

New Mines President

Engineering Beer

Edgar Mine Renovations

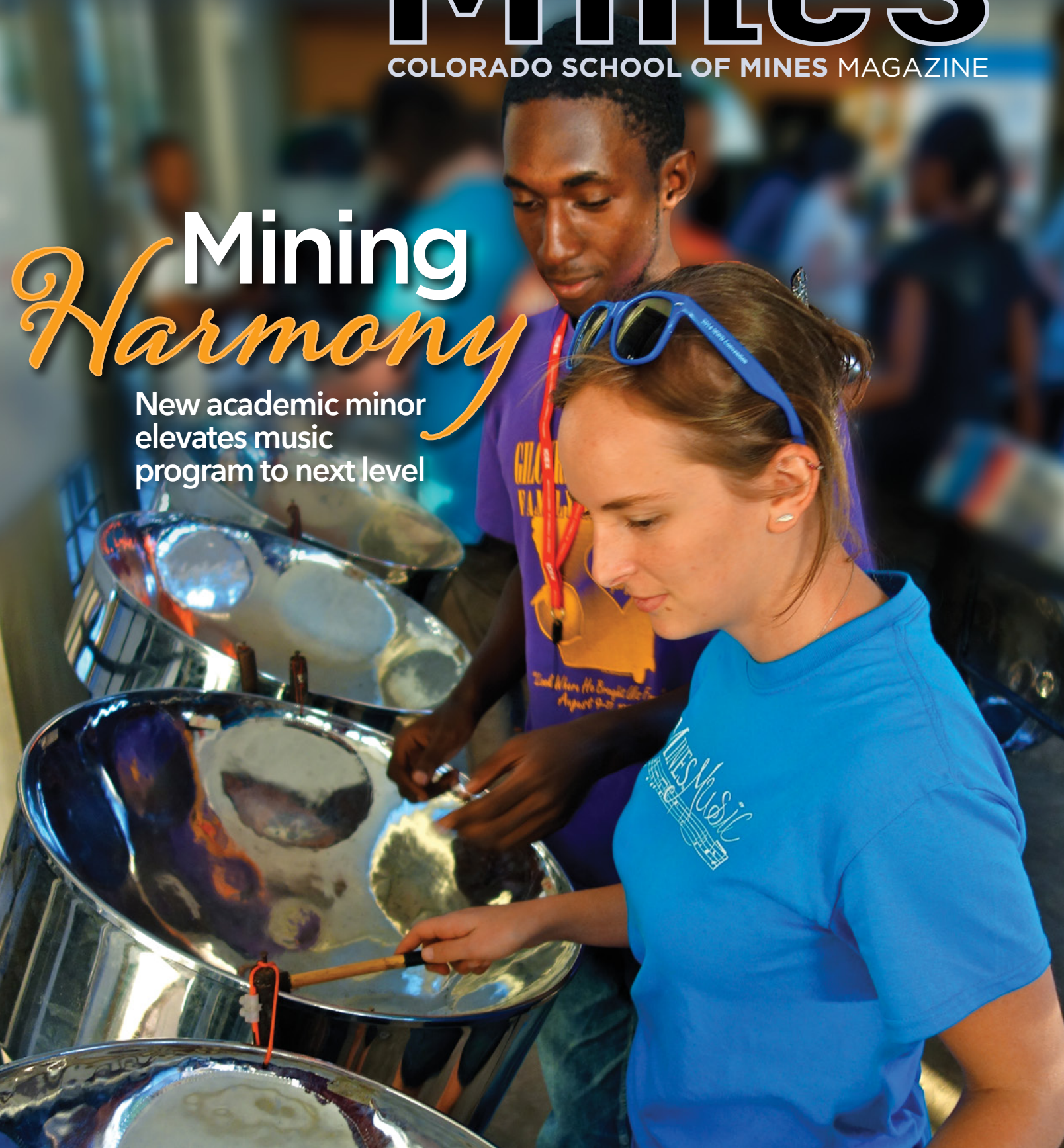
Summer 2015 Volume 105 Number 2

Mines

COLORADO SCHOOL OF MINES MAGAZINE

Mining *Harmony*

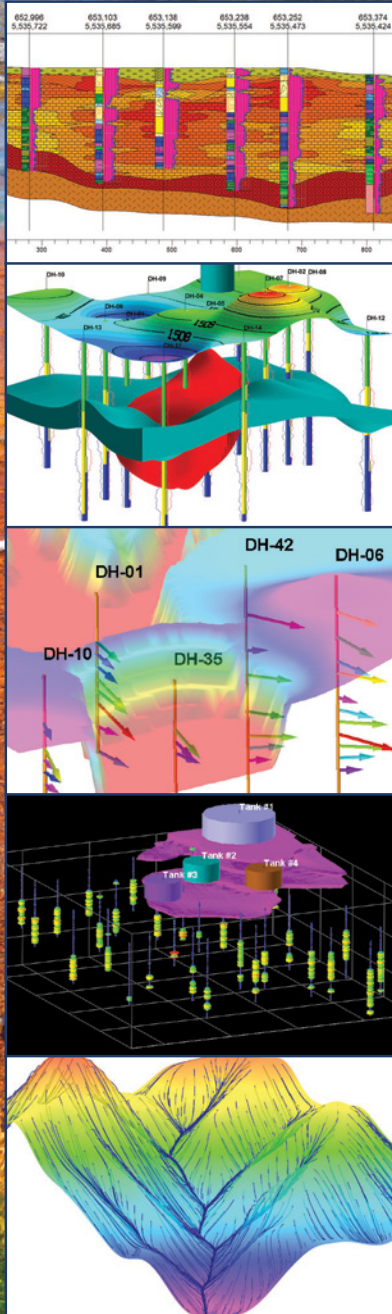
New academic minor
elevates music
program to next level





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The new course on brewing science marks the latest chapter in a long relationship between Mines and beer. For some Mines graduates, it also signals the start of what could be a bright future in the burgeoning craft brewing industry.



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Cover image: Mines engineering physics major Leah Hill gets instruction in playing the steel drums from Daniel Scott, a science and technology student at the University of the West Indies in Jamaica. Mines music students, faculty, and alumni traveled to Jamaica on a "Music Engineering Adventure" during Spring Break 2015. (Photo by Ray Priestley)

WEB EXTRAS | MULTIMEDIA

minesmagazine.com

Jammin' in Jamaica Mines students and alumni play the steel drums with a little help from their friends in Jamaica. Read more on page 14.

Mobility Clinic for Amputees Returns to Campus The second annual Running and Mobility Clinic for Amputees was held on the Mines campus, co-hosted by the Colorado School of Mines Center for Biomechanics and Rehabilitation.

Through the Laundry Room Door The entrance to this former Colorado School of Mines experimental mine is through the laundry room of Holly Bidle's house in Golden, Colo. Take a video tour and read more on page 22.

Edgar Mine Take an online tour of the Edgar Mine and underground classroom. Learn about Freeport-McMoRan Foundation's gift to the school to renovate the Edgar Mine on page 6.

Spectacular Light Show, Mines Style Watch this year's E-Days fireworks display, and check out additional photos from E-Days and E-Days 'Round the World 2015. Read more on page 24.

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ALUMNI NOTE

Meet the New Editor



It is the pleasure of the Colorado School of Mines Alumni Association to formally introduce and welcome our new editor, Laurie Schmidt. Through a bit of role reversal, we sat down with Laurie to ask her questions about herself and her vision for the magazine.



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President, Board of Directors
CSM Alumni Association
Ray Priestley '79

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Comments and suggestions are welcome. Contact us at magazine@mines.edu or *Mines* magazine, PO Box 1410, Golden, CO 80402. Just need to update your address? Go to minesalumni.com/update.

PROFILE

Name: Laurie Schmidt

Hometown: West Palm Beach, Florida

Education: University of South Florida (BA '95), Colorado State University (MS '98)

Start Date at CSM Alumni Association: December 5, 2014

Mines: How did you become interested in science?

Laurie: I grew up in south Florida, about 150 miles from Kennedy Space Center. The Apollo space program started when I was in elementary school, and my family would drive up to Cape Canaveral to see the launches. We'd pack a picnic lunch and sit on the beach for hours waiting for launch. I'll never forget feeling the ground shake and hearing that explosive noise as the rockets lifted off. I was 10 years old when Apollo 13 launched, and I also remember running home from school every day to ask my mother whether the astronauts were going to get home. Without a doubt, those were the experiences that got me hooked on science.

Mines: Why did this position interest you?

Laurie: First, Mines has such a great reputation that I didn't think twice about applying. I had been working as a freelance science writer for seven years, and while I enjoyed the challenge of explaining science to lay audiences, I really love the planning and coordinating aspects of managing a publication. And after working at home in isolation for such a long time, I was anxious to be part of a team again.

Mines: Can you tell us about a favorite job you've had in the past?

Laurie: I've been fortunate to work on some really interesting projects, but my favorite job was working with the Phoenix Mars Lander team at the University of Arizona to create content for the mission's website. It was a real honor to be part of such an important project. One of the sections of

the website focused on life in the universe, and I would be up at all hours of the night reading books about this stuff because I was so fascinated by it. And I'll always remember sitting in front of my computer holding my breath during the Phoenix landing on Mars.

Mines: What are some of your interests outside of work?

Laurie: I love to travel, especially to any place that involves palm trees and sandy beaches. Having grown up in south Florida, I have a real connection to the ocean. So if there are any Mines professors doing research on coral reefs who need volunteers, I'll be happy to sign up. I also spend a lot of time in southeast Utah's canyon country. And, of course, space exploration and missions fascinate me.

Mines: Can we anticipate any changes with the magazine?

Laurie: The biggest change is that we'll be publishing four issues each year now—in April, July, October, and January. I've also heard some folks say we need to dispel the myth that Mines people are always serious, so while it's important to cover the serious topics, we want to have some fun content, too. And we have a good start with this issue: music, Jamaica, and brewing.

Mines: Have you been surprised by anything you've learned about Mines since you've started working here, either about the campus, the history, or the alumni?

Laurie: I've been pleasantly surprised at how engaged and involved Mines alumni are, and I think that's a great compliment to the university. I am also fascinated by some of the cool traditions here on campus. I watched a video of last year's M Climb, and I can't wait to cheer on the freshmen this fall as they head down Maple Street with their hard hats on. I love meeting people in the Mines community, so folks should feel free to stop by and say hello any time.

EDGAR MINE RENOVATIONS

Mines Receives \$1 Million Gift from Freeport-McMoRan Foundation



The Freeport-McMoRan Foundation made a \$1 million gift to Colorado School of Mines to support extensive renovations and upgrades to the Edgar Mine, the university's experimental mine facility located in Idaho Springs, Colo. "This significant investment by the Freeport-McMoRan Foundation will not only strengthen earth sciences education programs at Mines, but also foster ongoing innovation in the mining engineering industry, facilitate expanded training for mine safety and rescue operations,

and create a modern facility for experiential learning and community outreach," said Mines President Emeritus Bill Scoggins. "We're grateful for Freeport's leadership in this endeavor, and we are excited to work together to preserve and enhance this unique resource and to create a fitting showcase of the 21st century mining industry."

The funding will be used for the first phase of a comprehensive, multimillion-dollar revitalization project that includes upgrades to a dry building

and underground classroom, as well as improvements to the electrical, sewer, and ventilation systems. "This gift represents our commitment to the highest quality mining education, including facilities that provide faculty and students the best opportunities to apply knowledge, think critically, and innovate before they ever enter the workplace," said Red Conger '77, president of Freeport-McMoRan Americas.

"We are extremely proud to be able to support the school's Edgar

Mine and its mission to provide an enhanced learning environment for improving mine operations and safety, and its function as a focal point for community outreach to help increase public awareness of our industry,” said Mike Kendrick ‘84, president of Climax Molybdenum Company, a Freeport-McMoRan company that owns and operates the Climax and Henderson molybdenum mines in Colorado.

With more than 800 students enrolled in earth sciences disciplines at Mines, the Edgar Mine is widely used as a unique underground laboratory for hands-on learning. The university awards 20 percent of mining engineering degrees in the United States each year, and a state-of-the-art facility representing the industry as it operates today is anticipated to increase student interest in the field. In addition, mine safety and rescue training programs at the Edgar Mine are in high demand; nearly 700 companies and organizations have trained at the facility throughout its history.

