

MINES MAGAZINE

COLORADO SCHOOL OF MINES ALUMNI MAGAZINE

WONDER WOMEN

Finding success in STEM fields, Mines alumnae are breaking down stereotypes and encouraging positive change for other women in the workforce.

14

DESIGNING OPPORTUNITY

Mines' Human Centered Design Studio is developing adaptive sports equipment to make recreation accessible for everyone.

20



TITLE

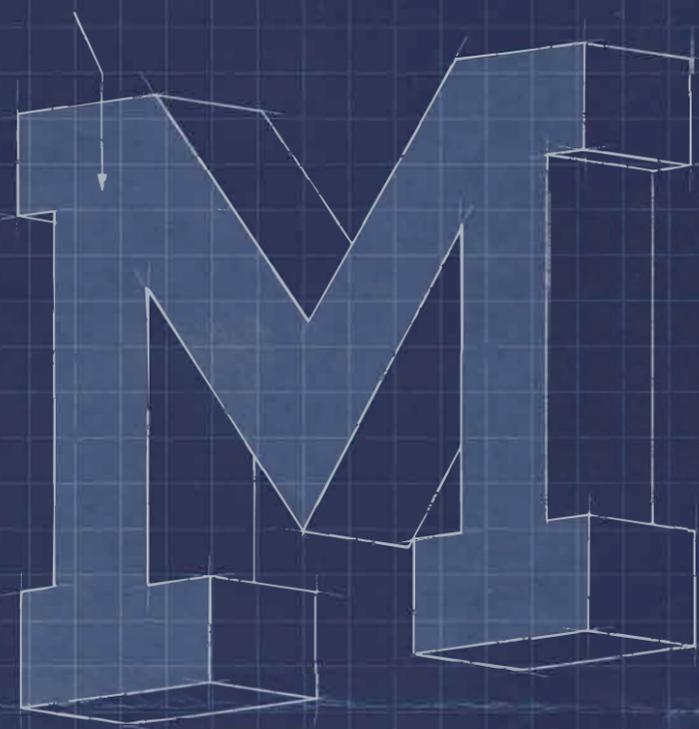
COLORADO SCHOOL OF MINES HOMECOMING

LOCATION GOLDEN, CO YEAR 2018

DATE OF EVENT
SEPT. 27-29

TYPE OF EVENT
CELEBRATION

Fig. 1 - JOIN US FOR HOMECOMING!



**SUNRISE M CLIMB, BONFIRE,
BOOTS & BARRELS: ALUMNI PARTY,
MINES@150 ADDRESS WITH PRESIDENT JOHNSON,
COLORADO MESA VS MINES,
OREDIGGER SPORTS, TAILGATE,
INAUGURAL 5K RUN, PARADE AND MORE!**

Fig. 2 - FOOTBALL GAME

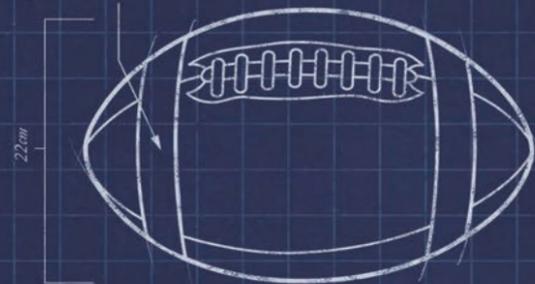
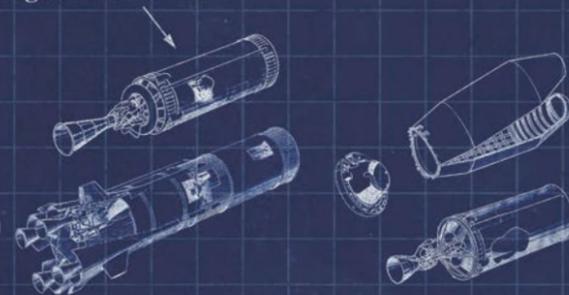


Fig. 3 - BONFIRE



Fig. 4 - HAVE A BLAST!



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THE OREDIGGER SPIRIT!**



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Cover image: Olivia Cordova '18 received her bachelor's degree in electrical engineering this past May. As a student, Cordova received a Martin Luther King Jr. Recognition Award for her role as an RA for the Nucleus Scholars program where she educated the Mines community on the benefits of having a diverse campus and advocated for first-generation college student needs. (Photo by Agata Bogucka)

FEATURES



14

WONDER WOMEN

Mines alumnae are succeeding in STEM fields and pushing for positive change in the workforce.

DESIGNING OPPORTUNITY

Mines' Human Centered Design Studio is designing adaptive sports equipment for better recreational accessibility.

20

WEB EXTRAS | MULTIMEDIA

TO VIEW WEB EXTRAS, VISIT MAGAZINE.MINES.EDU

Q&A WITH OLIVIA CORDOVA '18

Olivia Cordova '18, who graces this issue's cover, is one of Mines' newest alumnae, and she sat down with *Mines Magazine* to talk about what it's like being a woman entering the workforce today and a first-generation college graduate and gave some advice for women pursuing STEM. Read her interview online, and see what other alumnae have to say about women in STEM on page 14.

WELCOMING OUR LATEST GRADUATES

This May, Mines welcomed its latest class of alumni. Visit *Mines Magazine's* website to see photos from this year's commencement ceremonies.

BOOK RECOMMENDATIONS

Looking for a good book to read? We asked around campus for some of the best reads for engineers and scientists. See which titles the Leadership and Social Responsibility Interest Group's book club recommends on page 37, and then check out the complete list online.

STEAM IN VIETNAM

The STEAM Interest Group organized a trip to Vietnam in March 2018, learning about the country's art, culture and some production processes in different manufacturing plants. View photos from the trip online.



DEPARTMENTS

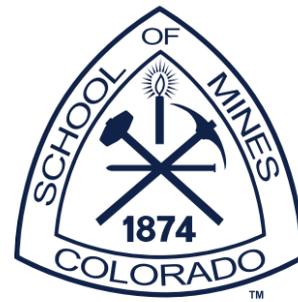
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DID YOU KNOW?

Mines' Arthur Lakes Library houses an extensive map collection with more than 162,000 maps, 6,000 books and atlases and 150,000 aerial photographs of Colorado. The gems of the collection are the unique maps of Colorado, many dating back to the late 1800s.

All the maps in the library's collection are cataloged and, with some exceptions, may be checked out in accordance with the library's policies.



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Comments and suggestions are welcome. Contact us via our contact form at minesmagazine.com/contact-us or via mail at Mines Magazine, 1500 Illinois St., Golden, CO 80401. To update your address, go to minesalumni.com/update or email minesalumni@mines.edu.

ALUMNI NOTE

Melanie Westergaard '87 leads the Women of Mines Interest Group, encouraging young women to pursue education and careers in STEM while helping to empower other alumnae to pursue their dreams.

Photo by Ashley Spurgeon



LESSONS LEARNED FROM WOMEN LEADERS

Throughout my career, I have had the opportunity to observe and work with some amazing female leaders. These women embraced diversity of thought and a collaborative style that habitually resulted in positive outcomes in areas ranging from simple problem solving within technical teams to determining the strategic direction of a business.

By observing and working with these leaders I learned several leadership lessons, including:

- To lead is to serve. Regardless of title, everyone can be, or rather, is, a leader.
- Be authentic. Don't change your style to fit a stereotype. To do so will compromise your effectiveness.
- Know the individual. Take time to learn what motivates the people around you. This will enable you to inspire them and help them realize their full potential.
- Lead within your entire sphere of influence. Leading should not be confined to direct reports. We can guide our leaders and colleagues through authentic actions, personal attention and compassion.

While these leadership lessons apply to both women and men, research shows women also bring a number of contributions to an effective workplace. According to Krishna Reddy's article "Top 12 advantages women bring to the workplace" on the talent sourcing website Wisestep, "When it comes to accomplishing goals or building solid workplace relationships, the feminine touch and skills like empathy, intuition and optimism of women work toward the benefit of the company."

These lessons also apply to the importance of having women representation in STEM fields. Women in STEM have introduced changes that have made a difference in product safety, such as airbag design changes to include protection for smaller builds and children. Women like Google's first woman engineer, Marissa Mayer, who had an instrumental role in the development of Google Maps, Google Earth and Street View, have made significant advancements in how we use technology. Mines' Aerospace Interest Group recently hosted an event with guest speaker Dr. Christine Darden, a career mathematician, aeronautical engineer and NASA researcher whose 40-year career at NASA led her to become one of the world's experts on sonic boom prediction, sonic boom minimization and supersonic wing design.

Women in leadership and STEM continue to pave the way for the future, and it's incumbent on us to increase diversity by placing more women in leadership roles. We must seek opportunities to mentor and develop the next wave of leaders to achieve this attainable goal.

Melanie Westergaard '87
Alumni Chair, Women of Mines Interest Group

PRESIDENT'S CORNER

A DEDICATION TO CONTINUED SUCCESS

What do you love the most about summers in Colorado?

I love all the seasons in Golden, but summer is one of my favorites. The beauty of our campus and surrounding area really stands out. The longer days and warmer weather allow more time for outdoor activities before and after business hours. The mornings are perfect for exercise—a sunrise run through campus or bike ride up Lookout Mountain before Golden wakes up always reminds me how lucky I am to live here. The evenings are great for a walk along Clear Creek to watch the kayakers and tubers. Weekends bring the local farmers market, classic cars cruising through downtown and art events.

I also enjoy the more relaxed atmosphere on campus and the energy the hundreds of young day camp participants bring in the summer. You should see them when they all converge at Mines Market cafeteria at noon—it's a one-hour pizza/ice cream/chocolate milk feeding frenzy.

What were some of your favorite moments with the Class of 2018?

The Class of 2018 contains many of the first students who welcomed Elyse and me to Mines in 2015. It also contains some of the first students I taught here, so I feel a strong connection to the Class of 2018. Elyse and I enjoyed dinners with the Greek Life community and student organizations, class breakfasts in the President's House, participated in fundraisers for heart health and literacy and watched them compete in athletic and academic competitions. The Class of 2018 contains incredibly gifted artists, writers, actors and musicians who likely spent as much time on extracurricular activities as they did on their coursework. They're going to do well. I already miss them—I hope they stay engaged.

Mines has built several new facilities over the past few years. How do you see the campus infrastructure growing over the next decade and how do alumni contribute to the success of these projects?

We're in the process of updating our campus master plan to identify the infrastructure needed to support our MINES@150 strategic vision. Top priorities include increasing student housing and dining options; new



Mines President Paul C. Johnson and Vice President of Research and Technology Transfer Stefanie Tompkins pose with Chuancheng Duan PhD '18 at the graduate commencement ceremony in May 2018.

Photo by Joe DelNero

classrooms for more interactive learning and alternate forms of course delivery; makerspaces to support hands-on learning, student projects and entrepreneurial activities; and space for institute-scale interdisciplinary research efforts. We're also looking at partnerships for property development that will benefit the community and industry partners.

