

Braking I-70's slow slide

5 best student jobs

UFC heavyweight alumnus

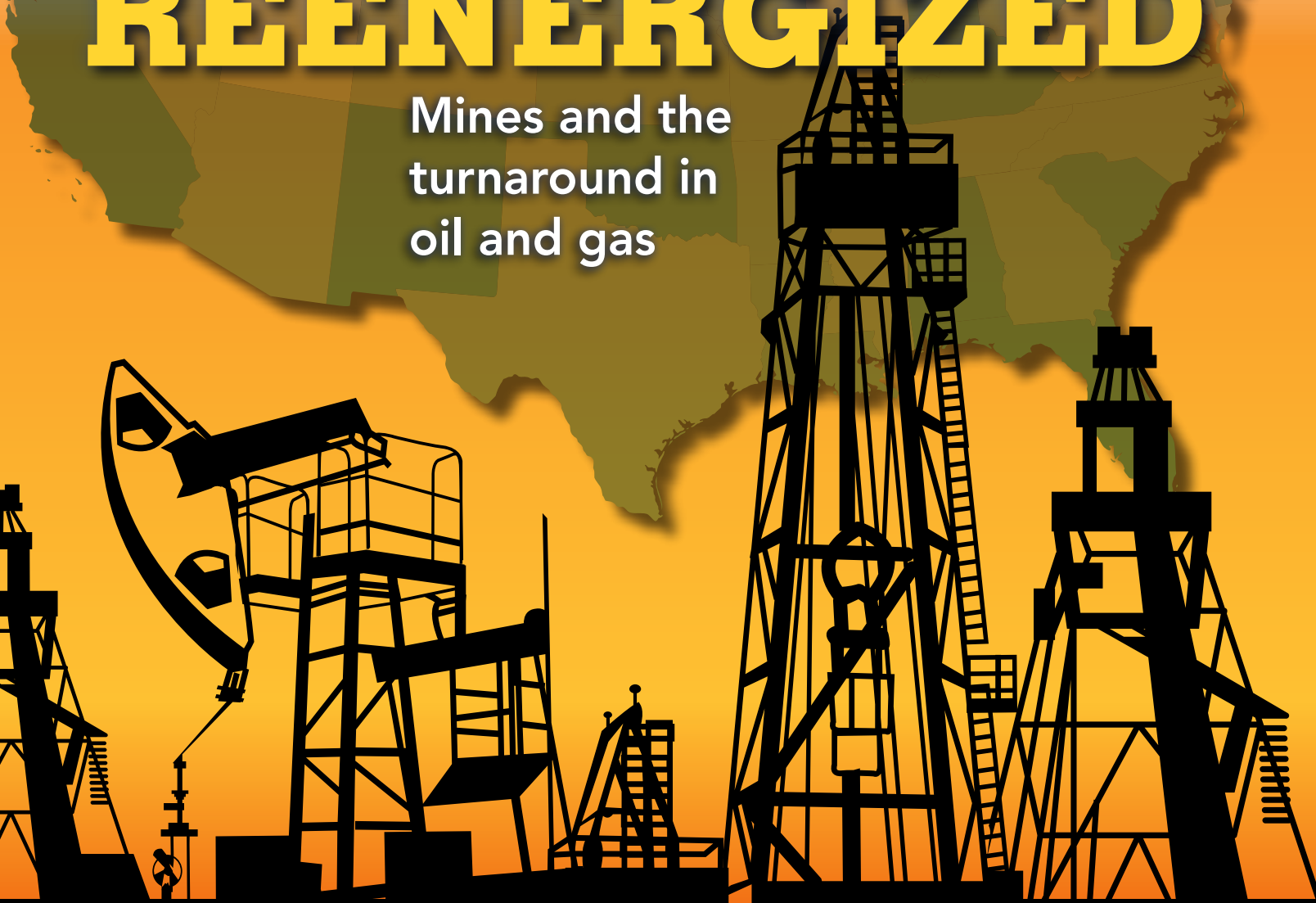
Spring 2013 Volume 103 Number 1

# Mines

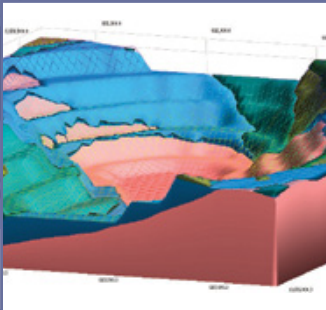
Colorado School of Mines Magazine

## AMERICA REENERGIIZED

Mines and the  
turnaround in  
oil and gas



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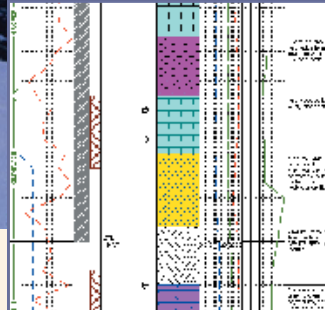


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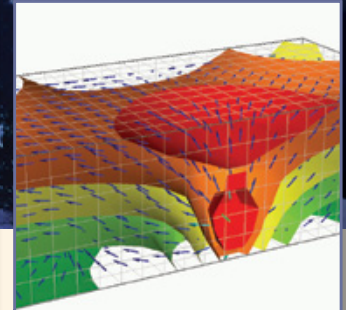


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## FEATURES

### 18 The Best Gigs on Campus

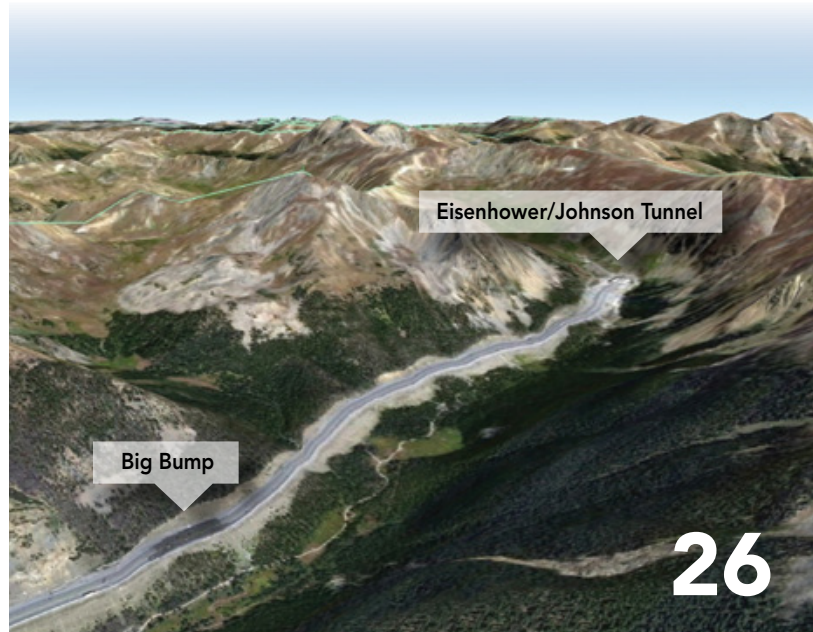
Working your way through college doesn't have to be a grind. Our informal survey of the best jobs on campus turned up quite a few students who love their work.

### 22 Earning Energy Independence

By the end of the decade, the United States could become the world's largest oil producer and by 2035, a net energy exporter. How has Mines contributed to this surprising turnaround?

### 26 Braking I-70's Slow Slide

Inch by inch, a stretch of highway near the Eisenhower Tunnel is sliding downhill. In search of a viable solution, CDOT turned to one of the world's top slope-stability experts, Mines Professor Ning Lu.



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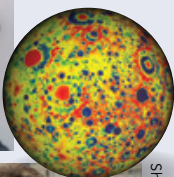
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## WEB EXTRAS | MULTIMEDIA minesmagazine.com



Shannon Teagart / NPR

**Tough Talk** "Conflict or Opportunity: Exploring the Art of Difficult Conversations," President's Diversity Breakfast

**George Saunders '81 Media Blitz** Charlie Rose, The Colbert Report, The New York Times, and more

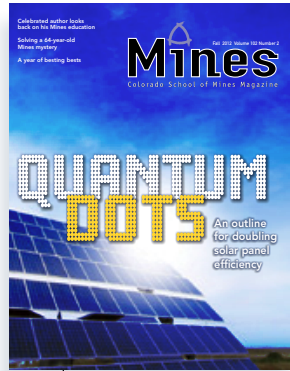
**Stories from the Syrian Frontline** NPR's Deborah Amos speaks on campus

**World War II Remembrances** By Bronze Star Medal recipient and long-time miner John Sullivan '38

**Lunar Landscape** Gravitational map of moon reveals its violent past

Icons indicate additional online content

- Video
- Photos
- Text
- Audio



## QUANTUM DOTS

I really enjoyed the cover story on quantum dots as they relate to breakthroughs in solar panels. It's like getting an issue of Scientific American that relates to research being done at my old school. My only comment is, more articles like this, please! I'm sure Mines has enough going on to fill a much larger magazine. The level of detail—given your audience—could be increased, though leaving it as-is makes this easy reading for a plane ride.

**Steve Schow '07**

Enjoyed the article on quantum dots. Very promising bench results. Also liked the news of new departments reflecting the diverse areas of research at Mines.

**Jay Gallagher MS '79**

Nice work on this edition, especially the article on Mark Lusk's solar research. You made a highly technical topic much more accessible.

**Jon A. Leydens, associate professor  
Division of Liberal Arts and  
International Studies  
Colorado School of Mines**

## UNFORTUNATE OMISSION

I enjoyed "Exploring Human Landscapes" [fall 2012], but in the photo on p. 25 you show and mention Bill Clinton and Saunders. You fail to mention the great Nelson Mandela. I worked on the extremely deep gold mines of South Africa from 1983 until 1995, and saw Mandela released from prison and eventually democratically elected as South Africa's president. He surely deserves to be recognized in this photo?