Named for the Edgar mineral vein that runs along the hillside above the mine, the Edgar Mine produced high-grade silver, gold, lead, and copper in the 1870s. The university will seek additional private industry support to complete phases two and three of the renovation project, which is currently in design with construction anticipated to begin early this year.

—Brenda Gillen



Jan Smits



Kathleen Morton

FACULTY NEWS

MINES PROFESSORS RECEIVE NSF CAREER AWARDS

Two Mines professors have received 2015 National Science Foundation (NSF) CAREER Awards. Kathleen Smits, assistant professor of civil and environmental engineering, received the award in support of her research *Advancing the Science and Education of Land Surface-Atmosphere Interactions: Interweaving Multiscale Experimental and Modeling Approaches for Land Surface Models (LSM) and Experiential Learning*. The goal of Smits’ research is to advance the understanding and modeling of mass and energy exchange at the land-atmosphere interface over a wide range of scales, ultimately improving LSMs that are used in global climate prediction. (Read more about Kathleen Smits on page 11).

Aaron Stebner, assistant professor of mechanical engineering, received the award to support his research *In-situ Advancements for Study of Multi-Axial Micromechanics of Solid Materials*. The project will examine the mechanics of the microscale level deformation of metal through advanced experimental mechanics and analysis, including novel in-situ X-ray diffraction experiments. Stebner’s work will help explore new territory in the study of micromechanics phase transformation in shape memory alloys and stainless steels.

The NSF CAREER award is the most prestigious award in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research within the content of the mission of the organizations.



Thomas Cooper

PRESIDENT'S CORNER

Passing the Torch—with Gratitude

Late last year I announced my intention to retire, and I immediately received scores of emails and phone calls offering congratulations and well-wishes. This strong backing from the Mines community has been a constant throughout my years serving as president, and I'm grateful for that support and all it has allowed us to accomplish.

During my time here at Mines, our community has transformed—not just our physical campus, but also our people. Positioning Mines to have the capacity to provide a world-class STEM education to more highly-qualified students is something I'm particularly proud of. At our May commencement ceremony, my 18th and last as president, we conferred 1,022 degrees. That's quite a change from my first Mines spring commencement in 2007, when we conferred 535 degrees. In fact, our newest alumni—those who graduated less than 10 years ago—make up about 35% of our total living alumni. The world needs more scientists and engineers, and at Mines we're doing our part to fulfill that need.

I have had the honor of leading this great institution for the past nine years, and working with and advocating for the next great generation of scientists and engineers has been one of the greatest pleasures of my life. I've always maintained that it's the people that make Mines great—our distinguished faculty, our hard-working staff, our very talented students, our accomplished alumni, and loyal friends. Together we have not only moved Mines forward, but have also simultaneously built a solid foundation from which even greater things can be achieved.

I came to Mines after a 32-year career in the oil and gas business that took me around the globe. Today's students come from—and our alumni return to—every point on the globe to learn and innovate together. We all found common opportunity here at Mines and built a worldwide alumni network of exceptional scientists, engineers, and leaders. That gives me great pride and great hope for our global future, and I hope it does you, too.

Now I leave Mines in the capable hands of Dr. Paul Johnson, but I say one last time to all you Orediggers at home and abroad: Don't forget that you're a helluva engineer!

—M.W. Scoggins

»» Mines Achievements under President M. W. Scoggins

The nine-year tenure held by M. W. "Bill" Scoggins, the 16th president of Colorado School of Mines, has been transformational for the university. According to Jim Spaanstra, chair of the Board of Trustees, "Through President Scoggins' leadership, Mines reached remarkable levels of excellence, grew its global reputation, and strengthened its financial health despite periods of economic turbulence."

Scoggins' vision to establish an integrated residential campus experience for students not only transformed the physical campus, but also created programming and services necessary to compete for the nation's top students. As a result, national demand for a Mines education has grown dramatically, with undergraduate applications increasing from 6,000 to more than 13,000, and non-resident students growing from 26 percent of the freshman class to 49 percent—the maximum allowed by Colorado statutes.

Other significant achievements include:

- The graduation rate for undergraduate students increased from 68 to 75 percent, and freshman retention rates increased from 84 to 94 percent.
- Doctoral degrees awarded have doubled since 2007, reaching an all-time high of 123 awarded during the 2014-15 academic year.
- Sponsored research volume exceeded \$60 million in 2013 and is expected to do so again in 2015.
- Philanthropic donations broke records for three consecutive years, and the Mines endowment now stands at \$271 million. The largest gift in Mines history, \$27 million, was announced in 2014.
- The Colorado Scholars scholarship program was established, ensuring that a Mines education remains affordable for the brightest students in the state who have the greatest financial need.
- Financial resources were dedicated to increase faculty size. Since 2006, the faculty headcount at Mines grew by nearly 35 percent to 277, and funding has been secured to reach a total of 305 positions in the coming year. In addition, the number of donor-established faculty positions has increased from 23 to 35.
- More than \$230 million has been invested in new buildings, facilities, and other capital improvements, transforming the campus's physical infrastructure while ensuring the institution maintains a strong financial balance sheet.

NEW MINES PRESIDENT

Colorado School of Mines Names Paul C. Johnson as 17th President

On June 1, 2015, the Colorado School of Mines Board of Trustees announced the appointment of Paul C. Johnson as the 17th president of Colorado School of Mines. He officially assumed his duties on July 1, 2015.

Johnson joins Mines from Arizona State University (ASU), where he served as dean and executive dean of the Ira A. Fulton Schools of Engineering since 2006 and as a professor in the School of Sustainable Engineering and Built Environment. He has also served as ASU's associate vice president for research and the Fulton Schools' associate dean for research. Before joining ASU's faculty in 1994, Johnson was a senior research engineer at the Shell Oil/Shell Chemical Westhollow Technology Center.

Jim Spaanstra, chair of the Mines Board of Trustees said, "Paul Johnson brings a distinguished track record of teaching, research, public service, and leadership. Throughout the search process it was clear that he understood Mines and its rich history, unique role and mission, and opportunities for enhancing global distinction. We are confident the university will be in great hands to guide it as we seek to achieve our strategic aspirations."

"I am excited and honored to be named Mines' 17th president," said Johnson. "Since being named a finalist, I have received emails from connections to Mines that I did not know existed. Mines' far-reaching, engaged, and supportive network is impressive. From on-campus

meetings it is clear that Mines has the components and drive to become the premier engineering and applied science university. I look forward to working with the students, staff, faculty, alumni, and Mines' global network to achieve that aspiration."

Johnson is also looking forward to participating in Mines' longest-standing tradition for new incoming students. "I've been searching for the perfect 10-pound rock to carry up to the M on Mt. Zion," he said.

Johnson is internationally recognized for his expertise in soil and groundwater remediation and risk assessment. Teaching, though, remains his passion. Johnson has received numerous outstanding educator awards and was twice selected the top teacher in the Fulton Schools at ASU. Colorado School of Mines' emphasis on both teaching and research was a key attraction for Johnson. "Every institution that I have chosen to be a part of

has emphasized the importance of both teaching and research," noted Johnson. "I have taught almost every semester during my 21 years as a university faculty member and administrator and will continue that at Mines."

Born in Washington, D.C., Johnson attended high school in Walnut Creek, Calif. He earned his bachelor's degree in chemical engineering from the University of California-Davis, and his master's and doctoral degrees in chemical engineering from Princeton University. Johnson and his wife, Elyse, an elementary school teacher, have two adult children; Kyle is an editor in Mesa, Ariz., and Kaitlin is a chemical engineering graduate student at the University of California-Davis.

Johnson is the co-author of 12 U.S. patents and has received



Kathleen Morton

awards recognizing the impact of his research and contributions to the groundwater profession, including the National Ground Water Association's Keith E. Anderson Award (2010) and the Lifetime Award in Remediation sponsored by Brown and Caldwell (2014). His research group has received Project of the Year Awards from both the Environmental Security Technology Certification and Strategic Environmental Research and Development Programs, which are given by the U.S. Department of Defense in partnership with the Environmental Protection Agency.

Johnson served on the National Research Council Committee on Future Options of the Nation's Subsurface Remediation Effort. He also served as the editor for the National Ground Water Association's journal, *Ground Water Monitoring and Remediation*.

SPORTS

All-American Honors for Mines Swimmer



Bryan Desch

In the span of just one month, Brennan Mays' freshman season at Colorado School of Mines came full circle. He went from experiencing the highest of the highs—three individual titles at the Rocky Mountain Athletic Conference (RMAC) Swimming and Diving Championships and conference Freshman of the Year honors—to the other end of the spectrum at the NCAA Division II National Championships.

Mays opened his inaugural nationals trip with a 20th-place showing in the 1000-meter freestyle on March 11 in Indianapolis, Ind. His performance was followed by a bout of stomach flu later that evening, which kept him down the next day and forced him to withdraw from the 500-yard freestyle. But rather than close out an impressive debut season on a sour note, Mays bounced back to place 15th in the 1650 and garner honorable mention All-American recognition, despite not being at full strength. "It was a pretty hard swim, but by that point I was no longer sick. I was just not at my best," Mays said. "I'm glad I swam just so I didn't let it completely define Nationals."

Not many freshmen could have handled a setback like that with such resilience, and that determination is just part of what impressed Mines coach Nate Rothman this year. Mays didn't just bring the physical intangibles to the pool—he was also strong

mentally. "I think it's a big learning experience for him this year. He's still pretty young, and after that first day he was really disappointed," Rothman said. "We needed to set some realistic expectations, and from that moment in the conversation, he kind of picked his chin up."

Mays wasn't sure what to expect in his first year with the program, even after winning a state championship at Air Academy in Colorado Springs during his senior year of high school. Rothman recognized the potential immediately, saying that during his tenure with the Orediggers, he's only had a handful of swimmers who have made an impact.

"I knew this kid was something special for sure," said Rothman. "After a couple weeks of training with the team and kind of getting dialed in, you could see him start to understand what it's about."

It was Mays' performance over four days at the RMAC in Grand Junction that really cemented those beliefs. He notched program records in the 1000, 500, and 1650 on his way to three conference titles, setting a pair of RMAC and pool records while recording 62 points on his own. He also broke a 15-year mark in the 500 at 4:32.05, and his time in the 1650 was 15:41.03.

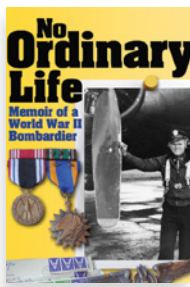
Even after becoming the first All-American at Mines since Andrew Zerwick in 2011, Mays pointed to the conference championships as the highlight of his season. "I had my whole team there," he said. "It was a lot more meaningful to me being up there and swimming at my best, rather than having a hard time and just managing."

The Mines men's and women's teams each placed fourth at the RMAC Championships, and Rothman was honored as Women's Co-Coach of the Year for the first time. The Mines women broke more than 20 team records during the season, and the 800-meter free relay team was close to qualifying for nationals. "We had some great swims on the guys' side and I'm really proud of how the men did," Rothman said. "But our girls had a season like I've never seen anywhere before. Having the girls step up to a new level is very exciting."

—Brian Miller



For more on Mines athletics, visit csmorediggers.com.



BOOKS

Just Published

No Ordinary Life: Memoir of a World War II Bombardier

Glenn W. King '50 is the subject of a recently published book titled *No Ordinary Life: Memoir of a World War II Bombardier*. Flying with the Eighth Air Force from Great Ashfield in England, Glenn was shot down on his 23rd combat mission. He parachuted into Germany and was captured and made a prisoner of war in Nuremberg. When Glenn and his fellow prisoners were forced to march more than 100 miles to Moosburg, Germany, they endured constant deprivation. A can of tuna—part of a Red Cross food parcel—was tucked in his coat pocket, and every morning he vowed to hold on to it for just one more day. *No Ordinary Life*, written by Sue Johnpeter, is the story of Glenn King's courage and resilience in the waning days of World War II. (CreateSpace Independent Publishing Platform, 2014).

FACULTY SPOTLIGHT

Five Interesting Facts about Mines Professor Kathleen Smits



Kathleen Smits is a civil and environmental engineering assistant professor at Mines. She became interested in the environment at an early age, and her passion

for engineering grew as she advanced through her college career. Smits began her journey at Mines in 2007 as a PhD candidate, and she now teaches Hazardous Waste Site Remediation, Fluid Mechanics, and Environmental Pollution. Here are a few things about her you may not know.