There are many ways for alumni to help with these efforts. They can periodically provide input in the campus master plan or join an alumni interest group to give more focused comments. For example, the Entrepreneurship and Innovation Interest Group will offer feedback on the design of the campus innovation hub. Alumni can also help raise funds for the projects as private investors and advocates.

Alumni have been key to Mines' physical transformation over the past decade, as evidenced by the names of our newest buildings and special-purpose rooms. We've been fortunate to have alumni and student interns involved in the design and construction of these projects, and others have reached out to share their expertise in land development, construction and project delivery.

Go Orediggers!

Paul C. Johnson, PhD
President and Professor

STRENGTH TEST

MINES ROBOTICS WINS EXOSKELETON COMPETITION

Mines students took first place in the 2018 Applied Collegiate Exoskeleton Competition on May 5 at the University of Michigan.

Exoskeletons—powered mechanical suits that augment the wearer's strength and abilities—could be used to improve mobility for people with disabilities, help airport baggage handlers lift heavy bags or assembly line workers handle repetitive movements.

For the competition, students focused on firefighters, designing a strength-augmenting robotic exoskeleton to help bear the load of 75 pounds of firefighting equipment.

After a design review to assess safety components and the time it took to suit up, the load-bearing leg exoskeletons and their operators were fitted with 75 pounds of weight and timed while moving through an obstacle course that simulated the difficult terrain likely to be found in an emergency situation: a balance beam, stairs, uneven terrain, a low-clearance beam and dragging a 165-pound mannequin for 100 feet.

The Mines Robotics Club narrowly beat out the host university team—by 0.09 points.

“What set us apart, in my opinion, was our mobility,” said team member Stav Wine. “We used ball joints on the hips of the exosuit so we could move almost as easily in the suit as without it.”

The victory didn't come without its share of challenges, though. The night before the competition, the Mines team accidentally shorted its Arduino during testing, incapacitating the linear actuators that would have fully powered the suit. It forced them to compete with just the suit using springs for support, Wine said.

But the malfunction didn't end up hurting them too much, as none of the teams were able to present fully functional suits, she said.

“Going in, our team's goal was to make a fully assistive robot, but we ended up competing with a non-powered, partially assistive bot and it worked great,” Wine said. “After going through one of these competitions, we feel much more prepared for the next one and have tons of new ideas for Squibby Jr., next year's model.”

By **Emilie Rusch**



A Mines student gets strapped into the exoskeleton at the 2018 Applied Collegiate Exoskeleton Competition.

Photo Courtesy of University of Michigan

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Patent Attorney,
Shareholder

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

Bruce Kugler
Patent Attorney,
Shareholder

B.S., Petroleum Engineering, 1981

Doug Swartz
Patent Attorney,
Shareholder

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

Brad Knepper
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B.S., Electrical Engineering, 1998

Kristen Gruber
Patent Attorney,
Associate

B.S., Chemical and Petroleum Refining Engineering, 2000

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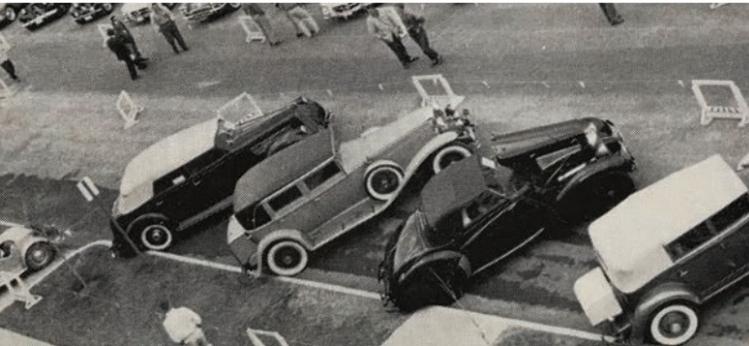
EVERLASTING TRADITIONS

Since 1934, Mines alumni and students have come together each spring for the annual Engineering Days to celebrate their hard work and Oredigger pride. The E-Days tradition has stood the test of time, and many of the activities—like the cardboard boat race down Clear Creek—have become staples of the Mines experience. This year's activities included a drilling contest, ore cart pull to downtown Denver, concert, car show and more, all capped off by an impressive firework show. Whether on campus or celebrating from afar with their local M Club, alumni joined the fun and embraced the Mines community.

Here, we've pulled together some of our favorite photos from past celebrations and this year's festivities. One thing's for sure: Oredigger pride never fades.



E-DAYS NOW



SUPPORTING HEALTH

MINES JOINS DENVER HEALTH CARE INNOVATION HUB



Mines is joining Catalyst HTI, a health care innovation hub, to advance capabilities and research in health-technologies.

Photo courtesy of Catalyst HTI

Expanding its presence in the health-tech sector and Denver, Mines will join Catalyst HTI, a first-of-its-kind health care innovation hub that will bring together startups, established health care entities, nonprofits and academic organizations to spur collaboration and innovation.

Mines plans to open a 1,700-square-foot office inside Catalyst HTI in early fall. The space will have an open workshop and classroom and be home to Capstone Design projects, career fairs, technology information sessions and a gallery showcasing student and faculty work.

“The biotech and health care industries offer great opportunities for Mines students and faculty who are working on the cutting edge of tissue engineering, computational systems biology, medical device development and more,” said Mines President Paul C. Johnson. “We’re increasing our visibility in this vital, growing field of health technology at a local level and accelerating our progress toward establishing Mines as an innovative partner for the industry.”

Catalyst HTI is the first facility of its kind in the U.S., designed to bring together stakeholders from across the health care market to foster collaboration and accelerate innovation.

Mines is one of three academic institutions that have committed to join the health-tech integrator, along with other national organizations and startups.

“If we want to create a long-term health-tech innovation ecosystem in Denver, we have to have a talent pipeline,” said Catalyst HTI President Mike Biselli. “There’s no better way to make that happen than by bringing entrepreneurs, executives and Colorado’s great educational institutions together under one roof to work collaboratively to ensure college graduates are ready to hit the ground running in the industry today and in the future.”

By **Emilie Rusch**

Appreciated securities: tax benefits for you, life-changing experiences for Mines students.



HOW DO YOU SHOW YOUR MINES PRIDE?

- Have a framed picture of me and Blaster on my desk at work
- Sing the fight song any chance I get
- Sport a Mines Colorado or Texas license plate



M

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minesalumni.com/plates

NEWLY MINTED ALUMNI



A ROUNDUP OF THIS YEAR'S GRADUATES

THIS YEAR, MINES WELCOMED **1,579 OREDIGGERS** INTO THE ALUMNI FAMILY



16 OUTSTANDING GRADUATING SENIORS

REPRESENTING EACH OF MINES' ACADEMIC DEPARTMENTS

★ 10 MILITARY COMMISSIONS

- ★ 3 COMMISSIONED AS SECOND LIEUTENANTS IN THE U.S. ARMY
- ★ 7 COMMISSIONED AS SECOND LIEUTENANTS IN THE U.S. AIR FORCE

MECHANICAL ENGINEERING was the largest represented department across all degrees

▶ To see photos from this year's commencement ceremonies, visit magazine.mines.edu.

ATHLETICS

STAYING ON TOP

NATIONAL CHAMPION

Being the last man standing in the pole vault takes a lot of skill and perhaps just as much luck. No one knows that better than Jake Pinkston, who won the 2018 NCAA Division II pole vault national championship on May 26 in Charlotte, North Carolina. He tied his school record of 5.28 meters, but getting there was no easy feat.

Making his fourth appearance at an NCAA national meet, Pinkston needed some luck. At the 2017 and 2018 NCAA Indoor Track and Field meets, he had taken a dreaded “no height” by failing to clear his opening bar, putting him in last place. At the 2017 NCAA Outdoor Track and Field meet, he finished a respectable 10th but knew he could go higher. It all clicked at the 2018 NCAA Outdoor Championships.

Going into the meet seeded second in the nation, Pinkston had to get past defending NCAA Indoor champion and conference foe Nolan Ellis of Colorado Mesa. The two had gone head-to-head at the 2018 RMAC Championships in April, and Pinkston came out on top at 5.28 meters. Now, facing the same height in the fifth round at nationals, it was down to Pinkston, Ellis and Grand Valley State’s Jacob Battani for the national title. All three men missed their first attempt, but Pinkston made no mistake on his second try. Both Ellis and Battani missed their second and third attempts, handing Pinkston Mines’ first NCAA individual title since 2011 and the first ever in a field event.



Photo by Tim Flynn

2017-18 SEASON

1 NCAA NATIONAL CHAMPION

11 NATIONALLY RANKED TEAMS

THIRD CONSECUTIVE
RMAC ALL-SPORTS CUP VICTORY



6TH PLACE in the Learfield Division II Director’s Cup standings, Mines’ best finish ever

7
RMAC
CHAMPIONSHIPS

3.18 ATHLETIC
DEPARTMENT
GPA

40
ALL-AMERICANS

12
ACADEMIC
ALL-AMERICANS



Photo by Tim Flynn

RMAC TRIPLE CROWN

Winning one RMAC championship? That’s a challenge. Winning two? Pretty tough. But to win three in the same year? It’s almost unheard of.

But that’s exactly what the Mines men’s cross country and track & field teams did this year, capturing the program’s first-ever RMAC “Triple Crown” of championships. Mines became the second school in conference history to win all three conference championship meets: the 2017 cross country race and both the 2018 indoor and outdoor track & field championships.

In cross country, Mines runners finished 1-2-6-8-9 to score 26 points and win by 54 points over Adams State; in indoor track & field, Mines set one of the largest winning margins in RMAC history with 151.5 points, beating second-place UCCS by 61. And in outdoor track & field, the Orediggers dominated again, scoring 201 points and beating UCCS by 93. The outdoor title was the first in Mines history. The Oredigger men went on to send 10 student-athletes to the NCAA Outdoor Championships, producing five all-Americans.

The Mines women’s cross country and outdoor track & field teams recorded their best-ever finishes at those respective championships, finishing second and third, sent five individuals to the NCAA Outdoors and produced three all-Americans, including freshman Gina Coleman’s fourth-place finish in the discus.



Photos courtesy of the USA Pentathlon



BECOMING AN OLYMPIAN

At the opening of the 2020 Summer Olympics, it will be 48 years since Mines produced an Olympian. But thanks to Seamus Millett, that streak could come to an end.

Millett, a junior studying civil engineering and member of the Mines swimming team, is one of the United States’ top young modern pentathletes. The Olympic event combines five different disciplines—swimming, cross country running, shooting, fencing and equestrian—representing the skills an ancient Greek warrior needed in battle.

