

MINES MAGAZINE

For Colorado School of Mines Alumni and Friends • Spring 2022

100 *years* AND COUNTING

In the century since the Petroleum Engineering Department was established at Mines, the university has educated the world's top energy leaders, and it's focused on doing the same and more for the next 100 years.

Plus:

Mines alumni take on a new kind of engineering challenge: restoring a 150-year-old family home.

Mines was elevated to the top tier of research universities in the U.S. this year, signaling the influence and excellence of research on campus.

MINES.EDU

The background of the entire page is a long-exposure photograph of a star trail timelapse. The stars appear as numerous bright, white, diagonal streaks against a dark, deep blue night sky. In the lower portion of the image, the dark, silhouetted peak of South Table Mountain is visible, its rugged features softened by the darkness.

@COLORADOSCHOOLOFMINES



There's nothing quite like the views from the Mines campus, especially when you can capture a timelapse of South Table Mountain under the stars.

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



FEATURE

100 YEARS AND COUNTING 18

A century after establishing the Petroleum Engineering Department, Mines continues to educate today's top energy leaders and remain at the forefront of the global energy future.

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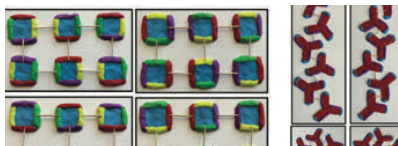
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Expanded business programs upgrade career potential for Mines students and alumni

Today, industry and government are looking for engineers and applied scientists who speak the languages of business and technology with equal fluency.

Mines is answering this demand by expanding our highly quantitative undergraduate and graduate business offerings to complement the rigorous, hands-on technical programs that bring students to Mines.

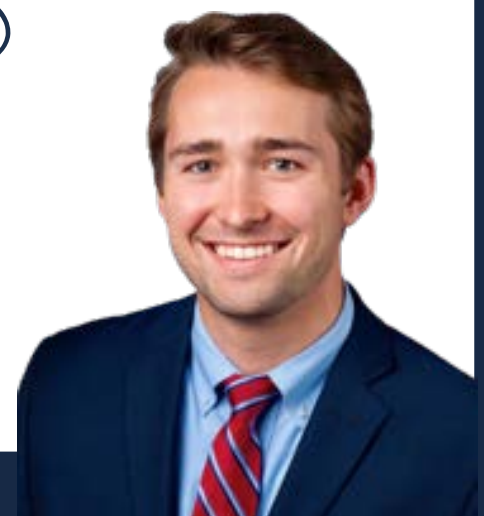
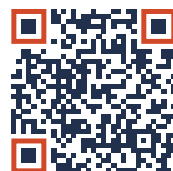
The one-year engineering and technology management master's degree program has been the foundation of business at Mines since 2001. It inspired Mines' new bachelor of science in business engineering and management, as well as new online graduate certificates.

ETM students learn critical business and management skills that traditional MBAs offer, but they zero in on gaining technical depth and quantitative management expertise that can lead to elevated career opportunities and lifetime earnings.

"Mines is world-renowned for producing incredible engineers and looks to put those engineers into the highest levels of leadership throughout our nation," said ETM graduate Robert Killion '17. "Having that engineering knowledge will take you a long way, but you must have business acumen to succeed in today's world. The ETM program gave me that leg up and put me on my path."

Whether a student aims to be a global corporate leader or to use business savvy on a different career path, Mines will deliver the possibilities. With your philanthropic support for business at Mines, you can make this happen.

Learn more about business at Mines at campaign.mines.edu/business



EDITOR'S LETTER

Celebrating Mines' accomplishments—
past, present and future

It's always exciting to celebrate Mines' many achievements, from innovative student projects, to the groundbreaking research led by Mines faculty, to the big wins from the Oredigger athletic teams and more. But it's truly special when we get to celebrate big milestones and not only look back on where we've been but also look forward to where we're going and what we can accomplish next.

This year, we get to celebrate the Petroleum Engineering Department's 100th anniversary—a century of educating the world's oil and gas leaders and standing at the forefront of energy innovation. When looking retrospectively on how the department has grown and evolved over the years, you get a good idea of the impact the department and its graduates have had on Mines and the world. Petroleum engineering alumni are known globally for their skills and expertise, and the department has an incomparable network that has cemented Mines' role as a leader in the U.S.—and the world's—energy conversations and actions for decades.

But this milestone also gives Mines a chance to look ahead at what comes next. As you'll read in our cover story, petroleum engineering will continue to play an important role in meeting the world's energy demands over the next century, and Mines graduates will continue to lead that work in addition to directing new efforts toward reaching a net-zero carbon future and tapping into renewable geothermal energy sources.

There are also many other stories in this issue that highlight Mines' leadership in some of today's most demanding challenges. It's a narrative that defines what it means to be an Oredigger. These stories are what elevate Mines to a new caliber of defining what is possible.

This magazine will continue to share all of Mines' biggest achievements, and I hope you'll continue to follow along and support your fellow Orediggers. Mines and its graduates are changing the world for the better—and that is something always worth celebrating.



Ashley Spurgeon



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REACHING OUR GOALS

Your ideas and investments are making an impact

This issue of *Mines Magazine* and the accompanying Campaign for MINES@150 impact report provide insight into some of the ways members of the Mines family are encouraging and supporting us to enhance our programs and Oredigger experiences. Behind each of these MINES@150 initiatives is a story that traces back to an idea, inspiration and investment from students, families, faculty, staff, alumni and/or industry partners.

I often think of these origins and the very special people behind them as we launch new programs and watch their impact grow. That was certainly true in this past month when I attended the inaugural symposium for the Vallejo-Irvine Professional (VIP) Development Program, walked by construction of the Labriola Innovation Hub and participated in the ribbon-cutting ceremony for the Beck Venture Center. I also saw it when I had pizza with Harvey and Grewcock Scholars, was interviewed by Thorson and Grandey first-year honors program students, heard about the 20 start-ups being helped by our McNeil Center for Entrepreneurship and Innovation, followed the Payne Institute's coverage of the Ukraine war, met with Betsy's Friends peer educators, and had lunch with about 100 scholarship students who probably wouldn't have been able to attend Mines without financial support.

As a public university, it often surprises friends, parents and others when I detail just how essential these individuals and investments are to moving us toward our "top-of-mind/first-choice university" goal and to ensuring we can do what Mines has always done—produce the talent, knowledge and innovations that our state, country and world need for prosperity. Today the state funds less than 10 percent of our budget, so private and corporate gifts and investments are essential to Mines being Mines. I often say that almost everything we have that makes us and our graduates distinctive can be traced back to private or industry support.

As you follow our progress toward our sesquicentennial through *Mines Magazine* and future impact reports, please know how grateful we are for your ideas and support of our programs and students. If you haven't already, I invite you to get involved. With two years to go, there is still a lot to do, and we can't do it without you.

Go Orediggers!



Paul C. Johnson
President and Professor





A NEW LEADER ON THE FIELD BY TIM FLYNN

Mines' new football coach is setting the Orediggers up to win

When Gregg Brandon announced he would hang up his whistle as Colorado School of Mines' head football coach after seven seasons in Golden and 43 years coaching the sport, it presented a unique opportunity for the program. Coming off their best season ever, and with the entire assistant coaching staff still in place and a veteran-laden roster ready to do it again in 2022, who would be the next leader for Oredigger football?

As it turned out, Director of Athletics David Hansburg didn't have to look far.

Brandon Moore was promoted to the head coaching role on January 31, 2022, after six seasons as an assistant coach for the Orediggers, including the last four as defensive coordinator. Moore had proven his merit on the defensive side of the ball by leading one of the nation's most dominant units in both 2019 and 2021. This past fall, a relentless Mines defense ranked among the top-10 in NCAA Division II in turnovers produced, interceptions and sacks, producing two shutouts and allowing only 14.7 points per game.

Now, Moore will apply the same mindset that elevated the Orediggers' defense as he guides the program to their next goal: a national championship.

"Defensively over the years, we've poured a lot into our players," Moore said. "That's our motto: 'everybody, all the time.'"

That motto was built over more than two decades in football for Moore, an NFL veteran and former national champion at University of Oklahoma. A native of Baldwin, N.Y., Moore played linebacker on the Sooners' 2001 national championship team then went on to a long professional career that included six seasons with the San Francisco 49ers from 2002 to 2007, a season with the

San Diego Chargers in 2010 and three seasons with the United Football League's Las Vegas Locomotives in 2009-10 and 2011. After his playing retirement, he eventually started in coaching as the defensive coordinator and linebackers coach at Scottsdale Community College in Arizona before coming to Golden as the Orediggers' linebackers coach before the 2016 season.

Now, he takes over a team that was two wins away from a national championship in 2021. At 12-2, Mines won its third consecutive Rocky Mountain Athletic Conference crown on the way to capturing the NCAA Super Regional title for the first time ever. That brought with it a trip to the NCAA Division II semifinals, a national TV appearance and, perhaps most importantly, the opportunity to know that the ultimate goal is within reach.

"We can see the national championship. We can see the possibility of getting there. And I don't think we've always had that mindset at Mines," Moore said. "Prior to this season, a lot of onus was put on luck, but I believe these players earned it. They went out and worked for it."

Hansburg has no doubt that Moore will take Mines' football program to the next level. "If I had to put one quality to Brandon Moore, he's a perfect fit at Mines," Hansburg said. "He is a 'Mines guy.' His collaborative style that I've seen over the years, he has a way to bring people together that's rare."

"I couldn't be at a better place," Moore said. "Coach Brandon did a great job with the culture and pushing this program to heights that nobody thought possible. We do great things here, with the best people, best athletes, best students."