1. SHE IS CURRENTLY A MEMBER OF THE U.S. AIR FORCE RESERVES.

Smits was on active duty in the Air Force for eight years. She also taught at the U.S. Air Force Academy in the Department of Civil and Environmental Engineering for three years. Currently, she is an operations research analyst in the U.S. Air Force Reserves, working part-time for U.S. Northern Command at Peterson Air Force Base in Colorado Springs.

Smits: *“At Mines I study current and emerging environmental problems that are of interest to our nation and the world using both analysis and experimentation. In the Air Force, I do the same thing for different problems and applications. A lot of the understanding and training that I have from being a scientist directly applies to what I do in the military.”*

2. SHE HAS BEEN SCUBA DIVING 150 TIMES.

As one of her first jobs out of college, Smits worked with the National Aquarium in Baltimore to help replant eelgrass in the Chesapeake Bay, a job

that required lots of underwater time. Since then, Smits has been on several scuba diving trips in the Caribbean, Japan, and Hawaii. She also enjoys sailing with her family, including trips on Lake Michigan and in the Grenadine Islands.

“I love every minute I’m either in or under the water, which is ironic because even though I study water, I focus mostly on water availability in dry, arid regions.”

3. SHE HAS LIVED IN MANY DIFFERENT PLACES.

Smits grew up in Pennsylvania and went to high school in Illinois. She studied environmental engineering as an undergraduate student in the U.S. Air Force Academy in Colorado and then studied Civil Engineering–Water Resources at the University of Texas



in Austin. While in the Air Force, Smits deployed to a military base in Saudi Arabia for about six months and has lived in both Virginia and Colorado.

“When I came to Mines to do my PhD, I realized that I really love teaching, but I equally love the research. That’s why I wanted to work and contribute at a university like Mines that has both a research and teaching focus.”

4. SHE LOVES RUNNING.

Since high school, Smits has been an avid runner. When her family took her to a national park for a vacation, she didn’t hesitate to use it as an excuse to go running. Her top three list of the most beautiful places to run are:

- Zion National Park, Utah
- Nakuru, Kenya
- Les Diablerets, Switzerland

“[In Kenya] there were giraffes and chimpanzees all over the roads that I had to dodge to run down the street. If you run in a straight line, you’ll hit a large animal!”

5. HER FAVORITE HOBBY IS PHOTOGRAPHY.

Smits began taking photos regularly seven years ago when her daughter, Elizabeth, was born. She also enjoys playing around with Photoshop to make

her photos appear different than the original.

“I also paint water color to get the other side of my brain to work.”

Smits was recently one of two Mines professors to receive the 2015 NSF CAREER Award for her research related to advancing the science and education of land surface-atmosphere interactions (see page 7).

INNOVATIVE TEACHING

Inspiring Students with Studio Physics

It's a wonder that Pat Kohl ever ended up loving physics. "My first few physics classes weren't impressive—actually, they were a little dull. I wasn't engaged, and the teachers were checked out," Kohl says of his undergraduate coursework. "Eventually I found faculty who helped me and made it inspiring."

Inspiring is a fitting word, and plenty of students would use it to describe Kohl in his role as a teaching professor in the Department of Physics at Mines. He's become kind of a rock star in using cutting-edge methods to teach physics—garnering lots of attention for his classes known as "studio physics," which transform traditional courses into a hands-on bonanza of learning.

When you listen to Kohl explain why he likes physics, it's clear that he's motivated. "I really like that you can use math to model physical reality in a way that's reliable," he says. "You can sit down and write this system of equations that describes this thing that actually exists, and those predictions will be right down to one part in a million. The fact that that's even possible just blows my mind."

Kohl became passionate about teaching while in graduate school. "I worked as a teaching assistant and I started thinking about how students make sense of physics within the context of their curriculum." In 2004, he made physics education research the subject of his PhD thesis at University of Colorado Boulder. Since then, he has continually worked on tweaking his craft.

"I'm a scientist by training. Science comes with the implicit assumption that you never really finish learning about anything and never really finish improving anything. I see no reason not to apply that attitude to education. If I ever stop considering different approaches to



Pat Kohl interacts with students in his Studio Physics class.

teaching physics, it'll probably be time to retire."

Kohl says activities in his studio physics classes vary: You might see group problem-solving, hands-on investigations of physical phenomena using equipment, or formal lab experiments. "The content isn't necessarily different from what you'd find in a traditional

physics course, but how the students interact with that content is very different," he says. "Rather than listen to me describe content, students spend time interacting with the material directly in groups of their peers. The focus

of the class shifts from the instructor to the student in a very real way."

The impact of Kohl's teaching style is apparent in Daryl McPadden BS '13, one of his former students. "Studio physics was a great opportunity to actually try problems and get immediate feedback," McPadden says. "There was a nice mixture of experiments with equipment and working through ideas. I remember learning, possibly more than I can put into words. Pat's ability to teach goes beyond information transfer—he taught us to think."

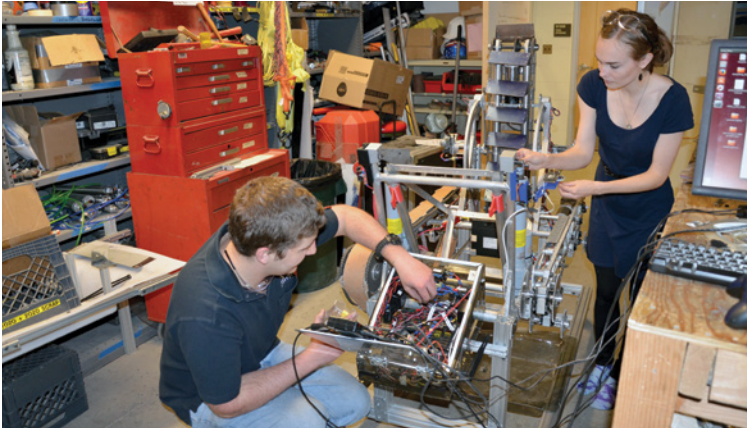
McPadden is now working on her PhD in physics with a focus on physics education research at Florida International University. "I'm still learning to appreciate how much he did for me and my classmates during my time at Mines. I consider Pat a role model, and I want to be able to teach others the way that he taught me."

While teaching is Kohl's first love, he dabbled in administration during the spring of 2015, serving as the interim director of the Center for Innovative Teaching and Learning at Mines, the organization he helped found. "We looked at ways to support the faculty, matching them with the right classroom space—studio or lecture. The university of the future won't have just one kind of classroom. Sure, there'll always be lecture halls, but we'll see more studio and workshop areas and students working with their hands in a technical way."

Kohl recently received an Alumni Teaching Award (see page 28), which recognizes superior teaching skills at the undergraduate level. He'll be back in the classroom in the fall and, not surprisingly, he says that's where he feels his best. "Working with the students is something I never get tired of."

—Doug McPherson





Blasterbotica team members Katie Kostecka '15 and David Long prepare the rover for the NASA Robotic Mining Competition held at Kennedy Space Center in May.

BLASTERBOTICA REPRESENTS MINES IN NASA ROVER COMPETITION In the sixth annual NASA Robotic Mining Competition, held at Kennedy Space Center on May 18-22, 2015, a team of 14 Mines students competed against 53 teams in the design and construction of a mining rover. The Mines Blasterbotica team took second place in the event's Presentation and Demonstration category. Made up of students in the fields of mechanical engineering, electrical engineering, and computer science, the Blasterbotica team is part of the capstone design program in the College of Engineering and Computational Sciences. Participation in the event was sponsored by the Center for Space Resources, Lockheed Martin, and BHP Billiton, with donations from Sterling Edge, Omnicut, and igus.

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Mining Harmony

New academic
minor elevates
music program
to next level

By Lisa Marshall

Ask a Mines student or recent graduate where they see their degree taking them, and chances are the music industry won't top the list. Some might even be surprised to learn that Mines has a music program. But more than a century after its establishment, the beloved but low-profile program is poised for a renaissance, thanks to a new music technology minor, a growing array of classes and travel opportunities, and a new generation of musical engineers eager to put their synergistic talents to work.

"We have gone from having a club of students getting together after school to do something they enjoy, to identifying the fact that those students actually have two trades: engineering and music," says Robert Klimek, director of the Mines music program. "By helping them combine their engineering mind and musical ears, we can bring forth job candidates with a really unique skillset."



Robert Klimek

The Mines concert band performed for elderly and under-privileged audiences in the shantytowns of Lima during the music program's 2013 trip to Peru.



Tom Cooper

The Mines Marching Band performs on campus.



Ray Priestley

Mines music program director Robert Klimek (center), Mines student Nicklaus Smith (right), and student drummer Clive Linton from the Alpha Boys School in Jamaica demonstrate a jazz piece for Alpha students.

Mines' music program is not a new concept. According to press archives, the first ad-hoc marching band came together around 1908, made up partially of football players who were known for swapping out their pads for band uniforms and playing the half-time show before returning to the field. Five years later, a barbershop quartet emerged, followed by an orchestra.

In 1925, a Mines chapter of Kappa Kappa Psi—a national fraternity for band members—was established. By the 1940s, the Mines Marching Band (with its trademark plaid shirts, blue dungarees, and hard hats) was a regular fixture at graduations and other campus celebrations. One band member, geological engineer Harry Kent '52, was so good that he played trumpet with famed composer Henry Mancini at one point.

For many students thrown into an extremely intense academic program far from home, the music program became part family, part medicine. "It kept me sane," recalls alumni Keith Kvenvolden '52, who played sousaphone in the band during his

four years at Mines. He went on to enjoy a lucrative career as a geochemist with Mobil Oil and NASA, and he still supports the music program from his home in Palo Alto, Calif. "My major connection to Mines now after all these years is through the band. It had a major impact on me."

For Catherine Skokan '70, MSc '72, PhD '75, who in 1975 became the first woman to earn a PhD at Mines, involvement in band and choir—on top of an already excruciating schedule—provided a crash course in time management. "As they say: If you want something done, ask a busy person. I learned not to waste any time." Now an associate professor at Mines, Skokan still plays in the orchestra. She also goes on trips with the music program, which now includes classes in music history, theory, composition, ethnology, and technology.

In the Ford Building at Mines, music resonates from practice rooms where a dozen different ensembles rehearse and instructors offer lessons in voice, strings, winds, piano, and other instruments. Kappa Kappa Psi, which had disbanded decades



Ed Gonzales

The Mines Choir sings at San Paolo alla Regola church during the music program's 2012 trip to Rome.

earlier due to lack of interest, was re-established on campus in 2006 and is now going strong again. Numerous scholarships, ranging from \$500 to \$2,000, are available for musicians. “Music has become an integral part of the campus,” says Skokan. “There are huge cross-overs between engineering and music.”

Do musicians make better engineers, or vice versa?

Research suggests that music training can have a measurable impact on cognitive skills, by stimulating areas in the brain involved with auditory processing, visual memory, and executive function (judgement and problem solving). One 2014 study by Nina Kraus, a researcher in the auditory neuroscience lab at Northwestern University, concluded that musically trained students are better able to perceive speech amid a noisy background, pay attention to sounds, and keep them in memory. While research on music training and test scores is mixed, several recent studies have shown that people involved in music are more likely to graduate high school and attend college, and that they consistently get better grades in math and science.

“Music and mathematics are intricately related,” writes University of Michigan mathematician Tom Fiore. “Strings vibrate at certain frequencies. Sound waves can be described by mathematical equations. The cello has a particular shape in order to resonate with the strings in a mathematical fashion. The technology necessary to make a digital recording relies on mathematics.”

Klimek, who holds a doctorate in music theory and composition, specializes in theory systems of different cultures—a field sometimes referred to as “ethno-theory.” He first started teaching at Mines in 1996 and has been involved in growing the academic music program ever since. He says that just as musicians have many of the tools to make great engineers, engineers are primed to be great musicians. Jazz

“As an engineer, you have to take things that are very dissimilar and put them in a harmonious pattern that works and is aesthetically pleasing.”

— Robert Klimek

pianist Herbie Hancock has a degree in electrical engineering, Albert Einstein was known to play a mean violin, and Brian May, guitarist for the band Queen, holds a PhD in astrophysics. “As an engineer, you have to take things that are very dissimilar and put them in a harmonious pattern that works and is aesthetically pleasing,” Klimek says. “These students don’t appreciate enough that what they are doing is an art form.”

