MINES MAGAZINE

COLORADO SCHOOL OF MINES ALUMNI MAGAZINE

Winter 2017 Volume 108 Number 1

PRIMING THE PEACE CORPS PIPELINE

Mines alumni have the engineering skills that make them the top candidates for global service.

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A RADIOCHEMISTRY RENAISSANCE

With a new nuclear energy chair, lab and research focus, Mines' latest research is radioactive.

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Graduate student Erin Bertelsen focuses on her research in the radiochemistry lab.

Photo by Ronald Kem

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COLORADOSCHOOLOFMINES
EARTH • ENERGY • ENVIRONMENT

Cover image: As part of a group of 16 Mines students, soon-to-be alumni Trinity Wilson and Chase Li traveled to Nepal in December 2016 on a trip sponsored by Mines' McBride Honors Program and Hike for Help, an organization that connects with communities in Nepal to work on projects that will have a high impact on the local community. Students supported the construction of the first public restroom facility and aided in repairing a local high school that was destroyed by an earthquake in 2015. (Photo by Agata Bogucka)

FEATURES

PRIMING THE PEACE CORPS PIPELINE

With a new college prep program and a growing emphasis on humanitarian engineering, Mines provides its students with the skills to become ultra-qualified Peace Corps volunteers.

A RADIOCHEMISTRY RENAISSANCE

Due to generous donations from *Transforming Lives: The Campaign for Colorado School of Mines*, innovations in Mines' radiochemistry lab is putting Mines on the map for nuclear research.

DEPARTMENTS

WEB EXTRAS | MULTIMEDIA

TO VIEW WEB EXTRAS, PLEASE VISIT MINESMAGAZINE.COM

IGNITE THE NIGHT

Students and alumni gathered on campus for Homecoming 2016, spending the weekend celebrating their Mines pride. Check out our photo spread on page 26-27, and then visit our website to see more photos from this year's festivities.

MINES PHOTOGRAPHY CLUB

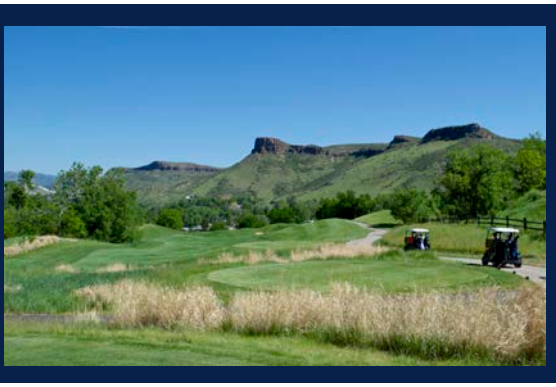
At the start of the academic year, Mines started a new club for students passionate about photography. With over 100 members within the first few months, Mines Photography Club is becoming one of the school's most popular student groups. See students' photos and learn more about the club at facebook.com/minesphotographyclub.

HIKE FOR HELP

Sixteen Mines students visited Nepal over winter break on a trip sponsored by Mines' McBride Honors Program and an organization called Hike for Help to support the construction of a restroom facility and reparation of a local high school that as destroyed in an earthquake in 2015. Watch a video about Hike for Help and learn more about the project and the humanitarian engineering efforts at Mines.

COVER SHOOT OUTTAKES

Mines students Trinity Wilson and Chase Li helped *Mines Magazine* with this issue's cover photo shoot. In between the serious shots, we had a bit of fun, resulting in a few "bloopers." See the outtakes on *Mines Magazine's* website.


COLORADOSCHOOLOFMINES
EARTH • ENERGY • ENVIRONMENT

2017 MINES ALUMNI GOLF TOURNAMENTS

17th Annual Houston Endowed Scholarship Golf Tournament
April 2017 | Houston, Texas

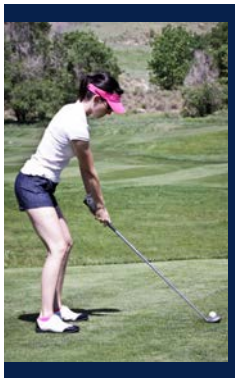
8th Annual Endowed Oklahoma Scholarship Golf Tournament
May 5, 2017 | Coffee Creek Golf Club

3rd Annual Dallas Scholarship Golf Tournament
May 19, 2017 | Bear Creek Golf Club

33rd Annual Golden Scholarship Golf Tournament
June 5, 2017 | Fossil Trace Golf Club

Make connections with fellow alumni while supporting Mines student scholarships.
Save the date and gather your Oredigger gang for a fun day on the links.

Sponsorships are available.

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COLORADOSCHOOLOFMINES

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Mines Magazine is published by Colorado School of Mines and the Mines Alumni Association for alumni and friends of the school. *Mines Magazine* is a critical communication serving the Colorado School of Mines community. Its mission is to keep readers informed about the school, to further the goals of the school and the alumni association and to foster connectedness.

Comments and suggestions are welcome. Contact us via our contact form at minesmagazine.com/contact-us/ or via mail at *Mines Magazine*, PO Box 1410, Golden, CO 80402. To update your address, go to minesalumni.com/update or email CSMAA@mines.edu.

ALUMNI NOTE

FINDING CONNECTIONS AND MAKING AN IMPACT

It is the pleasure of Colorado School of Mines and the Mines Alumni Association to formally introduce and welcome the new Executive Director of the Alumni Association, Mines alumnus Damian Friend. To get to know Damian and share a bit of his story, *Mines Magazine* sat down with him for an informal discussion about his time at Mines and his new role.

DAMIAN C. FRIEND

Hometown: Denver, Colorado
Education: BS Geological Engineering
Start Date at Mines: October 17, 2016

Damian Friend, the new executive director of the alumni association, pictured with his wife, Wendy.

Photo by Thomas Cooper

What made you want to come back to Mines and be involved with the alumni association?

I was really looking for an opportunity where I could make an impact—a challenging job that was impactful, that had a purpose, something larger than myself and that could really add value to what I would be doing. And this position has all of those ingredients. What a great place—I started here, and now I'm back.

What are your goals for the alumni association in the near future?

Communication is very important. 60 percent of the alumni are under the age of 40, and all alumni communicate in different ways. It's important to me to find out what the best means of communicating to the majority of the alumni is and to get the word out about what is going on at Mines now—the great research that's going on, the programs that are in place—and then to engage the alumni in terms of time, talent and treasure.

We all have time, talent and treasure, so we need to engage on all of those levels, but I found that I personally would become engaged in something if I had an interest in it. That's what really motivates me—an interest and then seeing results that are tangible and that make a difference. If we can get the word out there to the alumni community of what's going on at Mines, it might peak an interest in them to where they'd be willing to give back in time and talent to the school.

What I'm doing now is building those relationships and network. We do that through the M Clubs, which are important in letting the M Club leadership know what is going on at the school so that information can be disseminated to get that message out to all alumni about different opportunities. The other thing is the special interest groups and the mentoring program. I'll be working on these four things—communication, M Clubs, interest groups and the mentoring program—for the first year.

What advice do you have for alumni?

To leave a meaningful legacy. To give your time, talent and treasure to something greater than yourself, like so many are already doing. To benefit society and the world in general by doing that. When I came here and interviewed, I gave a presentation and its title was "A Greater Purpose." I think that's what we all should look for: something in life that's bigger than ourselves. And that's what I encourage alumni to do. Look at Mines: the students and their future; the school and its future; and you as an alumnus and your own future. What are you going to leave as a legacy that will be greater than your individual life?

Read our full interview with Damian Friend online at minesmagazine.com.

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President Paul and Elyse Johnson celebrate Homecoming 2016 with Marvin the Miner.

Photo by Tim Flynn

PRESIDENT'S CORNER

It was great to see so many of you here in Golden for Homecoming. There were many new events this year, including the Alumni M Climb, the pass-an-old-class opportunity, a Boots & Barrels BBQ and music social, and my favorite new tradition: a pre-game giant bonfire that all Orediggers would be proud of and that could probably be seen as far away as Boulder.

I will always remember the Class of 1966 alumni—with their bandit scarves, strong Mines pride and entertaining stories of their lives at Mines—and how much they laughed when Blaster suddenly decided in front of the president's house that he wasn't walking any farther with me in the parade.

Homecoming is a great time for alumni to show off Mines to family and friends, visit favorite faculty, tour new facilities and to connect with current students. Some of you saw our students let loose at the Bill Nye lecture, while others connected with them at various Homecoming events. If you had the opportunity to meet some of them and hear their stories, I suspect that you would agree that our current students are amazing, and that you can't help but be impressed by their passion and energy. To me, the strength of the students is the sign that Mines continues to be a unique and special university and that the future for Mines and our graduates is bright.

My hope is that Homecoming will not be the only time we see alumni on campus. We envision a future with a very visible and constant alumni presence on campus, through engagement in student mentoring, in classroom instruction or in one of our alumni focus groups supporting entrepreneurial activities, recruitment of underrepresented students, and preparing our students for opportunities in the aerospace industry. This is a priority for our new alumni association executive director, Damian Friend (read more about Damian on page 5).

I always say that our proud alumni are one of Mines' greatest assets. Your passion for Mines and desire to see it prosper in the future will help carry this institution forward. We are updating our strategic plan with an eye on Mines' future. Mines will celebrate its 150th anniversary in eight years, in 2024. Your input to this planning process is critical, and I invite you follow my blog (GoOrediggers.wordpress.com), follow me on Twitter (@ILoveBlaster) or share your thoughts via email (pauljohnson@mines.edu).

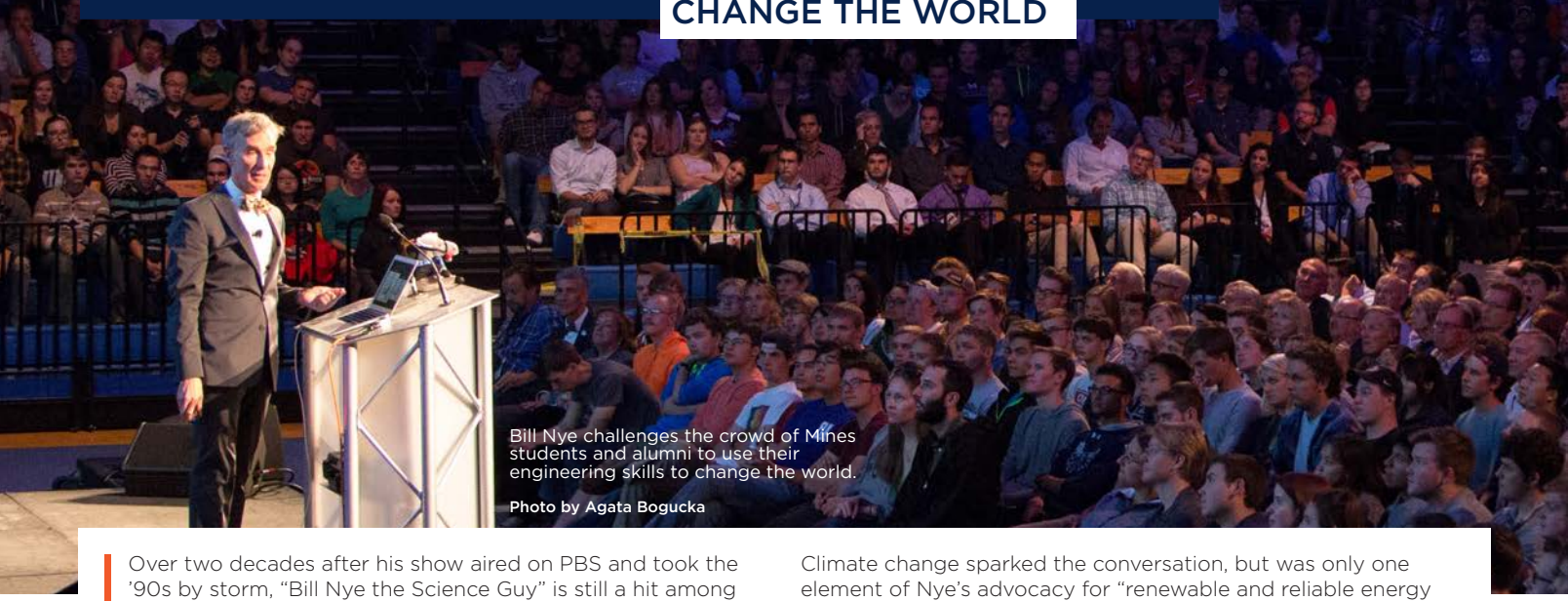
Thank you for staying connected with Mines.

Go Orediggers!

Paul C. Johnson
President and Professor

BILL NYE THE SCIENCE GUY

DARING STUDENTS TO CHANGE THE WORLD



Bill Nye challenges the crowd of Mines students and alumni to use their engineering skills to change the world.