The modern pentathlon is in Millett’s blood. His mother, Jennifer Thurston, was a member of the U.S. national team in the 1980s, and Millett grew up riding horses and running, eventually taking up fencing in middle school and becoming one of the top youth pentathletes in the world. When it was time to choose a college, Millett knew he wanted to be able to continue in the sport.

“I chose to come to Mines because of the academics and the career I was looking to pursue,” Millett said. “But I definitely did work hard to make sure I could still do pentathlon in college. That’s where swimming with the team comes in, and I made sure to find fencing and riding clubs in the Denver area.”

Millett’s training looks different from most student-athletes. He can often be found in the pool with the Mines swimming team practicing for the 200-meter freestyle event. Other times, he’s at a fencing club in Denver to train with an épée or for target practice with a laser gun. For riding, which consists of a show jumping course, Millett trains at an equestrian club in Parker, Colorado. He also follows a running plan created by USA Pentathlon.

At only 19 years old, Millett has plenty of time to qualify for the Olympics in Tokyo in 2020, Paris in 2024 or Los Angeles in 2028. To get there, he’ll have to be one of the top two ranked Americans and in the top 36 in the world or win an automatic berth through certain major events such as the Pan American Games.

A five-time USA Youth Modern Pentathlon national champion, Millett is currently ranked second in the U.S. senior men’s rankings and finished 27th at last year’s Youth World Championships.

“You have to qualify internationally, and each country is only allowed two spots,” Millett said. “I need to get involved in some more international senior-level competition, the 21-and-over Olympic-level age group.”

Millett is entered in the U.S. Nationals in San Antonio and the Junior World Championships in Prague. If all goes well, he hopes to attend the Senior World Championships this September in Mexico City and eventually the 2019 Pan Am Games in Lima, Peru.

By **Tim Flynn**

▶ Mines’ golf and baseball teams also had a great season this year. Check out the details at magazine.mines.edu.

For more on Mines athletics, visit minesathletics.com

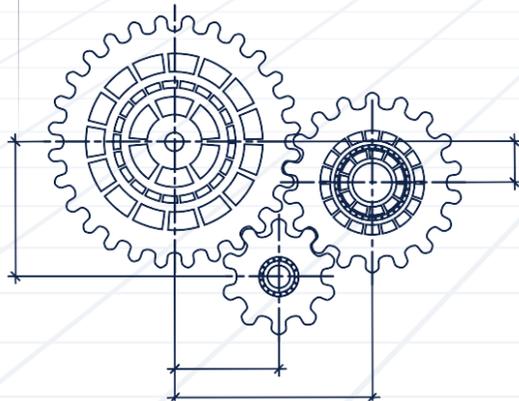


WONDER

Women

Mines alumnae are succeeding in STEM fields and encouraging positive change in the workplace

By **Amanda Schuster**



It's 2018, and women are changing what it means to work in STEM.

This year, Mines graduated its highest number of women to date: 420 received a bachelor's, master's or doctorate degree. Still, women comprise only 29 percent of the student body—slightly more than are represented in the STEM field as a whole.

According to the "STEM Jobs: 2017 Update" report by the U.S. Department of Commerce's Office of the Chief Economist, women currently represent more than 50 percent of the college-educated workforce in the United States but only 25 percent of college-educated workers in STEM.

As in many industries, women in STEM report facing challenges due to their gender, from being overlooked for promotions or not taken seriously in meetings to shouldering the burden of balancing work and family.

Mines has an initiative to increase the percentage of female students over the next several years, and many women currently working in STEM field are doing everything they can to make the workplace better for upcoming women.

Mines alumnae are a part of that effort, using the tools and values they learned at Mines, not only to help them succeed in their careers but also to make the changes they want to see in the field.





**CHRISTINA
VOLPI '12**

A PUSH FOR SUSTAINABILITY

Growing up in Colorado and California and living next to mountains or the ocean her entire life, Christina Volpi '12 said she “always had an innate desire and purpose” to help conserve the planet’s natural resources.

“From day one, my ultimate goal with a career was to be able to alleviate the stressors that people are putting on the environment,” Volpi said. Using her bachelor’s degree in geological engineering from Mines, as well as a master’s in oceanography from California State University’s Moss Landing Marine Laboratories program and an MBA from University of Colorado Denver, Volpi is finally doing what she set out to do.

“I wanted to be able to pair my technical background with the business side of things to more effectively communicate to decision-makers and to eventually become one of those decision-makers, making energy-efficient solutions and resource conservation decisions,” she said.

For the last few years, Volpi has been contracting with various companies to develop structured plans to increase sustainability, including working as a renewable energy markets and policy analyst at the National Renewable Energy Laboratory and conducting a sustainability study for the Denver Zoo. She is now looking for more permanent roles that similarly involve making sustainable changes at a structural level.

Unlike many other STEM-related fields, the sustainability industry has more women than men, and Volpi said she hasn’t run into the same challenges as some of her female peers. Still, she believes diversity on project teams is important. “If you have just one type of person who has been trained in the same way, you’re not going to bring any innovation to the table,” she said.



**BETH
HUTCHINSON '07**

DOING IT ALL

When Beth Hutchinson '07 was a sophomore at Mines, she made the difficult choice that engineering wasn’t for her. Still, she knew she wanted to stay at Mines and stay relevant to the industry, so she decided to pursue her degree in economics and business instead.

AT THE FOREFRONT OF CHANGE

The child of two parents in STEM, Emily Wong '16 grew up knowing STEM “are fields you can succeed in, do something different every day and solve problems that the world is facing.” For her, choosing a career in engineering was a no-brainer.

With a bachelor’s degree in mechanical engineering, Wong now works as a design project engineer at McKinstry in Seattle, a company she said she chose partly because of their commitment to diversity in the workplace.

“I knew going in that [McKinstry] hugely supported women in engineering and would do whatever they could to hire them, grow them and promote them from within,” she said. “The support I get from my engineering group and across the company is amazing.” Specifically, McKinstry is aiming for a 50-50 ratio of men to women in her engineering group, which Wong said is “unheard of in this industry.”

Still, women shoulder much of the responsibility of making changes in the company. “It’s definitely not that we are given all the support that we need,” Wong said. “We are given this room to make progress, but we still have to work our butts off to actually enact that change.”

Part of that work includes the creation of networks of women within the company, as well as speaking up when the company or vendors make decisions or plan events that may discourage women from participating.

Wong said her participation in residence life and the Society of Women Engineers while at Mines prepared her well to face these challenges. “They were how I built up a lot of my skills in dealing with people,” she said. “I learned a lot of innovative thinking. How can I solve this problem in a way that someone else hasn’t solved it before?”



EMILY WONG '16

Today, Hutchinson works closely with engineers in her configuration management role at United Launch Alliance. It’s that struggle at Mines, she says, as well as the school’s emphasis on teamwork and problem-solving that has prepared her to face both the professional and personal challenges in her career.

“When you find that adversity, having already been there and done that kind of thing sets you up to understand, all right, here’s what I need to draw on, and here’s how I’ll get through it,” Hutchinson said.

As someone who is used to being the only woman in a room of 20 or more coworkers—and, often, the only person under the age of 50—Hutchinson, who has three young children, acknowledges there are many challenges still facing women in STEM. Even though there seems to

be more support for women these days (Hutchinson works an abbreviated schedule of four days a week to spend more time with her kids), she said she still feels as though she must fight the stigma of being a working mother.

“I feel like I often have to overcompensate and do more, work harder,” she said. “I never want someone to hold that as something over me—that I’m not getting the work done or I’m getting special treatment.”

Still, Hutchinson believes at least some of her worry is self-imposed. She’s gotten a lot of support from both male and female superiors, and the industry is changing. “I think there’s been a lot of societal pressure to really empower women and to bring [their issues] more to light,” she said.



SYLVIA BOTELLO ANDRUS '89

OPENING DOORS

Sylvia Botello Andrus '89 had advanced beyond the available math classes at her high school by her junior year, so her math teacher, Mines alumnus Shiegeo Hayashi '50, created an independent study for her. He encouraged Andrus to pursue engineering and even recommended her for a Mines scholarship.

Andrus obtained her degree in mechanical engineering as a first-generation college graduate and has spent most of her career in a variety of roles in the field, starting with ARCO Alaska, where she trained as a petroleum engineer. She has also worked as a field production engineer and a facility engineer, including working in a gas field that powered a main power plant south of Anchorage and fed natural gas to a large portion of Alaska. She is currently a production engineer with ConocoPhillips in Colorado, where she has

been for the past four and a half years.

Andrus said she was used to being one of only a few women engineers in the field. As a result, she looked for support from other co-workers and felt it was important to make every effort to work hard and do the job well. She also believes talking to other women helps with a sense of

camaraderie, as well as with gaining useful information for how to navigate female-specific issues in the industry.

Andrus says Mines' reputation has taken her a long way in her career and credits the problem-solving she learned there for her ability to face the challenges she found in her work. "[Attending Mines] was a really hard process for us to go through," she said. "Once you were done with Mines, you felt like anything else was going to be easy."

Andrus' daughter, 16, has participated in Girls Lead the Way, a program that brings high school girls to the Mines campus to learn about career opportunities in STEM. Both Andrus and her son, who also currently works as an engineer, are encouraging her to enter the field.

"One of the things about STEM is that it's so versatile," Andrus said. "You're going to have the doors open for any field."

"People often say women are more emotional, but I think that gives us a different perspective on science—it's not all about numbers and calculations. It's also about human life in general."

OLIVIA CORDOVA '18

BE THE BEST

Cathy Farmer's '79, MS '81 success in her field started at Mines, where she was first in her class at the end of her freshman year and her classmates elected her "Mr. Engineer" in 1979.

"I loved the fact that all the guys in my class voted for me and insisted that the 'Mr. Engineer' title not be changed in any way," she said. "The engineering professors who had their doubts about women in the profession learned that the world was changing."

Farmer graduated from Mines with a bachelor's degree (and a number of awards) in geological engineering and a master's degree in geology. In her first job as a roustabout with Amoco Corporation in an oil field in Wyoming, she was the first woman engineer to be in the field on that site, and her truck got a flat tire on her very first day. "Every guy in the field came to watch me change it," she says. Of course, she changed it without a problem.

"Once you proved yourself," she said of working in the field, "there was no issue."

Working in management was a different story, Farmer said. She chose to stay on the technical side of the business, because she preferred geology. "It wasn't hard proving my technical abilities," she said. "I did not fear competing head on, toe to toe, and kicking butt."

Farmer worked with BP Amoco around the world for more than 30 years, and her career involved such highlights as recommending the discovery of several large gas fields in Trinidad and Tobago. She retired from BP in 2009 and went to work for ConocoPhillips as a Geoscience Fellow. In 2014, Farmer recommended drilling the SNE-1 well in Senegal, which turned out to be the largest oil discovery in the world that year.

Farmer recently retired for a second time and works occasionally as an independent consulting geologist. Her full-time occupation now is breeding racing quarter horses and managing two ranches. For women considering or entering a STEM field, Farmer's advice is "Be the best, and be prepared to prove it."