Recognizing those fundamental connections, Mines music teachers worked for years to bolster credited music offerings on campus and establish a music minor. This year, they succeeded. In December 2015, computer science major and lifelong musician Krista Horn expects to become the first Mines student to graduate with a minor in music technology. She hopes to someday design specialized software that enables musicians to manipulate or augment their sound while recording. “I got lucky,” she says of the serendipitous timing of the new minor. “It enables me to apply my engineering background to something that is so fun.”

For other future graduates with a music technology minor, an array of unique job opportunities awaits, says Klimek. In

talking with companies that install sound systems for concert halls and recording studios, he has heard repeatedly about the need for applicants who have both an interest in music and technical engineering skills. “They say it would be so nice to have someone apply for a job and not have to teach them what an electrical circuit is and how to solder and wind wire,” he says. “We teach music that is applicable to the engineer.”

In the future, Klimek hopes to work with companies like Yamaha and craftspeople like luthiers and piano-builders to develop instrument design courses for Mines engineering students. Someday, those graduates could put their unique skills to work developing new lacquers to extend the life of an instrument, materials to make them more affordable, or designs that will coax a bigger, better sound out of them.

Breaking cultural barriers with song

Job prospects aside, students say the cultural connections made via the music program’s robust international travel offerings have been priceless. During the program’s inaugural trip to Rome in 2012, Mines students carved their own baroque fiddle with an internationally known luthier and sang in the choir during mass at the world-famous St. Peter’s Basilica. “I’ll never forget that day,” recalls Martha Grafton ’13. “The acoustics were amazing.” Another group of music students went to Peru in 2013, where they visited local mines and performed for children in the shantytowns of Lima.

In 2015, students and alumni headed to Jamaica for a whirlwind eight-day immersion into the country’s rich musical heritage. During a trip to the University of the West Indies (UWI), they met with students in the environmental science and engineering departments to learn about their design projects. They then headed to the music room for a deafening three-hour jam session and drum lesson with UWI’s famous 26-piece steel pan orchestra Panoridim.

Playing a dozen different kinds of steel drums, each with their own unique tone, UWI and Mines students played side-by-side in one joyful harmony. “That was definitely a highlight,” says Grafton. “I still keep in touch with some of the people I met there.”


During the Jamaica trip, Mines students also visited the Alpha Boys School—a residential trade school for disadvantaged boys and the legendary birthplace of Ska, a music genre that combines Caribbean calypso and American jazz. Later, they teamed up with students from the school for a five-hour recording session at reggae legend Bob Marley’s Tuff Gong Studio. After hearing a recording of Leroy Smart’s “Without Love,” Nicklaus Gable Smith, a sophomore engineering physics student at Mines, helped coordinate his fellow musicians in laying down tracks for their own interpretation of the song. They built the “skeleton” first—base, drums, piano, and vocals—and then added sax, trombones, flute, clarinets, and violins. In many ways, Smith says, it was a classic engineering problem. “You need to find the basic parts of your goal first and build details upon it to create your final project.”

Smith, who plays bassoon in concert band, tenor saxophone in marching band, cello in orchestra, and bass in the jazz band, says music and the travel that has come with it have been an indispensable part of his Mines education. “In a discipline like engineering where you are working with science and machines, it can be easy to lose touch with humanity sometimes,” he says. “I think everybody here should have something to connect them with the arts.”

Ray Priestley, president of the Mines Alumni Association’s Board of Directors, agrees. During the Jamaica trip, he watched typically-shy students blossom into leadership roles as they sat down to craft a song with a group. If the subject of engineering failed to spark conversation between Mines students and their Jamaican counterparts, talk of Ska, Reggae, or steel pan orchestra broke the ice.

As an internship recruiter for his company, Encana, Priestley says he always looks for new grads with a music, arts, or other extracurricular background. “It shows they have the ability to interact with different groups and do something besides just study.” A strong music program, he says, also makes a school more attractive to prospective students. “I have traveled with the admissions department for 25 years recruiting high school students. The second most common question I get is: ‘Does Mines have a music program?’ I can’t wait to tell them about it.”

In 2016, Priestley, Klimek, and Skokan plan to join a group of 50 student musicians for a trip to Dublin, Ireland, to explore its rich history in engineering and music and march in the St. Patrick’s Day Parade. It couldn’t be a more fitting destination, says Priestley.

“The patron saint of engineers is Saint Patrick. What could be better than being in Dublin as an engineer marching in the St. Patrick’s Day Parade?” 



Jamaican tenor player Jahnoy Davis provides guidance as Mines students (L to R) Jaimie Stevens, Christina Ochoa, and Krista Horn try their hand at steel drums. Horn will be the first Mines student to graduate with a music technology minor.

For details about the 2016 Dublin trip, visit www.minesalumni.com/Dublin2016

Engineering

A BETTER

Beer

Mines alumni and students
have brewing down
to a science

By Lisa Marshall



It's

a Wednesday afternoon in the Unit Operations Lab on the Mines campus, and Nick Martella, a senior in chemical and biological engineering, just tapped the keg. He fills a clear plastic cup with a light amber ale he and two classmates spent weeks brewing themselves. Just as he sets it on the table and goes to fill another, the interim department head Colin Wolden appears. But instead of eying Martella with a disapproving look, Wolden reaches for a cup, takes a sip, and jots down a few notes.

It's finals week, and for Martella and the 39 other students nervously pouring beer around the room for local brewers and Mines faculty, today's taste test is worth 20 percent of their grade. "We are drinking their final," says Wolden. This spring's inaugural "Introduction to Brewing Science" course marks the latest chapter in a long, synergistic relationship between Mines and beer. It also signals the start of what—for some in the class—could be a bright future in the burgeoning craft brewing industry.

Colorado ranks second in the nation for production and economic impact of craft breweries, with more than 232 breweries state-wide (double the number in 2009) generating \$826 million in 2013, according to the Colorado Brewers Guild. While many people associate Mines grads with the oil and gas and mining industries, dozens of alumni have taken a different course over the years, applying their rich knowledge of microbiological processes, mechanical design, and quality-control to engineering a better beer. With its first-ever official brewing science course so popular that it had to turn away about 40 students, the school is now mulling how to expand such offerings in the future and is even considering adding a brewing minor.

"Brewing is a classic chemical engineering process," says Wolden, noting that students learn about fermentation, distillation, enzyme kinetics, heat transfer and thermodynamics, and a host of other processes that can be applied across a broad range of industries.



Laurie Schmidt

Students from the "Introduction to Brewing Science" class at Mines await the verdict as Pete Turner '90, MS '94 tastes the team's crafted beer. Turner is a manufacturing systems engineer and sensory panelist at MillerCoors.

Both Mines and Colorado have long been “very beer-centric,” says Dave Thomas, retired head brewer for Coors Brewing Company and author of the book *Of Mines and Beer: 150 Years of Brewing History*. The first Colorado brewery, Rocky Mountain Brewing Company, opened on the Front Range in 1859 to serve the many thirsty miners that had come to the foothills in search of work. In 1873, German-born brewer Adolph Coors converted an old tannery east of Golden into a brewery. That same year, Colorado School of Mines opened its doors.

“It made sense for Mines and Coors to work together,” says Thomas. At one point, Coors paid for an underground pipeline to pump brewery steam to Mines buildings for heat. To this day, on a snowy morning, you can see a clear line of melted snow delineating the warm pipe. For decades, it has been a Friday afternoon ritual for Mines students to migrate down the hill for “the short tour at Coors lab”— heading straight to the tasting room. Coors brewers frequently lecture at Mines classes, and Thomas guesses at least 50 alumni have worked at Coors Brewery over the years. “A Mines education sets them up nicely for a large industrial plant like Coors.”

Their education also set them up nicely for the craft brewing industry, which emerged in Colorado in the late 1970s. In 1978, the national Brewers Association was founded in Boulder. In 1982 the first Great American Beer Festival was held in Colorado (the event now hosts 50,000). While some large brewers vowed to crush the fledgling craft, Coors took a rising-tide-floats-all-boats approach, loaning barley, hops, and expertise to upstarts—many of them from Mines—working to evolve beer as we know it. “Back when I first started at Coors in 1975, everybody in the industry was applying science to try to essentially make the same beer: a pale, bright, crisp lager,” recalls Thomas. “Today, brewers are applying science to brew beers that have never been brewed before with ingredients that have never been used before.”

While many view brewing as an art, chemical engineering alumnus Mike Blandford '11 sees the process as more of a science.



Laurie Schmidt

Laboratory coordinator Mike Stadick tests brewing equipment in the Chemical and Biological Engineering Department at Mines.

“We are using biological materials to turn sugar into alcohol,” he says. After 18 months in the oil and gas industry, Blandford teamed up with Mines associate professor Paul Ogg and Mines alumnus Greg Schlichting '09 to found Declaration Brewing in November 2014. With a 2,000-square-foot tap room, a beer garden double that size, 18 beers, and taps for 32 more, the Denver brewery has already garnered a loyal following. But Blandford is most proud of what goes on in the lab. Unlike many breweries, which use one or two yeast strains bought off-site to

convert sugars from grain into alcohol, Declaration propagates its own yeast. By growing its own, Blandford says, the brewery can boost production and save money, create a wider palette of flavors, and have more control over purity.

Declaration’s founders also use their biochemical wizardry to develop new flavors. For instance, when a specific yeast interacts with the alpha acid byproduct of a specific kind of hops, it forms a strawberry-flavored molecule. “We can make a strawberry beer without ever touching a strawberry,” Blandford says. Meanwhile, state-of-the-art analytical testing equipment enables them to look at things like alcohol content, color, turbidity, and bitterness at various stages in the brewing process, and manipulate them to assure that each batch of beer is consistent—even when the ingredients vary from season to season. “There is a big campaign in the craft brewing industry for everyone to up their quality control game,” Blandford says.

Coming from an engineering background can also help a newcomer entering the brewing industry save money and time, alumni say. Josh Robbins earned his first degree in chemical engineering from Mines in 1995 and went to work for Texas Instruments developing semi-conductors. He finished his PhD in 2003 and then founded two companies that developed novel thin-film technologies. After visiting 108 of Colorado’s breweries with his wife Kaylee Robbins MS '09, PhD '13, the long-time home brewers opted for a drastic career change. In 2013, they opened Mountain Toad Brewing in a former machine shop just blocks from where



Declaration Brewing



Kaylee Robbins

Josh Robbins '95, PhD '03 rakes out the grain from the mash tun at Mountain Toad Brewing.



Mockery Brewing

Sara Heinle '13 pours Mockery Brewing's Salted Scotch Ale.




Coors developed the first aluminum beer can in 1959. Josh drew on his mechanical skills to save roughly \$100,000 by installing his own pumps and control boxes, and Kaylee developed the business plan. Today, for the first time in his entrepreneurial career, Robbins is enjoying positive cash flow. “And the conferences I get to go to now are a little more fun,” he jokes.

Mines alumnae and siblings Rachel Rabun '08 and Sara Heinle '13 work at petroleum engineering jobs by day, but at night they put their skills to work on the business side of things at Mockery Brewing, a new craft brewery they co-own in Denver's River North District. “Just today, we were trying to determine whether we wanted to change our hours,” says Rabun. “So, in true Mines fashion, I downloaded all of our sales data by hour and wrote a code to organize it.” When something breaks, she adds, “We know how to fix stuff, because we went to Mines.”

Mines alumni working as craft brewers say they get together often to share advice, and many are now paying it forward, serving

as guest lecturers for the new “Intro to Brewing Class” and volunteering as taste testers for the recent course final. With the help of lab coordinator Mike Stadick, students were assigned to brew two 1-gallon kegs, using specialized equipment to malt their own barley (germinating and roasting it), mash and boil it to convert its starches into sugars, add hops for flavor, and add yeast to convert those sugars to alcohol. Decisions they made along the way influenced the color, aroma, flavor, mouth feel and alcohol content, which they then assessed using various analytical tools.

Not everything went smoothly, however. “We had to throw our first batch of barley out because it turned to sludge,” says Martella. “And our first batch of beer had to go, too—we put too much yeast in and it tasted like dough.”

In the end, his team of three served up a tasty, mildly bitter American Pale Ale with five percent alcohol that seemed to please the judges. Martella also walked away with a new career choice in mind. “I can definitely see myself opening a brewery someday.” 