Photo by Agata Bogucka

Over two decades after his show aired on PBS and took the '90s by storm, "Bill Nye the Science Guy" is still a hit among science enthusiasts, especially the millennials who grew up watching him. On October 5, 2016, Nye visited Mines to speak to a sold-out crowd of students, alumni, faculty and staff as part of the President's Distinguished Lecture series and kickoff to the 2016 Homecoming festivities.

"It was a childhood dream come true," said sophomore Victoria Martinez-Vivot. Martinez-Vivot got the opportunity to meet Bill Nye prior to the talk, due to her role as MAC Co-Publicity Chair.

Nye's talk focused on the biggest problems facing our planet and what society, especially young people, can do to make the world a better place. His catch phrase for the night was: "I want you guys to—dare I say it—change the world."

Bill Nye and Mines President, Paul C. Johnson, coordinate by wearing bow ties during the President's Distinguished Lecture in October 2016.

Photo by Thomas Cooper

> **"It was a childhood dream come true."**
>
> **- Victoria Martinez-Vivot**

Climate change sparked the conversation, but was only one element of Nye's advocacy for "renewable and reliable energy for all." In addition to encouraging the crowd to recognize renewable resources as the future of energy, he also dared Mines students to design a better battery and invent hydro-fusion engines for airplanes.

Fueled by his views on climate issues and the need to recognize the reality of our rapidly changing planet, Nye challenged the crowd of young engineers to solve the world's top three engineering grand challenges: providing clean water; renewable, reliable energy; and internet access for all. He also expressed his support for space exploration.

"Space exploration brings out the best in us," said Nye. "There are two questions we all ask: Where did we come from, and are we alone in the universe?" Nye asserted that our desire to explore space illustrates the innate yearning within humankind to understand our origins, despite the problems Earth may face.

Highlighting just how exciting Nye's presence was for Mines, one student shared a heartfelt message with Nye during the Q&A at the end of the lecture: "I just want to say that your plate tectonics episode is probably the reason I'm here studying geology right now, so thank you."

Nye is currently the CEO of **The Planetary Society,** continuing his legacy of teaching people of all ages the joys and wonders of science. He spent Earth Day 2015 speaking with President Barack Obama about climate change and science education. He also had a short debut on ABC's "Dancing with the Stars" but had to drop out after sustaining an injury.

From the fans who have followed him since childhood to those newly introduced, the crowd who came out to see Nye's lecture at Mines will not soon forget his challenge to change the world.

by **Agata Bogucka and Leah Pinkus**

HUMANS OF MINES

Inspired by Brandon Stanton's Humans of New York, Colorado School of Mines created a photo-storytelling project, called Humans of Mines. The project features a different student, faculty, staff or alumnus and a bit of their personal story every Monday, Wednesday and Friday on Facebook. With more than 2,500 followers in the first year, the project has become a source of pride in the community, as we share what we love most about Mines and our individual experience.

Photo by Leah Pinkus

PAIGE BOWLING Class of 2018

CHEMICAL AND BIOCHEMICAL ENGINEERING/ CHEMISTRY AND BIOCHEMISTRY

"My grandmother had Alzheimer's, and she actually passed away my sophomore year. I always knew there was a chance my mom could get it, because 1 in 7 children will [inherit] it from a person with Alzheimer's, and my grandmother had exactly seven children. It is personal. I am trying to prevent that sort of thing before it happens to my mom."

ASHANAFE GEBERKIDANE Class of 2019

PETROLEUM ENGINEERING, ECONOMICS MINOR

"It's a pretty cool club [Mines Investment Club]. Here at Mines, everyone is very math-oriented, but they don't always think about the economics side. I wanted to get a group of people together and talk about basic economics, talk about the markets and how they affect our decisions. When you're able to invest and make these decisions yourself, it's exhilarating and fun, not to mention a great life skill to have.

"I started this club, because I want to hear people's ideas. Everyone comes from a unique place and a unique thought process. For me, it's a way to gain a new perspective. Joining clubs and making new friends will help get you through the tough academics here at Mines—you struggle together. School is very important, but establishing yourself outside of the classroom, that's where everything happens, because you build relationships among your peers. You never know if your friend will be the next CEO of some company. By socializing and talking with people, you'll build connections that'll help you get started in your industry, and more importantly, establish relationships that will last forever."

Photo by Kelly Beard

Photo by Ashley Spurgeon

ALYSSA ALLENDE MOTZ BS '11, MS '12

PHD CANDIDATE IN APPLIED PHYSICS

"I think one of the best things about Mines is how diverse and international the community is. I've met people from Kazakhstan, Saudi Arabia, Iran, Nigeria—all over the world. I think Mines does a really good job of fostering that and celebrating that.

"I'm the first woman on my dad's side of the family to get a PhD. My dad's an immigrant from Mexico, so I really like being an example of why we should embrace diversity. I think if you want to say something, the greatest way to speak the loudest is to do it with a positive example."

PENG LI Class of 2018

GRADUATE STUDENT IN COMPUTER SCIENCE

"I will never forget when I attended the Apple Worldwide Developers Conference in San Francisco four years ago. This experience propelled my passion for computer science and strengthened my determination to study abroad.

"It was my first time in the United States. I was more than dedicated to all the sessions of WWDC, and even obsessed with the cutting-edge technologies and the terrific learning atmosphere in America. I still remember telling myself on the return flight, 'I will come back!'

"And here I am now, not just trying to do what I want—I am doing it!"

Photo by Deirdre O. Keating

Photo by Ashley Spurgeon

MICHAEL KOSSYREV Class of 2017

ENGINEERING PHYSICS

"A lot of the problems that we solve here are fairly open ended, and while there may be correct solutions, there are always a bunch of different ways to get to them. From my internships, I've noticed that what employers look for a lot is that creativity and that ability to solve problems outside the box. I think Mines is really good at teaching you how to do that."

KOWNOON HER BS '16

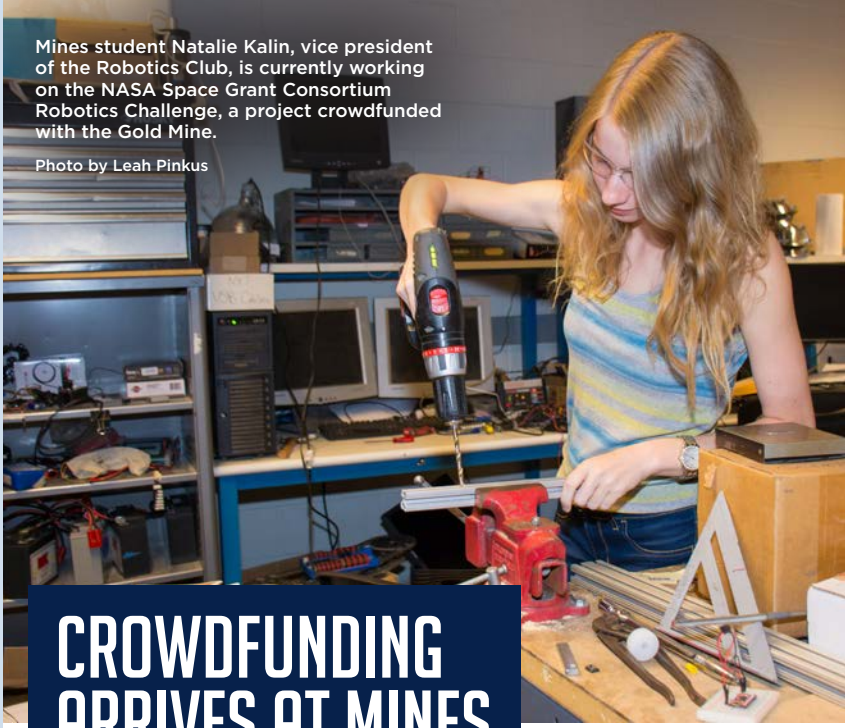
APPLIED MATHEMATICS AND STATISTICS/ ECONOMICS

"There are so many things I enjoyed as a Mines student—professors who knew me by name, clubs that kept me active and friends that felt less like fellow students and more like family. They made Mines a second home.

"The classes are challenging, of course. They won't become easier, necessarily, but if you actively seek out help and find outlets to not only support your learning but also your interests, that makes all the difference."

Photo by Deirdre O. Keating

For more stories, follow the project at facebook.com/HumansofMines



Mines student Natalie Kalin, vice president of the Robotics Club, is currently working on the NASA Space Grant Consortium Robotics Challenge, a project crowdfunded with the Gold Mine.

Photo by Leah Pinkus

CROWDFUNDING ARRIVES AT MINES

MINES DEVELOPS A NEW WAY FOR STUDENTS TO FUND THEIR PROJECTS

Crowdfunding is the fastest growing form of fundraising on a national basis, and Mines is on the cutting edge as one of a small number of universities who have launched platforms. On October 4, 2016, the university launched its exclusive crowdfunding platform, the Gold Mine, to help students, faculty and staff bring the projects they're passionate about to life.

Crowdfunding is online fundraising for a specific project through small gifts from a large number of contributors. "We are pleased to provide the campus community an opportunity to raise money for projects they may not have been able to get funded through more traditional means," said Mines Foundation President and CEO Brian Winkelbauer. "By showcasing some innovative projects from our talented faculty and students, the Mines community can help them reach their goals."

Last spring the Gold Mine piloted the platform featuring two student projects. Relying on outreach to their own personal networks and corporate connections, both teams exceeded their goals, raising over $10,000 and receiving gifts from 113 donors across the country.

"Crowdfunding was instrumental in getting our feet off the ground on fundraising," said Ethan Palay, of the Mines Tiny House team pilot project. "It helped give our team credibility and was also the most effective means of communicating to my friends and family how I am spending my time, and getting them excited about my project."

The Gold Mine is available to help academic departments, student groups and other members of the Mines community raise money for research, service trips, projects, events and other Mines-specific ventures. Gold Mine projects have the credibility of the Mines brand and teams receive personal training and coaching to help them succeed.

To learn more about crowdfunding at Mines, to support any of the student and faculty projects or to apply to fundraise on the Gold Mine, head to giving.mines.edu/goldmine.

by **Brandon Farestad-Rittel**

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COLORADOSCHOOLOFMINES FOUNDATION

ATHLETICS

Mines women's soccer won its sixth consecutive RMAC Tournament cup—the most in conference history—on November 6, 2016, with a thrilling 2-1 victory over CSU-Pueblo.

Photo by Trey Bloomer

MINES' TEAMS CONTINUE TO SHINE

Coming off what was arguably the best year in its history, Colorado School of Mines Athletics had big shoes to fill entering the 2016 fall season. So how did the Orediggers respond? With four RMAC championships, an RMAC Tournament title and five NCAA Championships appearances. Here is a closer look at another historic fall season for Mines Athletics:

CROSS COUNTRY

The rise of Mines cross country continued as the men's team—the 2015 national champions—again made history with the program's first-ever RMAC and NCAA South Central regional championships. Mines had one of the most dominant RMAC Championships runs ever with five of the top six finishers. The women's team continued its development to qualify for NCAA Championships for the third straight season, finishing fourth at regionals in Denver. Both teams were nationally ranked, with the men spending much of the season at number one in the nation.

FOOTBALL

Mines football won the 21st conference championship in program history, earning a trip to the NCAA Championship. Led by record-shattering quarterback Justin Dvorak, the RMAC Offensive Player of the Year, and national receiving touchdowns leader Brody Oliver, the Orediggers recovered from two early losses to rattle off seven straight wins to end the regular season. Their reward was the program's fourth NCAA Championship tournament selection. Mines compiled 20 all-RMAC players as it led the nation in total offense and passing offense.

Mines football beat Black Hills State 83-28 on November 12, 2016, to win a share of the RMAC Championship, their 21st conference title in program history.

Photo courtesy of Black Hills State

GOLF

Mines golf captured the RMAC regular-season championship, winning the RMAC #1 tournament and placing second at the RMAC #2 to win the program's fifth RMAC title overall. A young Oredigger squad led by freshmen Tim Amundson and Nic Beno and sophomore George Markham, with only one senior, Taylor MacKay, in the line-up shows that the spring season will be one to look forward to.

WOMEN'S SOCCER

Mines women's soccer has been a veritable dynasty in the RMAC over the past decade, and that didn't change in 2016. The Orediggers finished the regular season as the RMAC champions and went on to host and win their sixth consecutive conference tournament, earning them the region's top seed and the right to host the first four rounds of NCAA Championships play. Defender Emily Garnier became only the second player in conference history to be named both the RMAC Player of the Year and the Defender of the Year, while Sam Zumbro earned the Goalkeeper of the Year honor.

MEN'S SOCCER

After their historic 2015 season, men's soccer was bitten by the injury bug as they went 10-6-3 in 2016. There were plenty of positives, however, as Mines qualified for the RMAC Tournament behind all-region selections Niki Grotz, Trevor Amann and John Haist. Amann was selected as the RMAC Freshman of the Year with his 13 goals. And the best news? Men's soccer returns every player on its roster for 2017.