**John D. Applegate (Dan) '83**

*Ed.: He certainly does, and we deeply regret that we failed to include his name. We thought he was so recognizable that we didn't need to name him, but of course we should have. Thanks for*

*pointing out this oversight and sharing your own experience.*

## PRIDE AND REMONSTRATION

After reading the story about the bell [fall 2012 issue] and seeing my uncle in Editor's Take, we found a couple more photos from the past. My dad and his two brothers were involved in the bell heist and engraving. We were told the story and passed it on to our kids when they visited the CU museum with their elementary school. When the school tour came to the bell, my wife would pull the child aside and tell their grandfather's story of how the M was carved into the CU bell—the smile of pride they had for their grandfather that day!

We also told them that times have changed and today they would be arrested (if caught). With a son now at Mines, we will see if the message stuck.

**Name withheld**

*Ed.: Turn to Miner's Pic, p. 50, for photos of the CU bell being engraved the night it was returned to campus.*

## SKIER SAFETY ENGINEERS

In the obituary for Donald Larson in the fall 2012 edition, it was such a pleasure to see that he had won the Robert Lesage award from the Rocky Mountain Lift Association in 2008. I know a little bit about Robert Lesage because he was my father, and also a Mines graduate with an EM degree in 1948.

As was learned in 1976 with the Vail Gondola accident, safety can never be assumed and is never an accident. The ski industry is a critical economic engine for Colorado. The RMLA is a critical and unsung hero that ensures the skiers' safety on their way up the mountain. Engineers from Mines, let alone any other engineering college, do not typically find their way

into the ski lift industry and ski lift engineering. These two truly were engineers of a thousand years.

**William Lesage '79**

*Ed.: After reading William Lesage's email, we were curious to learn a little more about his father. Read what we found at minesmagazine.com/lesage.*

## REACHING OUT

I loved [the fall 2012 issue]. Great magazine. I always give them to kids in the neighborhood who have an interest in going to Mines.

**Douglas Carlson '84**

You are doing a great job with *Mines* magazine. Keep up the good work! I guess that I am old-fashioned, but the electronic copy is not the same as holding the paper copy, regardless of how often I try. Maybe some day I will get an iPad and that will work. In the meantime, please keep the paper copy coming.

**Jim Holley '64**

*Ed.: Almost everything we print in the magazine is available at minesmagazine.com; however, so long as we have the demand and revenue for the print edition, we'll continue producing it. (Yup, that was an oblique reminder of the importance of CSMAA membership. Thanks for keeping the presses rolling!)*

As usual, the issue is outstanding—just amazing how you top yourself each quarter. Keep it up ... for all of us.

**Harry J. Briscoe '71, MS '72**

Really enjoyed your article on the theft of the bell from CU.

**Fred Fraikor**

Not only did I read the magazine, I thoroughly enjoyed ALL of it. Thank you for your hard work.

**Jim Larsen '65**



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# EDITOR'S TAKE

## STAY CONNECTED. KEEP IN TOUCH.



I had a very different Editor's Take in mind until the day before we went to press. That was when my boss and friend, Anita Pariseau, came into my office at the end of the day to say she'd taken a position at Colorado College and would be leaving in a few weeks.

I'm happy for her: After nine years at Mines, she's excited about the new challenge, and the position sounds like an ideal fit for her skills and experience. However, saying goodbye to a colleague is never easy, and she will be sincerely missed.

Anita is the best kind of leader. In six years, I can't recall a single time she's told me what to do, yet I can't count the number of times I've gone to her to discuss a knotty problem or issue, and left with a solution.

My colleagues report much the same. By giving us all the latitude to create and innovate, she's encouraged us to take ownership in our work, nurturing our development as professionals and growing CSMAA at the same time.

A strong alumni association is a powerful partner to any university, and her legacy will be felt for years. Today, CSMAA is at once warm and service-oriented, yet administratively lean and efficient. Alumni have more opportunities than ever to engage with the school, and network in person and online with each other; staff provide a steady stream of news and information to the community; CSMAA offers a wide range of programs and services to alumni and campus; and *Mines* magazine is more widely read and appreciated than ever.

Anita also leaves CSMAA well situated for the transition. Serena Bruzgo, who will serve as interim executive director during the search, has worked for CSMAA for seven years, the last two as deputy director. She's extremely competent, knows the organization intimately, and has earned the trust of the staff and board of directors.

It was Anita who brought us the tagline displayed on our website: "Stay connected. Keep in touch. Get involved. Give back." After giving so much of her time and energy for the last nine years, I, for one, won't be asking her to remain involved and give back. However, those of us who have been privileged to work alongside her will make sure she stays connected and keeps in touch.

Thank you, Anita, for your leadership, your counsel, and your friendship.

### Nick Sutcliffe

Editor and Director of Communications  
Colorado School of Mines Alumni Association

P.S. Once you've read the issue, check out the Web Extras at [minesmagazine.com](http://minesmagazine.com). After publishing the profile of George Saunders '81 in our last issue, he's experienced a media blitz. Our doing? Well... the effusive New York Times Magazine article, "George Saunders Has Written the Best Book You'll Read This Year," might have made the bigger splash.



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President, Colorado School of Mines  
M.W. "Bill" Scoggins

President, CSM Alumni Association  
Paul Wareham '85

Executive Director  
CSM Alumni Association  
Anita Pariseau

Editor and Director of Communications  
CSM Alumni Association  
Nick Sutcliffe

Managing Editor and  
Assistant Director of Communications  
CSM Alumni Association  
Amie Chitwood

Art Director  
Craig Korn, VeggieGraphics

Editorial Board  
Amie Chitwood, Tina Gianquitto, Karen Gilbert,  
Peter Han, Trisha Bentz Kendall, Anita Pariseau,  
John Poate, Matt Showalter '99, Nick Sutcliffe

Contributing Writers  
Robert Benchley, Colin Bonnicksen, Larry  
Borowsky, Anna Gerber, Lisa Marshall, David  
Tauchen

Copy Editor  
Trisha Bentz Kendall

Administrative Support  
Heidi Boersma, Jo Marie Reeves, Nancy Webb

Student Intern  
William Weiskopf

Printing  
American Web  
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Comments and suggestions are welcome. Contact us at [magazine@mines.edu](mailto:magazine@mines.edu); *Mines* magazine, PO Box 1410, Golden, CO 80402; or 303.273.3294. Just need to update your address? Go to [minesalumni.com/update](http://minesalumni.com/update).

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## MIDYEAR DEGREE CONVOCATION

# Parting Advice: "Big Things Come from Bold Approaches"

Almost 45 years after graduating with a professional degree in physics from Mines, Joe Gray '68 returned to campus on December 14, 2012, as guest speaker for Midyear Degree Convocation in Lockridge Arena. A world-renowned leader in cancer research who currently holds an endowed chair at Oregon Health and Science University, Gray began by saying that if his experience at Mines was any guide, then the assembled graduates had accomplished something remarkable.

His predictions for their careers in the decades ahead included reference to the past: His own graduation, he said, came a year before the United States put a man on the moon, at a time when a 4-kilobyte core processor was a technological marvel. We've seen astronomical growth in raw computational capacity since then, Gray pointed out, but great changes lie ahead. "Capabilities in information management and processing are fundamentally changing the fabric of society." Speaking of issues like disease management, climate change and energy supply, he said, "You are going to be able to approach



Photos: Jolesch Photography

President Bill Scoggins, Joe Gray and Richard Truly all participated in December's Midyear Convocation in December.

the engineering challenges of your generation at scales and at levels of detail not previously imaginable."

Achieving this will involve harnessing the intellectual power of colleagues worldwide, he said. "So long as free worldwide information exchange can be maintained, you'll just need to figure out how to sift through the enormous worldwide noise to find the useful

signals to guide your work."

He concluded with three recommendations: "Embrace intellectual diversity. Using knowledge in one domain to solve problems in another is something that has served me well," said Gray, whose accomplishments in cancer research came with no formal education in the biosciences.

Secondly, "Expose your own ignorance to people who possess the knowledge you need ... It is difficult to learn if you don't let your potential teachers know what you don't know."

And lastly, "Have the courage to attempt things that others think impossible ... Big things come from bold approaches."

—Nick Sutcliffe



### DEGREE BREAKDOWN

Bachelor's: 177

Master's: 191\*

Doctoral: 43

\*MS>BS—that's unusual!

For more on Joe Gray's research, read the spring 2010 article, "Cracking Cancer's Code," at [minesmagazine.com](http://minesmagazine.com). There, under Web Extras, you can also find an update on his move to Oregon State University and the role Nike founder Phil Knight played in getting him there.



## MUSIC AND ART

# Mines Musicians Perform at the Vatican

The chance to perform in the Vatican's St. Peter's Basilica—the world's largest church and, acoustically, one of the most remarkable—would be a far-fetched dream for many musicians, but for 21 members of the Mines community, it's one they realized last October when they performed during a Saturday evening mass.

The opportunity came by way of Mines Music Director Bob Klimek, a composer of Catholic music who managed to turn his own personal invitation from the Vatican into a rare travel experience for the group, which included 14 students, three faculty members and four alumni.

In addition to exploring the region's musical and artistic heritage, their itinerary emphasized science, engineering and art, as they explored Roman ruins and the works of Leonardo da Vinci, the father of modern science.

It became "a chance to explore the relationship between art, music and engineering," says Klimek. Besides the Vatican, they visited the workshop of Marco Salerno, an internationally known Renaissance and Baroque instrument maker in the hills outside Rome. Surrounded by raw wood, lacquers, parchment and glues—the very same tools used to make these instruments for centuries—students carved a Baroque fiddle.