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



BEHIND THE SCENES OF *THE COLLEGE TOUR*

Mines had the unique opportunity to showcase all the best aspects of the Oredigger experience in a new way this year—by being featured on an episode of *The College Tour*, a TV series that tells the stories of colleges and universities across the U.S. To celebrate the premiere, Mines hosted a behind-the-scenes look at the episode and a live Q&A with the student stars in March to learn what it was like to film the episode and share their Mines experience in a new way.

A couple of Mines alumni were also featured in the episode to share what they love about Mines and the opportunities their education and Mines experiences have given them. Here's what they had to say about representing Mines on *The College Tour*.

"Mines has given me so many great opportunities (track, Blue Key, internships), friendships (through Pi Phi and athletics) and just overall great times. I wanted to share the uniqueness of a STEM athlete experience but also share how much Mines means to me. It was a little daunting for sure being in front of a camera, but it was great to have the support of my coaches, teammates and friends. I wanted to be involved not just for me but for them, to show how amazing our community is."

Kat Tomon '21

Master's student, Operations Research

"Having been through Mines a couple times already, I know the positive impacts these degrees have made on my life. Being able to share that message with the world through *The College Tour* was something I was excited to do, and I hope any aspiring engineers see the show and take up the challenge of being the next generation of Orediggers."

Eric Wilson '94, MS '04

PhD candidate, Space Resources

► Watch the full episode at mines.edu/the-college-tour before it streams on Amazon Prime Video in late April 2022.



MINES GRADUATES HAVE HIGHER-THAN-AVERAGE OUTCOMES AFTER GRADUATION

Mines Career Center's latest annual report found that Mines graduates continue to have overwhelmingly positive outcomes after graduation. This includes graduates committed to their first destination, whether that was a job in industry, government and military service or going to graduate school, as well as international students returning to their home countries.



CONNECTIONS

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



◉ A HUB FOR MINES-USGS COLLABORATION

■ Mines welcomed U.S. Secretary of the Interior Deb Haaland to campus on Friday, Feb. 18, 2022, as part of her tour of the U.S. Geological Survey's Geologic Hazards Science Center.

During her visit, Haaland and members of Colorado's Congressional delegation announced that Mines will be the location of a new energy and minerals research facility for USGS, being made possible by funding from the Bipartisan Infrastructure Law.

The new facility will be located on campus at 18th and Cheyenne streets, on the site of a parking lot that currently serves the Geologic Hazards Science Center. USGS energy and minerals researchers will work alongside the university's geoscience and energy professors in the new building.

"We are excited to be expanding the U.S. Geological Survey presence on the Colorado School of Mines campus," said Mines President Paul C. Johnson. "The combined expertise of our two organizations will make Golden, Colorado, the epicenter of knowledge, research and education related to earth, energy and the environment. The soon-to-be-built world-class energy and minerals research facility will be the central hub for Mines-USGS collaborations on the critical mineral and energy challenges of our day, and it will also provide an unparalleled educational opportunity for our students to work and learn at the cutting edge of research and technology development with both Mines and USGS experts."

92% of the Class of 2021 saw positive outcomes.

Graduates had an average starting salary of **\$76,000**.

18% of the Class of 2021 continued with advanced education.

58% of bachelor's degree graduates accepted job offers in Colorado.

87% of students who pursued graduate school chose to do so at Mines.

92% of master's degree graduates and **96%** of PhD graduates from August 2020, December 2020 and May 2021 had positive career outcomes post-graduation.

In separate rankings from Georgetown University, Mines was shown to have the second highest return-on-investment for low-income students among all public universities in the U.S. Mines' expected 40-year earnings for low-income students are listed as **\$2,067,000**.

◉ DAVID LAWLER APPOINTED TO MINES BOARD OF TRUSTEES

■ In December 2021, Colorado Gov. Jared Polis appointed David Lawler '90 to the Mines Board of Trustees for a four-year term.

Lawler—who served as a student trustee to the board during his undergraduate days at Mines—is chairman and president of BP America and CEO of BPX Energy. As BP's chief representative in the United States, Lawler leads the collective efforts of the company's U.S. businesses as they progress toward BP's net zero ambition and shift into an integrated energy company, producing resilient and focused hydrocarbons, expanding the company's presence in convenience and mobility, and increasing investments in low-carbon electricity and energy.

In his role at BPX Energy, BP's onshore energy team in the U.S., Lawler guides the delivery of resilient, high-margin hydrocarbons from positions in Texas and Louisiana. Under his leadership, the company recently committed to reaching zero routine flaring in its U.S. onshore operations by 2025, building on recent success reducing flaring intensity in the Permian Basin to 2 percent in 2021 from 16 percent in 2019.

A Denver native, he also serves on the executive committee of the American Petroleum Institute, board of directors of the Permian Strategic Partnership and board of directors of the Mewbourne College of Petroleum Engineering at the University of Oklahoma.



► Wendy King '90 gave a presentation about her road to success at ConocoPhillips at the North American Prospect Expo reception in February 2022. •



DEFINING THE OREDIGGER STORY

Revealing—and repeating—what is real, relevant and rare about Mines

In 1997, Steve Jobs appeared in front of a small audience to talk about his ambition to make Apple better understood and more desirable than anyone believed possible at the time.

“This is a very complicated world [...] a very noisy world. And we’re not going to get a chance to get people to remember very much about us,” he said. “And so, we have to be really clear about what we want them to know.”

The grainy video of this speech is popular in marketing circles because of how succinctly it states the purpose of branding. It’s not about logos and colors. It’s about deciding what is valuable and distinct about a business or product and putting all your time and energy into telling that story.

As Mines approaches its 150th year, it too is applying increased attention to becoming better known and understood as a “top-of-mind and first-choice university” among students, public and private partners, and faculty and staff. To reach this goal, Mines is sculpting a succinct message it can broadcast—and repeat—to an ever more complicated and noisy world.

“As a public university, we don’t have the resources to launch a large-scale and ongoing media blitz,” said Jason Hughes, chief marketing officer at Mines. “But this is Mines. And what we do have is the ambition and discipline to distill who we are and consistently and creatively demonstrate our value and distinctiveness to a growing audience of potential students, government officials, industries, journalists and others.”

Mines hired an agency partner, Ologie, in fall 2021 to host dozens of focus groups and interviews and complete a survey of more than 4,000 alumni, current students and employees, industry leaders and even high school counselors. Next up, as Jobs put it, is getting specific about what we want to say about Mines. That message will be defined and tested—including with a survey to all alumni and donors—this spring.

Even as this work gets moving, Mines will also be launching its first-ever comprehensive logo project to assess how well the university’s marks represent Mines and help tell our story. This work will be tested with the Mines Alumni Board and many others across the spring with the plan to debut a new, evolved brand kit later next year.

CONNECTIONS

- ▶ Jered Dean '04, MS '09 joined other entrepreneurial leaders at this year’s Mines Entrepreneurial Showcase in February 2022 to share insights into creating a company. •



Here are a few insights we've learned so far that are informing this work:

What makes Mines different?

According to institutional and competitor research completed by Ologie, there are five things that differentiate Mines from peers and competitors:

1. Our historic connection to industry.
2. Our work ethic and collaborative approach. "We carry rocks up a mountain for fun."
3. A location that inspires, challenges and offers opportunities.
4. "Our work creates the next frontiers." Mines presents solutions to the challenges confronting industry and society.
5. "We're powering a sustainable and more prosperous future. Mines graduates show up prepared and deliver solutions that move them and the world forward."

"What words would you use to describe a Mines graduate?"

(Top results across responses and audiences):

"Hardworking, intelligent/smart, driven, dedicated, prepared."

"What are the most important outcomes for college graduates today?":

1. The ability to communicate clearly and effectively
2. Being ready to work
3. The ability to learn quickly as tools, expectations and industries evolve.

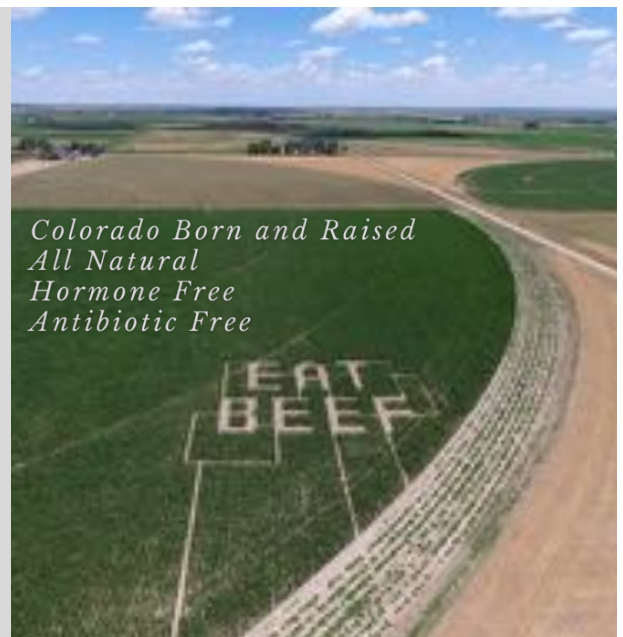


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Ryan Hemphill, Owner
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*Colorado Born and Raised
All Natural
Hormone Free
Antibiotic Free*



Photo by Katy Neubauer,
Studio708

A FAMILY LEGACY, RESTORED

BY ASHLEY SPURGEON

A historic home gets new life while preserving the original details

In the past couple of years, it's been common to try out some new do-it-yourself home projects or even some larger-scale renovation projects. Maybe you decided to hammer out a new deck to give yourself a more enjoyable outdoor oasis or perhaps you updated your home office while working more hours from home. But while the rest of us were figuring out which paint colors worked the best in our updated spaces, Becky Brown '92 and Paul Williams '89 were finishing up a much bigger—and much more complex—project.

