Similarly, in computer science, students can select space as their area of focus. Curriculum for the CS + Space program was developed in partnership with the Center for Space Resources at Mines, Lockheed Martin and Ball Aerospace.

Some of the Computer Science Department’s field session projects also relate to aerospace, including collaborations with Lunar Outpost, a Golden-based and Mines alumni-owned company specializing in commercial space robotics, planetary mobility and space resources. For example, in summer 2024, computer science students could work with the company to develop skid steer drive systems for its commercial rovers, create a visualization tool for its mission control platform or verify its primary communication system.

Orediggers who have their sights set on the aerospace industry can also pursue an area of special interest (ASI) in space and planetary science and engineering. This interdisciplinary program, which also appears on a student’s transcript, blends knowledge from fields like space physics, planetary science and astronomy.

Mines is also home to the Center for Space Resources, which is a leader in the field of in-situ resource utilization (ISRU), or the practice of extracting natural resources at mission destinations, rather than bringing supplies from Earth. Each year since 1999, the center has hosted the Space Resources Roundtable, which brings together space scientists, engineers, government officials, policy makers, entrepreneurs and other experts to discuss the latest issues and trends in extraterrestrial resources.

Drawing on the center’s leadership, Mines created a first-of-its-kind graduate program in space resources in 2017. Students can earn a post-baccalaureate certificate, a Master of Science and a doctorate in this developing field, which will be critical for establishing a permanent human presence on the Moon and, eventually, venturing farther into the solar system.

Reimanis said, “Mines has a 150-year track record of preparing graduates not just for the jobs of the day, but for the careers of subsequent decades.”



BREAKING BEATS AND BOUNDARIES

Le'Toya Garland '04 turned a career curveball into hip-hop joy

BY CYNTHIA BARNES

There's no arguing that hip-hop is electric—but it's not often associated with electrical engineering. Engineers, however, are nothing if not inventive.

After a 2019 layoff put the brakes on her tech career, Le'Toya Garland '04—who played outfield on the Orediggers' softball roster while getting her degree in electrical engineering—completely reinvented her professional life, turning the career curveball into a homerun. She's now co-owner of the School of Breaking, which offers hip-hop dance and arts education in Aurora, Colorado.

Growing up on military outposts before her family settled in Denver, Garland was attracted to hip-hop dance, but remote locations were lacking in opportunity. Hip-hop dance, like engineering, has

a “make it work with what you got” ethos, but “you can't learn breaking from a book,” she said with a laugh. “I tried.”

In 2014, she enrolled her young son in classes at the School of Breaking, waiting in the lobby before finally venturing the courage to hit the floor herself. Now the school's co-owner and operations manager, Garland, also known as “B-Girl Tweezy,” credits her years at Mines with preparing her for success.

“At first I wasn't really sure about how my technical background and college education would be useful working at a school that deals with arts and culture,” Garland said. “But there are all kinds of things that I have to be responsible for learning and mastering. I took the concepts of analysis and troubleshooting that are a huge part of engineering and applied it to teaching myself how to do all of the functions that are within a business. I've always felt like I've been really good at troubleshooting and being very solution oriented. And that skill set and mindset are very useful in terms of me running a business today.”

Garland credits the Multicultural Engineering Program at Mines for fostering a sense of belonging that she works to create for others today. “That was an important part in me choosing to go to Mines, because I felt like it was a school that actually cared

about my attendance and my participation and me being a student there,” she said. “Before my freshman year, there was a week of learning and social activities for students who were a part of the minority engineering program. It was very helpful in making the transition to being a college student and being in a space where our numbers were small. It didn't feel as intimidating, and I wasn't as anxious about starting after having gone through that summer program.”

That support and encouragement inspire her efforts to make the School of Breaking a welcoming environment for all. For example, the diversity in hip-hop has not always extended to gender, and Garland's school has hosted sessions to specifically encourage more girls to try breaking.

“Sometimes all we need is to be around people who believe in us and encourage us to move in our own way, at our own pace,” said Garland. “I'm in spaces oftentimes where I'm the only person who looks like me—especially being in technology, being a Black woman, being a woman within hip-hop culture. It's important for me, leading an organization, that I maintain awareness around that and do anything that I can so others will know

that their presence is desired and that it's a safe space for them to be in. That's a part of the work that we do as a school—not just for women or girls, but for anyone. Hip-hop is a culture for everyone. Its values are peace, love, unity and having fun. And though it was created by Black and brown youth in the seventies in New York, it's meant to be a space for anyone who shares those values to participate and uphold those cultural responsibilities.”

“SOMETIMES ALL WE NEED IS TO BE AROUND PEOPLE WHO BELIEVE IN US AND ENCOURAGE US TO MOVE IN OUR OWN WAY, AT OUR OWN PACE.”

Breaking—which debuted as an Olympic sport in 2024—and hip-hop culture have now been around for more than 50 years, expanding from music, graffiti and dancing to encompass values like health, wellness and education. The school is planning to expand as well, adding more programs and exploring larger locations.

“It's a challenge,” Garland admitted. “But I felt very prepared to address all of life's challenges after I graduated from Mines.”