CATHY FARMER '79, MS '81



Don't miss our interview with one of Mines' most recent alumnae (and who graces this issue's cover), Olivia Cordova '18.

Visit magazine.mines.edu to read her take on what it's like to be a woman entering the workforce, a first-generation college graduate and what her plans are for the future.

DESIGNING OPPORTUNITY

Human Centered Design Studio provides adaptive sports equipment for all ability levels **By Emilie Rusch**

In Joel Bach's lab, the governing question, the mission that motivates his work, isn't why. It's why not.

If a visually impaired client wants to try archery, why not design a system that uses sound to help him aim safely and accurately?

If a quadriplegic wants to go downhill mountain biking, why not engineer a better braking system and seat for a four-wheel bike to improve her ride?

"What we can do, in part, is only limited by creativity," said Bach, associate professor of mechanical engineering and director of the Human Centered Design Studio. "As we start to do things and people start to see what's possible, it opens up more ideas. The idea of handing a bow and arrow to someone who is blind might seem a little crazy to some, but we can use low-cost components to give them the ability to aim safely.

"By knowing what their capabilities are, we're able to come up with a fairly simple solution that's elegant and lets them participate," he said. "Why not use technology to give people the chance?"

And through Human Centered Design Studio, Bach is also giving Mines students a chance to get hands-on experience in adaptive sports equipment design and work with real-world clients to overcome the obstacles keeping them from trying something new or continuing what they already love.

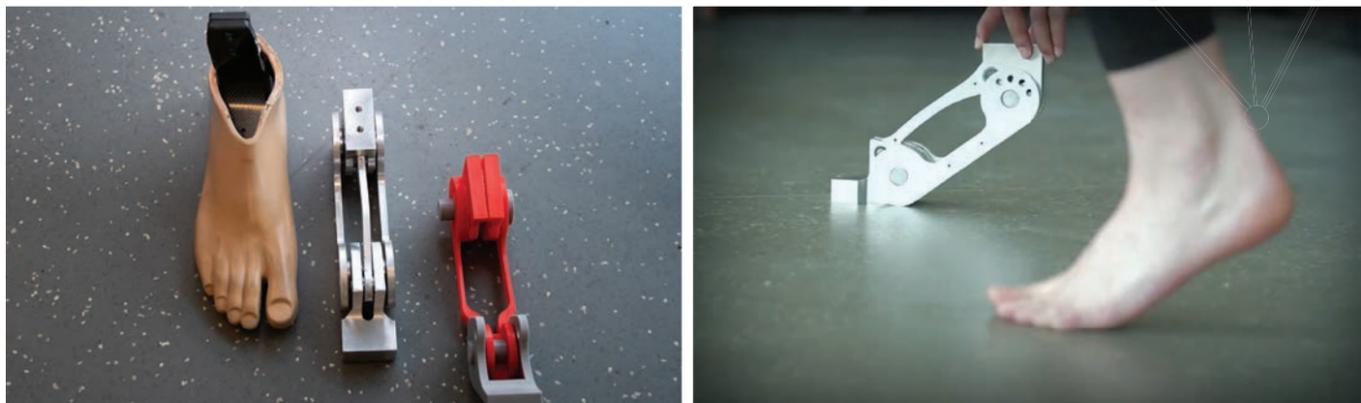
An alternative to the traditional Capstone Design program, HCDS operates like a design firm, with students working on multiple client-driven projects over the course of two semesters. Each student gets to be team leader for one project, with each project varying in start date and duration. Students cycle in and out of the program every semester, so project knowledge carries over beyond a single year.

The idea for HCDS was born out of Bach's own evolving research interests.

When he first came to Mines in 2001, his main focus was orthopedics, and he had a joint appointment at CU Anschutz Medical Campus. But after spending his sabbatical working on adaptive equipment with Assistive Technology Partners in Denver, Bach found a new calling. A trip to No Barriers, an adaptive adventure sports summit, sealed the deal.

"I volunteered at a bike clinic for a morning and just fell in love with adaptive sports and the idea that I could take the engineering and design I like to do and the biomechanics that I'm good at and apply it to something that really helps people out," Bach said.

Two years later, he proposed his first student projects—a new braking system and seat for a four-wheel mountain bike used by quadriplegics at the Adaptive Sports Center in Crested Butte and a better cross-country sit ski for an individual client who uses a wheelchair.



Projects in the Human Centered Design Studio include a prosthetic foot for dancing that enables the wearer to rise to the ball of the foot and have a greater range of mobility.

Left photo by Joe DelNero, right photo courtesy of Human Centered Design Studio



Joel Bach, director of the Human Centered Design Studio, shows the inner workings of a climbing wall handhold that helps the visually impaired to climb safely.

Photo by Joe DelNero



The Human Centered Design Studio works like a design firm, with students working on multiple client-driven projects, including a four-wheel mountain bike (above), a cross-country sit ski and more.

Photo by Joe DelNero

The traditional Capstone Design model worked fine for the mountain bike, but for the sit ski, it posed a challenge. By the time the client was able to provide feedback on the design, the students were gone and graduated, Bach said.

The HCDS model was designed to solve that problem, providing more flexibility to take on projects of varying complexity and length.

“A friend of mine is a Paralympic ski racer, and we had talked about the need for a better binding to attach his frame to his ski. Then he crashed because his binding released, and he broke his collarbone. That was on a Thursday in February. On Friday, I emailed him and asked if we could start work on the new binding, and on Tuesday I had it to my students. In May, we had a prototype,” Bach said. “We can react much more quickly to things.”

The opportunity to work with clients and help them stay

active is what attracted Corbin Cargil to Human Centered Design Studio. He got his first taste of adaptive equipment design at the Colorado Adaptive Mobility Clinic, an annual event that Mines hosts with Hanger Clinic to give Coloradans with limb loss or limb difference the chance to practice walking, running and more.

A member of the Mines football team, Cargil was among the volunteers at the event helping with drills. “The kids were fearless,” he said. “Seeing the smiles on their faces, I felt this would be very rewarding to make a career out of.”

Now, the mechanical engineering student is working in Bach’s lab over the summer and plans to enroll in HCDS for his senior design experience next spring.

“I’ve played sports my whole life. Whether it was T-ball when I was really little or playing football here at Mines, physical activity has always been really important to me,” Cargil said.



Students test out a mountain bike for quadriplegics.

Photo courtesy of Human Centered Design Studio

“Being able to combine that with mechanical engineering and give back to people and help them be active and get back to doing something they love is very appealing to me.”

Clients come from a wide variety of backgrounds and ability levels—they are adaptive sports organizations and individuals, civilians and veterans, children and adults, amateur athletes and Paralympians.

Projects run the gamut, as well. Current and past designs include climbing holds for the visually impaired; a prosthetic foot for a dancer; and a curling pole, horseback riding saddle and whitewater rafting seat for wheelchair users. Bach’s to-do list currently numbers roughly 30 projects, the only limitation being the number of students Bach can oversee.

Bob Radocy is among those clients looking forward to working with Bach and his students. His company, TRS Prosthetics of

Boulder, specializes in activity-based devices for upper limb amputees and has already partnered with Bach’s students on two adaptive sports projects.

The first, an improved prosthesis for golfers with above-the-elbow amputations, is nearing fruition, with the final prototypes heading to Pennsylvania soon for testing by an avid one-armed golfer. The second, still in development, is a prosthetic that can snap on and off the handlebars of a snowmobile, all-terrain vehicle or bicycle.

For a small company without the services of an in-house engineer, the partnership with Bach’s program has really helped push product ideas forward, Radocy said.

“Working with the students moved our project forward at least 50 percent, from basic engineering sketches to a physical model, a rapid prototype model,” Radocy said. “We’re hoping to do more in the future.”

Radocy founded TRS Prosthetics in 1979 because of his own frustrations with the performance of commercial prosthetics available at the time. He has used a prehensor—a hand replacement prosthetic with gripping ability—since 1971 when his left forearm was amputated following a car accident in college.

After starting out with just the prosthetic he designed for himself, the company has become increasingly focused on activity-specific devices in recent years, largely due to demand, he said.

“It really relates to physical health—a person who is missing their hand, they need to exercise throughout their entire life. They need a device they can go weightlift with or exercise with or go kayaking with,” Radocy said. “It’s not just recreation. It’s really necessary activity to help those people maintain their physical health, their spinal health and muscular health.”

Technology is helping make adaptive sports equipment more accessible to more people, too. Innovations in 3D printing and low-cost microelectronic devices have been especially helpful in driving down the cost of the often-custom equipment, Bach said.

A recent donation from the nonprofit Quality of Life Plus funded the purchase of multiple 3D printers for Bach’s lab, including one machine that can print not just prototypes but usable parts out of carbon fiber.

“The sky’s the limit,” Bach said. “We’ve had the ability to create adaptive sports equipment for a long time, but it’s been cost-prohibitive. Now, we can create final products at a much lower cost, which is important because insurance in most cases isn’t going to pay for the recreational opportunities.

“The more inexpensively we can do things, the more people who can take advantage of them.”

ENGINEERS HAVE THE LAST LAUGH

As students in the 1960s, Harold Heinze '64 and his classmates were committed to a rigorous work ethic. "From Sundays at 6 p.m. to Fridays at 4:30 p.m., Mines was a serious place," Heinze recalled. "You were a student and worked hard—that's what you did."

There were, however, two exceptions to that rule. "Friday evening until Sunday afternoon was fun time, and then there was the annual Engineer's Day, or E-Day, a spring weekday when classes were canceled and everyone was given time to play in activities and contests on campus," Heinze continued. In other words, it was the perfect day for a caper.

"No one would expect a bunch of college types to show up on a weekday and do what we were doing," Heinze said. A half-dozen Mines dorm residents, including Heinze, were actually pulling off some high-elevation high jinks.

In the spring of 1962, the water tower at the neighboring all-girls school, Loretto Heights College, was ground zero for a graffiti war perpetrated by students from Mines' local rival institutions: University of Denver (DU), Regis College and the U.S. Air Force Academy.

Under cover of darkness, DU students painted "Regis" on the tower in hopes of getting their rivals in trouble. When their plan failed, the students returned and painted over their handiwork. However, the Regis students liked the attention they got from having their name overlooking the Loretto Heights campus and climbed the tower and repainted their name.

Air Force Academy cadets soon joined the fun and replaced "Regis" with "U.S.A.F.A." From then on, it was a game of back and forth, with Regis students again painting over the cadets' handiwork and restoring their claim to the tower.

The Mines crew knew they couldn't miss out on being a part of the friendly rivalry. "I don't know who came up with the idea, but we all thought it was a good one—it was fun, different and didn't entail damage to property," Heinze said.