Back in early 2018, a historic house built in 1869 went up for auction in Oshkosh, Wisconsin. The house was originally built for Oshkosh resident William H. Doe, a prospector who made his fortune from silver found in Central City, Colorado. He was also the former father-in-law to Elizabeth McCourt, who became Colorado's famous "Baby Doe Tabor" after divorcing Doe's son and marrying Horace Tabor. Doe became instrumental to Oshkosh's development but eventually moved back to Colorado, and the house was sold.

It turns out, Brown is Doe's lineal descendent. And when she found out the house she knew once belonged to her great-great-great-grandfather was up for auction, she knew she had to make a bid.

"I realized that historically in Oshkosh, if a house is on the auction block it's likely to get torn down," she said. "Since it was an ancestral home, I talked with my husband, Paul, and we decided to try to save it."

Since they were living and working in Texas when the house went up for auction, Brown and Williams bought the house basically sight unseen. From the photos they saw, the house didn't look like it was in too bad of shape—Brown thought it needed some cosmetic updates, such as new paint and carpet—and she and Williams thought they could turn it into a bed and breakfast. But when they finally took ownership, as you might expect with a 150-year-old house, it quickly became clear more extensive repairs were needed.

The couple wanted to return the house as near to its original 1869 design—with some modern amenities

CONNECTIONS

- Mines alumni got to hear from Arthur Lakes Library at the February 2022 Lunch Bunch event and discover all the ways the library helps Mines students learn. •



One challenge of renovating the Doe House was the corroded galvanized pipes that needed to be replaced throughout the house.

Photo courtesy of Becky Brown

and conveniences—but quickly discovered some plumbing, electrical and other renovations that had been added over the years would have to be completely redone.

“We went in and turned the water on and immediately started hearing a burbling somewhere, so we knew there must be a leak,” Williams said. “We realized we had a tiger by the tail at that point.”

He wasn't joking. The original city water line that ran to the house was lead pipe, and the 75-year-old galvanized plumbing Brown said “looked like Swiss cheese.” The dining room ceiling was sagging due to some leaking pipes and a previous renovation where several ceiling joists had been cut, compromising its structural integrity. New boilers had to be added to utilize the converted hot-water radiators. The knob-and-tube wiring throughout the house all had to be removed and replaced. The kitchen had to be updated to become more functional.

Despite the enormity of these challenges, Brown and Williams' engineering backgrounds proved useful for all the major decisions they had to make when restoring the house. “It was a huge impact on

the direction we took with doing the house,” Brown said. “I was more interested in the pipes and the efficiency and the function of the structure. Somebody once said to me, ‘You know, nobody's going to be able to see any of these things.’ But it's important to me. I want to know that this is more efficient, and there's some sustainability in preserving the structure as opposed to tearing it down and starting over. The appeal to me was on the engineering side.”

Williams approached the project in a similar way. “It's definitely the engineering view of things,” he said. “How can we create something better, but at the same time, drive some additional efficiencies into it and do some cost-benefit analysis.”

The couple spent the next couple of years overseeing these major updates, and the house became a passion project for them both. For Williams, in particular, it was a great project to pick up after retiring from the oil and gas industry. To recognize their efforts at preserving and restoring the historical aspects of the house, Brown and Williams were awarded the Acanthus Award by the City of Oshkosh Landmarks Commission for educational outreach in historical preservation. The house was also awarded a landmark plaque in July 2019 for the structure's 150th anniversary.

“I think, in the end for us, it was being able to preserve that history and then be able to share it with others and maybe drive some enthusiasm for that,” Williams said. “I think we would do it again. This one was special, because it was in [Becky's] family and it was a labor of love. The next one will also probably be a labor of love, but in a different kind of way.”

THE DOE HOUSE

- 4,700 square-foot house
- Four bedrooms that sleep up to 12 people
- Originally built in 1869
- Available to book on VRBO

Artist-in-residence program

Much of the Doe House's restoration and renovations were completed at the height of the COVID-19 pandemic. While Brown and Williams couldn't open the house as the bed and breakfast they originally intended, they did open it as a short-term rental. And In February 2021, they started an artist-in-residence program to give artists a safe place to isolate while gaining a new place to find inspiration and creativity. The program continues today, and artists of all mediums are invited to apply to stay anywhere from 10 days to three weeks.

The Carriage House

Brown and Williams also restored the carriage house on the Doe House's property. The carriage house was rebuilt in 1913 but was infested with critters and had been pushed off its foundation. They fixed the foundation, insulated the structure and updated the wiring for electric vehicles.

► Robert Braun, advanced energy systems graduate program director, shared an overview of the AES program with Mines alumni at the March 2022 Lunch Bunch event. •



NEXT-GEN MATERIALS

A new class of crystalline framework could lead to a materials revolution

Chalcogen bonding, a recently discovered interaction between molecules, could lead the realization of a new class of crystalline framework materials: Chalcogen-Bonded Organic Frameworks.

Mike McGuirk, assistant professor of chemistry, received a National Science Foundation CAREER Award for research related to this idea that could contribute to the discovery of new materials for solar energy production, low density conductors and more. He shared more about why this work is important and the impact this could have on our materials knowledge.

The problem

“We are seeking to understand if chalcogen bonding should join the ranks of other long-studied inter-molecule linkages, like covalent, hydrogen, and coordination bonds, in the realm of synthesizing porous frameworks,” McGuirk said. “These efforts build on our recent discovery of the first example of a porous chalcogen-bonded framework in 2021.”

The hypothesis

“Because of its unique combination of physical properties, we hypothesize that porous frameworks

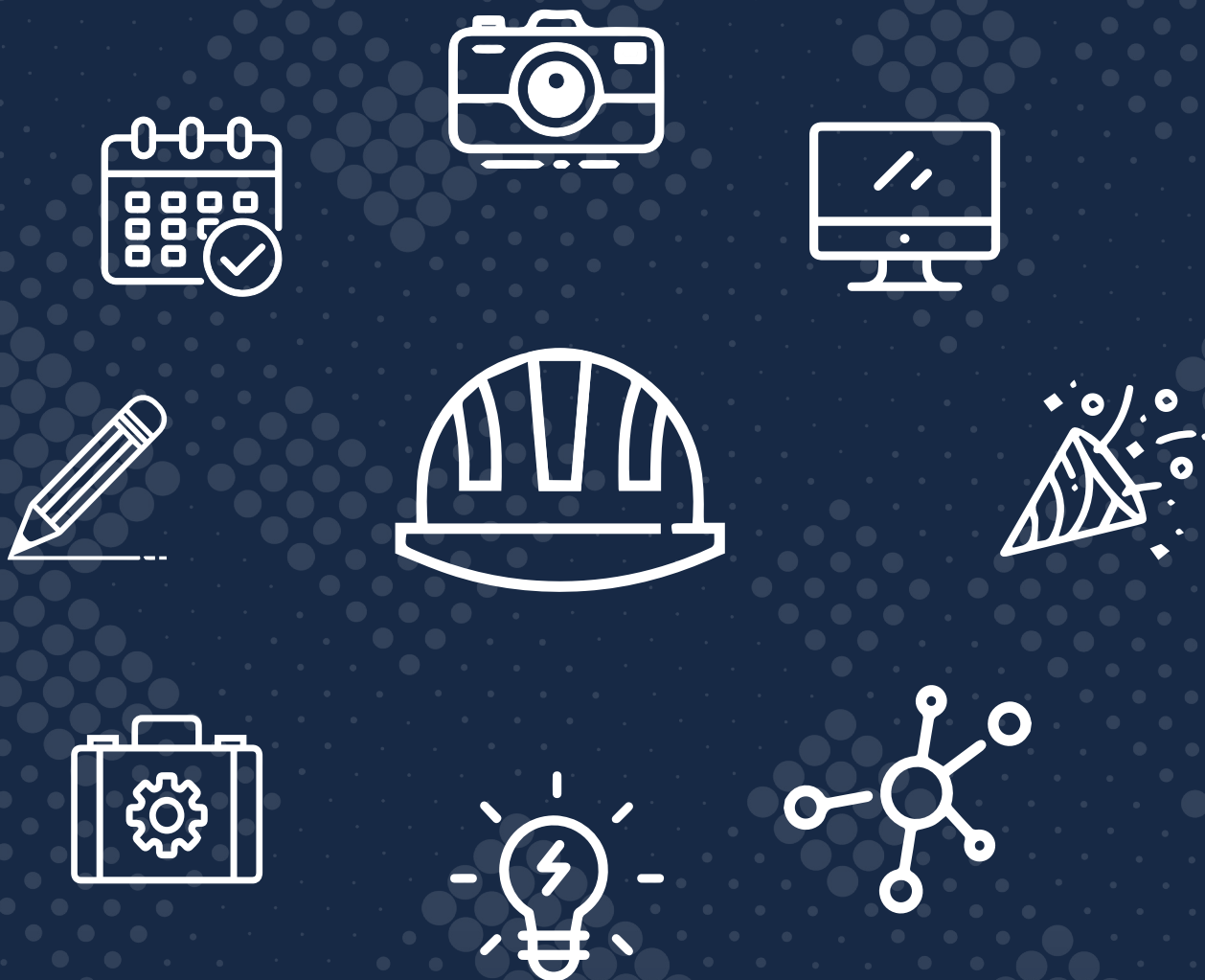
built through chalcogen bonding will exhibit structural and physical properties complementary to established systems, therefore filling functional gaps of established systems,” McGuirk explained. “For example, we believe chalcogen-bonded frameworks have great potential in the realms of solar harvesting for clean energy production, self-healing materials and electron conduction. Furthermore, the establishment of this complementary class of materials, along with insights from proposed fundamental studies, will help cement chalcogen bonding as a reliable and intuitive interaction in the chemistry and materials community.”