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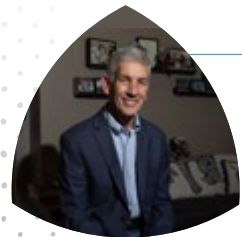
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EMBODYING THE OREDIGGER SPIRIT

A new class of honorary alumni is recognized for their extraordinary service to Mines

Every so often, someone who is not a Mines alum gives magnanimous and distinguished service to Mines over many years. The Mines Alumni Board votes to recognize such individuals as honorary Mines alumni.

“Conferring honorary alumni is especially meaningful as we celebrate Mines’ 150th year in 2024,” said Melanie K. Westergaard ’87, president of the Mines Alumni Board. “The incoming class of honorary alumni truly epitomizes the authentic pride, integrity, spirit, philanthropic service and humble leadership of Mines—in the past, the present and the possibilities of the future.”



President Paul C. Johnson

Paul Johnson became the 17th president of Colorado School of Mines in 2015 following his role as the dean of the Fulton School of Engineering at the University of Arizona. His ambitious strategic plan for MINES@150 and goals for the Campaign for MINES@150 were actualized this year, transforming the campus and the student experience in the process. Many students will tell you that “PCJ” is not only their leader but also their hero. Mines is what it is today because of Paul Johnson, a true honorary alum.



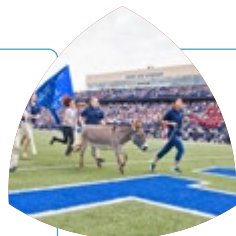
Terrance Tschatschula

Terrance Tschatschula is a University of Texas graduate, and his career as an energy industry leader brought him to Colorado, where he was appointed to the Mines Board of Trustees in 2001. He is a founding member of the Mines Foundation Board of Governors and tirelessly supports the university and its students. He’s been known to bring his smoker to campus to grill burgers and bratwurst for students and alumni alike. Tschatschula embodies the Oredigger spirit and is a deserving honorary alum.



David Wagner

David Wagner is an Air Force Academy graduate but found himself drawn to service at Mines and was on the Board of Trustees from 1999 to 2007. He built a career specializing in corporate and securities law, and his experience as chairman of the board for Exter and Gila Communications gave him the background to help establish the Mines Foundation Board of Governors in 2009. He served as president and chairman and created the board structure that exists at Mines today. His contributions of time, talent and treasure have earned him honorary alum status.



Blaster the Burro

Burros have long been known as hard workers in the mining industry and are the embodiment of Mines’ culture through their determination, hard work and dedication. Zenith, the first burro to represent Mines made his debut at the 1936 Homecoming festivities, inspiring the Mines spirit and pride. The mascot was officially named Blaster in 1951. With his fortitude and unparalleled work ethic, Blaster has become a beloved part of the Mines community and certainly is a deserving honorary alum.

A BOLD CAMPAIGN FOR MINES’ SUCCESS

Alumni generosity has helped shape the university’s future of excellence

In the final months of the Campaign for MINES@150, the generosity of Mines alumni has helped the university exceed expectations and reach a milestone we should all be proud of. Donors have given more than a half a billion dollars to benefit the students, faculty and programs that have made Mines a top-of-mind, first-choice engineering and applied science university.

It was ambitious to launch a comprehensive fundraising campaign during a global pandemic in 2020—many other universities cut short their efforts or delayed their kick offs. At Mines, our alumni are fiercely loyal and generous, and we knew they would rise to the moment to help the university achieve the strategic priorities for our 150th anniversary and beyond.

While we have a lot to celebrate, there is still much more to do to propel Mines to a higher degree of excellence. If you have not participated in the campaign, you still have a few months to make an impact and be a part of history—every gift matters and makes a difference at Mines.

Thank you, Oregivers!

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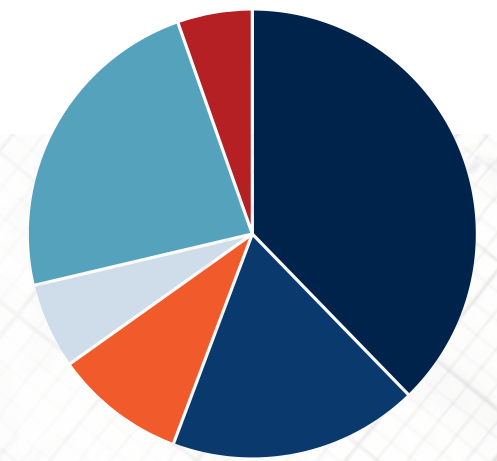
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STRENGTHENING PARTNERSHIPS AND BUILDING COMMUNITY

Bill Zisch '79 has been instrumental in building the vision for Mines' next century of innovation

BY JEN A. MILLER

When Bill Zisch '79 became president of the Mines Alumni Board in 2017, he did so not just because of his affinity for the university but also because he saw an opportunity to engage with other alumni in ways that would help elevate Mines' reputation and ensure future graduates would become industry leaders.

Zisch was in this role leading up to Mines' 150th anniversary when the university was positioning itself to lead the next century of innovation with new strategic initiatives. He was instrumental in getting alumni on board with those goals.