Home is Where the Mine Is

Holly Bidle and her husband Jim Reed fell in love with the house on Mt. Zion Road in Golden the minute they learned about the mine entrance from the house's laundry room. Never mind the building's peeling paint, the rusting elevator in the yard, or the creepy trophy mounts that covered the walls of almost every room.

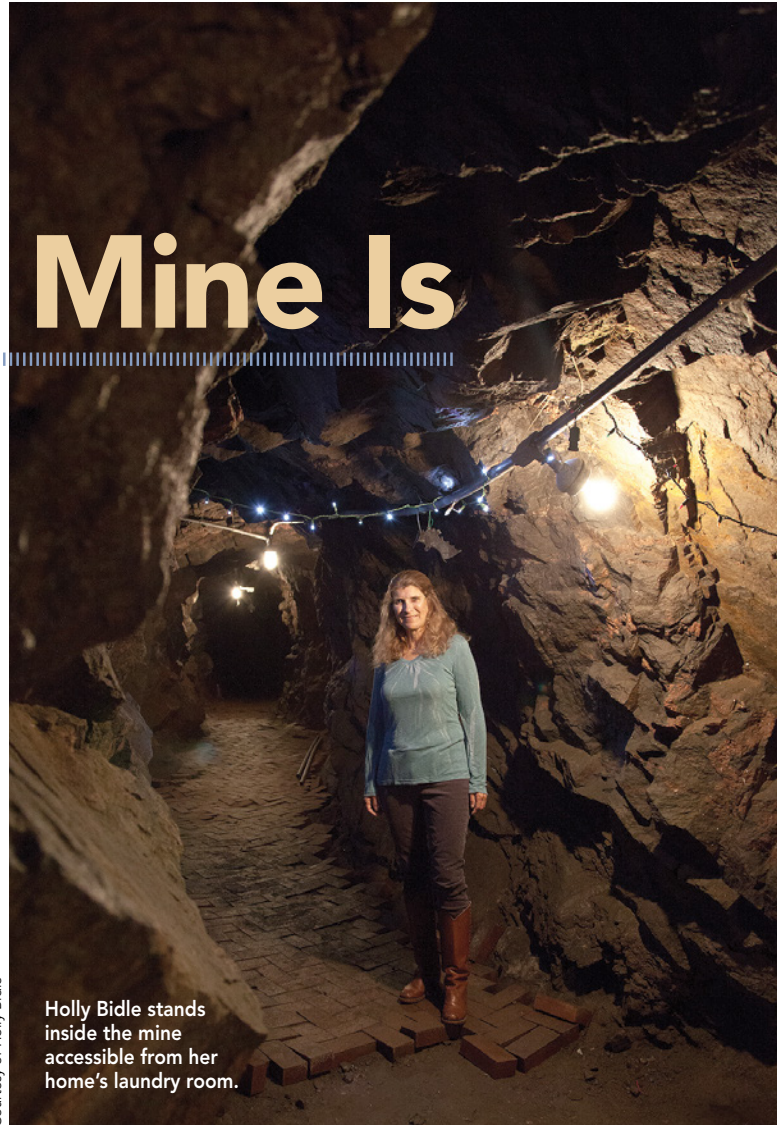
"It had been on the market for about 18 months without getting a single offer," says Bidle (rhymes with "riddle"), recalling the day in 1990 when she first saw the house. "It was out of our price range and it needed a huge amount of work, which we couldn't afford and had no time to do ourselves. We were running a business. We had a two year old and a four year old. It was totally impractical."

But it was the only house in the neighborhood—or anywhere else—with a back door that opened on a mine tunnel. And that cinched the deal. "We had to have that house," Bidle says, "because of the mine."

Their attraction to the property had nothing to do with the mine's ores, which were worthless, and everything to do with its history. Built in 1906, the mine was established by the Colorado School of Mines to serve as an instructional facility for mining students. Its purpose, according to a *Colorado Transcript* article announcing the mine's construction, was to conduct "critical and comparative studies of processes and machines" and to "solv[e] problems in mining engineering which the mining companies have neither time nor opportunity to investigate."

The mine's history proved irresistible to Holly and Jim, who were themselves innovators in the field of mining technology. In 1983 they founded RockWare, which developed one of the first commercially viable software packages for geological modeling. By 1990, when they bought the Mt. Zion house, their flagship product (RockWorks) was beginning to emerge as an industry standard for mineral and petroleum exploration.

The couple purchased the property from Louise Rohwer, who had built the home with her husband, Rolfe, in the late 1950s. Rolfe Rohwer '50 was a Mines graduate who made his living as a geological engineer. It's not clear how he came to purchase the property, nor where he dreamed up the idea to attach a house to the front of the mine. But his unusual abode drew a brief mention in the June 1960 issue of *Mines* magazine:



Holly Bidle stands inside the mine accessible from her home's laundry room.

Courtesy of Holly Bidle

Rolf Rohwer, '50, is the envy of all Miners, for he can boast of having his own private mine tunnel connected directly to his house. . . . The Rohwers built their home at the entrance of the old school mine which was used by Colorado School of Mines mining students before the Experimental Mine was established in Idaho Springs.

Holly and Jim may have elicited more sympathy than envy when they took possession of the rundown building in 1990. They gradually made the house livable, while fixing up the mine tunnel with new lighting, decorations, and artifact displays, and their two young sons enjoyed the coolest playhouse and hideaway any kids could ask for.

"We had most of their birthday parties back in the mine," Bidle says. "They'd have all their friends over, we'd lay down a tarp, and they'd roll out their sleeping bags and sleep over—right there in



Courtesy of Holly Bidle

Snow and rain in May 2015 caused the spring in the mine to overflow.



Larry Borowsky

The house currently owned by Holly Bidle was built into the side of Mount Zion. Through this entrance and to the left is the tunnel leading into the mine that was once used by Mines students.

the mine.” Holly also extended an annual invitation to her kids’ school classes, from kindergarten through high school, for field trips in the mine.

Well lit and just a few hundred feet long, the tunnel was perfectly safe for her children to explore on their own. Bidle can only recall one time when the mine posed any danger, and that was self-inflicted. “When one of my sons was in high school, he went back there with one of his friends and they tried to set off a Molotov cocktail,” she says. “Luckily, they didn’t really know what they were doing. It wasn’t much of an explosion.”

A few years ago, with her boys grown and the house largely vacant, Bidle began renting out spare rooms to Mines students from overseas through a service called Interlink. That led to her decision in 2014 to open her home to tourists. She listed her home on the online booking service Airbnb, becoming the only property



Courtesy of Holly Bidle

An old wooden beer barrel from the Coors Brewery stands in a side tunnel of the mine.

in the company’s vast database that includes a mine tour as an amenity.

“We have a great view, too,” says Bidle, standing on her brick deck overlooking Golden and the Clear Creek valley. “But so do lots of places. People don’t stay here because of the view. They like to stay here because of the mine.”

Bidle personally guides each guest through the mine, eliciting responses that vary from delight to curiosity to mild phobia. She points out the tunnel’s ventilation tube and drainage features; a collection of safety gear (not vintage) that includes hard hats, lanterns, and utility belts; and a wooden beer barrel from the Coors Brewery. Visitors also get a quick primer on early 20th century mining as she points out drill holes, anchor points, and other features of the instructional mine.

Naturally, the tour includes some lessons on the tunnel’s geology. “That’s one of the major things they used to teach the students back in the day—how to follow a fault,” she says. “There are no precious metal veins here, it’s just gneiss. But the principle is the same.”

Word seems to have gotten around about the unique lodging. Earlier this year, Bidle’s house claimed the top spot among Golden properties listed in Airbnb’s search engine. “People come from all over,” Bidle says. “Some of them are parents of Mines students. I’ve had people from the Western Slope who are over here on business. I’ve had hikers staying here. I’ve had people who are in town for concerts at Red Rocks.”

Guests from as far away as Denmark and China have booked a stay in Bidle’s home and toured the old instructional mine. Each time she opens the laundry room door to reveal the dark tunnel beyond, she enjoys a brief flash of her own excitement the first time she saw the house back in 1990.

“People’s jaws just drop,” she says with a smile. “They’ve never seen anything like it.”

—Larry Borowsky



CSMAA BOARD ELECTIONS

Calling all alumni: please visit www.surveymonkey.com/s/AlumniBallot15 to vote for new members of the Mines Alumni Association's Board of Directors. Votes are due by July 31.

E-DAYS CELEBRATIONS

Touching all Corners of the Globe

The ore cart pull...the trebuchet launch...cardboard boat races... fireworks. Springtime and E-Days just seem to go together.

The first "Engineering Days" (E-Days) was held in 1927, and the event has been celebrated on campus annually ever since. Fast forward to 2005 when E-Days festivities began to make their way to cities around the globe, with activities ranging from pig roasts to beach bonfires. E-Days 'Round the World extends the campus celebration and brings alumni together in their local communities to raise a toast to Mines, marking this most popular of spring rituals.

The 2015 E-Days 'Round the World events were sponsored by Assured Flow Solutions, who generously supported the 42 cities that celebrated in places as far away as Perth, Australia, and Kuala Lumpur, Malaysia. "Assured Flow Solutions was proud to sponsor E-Days 'Round the World to help connect the global community of Mines alums," said Elijah Kempton '00, onshore manager and flow assurance advisor from Assured Flow Solutions. "The cardboard boat race on campus brought back many fond memories of spending time with friends during E-days as a student. We hope that the various celebrations around the world were able to recreate that same E-Days feeling—even thousands of miles away from Golden."

As soon as the E-Days dates were confirmed, planning was in full swing to engage as many alumni as possible in its global counterpart, E-Days 'Round the World. Most events were planned by CSMAA's volunteer section coordinators, who got the word out to their local Orediggers. Back at Coolbaugh House in Golden, Alumni



Tyson Brown

Association staff prepared care packages filled with goodies like Blaster emblems, Mines pennants, bumper stickers, and nametags. These virtual "parties in a box" were sent to every E-Days event host around the globe in time for the big celebration. On event day, E-Days activities unfolded simultaneously, and photos and stories began rolling in.

Groups of any size are invited to participate in E-Days celebrations each year, and non-Mines alumni are welcome to join in the festivities. "Here in Trinidad and Tobago, I only have two or three Mines alums on my list every year," says Roxanne Skeene '83, a senior geophysicist for BP Amoco Production. "I consider my best friend (not an alum) an honorary Miner now, since she has been there with me every year, and we both

look forward to our E-Day celebration—with or without other alums."

In Butte, Montana, alumni joined professors and deans from Montana Tech, mining industry professionals, and local geologists to share in Mines' unique tradition of camaraderie and school spirit. "Our dinner was a great success, mostly for getting together people with common interests, experience, and current business," said John Gabelman '43, MSc '48, PhD '49.

In The Woodlands, Texas, Amy Bordonaro '12 made the E-Days event her first outing since giving birth 17 days earlier—traveling 50 miles to The Woodlands celebration. "That is real Mines spirit," said E-Days host and section committee member Barclay Macaul '84.

NORWAY

Madison Stingerie was one of the youngest attendees of E-Days 'Round the World, celebrating in Stavanger, Norway, with her parents Darcy '08 and Jason Stingerie '07.



FLORIDA

CSMAA's Ruth Jones (second from left) joined Mines alumni in Polk County, Florida, for the annual Bone Valley picnic in celebration of E-Days 'Round the World.



SAN DIEGO

The San Diego section gathered at the Ballast Point Brewing Company to celebrate E-Days 'Round the World.



KUALA LUMPUR

Mines alumni celebrated E-Days 'Round the World in Kuala Lumpur.



THE WOODLANDS

Alumni in The Woodlands, Texas, celebrated E-Days 'Round the World on the rooftop of Grimaldi's Pizza.

- E-Days 'Round the World events took many shapes and forms this year, including:
- Re-enactment of the M Climb in Colorado Springs at the famed Incline just outside of town
 - Museum tour and laser light show in Boston
 - Rooftop toasts in Houston
 - Happy hour cocktails served in beakers at the Science Club in Washington, D.C.
 - Home-style, deep fried alligator served up in Bone Valley, Florida
 - Portland area potluck

- Pizza party in Coeur d'Alene
 - Wetsuit-sporting alumni who competed against current students in the cardboard boat race down Clear Creek in Golden
- All around the globe, Orediggers gathered to celebrate the E-Days tradition in their own way, reminisce about their student days, network with one another, and most of all, continue nurturing the spirit of Mines that binds them together—no matter their class year, industry, or hometown.