VOLLEYBALL

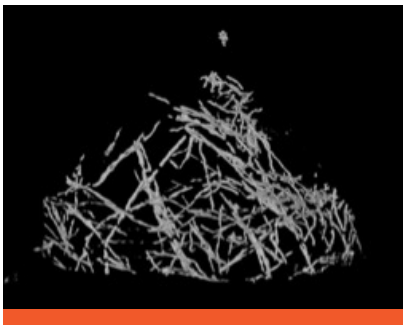
Despite graduating a celebrated core of seniors from the 2015 team, Mines volleyball reloaded and spent the entire season ranked in the AVCA Top 25. The Orediggers earned the RMAC's #2 seed in the tournament and qualified for their eighth consecutive NCAA Championships. Individually, Mines was led by RMAC Academic Player of the Year and Co-Defensive Player of the Year Taryn Huber and all-time kills record-setter Alanna Winfield.

by **Tim Flynn**

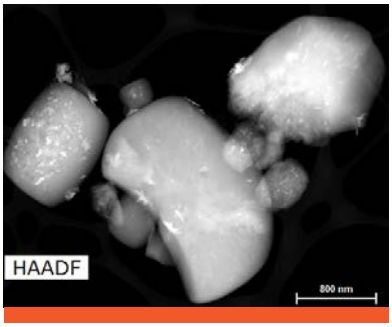
THE WORLD AT A MICRO LEVEL

SEEING WHAT MINES RESEARCHERS SEE

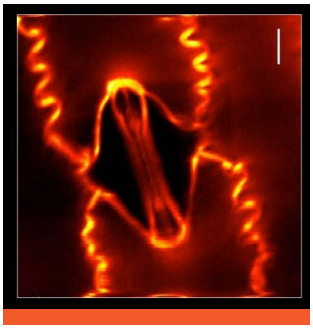
Researchers across the Mines campus often see a part of the world that the average person will never know. Fortunately, using advanced microscopy, researchers were willing to share a peek at what they are working on, allowing us to see what they see while in the lab.



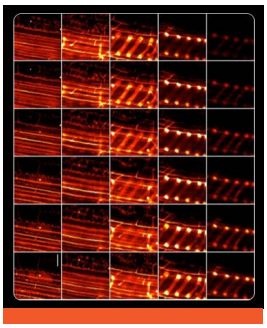
3-D transmission x-ray microscopy image of platinum nickel nanowire fuel cell catalyst when embedded in an electrode.



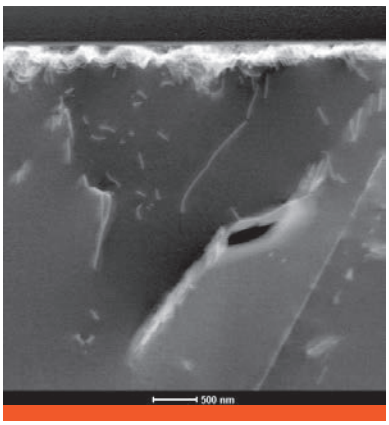
Nanoscale chemical mapping of a catalyst for liquefying natural gas.



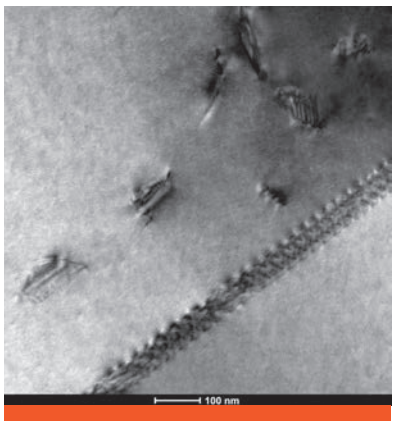
Two photon excitation fluorescence image of a Yellow Fluorescent Protein labeled corn plant.



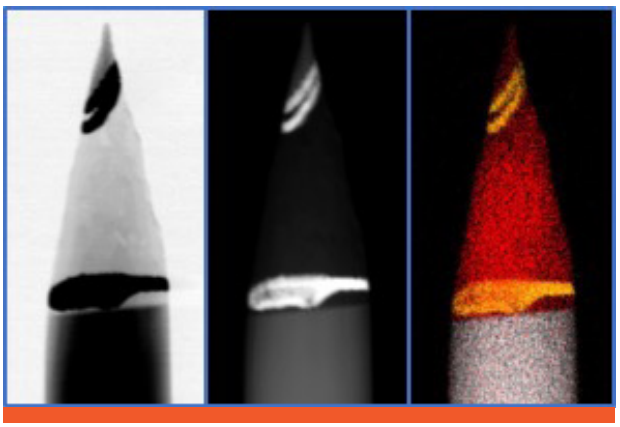
Two photon excitation fluorescence image of a Yellow Fluorescent Protein labeled corn plant.



Scanning transmission electron microscopy micrograph illustrating defects in a natural Brookite (Titanium Dioxide) crystal acquired in dark field mode. Crystallographic defects include line defects such as dislocations and planar defects such as stacking faults and grain boundaries.



Transmission electron microscopy image illustrating defects in a natural Brookite (Titanium Dioxide) crystal acquired in dark field mode. At bottom right, a series of dislocation loops are present, giving the appearance of a zipper. Defects in the top left of the image are single dislocation loops.



Thinned, needle-shaped sample for atom probe tomography, prepared by milling in a dual-beam scanning electron microscope and focused-ion beam (FIB) instrument. Left to right: Scanning transmission electron microscopy images in bright-field and high-angle annular dark field modes, with a corresponding energy dispersive spectroscopy compositional map. The carbon sample (red) is clearly sandwiched between layers of metallic gold coating (yellow) on a silicon substrate (gray).

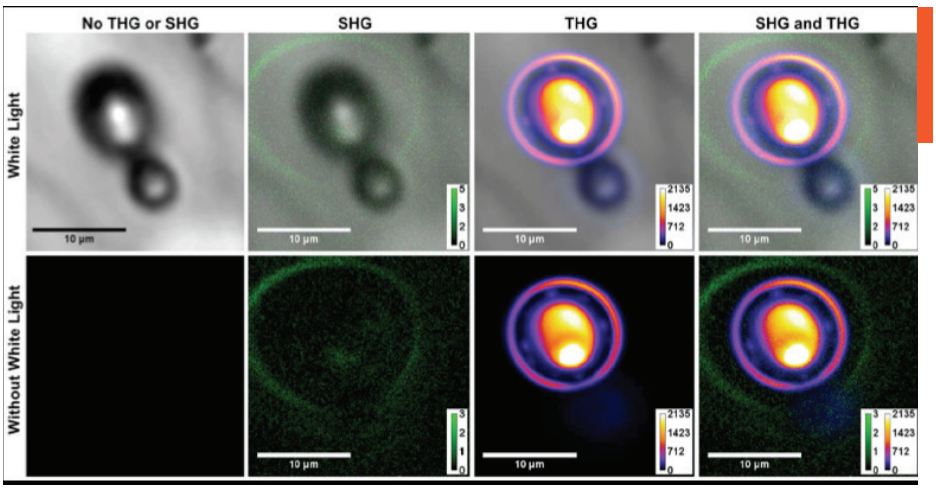


Image series of bubbles in glass that were created by a femtosecond laser. Two different image contrast mechanisms are used, second harmonic generation (SHG) and third harmonic generation (THG). These bring out different features—especially when compared to the traditional white light image on the far left column.

GRAND CANYON RAFTING ADVENTURE

May 20–28, 2017

Join fellow alumni and friends on this eight-day rafting adventure. Glide down the Colorado River with expert geologist and Mines professor, Dr. Steve Sonnenberg '81.

It will forever change the way you think about the Grand Canyon.

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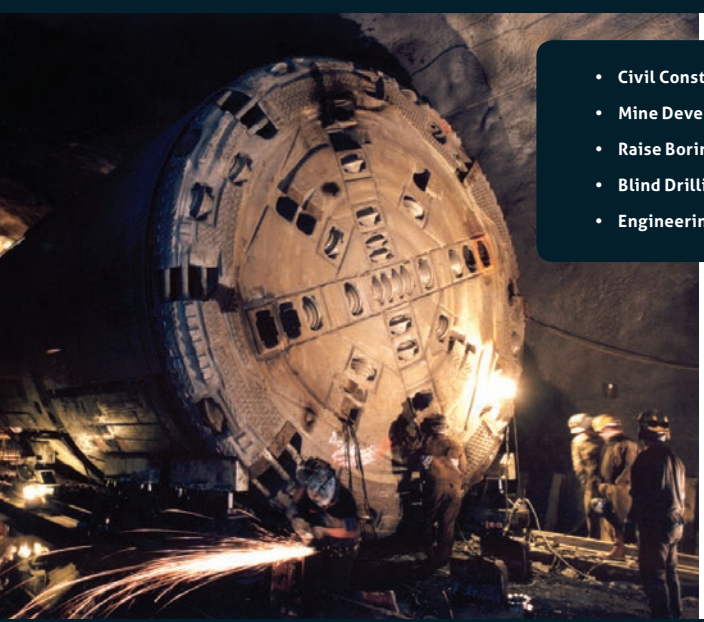

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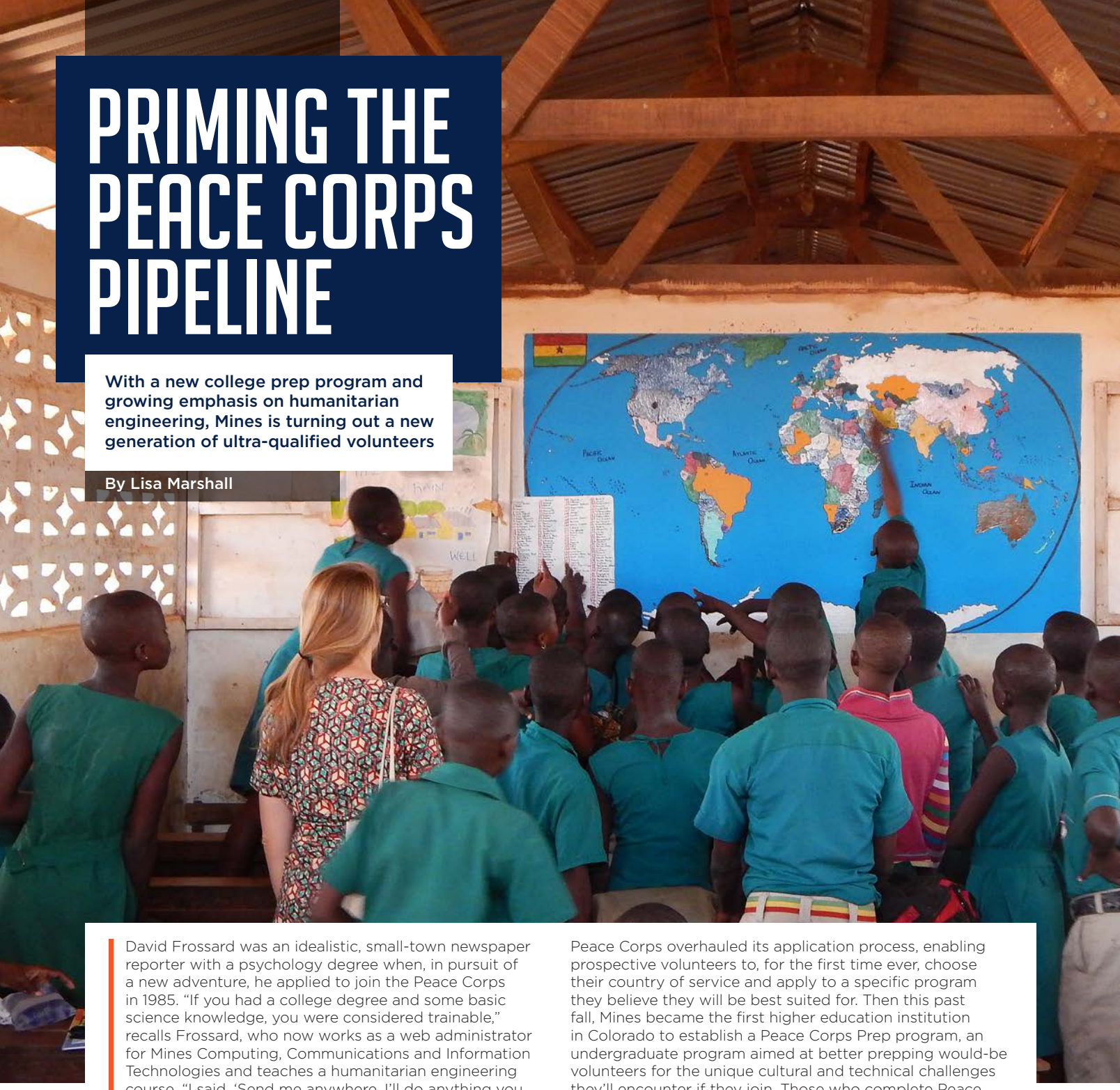
PRIMING THE PEACE CORPS PIPELINE

With a new college prep program and growing emphasis on humanitarian engineering, Mines is turning out a new generation of ultra-qualified volunteers

By Lisa Marshall



David Frossard was an idealistic, small-town newspaper reporter with a psychology degree when, in pursuit of a new adventure, he applied to join the Peace Corps in 1985. "If you had a college degree and some basic science knowledge, you were considered trainable," recalls Frossard, who now works as a web administrator for Mines Computing, Communications and Information Technologies and teaches a humanitarian engineering course. "I said, 'Send me anywhere. I'll do anything you think I can do.' It was the luck of the draw."