"It meant stopping and taking time to celebrate the past and the foundation of everything that has come in those 150 years," he said. It was a way to "take stock of where we are at and what we need to do going forward to continue to build off that very solid foundation."

His work in bringing the alumni network closer together helped build affinity for the university and highlight the close bonds within the Mines community. "It was really fun to be able to establish new relationships based on that same foundation," he said.

As board president, Zisch led new initiatives like the establishment of alumni interest groups to connect Orediggers with shared interests



and enhance the professional networking opportunities available for alumni and students. These groups also helped showcase Mines' close relationships with industry and being a preferred partner for private companies and state and federal organizations.

Zisch encouraged alumni to get involved in on-campus opportunities, too, through things like inviting them to share their expertise with students in the classroom, volunteering to help with signature events like the M Climb and judging Capstone projects. He also encouraged alumni to get involved with other Orediggers in their local communities through the M Clubs and Welcome Parties.

Though his term as Mines Alumni Board president is over, he's not done helping Mines reach its goals. Zisch has stepped into a new role as the first J. Steven Whisler Chair for the Head of Mining Engineering, where he plans to work to maintain Mines' reputation, increase enrollment and work

to "continue to ensure that we put out high-quality graduates that are meeting the needs of what industry is asking us to provide," he said.

Zisch is focused on supporting an industry faced with the challenge of sustainably securing the critical minerals and materials needed for societal progress. That means making sure future mining engineering graduates have the skills to lead the industry in new and different ways.

"We have an increasing need for minerals to support energy expansion, population growth and the increased standard of living around the world," he said. "The industry doesn't just need mining engineers and mineral processing engineers. They need a broad array of cross-functional, interdisciplinary individuals that can help meet the world's mineral challenges."

Zisch is also seeing an increased demand from across the university to use the Edgar Experimental Mine in new ways. The Mines-owned underground laboratory is a key classroom and

"THE INDUSTRY DOESN'T JUST NEED MINING ENGINEERS AND MINERAL PROCESSING ENGINEERS. THEY NEED A BROAD ARRAY OF CROSS-FUNCTIONAL, INTERDISCIPLINARY INDIVIDUALS THAT CAN HELP MEET THE WORLD'S MINERAL CHALLENGES."

research space for Mines students and faculty. It also enables unique collaborations with industry, state and federal organizations on projects spanning from advanced mining technology to quantum research.

Zisch wants to make sure that the Edgar Mine continues to be used to train and educate students in the mining department while expanding its use by other departments at Mines. In that way, Zisch can continue to support the idea of future mining operations being a cross-disciplinary venture, with Edgar Mine being "optimized to meet the goals of educating students, enriching research and providing a signature student experience."

Overall, Zisch is focused on helping Mines be a hub for students, alumni and outside partners in government and industry to work together in new ways to move the world forward.

Paul C. Johnson
President and Professor
Heritage Society Member

Brian Winkelbauer
President and CEO, Mines Foundation
Heritage Society Member



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FITTING THE PIECES TOGETHER

Chris Staples MS '96 assembled her journey to CEO through an insatiable curiosity, gaining a diverse leadership skill set

On her path to becoming a CEO, Chris Staples MS '96 has always been motivated to learn something new. Staples has held leadership roles in a variety of companies across the water treatment, oil and gas and manufacturing industries, picking up new skills and experiences along the way. She has compiled her capabilities into a skill set that has enabled her to take on executive-level roles and help underperforming organizations get back on track and achieve profitable growth.

"I moved around in various positions to teach myself things I didn't know," Staples said. "I realized both my education and variety of cross-functional roles landed me in a position where I could be a successful CEO."

Staples is currently the CEO of Cohere Beauty, a formula incubator and contract manufacturer for the beauty, personal care and fragrance industries—an area Staples was not initially familiar with. However, she relied on her innate curiosity, passion for making data-driven decisions and experiences leading other companies to step into the role ready to take on new challenges with confidence.

We sat down with Staples to hear more about her thoughts on being a leader and the capabilities and skills that have been essential to her success.

Mines Magazine: What aspects of leadership appeal to you and make you want to pursue such roles?

Chris Staples: I really love developing people and seeing them navigate along their own leadership journey. How do I make my team better? Typically, at my level, it's not about making their functional skills better—it's making them better leaders. My ability and passion to cultivate leaders at all levels—especially women leaders—is what inspires me. You're asking really hard questions to help them make decisions and challenging them to learn from their mistakes. It's enormously rewarding to watch a leader become a better leader, because it pays forward to the next leader and the next. That is genuinely my passion. I love it.

MM: What do you think are some of the skills and qualities that make a good leader?

Staples: I think one of them is listening—actively listening and asking questions to understand a situation. Too many leaders think

they have all the answers. I also think it's important to be a very clear, effective and consistent communicator. It's critical to be consistent in your leadership behaviors and decision making so you're predictable. Additional keys to being a good leader are having humility and emotional intelligence. I try to be a highly collaborative leader—I'm going to motivate and inspire the people on my team to try their hardest, to go above and beyond by practicing these behaviors myself every day. Frankly, I want my team to be better than me—that gives us the best odds to win. I love to win.