—Ruth Jones



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ON OUR WALL

Have you started a business?
Tell us how you've used your Mines degree in a unique way to become an entrepreneur.



In the middle of researching alternative ways to power a coal mine, I was laid off. Since it was difficult to get another job, I started Wright Way Wind, a wind resource development company. Being an entrepreneur has been quite fulfilling and has tapped into my early days as a paperboy.

—Cris L. Wright '90

I started ESTS Corporation in 1977 with the intent of becoming a space entrepreneur in the commercial launch services industry while keeping my primary job as an airline pilot. Seven airline employer bankruptcies later, I now find that the rest of the space entrepreneurs (e.g., Richard Branson, Elon Musk, etc.) have finally caught up with me, and space commerce is actually taking off. It's been good to have a Mines degree when commercial space resource extraction opportunities present themselves.

—William Good '10

I've consulted between jobs several times. Some of my self-confidence in the consulting world comes from being the daughter of a consultant and independent business owner. But I do credit Mines with teaching a good mix of the basics to us, as well as our professional specialties. I've also enjoyed being part of the Mines network in the resource exploration world. I've gone a different direction in the past decade plus, but I still use my economic and technical knowledge from Mines, as well as my exploration and engineering experiences.

—Phyllis Fett Halvorson Porter '80

I've been an entrepreneur ever since I couldn't get a job because of the downturn in the oil industry in 1986. I've ended up starting or buying/building 8-10 businesses in the last 25+ years.

—Jim F. Mattern '86

I started a technology boutique investment bank in 2011 (Vista Point Advisors) based in San Francisco. My Mines degree was invaluable in terms of analyzing the risks associated with starting the business, as well as evaluating the business models of potential clients. Being an engineer is also an advantage from a marketing perspective. Engineers like the way engineers think, and they are more comfortable working with someone who understands a structured decision-making process.

—Mike Lyon '96

I worked as an engineer while going to law school. Then I took and passed the USPTO patent bar, for which one must have a certain number of science or engineering credits. Now I run my own patent law solo practice.

—Michelle Carey '05

I started my machinery and equipment appraisal business in 2004 and earned my Accredited Senior Appraiser certification in 2012. I've had my independent practice (Sandalwood Valuation) for over 11 years now. I've loved how flexible and interesting the work is. I specialize in oil and gas, biodiesel, solar, and wind equipment.

—Catherine Rein '93

During the mining slowdown in the early 1980s, I did some contract work for a few companies, became a part owner in a small engineering firm, and in 1994 founded Western States Mining Consultants, P.C. Without the degree from Mines, it wouldn't have been possible to do the things I've done or to have gone to the places I've been. I have never regretted getting an EM degree from Mines.

—David Scriven '70



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MINERS AROUND THE WORLD

Four Mines alumni connected at a business meeting in Fang, Thailand, on February 5, 2015. Pictured from left to right: Captain Pinan Dawkrajai (Thailand Navy) MS '03; Colonel Sirichai Keawseekhao (Thailand Air Force) MS '10; Captain Ronnie Busaba (Thailand Army) '08, MS '10; and Andy Baker (Schlumberger and former Captain, U.S. Army) '89. The three Thai officers pictured serve dual roles, working for the Thailand military and for the Thailand Department of Energy Defense (DED) in Fang, Thailand. Fang is home to Thailand's first oil field and supplies energy to the Thai military forces. Andy Baker, who works for Schlumberger, was visiting and is an ex-Captain, U.S. Army, and Mines ROTC graduate.



COLORADO SCHOOL OF MINES FOUNDATION THANKS ALL OF ITS OUTSTANDING DONORS!

GIFTS AND COMMITMENTS OF \$100,000 AND MORE*:

BP made gifts totaling \$140,000 towards the BP Scholarships and the Center for Academic Services & Advising (CASA) Bounce Back Program.

Foundation CMG pledged \$1.375 million for continued support of the CMG/CSM Reservoir Modeling Research Chair in Petroleum Engineering.

ConocoPhillips made gifts totaling \$115,000 in support of numerous departments, programs and student organizations.

David A. Flanigan '81 '83 and **Candace Winkle** made a gift of \$456,600 in support of the Dr. Arthur Kidnay Endowed Memorial Graduate Fellowship Fund.

Howard E. '76 '77 and **Cherine Janzen** pledged \$1 million in support of a challenge during the final phase of the Transforming Lives Campaign.

David J. and Marti Wagner committed \$100,000 to the Starzer Welcome Center Building Fund.

GIFTS AND COMMITMENTS OF \$25,000 AND MORE*:

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*The CSM Foundation received the gifts and commitments listed here between 1/1/15 and 5/25/15.



ALUMNI TEACHING AWARDS 2015 Recipients Announced

Each year, the Alumni Association recognizes two professors for their superior teaching at the undergraduate level through the CSM Alumni Teaching Award, which includes a \$2,500 grant. The 2015 recipients were selected from nominations by department heads, with input from faculty members, students, and alumni.

We would like to congratulate this year's winners: Pat Kohl from the Physics Department and Matthew Liberatore from the Chemical and Biological Engineering (CBE) Department.

Kohl is responsible for creating environments that help disseminate best practices across campus and was one of the first faculty members at Mines to pioneer a flipped classroom methodology. "He combines a gift for teaching with an insight for effective innovations in teaching practice," said Reuben Collins, a physics professor at Mines. (To read about Kohl's Studio Physics classes, see page 12)

Similarly, Liberatore is known for his ability to make course material come alive. "His primary pedagogical innovation has been the use of web-based tools [such as YouTube Fridays and personalized homework] in the CBE Department's energy balances, thermodynamics, and transport courses," said David Marr, department head of the CBE Department. Liberatore also recently published an interactive e-textbook titled *Fundamentals of Material and Energy Balances*.

It is the Alumni Association's hope that this award provides encouragement for teaching achievement and that current students will continue to experience exceptional instruction, helping to shape them into motivated and successful Orediggers for life.

—Emily (Milian) Gonzales '08



Mark Ramirez

Terry Parker, executive vice president and provost at Mines, congratulates Alumni Teaching Award recipient Matthew Liberatore.



Danelle Herrra

Emily Gonzales, interim director of the CSM Alumni Association, congratulates Alumni Teaching Award recipient Pat Kohl.



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ALUMNI ASSOCIATION
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ALUMNI NEWS



EDITOR'S NOTE

Are you looking for Class Notes? To fulfill readers' requests to increase magazine space for feature articles and other Mines stories, Class Notes are now listed exclusively online. Visit minesalumni.com/minesmagazine to see your classmates' latest accomplishments, employment changes, photos, and other updates.

To submit a marriage, birth, or other alumni news announcement for potential publication in the magazine, visit minesalumni.com/announcement.



A SCOTTISH BABY OREDIGGER

Charlotte (Coates) '07 and Kevin McNamee '05, MS '07 joyfully welcomed their new son Edmund Charles McNamee, who was born on August 16, 2014, in Aberdeen, Scotland.



ENVIRONMENTAL EDUCATOR AWARD

Dan Witkowsky '66 received the 2014 Outstanding Retired Environmental Educator Award of the Colorado Alliance for Environmental Education for his 17 years of service to the mining industry and the K-12 educational community. After 23 years as a civil servant with the U. S. Bureau of Mines, Dan transitioned to coordinating

learning opportunities for K-12 teachers through the Colorado Mining Association Education Foundation's All About Mining course offered at Mines. He was instrumental in developing a curriculum on all phases of mining that emphasized the importance of environmental stewardship. Dan has served as a volunteer for CSM's Alumni Association since the 1980s, and he continues outreach activities for the mining industry as an active member of the Minerals Education Coalition.



WEDDING BELLS IN THE DESERT

Chris Wooten '07 and Jenna Alexander were married on October 5, 2014, in Tucson, Ariz. Mines alumni in the wedding party were Cole Ones '06 and Dahren Wayman '06. Other Mines alumni in attendance were Guang Yeung '11 and Allen Thomas III '12, MS '12.



MILE HIGH ADDITION

Andrea (Stephens) '09 and Mike Gioia '09 welcomed their second son Tyler Gioia, born in March of 2013. He is energetic and full of curiosity; perfect for a future Mines student. Tyler and his big brother James, 3, spend countless hours playing games, asking questions, and discovering reality together.

MILE HIGH MATRIMONY

Erica Hanley '11 and Adam Keyser tied the knot Colorado-style in snowy Durango on December 27, 2014.



HER KNIGHT IN SHINING ARMOR

Katie Huckfeldt '13 married Daniel O'Sullivan on Valentine's Day 2015. Fellow Mines alumni in attendance included Aaron Hammer '13, Nicole Johnson '13, Aaron Glauch '13, Joey Caruso '13, Lauren McIver '13, Matthew Krueger '13, Andi Barendt '13, Jennifer Schrant '13, Shannon McAvoy '14, Thomas Harris '13, and Mark Peak '86.

TRIPLE GIRL POWER

Brian '09 and Ashley Ramsey are excited to announce their third baby girl, Nancy, who was born November 14, 2014. Nancy is always surrounded by her adoring older sisters Ava (4) and Penny (2). Brian, a financial planner, and full-time mom Ashley feel blessed by their newly extended Colorado Springs family.



TOP PERFORMING CFO

Stephen Smith '85 has been ranked as one of the top performing chief financial officers (CFOs) by CFO Journal, part of the *Wall Street Journal*. To compile the rankings, CFO Journal studied the performance of companies in the S&P 500 index, focusing on financial metrics for the three-year period ending June 30, 2014. In 2008, Smith assumed the role of CFO at NiSource, Inc., a Fortune 500 company engaged in natural gas transmission, storage, and distribution, with operating companies that deliver energy to 3.8 million customers. NiSource was



also recognized by the Edison Electric Institute as the best performing Large Market Capitalization stock for shareholder-owned utilities from October 2009 to September 2014. Smith earned his BS in Petroleum Engineering at Mines and his Master of Business Administration from the University of Chicago Graduate School of Business.

THE OREDIGGER



Coverage of campus events, departmental research, academic lectures, and student life at CSM.

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THAYER LINDSLEY AWARD

David Broughton PhD '14, a recent doctoral graduate of the Department of Geology and Geological Engineering, was awarded the prestigious Thayer Lindsley Award from the Prospectors and Developers Association of Canada (PDAC) in Toronto on March 3, 2015. Broughton received the award for the discovery of the Kamao copper deposit in the Democratic Republic of Congo. The annual award recognizes an individual or team credited with a recent significant mineral discovery anywhere in the world. The Kamao deposit was part of Broughton's PhD dissertation under the direction of Mines professor Dr. Murray Hitzman.

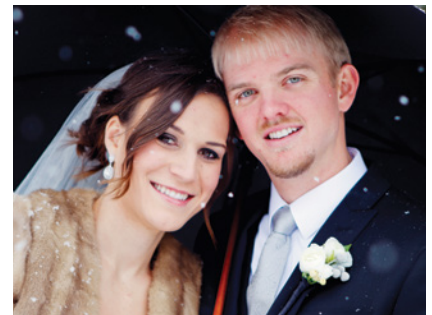


OREDIGGERS CELEBRATING IN PARADISE

Wendi Smith '90 and Joseph James were married on January 23, 2015, in the courthouse of St. Charles, Ill. They also celebrated with a wedding ceremony in Puerto Rico on March 8, 2015, where Wendi's son Corbin Smith '15 and his girlfriend Maria Monroe '15 were in attendance.

LOVE ON THE FAIRWAY

Jim Knous '12 and Heidi Boersma were married on January 3, 2015, at St. Frances Cabrini Catholic Parish in Littleton, Colo. Jim and Heidi met at Fossil Trace Golf Club during the Colorado School of Mines Alumni Association annual golf tournament. In attendance at the wedding were Mines golf coach Tyler Kimble and Mines alumni Christian Neal '12 (groomsman), Russell Quick '12, Austin Dean '12, Bobby McCracken '12, Michael Lee '14, Kyle Grassel '14, Cory Bacon '12, Chad Herges '13, Elliott Feng '13, MS '14, and Jordan Arndt '15.