He landed in a mountainous region of the Philippines, tasked with helping villagers establish tilapia ponds. The work was rewarding and, as he puts it, life-transforming. But the village turned out to be too cold for the fish he was trying to breed. In retrospect, he says, "My project was a failure. I came back from Peace Corps the first time asking: 'How come so many projects fail?'"

Fast-forward to today and Frossard, Mines and the Peace Corps have all come a long way in answering that question and are taking bold steps to improve the success rates and sustainability of community development efforts abroad. In 2014, more than 50 years after its founding, the Peace Corps overhauled its application process, enabling prospective volunteers to, for the first time ever, choose their country of service and apply to a specific program they believe they will be best suited for. Then this past fall, Mines became the first higher education institution in Colorado to establish a Peace Corps Prep program, an undergraduate program aimed at better prepping would-be volunteers for the unique cultural and technical challenges they'll encounter if they join. Those who complete Peace Corps Prep get a certificate from the Peace Corps, a notation on their Mines transcript and a good shot at a modern-day Peace Corps that has become increasingly competitive to get into.

"Peace Corps Prep lets us take students years before they apply and make sure they get the skills Peace Corps is looking for," says Frossard, who got a PhD in anthropology after his first Peace Corps stint, returned in 2003 to help establish a wildly successful aquaculture project tin Zambia and is now co-coordinator of the Mines prep program. "We want to make sure the courses you take, the languages you take, your leadership activities and your volunteer activities all lead you in a direction to make you an effective volunteer."

HUMANITARIAN ENGINEERING A PERFECT PEACE CORPS PRIMER

Mines professor Juan Lucena, co-coordinator of Peace Corps Prep, stresses that while the formal partnership with the Peace Corps is new, Mines has been churning out uniquely qualified volunteers for years via its humanitarian engineering program. Established in 2003, the program aims to explicitly connect the technical aspects of engineering with the humanities and social sciences, exposing students to the oft-neglected subject of social justice and cultural, gender, economic and environmental sensitivities that often collide with development projects.

One course in particular, Engineering and Sustainable Community Development, is "maybe the most perfect Peace Corps prep course ever created," says Frossard, who has taught the class. It explores the unique challenges that can arise when an engineer is trying to sensitively develop a small-scale project (such as a new water or sanitation system) and be sure it's still in use years down the road.

"Many engineering students have a tendency to assume money is endless. But when you are doing a small-scale community development project, the Home Depot is not just around the corner," says Lucena. "You have to know how to design under precarious circumstances, with low budgets, for multiple stakeholders. And you have to think about big concepts like poverty, inequality and social justice."

Peace Corps spokesman David Reese says Peace Corps Prep was founded in 2007, to draw more students with foreign language fluency, intercultural competency and leadership skills and to introduce the program to populations on college campuses that might not otherwise think of serving. For the past three years, more than 20,600 people have applied annually to Peace Corps, and only about 6,000 currently serve. "We're focusing to a greater degree on qualified diversity and applicants over age 50, as well as those individuals who have the skills to match hard-to-fill positions," says Reese.

The takeaway: It's competitive. And those with a Peace Corps Prep certificate are about twice as likely to apply, get accepted and go.

With a strong humanitarian engineering curriculum already in place, Mines is a "wonderful fit" for Peace Corps Prep, says Reese. "In the developing world there just is not enough manpower in the engineering field to currently fill the need. Our partners, such as Mines, are critical to filling that void."

Above: Ghanaian students are taught a lesson by Molly Jane Roby '11 on a world map painted on a wall in a classroom.

Photo by Seth Roby

Right: Members of the Fulani tribe decorate Molly Jane Roby '11 with jewelry made from shells and beads.

Photo by Seth Roby

PUTTING HUMANITARIAN ENGINEERING SKILLS TO WORK

Molly Jane Roby '11 graduated from Mines long before Peace Corps Prep came to campus, but in many ways her experience reflects what newcomers to the formal program might be able to look forward to. She had a mild interest in the Peace Corps when she entered college, but after taking Engineering and Sustainable Community Development and hearing Frossard talk about his experiences, the deal was sealed.

"When my husband asked me to marry him that year I said, 'Okay, but we're going to the Peace Corps. Either we go together, or I go by myself," she recalls.

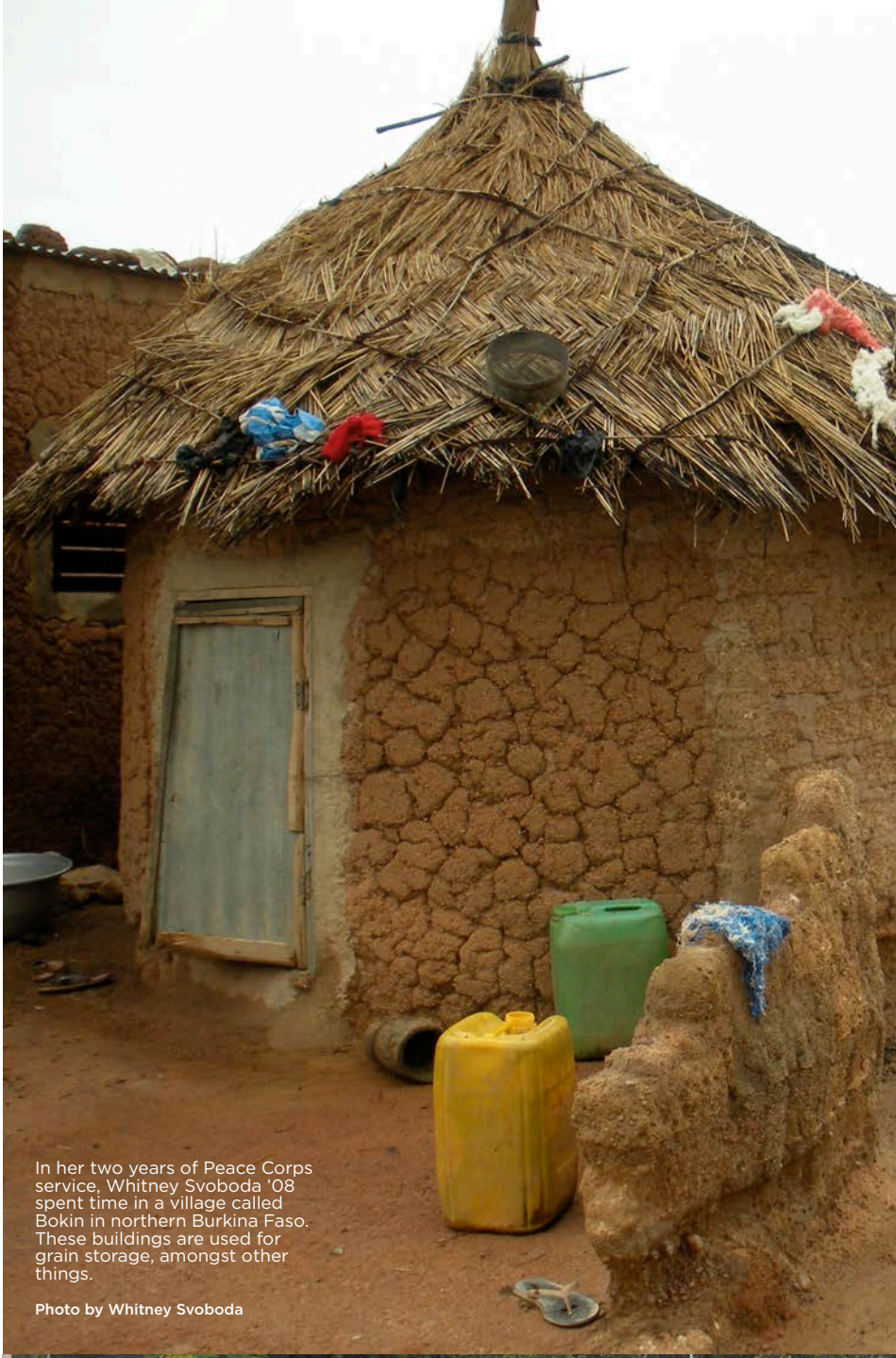
Her pursuit of a humanitarian engineering minor directed her toward classes and volunteer projects that forced her to explore the ethics and human impact around projects—not just the technical details. When it came time to apply to the Peace Corps, she felt as prepared as she could be.

"I don't think anything can completely prepare you for the Peace Corps. There were certainly times that we were miserable and looked at each other and said, 'What the hell are we doing here?'" Roby says. "But being a problem-solver and having confidence that you can get through it—that there is always an answer to the problem—really helped me."

In February 2012, she arrived in Ghana, where she and her husband spent two years working on water and sanitation projects. They lived in a small concrete structure with a corrugated tin roof on a school campus, using bucket-flush toilets that had been installed but were not actually hooked up to water (due to an unsuccessful previous development project).

Roby's roles varied over the years. At one point, when there was an instructor shortage, she stepped in and used her math and science skills to teach. At another point, she worked on a latrine project in a tribal village, grappling with a delicate problem to which only those who have done international development work can truly relate. "For one of the tribes, the concept of pooping on someone else's poop was equivalent to cursing them. The concept of a latrine for them was just unfathomable," she recalls, noting that they had to have numerous conversations before arriving at a different plan that worked for the tribe. "Just throwing money at the scenario and building a latrine without having someone on the ground to ask lots of questions just doesn't work."

In another instance, she worked with a group of students to address a dangerous sanitation issue at their school. Trash riddled the ground, foraged by wild goats, cows and chickens. Rather than opting for a technical fix, Roby helped the students use enamel paint and discarded boxes to create dozens of trash cans, which they distributed first throughout the community, and then in their own villages.



In her two years of Peace Corps service, Whitney Svoboda '08 spent time in a village called Bokin in northern Burkina Faso. These buildings are used for grain storage, amongst other things.

Photo by Whitney Svoboda

During her volunteer service in Ghana, Molly Jane Roby '11 helped with sanitation efforts at a high school.

Photo by Molly Jane Roby

"The idea was to empower these kids to do the education on their own and take it back to their communities. We wanted to be able to walk away and know they could keep doing it without us."

- Molly Jane Roby

Molly Jane Roby '11 teaches children hand washing techniques in a village called Zabzugu, in the northern region of Ghana.

Photo by Seth Roby

In the years that followed, the students did just that. And the whole project cost almost nothing.

"We did our entire service without writing a single grant or asking for a single penny. I'm very proud of that," says Roby, who now works for environmental consulting firm Tetra Tech.

Roby says her Peace Corps experience taught her patience, flexibility and resourcefulness—key attributes for an engineer required to work on a team. For other Mines students, like Whitney Svoboda '08, the Peace Corps offered a chance to see the world and gain a multicultural perspective they didn't have before. Svoboda was applying for jobs her senior year at Mines when she began to feel a twinge of dread. "I thought, 'I am going to go work in a lab for 40 years and then retire?' I was only 21. I wanted to do something different with my life," she says. She applied to the Peace Corps, got in and spent two years teaching in a sweltering village a bumpy seven-hour bus ride from the capital city of Burkina Faso, Africa.

Going in, she had little travel experience and didn't speak a word of French. "I wasn't very prepared," she concedes, lauding the new Peace Corps Prep program as a useful addition. She thrived regardless, teaching English and helping turn a dilapidated building on campus into a library that is still in use today.

Coming out, she had an insatiable travel bug and a knack for making things happen in even the most challenging of environments. She now works as a field engineer for oilfield services company, Schlumberger, a job that has taken her to Equatorial Guinea, Abu Dhabi, Norway, Spain and elsewhere.

"The Peace Corps completely helped me get my job," she says. "I said, 'You can send me anywhere. I used to work in Africa.'"

A WIN-WIN

Since 1961, the year the Peace Corps was founded, 89 Mines alumni have served as volunteers in the Peace Corps, with four currently serving in Tanzania, Uganda, Namibia and Paraguay.

Frossard and Lucena hope the new Peace Corps Prep program will encourage more Mines students to consider joining the Peace Corps. But they also hope to use it as a recruitment mechanism to draw more engineering students—tantalized by the prospect of serving overseas after college—into humanitarian engineering classes and perhaps adding a humanitarian engineering major. (In 2017, the program will also establish a new minor in leadership in social responsibility).