MM: How do you think your Mines background has contributed to your career success?

Staples: Using the scientific method, making data-driven decisions, learning how to analyze numbers to find solutions and critical thinking skills are huge components of what you learn at Mines. I use these skills every day.

I also learned to be very confident among very smart people, because Mines is filled with highly intelligent people. You have to be confident in yourself, both in your technical skills and your leadership skills, especially as a woman CEO.

At Mines, you gain a strong work ethic that sticks with you your whole career. You're taught to keep working until you find the answer to the question or solve the problem.

MM: You and your husband, Nick, established an endowed scholarship at Mines to support women students pursuing studies in economics and business. Why is it important to you to give back to Mines in this way?

Staples: When my mother died, she set up two scholarships but was never able to feel the joy of giving. I wanted to do the same and feel that joy. Nick and I chose to give at a place that meant something to both of us and support and encourage women to pursue technical careers. I take the

added step to personally mentor and sponsor early-career women because the statistics haven't changed—early-career women are promoted later than men, and this has a long-term impact on their career trajectory.

We chose business and economics because it's a great complement

to the more classic engineering disciplines. When I graduated from Mines, I didn't understand anything about business or how companies operated. I went on to get an MBA, and that put it all into perspective for me. The combination of the technical education from Mines and the MBA were like hand-in-glove.

When I found out that Mines had an economics and business degree, I thought it filled a gap and would be a great degree and asset for many companies.





Derek '14 and Chris '11 Saykally with their father, Steven, outside AC Transmission Total Car Care. Derek and Chris bought the business in 2020, pivoting from careers in oil and gas.

TAKING UP THE BUSINESS MANTLE

As baby boomers retire, younger generations of entrepreneurs are continuing their businesses' legacies

BY JEN A. MILLER

When brothers Chris Saykally '11 and Derek Saykally '14 bought AC Transmission Total Car Care, a Denver-based transmission repair shop in 2020, they joined a trend for entrepreneurs their age.

With nearly 10,000 baby boomers retiring every day, many of their small businesses are changing hands, with younger generations making up the majority of small business buyers today. Boomer-generation entrepreneurs don't want to have to close the businesses they've spent their careers building in order to retire or be forced to work through their golden years just to keep that business going. Now, they're looking for someone new to step into their shoes to not only carry on their business' legacy but help that business continue to grow in new ways.

"They wanted to sell to another family that would essentially keep employees and keep the shop going," Derek said of the previous owners of AC Transmission.

From layoff to opportunity

The Saykallys both started their careers in the oil and gas industry. They worked for the same company in different roles—and in different states—but both got laid off in 2020. It was Derek's second time on the chopping block, which made him realize he wanted to work in a less volatile industry. He talked to his brother about owning their own business to have control of their careers.

"We were both in the same house trying to regroup and see what we were going to do," Chris said. They struck upon an idea: why not go into business for themselves?

They logged onto a website of businesses for sale and looked at everything from a barber shop to a brewery. The

description for AC Transmission was vague but the financial numbers listed looked good. When Derek read the description of the business out loud, their father overheard him and said he knew the shop from when he had worked at a Cadillac dealer in Denver. The brothers decided to take on the challenge.

A new generation bringing crossover skills

Despite not having any experience in the automotive industry, the Saykallys turned a stable-but-not-growing business into a booming one. They doubled the shop's business in the course of three years.

"It was a huge learning curve," said Chris. "But we implemented what we used to do in oil and gas, just on a smaller scale with our own money. It's working great."

Chris and Derek changed the sales strategy, the parts system, taught themselves digital marketing and dug into how the business was run.

"Well optimization wasn't just gathering data and handing out reports. We were literally changing operational procedures on the drilling rig to save millions of dollars in down time," Derek said of his previous oil and gas role. "We were able to do it at a smaller scale for our own business."

For example, transmission jobs take a lot of time, which meant that technicians would be very busy or not busy at all. They worked on a performance-based pay structure, meaning their income often fluctuated. To make things smoother for the employees and for the business' cash flow overall, AC Transmission started adding other kinds of services, like general repairs and tune-ups, which now make up about 10 percent of their income.

A large part of their success has been due to striking a balance between maintaining the shop's existing employees and principles while implementing new business practices and tools.

The brothers see it as their mission to maintain the same culture, quality and standards of AC Transmission. They knew they would be taking over the legacy the previous owner had worked hard to build and maintain. But they also knew they could take skills honed in their engineering careers and bring new strategies to a small business to handle different economic factors and business trends.

Derek said, "Add a little bit of technology, data-based decision making and a little bit of optimization and you will definitely increase any business."

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INVESTING IN NEW VENTURES

The Mines Venture Fund 1 is helping take Oredigger ideas to market

BY ASHLEY SPURGEON

Bold ideas. Industry-leading innovation. Forward-thinking businesses. The Mines community is known for pursuing new ventures that provide solutions to industry and societal challenges. To help students, faculty, staff and alumni bring those transformative ideas to life, the Foundation launched a critical new resource last year: the Mines Venture Fund 1.