They also attended a conservatory-style master class with the famed Italian musician Alessandro Buccarella, who remarked that the engineering mindset lends itself well to the interpretation and shaping of music. Their class culminated



Courtesy of Bob Klimek

Mines alumni, faculty and students traveled to Rome in the fall with Mines Music Director Bob Klimek, performing in St. Peter's Basilica and, here, at San Paolo alla Regola.

in a performance at the 13th century church of San Paolo alla Regola.

"As a musician, the experience was unparalleled," says graduate student Joseph Capriotti '12. Klimek is hoping to organize a similar trip in spring 2014, which will also be open to alumni.

—David Tauchen

## ACADEMIC OPPORTUNITIES

# \$5M Gift Boosts Underground Construction and Tunneling Program

A 1976 alumnus has contributed \$5 million anonymously to Colorado School of Mines to support the university's Underground Construction and Tunneling Program and to provide scholarships for undergraduate students. A total of \$3.5 million will go to faculty support, \$1 million will be used for startup, and \$500,000 for undergraduate scholarships.

In 2011, the university established the Center for Underground Construction and Tunneling as an interdisciplinary program, principally between the departments of mining engineering, geology and geological engineering, and civil and environmental engineering. Academic programs and research within the center provide student training and education related to site characterization; design and construction of underground infrastructures, including water, highway or subway tunnels; and subsurface facili-



Last spring, the Center for Underground Construction and Tunneling sponsored 16 engineering students as they traveled to New York City to learn about the industry.

ties beneath major metropolitan cities.

"The underground construction and tunneling industry relies on a highly skilled engineering workforce and technical innovation that is only possible through interdisciplinary research and education," says Mike Mooney, professor in the Department of Civil and Environmental Engineering and acting director of the center, explaining that the challenges of underground construction are getting increasingly complex.

The gift will enable the center to diversify its educational opportunities, which currently include industry-driven research,

field trips, technical conferences and internships with industry professionals. Along with the undergraduate minor and "area of specialization" offered at the moment, a graduate degree program is now under development.

—Anna Gerber

Photo courtesy of the Center for Underground Construction and Tunneling



David Tauchen

Students demonstrate a bicycle modified to generate electricity. The device will be used for K-12 classroom outreach.

### UNCONVENTIONAL TEACHING

## Renewable Energy Lessons from the Real World

If the real world can be the best classroom, then it's probably a good idea to get away from school every now and then.

That's precisely the idea behind an assignment in Chuck Stone's course, Renewable Energy, in which students design their own field trips to companies or organizations involved in renewable energy or sustainability and outline their experience in a report.

"It was wide open," said Stone, a teaching professor in the Physics Department, surrounded by students showing off their posters and reports during the "Forum on Renewable Energy" at Mines on December 6, 2012. "If I had told them what to do, we wouldn't have this depth and breadth of projects here. I was incredibly impressed with the variety and creativity."

The field trips took students from solar companies to train stations and even elementary schools.

Senior Katherine Bony contacted engineers at Wheat Ridge-based Major Geothermal to discover how engineers at the company access heat energy from below the earth's surface.

"I learned all about the different types of geothermal [systems]. I originally thought there was only vertical, but there's horizontal, too. It all depends on the thermal conductivity of the ground," says Bony. Her experience also led to an internship opportunity with the company.

Senior Kristen Heiden reported on her experience with civil engineers working on LEED certification for the Union Station redevelopment project in Denver. "Union Station has a big waste management system," says Heiden, explaining that in addition to recycling, they look for ways to use waste material for construction.

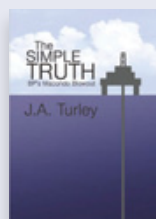
Heiden also learned how lighting, ventilation systems and gardens can be incorporated to use less energy and enhance public space. "It's a glimpse at what we can look forward to as engineers when we're actually designing things," she says.

Stone's Renewable Energy class is part of the energy minor at Mines.

—David Tauchen

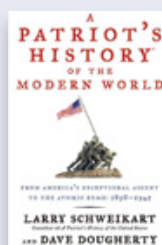
### BOOKS

## Just Published



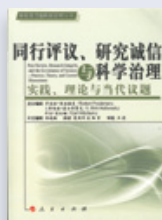
### The Simple Truth: BP's Macondo Blowout

John Turley '65, petroleum engineering graduate, offshore-drilling expert, and ocean engineer, describes his book as a "facts-based nonfiction novel." The 350-page book takes readers aboard Transocean's Deepwater Horizon drilling rig, dramatizing the drilling of the 3.5-mile-deep exploration well, and documenting the operating and engineering decisions that led up to the catastrophe. (The Brier Patch, LLC, 2012)



### A Patriot's History of the Modern World: From America's Exceptional Ascent to the Atomic Bomb: 1898-1945

Dave Dougherty '61 co-wrote this historical work with author Larry Schweikart, presenting a conservative perspective on America's rise to undisputed dominance over the nearly 50-year span from the Spanish-American war to the end of World War II. They argue that the United States drove improved living standards, accelerated innovation, guaranteed liberties, and created new opportunities on its ascent to superpower status, eventually defining a new ideal for the world. (Sentinel HC, 2012)



### Peer Review, Research Integrity, and the Governance of Science—Practice, Theory, and Current Discussions

Carl Mitcham, a professor in the Division of Liberal Arts & International Studies at Mines, co-edited this Chinese-English book, which provides an analysis of general ethical and policy issues related to the theory and practice of peer review. The book was published in conjunction with an international workshop of the same themes co-organized by Mitcham at Dalian University of Technology in China, May 21-23, 2012. Both projects were supported in part by Mines' Hennebach Program in the Humanities, of which Mitcham is the director. (Renmin Press, 2012)

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FACULTY SPOTLIGHT

# Taking Work Home

Farmer-scholars were common enough in the days of Thomas Jefferson, who proudly described himself as a “gentleman farmer,” but that is no longer the case. Today, the life of a university professor is generally far removed from that of a modern farmer.

Not so for Tom Davis PhD '74, a professor of geophysics at Mines, who keeps a foot in both these worlds.

Since beginning his academic career at Mines four decades ago, he's returned almost every summer to Saskatchewan to help run the family farm, a 2,400-acre spread that includes lands his father, Len Davis, started farming in 1946. These days, Tom and his wife, Pat, get plenty of help from their three sons, and some from their six grandchildren. Even Len, aged 94, spent several days last August running the combine harvester.

On campus, Davis is co-director of the Reservoir Characterization Project, an independently sponsored research consortium whose mission is to develop and apply advanced seismology and associated technologies to characterize complex oil and gas reservoirs.

“Historically, oil has been extracted using vertical drilling and vertical wells,” says Davis. “As we have sought to increase production, we have learned a lot about fractured reservoirs. The challenge is finding the fractures, and that's where RCP comes in. We look for the so-called ‘sweet spots’ where natural fractures occur.” The industry is now able to drill into those sweet spots with horizontal wells and, using multi-stage



For three decades, geophysics Prof. Tom Davis has divided his time between campus and his family's farm in Saskatchewan. Taken in his office, this photo includes a model of the earliest known seismoscope that was developed in China in 132 A.D.

hydraulic fracturing, connect wells with natural fractures.

Established by Davis in the mid-1980s, RCP has been bringing industry together to collaborate on research for almost 30 years. Working closely with his co-director, Bob Benson '76, MS '84, PhD '97, who joined RCP in 1987, the consortium has steadily grown in stature and size. Over the last 10 years, they've received a total of about \$20 million in funding

from an expanding circle of private sponsors—currently 40, up from 25 in 2003.

Joining the consortium gives member

companies access to RCP's diverse research, including reservoir modeling, simulation, and 3D and 4D visualization, much of which draws on RCP's seismic datasets, claimed to be the most comprehensive in the world.

Davis is proud of the services they offer industry; he's also proud of the opportunities they offer students. “The

research enables students to get their hands dirty in the oil fields, analyze the data and present at conferences,” he says.

After announcing plans to retire in 2015, Davis says he's looking forward to spending more time on the farm. And perhaps by then oil will have been discovered on the property, which sits squarely on top of the oil-bearing Bakken Formation. The first wells will be drilled this summer.

In the years ahead, he anticipates continuing to help Mines and RCP, devoting time to research and consulting, and continuing to serve on the board of Geospace Technologies, a manufacturer of specialized seismic equipment for the oil and gas industry.

If they do strike oil, will the family continue to farm? “Absolutely,” says Davis, who jokes that they have no plans (or inclination) to pack up and move to Beverly Hills.

So Davis has plenty of changes in store, but one thing will remain the same: He'll continue to divide his time between subsurface exploration and farming. These worlds are just moving closer together.

“The challenge is finding the fractures, and that's where RCP comes in.”



**DID ARTHUR LAKES DISCOVER T-REX?** Arthur Lakes' role in the discovery of the first T-Rex fragments near Morrison, Colo., in 1874 is captured in a recently released 60-minute documentary titled, “Arthur Lakes: Discovering Dinosaurs.” The documentary includes reenactments and an interview with Bruce Geller, director of the Mines Geology Museum, who describes Lakes as the originator of the museum. Lakes taught geology, drawing and writing at Mines from 1876 until 1893. DVDs are available for \$19.95 at the Geology Museum and the Dinosaur Ridge gift shops ([dinoridge.org](http://dinoridge.org)).



Watch an excerpt from the documentary at [minesmagazine.com](http://minesmagazine.com) under Web Extras.

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**ATHLETICS**

**Orediggers No. 1 in Learfield**

In the final fall edition of the NCAA Division II Learfield Sports Director's Cup standings, Colorado School of Mines ranked No. 1. The Orediggers finished second in men's cross country, fifth in women's soccer, eighth in women's cross country and 17th in both men's soccer and women's volleyball.