Potential applications

“Since their discovery about 25 years ago, porous framework materials assembled through coordination or covalent bonds have led to a materials revolution,” McGuirk said. “With this broad class of materials, chemists can design and synthesize nanoscale and sub-nanoscale environments across many orders of magnitude. This has led to great leaps in a broad assortment of applications, such as water harvesting from arid environments, capture of CO₂ from the burning of fossil fuels, and even the delivery of small snippets of DNA to cells.”

CONNECTIONS

- Elena Dutcher '14, Adam Janikowski '20 and Scott Bennett '00 shared their experiences living and working internationally at a Mines-hosted virtual event in February 2022. •



Want to get involved but not sure where to start?

From your couch to the classroom, there's a volunteer spot for you.

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volunteer.mines.edu • minesalumni@mines.edu • 303.273.3290





RESEARCH OF THE HIGHEST CALIBER

A new research classification for Mines means new ways of finding meaningful solutions

As a university that strives for excellence and reaching new heights, Mines joining the top tier of research universities in the United States earlier this year was just one more way for the university to showcase the innovation and leadership of its faculty, students and graduates.

Recognized by the Carnegie Classification of Institutions of Higher Education, Mines was elevated to the Research (R1) classification, the highest and most prestigious designation granted to U.S. research universities. Only 146 colleges and universities—out of nearly 4,000 public and private higher education institutions nationwide—have this classification.

We sat down with Walter G. Copan, vice president for research and technology transfer at Mines, to learn more about what this classification means for Mines and the innovation happening on campus.

Mines Magazine: Why is Mines' elevation to R1 status a significant achievement for the university?

Walter Copan: The elevation to R1 is an external recognition that signifies to the world and to our science and technology funding agencies that Mines is a place where research matters—that we have the infrastructure to support research at a very high level and with wide reach. As we attract new faculty, students and research partners, they know they're working with an institution

that's been independently assessed as having a high-caliber, high-intensity research environment. The stature the R1 designation further amplifies and conveys to our graduate and undergraduate students the value of the education here. It is another justly-deserved accolade for Mines as an amazing, top-tier university.

MM: What does this mean for how Mines engages with our research partners and wider society?

Copan: Members of Congress and leaders in the public and private sectors call upon Mines for our opinions, seeking our viewpoints and expertise on critical issues that face the nation and the economy. As we look to the future of science and technology investment and of innovation and competitiveness

CONNECTIONS

- ▶ In partnership with the Leadership in Social Responsibility Interest Group, Bob Hedlund '75 gave a presentation on transitioning into a non-traditional international development agency. •

for the U.S., Mines has a reputation of being highly credible in conducting impactful research, as well as a place that's grounded and practical. Industry values the research conducted by Mines, the partnerships with our faculty and the quality of the students we produce. The fact that more than 20 percent of the Mines research volume comes from industry attests to the relevance of our work to the economy. Our reputation in research and academia has worldwide reach, leading to a steady stream of new relationships with governments, academic institutions and corporations around the globe.

So much of what industry needs today is people who are well prepared to lead, think holistically at a systems level and are able to engineer solutions that matter. I'm thrilled at the journey that we're on as a university to take our relationships with industry to the next level and foster partnerships that also create important new solutions.

MM: What does the future of Mines research look like?

Copan: If we can extrapolate from where Mines has come over the past century and a half, as a university that educates, inspires and innovates, we have a very bright future ahead in our next 150 years. Mines was founded to deliver relevant impacts to society and industry, advancing the leading edge of technologies and educating scientists and engineers uniquely well-prepared to lead. We will build upon those strengths in a broadening research portfolio that is relevant to tomorrow's economy and to address the challenges facing our planet and civilization.

We don't know in many cases where today's science and technology discoveries will lead. We do know we are building upon a tremendous heritage of innovation. We have not forgotten our roots. The name "Mines" persists, and what that means to the world today and for the future has expanded broadly. I think a big part of our role at this university is to be the champions for future possibilities, the researchers and innovators for the earth, energy and the environment. Mines has embraced the roles that science and technology play in society and to ever be partners to industry, academia and to governments here in this nation and around the world—to achieve solutions that matter. I firmly believe that this university has a brilliant future in store.

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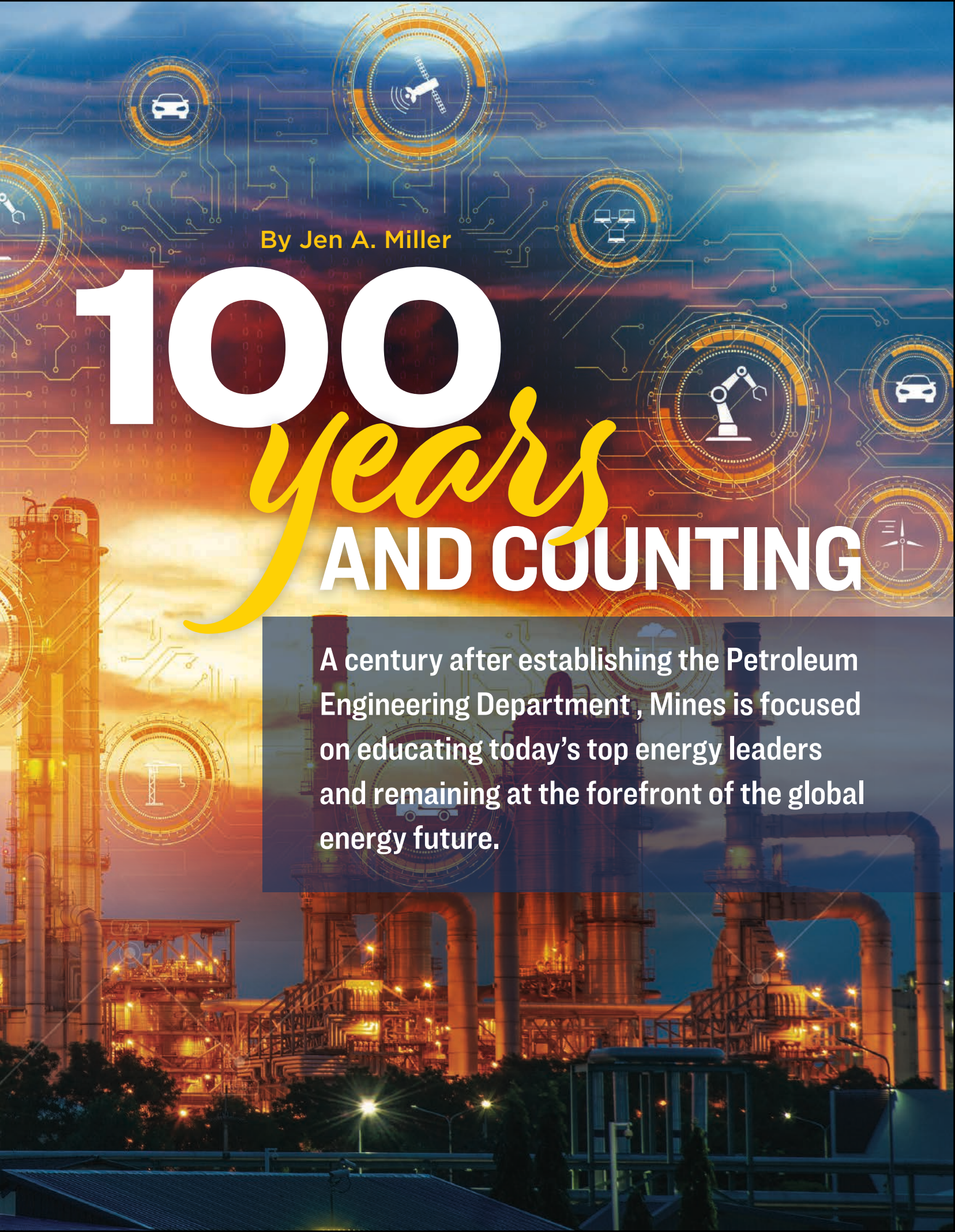
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COLORADO SCHOOL OF MINES
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By Jen A. Miller

100 *years* AND COUNTING

A century after establishing the Petroleum Engineering Department, Mines is focused on educating today's top energy leaders and remaining at the forefront of the global energy future.

In 1921, the first Miss America was crowned in Atlantic City, bread cost a nickel a pound and Warren G. Harding became the first U.S. president to arrive at his inauguration in an automobile—following the country's first presidential election in which women could vote. In the fall of that same year, Mines also enrolled 498 students in its brand new petroleum engineering program. The first cohort graduated the following spring.

For the past 100 years, Mines has been graduating the world's top petroleum engineers and been at the forefront of educating generations of energy leaders. Mines' petroleum engineering undergraduate degree was one of the first in the U.S. and has been accredited by the Engineer's Council for Professional Development since 1937. It has also ranked as one of the best such programs in the country since 1942.

Not only has Mines' petroleum engineering program been educating the men and women who have shaped the energy industry for 100 years, but it has also encouraged thought leadership and research. Mines students, alumni and faculty fostered breakthrough advancements in the oil and natural gas industries, including the development of foam cementing, which was a major leap forward in well drilling technology in the 1960s; and pioneering the application of lasers to drill and perforate wells in the 1990s. Several research and commercial software packages have started as research projects at Mines, and the first student chapter of the American Association for Drilling Engineers formed at Mines in 1996.