That last point was especially important, Heinze confessed. "As a freshman, I was involved with a prank at DU—the aluminum 'Denver University' sign was disassembled with ball-peen hammers. I got the 'D,'" he explained. Unfortunately, DU campus police got

THE LORETTO HEIGHTS WATER TOWER CAPER OF 1962

Heinze's license plate number, and he was presented with an ultimatum by Mines' dean of students: pay \$400 to replace the sign or be expelled. Heinze passed a hat around campus and quickly raised the funds to restore the sign and vowed that future pranks would involve no property damage.

The water tower caper struck Heinze and his friends as a perfect opportunity to have some good, clean fun. "We had been watching the whole thing unfold for several weeks and thought, 'What a bunch of amateurs. They're doing a lousy job lettering, and as engineers, we know how to do it right,'" Heinze recalled.

The crew spent several weeks prepping for their strike, creating a "Mines" stencil with butcher block paper—the "M" was in perfect proportion to the other letters, Heinze proudly remembered—securing painters' uniforms, even splashing a bit of whitewash on the truck they planned to drive to the site. "We knew the nuns at Loretto were watching the tower pretty closely, so we wanted to have a good story if they caught us in the act," he said.

In the early hours of E-Day, Heinze and his classmates traveled to Loretto, climbed the tower, painted over "Regis" with a rectangular background and loosened the nuts holding the uppermost section of the ladder in place. Their plan was to return that night, spray-paint "Mines" on the tower and remove the highest section of the ladder so no one else could scale the tower and destroy their handiwork.

"The mother superior spied my classmate, Stan Lukezic '65, on the tower that day—he was up there jumping on a four-foot wrench, trying to break the rusty nuts loose," Heinze said. "She asked what he was doing. We told her he was tightening the nuts and, fortunately, not knowing the 'rightly tightly lefty loosey rule,' she bought it."

The team returned later that night to complete their work. "We worked quickly and were out of there in less than 30 minutes," Heinze recalled with a laugh. "Two or three guys slapped up the stencil we'd made, spray-painted

"Two or three guys slapped up the stencil we'd made, spray-painted the letters on, removed the section of ladder we'd loosened and set off fireworks on the way down to illuminate our handiwork."

the letters on, removed the section of ladder we'd loosened and set off fireworks on the way down to illuminate our handiwork."

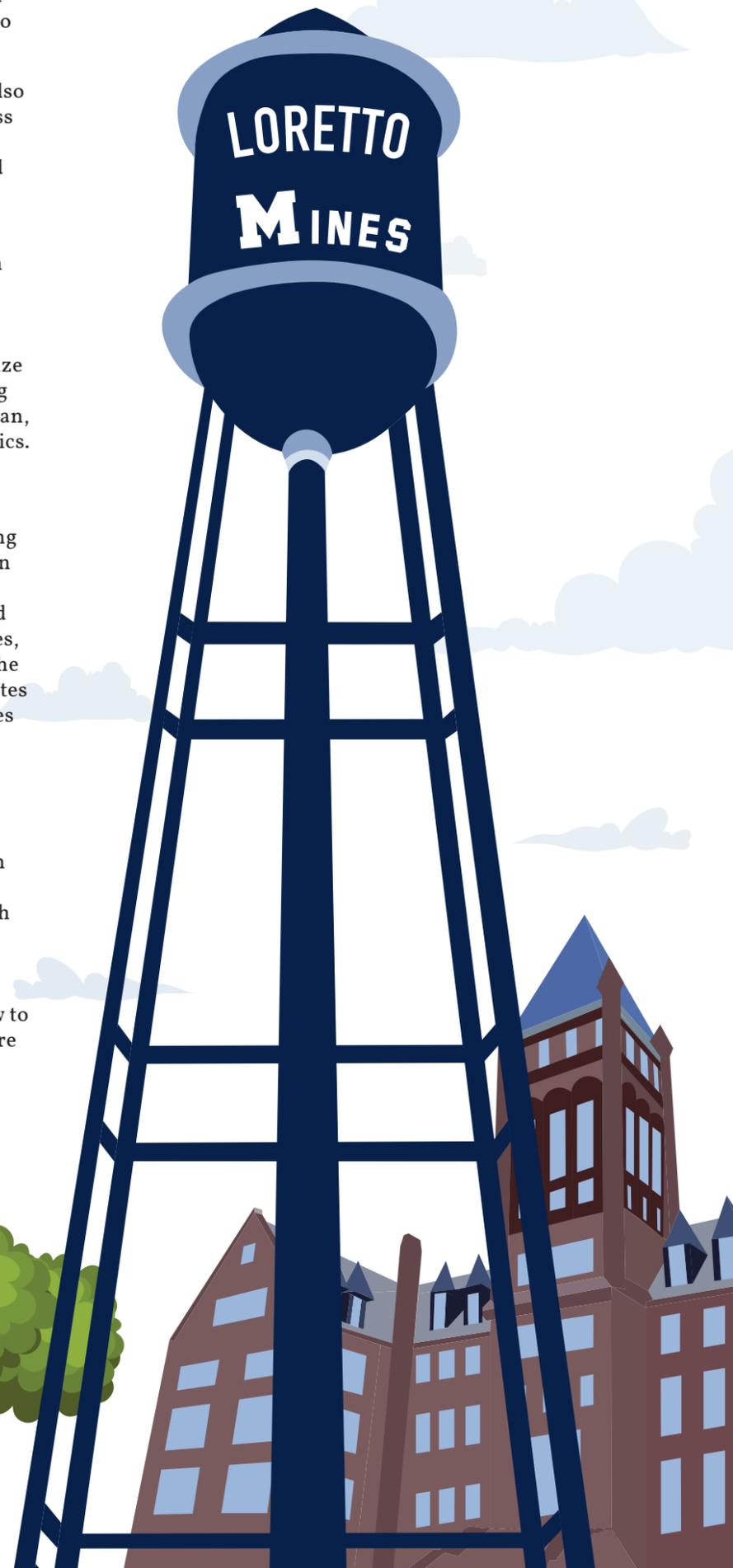
It was a great gag and fun to pull off, but it was also a telling commentary on the members of the Class of 1964, Heinze said. "In an interesting way, the prank spoke to who we were, how we grew up and what was going on around us," he said.

Born on the front edge of the post-World War II baby boom, Heinze's generation was caught up in the space race with the Russians. "When Sputnik was launched in 1957, it made the education gap between Russia and the U.S. very clear, and my high school curriculum changed overnight," Heinze said. "I and many others were identified as having engineering potential, so as a high school freshman, I was fast-tracked into math, chemistry and physics. It was a formative experience for me."

Heinze and his classmates were also part of the generation sent to war in Vietnam after graduating college. Heinze and nearly every other graduate in the Class of 1964 entered the U.S. Army Corps of Engineers as second lieutenants after college, and almost all served in combat units. "While at Mines, we learned to work hard and keep a low profile," he said, skills that helped carry him and his classmates safely through the war. "There were 200 graduates in our class, and not one was killed in Vietnam. That's an amazing tribute to our resourcefulness and our good sense at keeping our heads down."

But despite all the hard work and seriousness of completing his Mines degree, Heinze says the fun times were still important in setting him up for success later in life. "It's hard to justify doing such a childish prank, but it was executed with some form, grace and thought," Heinze said. "It was a nod to the school's reputation—Mines turns out engineers who are action-oriented and know how to do something. It was in keeping with what we were all about."

By **Lori Ferguson**



SPRING 2018

ON OUR WALL

What was your first job after graduating from Mines, and what did it teach you?

Ball Corporation, beverage container engineering support group, heat transfer/combustion engineer supporting manufacturing plants worldwide. Ball taught me how to travel comfortably every week.

Vince Carabelos '98

Engineer at PPL Electric Utilities. I learned I made a good career choice that launched me into renewable energy.

Jennifer Ayers-Brasher '00

Unit engineer for an acetylene cylinder fill plant. We augered calcium carbide rocks into the reactor which reacted with water to make acetylene and a lime slurry byproduct. In six months, I blew up a pump suction filter, destroyed the soft seat of a critical reactor isolation valve at 4:30 p.m. on a Friday and helped a foreman wrench a bleed valve off the high-pressure acetylene line, bathing us both in 300 psi acetylene. We justified and built a water recycle system, three new cylinder fill lines and the replacement of our old acetylene compressors. Plus, we tested the deluge system. Great job, loved the guys there, worked like a dog and got covered in more lime slurry than I would care to admit.

Brad Piggot '02

While I was in school, I worked as a quality control technician for asphalt paving at Martin Marietta Materials. Less than a month after graduation, I accepted a position as a junior geologic engineer at a small water rights and resources company, W. W. Wheeler & Associates. While it has only been a few months, I have done everything from geotechnical field work, borehole logging and establishing a piezometer to geologic modeling, inspection and report writing.

Jesse Reigle '17

I worked for a consulting company doing numerical modeling of groundwater. It taught me that knowing the geology of an area is very important, and it's more than numerics.

Wayne Belcher MS '88, PhD '98

I graduated in 1978 and got a job as a process engineer at Jacob's Engineering in Pasadena, Calif. I'll never forget one interview question: "What was the most important mathematical symbol I learned at Mines?" My answer: The dollar sign. I got the job! After I started, my boss told me if the engineering solution didn't result in profit for the company it wasn't the right solution. Cost-benefit analysis!

Mark Jackson '78

STEAM POWERED

INTEREST GROUP FUELS THE CONNECTIONS BETWEEN ENGINEERING AND THE ARTS

The arts have long been an important part of campus life and curriculum at Mines, but alumni recruiting students often find that they're unaware of all the school has to offer.

"Their second most frequent question after asking about engineering degrees is, 'What can I do here besides pure academic stuff? Do you have a band, a music program, a way for me to do art?'" said Alumni Association Board Vice President Ray Priestley '79, who has worked closely with Admissions for many years.

To connect students with the school's many talented alumni and encourage the dimension of creative thinking the arts lend to engineering, Priestley and other faculty and alumni recently formed the STEAM (Science, Technology, Engineering, Arts and Mathematics) interest group.

The interest group wants to introduce students to its diverse assortment of artistic alumni, who range from French horn and cello players to writers, photographers and museum curators. It also wants to honor alumni accomplishments. "We know their technological achievements, but we want to recognize their artistic achievements, too," said Bob Klimek, director of the music program at Mines and a member of the group.

PRODUCING CREATIVE ENGINEERS

Historically, engineering and the arts were intertwined, the preeminent example being Leonardo da Vinci, who was not only an artist but also a revolutionary inventor. Plenty of other Renaissance artists were equally versatile, if less famous. But as technology developed, engineering became more specific and purpose-driven, and aesthetic considerations were de-emphasized.

"Now there's a call to bring art back," Priestley said. "People want structures that are not just designed for function, but are pleasing and enhance the environment."

Artistic experience also encourages engineers to think outside the box, a trait valued by employers and recruiters even in a profession known for its exacting standards. "People solve math problems using both sides of the brain," Klimek said.