"I think Peace Corps Prep is going to give an additional incentive for students to complete the minor and have something very concrete to look forward to at graduation," says Lucena. "They will be able to say, 'I have a real chance at being a Peace Corps volunteer and can put into practice everything I learned in the humanitarian engineering classroom.'"

Melissa Breathwaite is sold. A sophomore pursuing a major in environmental engineering and a minor in humanitarian engineering, she was among the first to sign up for the Peace Corps Prep program. She's not certain yet what she wants to do with her career long-term: maybe research, maybe graduate school, maybe serving as a liaison between oil and gas companies and the communities in which they operate.

But she does know what she wants to do right after graduation: Join the Peace Corps.

Whitney Svoboda '08 poses with the other teachers she worked with at a school in Burkina Faso.

Photo by Joseph Bonzi

With strong engineering backgrounds, Mines alumni have proven to be strong candidates for the Peace Corps, volunteering all over the world, including Africa's northern savanna.

Photo by Molly Jane Roby

As part of her volunteer work abroad in the Peace Corps, Whitney Svoboda '08 taught English to a class of about 110 students.

Photo by Molly Jane Roby

Above:
Molly Jane Roby '11 plays with local Ghanaian children while volunteering as part of the Peace Corps.

Photo by Seth Roby

Left:
Community members plant trees on a school campus in Ghana.

Photo by Molly Jane Roby

A RADIOCHEMISTRY RENAISSANCE

New Nuclear Science and Engineering chair, lab and research focus is putting Mines on the map

By Lisa Marshall

You could call them the neglected stepchildren of the periodic table.

Stretching across the bottom of the table, the 15 actinides are among the heaviest elements, are all radioactive and are generally not found in nature. The most famous among them, uranium and plutonium, have been integral in shaping the global political and energy landscape, used in nuclear weapons production until the late 1960s and nuclear plants since the mid-1950s. To this day, roughly 20 percent of the United States' energy comes from nuclear power. But in the wake of the Cold War's end and the nuclear accidents at Chernobyl and Three Mile Island, interest in studying such elements fell off in the '90s, leaving a wide knowledge gap at a time when expertise was still badly needed.

Today, Mines, with a new nuclear science chair, a new state-of-the-art 2,200-square-foot radiochemistry lab and a burgeoning research and education program—all funded with help from *Transforming Lives: The Campaign for Colorado School of Mines*—is working to fill that gap.

"These additions have allowed Mines to become one of the foremost institutions in the world when it comes to expertise in radioactive elements," says Mines Foundation President Brian Winkelbauer, who points to the nuclear science program as one of many key successes of the six-year, half-billion-dollar campaign. In all, the campaign, which drew to a close this past fall, raised $456 million which was used to fund scholarships, numerous capital projects, campus programs and fund 10 new faculty positions, including the Jerry and Tina Grandey University Chair in Nuclear Science and Engineering.

As the United States grapples with what to do with its nuclear waste and nations around the world eye nuclear energy as a clean and relatively cheap energy source, Mines is poised to be a go-to source for solid science and informed perspectives.

Graduate student Jarrod Gogolski works in Mines' new state-of-the-art radiochemistry lab, funded with help from *Transforming Lives: The Campaign for Colorado School of Mines.*

Photo by Ronald Kem

WHY PLUTONIUM RESEARCH IS STILL CRITICAL

Prior to arriving for his new post at Mines in January 2015, Mark Jensen, director of the nuclear science program, spent 20 years at the U.S. Department of Energy's Argonne National Laboratory studying radioactive elements, particularly plutonium. Asked why it's important to study, he responds:

"First, let me tell you why it's fun."

Jensen explains that until 1941, when University of California Berkeley chemist Glenn Seaborg secretly isolated and synthesized plutonium in a lab, it had "not existed on Earth" in any significant quantities for about 2 billion years. "What that means is that, unlike other elements, we can't go learn about its chemistry, biology or physics by looking at the world around us," Jensen says. "Since it hasn't existed on Earth, nature—especially biology—hasn't developed any way to handle plutonium." For a scientist, that presents a rare and tantalizing challenge.

There are also plenty of practical reasons to study plutonium, he adds. "In the last 70 years, we have gone from having no plutonium on Earth to having many hundreds of tons on Earth." Roughly 60 tons of spent plutonium are generated per year globally, via nuclear energy production, placed in repositories next to plants where they take an unfathomably long time to decay. "Half of it goes away every 24,000 years," explains Jensen.

Meanwhile, interest in nuclear energy—a relatively cheap, clean-burning fuel source which uses uranium as its feedstock and produces plutonium as waste—is growing globally as nations like China and India grapple with unmanageable CO_2 emissions.

With a group of seven faculty and five associate researchers, Mines' nuclear science and engineering program is exploring not only how to use uranium for energy most efficiently but also how to better deal with the waste and be prepared to address security and safety issues in the unlikely event that it, or legacy waste from the use of plutonium in weaponry, ends up in the wrong hands.

"I think that peaceful nuclear power production is going to be a really important part of our energy portfolio worldwide in the future," says Jenifer Braley, an assistant chemistry professor and nuclear science researcher who works with Jensen. "We would like for its implementation to be as secure and responsible as possible."

Graduate student Nathan Bessen, right, talks about nuclear science and chemistry with Assistant Professor Jenifer Braley.

Photo by Leah Pinkus

TRANSFORMINGLIVES
The Campaign for Colorado School of Mines

TRANSFORMING LIVES BY THE NUMBERS

The six-year *Transforming Lives: The Campaign for the Colorado School of Mines* drew to a close in fall 2016, having raised $456 million and far exceeding its fundraising goal of $350 million.

"This is an unheard of fundraising feat for a small public school like ours," said Mines Foundation President and CEO Brian Winkelbauer. "We capitalized on the incredible pride that our alumni have for this institution and their willingness and interest in making Mines one of the best STEM institutions in the world."

Who gave:

- Out of 8,857 donors, 5,403 were alumni
- 3,566 gave for the first time
- Mines received 50 gifts of $1 million or more
- Mines' endowment now sits at $248 million, a growth of 50 percent

What it bought:

Donors contributed $63 million for financial aid, creating 168 new scholarships

Several buildings were built or enhanced, including: Marquez Hall; the Wright Student Wellness Center; the Clear Creek Athletic Complex, including a new football stadium and soccer and track facilities; a renovated student center; the Starzer Welcome Center; and the CoorsTek Center for Applied Science and Engineering (currently under construction).

New faculty positions endowed with campaign funding:

Stephen Liu, ABS Endowed Chair in Metallurgical and Materials Engineering

Open, Fred Banfield Distinguished Endowed Chair in Mining Engineering

Paul Constantine, Ben L. Fryrear Assistant Professor of Applied Math and Statistics

Dehui Yang, Ben L. Fryrear Assistant Professor of Electrical Engineering and Computer Science

Tzahi Cath & Michael Wakin, Ben L. Fryrear Endowed Professorship Fund for the College of Engineering and Computational Sciences

Mark Jensen, Jerry and Tina Grandey University Chair in Nuclear Science and Engineering

Mike Mooney, Bruce E. Grewcock University Chair in Underground Construction and Tunneling

Jamal Rostami, Timothy J. Haddon/Alacer Gold Endowed Chair in Mining Engineering

Erdal Ozkan, F.H. "Mick" Merelli/Cimarex Energy Distinguished Department Head Chair in Petroleum Engineering

Lesli Wood, Robert J. Weimer Distinguished Endowed Chair in Sedimentary and Petroleum Geology

To see more about the impact of the campaign, visit campaign.mines.edu.

THE CSI OF NUCLEAR SCIENCE

Braley says she was always fascinated with the "basement of the periodic table" and got turned on to radiochemistry as an undergrad when she attended a Nuclear Chemistry Summer School sponsored by the DOE to reinvigorate the field.

"Research in this area had basically just died off," she says.

She came to Mines in 2012, drawn to what was already a growing program, and has watched the program flourish ever since. "The facilities infrastructure and support provided by the Transforming Lives campaign has really helped this research move forward," she explains.

While research is slowly increasing, there are only seven institutions in the country with the specialized equipment, lab space and expertise to work with radioactive "transuranic" materials like berkelium, plutonium and neptunium. Only two academic institutions in the world—Mines and Florida State University—have the resources required to study berkelium. "We have the best-looking radiochemistry lab in the nation," Braley says.

She and FSU researchers recently published a paper in Science, heralded as the most rigorous characterization of the actinide berkelium. Just understanding the basic science behind how such elements behave could ultimately lead to more efficient nuclear fuel systems and shorter waste-management times, she says.

Braley also specializes in nuclear forensics research, helping to identify chemical fingerprints and develop forensic tools which could ultimately assist government agencies in identifying the source of nuclear materials should they end up in the hands of rogue states or terrorist organizations.

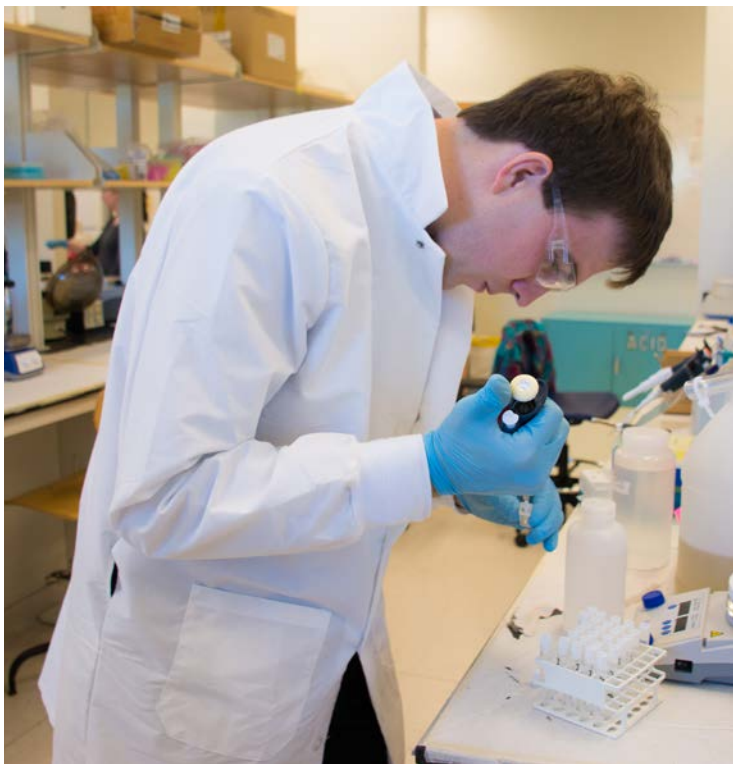
"It is, in a sense, the CSI of the nuclear world."

Mines students Gabi Picayo and Erin Bertelsen work on a project together.

Photo by Ronald Kem

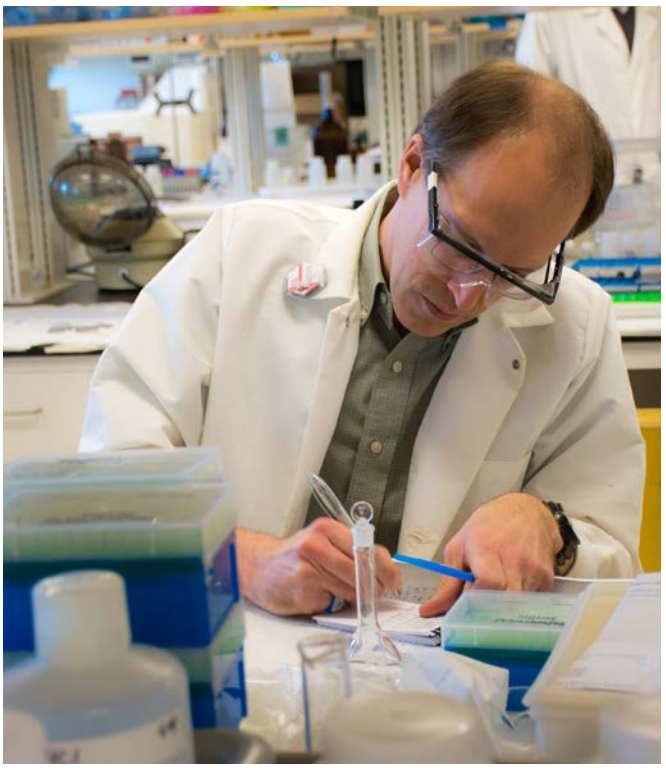
Jarrod Gogolski, a graduate chemistry student, works on a project in the radiochemistry lab.

Photo by Leah Pinkus



Chemistry Professor Mark Jensen holds the Grandey Chair in Nuclear Science and Engineering, a position endowed with funding from the Transforming Lives campaign.