However, that doesn't mean Mines is resting on its laurels, especially at the 100-year mark. "We think a lot about how, if we're 100 years old today, what are we going to do in the next 100 years," said Jennifer Miskimins MS '00, PhD '02, the current head of the Petroleum Engineering Department.

And that's exactly what the Petroleum Engineering Department is focusing on as it continues to prepare future generations to work and innovate in an ever-evolving global energy landscape.

PETROLEUM ENGINEERS ARE STILL IN DEMAND—AND IMPORTANT AS EVER

Leading into the department's milestone, Miskimins helmed a group of experts—including Mines alumni—to develop a 20-year vision plan for the program. The plan had to account for how the world is changing, especially in how it accesses and uses energy.

According to the U.S. Energy Information Administration, fossil fuels made up 60 percent of energy resources in the U.S. in 2020. Those percentages are expected to shift as the demand and deployment for renewable energy rises, along with global investment in different kinds of energy sources and technologies.

That doesn't mean the world will stop using fossil fuels though—the EIA also projects that internationally, energy needs will grow by nearly 50 percent by 2050. So even though energy source growth will be largely driven by renewables, fossil fuel demands will increase, and petroleum engineers will continue to be in demand.

"We're graduating petroleum engineers, but the difference is that they're petroleum engineers who can function in a net-zero carbon world," said Miskimins.

Students are graduating from Mines equipped with skills appealing to oil and gas companies, she said, but also with the right knowledge to lead efforts on carbon capture, utilization and storage, which is important for capturing and storing atmospheric carbon dioxide, and how and where to tap into renewable geothermal energy sources. Students are also working on methane emissions capture, blue hydrogen (which is hydrogen produced from natural gas) and helium production, technologies that have only been developing in the last few decades, Miskimins said.

"The school has a tradition of applied science versus pure science, and it's interdisciplinary—whether it's in working with geology or other aspects of engineering," said Mark Sonnenfeld MS '91, PhD '96, chief geologist at Coterra Energy. "Mines gives people more flexibility down the road as career paths evolve, especially in energy areas that require working with what's under the ground."

Today, about 95 percent of Mines' petroleum engineering graduates work for oil and gas operations. Miskimins anticipates that percentage to be between 70 and 75 percent in 20 years. But that's just because there will be more available avenues petroleum engineering graduates can take with their degrees.

"There won't be a huge difference in what our students know from a basic petroleum engineering point when they walk out the door, but they are going to have a broader set of skills and do different things," Miskimins said.

GAINING THE SKILLS TO LEAD THE ENERGY FUTURE

While some universities are closing their petroleum engineering programs or rolling them into other degrees, Mines plans to stay the course, because the school believes it's the best way to educate students for key jobs in the oil and gas industry while also training them to be part of the larger and expanding overall energy picture.

"We make sure that our students not only have solid petroleum engineering skills but see those future needs and how they can contribute to those future solutions," Miskimins said.





Amanda Rebol '07, vice president of operations at Kimmeridge Energy, believes that Mines is perfectly poised to educate, inform and evolve the future of energy engineering. "A good education doesn't necessarily teach you a set of subject-matter skills. It teaches you how to learn," she said. "It teaches you how to problem solve. It teaches you how to identify what's in front of you and develop yourself to work around it or through it."

Mines' robust and dedicated alumni network also helps graduates explore what they can do with the abilities and skills they learned at Mines, she added, "whether that's in oil and gas or adjacent businesses. Together, we're able to figure out what's next for us as individuals but also how the industry has had to adapt over the years. Mines has helped us all stay ahead in the game and drive innovation and change."

Sonnenfeld has seen how skills learned at Mines can be put to work in different areas of energy production and give students more options than strictly petroleum engineering. He oversees a technical team for Coterra Energy's geoscientists and ensures that projects have both geological and engineering integration. It's a connection he first saw as a Mines graduate student, when he taught the geology portion of the Petroleum Engineering Department's field camp in northwestern Colorado and Utah.

Mines graduates are particularly prepared to work in subsurface renewable energies, he added. "I doubt a petroleum engineer is going to become a solar expert or a wind expert, but they will definitely have the necessary technological skills for geothermal, carbon sequestration or anything in the subsurface."

Barry Thomas '91 is in charge of career development for early engineers at ConocoPhillips and sees the difference that a petroleum engineering degree from Mines makes. "Mines graduates know how to get stuff done. They're given a task and they find a way to do it, whatever it takes. They hit the ground running," he said.

That's especially true when it comes to problem solving and finding new solutions to a tricky problem, such as how to recover more oil in the ground and from unconventional reservoirs. "Mines degrees are technical degrees. Because of this, critical thinking is just the air we breathe," he said.

He's also found that Mines students are encouraged to pursue interests outside of the classroom, which makes them more well-rounded job candidates and poised

to grow into industry leaders. He himself came to Mines from Texas to get an engineering degree and play football. This focus on the development of the entire student, plus the size of the school, "gives Mines students leadership experience and teamwork experience at a level that they might not get at a bigger university."

These skills have become crucial, added Thomas, especially as reaching oil and gas trapped underground is becoming more challenging and more technical. Accessing those resources is important beyond just the energy industry. "Petroleum is in the clothes we wear, the phones we talk on. It's in the sanitization of our hospitals, the plastic tube in an IV," he explained. "The skills to unlock those resources are in demand now more than ever."

A YEAR OF CELEBRATION

Mines is celebrating the Petroleum Engineering Department's 100th anniversary in many ways this year. Events each month for students, alumni and industry supporters include open houses, alumni panels and seminars, an alumni weekend in Massadona, Colorado and more. The department has also established a Petroleum Engineering Excellence Fund to support students earning a high-quality Mines education with cutting-edge lab equipment and hands-on learning opportunities.

"We want everyone involved in the history of the program to celebrate what we've achieved, whether they can be with us on campus or tap into one of our virtual events," said Miskimins.

These events will culminate in November 2022, when Mines will announce the first class of the Petroleum Engineering Department Hall of Fame to honor alumni who have made significant contributions to the oil and gas industry, including technical leaders, innovators and industry leadership.

► See all the details and get involved in the celebrations at weare.mines.edu/PE100.

► Want to know more about the history of the Petroleum Engineering Department at Mines? Check out the timeline on page 42 and then visit petroleum.mines.edu/100 for a deeper dive into the department's history and details about all the ways we're celebrating this historic anniversary.



A LOFTY CAREER

How a mining engineer ended up in the air

BY AND SCHUSTER

With qualifications in engineering, geology and other earth sciences, many Mines alumni work with complex issues on and under the ground. Collin Fay '80 was among them until his career took an unexpected turn. After contributing to the mining industry for twenty years, Fay took his aspirations to the sky, working as an air tour operator, flight instructor and aerial firefighter over the last two decades.

Fay and his wife, Marisa, came up with the idea of starting an air touring company while on vacation. They had recently taken a tour in Australia in which licensed participants piloted planes over scenic attractions while following a lead plane—similar to a guided horse tour, said Fay, except in the sky. The couple loved the experience and knew there was nothing like it in the U.S., so they jumped at the chance to start a similar business.

"Having the opportunity to tour by air gives a very unique perspective, allowing for both aerial and ground-based appreciation for the destinations and landscapes," Fay said.

CONNECTIONS

- ▶ Mines alumni gathered for a happy hour during the Society for Mining, Metallurgy & Exploration's annual convention in Salt Lake City in March 2022. •

In 2000, the Fays launched Parkwest Air Tours and led groups of pilots all over the western U.S., Canada and Mexico. The tours drew clients because they provided exciting environments, full of mountains, valleys and canyons—landscapes many private pilots don't commonly have much experience with.

"Flying with us provided pilots a 'security blanket' to stretch their wings to more challenging environments while also visiting unique destinations and meeting new flying friends," said Fay.

Facing a fairly narrow market, the Fays took their time and slowly built a clientele. Within a few years, business was booming. At that point, the couple decided to branch out by opening a flight school to make use of their planes in the off-season. They continued conducting tours and training pilots and eventually added an air charter component to their services.

And yet, there was more Fay thought he could be doing as a licensed pilot. From 2015 to 2021, Fay worked as an aerial firefighter, delivering smokejumpers (highly

trained firefighters who parachute into the wilderness to fight wildfires) to their destinations and flying tankers and scoopers to bring water to firefighting sites across the U.S.

"I pursued aerial firefighting as a way to further my experience as a professional pilot. I worked as a volunteer EMT and firefighter as a young adult, and the fire aviation world sort of brought all those aspects together," Fay said. "It was a good way to use my aviation background, and it was satisfying to see the results."

A few years into Fay's firefighting career, the couple decided to scale their business down. They sold the flight school but continued to conduct air tours for clients who brought planes of their own. Today, Fay continues flying for fun and provides advanced instruction and commercial piloting services on a limited basis.

"I didn't anticipate that [flying] would become a second career for me," he said. "But I feel lucky to have had two very distinct and rewarding careers."

SHERIDAN ROSS PC

ATTORNEYS AT DIFFERENT PERSPECTIVES



Patent



Trademark



Commercial
Litigation



IP Litigation



FORCES OF MINES

Kicking off a new wave of elevating women in STEM

As more women enter and climb the ranks of science, technology, engineering and math professions, a tight network of allies, advocates and mentors is essential to their success. And that support needs to exist from the time they are first interested in STEM through the extent of their careers.

That's where the Women of Mines Interest Group comes in. With a new event called Forces of Mines: Elevating Women aimed at utilizing the powerful network that comes with earning a Mines degree, the interest group hopes to open doors in new ways for women in STEM.