Perhaps because Mines attracts students already interested in the arts or perhaps because the arts are included in their studies, Mines graduates are known for being well-rounded, creative thinkers.

"They're more than one-dimensional, tell-me-how-much-concrete-to-pour people," Klimek said.

Priestley agrees. "A tech industry recruiter recently told me they like to recruit from Mines because of the innovative approach students have shown on the job," he explained. "They said often engineers from the academies and other top engineering schools tend to do things one way, and they need more innovative design thinking in company programs."

A CORNUCOPIA OF THE ARTS

Mines' involvement in the arts predates 1908, when the school formed the first school marching band in Colorado. Earlier, students sang in barbershop quartets, Klimek said.

Today, the school gives students a wide variety of options for studying and participating in the arts, both through classes and campus activities.

Mines' Humanities, Arts and Social Sciences (HASS) Division offers courses in music technology and acoustical engineering, as well as music theory, creative writing and culture and film studies. STEAM curriculum is also offered in the McBride Honors Program and the J. Don Thorson First-Year Honors Experience.

Through the Hennebach Program in the Humanities, artists come to Mines to conduct workshops, and visiting liberal arts professors give lectures. Students can also take field trips to the Denver Center for the Performing Arts and other local theaters.

In April, Mines opened a new "black box" performing arts space for music and theater productions. The interest group is making arrangements to hold master classes in dance and theater there, as well as a planned lecture by a lawyer versed in the arts and intellectual property law.

The campus also has many arts-related clubs, including a theater group, an improv club, an award-winning competitive tango dance team and clubs for photography and creative writing. There's also the Creative Arts Club, which painted a mural at the school's Center for Technology and Learning Media and produces sidewalk chalk art to beautify the campus. The STEAM Interest Group is forming relationships with all of these clubs to get them involved with the group and to help promote their own activities.

And of course, there's *High Grade*, Mines' award-winning literary journal, in circulation since 1976. The STEAM Interest Group recently held a reception for the publication, which nearly 150 alumni, students, faculty and staff attended. More than 40 of those attendees signed up to join the group.

LEARNING ABOUT OTHER CULTURES ABROAD

The interest group's highlight so far has been a trip to Vietnam in March, organized with help from Klimek, who has taken music students on many international trips, and Khanh Vu '93, a former instructor at Mines who is now the executive director of the Society of Asian Scientists and Engineers.

Students, alumni and faculty on the trip watched a traditional Vietnamese water puppet show, in which marionette-like figures of fairy-tale heroes and mythical animals prance about and dive into a surface of water, manipulated by operators behind a screen. The performance was accompanied by music and singing.

"We didn't understand a word, but we really enjoyed the show," said Michael Pierce '90, who went on the trip with his wife, Tina Pierce '89.

The group attended another musical show that included acrobatic performances and scenes about rural Vietnamese life. They visited the home of a renowned instrumentalist, who played tunes on traditional flutes and stringed instruments accompanied by family members. After the performance, the family invited the curious engineers and students to try out the instruments on their own.

Michael Pierce tried the *đàn bầu*, a deceptively simple-looking one-stringed instrument that, when plucked correctly, produces notes along harmonic frequencies. "It has a unique sound, and it's extremely difficult to play," Pierce said.

Because the group was so interested, the performer later brought a box of bamboo flutes to sell to them at their hotel.

To incorporate engineering into the trip, the group toured a Procter & Gamble plant that makes razors and diapers.

Some of the production processes were complex. "I never knew how difficult it was to manufacture disposable diapers," Priestley said.

Other processes involved more manual labor than is typical in the U.S. For example, razors were packaged entirely by hand, but workers appreciated having a job in the factory because it had air conditioning. "It was a real eye-opener from a cultural perspective," Michael Pierce said.

Gaining cultural and artistic perspective for a region is invaluable to engineers, Vu said. "If you're working on a bridge or dam or drilling an oil well, you need to take the culture into consideration. Part of that is the arts, which expresses what the community values."



STEAM hopes to host more cultural exchanges. It will also sponsor campus events, including a juried photography show featuring work by talented students and alumni.

Participating in STEAM allows alumni to inspire students who want to be creative thinkers and show them it's possible to pursue artistic goals along with an engineering career.

For practicing engineers, the interest group stimulates fresh ideas. According to Priestley, "It gets us traditional thinkers to think outside the box."

By **Teresa Meek**

▶ To get involved with the STEAM Interest Group or learn more about other interest groups, visit minesalumni.com/interestgroups.

ALUMNUS PROFILE

TEACHING ENGLISH, INSPIRING CIVIC ENGAGEMENT

When Ernesto “Eric” Aguilar ’01 left his career in counterdrug operations with the United States Air Force in 2005, he took the opportunity to travel the world. Over the next two years, he biked the “Big Lap” around the perimeter of Australia and through New Zealand, spent time whitewater kayaking and visited Cambodia and Europe.

But when he returned to the U.S., Aguilar found himself without a plan for the first time in his life. Knowing his love of other cultures, Aguilar’s stepmother offered him some advice: enroll in a graduate course to teach English to non-native speakers. There, Aguilar found his passion.

For someone with a bachelor’s degree in chemical engineering, a career teaching English might seem an unexpected place to end up. But for Aguilar, it was a natural step. He’s been interested in other cultures since childhood, when his father sent him postcards from various places around the world. Being exposed to different ways of life was key for him growing up, Aguilar said, and it still is.



Photo courtesy of Ernesto Aguilar

Aguilar acknowledged his unusual career path with a laugh. “I did a complete about-face,” he said. “I don’t regret it. I still don’t regret it at all. The experiences I’ve had, you just can’t put a price tag on those.”

As part of the graduate course, Aguilar “taught people who didn’t know one drop of English.” He came to believe that not only could learning the



After traveling extensively around the world, Ernesto “Eric” Aguilar ’01, pictured here with his partner, Margo Russell, and daughter, JoJo, discovered a passion for teaching English to non-native speakers.

Photo by Sue Sullivan

common language make the immigrant experience easier (something Aguilar knew firsthand after living in many foreign countries himself), but also that knowing English granted his students access to better career opportunities and, ultimately, a greater capacity to both benefit from and contribute to the U.S. economy.

Aguilar also valued his students’ gratitude and enjoyed seeing the immediate results of his work. “I was impacting someone who was really disadvantaged,” he said. “I found it motivating, and I just went for it.”

He again went abroad to gain international teaching experience but returned to the U.S. a few years later to get his master’s degree in applied linguistics from Portland State University in 2014. Still, Aguilar credits Mines with his ability to think big. “Mines was the first place that pushed me way, way past [my perceived limits]. It took me to a place far beyond where I thought I could ever reach,” he said.

This mindset has taken Aguilar from working with indigenous groups in Malaysian Borneo to advising English professors at a university in Bangkok, to providing support for minority and immigrant groups in the United States.

So what’s next for Aguilar? He currently teaches English in Arizona, and he has a vision of starting a nonprofit to help immigrants and refugees acclimate to life in the United States. “Hopefully I’d be giving them the language and culture skills to blend in with society but also to be civically engaged,” Aguilar said.

Civic engagement is important to Aguilar, and he believes it is something everyone should participate in. “I really love the notion that all citizens have some skin in the game,” he said. “And be it military service or be it social service of some kind, volunteering of some kind, I believe all should have an obligation to have some skin in the game and to give back.”

By **Amanda Schuster**

A NETWORK OF ENCOURAGEMENT

WELCOME PARTIES BUILD COMMUNITY FOR NEW STUDENTS AND ALUMNI



Alumni in Houston gathered together to welcome the latest Orediggers to join Mines, providing advice, stories and community.

Photo courtesy of Mines Alumni Office

Before another school year begins, Mines alumni gather in cities around the country to welcome new Orediggers who are about to begin their college journey or graduates who are settling in a new city. Alumni are available to answer questions and help alleviate some anxieties, while providing new students with an informal welcome into the Mines community.

“By helping organize a send-off party, I can only hope to make new students feel encouraged by the opportunities they have in front of them and make their time at Mines rewarding and fun.”

Bill Warfield ’75 | M Club Leader, Sacramento

“My dad is a Mines alumnus. We actually started one of the first Mines local groups in Bellingham, Washington, back before there were M Clubs. It was a fun activity to do together with my dad and bond over fun Mines experiences. We quickly found other like-minded alumni in our hometown. It’s great to meet the freshmen and hear about their decision to attend Mines; I have stayed in touch with a few who are at Mines now.”

Sabine Brueske ’94 | M Club Leader, Bellingham

“We had a fantastic dinner meeting the Mines alumni and incoming freshmen of the Austin, Texas area. Listening to alumni talk about their experiences at Mines was so uplifting and made this Mines momma feel even more confident about our choice. I’m bursting with Mines pride.”

Diane Newsom Wells | Parent, Austin

Stay connected to Mines, no matter how far you are from campus. Join your local M Club and attend a welcome party this summer to support the newest additions to the Oredigger family.

► Visit minesalumni.com/mclubs to find an M Club in your hometown or learn more.

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Allison Keator ’16, MS ’18 (Orediggers Connect student representative)

Shawn Kobylinski ’15
(advisor)

Dean Liley ’77

Tim Saenger ’95

Chuck Shultz ’61

Melanie Westergaard ’87

Allyson York (graduate student representative)

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OREDIGGERS GIVE BACK

OPENING DOORS FOR SUCCESS

Harold and Patricia Korell
Athletic Center

On the 50th anniversary of his own graduation from Mines, Harold Korell '68 gave the commencement speech to the Class of 2018. He encouraged them to think about the impact the university has had on their lives and will have in the future and to give back to Mines in whatever ways they can.

Korell is a loyal supporter of the university and created an endowed fund, which has provided scholarships to more than 15 students, several of whom have been basketball players. "Mr. Korell's generosity has contributed immensely to our basketball program's recent success," said Zach Rusk '18. "We cannot thank him enough for all that he has done and the wonderful example he represents for us student-athletes and all Mines students."

Korell made naming-level gifts to the Harold and Patricia Korell Athletic Center at the Clear Creek Athletics Complex and the Harold M. and Patricia M. Korell and Southwestern Energy Lobby in Marquez Hall. He has also supported The Mines Fund and many other initiatives on campus.

Korell, the former CEO and chairman of Southwestern Energy Co., led the company in its discovery and development of the Fayetteville Shale in Arkansas, one of the pioneering developments of shale plays in North America and the world. Under his leadership, Southwestern also achieved the honor of being the top-performing company in the S&P 500 from 2000 to 2010, beating out second-place Apple. Korell currently serves on the Mines Foundation Board of Governors and is an active member of the Mines community.

"There's no better place to support than the one that kicked you off and got you going, gave you the opportunity to earn what you have. You do it by your own hard work and intelligence, but the fact of the matter is, a Mines education is a big plus because it opens doors for you," he said. "I'm smart enough to reflect back on life and see how it happened. Mines was a big part of it, and that's why it's becoming a big part of our philanthropy."