**CROSS COUNTRY.** Men took a top-five finish at the NCAA Division II National Championships for a fourth straight year, with a program-best second place showing and five USTFCCCA All-Americans. The women took eighth for their third top-10 finish since 2003.

**WOMEN'S SOCCER.** The women's squad captured its second consecutive RMAC Tournament Championships and advanced to the NCAA Division II Championship quarterfinals for the third time in four seasons. The Orediggers achieved a 14-game unbeaten streak—a new school record—concluding the year 18-4-2 overall.



Mines Sports Information

Megan Woodworth

**MEN'S SOCCER.** The team upset NSCAA No. 1 and previously unbeaten Regis for its second RMAC Tournament Championship in three years. The RMAC regular season runners-up also advanced to the NCAA Division II National Championship tournament for the fourth time in program history, finishing the season 14-5-2 overall.

**VOLLEYBALL.** Mines posted a program-best 26-7 record in 2012 en route to the program's first-ever RMAC Championship. After advancing to the NCAA Tournament for the fourth consecutive year, they ended the season with a school-best No. 12 national ranking. Head coach Jamie Skadeland was named the RMAC and Region Coach

of the Year, while Jackie Stabell and Melanie Wannamaker both earned All-American honors.

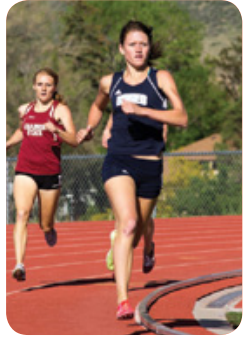
—Colin Bonnicksen

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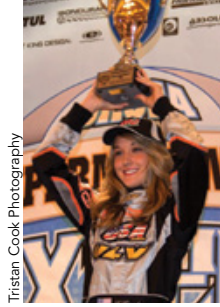
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## INSIDEMINES

### STUDENT Q&A

## Girl Power Propels Motorsports Champion



Tristan Cook Photography

Navigating her first year at Mines and keeping up with a rigorous kart-racing schedule, Sabré Cook must work hard to stay ahead in these two predominantly male arenas. The freshman studying mechanical engineering has been behind a wheel since her dad first drove her around a racing track in his lap shortly after she learned to walk. Her first major victory came in 2007 with a TAG World Championship win, and last November she became the first-ever woman to win a Superkarts USA national title. After learning about Cook and her accomplishments, we got in touch, wanting to know more.

**What captured your interest in engineering?** I really got interested in engineering—particularly mechanical—by growing up around motorsports. I enjoy the basics of how things move and work in a system. I also had a great engineering class in high school.

**How was your first semester at Mines?** It's been challenging, because it's hard being away from home and balancing my class load with my racing schedule. But I'm beginning to get the hang of things and am getting better at time management, so I can enjoy it more.

**How did you get started in racing?** My family had always been involved in it, especially my father, who was a professional motorcyclist. Motorcycles tend to be a bit risky so, of course, he didn't want his children doing that. Putting us in karting and cars was the compromise.

**How do you prepare for a race?** My pre-race ritual can be anything from listening to music to motivate me, or reading inspirational quotes I've saved, or even taking a quick nap to calm myself down and make my senses alert. But I always take some time alone before I race to think about my plan of execution and to focus on what I need to do. Then, right before I get in the seat, I usually do some ballistic movements or jumping to get my heart rate and my aggression up. This part is vital since, being a girl, I don't possess as much natural aggression as a male would.

—Amie Chitwood



On Track Promotions

In November 2012, freshman Sabré Cook became the first woman to win a SKUSA national title.

### IN BRIEF

Mines' section of the **Society of Women Engineers** (the largest student section in the country at 545 members) received three awards at the organization's 2012 national conference.

In December, Adjunct Professor **William Fleckenstein** '86, MS '88, PhD '00 was appointed interim department head of the Petroleum Engineering Department.

Colorado School of Mines and Yale University researchers were awarded \$2.6 million by the Department of Energy's **Advanced Research Projects Agency – Energy** for a study aimed at lowering the cost of electricity.

The National Science Foundation has awarded Colorado School of Mines a \$3.9 million **Partnerships for International Research and**

**Education** grant to advance knowledge on earth dam and levee sustainability—a topic with broad relevance to issues such as flood protection, clean water supply and hydropower.

The Chinese Ministry of Education awarded a \$720,000 grant to support an international solar research partnership that includes Professor **Mark Lusk**.





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# The Best Gigs On Campus

## 1 Outdoor Recreation Center climbing wall route setters

From the intellectual to the adventurous, students employed by Mines report that, along with a paycheck, their work provides balance, fun and intellectual stimulation. Having access to a deep pool of driven, high-achieving young men and women is good for Mines, too.

By Amie Chitwood  
Photography by Chelsea Panos

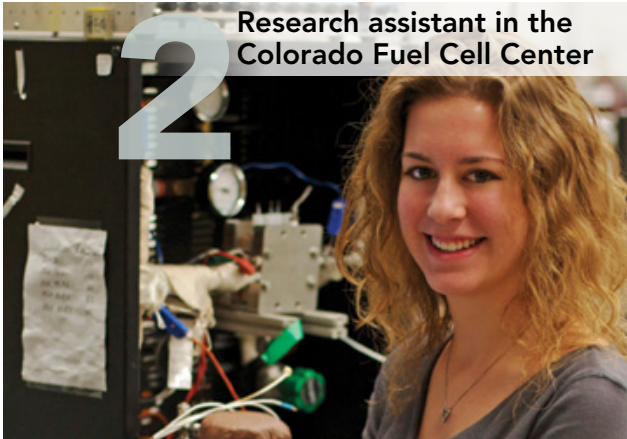
Scooping ice cream or flipping burgers is honorable work for a college student, but some of the job opportunities for Colorado School of Mines students offer a lot more, kick-starting careers, forging community connections and pushing physical limits. On a headcount basis, more than 60 percent of the individuals employed at Mines are students (40 percent undergraduates), and while most may work only a few hours per week, their cumulative contribution to campus operations is substantial. Interested in finding out which undergraduates had the best gig, we took a survey. Here we bring you our top five and comments from others who caught our attention.

**Andrew Lee**, sophomore  
**Field of study:** Chemical engineering

**Brandon Conaway**, sophomore  
**Field of study:** Geological engineering

When they're done solving problems in their calculus classes, Andrew Lee and Brandon Conaway head to the Student Rec Center and invent problems for others to solve—climbing problems. "This job puts you in an environment where you can be creative," says Conaway. "It gives you the opportunity to set routes that challenge your abilities and other students. I think my favorite part, though, is watching people who have never rock climbed before come in and have a blast."

Lee, who's the head route setter, has climbed for 12 years. "I get to spend a lot of time getting paid to do what I do best," he says. "I also get to climb all the other setters' problems and tweak them if they need to be adjusted." When asked for his strategy in establishing routes, Lee doesn't hesitate: "As an experienced climber, you know what's next; it's natural. You start with a move or hold and then devise a set of movements to go into it. It just flows. It's an art form."



**Research assistant in the Colorado Fuel Cell Center**

**Hailey Meyer**, first-year sophomore  
**Field of study:** Chemistry and chemical engineering

If Hailey Meyer is the future of renewable energy, we have little to worry about. “Thursdays are my favorite—that’s the day that I work,” she gushes with palpable enthusiasm. She’s at Mines because of the Harvey Scholars Program, which she was invited to apply for last summer while in Spain (“that was an adventure and a half, trying to find an English word processor to write my essay”), and is creating polymers, learning about zero-emission anion-exchange fuel cells that use rock minerals as a catalyst instead of precious metals, and worrying about research funding drying up. Meyer landed a dream job working in renewable energy thanks to work-study funds and a connection she made through a Society of Women Engineers Evening with Industry event last September. “I hope NREL hires me some day,” she confides. “It’s comforting to know that I have a network now. I am one of the lucky ones to find what I am passionate about so early in my college career.”



**Mine Safety and Health program assistants**

**Clancy Harman**, senior  
**Field of study:** Mining engineering

**Nicole Henderson**, junior  
**Field of study:** Mining engineering

When professionals in mine safety and rescue come to Mines for training, Clancy Harman and Nicole Henderson teach and learn from them. “It gives me a chance to see how other mine rescue teams practice their skills and how we can use that experience to improve our own training programs,” says Harman. “A day at work can include research in the office, instructing heavy-lift rescue, or firefighting exercises at Edgar Mine. The variety keeps the job interesting and encourages me to give my best.”

That included his first week on the job, when he was observing and critiquing a U.S. Army rescue team. “I was only 19, but because I was a civilian trainer, these U.S. Army Rangers and sappers called me ‘sir,’” he recalls. “It took some getting used to.”

Henderson helps prepare and teach the safety classes, contacts teams who may be interested, and assists in the training. “Recently I helped teach a heavy-lift class and run our computer simulator with a coal mine rescue team from Oklahoma,” she says. “I’m able to learn a ton while also getting to practice public speaking and presentation skills.”

Lately Henderson and Clancy have been preparing to offer instruction on some brand-new technology that just arrived at the Edgar Mine in December: a refuge chamber for miners trapped underground.