Photo by Leah Pinkus



FROM RECYCLING PLUTONIUM TO TREATING TOXICITY

For years, Jensen has focused his research on a concept called "partition and transmutation"—a proposed technology that would essentially extract radioactive materials from nuclear waste stored in repositories and recycle them, both creating more energy and radically reducing the amount of time it takes waste to decay. "You would take them out and put them in a different reactor that would actually destroy the plutonium and other radioactive materials that are going to last a long time. In destroying them, you turn the problem of radioactive waste into something that could be gone in a thousand years instead of a hundred thousand years."

In 2011, Jensen and his co-authors published a paper in Nature identifying for the first time, precisely how plutonium gets inside of human cells, causing health problems. As he explains it, plutonium binds to transferrin—a protein responsible for shuttling iron into the cells—changing the shape of transferrin in almost the same way that iron does and "tricking the cells into thinking it is iron" so they let it in.

He hopes that someday the research could be used to help develop a drug to block that "Trojan horse" from entering the cell. It could be used to treat workers who are accidentally exposed to radioactive elements or provide an emergency remedy in the unlikely case of a terrorist attack or accident.

For now, Jensen and his students at Mines are working to better understand how cells in the body process and separate other naturally occurring metals, with the hope of learning new strategies for dealing with nuclear waste.

"The real, practical avenue for this research right now is the recognition that biology does its metals separation differently than I as a chemist would do it, and it works pretty well. There's a lot we can learn from that," Jensen says.

Mines alumnus and uranium industry leader Jerry Grandey '68, who donated $3 million to establish the new chair, said he felt that as a school with a strong emphasis on coal, petroleum, mining and renewable energy, Mines would serve its students well by offering a robust look at the technical and policy issues surrounding nuclear energy, too.

So far, so good, Grandey says.

"It's achieving the objectives I had hoped—exposing students to the nuclear field from beginning to end and all of the issues that come with it. I feel very good about it."

THE EVOLUTION OF A UNIVERSITY

By Brenda Gillen

A brief look at the changes implemented 50 years ago that helped make Mines the institution it is today

Mines students saw a period of change 50 years ago as Mines expanded its curriculum in order to build itself into one of the nation's top technological institutions.

Photo from Prospector 1966

In the 1960s, the United States was in upheaval. President Kennedy had been assassinated, the Civil Rights Movement was underway and America was embroiled in the Vietnam War. Many higher education institutions were forced to adapt to America's changing social and political scene and meet the evolving needs of its students. But it wasn't easy. Although it hadn't happened at Colorado School of Mines, colleges across the country were seeing declining enrollments in mineral engineering programs.

When Orlo Childs was in his third year as 11th president of the school, enrollment was at its highest to date with 1,544 students, attributed to new degree offerings and an increase in financial aid for students. Yet, Mines was at a crossroads. The school could continue offering professional degrees, which required about 170 credit hours, or it could more closely approximate the BS degree in mining engineering, requiring as few as 130 semester hours at other colleges. Less than a third of the companies that recruited on campus distinguished between the two degrees, according to a 1978 *Mines Magazine* article about credit changes. Since Mines graduates with the professional degree were offered the same positions and salary packages as their counterparts from other schools who had completed their degrees in far less time, faculty recommended the professional degree be made into a second degree in recognition of the extra work required.

Additionally, an evaluation of the college and its operations suggested Mines could build itself into one of the nation's leading technological institutions. Changing the degree structure could help the school attract the kinds of students and faculty that would make that happen. In its ninth decade, the college had evolved from its original academic focus on gold and silver assaying to an expanded curriculum suited for modern students. In 1959 the school increased humanities and social sciences course requirements; in 1962 it offered new degrees in chemistry, mathematics and physics.

"For Mines, the 1950s and 1960s were watersheds of curricular development and predictors of new demands and goals to be recognized and molded into reality."

- Wilton Eckley

Early in his administration, Childs attempted to rename the college to include the word "university." He thought having "school" in the name was misleading for an institution that granted doctoral degrees, but he dropped the plan due to vehement opposition. During Childs' tenure, the school was in a formative stage, so it undertook myriad evaluations. Among them were Alumni Advisory Council reviews in 1962, 1965 and 1968; a 1967 report to the Colorado Commission on Higher Education (CCHE); an evaluation by the Engineers Council for Professional Development in 1967; and a task force report from a panel of CCHE experts in 1967–68.

"There are obvious conflicts in the various recommendations and actions that have been reviewed," wrote Geology Professor John D. Haun in the "Future of Colorado School of Mines," a December 1968 article in *Mines Magazine*. In describing evaluations concluded in the prior year, which had "come with bewildering frequency," Haun addressed the difficulty in meeting CCHE's desire for each state college to have a distinct

Members from the Class of 1966 reminisced on old times during Homecoming 2016 for their 50th class reunion.

Photo by Thomas Cooper

focus. "There will obviously be some overlap with programs at C.U. and C.S.U., but it [is] not possible to expand and strengthen our various departments and at the same time completely avoid duplication," Haun wrote.

In an effort to meet changing needs and to attract more students, the Board of Trustees voted on March 29, 1968, to approve the BS in engineering or science, the MS in chemistry, mathematics and physics, the MS in mineral economics and the PhD in engineering and science. In response to alumni concerns about dropping the professional degree in engineering, the board compromised by moving the last year of the professional degree to the master's level.

Stu Bennett '66, an undergraduate student during this period of change, recalls students' concern about the shift in degree offerings. "The traditions of the school were very important to us. The professional degree was a five-year program that covered all aspects of engineering. As a result, Mines students were reputed to be competent in any area of engineering," he says.

However, the departure from tradition was necessary for the school to remain competitive. "The change made the Mines degree more comparable to those of other engineering institutions, and it brought in quality faculty and research," Bennett says. "Mines was forced into a culture change, and it has grown from an excellent technical school into a major research and education university that is quantum leaps different and better."

Childs' legacy of leadership during a transformational time for the school is perhaps best understood by looking back. In a memorial for Childs published in November 1997 by the Geological Society of America, Robert Weimer and Anton Pegis wrote about his seven years as president of Mines: "His recommended curriculum revisions and new degree programs were instrumental in stabilizing and increasing enrollment at the school."

Don Van Arnam '66, who graduated from Mines with a degree in metallurgical engineering, sees the modifications the college made in the late 1960s as part of a long transition that started before his arrival and continues today.

"Mines was originally funded by the legislature of the state of Colorado to provide engineers for the mining belt in the Colorado mountains. While we were at Mines, legislators realized more Mines graduates were going out of state than were staying in state so they reduced their level of support," Van Arnam says. "Basically, Mines' customer was changing from industry in the state of Colorado to industry, nationwide and worldwide."

Van Arnam believes that Mines' investment in world-renowned faculty and its close connections to industry have helped train graduates to be well-equipped for the workforce.

To better meet the needs of its students, Mines implemented new programs in the 1960s, including degree offerings in physics, mathematics and geochemistry.

Photos from Prospector 1966

Today Mines is a highly selective, public research university offering bachelor's, master's and doctoral degrees in engineering and applied sciences. In 2015–16, through its three colleges and 14 academic departments, Mines' enrollment totaled 5,924 students, including 4,608 undergraduates and 1,316 graduate students. More than half of the instructional faculty have doctorate or other terminal degrees. In 2015, the school's research awards amounted to nearly $64 million and were split about equally between federal and non-federal sources. According to the college's 2016–17 research magazine, Mines is "internationally recognized for its education and research programs focusing on stewardship of the Earth and its resources, developing advanced materials and applications, addressing the Earth's energy challenges and fostering environmentally sound and sustainable solutions for the world's greatest challenges."

The strong enrollment figures, distinguished faculty and quality research are key indicators that the changes the university made decades ago have led to its current status as one of the leading technological institutions in the United States. Mines continually undergoes periods of change and rises to the challenges it faces, but the school always remains true to its roots.

2016 HOMECOMING

IGNITE THE NIGHT

This fall's annual homecoming festivities welcomed Orediggers back to campus to celebrate and reminisce on the memories and experiences Mines students and alumni share. The special weekend was kicked off with the President's Distinguished Lecture featuring Bill Nye, with a call for today's students to be the next great generation. Alumni hiked to the M to watch the sun rise, attended classes to see how teaching techniques have changed since they were students and danced to bluegrass while enjoying barbecue during Boots & Barrels, the alumni party. By popular demand, President Paul C. Johnson and the Mines Activities Council brought back the bonfire this year, an event that fired up students and alumni the night before the big game. The traditional parade, tailgate and football victory capped off the weekend. The Class of 1966 celebrated their milestone 50th reunion while other classes hosted dinners that allowed alumni to mingle with their classmates. To join the fun of Homecoming 2017, stay tuned for details.

Photos by Leah Pinkus

RECOGNIZING EXCEPTIONAL ALUMNI

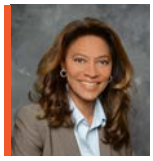
Each year, Colorado School of Mines Alumni Association proudly honors exemplary members of the Mines community with several awards. Alumni nominate their peers for each award, and the winners are chosen by an awards committee made up of alumni members. We would like to congratulate the 2016 winners and thank those who submitted a nomination.

ALUMNUS OF THE FUTURE

Presented to a student for their efforts in strengthening and embodying the spirit of the alumni association, the 2016 award was given to **Hyung (Tony) Kim**, class of 2017. Tony is a petroleum engineering student and plans to graduate this spring. He is president of the Student Alumni Association, where his greatest accomplishment has been helping to establish an alumni/student mentor program. The pilot program called "Mentorship @ Mines" launched this fall. Tony is also a Blue Key Honor Society member and was one of the Duane J. and Marcine M. Fritz Scholarship winners in 2016. After graduation, Tony would like to work as a reservoir engineer and further his education by earning an MBA. He ultimately would like to start-up and operate his own oil and gas company.

MELVILLE F. COOLBAUGH AWARD

Jimmy B. Taylor '76 was selected for this award for making an outstanding contribution toward improving the image and enhancing the reputation of Mines. Jimmy graduated from Mines in 1976 with a bachelor's degree in engineering and math. He serves on the alumni association golf committee and founded the Oklahoma City golf tournament in 2010, which he still chairs today. His efforts with the golf tournament have helped raise awareness of Mines in the Oklahoma City community, expand the local M Club and generate a Mines academic and athletic scholarship for students from the area. Jimmy also took a leadership role in fundraising for the Marv Kay stadium project as a member of the first football team that Marv Kay coached in 1969. He also acts as an admissions representative. Jimmy currently works for Johnson Controls as an energy solutions development engineer.



OUTSTANDING ALUMNA AWARD

Presented to an alumnus or alumna who has contributed meritorious service on behalf of the alumni association, the 2016 award was given to **Norma Mozee '83**. Norma graduated with a bachelor's degree in mineral engineering mathematics and a minor in geophysics from Mines in 1983, and earned her master's degree in global energy management from the University of Colorado Denver in 2010. Norma serves on the *Mines Magazine* editorial board and has been instrumental in the development of the "Women at Mines" interest group, working with Admissions, SWE, WISEM and alumnae on ways to increase the number of women students attending and thriving at Mines. Currently, Norma is the principal and founder of Afinidad Americas, LLC, an international business strategy and advisory consultancy focused on energy services companies.

YOUNG ALUMNA AWARD

Carol L. Skelton '14 was selected for this award, presented to a young alumnus or alumna whose accomplishments have reflected favorably on the school and the alumni association. Since her graduation in 2014 with an environmental engineering degree, Skelton has been working diligently on some of the largest, most technically challenging infrastructure projects in Denver. As a civil engineer at Jacobs in Denver, she designs intricate drainage systems and complex hydraulics models in her day-to-day, and devotes her evenings and weekends to volunteering, hiking and family. She is an active member of the Women in Transportation Seminar and Water Environment Federation. Skelton has a knack for translating engineering topics into plain English, breaking down big, data-centric ideas into something digestible. At Mines, she participated in EPICS and was a member of the Society of Women Engineers, the Minergy "renewal energy" Club and EarthWorks. Carol's passion for environmental engineering includes water rights, pollution and the prevention of waterborne illnesses.

by **Danelle Herra**

Visit minesalumni.com/awards to view past recipients or to nominate alumni for 2017 Alumni Association awards.

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ALUMNA PROFILE

DREAMING BIG TO PREVENT DISASTER

Shayma Amin '00 is working to bolster Kuwait's oil production and reserves on an international scale, fulfilling a dream she had as a child of working in petroleum.

Photo courtesy of Shayma Amin

As the Persian Gulf War drew to a close in February 1991, Kuwait experienced one of the country's worst environmental and economic disasters as Iraqi forces set fire to more than 600 Kuwaiti oil wells, which burned for more than eight months. Crude oil spewed across the desert and into the Persian Gulf, a mark of the devastating environmental consequences of war.