We talked to Todd McLean, managing director of the Mines Venture Fund, to learn more about the Fund, how it helps enhance innovation at Mines and how alumni can be part of the Fund's success.

About the Mines Venture Fund 1

This inaugural fund is the first of its kind for Mines as part of the university's entrepreneurship and innovation ecosystem and provides startup capital to entrepreneurs and innovators. The Fund will help commercialize products and technology or support companies that are providing a service that fills a market gap and solves a problem.

"The whole goal of the entrepreneurship and innovation program is to help build successful companies with those who have an affinity for Mines and truly have a remarkable impact on the world," McLean said.

How the Venture Fund directly supports Mines

The Mines Venture Fund general partner is owned by the Mines Foundation, which McLean said is uncommon for universities due to the high-risk nature of venture investing. But this structure means Mines directly benefits from the 20 percent carried interest by using those funds to support the entrepreneurship and innovation program. It also means Mines has a lot of confidence in the startups—and the people—it invests in.

"There's a lot of failure rate in venture investing," McLean said. "We'll have that same failure rate,

no doubt, but I believe it can be mitigated from investing in companies with economic tailwind, not headwinds. Plus, we have a lot of resources, and we can pull on our insight into the industries we're involved with."

Who is involved in the decision-making process

When an individual or business applies for funding, McLean meets with them to address gaps in their business model and discuss the problem the venture aims to solve and its market outlook.

The Fund also partners with Mines' economics and business students who perform due diligence. "It's not just number crunching," McLean said. "They talk to the founders, and they get into market analysis and financial analysis and people analysis and all the due diligence you do when you get into this business. It's really great experience for them and looks good on their resumes."

McLean presents this information to the Fund's seven-member investment committee, who all have Mines connections and determine whether a company or product is a good fit for the Venture Fund to invest in and, if so, the best path forward.

Who can be considered for funding

The Mines Venture Fund supports companies with ties to Mines, including graduates, faculty, staff and students. It also partners with the National Renewable Energy Laboratory and the West Gate Lab-Embedded Entrepreneurship Program to back ventures focused on alternative energy solutions. Two companies have benefited from the Fund so far: GelSana Therapeutics and Infinite Outdoors. GelSana Therapeutics, a startup founded by Mines Associate Professor of Chemical and Biological Engineering Melissa Krebs, received seed equity funding for a novel polymer-based

gel that improves wound healing. Infinite Outdoors, founded by Mines alumni, received support for their website and mobile app that connects property owners with hunters, anglers and other outdoor enthusiasts seeking private outdoor experiences.

The Venture Fund is prepared to help any Oredigger with a good idea that meets the funding requirements. "I've had an 87-year-old walk in with an invention, and I've had a 17-year-old walk in," McLean said. "That's five generations we're touching right now. I'm already seeing great excitement develop around this."

Mines alumni are important to the Fund's success

While Mines alumni can bring their ideas and inventions to the Venture Fund for consideration,

they can also support Mines entrepreneurs and innovators by sharing their business networks and industry insights. They can also directly invest in the Fund as limited partners.

The Venture Fund is seeking an additional \$7 million in investments to sustain and expand the entrepreneurial support Mines has built in recent years.

"It is critical that alumni get behind this," McLean said. "They can become part of something brand new to Mines, unique to the world and uniquely structured that is 100 percent aligned with companies that have an affinity for Mines. We hope that will reward them for taking that risk as early investors and build remarkably impactful companies and have remarkable success together."

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Rystad Energy is proud to employ Mines alumni and students and gathered the Orediggers working at the company for a photo earlier this year. **Rob Corday MS '93** was recently promoted to managing director for the Americas Region. **Roxanna (Frary) Bush '10** has been at Rystad for more than three years. **Susana Palacios Lopez MS '23**, **Darshil (Manish) Shah MS '23** and **Abdallah Ahamada El Badaoui MS '23** joined Rystad in January 2024. Graduate students **Everett Delate '23** and **Ella Baldwin** completed summer internships with the company this year.

1980s

Linda Chalot '83 stepped down as shareholder, officer and director of Chalot Hatten Banker PC after 33 years in February 2024. She continues to work on selected matters for the firm.

Kelly Coleman MS '87 was inducted into the American Institute for Medical and Biological Engineering (AIMBE) College of Fellows on March 25, 2024. Kelly was selected for scientific and engineering contributions to biocompatibility and toxicology that have supported advancements in both medical technology and testing standards. Of the 2,833 members of the AIMBE College of Fellows, Kelly is the sole toxicologist.

Jon Johnson PhD '87 received DuPont's 2023 Pederson Award on Sept. 7, 2023. The Pederson Award is awarded to those whose deep technical knowledge, skill, achievements and commitment in

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.

their respective areas have resulted in important new products for DuPont customers.

2000s

Bernadette "Bern" Johnson '07, the general manager of power and renewables at Enverus, was named the Outstanding Woman in Business winner by the Denver Business Journal in August 2024.

2010s

Preston Wolfram '11, MS '13 married Amanda McGee on October 7, 2023, in Oklahoma City. Many Mines alumni were in attendance, including groomsmen Edward Wolfram '15 and Phillip Wolfram '08.