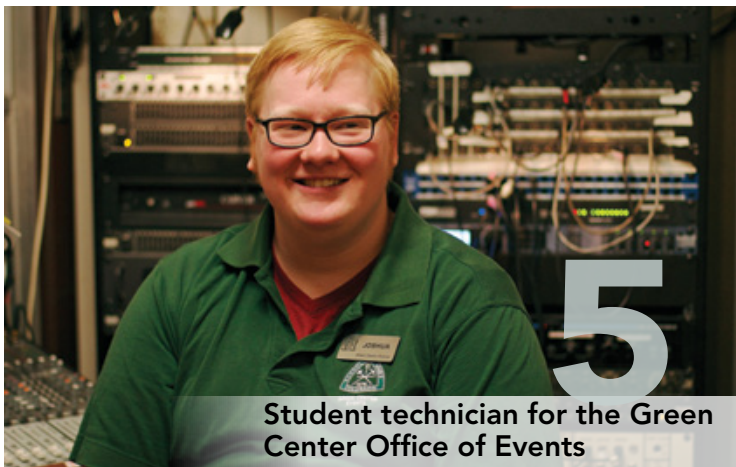
**Research assistant, teacher and organizer of STEM classes for 4th and 5th graders**

**Julia Morin**, junior  
**Field of study:** Mechanical engineering, pursuing a minor in computer science

Over the din of chatty, bouncing nine- and ten-year-olds comes Julia Morin’s calm voice. “Today is our last class,” she says. “Nooooo!” the students respond with dismay. Morin is working for the Department of Electrical Engineering and Computer Science teaching after-school classes on what engineers do. It’s a significant time investment: She spends 10–20 hours preparing for each 1.5-hour class, but she loves working with kids and is considering a career in teaching at the high school or college level.

“For the first class, I asked the students to build a house out of straws for the Three Little Pigs,” Morin says. “I hired the kids as my civil engineers and they came up with different designs for a house that would withstand the huffing and puffing of the Big Bad Wolf—some were very clever. The kids had fun blowing their houses over and seeing which house was the best.”

On the day *Mines* visits the classroom, Morin is introducing an electrical engineering student, Timothy Tribby, who’s going to demonstrate a 1990s-era robot donated to Mines by GM. But that’s for later. Skillfully sliding past the questions that follow (“Do you have a hugging machine here? There’s a hugging machine in China”), she launches into a Q&A recap of the past four weeks, and then transitions into interactive websites and videos that pull all 14 pairs of eyes to the front of the room. Her poise, focus and ability to pace the class are impressive. The students are engaged.

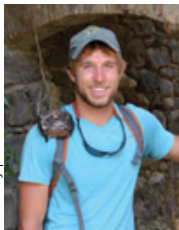


**Student technician for the Green Center Office of Events**

**Joshua Lamson, senior**  
**Field of study:** Computer Science

Joshua Lamson sits on an elevated rolling chair in front of an array of sound and lighting equipment in the booth that overlooks Bunker Auditorium. There isn't a moment of silence as he fills the space with gleeful descriptions of amplifiers, new CD equipment, and stories of solving clients' problems over "the God mic," a microphone that enables the technician's voice to be heard throughout the auditorium. "Learning how to work with full sound systems and doing crazy lights for a dance recital is fun, fast-paced work that makes time fly," Lamson says, adding that the occasional free food is a nice perk. He's been working events at the Green Center since his freshman year, giving him an eagle's nest view of numerous professional speakers, plays, concerts and movies that come to campus. It's more than fun and games, though: "I've had the opportunity to meet many professors and other staff and faculty, giving me a leg up in networking on campus."

## What they like best about their jobs



Courtesy photo

**Research assistant for Prof. David Pyles, Chevron Center of Research Excellence**  
**Bradley Nuse, senior,** geological engineering  
 I went to Spain last summer to help a doctoral candidate finish his thesis.



Courtesy photo

**Kickboxing instructor, SRC**  
**Shawn Miks, junior,** petroleum engineering  
 I teach kickboxing at the Student Rec Center. Nothing's better than kicking and punching.



Courtesy photo

**Research assistant, ceramic engineering**  
**Scott Harper, senior,** metallurgical and materials engineering, Harvey Scholar  
 Last summer I spent 2.5 months at the Indian Institute of Science in Bangalore, continuing research on the kinetics of grain growth in nickel oxide-doped yttria-stabilized zirconia.



Courtesy photo

**Biology teaching assistant**  
**Sandra O'Brien, junior,** biochemistry  
 I love biology and I love teaching. Many freshmen struggle with Biological and Environmental Systems 101, and hopefully I make their transition to the learning environment at Mines a little smoother.



Courtesy photo

**CASA peer advisor/mentor**  
**Nicole Neals, sophomore,** environmental engineering, McBride Honors Program  
 I like helping new students because I know how overwhelming Mines can be—I feel I make an impact on their success at school.



Courtesy photo

**Geology Museum aide**  
**Stephen Cuttler, senior,** geophysics  
 During tours, I see kids reach aha! moments that might put them on paths to pursue lifelong careers in science and engineering.



Colin Bonniksen

**Announcer for Mines home sporting events**  
**Nate McClain, senior,** geological engineering  
 I'm paid to talk. I get a front row seat to all sporting events, I can build camaraderie with the athletes, and I've worked with famous people like Woody Paige (sportswriter and a regular panelist on ESPN's "Around the Horn").



Chelsea Panos

**Circulation desk assistant at Arthur Lakes Library**  
**Molly Katolas, senior,** environmental engineering  
 I get first dibs on the new books and, when it's not busy, I can read or do homework.



Courtesy photo

**Chemical storeroom assistant**  
**Jack Stuntz, freshman,** chemical and biochemical engineering  
 I sort and distribute every chemical ordered on campus. We've had some interesting ones come through, like one that cost more than \$3 million for 1 gram.



**Mines magazine photographer**  
**Chelsea Panos, sophomore,** engineering physics  
 Photography is a creative outlet in my otherwise very analytical life; this job combines that with my love for this school. It's an awesome adventure!

**And you?** Did you have a cool or interesting job when you were a student at Mines? Make your experience a part of this article by going to [minesmagazine.com/student\\_jobs](http://minesmagazine.com/student_jobs) or email [magazine@mines.edu](mailto:magazine@mines.edu).



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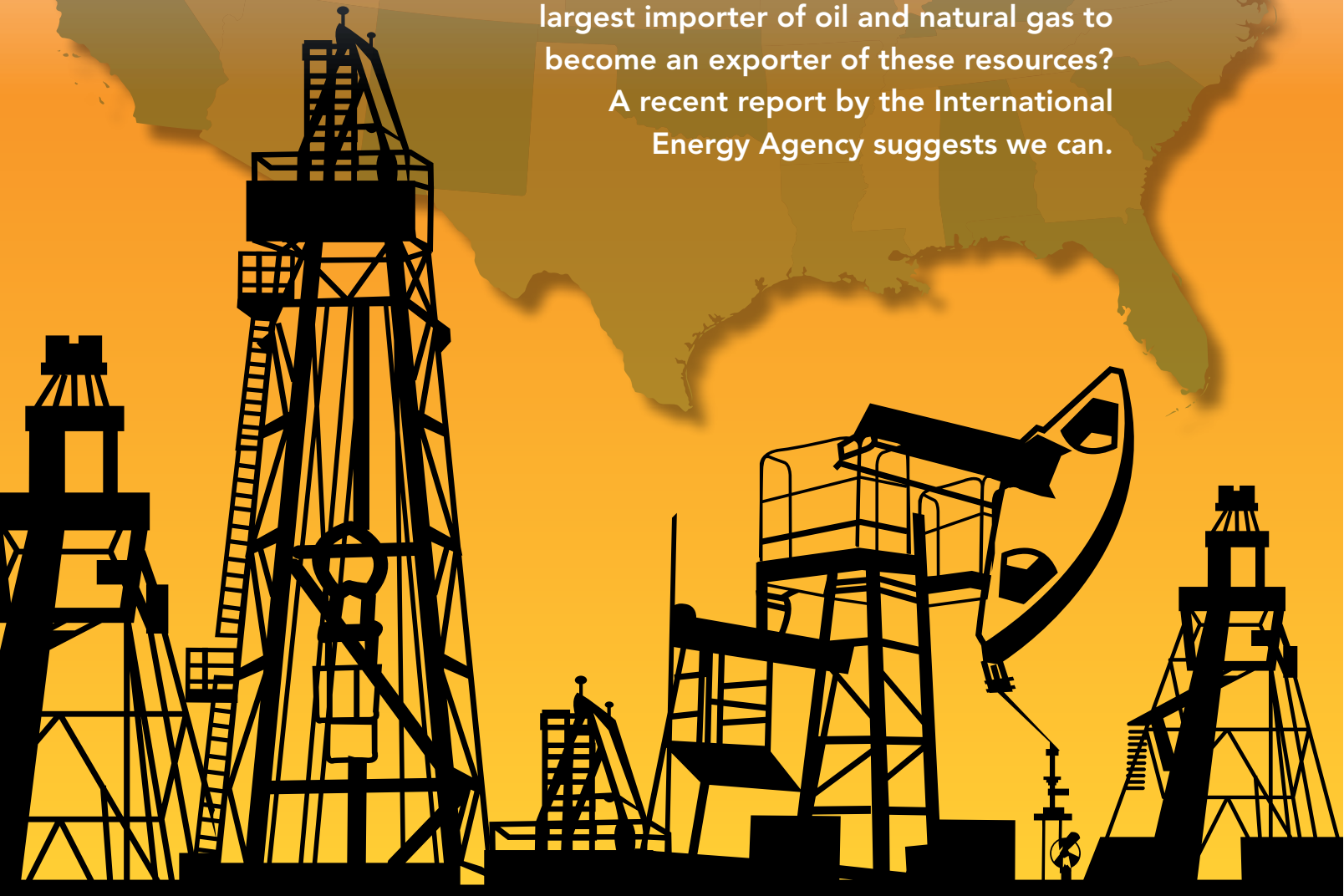
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# Earning ENERGY Independence

Could the United States reverse course from its position as the world's largest importer of oil and natural gas to become an exporter of these resources? A recent report by the International Energy Agency suggests we can.