We talked to Andrea Passman '98, the interest group's current chair, to learn more about the event and why this is an essential step toward supporting women in STEM. This is what we learned.

This inaugural event will bring the Mines community together in a new way to take advantage of the vast network of Orediggers.

On March 5, 2022, the Forces of Mines: Elevating Women leadership and networking summit invited women from across the Mines community to share best practices, discuss the unique challenges women face, network across generations of Mines graduates and more. With many Mines alumni returning to share their perspectives and expertise and engage with other Orediggers, it's the first step in a new wave of support for women in STEM—specifically Mines women in STEM—and help Mines reach its goal of increasing the number of women enrolled in the university to 40 percent by 2024.

CONNECTIONS

- ▶ In March 2022, Adam Janikowski '20 hosted a virtual event to brainstorm ways to help connect Mines alumni who live in or frequently visit Asia. •

"One thing all Mines graduates have in common is that we all survived and thrived and got through the challenges of Mines," Passman said. "We need to be able to help each other through, and that goes all the way from C-suite or CEO or business owner to getting more people to come to the school. We can reinvigorate the women of Mines to pull through from generation to generation and help each other."

That support starts by bringing together the unparalleled connections, skills and experiences Mines women have and recognizing the mentors, allies and advocates available to help build up future generations.

"It's a small group, but it's such a powerful group. We need to be able to leverage that," Passman said. "This event kicks it off, and then after that, we're going to start working on building that network out. I'm hoping that what we really see is women come back and realize they don't have to go it alone. This is really about connecting women so we can make sure we keep pulling generations of women in STEM all the way through."

- Learn more about the Women of Mines Interest Group and get involved at weare.mines.edu/womenofmines.

A NETWORK OF ALLIES

To recognize Orediggers who have been extraordinary advocates for women in STEM, the Women of Mines Interest Group presented three awards at the inaugural event.

Michelle Moorman Applegate '05

Senior Director of Regulatory and Legislative Affairs, Summit Utilities

As an advocate for young girls and women in STEM, Moorman Applegate frequently mentors women in STEM and business fields who are navigating the professional landscape and finding their version of a work-life balance. She serves on multiple boards and volunteers with many organizations in the Denver metro area.

Lia Martinez '07

Geophysical engineer, Mount Sopris Instrument Company

Martinez is an avid volunteer for K-12 STEM events and actively promotes diversity, inclusion and equity efforts in the geophysical and environmental engineering sectors. She is an active member of Geolatinas, Women Geoscientists of Canada and Women in Mining and also volunteers at many Denver-based nonprofit organizations.

Azlan Tubbs

Mechanical engineering student

Tubbs founded a premedical branch of the American Medical Women's Association to support and empower women at Mines who are interested in the medical profession. She is also the treasurer for the Society for Women in Math and an officer on the Society of Women Engineers' executive board, using these positions to elevate and support women and girls in the Mines community through volunteer work and leadership.

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Left to right: Caleb Thomas '17, MS '18, Sammi Steele, Barry Thomas '91, Lori Thomas, Hannah Halpern '18 and Evan Halpern '18

Photo by Kristyn Rose Photography

DRILLING UP A FAMILY LEGACY

Petroleum engineering runs in the Thomas family, and now they're helping other Orediggers get into the field

BY KELLIE SPOERL

Barry Thomas '91 came to Mines knowing it was one of the top engineering schools in the world and would allow him to earn a world-renowned petroleum engineering degree while playing college football. But little did he know that his decision to go to Mines would kickstart a family legacy.

Barry pursued his degree, but along the way, he also met his now-wife, Lori, during their first year at Mines when they were both part of the McBride Honors Program. By their second year, they were engaged. Eventually, Lori decided she wanted to be an educator, so she transferred to a different university, but her affinity for Mines remained.

After completing their degrees, Barry and Lori moved to Liberal, Kansas, where Barry began his career with Anadarko Petroleum as a production engineer before moving on to other oil and gas operations around the U.S. As he built his career, Barry came to realize the role Mines played in what he was able to achieve in his professional life. "I appreciate how Mines prepared me to

CONNECTIONS

- ▶ Mechanical engineering alumni were invited to join the Mines American Society of Mechanical Engineers chapter for the spring banquet reception to network and connect with fellow Orediggers. •

have a good balance between the technical and the practical sides of operations. I have the ability to get technical and I have the propensity to keep it simple and practical whenever possible," Barry said.

Barry and Lori's two children, Caleb '17, MS '18 and Hannah '18, often visited Barry at work while growing up. Seeing the kind of work available in that field, both eventually decided to pursue petroleum engineering degrees.

"We love that it has become part of our family's identity," Hannah said.

And while Caleb and Hannah had their sights set on degrees in this field, Barry and Lori did not pressure their children to attend Mines. For Caleb and Hannah, choosing Mines came down to the school's environment.

Caleb wanted to pursue a world-class education, and like his father, played a sport he loved: baseball. His Oredigger teammates became

his roommates and some of his closest friends, just what he needed to succeed at Mines. "I found a support system that knew exactly what I was going through, and I can look back and appreciate every moment," he said.

And while pursuing her challenging petroleum engineering degree at Mines, Hannah participated in extracurricular activities and was a member of Pi Phi Sorority.

"I really thrived at Mines because I found something in common with everyone, and I was able to make lifelong friends," Hannah said.

Hannah's Mines journey also led her to follow in her parents' footsteps in another way. She met fellow petroleum engineering student Evan Halpern '18 in their rock properties class and got to know him through long hours of studying with friends. After a Society of Petroleum Engineers trip to Dubai, they started dating and later got married in 2021.

The petroleum engineering industry has provided a stable base for the Thomas family to grow, try new things and achieve the lives they envisioned. Lori noted her family has always known they are fortunate in what they have. "My family's degrees from Mines have given them a great launching pad," she said. "It's important to us to give back to others who may not have all the advantages we do."

To give back to where their story first started, Barry and Lori created the Thomas Family Scholarship, awarded for the first time in 2021, to help undergraduate petroleum engineering students earn a Mines education.

"We want these scholarship students to help make Mines a better experience for others," Barry explained. "We think it is important for people to find something they enjoy and a place to belong."



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RIPPLE EFFECTS

How the clean energy transition will influence global supply chains

BY SARAH KUTA

Deploying more renewable energy technologies, such as wind turbines and solar panels, within the next few decades is a critical step forward in our global energy future.

But to produce more of these technologies, companies need greater quantities of certain minerals—lithium for electric vehicles and battery storage, for example—which are often mined and processed in other countries. The increasing demand for these minerals

puts pressure on global supply chains and will likely create or exacerbate other issues, such as crime, conflict, child labor and pollution, to name a few.

Though increased clean energy should ultimately help slow the progression of climate change, it may also cause wide-ranging ripple effects around the world. The new Supply Chain Transparency Initiative at the Payne Institute for Public Policy aims to better understand these issues and, using Mines' technical expertise, offer solutions for addressing them.

"As the world wants to dramatically increase renewable energy, well, that takes a lot of minerals," said Gregory Clough, deputy director of the Payne Institute. "In the U.S., we're focused on the immediate environmental concerns, but there are all these other issues that arise

CONNECTIONS

- ▶ Bill Ward '84, Jeffrey Vaughan '82 and Steve Enger '81 were featured at the CEO Roundtable event in March to talk about the future of petroleum engineering and building their careers. •



from the demands being put on developing countries to essentially fulfill Western countries' desires for renewable energy. This is an overlooked part of the conversation."

Working in collaboration with Mines' researchers and industry partners, the institute's experts are beginning to study and document the supply chain journey for materials that are critical to the clean energy transition, such as copper, nickel, lithium and cobalt. They're also exploring the social, political, environmental and humanitarian impacts of these minerals. They'll then share their findings so that lawmakers, companies and consumers can make the best decisions possible for the environment, the economy and communities around the globe.

"We want to make supply chains more sustainable, and the way we do that is with transparency and researching the ins and outs of these different materials," said Jordy Lee '19, the initiative's program manager.

To start, Lee is analyzing basic commodities, such as copper, mapping the metal's journey from mines in Chile, Africa and Arizona, to finished products like solar panels, wind turbines and batteries—and every step in between. With that information in hand, he'll be able to compare and contrast supply chains around the world and consider the effects of mining, processing, refining, using and recycling copper in different places.

Since those impacts will likely vary from region to region, the institute's experts can then suggest customized policy solutions to help address them. They can also help companies find and partner with the most sustainable suppliers.

In the long-term, the institute hopes to create a standardized system for companies to report the environmental impacts of their operations, a process that is currently unregulated, Lee said.

"There's so much missing information," Lee said. "It's difficult to make policy decisions or business decisions when there's a lot of noise and you don't really know what data sources to trust. We want to be this trusted source for really robust supply chain data that policymakers and industry can use to make better decisions."

Lee also wants to help bridge the gap between the upstream companies that mine and process the materials and the downstream companies that actually use them. Part of the initiative will include creating a research consortium made up of stakeholders from all along the chain, Lee said.

Through it all, the institute will work closely with Mines faculty and student researchers in mining engineering, economics and business, applied mathematics and statistics and other fields, bringing much-needed technical expertise to discussions about how best to achieve a greener future.

"Mines is the No. 1 mining engineering school in the world, and it's just a matter of bringing that technical expertise to the global policy conversation," said Clough. "That is the opportunity we have here at Mines."

- Local Mines alumni are invited to campus for a monthly event to learn about what is happening at Mines over a cup of coffee. March's event featured updates from the economics and business department. •



MITIGATING METHANE

Energy leaders discuss methane emissions and the future of energy

Last fall, the United States and European Union announced the Global Methane Pledge, an initiative to reduce global methane emissions by 30 percent by 2030. With Colorado being an early leader in methane regulations and providing a model for the EPA's proposed federal regulations, Mines experts are essential players in these solutions.