Clayton Kyle Bible '13 and **Cassie Bible '15** welcomed their third son in April 2024, joining his big brothers Emmett (4) and Beck (2). Otto Graham Bible can't wait to be an Oredigger.

Erica (Kellenberger) Ladwig '14 and her husband, Matthew, welcomed their baby boy, Viktor Joseph, on March 19, 2014. The new parents are looking forward to bringing the future Oredigger to many football games to cheer the team on in a successful season and enjoy the marching band.

Roy Stillwell '14, with his company Nearwave, launched a non-invasive handheld imaging device that helps physicians select the right therapy for breast cancer patients in May 2024.

Leo Frenkel '15 and his wife, Carly, welcomed a baby boy to their family. Asher arrived on March 26, 2024.

Taylor (Helbig) Spurgeon '15 and **Cole Spurgeon '16** welcomed a baby girl, Ridley Lake, on March 24, 2024. Ridley joins the Spurgeon clan with two older sisters, Ryman (3) and Rowyn (1), and an older brother, Link (3).

Andromeda King '18 and **Alexander Bart '18** were married April 6, 2024, in Colorado Springs, Colo. The couple met as Mines students while they were both earning degrees in engineering physics.



Abbie Steiner '19, MS '20 and **Grant Martin '19** were married at the Evergreen Lake House in Colorado on September 21, 2024. The couple met on the concrete canoe team at Mines and began dating after competing in the national competition.

2020s

Jed Wilson '21 and **Tara Buzinski '21** were married on June 1, 2024, in Salt Lake City. A quarter of the attendees were Mines alumni, including bridesmaids Vasey Stephens '22 and Kiki Herbst '22 and groomsmen Ignacio Varela '21 and Alex Coronado '21. The couple met on move-in day as first-year students at Mines and have since lived an adventure-filled life together in Colorado and Utah.

Lander Turner '23 joined the Institute for Defense Analyses (IDA) as a research associate in the Strategy, Forces and Resources Division of IDA's Systems and Analyses Center in June 2024. IDA is a nonprofit corporation that operates three federally funded research and development centers in the public interest.

Sana Zafar PhD '23 was awarded the 2024 D. N.G. W. Cook PhD Dissertation Award for the best PhD thesis in rock mechanics at the 2024 U.S. Rock Mechanics/ Geomechanics Symposium, hosted at Mines this summer.



Asher Frenkel



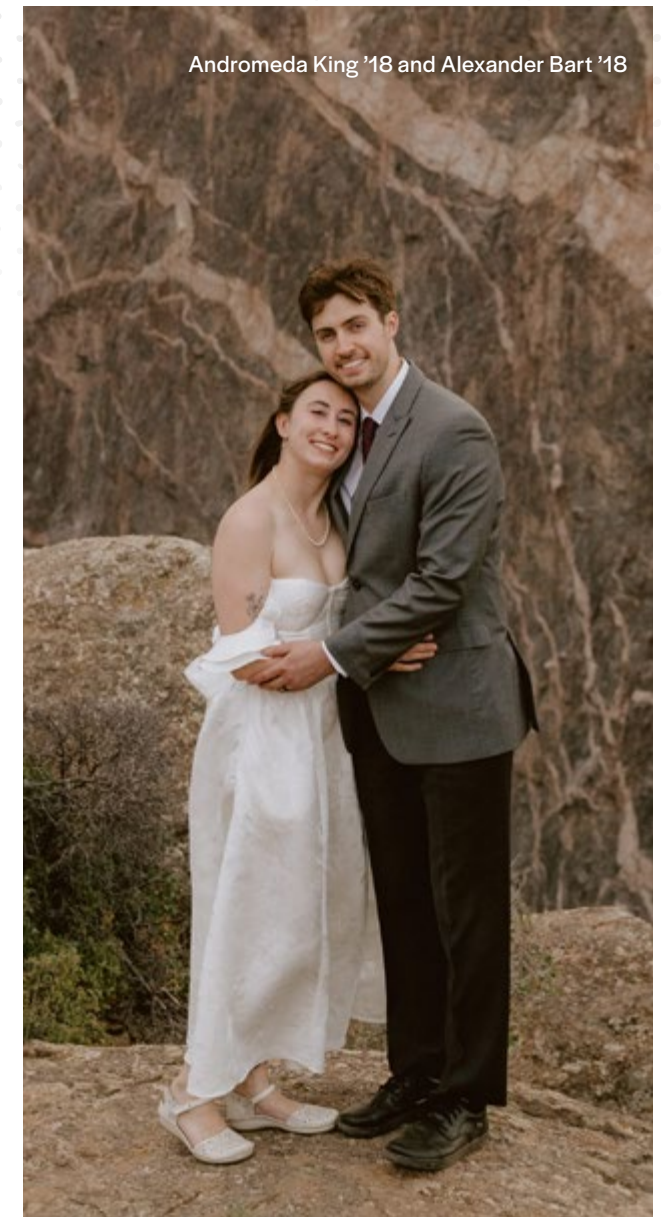
Abbie Steiner '19, MS '20 and Grant Martin '19