When Jennifer Miskimins MS '00, PhD '02 received her bachelor's degree in petroleum engineering in 1990, the United States oil industry was still reeling from the '80s price collapse, most major companies had shifted their exploration efforts overseas, and those remaining on shore were slowing production and focusing on the lowest-hanging fruit.

Talk of an imminent "peak oil" crisis was escalating. And for bright, forward-thinking engineers, job prospects were bleak.

"Nobody in their right mind was going into oil and gas at the time," recalls Miskimins, an associate professor of petroleum engineering at Mines.

A quarter-century later, the U.S. energy landscape couldn't look more different. According to a November report by the Paris-based International Energy Agency, "World Energy Outlook 2012," the United States is poised to be the planet's largest oil producer by 2020, overtaking Saudi Arabia for the number one slot with a production rate of 11.1 million barrels per day. Already, domestic oil production rose more than 7 percent in 2012, marking the fourth consecutive year of increases, and the largest year-over-year spike since 1951.

Meanwhile, according to the Mines-based Potential Gas Committee, the U.S. currently possesses 1,898 trillion cubic feet of "technically recoverable" natural gas (the highest assessment in the committee's 46-year-history), a fact that recently prompted the Department of Energy to conclude that the time has come for the country to become an exporter.

As oil imports shrink and energy efficiency efforts expand, the IEA predicts that in net terms, the United States could reach energy self-sufficiency by 2035.

"North America is at the forefront of a sweeping transformation in oil and gas production that will affect all regions of the world," states IEA's executive director, Maria Van der Hoeven.

So how did we get here and where are we going next? The answers to both questions have a lot to do with Colorado School of Mines.

"Mines has played a very significant role in this evolution," says Tom Davis PhD '74, a professor of geophysics at Mines. "We've been involved in everything from developing drilling and stimulation technologies to better understanding the geology of formations to using geophysics to look for natural fractures in the rock and find the best areas to stimulate and drill wells."

#### FROM "EASY OIL" TO "HARD OIL"

Roughly 8,000 feet below the Mines campus lies the Niobrara Formation, a dense, 80-million-year-old chunk of shale that stretches across parts of Colorado, Wyoming, Nebraska and

Kansas and is believed to contain as much as 6 billion barrels of oil.

Petroleum engineers first tapped into it in 1901 at the Boulder Oil Field between Niwot and Boulder, where crude oil was found bubbling to the surface in a manner reminiscent of a Beverly Hillbillies episode, says Davis. The source of the unusual spring? An underground reservoir filled with oil that had seeped, over the millennia, from the Niobrara Formation.

In the decades that followed, as petroleum engineers tapped into this and numerous other similar pockets of oil, known as "conventional reservoirs," in Colorado and around the U.S., this "easy oil" was depleted.

Meanwhile, "unconventional reservoirs"—where oil and gas are trapped in tiny pores within the rock where they were formed—remained largely untouched. "We always knew as an industry that the oil and gas were there. We just didn't have the techniques to get to them," says Miskimins, who specializes in hydraulic fracturing and reservoir stimulation.

With its blend of petroleum engineers, geologists, geophysicists, chemical engineers and environmental scientists, Mines stepped in early to help solve the puzzle.

"Mines was working on unconventional reservoirs before we even called them unconventional reservoirs," quips Miskimins, noting how faculty and students have studied hydrocarbons in tight sand systems in Colorado, Wyoming and Utah for decades. "Today, there are probably 60 or 70 people working on these oil and gas issues here, and a lot of step-by-step changes are coming out of it."

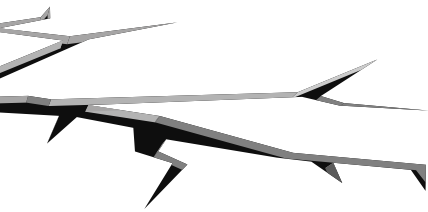
Contrary to popular belief, hydraulic fracturing is nothing new. In 1947, engineers at the Hugoton gas field in western Kansas became the first in the world to pump fluid down a well in an effort to crack the surrounding rock, boost its permeability and increase flow. By the 1980s, about 40 percent of all wells were fractured.

In the 1980s—thanks in part to drilling motor improvements and subsurface mapping technologies that came out of Mines—horizontal drilling was adopted by the energy industry. Energy companies began drilling horizontally to reach their targets, and a handful began experimenting with fracturing rock along the horizontal wellbore.

Ultimately, the successful integration of horizontal drilling and multi-stage fracture stimulation transformed the industry, boosting the nation's inventory of recoverable fossil energy resources practically overnight. The Potential Gas Committee's biennial report in 2009 reflected a 40 percent



Some of the faculty at Mines involved in unconventional oil and gas recovery (left to right): Tom Davis, Carolyn Koh, Jennifer Miskimins, Azra Tutuncu, Steve Sonnenberg, Yu Shu Wu.



This EIA map from 2011 indicates the known sources of natural gas in play. Source: Energy Information Administration



jump in “technically recoverable natural gas” reserves over the 2007 report. And in 2010, proved reserves of recoverable U.S. oil and natural gas rose by the highest amounts ever recorded since the U.S. Energy Information Administration began publishing estimates in 1977.

Technology changed the economics as well. Within a few years, unconventional oil resources that were previously uneconomic became spectacularly profitable. “Wells that used to produce 30 to 50 barrels of oil per day are producing 1,000 per day,” says Steve Sonnenberg PhD '81, a professor of petroleum geology at Mines.

### CONTRIBUTIONS THEN AND NOW

On a snowy morning in 1985, Davis and an interdisciplinary team of geologists and geophysicists began to set up equipment at Silo Field in Wyoming to record seismic waves and gain a clearer picture of what the reservoir thousands of feet below looked like. Their efforts led to the first detailed 3D map of natural subsurface fractures and faults within an oil field, and the information was used to guide the drilling of some of the earliest horizontal wells.

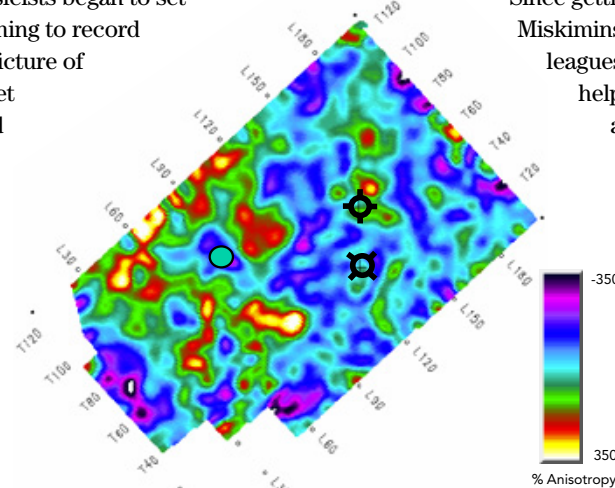
It was one of the first major projects undertaken by the Reservoir Characterization Project, a research consortium at Mines formed by Davis that has since emerged as an industry leader in a technique called 4D seismology, which involves taking regular 3D seismic snapshots of

the same reservoir over time (the fourth dimension) and creating time-lapse video sequences of oil or gas migrating through rock as hydrocarbons are pumped out.

The approach has given operators unprecedented insight into the effect of their stimulation efforts, and now, having accumulated the largest seismic dataset in the world, their models are widely used to guide drilling and stimulation efforts. “We can determine the best place to sink a well, see the effectiveness of hydraulic fracturing, and monitor the area over time to see what happens to the subsurface rock,” says Davis, noting that the approach can also help avoid induced earthquakes and water contamination—two of the biggest concerns raised by opponents of hydraulic fracturing. “We can predict and avoid areas where we have the potential to cause harm.”

Since getting her PhD at Mines in 2002, Miskimins has been working with industry colleagues, fellow researchers and students to help determine what materials work best as proppants (particles mixed into hydraulic fracturing fluids that prop open cracks in fractured rock and facilitate the flow of oil and gas) and where and how to stimulate the well for maximum efficiency. In 2003, she helped launch the Fracturing, Acidizing, Stimulation Technologies (FAST) consortium, the only university-based hydraulic fracturing consortium in the nation.

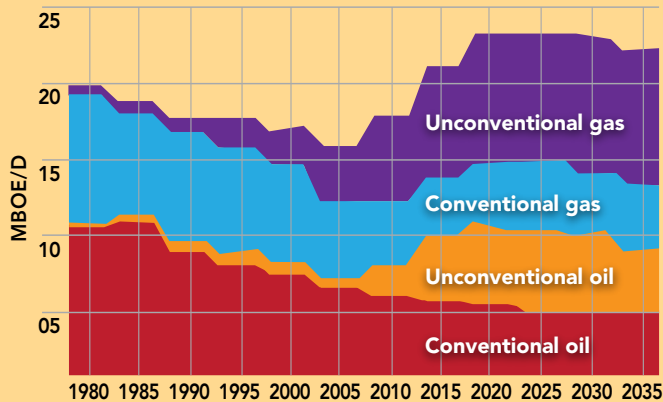
Meanwhile, Sonnenberg works with industry to make the most of the oil and gas



This map, by graduate student Lillian Comegys, is an example of the Reservoir Characterization Project's work and indicates the best locations to drill—yellow being the best, purple the worst—in an area just southeast of Parshall Field, N.D. Two existing well sites are also marked.



## U.S. OIL AND GAS PRODUCTION



Production of unconventional oil and gas is expected to peak in 2020.  
Source: "World Energy Outlook 2012," International Energy Agency

“Wells that used to produce 30 to 50 barrels of oil per day are producing 1,000 per day.”

resources in the Rocky Mountain region by directing the Niobrara Research Consortium, a collective of roughly 30 companies and a few dozen students who study everything from seismic reservoir modeling to fracturing techniques.