Mines hosted the inaugural Mines Methane Symposium earlier this year, bringing together thought leaders from industry, academia, think tanks and local and foreign governments to discuss the impacts, challenges and opportunities of methane management. The symposium provided a critical foundation for future decisions on technology and regulation for methane emissions with discussions on policy, measurements and standards, research and technology, and innovative solutions.

Here are a few notable points from the event's keynote speakers.

The knowledge and experience we've been building over the years will be key to meeting future goals.

"If the 110 countries do succeed in meeting the Global Methane Pledge, our ability as an agency and our ability as a government to disseminate the know-how that we've accumulated may turn out to be the 'secret sauce' of

that success. We're continuing to support these programs and investing in them and work with our partners and recruit additional partners, because at this point, the stakes are even higher in the context of the Global Methane Pledge for our ability to generate experience and expertise and disseminate it."

Joseph Goffman

Principal Deputy Assistant Administrator, Office of Air and Radiation
U.S. Environmental Protection Agency

Despite the challenges, these moves are going to give the U.S. energy industry a competitive advantage.

"It's going to be a challenging environment going forward. We're a business that manages risks. We also see this as a competitive advantage from the U.S.'s point of view. Here in the U.S., you've got EPA, you've got companies that are thinking about this as a priority. And we think over the medium term as throughout Europe, they're thinking about what the mix is going to look like, what's going to be the role of natural gas in the transition to a lower carbon economy. Having this kind of transparency and also efforts to reduce emissions is going

to be a competitive advantage for the energy sector in the U.S."

Chris Smith

Senior Vice President, Policy, Government and Public Affairs
Cheniere Energy

The example Colorado has set has and will continue to provide a model for the U.S. and the world in regulating methane emissions and leading the energy future.

"It's easy to see that Colorado is a pioneer on so many of these issues related to methane. So much so that our methane rules have continued to serve as a role model for the EPA and other states, and we're setting the bar high for national standards. We have institutions like NREL and the School of Mines, whose deep, cross-cutting expertise is enabling responsible and affordable energy transitions. Colorado and the whole Rocky Mountain West—the whole west of the United States—are best when we lead, and we need to build on our successes. We need to look at where the energy transition is heading—and I think the trends are clear—we have got to get there first."

John Hickenlooper

U.S. Senator

► Check out the full discussion at payneinstitute.mines.edu/event/mines-methane-symposium.

CONNECTIONS

- Alumni dropped by campus in March to donate items to Blaster's Basket to help support Mines students struggling with food insecurity. •

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Dr. Jennifer Miskimins
MS '00, PhD '02
Department Head
Petroleum Engineering



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"My involvement with entrepreneurship and innovation programs allowed me to view opportunities from a much different angle as a Mines alum. I wanted to work for a big company—now I want to work for myself."

Israel Olivas Morales '21
Mechanical Engineering



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BUILDING A BUSINESS FROM THE GROUND UP

BY ASHLEY SPURGEON

Taking advantage of resources is key to growing a company

During the economic downturn of the Great Recession and subsequent recovery in the years following, many people were looking for new opportunities and career paths that offered more stability and fulfillment. For people such as Shane '98 and April Dittrich '01, that meant leaving the threat of layoffs at big engineering companies behind.

Instead, they decided to start up their own business, House of Design Robotics, in Idaho to specialize in custom automation. The company focused on project-based robotic systems integration, taking existing robotics and integrating them with other mechanical and electrical devices and chemical processes into one system to serve their clients' needs. That turned out to be an advantageous decision, and they grew the company to more than 100 employees over the next several years before eventually selling the business in September 2021.

We sat down with Shane and April to talk about what they learned from building a business from the ground

up and how they knew when it was time to hand the company over to new leadership.

Mines Magazine: You built House of Design Robotics from the ground up with minimal experience or training in starting a business. How did you approach this process, knowing it was a significant risk?

April Dittrich: My parents were business owners, so I knew that business is cyclical, so that was nerve racking. But having lived through 2008 to 2012, it was like that anyway, so thought we might as well just control it and begin.

Shane Dittrich: We started down at the Small Business Development Center. We are huge advocates of the government programs around small businesses. They offer courses that help you set up a business plan. They connected us with Boise State University that had a class that drew us up a rough draft of a business plan, and they did our HR manual that we then had our lawyers review. It was super helpful to use these



April Dittrich '01, House of Design Robotics



Shane Dittrich '98, House of Design Robotics

CONNECTIONS

- ▶ A selection of economics and business alumni were featured on a panel discussion in March 2022 to discuss the different career paths available in their field. •

resources that are free, but not a lot of people know about them. It really gave us a good start.

MM: What would have been advantageous to learn as a student or before you decided to start your own business to help you through your entrepreneurial journey?

Shane Dittrich: Number one, teaching me what a profit and loss and a balance sheet were. I know what they are now, but I did it through hard knocks. It was never shown to me, and I was never trained on it. And there's also external money that can help you. We grew our company from four people to more than 100 employees, and we bootstrapped the whole thing with basically a \$6,000 personal investment.

April Dittrich: Training on the resources that are available through the government and through the state is huge. We couldn't have done what we did without the SBDC. We didn't know about that when we came out of Mines. We also applied for a huge training grant from the state of Idaho, which we got, and we could send our employees out to get trained, or we ourselves could get trained and then come back and train our employees.

MM: You sold House of Design Robotics in September 2021. How did you know when it was time to sell the business?

Shane Dittrich: We started doing some off-site construction projects and came up with four or five products that we saw we could sell to different manufacturers. But going from a project-based business to a product-based business is a totally different business model. We knew that if we wanted to take advantage of what the market was doing, we need to scale and scale fast. But we didn't have the resources, personally, to be able to do that.

MM: What advice do you have for other entrepreneurs who are looking to strike out on their own and start their own businesses?

April Dittrich: You can't go wrong betting on yourself. Just know it can be hard, but you can look for resources out there that are free that can help you if you take advantage of them.

Shane Dittrich: Don't be afraid to understand your weaknesses and be able to have people jump in and help you. I had to learn the hard way that I'm terrible at managing people. But April is great at it. Now, if you want to talk vision and concept or get brainstorming, that's where I shine. So being able to know yourself and who you are and be able to build up the people who excel in your weak areas, that is a big deal.

SAVE THE DATE



Fall Career Days

September 13, 2022 (in-person)

September 21, 2022 (virtual)

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

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Sarah Wilson MS '17 and Mines professor Jenny Briggs were included in the Smithsonian debut of *#IfThenSheCan—The Exhibit*, an installation on and around the National Mall in Washington, D.C., of 120 life-size 3D-printed statues to represent a diverse coalition of contemporary women STEM innovators and role models leading a variety of fields.

1970s

Southern Empire Resources Corp. appointed **Larry Kornze '72** as an advisor in February 2022.

Bruce Rogers '79 retired in January 2022 after 42 years of federal service, including four years of active duty with the U.S. Army and 38 years in the U.S. Army Corps of Engineers. He also served 18 years in the U.S. Army Reserve before retiring as a lieutenant colonel.

1980s

Jeff Bolke '83 joined Eventus Systems as the chief revenue officer in January 2022.

Doug Lawler '88 was named chief operating officer and executive vice president of Continental Resources, Inc. in February 2022.

The supervisory board of ASM International nominated **Hichem M'Saad '88** to join the management board as the chief operating officer in February 2022.

Amy Jacobsen '89 was appointed to Endeavour Silver's board of directors in January 2022.

Steven Sparkowich '89 joined CBMM as a business development manager for Niobium products in February 2022.

2000s

Laura Schafer '00, MS '02 was a keynote speaker at the Society of Women Engineers Des Moines WE Local event in March 2022.

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.



FAYE
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EMMA MORAN



■ In January 2022, Mines leaders traveled to Saudi Arabia and attended an alumni meet-up where they met **Abdulrahman Basager** and **Abdulaziz Alalyani**, two 2020 petroleum engineering graduates who weren't able to attend an in-person graduation because of the COVID-19 pandemic. Mines Foundation President and CEO Brian Winkelbauer and Mines Vice Provost of Global Initiatives John Bradford conducted an impromptu and informal commencement ceremony on stage to recognize the two alumni.



MELODY CLAY '15 & MS '18
AND COLIN DOWNS '13

Josh Viets '01 was appointed to executive vice president and chief operating officer of Chesapeake Energy Corporation in February 2022.

Shawn Buell '02 joined Neel-Schaffer as a water resources senior project manager in February 2022.

Andrew Ramcharan MS '05 was appointed as Rockridge Resources' senior vice president of corporate development in January 2022.

On December 20, 2021, **Lorelei Mote '07** and her husband, Eric, welcomed baby No. 9, Jackson Augustus, into their family. He joins his siblings, Olivia Ninetta (11), Emmeline Victoria (10), William Dabney (8), Elizabeth Pereira (7), Charles Vernon (5), Winifred Pearl (4), Wiley Arthur (3) and Margaret Scynthia (2).

Maxwell Robb '09, assistant professor of chemistry at the California Institute of Technology, was awarded a 2022 Sloan Research Fellowship in February 2022.

2010s

Laura Yanowich Archibold '11 and **Johnny Archibold** welcomed their first child, Faye Jeannette Hildegard Archibold, in June 2021.