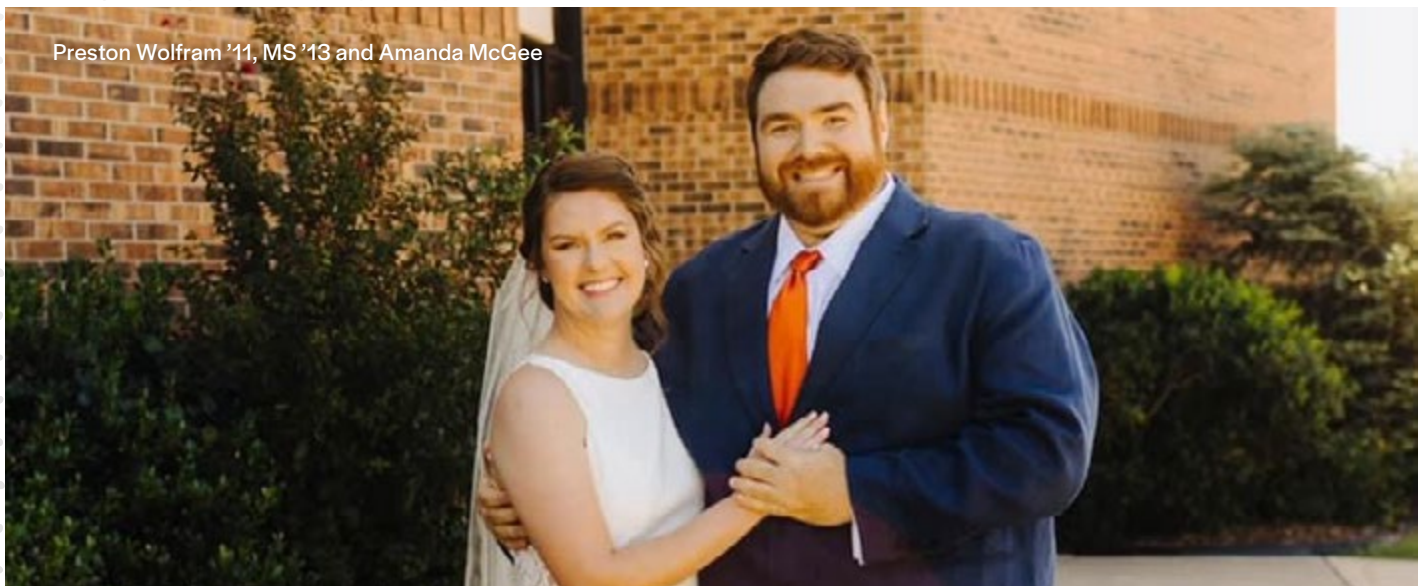
Jed Wilson '21 and Tara Buzinski '21



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Andromeda King '18 and Alexander Bart '18



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IN MEMORIAM

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

Prem S. Advani MS '56 died March 28, 2024. Prem was born in 1930 and emigrated from India to the U.S. to pursue a master's degree in petroleum refining at Mines. He spent his career in the chemical manufacturing industry, working for Texaco. He advanced to senior leadership in the company before retiring in 1993. He then consulted for a small chemical company for more than 20 years.

Arvid "Andy" N. Anderson '54 died February 4, 2024. Born in 1931, Andy spent 39 years with Alcoa Corporation as a metallurgical engineer, specializing in foil rolling. He also served in the U.S. Army Corps of Engineers for two-years and worked as a consultant in his later career.

Robert R. Cederstrom '60 died June 11, 2024. Bob started his career as a metallurgical engineer with Asarco. He later went to work for Monsanto in industrial construction, working on projects across the United States. He then joined Alyeska Pipeline and worked on the construction of the Trans-Alaska Pipeline System. Upon its completion, Bob worked for local construction companies and then continued consulting in retirement.

Harold "Hays" H. Griswold '75 died November 7, 2023. Born in 1950, Hays began his career as the general manager of the Bellevue Underground Mine for Sunshine Silver Mining and Refining Company. He later was part of the emergency response division of the Environmental Protection Agency until he retired in 2018.

Douglas N. Halbe '61 died April 9, 2024. Born in 1939, Doug built a career in the mining industry and worked in the United States, Australia and Papua New Guinea. He also was an honorary teaching fellow at the Western Australian School of Mines and later an adjunct professor at the University of Utah. He ended his professional career as a consultant before his retirement.

Robert "Bob" B. Joyce '54 died on April 25, 2024. Bob served in the U.S. Corps of Engineers during the Korean War. He then spent his career working in a variety of roles, including as a geologist, petroleum engineer and oilfield machinery marketing executive.

Joseph J. Krupar PhD '73 died March 22, 2024. Born in 1941, Joseph went to work for the U.S. Atomic Energy Commission in 1972 to research the design and performance of MOX fuels. He later joined the U.S. Department of Energy team that oversaw the construction and operations of the experimental Fast Flux Test Facility at the Hanford Nuclear Site and served as a DOE operations manager of the Hanford Site Tank Farms. He was transferred to the Rocky Flats Plant where he served as the senior resident inspector and played a key role in the plant's eventual shutdown. He was awarded the DOE Meritorious Service Award October 1990 in recognition of his accomplishments as a site safety representative at Rocky Flats. He also received the DOE Distinguished Career Service Award when he retired.