Professor Azra Tutuncu, who holds the Harry D. Campbell Distinguished Chair in Petroleum Engineering, directs the university's Unconventional Natural Gas and Oil Institute, which launched a consortium in 2012 to support unconventional natural gas and oil exploration and development. UNGI also offers educational programs for students, policy makers and regulators.

### PROMISE AND CHALLENGES IN THE FUTURE

Dismissing popular environmental concerns about hydraulic fracturing as unfounded, the IEA's report assumes uninterrupted proliferation of the technology. However, every faculty member and alum interviewed for this story concedes that the industry faces a significant public relations challenge.

“We have to assure people that this is not a technology to fear,” says Davis.

Miskimins often gives free presentations to community groups to explain the pros and cons of hydraulic fracturing, and to dispel what she sees as widespread misinformation. She explains that because the unconventional reservoirs being tapped are so far below the surface, the chance of groundwater contamination is relatively slim. She also says the amount of water used in hydraulic fracturing has been somewhat overplayed in the media.

“But if public perception is that it is a bad thing to be using all this water, then industry needs to be looking for other options,” she says.

In August, Mines professor Yu-Shu Wu, Miskimins, and Xiaolong Yin (an assistant professor at Mines) were awarded a \$4.66 million grant, funded jointly by the Department of Energy and the petroleum industry, to explore using rapid cooling to

fracture rock instead of water.

“The idea is to use liquid nitrogen, which is very cold, to generate fractures,” explains Wu. “After a couple of hours, when the temperature warms back up, it evaporates.” That reduces the risk of contaminating groundwater and of damaging the formation itself, which lingering water from hydraulic fracturing can do. “It's really early days, but if it works, it could change the industry,” says Wu.

Along similar lines, Wu, Davis and dozens of other Mines faculty and students are exploring ways to use CO<sub>2</sub> emitted from coal-fired power plants as a fracturing fluid. In addition to addressing water use concerns, the CO<sub>2</sub> would largely remain sequestered in the subsurface rather than going into the atmosphere.

On the natural gas front, one area that scientists at Mines' Center for Hydrate Research are pursuing is how fuel might one day be transported in crystalline hydrate form. Currently, natural gas is transported by ship as a liquid that must be kept at a frigid -260°F. If systems could be developed to efficiently create natural gas hydrate, which remains stable at a balmy -4°F, the energy savings could be considerable. The trade-off is that the hydrate is much less dense than liquified natural gas. “The key is making these hydrate crystals in a way that is very efficient,” says Carolyn Koh, a professor at Mines and co-director of the center. “It involves fundamental science with important applications.”

In the end, faculty members say, the greatest contribution the school has made to the energy industry is to turn out graduates with a broad-based interdisciplinary understanding of oil and gas, which they apply to everything from exploration to policy making.

For those graduating today, the future looks bright. “We are unique, and that is recognized by industry,” says Sonnenberg. “One hundred percent of the students coming out of our programs are getting hired right now.”

A slow, persistent landslide is undermining a short section of I-70, about a mile from the highest point on the nation's Interstate Highway System. Finding a solution is a conundrum that one Mines professor is helping to unravel.

By Larry Borowsky

Two summers ago on I-70, about a mile from the highest point on the nation's Interstate Highway System, a dip in the pavement grew so large that cars were going airborne and getting tossed out of their lanes. Fortunately, no one crashed before the Colorado Department of Transportation made repairs, but drivers shouldn't rest too easy; the Big Bump will be back.

Located about a mile west of the Eisenhower Tunnel in Summit County, the Big Bump is a perennial headache for CDOT. The dip forms in the eastbound lanes on a slope-side stretch of highway perched hundreds of feet above Straight Creek. As spring snowmelt soaks underlying layers of rock and soil, the roadbed sinks a few inches every year. When it gets bad enough, CDOT repaves to level things out, but come the following June, the Big Bump returns.

"At that point, the asphalt is now 6 to 7 feet deep," says Ning Lu, a professor in the Department of Civil and Environmental Engineering, who refers to the slippage on I-70 as a slow-motion landslide. "CDOT keeps laying over more asphalt, but that's just a short-term solution. With each passing year, the chance of a catastrophic event grows, and finding a long-term sustainable engineering solution is critical."

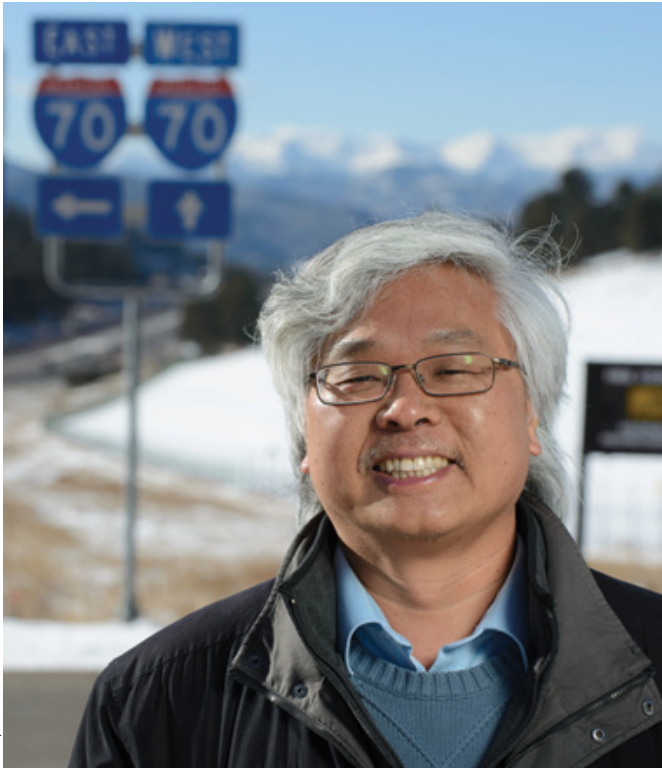
CDOT turned to Lu, an international expert on landslides, in 2009. Since then, he's partnered with the state's engineers to gather baseline data about slope stability, with an eye toward developing a plan for a permanent fix.

# Braking I-70's Slow Slide

Ski Loveland

Eisenhower/Johnson Tunnel

Big Bump



Tyson Brown '08, MS '11

Professor Ning Lu has been working with CDOT for three years, seeking a long-term solution to the seasonal slope instability.

“We started a field investigation there three years ago,” Lu says. “We put in sensors to measure embankment movement and groundwater table fluctuation in the slope over time. The main purpose of our research is to understand the configuration of the water table and soil—what type of soil is there, what’s happening with the water table.”

Lu found a clear pattern: “Stabilize, slide, stabilize, slide. But at some point, rather than 2 inches of subsidence in a year, there could be 2 feet of subsidence, and the highway would not be functional.”

That’s an outcome both Lu and CDOT hope to prevent.

Over this stretch of I-70, the eastbound lanes are built on fill excavated from the tunnel in the 1970s. There is no subsidence on the westbound lanes, which sit more directly over bedrock.

Located at 11,000 feet, winter snowfall accumulations are considerable. By early spring, drifts at the edge of the highway often stand more than 10 feet high, and a snow-laden mountain-side rises another 1,500 feet to the north.

“All that snow melts within a couple of weeks in the spring,” explains Lu, adding that the topography funnels surface runoff directly toward the area of the Big Bump. “As subsurface moisture content increases, the water table rises rapidly and the slope loses stability. Our monitoring results indicate that the water table rises by as much as 30 feet within the two-week snowmelt period.” It doesn’t help that there are two springs nearby.

“We’re looking at a dynamic process that extends from the surface to the water table and the underlying bedrock,” Lu says. “Precipitation alters the stress inside a slope, and when the stress state reaches its limit along the sliding surface, there will be a landslide. Sometimes it could take a few hours. Other times it could be weeks or years.”

### SEARCHING FOR A SUSTAINABLE SOLUTION

The highway has sunk on a seasonal basis since it was completed in the 1970s. One of the primary concerns is that this consistent movement over four decades has defined a shear plane—an interface between bedrock and the material supporting the road that gets weaker with each spring melt. “It is likely that at some point in the future, accelerated sliding is going to occur if effective measures are not taken,” says Lu.

Over the years, CDOT has looked at various options for permanently stabilizing the slope. One is to keep the area dry by channeling surface runoff away from the slide area and installing a network of subsurface drains. With adequate drainage, efforts could then be made to reinforce unstable soils with underground structures.

Another idea is to stack the eastbound and westbound lanes in an overhang configuration—as in Glenwood Canyon—so that both directions lie atop stable bedrock, but complex construction on this scale at this elevation would be very costly.

In addition, projects of this magnitude would necessitate closing I-70 for several months and diverting traffic over Loveland Pass, which would result in hours of delays, have a national impact on transit and shipping, and wreak havoc



Grant Anderson, CDOT

Every year since the 1970s, the eastbound lane has subsided a few inches during springtime snow melt. This fissure was found after asphalt was removed for repairs in summer 2012.

with state commerce and tourism. Such economic costs need to be considered along with the cost of construction.

“It would be very expensive to fix,” says Mark Vessely '94, a former CDOT engineer who now works for the consulting firm Shannon and Wilson.