ROCKY MOUNTAIN NUPTIALS

Jaqui Knous and Christian Neal '12 were married on August 23, 2014, in Carbondale, Colo. Other Mines alumni in attendance were Austin Dean '12, Bobby McCracken '12, Russell Quick '12, Christian Neal '12, Daniel Heptig '12, MS '13, Jon Neal '12, and Jim Knous '12 (bride's brother).



GOING WITH THE FLOW

Katy Buell '81 took this photo of her husband Richard Scot Buell '81, MSC '86 as he floated down the Colorado River during the 2015 Grand Canyon trip. On May 23-30, Mines alumni and their family and friends embarked on an eight-day river raft trip from Lees Ferry to Whitmore Wash. Sign up for the 2016 Grand Canyon trip at minesalumni.com/canyon2016.



M FOR MAXWELL

Christopher '07 and Brandy (Laudig) Howard '08, MS '09 welcomed their first child, Maxwell Orion Howard, on August 1, 2014. Maxwell's first introduction to Mines and the famed "M" occurred just five days after his birth, cementing his place in the Mines family.




A NEW MINES FAMILY

Sarah Vega '99 and Wesley Watkins were married on February 2, 2014, in their hometown of Ponchatoula, La. The newlyweds took a ski vacation in Colorado later that month with fellow Mines alumni friends Carrie Strand '99, Dave Schwabel '99, and Josh Wood '99. Sarah, Wesley, and his daughter Savannah welcomed baby Hazel Grace Watkins to the family on September 9, 2014. Hazel is named in honor of Wesley's great aunt who lived across the street from him when he was growing up. They now live in her old house.

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MINES CONNECTION

Paul Trost PhD '71 and Kim Spratt, a retired Colorado School of Mines Foundation fundraiser, were married on March 7, 2015, in Arvada, Colo., with a reception held in Golden. Mines alumni in attendance included Wale Adelmule MS '14, Mike Cruson '65, PhD '73, Bill Martin '69, MS '73, Ron Miller PhD '82, Koko Obott MS '13, Don Ranta PhD '74, Jim Weber MS '71, Dave Winslow '77, and John Wright '69, PhD '85.



DELAYED DESTINY

Justin Cammon '01 and Cambrey Johnston '02 were married at their home in Arvada, Colo., on June 21, 2013. Although they hardly knew each other while at Mines, they connected at a mutual college friend's wedding a decade later. In attendance at the wedding were 19 Mines alumni, including Stefani Whittaker-Brakenhoff '02, Cristin Cammon Rhinehart '05 (groom's sister), David Feth '03, and Mike Williams '03, MS '05. The couple resides in Arvada, where they are building a new home at the site of their wedding.



POLKA DOT PRIDE AND JOY

Katie (Smith) '07 and Grant Millener '07 are the proud parents of Georgie Estelle Millener, who was born on June 25, 2014.

ALUMNA PROFILE

From EPICs to Rocket Launch Systems

“There’s nothing like the excitement of a solid rocket motor static test,” says Alicia Carrillo ’00. “The anticipation, preparation, final countdown, and sense of accomplishment in the control bunker make it worth it every time.”

Carrillo, a Mines chemical engineering graduate, oversaw plenty of those tests during her tenure as chief engineer for the Space Launch

System rocket. The massive booster—SLS for short—is being developed as the launch module for the Orion space capsule, which may someday carry astronauts to Mars.

But Carrillo won’t be in the command center for SLS’s first unmanned test launch in 2018. She recently accepted a new position as an R&D manager at Orbital ATK, the contractor that’s developing the SLS for NASA. How will she feel when the rocket finally blasts skyward? “It will be bittersweet,” Carrillo says. “I worked on SLS from its inception, and I’ve worked on the Mars mission since the very beginning.”

Three years before its first voyage, the SLS has already traveled quite a distance. It began as a “heritage derivative” project, says Carrillo, cobbled together out of parts salvaged from the booster rocket used in the space shuttle program. “The first thing we were told was, ‘All your parts are broken,’” she says. “These are components that splashed into the ocean. NASA would send divers out to retrieve those pieces, do a post-flight inspection, and refurbish the parts. We’re literally using that same hardware.”

Few events put material under stresses as intense as those associated with a rocket blastoff. In addition to extraordinary loads and oscillations, the components have to survive extreme heat as the engine ignites, followed almost immediately by extreme cold as the vessel enters the vacuum of space. “When we started, we had to work with 200 parts that were considered broken,” Carrillo says. “We made minor modifications to some, we analyzed others with greater fidelity, and some we simply designed around.” In the end, the team finished with only eight parts that needed to be redesigned.

Carrillo says the challenges posed by the SLS project reminded her of experiences in her Engineering Practices Introductory Courses (EPICs) at Mines. Those classes, she recalls, taught her to take a creative approach to complex



problems. “In those courses, you just get thrown into it,” she says. “What sets people apart is being able to bring a positive attitude to solving problems, as opposed to being overwhelmed. Taking something difficult, breaking it down, attacking the pieces you can attack, and working toward a solution—that’s the preparation you get at Mines.”

Carrillo recounts

an EPICs assignment in which her team had to develop a mechanical system for loading and unloading spools in a manufacturing process. She says she didn’t even know where to begin. The task fell way outside her comfort zone, but Carrillo muddled through. That type of experience, she says, helped her develop the self-confidence to take on daunting projects like the SLS—even to enjoy them and seek them out. “There is an enormous variety of topics and challenges associated with the integration of an entire booster,” says Carrillo of the SLS project. “We’re integrating the motor, the avionics, the safety systems, and then putting it together to make sure that it all works.”

Carrillo was recruited by Orbital ATK at a Mines job fair. The Salt Lake City-based company employs so many Mines alumni that Carrillo refers to it as “Mines West.” While she didn’t want to leave the Mars program, the new job offered possibilities that were too exciting to pass up. As R&D manager for inert materials, she will enjoy an even greater variety of tasks than on the SLS team. “I’m changing from one big program to lots of little programs,” she says. “Our R&D lab supports commercial and strategic projects, as well as the NASA program.”

The R&D lab will conduct occasional tests on materials for the SLS, so Carrillo will stay tangentially involved in the project. If all goes according to plan, the rocket’s initial launch will be quickly followed by the first manned SLS launch, and then—sometime in the 2020s—the first trips beyond earth orbit. “The first mission will probably be what’s called Asteroid Redirect,” says Carrillo. “Find an asteroid out there, haul it into lunar orbit, and then land astronauts on it to study it.”

The hoped-for Mars mission likely won’t happen before the 2030s, but Carrillo will always feel like part of the team. “I want it to succeed,” she says. “I might even have to make it down to Florida for that first launch in 2018.”

—Larry Borowsky

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Of Counsel*
B.S., Mining Engineering, 1974



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



Bruce Kugler
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B.S., Petroleum Engineering, 1981



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M.S., Engineering Technology Management, 2005
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Cliff Brazil
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Engineering; Minor Bioengineering
& Life Sciences, 2011



Brad Knepper
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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



EDITOR'S NOTE

Remembrances in Mines magazine focus on an individual's connections to the school, as well as key events and accomplishments. We aim to keep a balance between these important points and obituary length in order to honor as many deceased alumni as possible. For this reason, we no longer include lists of survivors in obituaries published in Mines magazine. To submit an obituary for publication in the magazine, visit minesalumni.com/obituaries.



G. HOSSEIN BAHMANYAR MSc '74 of Woodland Hills, Calif., died Jan. 5, 2011. Born in 1945, he received his bachelor's degree from the Fanni School of Engineering in Tehran,

Iran (1967), his master's degree in mining engineering from Mines (1974), and his PhD in rock mechanics and soil engineering from the University of Wisconsin (1981). He also received a second master's degree in geotechnical engineering.

Hossein was a skilled geotechnical engineer for Caltrans District 7, which serves Los Angeles and Ventura counties in California. His six years working in the District 7 Hazardous Waste Branch involved soil and groundwater testing and remediation to ensure compliance with federal, state, and local environmental laws and regulations. In 1993, he co-founded the Fanni Reunion Foundation, a California nonprofit organization that benefits the alumni and staff of his alma mater in Iran and promotes social, technological, academic, and professional networking among its members. He was a member of the American Society of Civil Engineers and the Society of Mining, Metallurgy & Exploration.

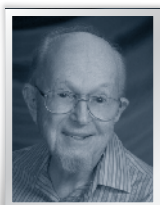


MICHAEL L. BATZLE of Golden, Colo., died Jan. 9, 2015. Born in 1950, he received his bachelor's degree in geology from the University of California, Riverside,

and his PhD in geophysics from Massachusetts Institute of Technology. He joined ARCO Oil and Gas in 1979, where he established an experimental rock physics laboratory in Plano, TX. After his retirement in 1994, he became a research associate professor in the Geophysics Department at Mines. In 2007, he was promoted to professor and became the Baker Hughes Distinguished

Chair of Petrophysics and Borehole Geophysics.

A pioneer in laboratory measurements of fluids and rock properties, Mike received the Virgil Kauffman Gold Medal award from the Society of Exploration Geophysicists. He was one of the fathers of the Batzle-Wang fluid properties equation, and he holds U.S. patents on tool designs. His research program includes low-frequency measurements of sonic dispersion and attenuation and the geophysical signature of fluids in rocks. He also perfected the unique seismic frequency velocity measurement apparatus now used at Mines.

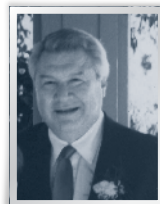


AUSTIN R. "BOB" BROWN JR. of Arvada, Colo., died Sept. 30, 2013. Born in 1925, he received his bachelor's degree from Grinnell College and his PhD from Yale University.

Bob was an emeritus professor of mathematical and computer sciences at Mines. He also served as the director of the computer center at Mines in the late 1970s and early 1980s.



WALTER M. "CHAPPY" CHAPMAN '50 of Cincinnati, Ohio, died March 25, 2012. Born in 1921, Chappy served in the U.S. Army with the 10th Mountain Division, renowned for its dramatic ascent and capture of Riva Ridge in Italy during World War II. After receiving his bachelor's degree in geological engineering from Mines, he became a surveyor for the National Lead Company in Tahawus, New York, and spent his entire career at the mine, working as mine superintendent for many years and retiring as mine manager in 1982. He served 30 years on the local school board and was active in the Adirondack Nature Conservancy.



G. MATTNEY COLE of Lakewood, Colo., died Dec. 18, 2014. Born in 1942, he received his bachelor's degree in chemistry from Southern Methodist University. Although

the NFL's Dallas Cowboys drafted Matt as an offensive lineman, he didn't enjoy the pro football experience and decided to teach chemistry instead. He received his PhD from Florida State University and joined the chemistry faculty at Mines that same year.

Matt taught general chemistry from 1982 to 1988, when he joined Special Programs and Continuing Education (SPACE). He developed several short courses, including one related to the assessment and remediation of petroleum-contaminated sites, especially underground storage tanks. He also authored two books on the subject: *Assessment and Remediation of Petroleum Contaminated Sites and Underground Storage Tank Installation and Management*. He was the program coordinator at SPACE from 1994 until he retired in 2000, and he was a member of the President's Council at Mines. His ashes were distributed on a 14er in Colorado and in Dark Canyon in Utah.

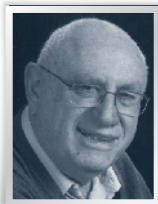


EUGENE M. "GENE" DICKERHOOF '66 of Corvallis, Ore., died May 23, 2012. Born in 1943, Gene, received a football scholarship at Mines, eventually earning his bachelor's

degree in metallurgy. He then completed a tour of duty with the U.S. Army in Vietnam.

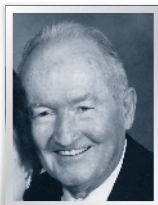
Marion moved to the San Francisco Bay area in 1969 and began selling industrial air-handling systems, but he soon developed an interest in construction. He obtained a general contractor's

license, took courses in real estate, and launched a new career in residential construction. In the late 1970s, he and his family moved to Carmel, Calif., where he developed a successful business building and renovating high-end residential properties. In the 1990s, he and his two sons formed Dickerhoof Properties and bought and renovated old apartment buildings in California and Oregon. The company owns 19 small to midsize retail centers, 17 of which are in Oregon. The Corvallis Chamber of Commerce recognized the company as the 2010 Business of the Year.