The drama and tragedy of such an event certainly leaves an impression, especially on a ten-year-old. Shayma Amin '00 was living outside of Kuwait during the Persian Gulf War, but when she was finally allowed to return to her hometown after the country's liberation, she recalls looking down at the destruction from the airplane window. "From above, we thought it was a lake, but it turned out to be oil spilled all over my country—flaming fires and barely any sunshine for months on end," she said. "I remember sitting next to my mom and telling her, 'I am going to one day get into the oil field. I am going to help my country.'"

Nearly a decade later, Amin was on her way to fulfilling that promise. With a high GPA, she was able to go to college in the United States on a full-ride scholarship. She researched the top universities with petroleum engineering programs, and Mines was high on the list. Combining that with the fact that Amin's then-husband would be pursuing an MBA at the University of Denver made Mines the ideal place for her to pursue her dream of becoming a petroleum engineer.

She completed her coursework in three and a half years, taking 23 credits each semester, despite being told that it was impossible. She even took extra classes during the summer at University of Colorado and DU in order to graduate on schedule. "I am a very stubborn human being," she said. "So you tell me I can't, and it just gives me more ammunition and more of a challenge."

After graduating, Amin worked for Schlumberger Geoquest for about a year, but it wasn't the career path she really had in mind. "I wanted to work for an exploration and production company. I wanted to work with companies that had the deals, had the assets, and I wanted more international exposure," she said. She found a job with Kuwait Foreign Petroleum Exploration Company and has worked there ever since, now serving as a senior international business analyst. "For me, it was a learning curve to work in an international company," Amin said. "You learn a lot more when it's a diversified field around the world." She works with the business development side of the company to increase Kuwait's oil production and reserves on an international level so that should a disaster ever hit Kuwait's oil reserves again, it won't be as economically devastating for the country.

Amin's work at KUPFEC earned her recognition from Kuwait's oil minister who nominated her to represent the company at the Organization of the Petroleum Exporting Countries' headquarters in Vienna in 2013. She held a post in OPEC for two years as a Kuwaiti diplomat, working as a petroleum industry analyst in the Energy Studies department. "It was amazing being able to present to oil ministers, to actually to get to do your own thing and be a part of the whole publication that OPEC does," she said. "It was probably the most rewarding experience of my career."

Despite her success, there is still a lot of work she would like to do. Amin would eventually like to move back to Vienna to work for the OPEC Fund for International Development and perhaps even build her own company one day. "I like out-of-the-box thinking and having that flexibility," she said. "It is far-fetched, but what is the point in dreaming small?"

written by **Ashley Spurgeon**
interviewed by **Leah Pinkus**

MEET THE ALUMNI ASSOCIATION BOARD OF DIRECTORS

HANNA AUCOIN Denver, Colo.

GRADUATE STUDENT REPRESENTATIVE

Originally from South Carolina, Hanna received her bachelor's degree in chemical engineering with a biomolecular engineering concentration from Clemson University in 2013. She enrolled at Mines in fall 2013 to pursue a PhD in chemical engineering. Hanna's research focuses on making genetically modified cyanobacteria for the sustainable production of complex special chemicals and hydrocarbon precursors used in the production of bioplastic and biofuels. Hanna is also active in student leadership, previously serving as the chemical engineering representative and vice president of the Graduate Student Government. During her term as vice president, she rebranded the annual Mines graduate conference to be the Graduate Research and Discovery Symposium. Hanna now serves as the president of the GSG.

WILLIAM ZISCH '79 Indian Hills, Colo.

VICE PRESIDENT

Bill received a bachelor's degree in mining engineering from Mines in 1979 and a master's degree in business administration from the Wharton School at the University of Pennsylvania in 1996. Bill has more than 35 years of experience in the mining industry, and has been President and CEO of Midway Gold since December 2014. He has been a member of the Nevada Mining Association's Board of Directors and is a past chairman of the Colorado Mining Association.

Find full bios for board members online at minesalumni.com/board. Interested in getting involved with the alumni association? Learn more about the opportunities at minesalumni.com/volunteer.

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MINES ALUMNI CAREER RESOURCES

Mines Alumni Job Center offers opportunities for both job seekers and employers.

AlumniJobs.MinesAlumni.com

Job seekers: Browse jobs in engineering, technology, energy-related industries and more. Post your resume and receive alerts when new jobs match your search criteria.
Employers: Post jobs and gain access to talented Mines alumni.

MinesAlumni.com/Directory

Network with Mines alumni in your city, company, industry and more using our **online directory**.

MinesAlumni.com/CareerResources

Access Mines alumni **resume forwarding** services. Visit our career resources page to join the CSMAA LinkedIn group or get advice on job searching.

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ALUMNA PROFILE

MINES ALUMNA COMES FULL CIRCLE

Denise Dihle '93 started her own engineering firm, 360 Engineering, which was recognized as the Women-Owned Small Business of the Year by the Department of Energy in 2016.

Photo by Anica Wong

From the moment she stepped onto the Mines campus, Denise Dihle '93 felt at home nestled against the mountains in the small community of Golden, Colorado. She always knew she wanted to be an engineer and felt that Mines was the right size with the right attitude. "Everybody was in the same boat, and sometimes it was sinking, and sometimes it wasn't," she said.

Twenty-three years after graduating, Dihle still lives in Golden, running her own engineering firm just a short walk from the Mines campus. She is the founder, owner and president of 360 Engineering, a mechanical consulting engineering firm specializing in heating, ventilation, air conditioning and plumbing for commercial, government and educational buildings.

Yet, Dihle didn't break into entrepreneurship right after graduating from Mines. With a bachelor's degree in mechanical engineering, she worked in the construction industry for a few years before moving to a mechanical contracting firm. She then had the opportunity a couple of years later to work for a consulting engineering firm, where she eventually became a partner.

But after several years, Dihle decided to take a risk and start her own engineering firm. She wanted to "explain highly complicated things in its simplest format to allow owners to make risk decisions based on finances and not need to understand the world of engineering that we deal with." She spends her days managing a staff of eight and catering to her clients' needs. And, it turns out, the education she received at Mines proved to be an asset when starting her own business 14 years ago.

Starting from the ground up was challenging when Dihle first became her own boss. "It takes a lot of phone calls," she said. "It takes a lot of sitting down at meetings, taking [clients] to coffee, going to lunch, all just to get your foot in the door." In addition to the endless relationship-building meetings, Dihle had to learn how to run a company. "There was a lot of learning that had to happen along the way of how to operate a business and making sure you put the right professional people in place to help you," she said.

Mines played an integral role in preparing Dihle to be a business owner. "Mines teaches us how to solve problems," she said.

"[Mines] does really well at making us think really broadly about what a problem is, what the problem statement should be and then how to step through it using your resources."

After years of hard work, Dihle received an email in early March 2016 announcing that 360 Engineering was being recognized as the Woman-Owned Small Business of the Year by the Department of Energy for providing exceptional performance directly contributing to the accomplishment of core DOE mission objectives. Anyone within the Department of Energy may nominate "any business that is woman-owned and providing catering services, representative. services or equipment to the DOE," Dihle explained. "I had no idea we would go that far, and after I got over the initial shock, I called my marketing coordinator and said, 'Read this email; we've got some work to do now.'"

Dihle's goal for 360 Engineering now is to expand, preferably with Mines graduates. "We joke that we just tell kids to roll down the hill," she said, referring to the fact that her office is in Mines' backyard.

But the DOE award is not the only recognition Dihle has received recently. On September 15, 2016, 360 Engineering was recognized by the Colorado Women's Chamber of Commerce as its Small Business of the Year. The Colorado Women's Chamber of Commerce recognizes and honors women in business who significantly contribute to their communities. "It's quite amazing to be singled out here in Colorado with all these great businesses," she said.

Dihle gives a lot of credit to Mines for her persistence and dedication, saying that her alma mater has taught her to keep trying. "You have to keep trying to figure out the problem from a different angle, a different direction, a different approach," she said. "You really just have to keep with it."

by **Leah Pinkus**

WINTER 2017

ON OUR WALL

What is the best advice you received that helped you find success at Mines?

Don't bite off more than you can chew" is the advice I gave myself when I started a master's degree at Mines, after several years in the real world. I bit off way too much as a Mines undergrad and paid the price.

-Richard Chinn '84, MS '95

Show up, sit in the front of the class, pay attention and ask questions when you don't understand.

-Melanie Gipe '81

Do not hesitate to follow up on a job or internship with a phone call. Call once a week, leave a voicemail if you don't get anyone on the phone and don't stop calling until they tell you to stop. Professional persistence proves dedication to a position and company.

-Elijah Thomas '14

Aptitude got you here. Determination will get you to graduation.

-Tiffany Brewster '07

Realize that what you learn at Mines is only 10 percent of what you will need in the job market. While your degree is immensely valuable, particularly from a school as strong as Mines, what you are proving now is your ability to listen and learn, which is priceless. This ethic will help you learn on-the-job skills you need to be successful. Buckle down, grind it out and it will be worth it.

-Christopher Hill '11

Do your homework.

-Brad Piggott '02

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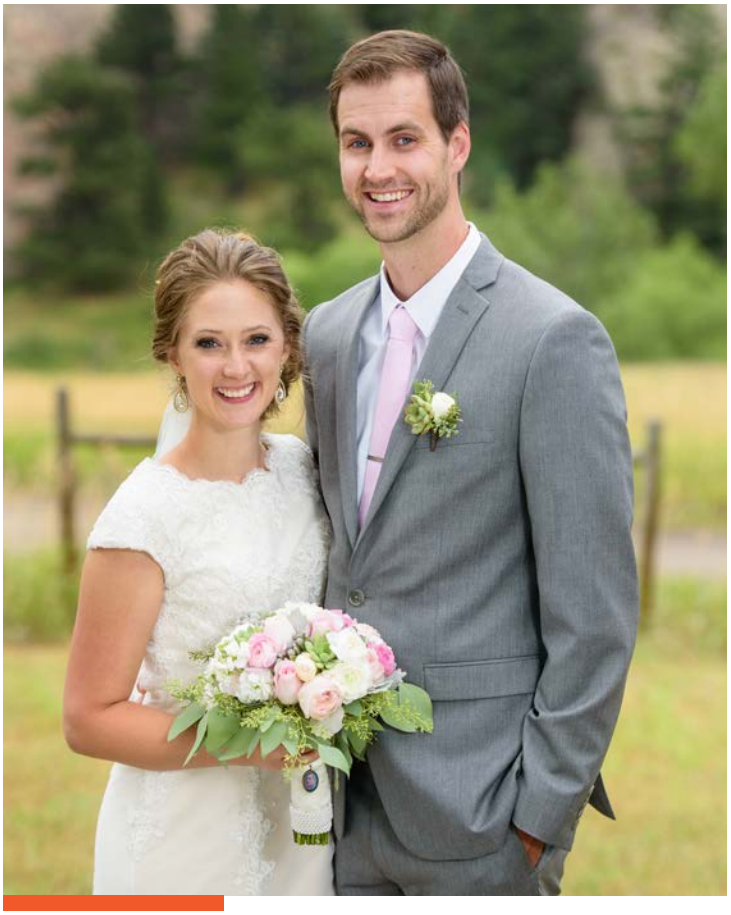
WEDDINGS

THERMODYNAMIC LOVE

Alex Corey '12 and Stephanie Biagiotti '12 were married on Sept. 17, 2016, at Arrowhead Golf Club in Littleton, Colo. Stephanie and Alex met in a thermodynamics class and starting dating after an Alpha Phi and Sigma Alpha Epsilon event in 2010. Many Mines alumni participated in the wedding festivities, including Hunter Dunham '12, Mandy Oanes '12, Johnny Musso '12, Brent Johnson '12, Steve Biagiotti, Jr. '86 and Scott Biagiotti '89, amongst many other members of Alpha Phi and SAE. The couple currently resides in Denver, Colo.



CELEBRATING BIG

Sarah Bisque '10 and Jeffrey "Scott" Clawson '12 were married on Aug. 5, 2016 at the Church of Jesus Christ of Latter-Day Saints in Centennial, Colo. The couple then celebrated with friends and family "Behind the Big Rock" in Blue Mountain, near Golden, Colo. Mines graduates who attended the wedding included Laura Brewster '10, Amanda Johnson '10, Crystal (Mapes) Salyers '10, Steve Bisque '83, Dan Bisque '89, Matt Bisque '90, Ed Ford '79, Scott Tracy '84, Lorae Deister '12, Robbie Deister '11, Dana Morris '12, MS '13, Carrie Eberhard '13, Alex Hamilton '09, August Heffner '11, Emily Cypher '10, Stephen Tracy (current student) and Evan Ford '15, MS '16. Sarah and Scott met during their freshman year at Mines.