By **Anica Wong**

To read an excerpt from Korell's commencement speech, visit magazine.mines.edu.

Harold and Patricia Korell have made many generous gifts to Mines, including a naming-level gift to the Harold and Patricia Korell Athletic Center at the Clear Creek Athletics Complex.

Photo by Thomas Cooper, lightboximages.com

ALUMNA PROFILE

DESIGNING THE NEXT OUTDOOR GEAR

As the fields between Golden and Fort Collins, Colo., rolled by the window of her family's car, then 12-year-old Karen Gilsdorf '15 made an announcement: she was going to be an engineer when she grew up. She had just competed in a Lego robotics competition at Mines earlier that day, and her team won the prize for innovative design. From that point, it seemed like she had her life's path drawn out.

Fast forward to her senior year in high school, when she was accepted into Mines, and then further into the future as she took her classes seriously but also realized that college was a time to experience as much as she could. She became a resident assistant, joined the Society of Women Engineers, Sigma Kappa and the American Society of Mechanical Engineers, wrote for the student newspaper and was elected vice president of the Panhellenic Council.

Despite her carefully laid plans, Gilsdorf still came to a major fork in the road. As an incoming senior, she was offered a great job in the oil and gas industry. But Gilsdorf had long wanted to design more comfortable and sustainable ski boots, something she hoped would get her into the outdoor gear industry. After some deep conversations with her academic advisor, Gilsdorf turned down the job and started cold-calling, networking and making connections however she could to pursue her passion.

"It was absolutely terrifying. But also, so very liberating. I didn't quite grasp it at the moment, but if I was ever to take a chance with my career, that was the best possible time," said Gilsdorf.

About eight months passed, and with a little luck from LinkedIn and several people in her network, Gilsdorf was offered a job at Patagonia, one of the world's premier outdoor gear companies. She's currently a material developer for trims, meaning she works on design and develops and sources all materials that are not the actual fabric of a product—think buckles, luggage hardware, elastic, zippers and webbing.

Part of her work includes the computer-aided design of customized hardware, one of her favorite parts of the job. 3D printers give her the opportunity to rapidly prototype and get feedback on solutions to gear problems.



Karen Gilsdorf '15 currently works as a material developer for trims at Patagonia, designing, developing and sourcing materials for components like zippers, elastic, webbing, buckles and more.

Photo courtesy of Karen Gilsdorf

"It is so genuinely fun. I feel silly saying that, but it's true," Gilsdorf said. "I'm in a unique position that enables me to brainstorm concepts alongside designers, without being in a design role, and work directly with my suppliers to see it through to completion. Because trims tend to be a small, niche area, I have a ton of freedom in the design aspects and get to continually bring new concepts to the table." Her education from Mines plays into her job on a daily basis through base material knowledge, project management and design principles.

Gilsdorf considers herself extremely lucky to have landed her very first gig at Patagonia. She truly believes in the company's mission, and its dedication to being ethically sustainable guides Gilsdorf in her work.

"I have a unique vantage point to see what that means from an R&D perspective, but it shows throughout the core of the business," she said. "Whether that means helping to fund and build sustainable supply chains from scrap, only using organic cotton or donating everything on Black Friday in 2017 to environmental grants, there is never any doubt about what our goal is. And that's pretty special. I have this conversation with my suppliers all the time: we aren't here for a 'one-season wonder' eco-friendly product. We're here to entirely change the industry."

Gilsdorf still hopes to one day design ski boots in a sustainable way, no doubt something that would make her younger self jump for joy.

By **Anica Wong**

WEDDINGS



SPREADING THE LOVE

Gerald Hua '12 and Catherine Elizabeth Ussery were married on Dec. 3, 2017, at the McGovern Centennial Gardens in Houston. Catherine and Gerald decided to change their original wedding plans to instead have a small wedding for close family and friends, including best men Chris Hatcher '12 and Anthony Bordonaro '12, in order to provide assistance and support for Hurricane Harvey relief efforts in Houston.

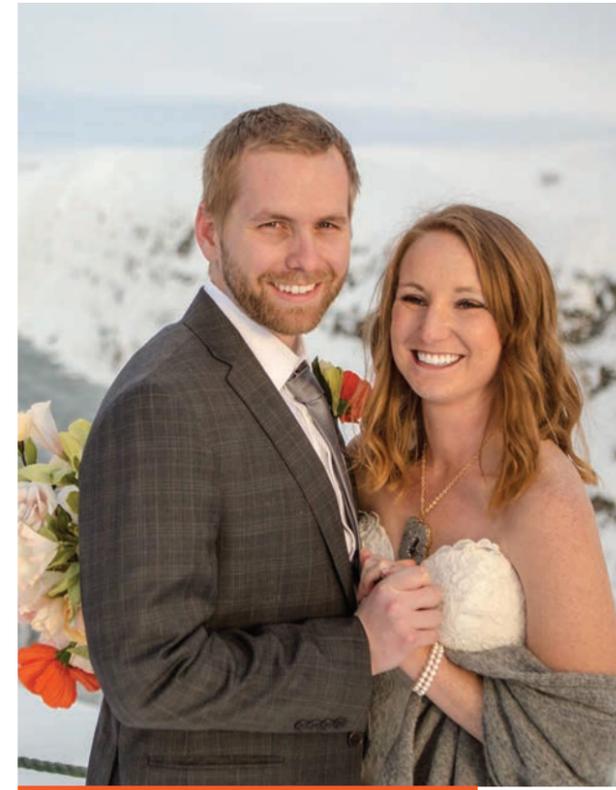
A GATHERING OF OREDIGGERS

Celine Graas '12, MS '14 met Alex Ramsey (Class of 2019) in Grand County, Colo., in between her bachelor's and master's studies at Mines. Following a Canadian proposal at the top of the CN Tower in Toronto, Celine and Alex were married in the foothills of Pine, Colo., on May 20, 2018. More than 14 students, alumni, employees and professors attended their wedding. Pictured front, left to right: Kyle Mowry (current student), Walter Prentice (current student), Heather Paschall '15, Alex Ramsey, Celine Graas, Katherine Morris MS '05 and Zira John MS '15. Pictured top, left to right: Chris Chicorelli (current student), Daniel Langemann (current student), Nathan Mills '18, Mark Graas (father of the bride), Timothy Rinn '12, Gerard Martins (metallurgy professor) and Carole Graas PhD '89 (mother of the bride).



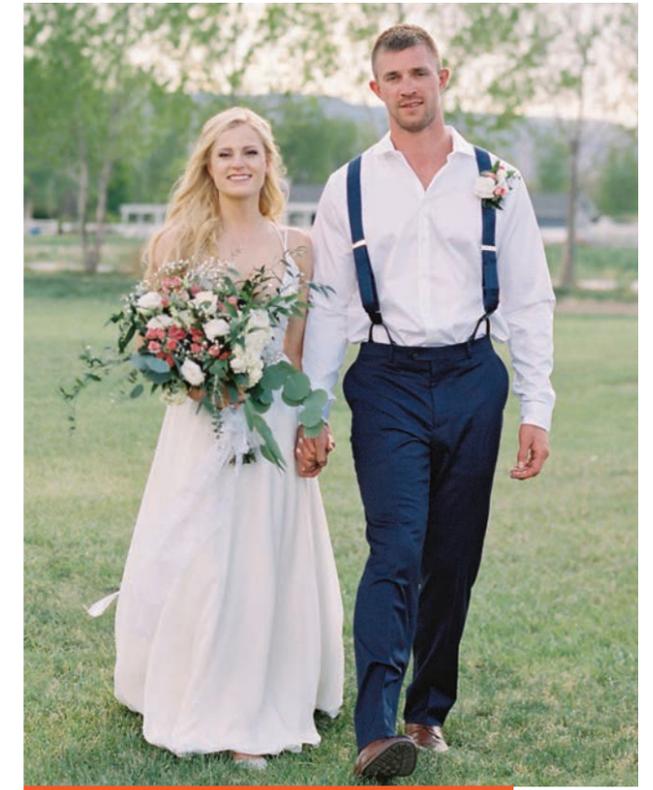
SEASONS OF LOVE

Isaiah Hess '11 proposed to Chelsey Kesson at the Broadmoor Hotel on a beautiful winter day in 2017 and got married on a rainy summer day six months later on July 8, 2017, in Colorado Springs, Colo. Isaiah and Chelsey honeymooned on Maui, and now live in Colorado Springs with their terrier puppy, Kula.



UNITING UNDER THE NORTHERN LIGHTS

Michele Wiechman '11, MS '13 married Travis Comer on Feb. 17, 2018, in Thingvellir National Park in Iceland. The couple met and became engaged in Houston. They were married in an intimate family ceremony, topped off with an adventurous weekend full of snowfall, waterfalls, sightseeing and the northern lights. The festivities continued when the couple later hosted a weekend celebration in Houston, which was attended by a dozen Mines alumni, including Rachel Wiechman '13 and Nick Clausnitzer '07 as members of the wedding party.



BONDING OVER PETROLEUM ENGINEERING

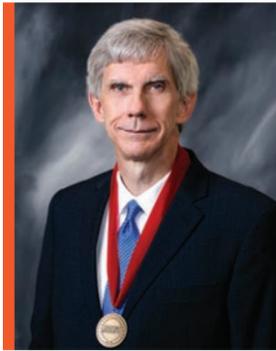
Ilsa Gustafson '13 and Ben Krane '13 were married on April 28, 2018, in Grand Junction, Colo. The couple met while completing their bachelor's degrees in petroleum engineering at Mines.

FRATERNITY BROTHERS REUNITE FOR A WEDDING

Frelynn Cohrs '10 married Michelle Fenati on Feb. 3, 2018, in Richmond, Texas. Mines graduates in attendance pictured left to right: Neil Hudson '09, Craig Melton '10, Ryan Merrion '10, Andrew Haines '10, Brandon Bush '10, Mickey Moulton '10, Estevan Bunker-Ward '11, Christopher Heim '09, Frelynn Cohrs '10 and Bo Beins '10, all brothers in the Kappa Sigma fraternity at Mines.



IN OTHER NEWS



BAKKEN SOCIETY INDUCTEE

Kelly Coleman MS '87, who is a distinguished toxicologist at Medtronic, was inducted into the company's Bakken Society on Aug. 10, 2017, in Minneapolis.

Named for Medtronic founder Earl Bakken, the Bakken Society is an honorary organization established in 1979 to formally recognize employees who have distinguished themselves in furthering the technical and scientific progress of Medtronic and have made multiple, significant contributions to the lives of patients, the corporation, physician customers and the biomedical industry. Membership in the Bakken Society is Medtronic's highest scientific and technical honor.

BABIES



HAPPY FAMILY

Justin Chichester '07, MS '08 and Christine (Hillier) Chichester '07, MS '08 are happy to announce that Edie Mei Chichester was born on Feb. 28, 2018, weighing 6 pounds, 11 ounces.