RICHARD J. EVANS '63 of Bellingham, Wash., died Feb. 22, 2015. Born in 1939, Richard received his bachelor's degree in metallurgy from Mines, where he was a member of the

Sigma Nu Fraternity. He worked at the Hanford Nuclear Facility until 1968, when he moved to Oklahoma City and worked for the Kerr-McGee Corporation's nuclear facility. Seven years later, Richard moved to Israel and worked for the Israel Electric Company. After becoming an Israeli citizen, he was drafted into the Israel Defense Forces as a reservist. In 1982, he moved to Johannesburg to work at South Africa's Electricity Supply Commission. In 1986, he returned to the United States and worked as the quality assurance manager for Carpenter Technology's special products division in San Diego until his retirement in 2004.



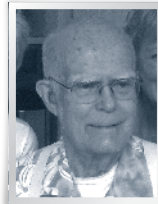
EDMOND H. FARRINGTON MS '49 of Marietta, Ga., died Aug. 4, 2011. Born in 1920, he graduated from the U.S. Military Academy in 1942, received his master's degree in min-

ing engineering from Mines, and served as a U.S. Army engineer in Europe in World War II and during the Korean War. Following the wars, Ed served in a variety of engineer and artillery postings until his retirement in 1967. He then worked as an engineer advisor for the Kerr-McGee Corporation for several years.



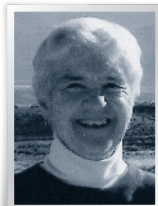
JOHN "GOLDIE" POITEVENT GOLDEN II '39 of Atlanta, Ga., died March 12, 2011. Born in 1917, he attended Auburn University and received his metallurgical engineering degree from Mines. A U.S. Marine Corps fighter

pilot in World War II, Goldie received numerous air medals for his outstanding service at Guadalcanal and Iwo Jima, and in several combat missions from the USS Bennington. He was also mentioned in the national bestseller *Flyboys*, which was adapted for a film in 2006. He retired in 1982 as the southeast regional manager for Fafnir Bearings.



KENNETH "ALLEN" GRANOT '43 of Temple, Texas, died July 17, 2011. Born in 1921, Allen received his petroleum engineering degree from Mines and worked as a petroleum engineer

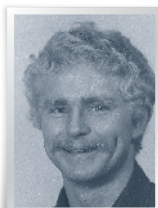
for most of his life. After graduating from Mines, he served in World War II as a first lieutenant in the U.S. Army Corps of Engineers and was a Bronze Star recipient. After completing his military duty, he moved his family to Ohio, where he worked as a petroleum engineer for Pure Oil at Heath Refinery from 1947 to 1957. They then moved to Illinois, where he worked for and retired from Union Oil.



CAROL JOB of Littleton, Colo., died Jan. 15, 2015. Born in 1939, Carol taught mathematics for 48 years at Catholic schools and in the public school system, and for 15 years at Mines.

received her bachelor's degree in 1965 from the College of Mount Saint Joseph (now Mount Saint Joseph University). In 1973, she received her master's degree from the University of Notre Dame.

In 2007, Mines recognized Carol as one of its most distinguished professors, based on student evaluations. Thanks to the support of friends, former students, and several mathematics faculty members, a scholarship fund has been established in memory of Carol. The fund recognizes and encourages excellence in instruction and recognizes students who have benefitted from such instruction and excelled beyond expectations.



RICK J. LESER '73 of Vincennes, Ind., died Jan. 21, 2010. Born in 1950, he received his bachelor's degree in metallurgical engineering from Mines. Rick worked for Alcoa for 19 years and was

plant manager for Scepter Industries for 10 years. Most recently, he was a vintner and owned and operated Windy Knoll Winery in his hometown in Indiana.



ROBERT G. MIDDLETON '49 of Palm Beach Gardens, Fla., died Sept. 2, 2012. Born in 1921, he served in the U.S. Navy during WWII and then returned to Mines to graduate with a bach-

elor's degree in metallurgical engineering. He was married to Sylvania "Sally" Ranes, who was an employee of Mines. Bob was the first metallurgist employed by the Maytag Company. He also worked for Solar Aircraft, Westinghouse, Atomics International, and Pratt & Whitney Aircraft, where he was one of the lead consulting engineers in the development of high-tech metals used on advanced aircraft. In 1976, while serving as Supervisor of Fabrication Research for PWA/United Technologies, he was given a U.S. patent for developing a special metal process.

Known as "Coach Bob" for his service to youth athletics, he served for years as director of the Palm Beach Gardens Youth Athletic Association, with whom he coached and umpired all over the county. He coached his last basketball game at the age of 82.



R. CRAIG MYERS '74 MS '77 of Windsor, Colo., died Sept. 8, 2013. Born in 1951, he received his bachelor's degree in geological engineering and his master's degree in geology from Mines.

Craig spent four years in Brazil as a child, so after graduating from Mines, he limited his job search to companies with a foreign division and spent most of his 30-year career overseas. With Marathon Oil Company and later with Royal Dutch Shell, Craig lived in Ireland, London, Oman, Scotland, Brunei, and The Hague, in addition to traveling to Southeast Asia and Australia. He came out of early retirement to join a former colleague as a principal geologist for Leap Energy in Kuala Lumpur, Malaysia.



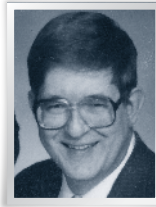
ANTHONY R. PAGANO '57 of Ormond Beach, Calif., died Oct. 13, 2010. Born in 1930, he served in the U.S. Army from 1952 to 1953, and then received his degree in metallurgical engineering

from Mines. Tony spent the last 35 years of his working life with Stanley Works in Connecticut.



TOBY T. PETERSON '68 of Durango, Colo., died April 8, 2010. Born in 1945, he received his professional degree in mining engineering from Mines. After graduation, he worked for Proctor & Gamble in

Kansas City. He and his family returned to Colorado and bought a restaurant in downtown Durango in 1973, which they named Farquahrts and Pizza Mia.



EUGENE J. RUTKOSKI '64 of Reading, Pa., died Nov. 5, 2012. Born in 1942, he received his BSE from Mines. He served in the U.S. Army from 1964 to 1966 and worked as a metallurgist at Inspiration

Consolidated Copper Company until 1971. After he received his MBA from the University of Denver in 1973, he founded General Battery Corporation and worked there for several years in various capacities. He became a private consultant in battery failure analysis before retiring in 1999.

Eugene was a member of ASM International; the Society of Mining, Metallurgy & Exploration; and the Minerals, Metals & Materials Society.



GUSTAV STOLZ JR. '50 of Butte, Mont., died June 25, 2011. Born in 1924, he enlisted in the Army Air Corps (now the U.S. Air Force), where he was trained as an airplane mechanic and saw action

in numerous battles. Soon after being discharged, he received his bachelor's degree in petroleum engineering from Mines, where he was Alpha Tau Omega. He then received his master's degree from the University of Oklahoma.

Gus performed research and development work for Standard Oil and Gas. In

1955, he moved his family to Butte after being recruited by Montana Tech (then the School of Mines) to head the college's petroleum engineering department and serve as dean of students and as director of placement. He retired as professor emeritus in 1983. Gus was then recruited by the Environmental Protection Agency and worked as a groundwater specialist for drilling operations based in its Denver office. He retired fully in 1997. In 2000, the College of Montana Tech of the University of Montana awarded him an honorary doctorate degree.



PAUL W. TAMM '66 of Oakland, Ore., died Feb. 16, 2013. Born in 1944, he received his professional degree in petroleum refining engineering from Mines, where he graduated valedictorian

and was a member of Beta Theta Pi. Paul obtained his PhD in chemical engineering from the University of Minnesota in 1970. He spent his professional career at Chevron Research in California, working in petroleum refining and conducting research on refinery processes, synthetic fuels production, and chemicals manufacturing.

Paul and his wife Betty moved to Oakland in 1992, where he served as mayor and then started Tripe Oak Vineyard. He served as a mentor for the Mines Alumni Association from 2008 to 2010.

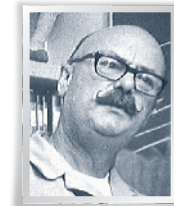


HARRY "KAY" WHITE '61 of Hudson, Fla., died June 6, 2011. Born in 1938, he received his bachelor's degree in metallurgical engineering from Mines, where he played

baseball and football. During his junior year, as quarterback, he was named Most Valuable Player (MVP) by the Rocky

Mountain Athletic Conference.

Kay was president of Sta-Power Industries, Inc., and he traveled the country as a successful entrepreneur. In 1971, he received the Spirit of Life Award from the City of Hope. This humanitarian award was presented to him by former California Governor Pat Brown.



ROBERT E.D. "GENE" WOOLSEY of Wheat Ridge, Colo., died March 16, 2015. Born in 1936, he received his bachelor's and master's degrees in mathematics and his PhD in mechanical engineering.

Gene came to Mines in 1969. Under his leadership, the Operations Research/Management Science Program became one of only five U.S. programs designated by the U.S. Army for educating its officers in this field. He also held teaching appointments at seven colleges and universities in four countries: the United States, South Africa, Mexico, and Canada.

In 1986, Gene was the first recipient of the Harold Larnder Prize for Distinguished International Achievement in Operations Research, awarded by The Canadian Operational Research Society. In 1999, he received the Institute for Operations Research and the Management Sciences (INFORMS) Award for the Teaching of OR/MS Practice. In 2002, he was named one of 113 in the world to receive the INFORMS Fellow Award.

The U.S. Department of the Army awarded Gene the Commander's Medal, the Outstanding Civilian Service Medal, and the Distinguished Civilian Service Medal, which is the highest U.S. civilian decoration. In 2003, he retired from Mines and became a professor emeritus. In 1987, he was made an honorary member of the Mines Alumni Association

—Compiled and written by Brad Dunevitz, Danelle Herra, and Jo Marie Reeves

ALSO REMEMBERED

DONALD W. BARTOW '82.....	November 7, 2009
JAMES E. BROWN '66.....	August 5, 2010
DANIEL M. COOPER '50.....	November 4, 2009
KEITH V. DAVIDSON '49, MS '50.....	July 13, 2010
RAYE L. FISCHL '81.....	November 18, 2012
JAMES E. GOOSMAN '70.....	April 23, 2009
WILLIAM I. HOGAN '55.....	December 26, 2010
EMMERSON KEMP '58.....	November 25, 2009
PHILIP R. PENNINGTON '56.....	March 31, 2009
GLENN J. POULTER '50.....	April 18, 2010

LEO JOHN RONAYNE, JR. '41.....	August 28, 2010
KIM L. RUMSEY MS '08.....	November 2010
MARK K. SHIPMAN '50.....	December 4, 2010
RICHARD KENT SPEARS '59.....	August 15, 2010
HOMI J. TATA '51, MS '52.....	March 29, 2009
ZOILO TOLENTINO, JR. '47.....	April 24, 2010
JAMES E. WASINGER '64.....	August 15, 2010
RICHARD T. WHITTINGTON '59.....	September 12, 2010
CLARK L. WOLLENWEBER II '63, MS '69.....	June 12, 2008
ANTHONY W. WORCESTER '64.....	December 5, 2010
JOE M. ZUTMAN '72.....	February 21, 2011

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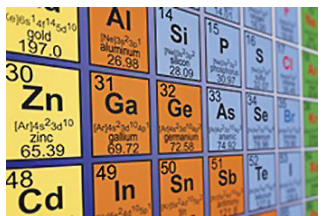
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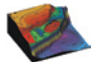


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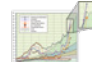
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MINES DOWN UNDER

Kristin Guerin '11 may have moved to the other side of the globe, but she hasn't forgotten her Mines roots.

Guerin, who earned her bachelor's degree in mining engineering, relocated to Australia in 2013 to accept a position in Caterpillar's Global Mining division. On a recent vacation trip to Cairns, Queensland, she grabbed her Mines bandana for a photo opportunity while diving at a location known as "Tracy's Bommie" on the Flynn

Reef, part of the Great Barrier Reef system. "I was doing a live-aboard dive cruise for three days, and this was dive number 10 out of 11," she said.

When she's not enjoying the scenery below the surface, Guerin spends her days working as a pit technician at the Solomon Hub mine, located within the Hamersley Ranges of the Pilbara Craton in Western Australia.



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