LAUGHTER AND LOVE

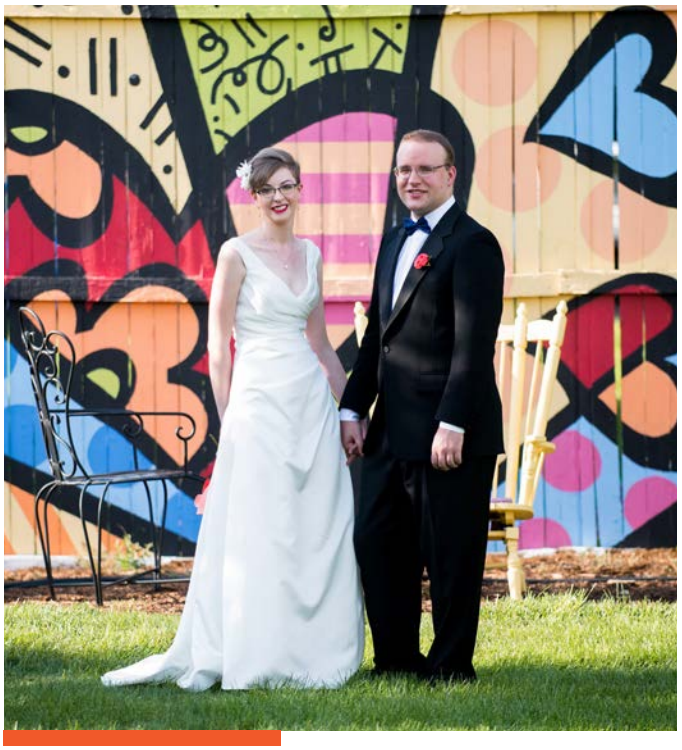
Spencer Wells '15 married Katie Herrera '15 on July 10, 2016 in Evergreen, Colo. The couple met in the civil engineering program at Mines. Mines alumni in the wedding party were Schuyler Wells '11, Michelle Danaher '15 and Evan Manning '15. Other Mines alumni in attendance included Becca Boggan '15, MS '15, Melody Clay '15, Peter Eisinger '15, Kapri (McMillan) Eisinger '15, Kyle Hampton '15, MS '16, Taylor Madden '15, Zach Nahman '15, Brett Mahon '15, Elliot Makuh '10 and Michael Werner '15.

A BLOSSOMED ROMANCE

Emily Schroeder '15 and Joshua Brown '14 were married on June 4, 2016, in Evergreen, Colo. The couple met as students at Mines at the Christian Challenge in fall 2012. Joshua proposed on Nov. 27, 2015, at the Denver Botanical Gardens' "Blossom of Lights." Several Mines students and alumni attended the wedding, including April Snively '15, Cheyenne Witherell '15 and Ryan Lowe '15.

HEADING INTO THE FUTURE TOGETHER

Amy Mapes '14 married Dan Deveraux '15 on Aug. 13, 2016, in Estes Park, Colo. Amy and Dan met as students at Mines when they were assigned to the same group for a project. Mines alumni serving in the wedding party included Mallory Wick '14 (bridesmaid) and Lexi (Salazar) Webster '14 (bridesmaid).



HEARTS FULL OF LOVE

Jen Allen '14 married Ben Goertz '12 on Aug. 7, 2016, in Colorado. Jen and Ben met as students at Mines, and Ben has decided to continue his studies at Mines as a graduate student. Mines alumni in the wedding party included Chris Loew '12, David Castro '12, Sean Gaudio '14, Charlotte Adams '14 and Madeline Tarasar '14.

BABIES

A GROWING OREDIGGER FAMILY

Phil Lawlor '07 and Erica (Pribble) Lawlor '08 are thrilled to announce the arrival of their son Murray Lawrence. Murray made his debut on March 15, 2016, and can't wait to wrestle with his big brother, Penn.

A NEW ADDITION

Xinwei (Michelle) Luo '02, MS '04 and Daniel Flaherty '01, MS '03 welcomed their first son, James Patrick Flaherty, on July 5, 2016. The family currently lives in Berkeley, Calif.

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In Other

NEWS

COMMUNITY SERVICE AWARD

Lauren Evans '82 was honored with a 2016 Community Service Award from the American Council of Engineering Companies during the National Fall Conference held Oct. 19–22, in Colorado Springs, Colo. She was recognized for outstanding contributions to the quality of life in her community, particularly her work fostering a company culture that promotes engaging with and serving others.

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

NEW MEMBER OF THE NATIONAL ACADEMY OF CONSTRUCTION

The National Academy of Construction inducted Bruce Grewcock '76 into it 2016 class on Oct. 20, 2016. As one of thirty new members, Bruce represents the best of those who have distinguished themselves through stellar careers and contributions to the engineering and construction industry. Election to the Academy allows members to volunteer their expertise to a variety of organizations for the betterment of the industry as a whole. Bruce is pictured here with NAC president Hugh Rice.

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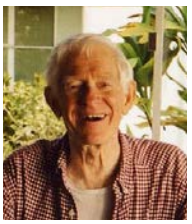
IN MEMORIAM

"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

PAUL A. BOLLHEIMER '51 died July 13, 2016, in Houston, Texas. He was born in 1919 and received a degree in geophysical engineering from Mines in 1951. Prior to enrolling at Mines, he enlisted in the U.S. Marine Corps in January 1942, serving until 1947. In his professional career, Paul played significant roles in the discovery of three supergiant oil fields in Alaska, Libya and Venezuela.

SAMUEL R. BOYLE JR. '52 died Sept. 23, 2016. Born in 1928, Samuel attended high school in Chicago, Ill., but came back to Colorado for college. He received a degree in geological engineering from Mines in 1952. As a student at Mines, he was a member of the Beta Theta Pi fraternity. After graduation, Samuel began his career working on a geologic survey team in the central plains. Then, after returning to his hometown of Sedalia, Colo., he worked for Looney-Bloess Lumber Company and Hermann Lumber Company until his retirement.



HOWARD F. DEKALB '56 died July 19, 2015, in Hilo, Hawaii. Howard was born in Barranquilla, Colombia, but grew up in Fairfield, Iowa, graduating from Parsons College after serving for a year in the U.S. Navy. He earned a petroleum engineering degree from Mines in 1956. Howard spent much of his life living abroad, working as a history and math teacher before building a career as a petroleum engineer. He worked for companies such as Stanvac, Esso and Exxon. After retiring, he published the book, The Twisted Earth, as well as various related articles describing theories about plate tectonics.

RAYMOND B. FRANKLIN '49 died Jan. 11, 2015. He was born in Cascilla, Miss., in 1924. Raymond was granted appointment to the Naval Academy at Annapolis but a spot on his lung prevented his enrollment. He eventually enlisted in the Marines, serving in the Pacific Theater. After the war, he moved to Oxford, Miss., where he attended the University of Mississippi. Raymond eventually transferred to Mines, where he completed his undergraduate studies in 1949 with a degree in geological engineering. He started his career as a division geologist in Shreveport, La., for Texaco, eventually becoming a chief geologist and general manager. He retired to Melbourne, Fla., in 1986.

HUNG-LIANG "LYNN" LIN MS '75, PhD '81 died Feb. 6, 2016, at his home in Lincoln, R.I. Born in Taiwan, Lynn settled in the United States in 1972. He pursued graduate studies at Mines, obtaining his master's degree in engineering physics in 1974 and doctorates in geophysics and engineering physics in 1980. Lynn was an engineer and a consultant for several technology companies throughout his career and was also a part-time electronics lecturer at Tulsa Junior College. He was the founder and co-owner of Photonic Marketing Corporation in Lincoln, R.I., and successfully grew the company from 1988 until his retirement in 2005. Steve Lin '00, the eldest of Lynn's three children, also attended Mines.

EDWARD P. "ED" MILKER '71 died May 17, 2016. Ed earned a bachelor's degree in mathematics from Mines in 1971 and a master's in statistics from Colorado State University in 1973. From 1973 through 1993, he was an employee of Mountain Bell and its successor, U.S. West. During the breakup of the Bell Telephone nationwide monopoly in the 1980s, Ed played a critical role in the establishment and acceptance of new rate structures, testifying before the U.S. Congress on several occasions. He also worked for AT&T and IT&T, traveling around the world locating and evaluating investment opportunities. From 1993 until his death, Ed worked as a teacher and independent consultant in econometrics and strategic investment.

GEORGE H. OLSON '66 died May 7, 2016. George was born in 1944 in Colorado Springs, Colo., and graduated from Mines in 1966 with a degree in geological engineering. As a student at Mines, he was on the wrestling team. He continued his educated by earning a master's of science in 1970. He worked as a geologist for the span of his career. George was also a youth mentor and coached girls' soccer in Midland, Texas.

ROBERT D. TURLEY '52 died Nov. 13, 2016. Robert earned a degree in geological engineering from Mines in 1952. As a student, he was on the boxing team and never lost a match. He was also a member of the Kappa Sigma fraternity. Robert spent his career working as a geological consultant, enabling him to travel to four continents. He retired in 2003.

W. LLOYD WRIGHT died Sept. 16, 2016, in Paonia, Colo. Born in 1917, in Sargent, Colo., Lloyd graduated from the University of Colorado School of Medicine in 1942 and went on to serve in World War II. He then served as Mines' school physician until 1968 while also establishing his own medical practice. Lloyd was awarded the Mines Medal in 1986 for his personal and professional contributions to the campus community. In September 2012, Mines celebrated the opening of the W. Lloyd Wright Student Wellness Center on campus.

ALSO REMEMBERED

John A. Beacham '58	January 9, 2016
Jeffery C. Bond Sr. '71	May 4, 2016
Richard L. Brustkern '59	September 18, 2015
Robert H. Chaisson '52	June 3, 2016
David A. DeCamp '52	August 16, 2016
Gerard J. Demaison MS '55	August 10, 2015
Jack D. Duren '48	July 20, 2015
Pamela K. Eckhardt-Appelhans '85	February 12, 2016
Robert B. Elder MS '80	February 25, 2016
Martin J. Garrity Jr. '51	July 7, 2013
George A. Golson '42	May 18, 2013
Donald Grybeck '69	August 24, 2012
Mark E. Hays '71	February 24, 2016
James A. Heist '69	January 24, 2016
Robert N. Hendry '50	March 5, 2016
E. Eric Hopper '49, MS '53	October 12, 2015
Alan E. McGlauchlin '61	January 3, 2016
T. Kenneth Miyoshi '65	January 31, 2016
David A. Rice PhD '69	May 27, 2016
Charles A. Royce '62	March 20, 2016
Raymond L. Ruehle '52	October 6, 2011
Sarah L. Schillereff '97	December 31, 2015
Bryce Stobb '00	March 4, 2016
Larry E. Urban '65	March 19, 2016
John S. Vanderpool '55	May 4, 2016

compiled and written by **Ashley Spurgeon**

To submit an obituary for publication in the magazine, visit **minesalumni.com/obituaries**.

Memorial gifts to the Colorado School of Mines Foundation are a meaningful way to honor the legacy of friends and colleagues while communicating your support to survivors. For more information, contact **Christina Dillinger (303-273-3213 or cdilling@mines.edu)** or visit **giving.mines.edu/givingguide**.

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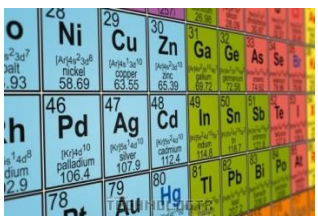

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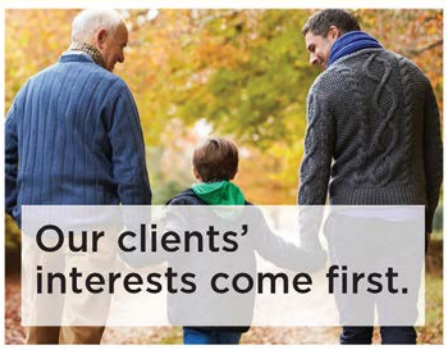

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MINER'S PIC

Photo by Ronald Kem

PAINTING WITH LIGHT

"Light and colors have always fascinated me since I started photography four years ago," said Mines student Ronald Kem, (economics and business, Class of 2018). Recently, he has been experimenting with new techniques to create interesting images, such as light painting using a pixelstick. The tool is a six-foot-long metal device that houses 198 LED lights and can be programmed to change into a wide range of different colors that seamlessly paint images, designs and animation on long exposure photos.

This photo was shot on the bridge over Clear Creek in Golden, Colorado. With the help of his friend and fellow Mines student Brendan Pattison, Kem shot the photo for fifteen seconds with Brendan moving across the bridge while motioning the device as if he were kayaking. The movement, mixed with a program that gradually transitioned through different colors, resulted in a traveling, circular-patterned rainbow. "I saw this device, and I knew that I would be able to use it to create some amazing pictures with friends," Kem said. "There are endless possibilities to being creative with a camera and some lights."

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Soon-to-be Mines alumni, Trinity Wilson and Chase Li.

Photo by Agata Bogucka