Raymond L. Lowrie MS '72 died on April 1, 2024. Ray was born in 1933 and spent more than 30 years working for the U.S. Department of Interior with the Bureau of Mines and Office of Surface Mining Reclamation and Enforcement. After retirement, he worked for the Society of Mining, Metallurgy and Exploration. Ray also published *The Elephant's Grip*, a novel focused on the Colorado Gold Rush.

Leslie "Les" L. Ludlam '62 died March 17, 2024. Les worked 30 years for ARCO in Colorado, California and Alaska. During his career in Alaska, he was appointed as the crisis manager of the response group following the Exxon Valdez oil spill. Les later earned a Master of Divinity from the Iliff School of Theology in 1995, was ordained in 1998 and then served as a pastor at several United Methodist churches in Wyoming and Colorado until he retired in 2006.

William E. Moyer '85 died March 2, 2024. He worked at Martin Marietta Materials as an electromagnetic compatibility engineer prior to graduating from Mines. He then worked as a subcontractor to Boeing on their defense program. He transitioned from military work into the commercial sector when he went to work for Qualcomm, working primarily on satellite phone systems. In 2000, he joined Hewlett-Packard in their commercial inkjet printer division until his retirement.

Martin G. "Marty" Olsen '65 died May 16, 2024. He was born in 1942 and served in the U.S. Army from 1965 to 1977 and worked with the U.S. Army Corp of Engineers. He was also a mining engineer for several years with North American Coal. He then worked until his retirement for the North Dakota Highway Department.

William "Bill" S. Price '61 died on April 19, 2024. Bill served as a second lieutenant in the U.S. Army. Following his military service, he built a career in the mining and construction equipment industry that spanned more than thirty years and took him across the globe. He was appointed president of Reed Mining Tools in 1977, which later became Baker Hughes Mining Tools. He later became the CEO of Eimco Jarvis Clark and then founded his own management consulting firm specializing in corporate renewal, acquisitions, mergers, and strategic redirection.

- ➔ To submit an obituary for publication in *Mines Magazine*, visit minesmagazine.com/obituary.
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Key moments in Mines history



Late 19th century

1874: Colorado School of Mines is founded in Golden, Colorado.

1883: Mines holds its first formal Commencement, graduating William Middleton and Walter Wiley.

1876: Mines becomes a state institution with the formation of the State of Colorado.

1885: "The Mining Engineer," the school's fight song, was established on campus.

1895: The Alumni Association is formed. The Alumni Office now operates within the Mines Foundation.

1898: Florence Caldwell becomes the first woman to graduate from Mines, earning a civil engineering degree.

Early 20th century

1908: The hillside "M" is constructed on the side of Mt. Zion.

1910: *Mines Magazine* is first published.

1919: Mines becomes one of the first four colleges in the U.S. to establish a ROTC program.

1924: The first Homecoming is celebrated on Nov. 15, 1924.

1927: Engineering Days, or E-Days, begins, kicking off an annual tradition.

1930s: The school adapts to the changing economic landscape and expands its focus to include other engineering disciplines, reflecting the broader technological needs of society.

1932: The "M" on Mt. Zion is permanently lit with electric lights.

1934: The first silver diplomas are awarded to the graduating class.

1950s: Mines experiences continued growth and modernization, establishing new facilities and laboratories to keep pace with scientific and technological advancements.

1951: "Blaster" officially becomes the name of Mines' miniature burro mascot.

1953: First-year students begin the tradition of adding a rock to the "M" during the M Climb.

Late 20th century

2000s: The school embraces technological advancements, integrating cutting-edge research and technology into its curriculum and becoming a leader in sustainable energy research.

2003: Marvin the Miner, named after alum Marv Kay '63, was named as a secondary mascot.

2010s: Mines continues to strengthen its reputation as a top engineering and science institution, with a focus on interdisciplinary research and collaboration.

2015: The Clear Creek Athletic Complex opens, with Marv Kay Stadium as the flagship facility.

2017: Mines hosts the inaugural Oredigger Camp, to introduce first-year students to what it means to be an Oredigger.

2022: Mines is designated as a R1 "Very High Activity" Research University.

Present Day

Present day: 150 years after its founding, Mines stands as a prestigious institution, known for producing leading graduates in a wide range of engineering and applied science disciplines. It remains at the forefront of engineering research and innovation, contributing to advancements in various industries.





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To commemorate 150 years of excellence, Mines hosted its biggest celebration yet this fall. Blaster’s Bash, part of Homecoming weekend, brought the Mines community together on Kafadar Commons for photos with Blaster the Burro, games, live performances and more. Orediggers could also try out exclusive products from alumni-owned businesses, such as Helluva Whiskey from The Block Distilling Co. and Helles and Engineer from Mountain Toad Brewing. The event also unveiled a new addition to campus—the Sesquicentennial Bell that now sits in front of Guggenheim Hall.

➔ Visit 150.mines.edu to learn more about Mines’ enduring legacy and where the university is headed next.