Following a proposal at the Schilthorn summit in Switzerland, **Whitney Rucker '12** and **Ryan Carroll '14** were married on November 11, 2021, in Estes Park, Colorado. More than 22 alumni attended the wedding, including groomsmen Chris Cool '14 and Connor Maxon '14 and bridesmaids Carrie Daves '13 and Maura Sullivan '12. The couple met through Sigma Kappa and Kappa Sigma events while attending Mines.

Erin Beach '13 and her husband, Chris Bouchet, welcomed a baby girl to their family. Lucy arrived on November 21, 2021, joining golden retriever Chewy and two cats Charlie and Lulu.

After a proposal on a black diamond ski run at Copper Mountain,

Melody Clay '15, MS '18 and **Colin Downs '13** were married in Bailey, Colorado, on October 16, 2021. More than 40 Mines alumni were present, including wedding party members Andre Wolff '13; Michael Harty '15, MS '17; Robert Urban '13; Sara Foster '17; Michelle Danaher '15; Haley Salzwedel '16; and Arielle Steers '13. The couple met at the Earth Treks climbing gym in Golden, Colorado.

Christine Birkholz '14 and **Max Moran '14** welcomed Emma Renée into their family on June 28, 2021.

Christian Kratz '16 and **Ashley (Burk) Kratz '16** welcomed a baby boy into their family. Creed Xavier arrived on December 21, 2021.

Franz Martinez MS '16 and **Teresa Ramos MS '17** welcomed their first addition into their family. Nicole Josephine Martinez was born on April 16, 2021.

Mona Smith '16 joined the Utah Inland Port Authority as an environmental engineer in March 2022.



RYAN CARROLL '14 AND
WHITNEY RUCKER '12



CREED KRATZ



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IN MEMORIAM

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

John R. Beers '53 died January 15, 2022. Born in 1931, John served in the U.S. Army Corps of Engineers as a topographic engineer and fought in the Korean and Vietnam Wars. As a Mines student, he was a member of the Alpha Tau Omega fraternity and the Mines wrestling team. He later taught in Mines' military science department and coached the soccer team.

Morton S. "Stu" Cecil '52 died January 9, 2022. Stu was born in 1927 and served as a U.S. merchant marine before earning his Mines degree. He spent his 33-year career with DuPont. After retiring from the company, he joined FIAP Group of Milan, Italy for nearly a decade.

Robert L. Einarsen '51 died December 7, 2021. Born in 1930, he spent his career teaching high school physics and geology. He also worked for the USGS Water Resources Department measuring streams in

Colorado.

Brian McKeever '83 died November 1, 2020. Brian was a metallurgist and worked at the Colorado School of Mines Research Institute and numerous mills in Colorado's high country. In more recent years, he worked for Asarco and Doe Run Company in Missouri.

Charles M. "Monte" Richard '60 died August 24, 2021. He was a member and former president of the Sigma Nu fraternity as a Mines student. After serving two years as a second lieutenant in the U.S. Army, Monte spent more than 30 years working for Standard Oil and Amoco.

Robert H. "Bob" Waterman, Jr. '58 died January 2, 2022. Born in 1936, Bob served in the U.S. Army Corps of Engineers and worked as a geophysicist, spending most of his career with McKinsey & Company before moving on to consulting work.

He co-wrote the highly successful business management book *In Search of Excellence* in addition to two others. Bob was a founding board member of the Applied Energy Services Corporation and served on various boards, including the Mines Foundation Board of Governors. He was awarded the Distinguished Achievement Medal from Mines in 1984, given in recognition for significant career achievements that enhance Mines' reputation and mission.

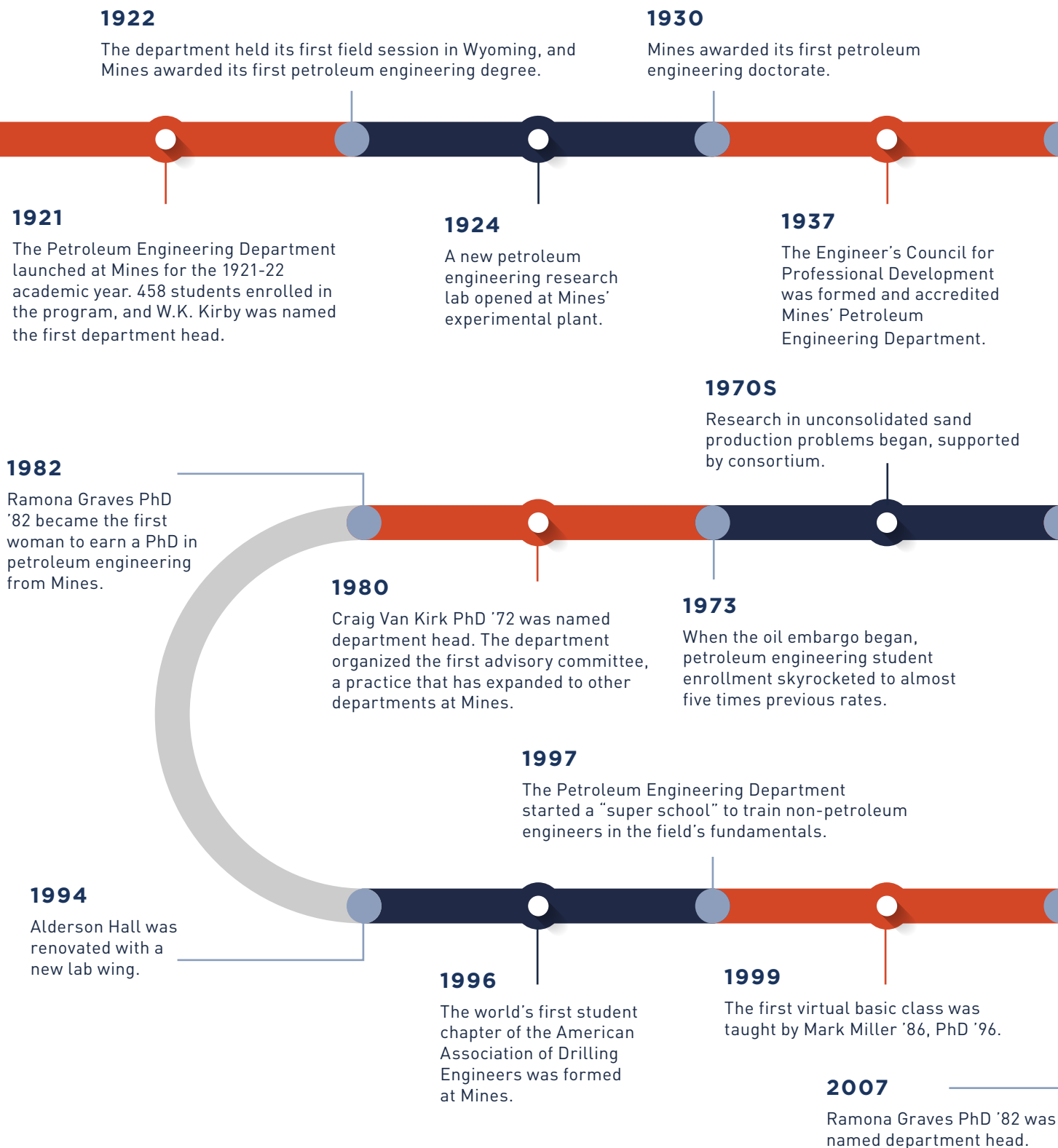
► To submit an obituary for publication in *Mines Magazine*, visit minesmagazine.com/obituary.

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

A 100-YEAR LEGACY

Mines' Petroleum Engineering Department celebrates a century of educating top engineers

Mines has spent the past century educating petroleum engineers, cementing its legacy of producing the top leaders and innovators in the field. To celebrate 100 years of petroleum engineering at Mines, we've pulled together a timeline of some significant moments from the department's history to showcase the accomplishments Mines has achieved while looking to the future.



1939

Room in Engineering Hall was converted into a petroleum engineering lab for chemical analysis as applied to hydrocarbons in soils.

1946

The Petroleum Engineering Department was split into two departments: the Department of Petroleum Production Engineering, with Clark F. Barb '25, MS '28 as department head, and the Department of Petroleum Refining Engineering, with James O. Ball as department head. The Department of Petroleum Refining Engineering later evolved into today's Chemical and Biological Engineering Department.

1942

Mines was rated as a top petroleum engineering school by Uren Survey.

1950-53

A new petroleum building was constructed on campus with modern apparatus and displays, eventually named Alderson Hall.

1940

The petroleum lab in basement of Stratton Hall was enlarged.

1963

A well stimulation course was added to the curriculum.

1960S

Research in foam cement began.

1956

The drilling mud course was added for the first time.

1962

Daniel M. Bass was named department head.

1969

George R. Pickett PhD '55 was named department head.

2022

Mines' Petroleum Engineering Department celebrated its 100th anniversary.

2014

Erdal Ozkan was named department head.

2019

Jennifer Miskimins MS '00, PhD '02 was named department head.

2012

Marquez Hall construction was completed, and the department moved to its new home.

► The Petroleum Engineering Department is hosting events each month in 2022 to celebrate this historic anniversary. Learn more and dive into more petroleum engineering history at petroleum.mines.edu/100.



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For the past 100 years, Mines has been educating the world's top petroleum engineers and providing the skills and expertise needed to meet—and exceed—global energy demands. As Mines celebrates this historic milestone and approaches its own major anniversary in 2024, we're reflecting on our past as we prepare for the future and all we aim to accomplish next.

Pictured here is what is believed to be the installation of a replica oil derrick built as part of Alderson Hall when the building was added to campus in the early 1950s. Alderson Hall served as the Petroleum Engineering Department's home until it moved to Marquez Hall in 2012.

► Follow along at mines.edu/mines-at-150.