DOUBLE THE FUN

Taylor Pellerin '13 and Samantha (Hawkins) Pellerin '13 welcomed twin baby boys into their family. Everett Hawkins (6 pounds, 6 ounces) and Sawyer Alan (5 pounds, 13 ounces) made their debut on Feb. 13, 2018.



Thank You 2018 Mines Philanthropy Awardees

Tourmaline Award:
Bruce '76 and Debra Grewcock

Student Philanthropist Award:
Seyma Yilmaz, Class of '18

Faculty and Staff Philanthropy Award:
Ramona Graves PhD '82

Volunteer of the Year Award:
Dr. Stuart E. Bennett '66

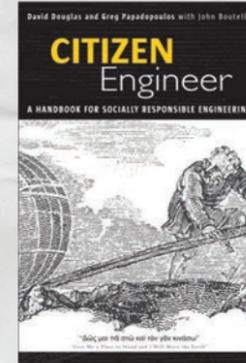
Young Philanthropist Award:
Christine '07, MS '10 and Justin '07, MS '08 Chichester

Read more about the awardees at giving.mines.edu/2018awards



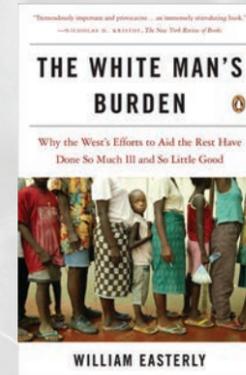
SUMMER READS

SOCIALLY RESPONSIBLE BOOK SUGGESTIONS



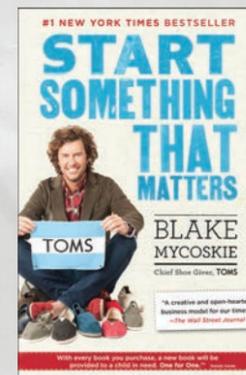
Citizen Engineer: A Handbook for Socially Responsible Engineering
by David Douglas, Greg Papadopoulos and John Boutelle (Prentice Hall, 2010)

A handbook and manifesto for engineers that shows how building more techno-responsible and eco-efficient products can translate to higher profits for businesses and an accelerated career path for engineers.



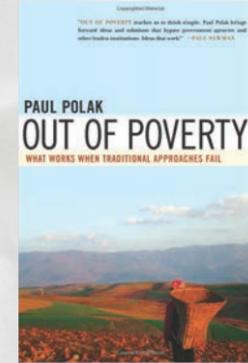
The White Man's Burden: Why the West's Efforts to Aid the Rest Have Done So Much Ill and So Little Good
by William Easterly (Penguin Books, 2006)

In an indictment of economic policies for the world's poor, Easterly argues the West needs to face its history of ineptitude when the question of transplanting Western ideals has become a pressing issue.



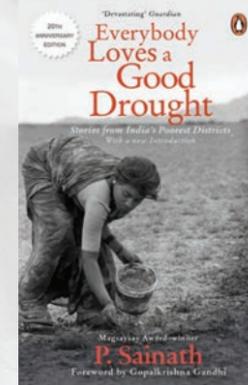
Start Something That Matters
by Blake Mycoskie (Spiegel & Grau, 2011)

Mycoskie tells the story of TOMS, one of the fastest-growing shoe companies in the world, and combines it with lessons learned from other innovative organizations and six simple keys for creating or transforming your own life and business.



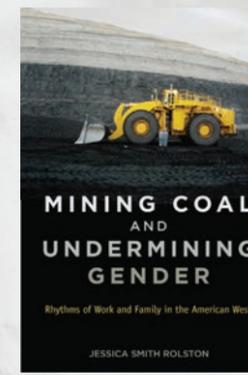
Out of Poverty: What Works When Traditional Approaches Fail
by Paul Polak (Berrett-Koehler, 2008)

Polak tells why traditional poverty eradication programs have fallen so short and how he and his organization developed an alternative approach that has succeeded in lifting 17 million people out of poverty.



Everybody Loves a Good Drought: Stories from India's Poorest Districts
by P. Sainath (Headline Review, 1996)

Sainath presents his research findings of poverty in the rural districts of India. He describes how the poor live, what sustains them and the often-ludicrous efforts to do something for them.



Mining Coal and Undermining Gender: Rhythms of Work and Family in the American West
by Jessica Smith Rolston (Rutgers University Press, 2014)

This book investigates gender and mining from the perspective of Wyoming's Powder River Basin, offering a view of the working "families" miners construct where gender roles are not nearly straightforward as stereotypes might suggest.

► Join the Leadership in Social Responsibility Interest Group's book club or learn more about the group at minesalumni.com/LSR.

Want more book recommendations? Check out *Mines Magazine's* website for an extended list of recommendations from other readers at Mines.

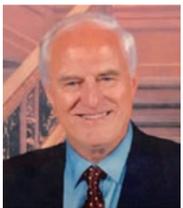
IN MEMORIAM

“When you are sorrowful look again in your heart, and you shall see that in truth you are weeping for that which has been your delight.”

-Kahlil Gibran



EMILY C. “CLAIR” BERGESON '12 died Feb. 12, 2018. Clair was born in 1989 and attended Thunder Ridge High School, graduating with academic honors. That summer, Clair and one of her best friends traveled to Europe. When they returned to the United States, they both found out they had been accepted to Mines. As a Mines student, Clair was a residence hall director and participated in numerous student organizations, clubs and teams. She graduated with a degree in chemical and biochemical engineering in 2012. She started her career with Sinclair Oil in Casper, Wyo., and was the lead engineer on a major refinery turnaround. Clair eventually returned home to Colorado, where she worked for Intellex. No matter what, Clair maintained a positive outlook on life.



ARTHUR T. “ART” BIDDLE '61 died May 6, 2018. Born in 1939 in Denver, Colo., Art graduated from Mines in 1961 with a professional degree in metallurgical engineering. As a Mines student, he was a member of the Sigma Phi Epsilon fraternity, later serving as the chapter counselor and a board member. Art served in the U.S. Army Corps of Engineers from 1963 to 1965, primarily stationed in Germany. When he returned home, Art completed law school at University of Colorado Boulder in 1968. He managed environmental, legal and public affairs and worked on challenging mining projects for AMAX. He also served as a senior construction attorney for the city of Denver during the construction of Denver International Airport. After retiring, Art was an executive director with Conciliation Ministries of Colorado. He also served as Mines Alumni Association Board president from 2004 to 2005.



BREWSTER CONANT '50 died March 18, 2018. He was born in 1928 and received a professional degree in petroleum engineering from Mines in 1950. As a student, Brewster was a member of the Beta Theta Pi fraternity. After graduation, Brewster worked for Dow Chemical Company for four years before attending Northwestern University, where he received an MBA in finance. He worked as a financial analyst in the Chicago area for many years before he and his family moved to Acton, Mass. Brewster continued to work as a financial analyst but also turned his attention to community service as part of the Conservation Commission, the Investment Advisory Committee, the Cemetery Commission and as a trustee of the Acton Memorial Library. Brewster successfully campaigned for the creation of an arboretum near the center of town and served on the Friends of the Acton Arboretum board. He received the Distinguished Steward for Acton Water Award as part of the Acton Water District's centennial celebrations in 2012 and was honored as the Acton Conservation Trust's 2017 volunteer of the year.



WAYNE LEBACK '49 died April 30, 2018. Prior to attending Mines, Wayne fought in World War II until he was severely wounded in the Battle of the Bulge in December 1944. He spent seven months in the hospital and arrived in Golden on crutches. After graduation, Wayne returned to Lyons, Kan., where he established Lebsack Oil Production Inc. and worked in oil and gas exploration and production for almost 70 years. Wayne remained an active geologist until his death. Wayne was also a dedicated conservationist and played a pivotal role in establishing the Kansas chapter of the Nature Conservancy. Wayne received many professional honors, including his induction into the Kansas Oil and Gas Museum Hall of Fame.



PAUL M. TYMAN '44, MS '47 died Feb. 6, 2018. Born in Chester, Penn., in 1923, Paul received a full scholarship to Mines, where he completed professional and master's degrees in mining engineering in 1944 and 1947, respectively, and graduated with honors. His schooling was interrupted by World War II, where Paul served in Okinawa, Tai Pei and Iwo Jima as a United States Marine. When he returned home, Paul began a successful career in the mining industry working for Stearns Rogers, where he built potash and molybdenum plants in Canada and the U.S. In 1988, he graduated from Unity College and became an ordained minister. He was active in the 12-Step community, led retreats, taught classes and acted as a spiritual mentor to many people. Paul also was instrumental in establishing the Centering Prayer Program in Tustin, Calif.



WILLIAM W. “BILL” WALKER '61 died March 18, 2018. Bill was born in Pittsburgh, Penn., in 1939, and graduated from Mines in 1961 with a professional degree in geological engineering. After graduation, Bill worked as an exploration geologist for the next 55 years, both internationally and domestically in grass-roots exploration, new mine development and the supervision of countrywide exploration programs. He also served as the division geologist for Central and Southwest Fuels, Inc. and as the vice president of Earth Sciences, Inc. Bill went on to found Canyon Resources Corp., serving as vice president until 1985 and president until 1987. He also established a large international exploration program and served as president of Canyon Resources Africa Ltd., CR Brazil Corp. and Canyon de Panama, S.A. Within the past 20 years, Bill worked as a consultant for projects in the western U.S., Canada, Europe and the Yukon.

ALSO REMEMBERED

Patricia A. Warner February 26, 2018

► To submit an obituary for publication in the magazine, visit minesmagazine.com/submit-an-obituary.

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MINER'S PIC



Photo by Chris Kogut

POINT OF SAIL

Dick Baxter '63 didn't initially think he had an interest in sailing. "A casual acquaintance invited me to go sailing with him. I really didn't want to go. I wanted to stay home and watch football. I couldn't think of a polite excuse, so I went," Baxter said. "It was an instant addiction, and I knew I wanted to learn how to sail."

Baxter did just that, and over the next 40 years, he raced small sailboats on Galveston Bay, just south of Houston. "Racing sailboats provides an escape from reality," he said. "It requires intense concentration and complex problem solving, but at the end of the day, it doesn't matter if you solved the problems correctly—it is just a game."

Baxter made twelve trips to the Upper Midwest and East Coast to compete in national championship regattas, racing on Lake Michigan, Lake Superior, Lake Huron, Lake Erie, Canandaigua Lake, Long Island Sound and Barnegat Bay. He finished in the top 10 five times, but Baxter's favorite race was the last of the 2010 National Championship Regatta in Cedarville, Michigan. "We benefited from an early wind shift and led the race from start to finish," he said. "This gave us a third-place finish for the regatta, which we considered a fantastic accomplishment."

Though he's now retired from sailing, Baxter's unexpected hobby turned out to be the experience of a lifetime.

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