With no viable alternatives, CDOT resorted to an asphalt Band-Aid until last

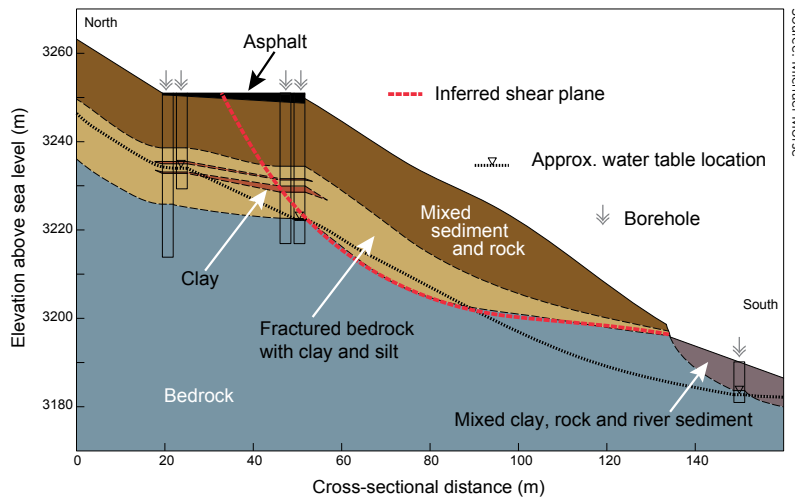
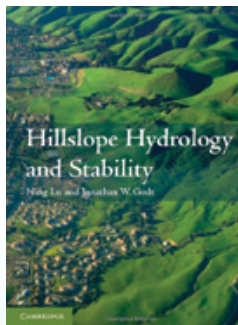
spring, when Vessely and his company devised plans to drill a series of shafts into the thick asphalt pad at the Big Bump and fill the holes with lightweight cellular concrete. “It reduces the weight and stress on top of the slide, and fills voids and loose soil beneath the pavement,” says Vessely. “The goal is to make some improvements and lower CDOT’s year-to-year maintenance costs, but it’s an interim measure. The long-term fix is still undecided.”

### PROBING THE ROCKIES

CDOT spokesperson Bob Wilson says the department brought in Lu to help because of his insight and experience. Lu has studied landslides around the world as part of an arrangement between Mines and the U.S. Geological Survey’s Landslide Science and Engineering Partnership.

The team monitors numerous active landslide sites in Washington, Oregon, California, North Carolina and Colorado in an effort to develop simulators and modeling tools. When a major slide occurs anywhere in the world, Lu and his USGS colleagues are generally among the first investigators on the scene.

“The response team goes to take samples and data, make assessments, evaluate mechanisms, and find out how much stress and what particular type of soils were involved,” says Lu, who points out that landslides are becoming more frequent. The reason? The primary culprit is global climate change, he says. More energy in the



A hydrogeologic cross-section of I-70 looking east developed by PhD student Michael Morse illustrates the possible location of a weakening shear plane under part of the highway. Boreholes are used to gather data about the elevation of the water table during spring snowmelt.

atmosphere leads to more intense storms and precipitation.

“Any natural slope you see today is in a delicate equilibrium that has evolved over thousands of years,” Lu explains. “If you change the pattern, it’s going to alter the balance and possibly trigger a landslide.” For this to happen, the total volume of precipitation is less relevant than the intensity.

“A slow rain will produce different effects on a

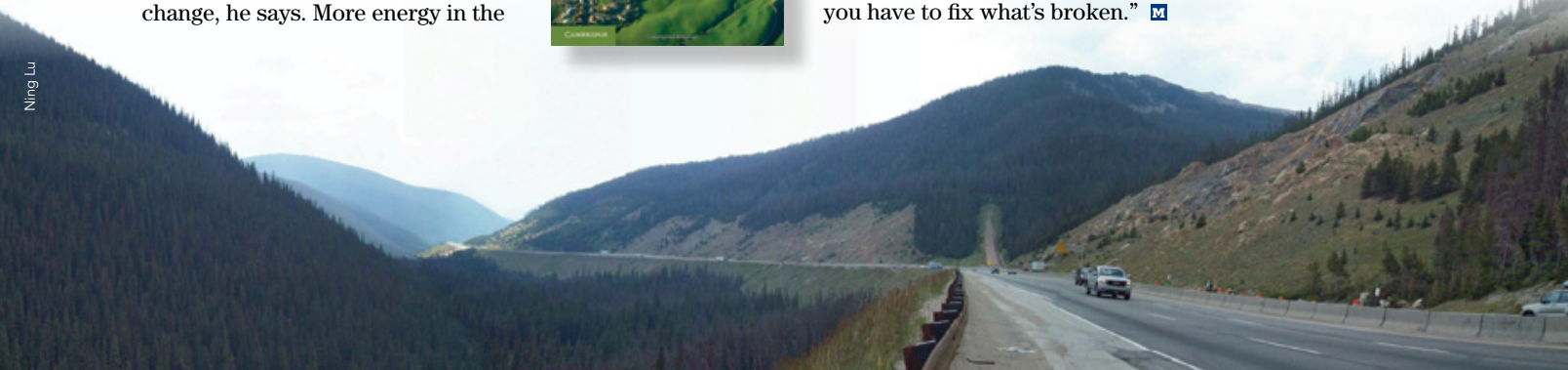
slope than an equivalent amount of rain that falls more quickly.”

Lu’s new book, “Hillslope Hydrology and Stability,” published by Cambridge University Press and co-authored with USGS colleague Jonathan Godt, offers a comprehensive set of global landslide data, along with a new hydrological and mechanical framework for predicting and analyzing the likelihood of a major slide on a given hill slope or region. It answers questions not covered in his 2004 book, “Unsaturated Soil Mechanics,” published by John Wiley and Sons, co-authored with William Likos PhD '00, a professor at University of Wisconsin–Madison, which has become a go-to reference for civil engineers around the world. Still, he says, landslide forecasting has lots of room for improvement.

CDOT renewed the research contract with Lu and Mines Associate Teaching Professor Alexandra Wayllace for another three years. During that time, the asphalt at the Big Bump may grow another foot deeper. But Lu’s body of soil and water data will grow deeper as well and, he hopes, yield the information necessary to formulate a strong long-term solution.

What are the chances they’ll be able to finesse the problem and avoid massive disruption and expense? “Once we know more about subsurface fluid flow and stress variation patterns, we’ll be in a better position to know if conditions can be changed to stabilize the slope in a natural setting without major overhaul,” Lu says. “The key may be controlling groundwater table levels within the highway embankment. That could happen, and it could be economical and sustainable.”

Engineers at CDOT certainly hope so. “We’ve been patching this over for too many years,” says CDOT’s Wilson. “Eventually you have to fix what’s broken.”





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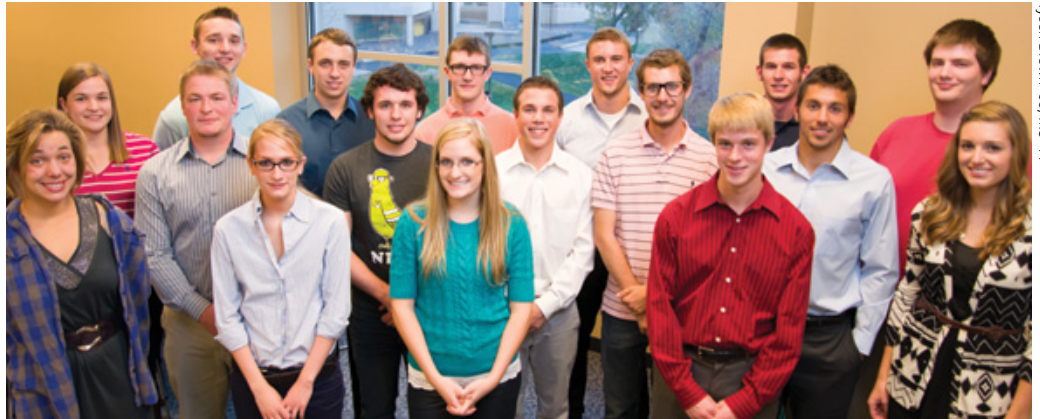
# ALUMNI NETWORK

## STUDENT SUPPORT

### Generous Legacies

More than \$14,000 was awarded to 19 freshmen and seniors at a reception on November 2, 2012, in the Ben H. Parker Student Center. Attended by more than 30 family members and friends, the event marked a longstanding alumni association tradition of offering special financial assistance to the children and grandchildren of members. Called Legacy Grants, students are eligible for assistance during their first and last years at Mines, the amount fluctuating based on donations to CSMAA's Student Financial Assistance Fund during the previous fiscal year. This fall, students came away with checks for \$750 each.

To qualify, the sponsoring parent or grandparent must have been an active, paying member of the alumni association for the last five consecutive years. After President Bill Scoggins welcomed family members to campus and thanked them for their loyalty to the school and CSMAA, Anita Pariseau, executive director of CSMAA, presented awards.



Tyson Brown '08, MS '11

Several Legacy Grant recipients attended a reception in their honor last November. Back row (left to right): Ryan Wareham, Dominick Condoleo, Sean McDaniel, Connor Clark, Steven Freytag, Matthew Cornellisson. Middle: Morgan Lindsey, Tyler Wylie, Newton Adamson, Taylor Seal, Sean Gildea, Giuseppe Pasqualino. Front: Marcelle Sprackling, Michelle Nilson, Jessica Nilson, Sean Coady, Julianne Wilson. Not pictured: Hannah Govett and Joshua Ratliff.



Tyson Brown '08, MS '11

## CAREER DEVELOPMENT


### Securing Your Next Move

On November 12, 2012, the Colorado School of Mines Alumni Association's ongoing Professional Development Series featured "Securing Your Next Move," a panel discussion moderated by Cooper Swenson MS '04. The panel included professional recruiters Dave White '81 and Leslie O'Connor, and seasoned business executive Becky O'Rourke. About 45 alumni attended the event, and another 40 tuned in to the webcast, posing questions along with the live audience.

#### FIVE TAKEAWAYS FROM THE TALK

- 1. Network:** Seventy percent of jobs come through personal contacts. Be strategic about nurturing your personal, professional and Mines connections.
- 2. Résumés:** Every application should include a résumé tailored for that specific job and a list of relevant accomplishments.
- 3. Elevator speech:** Be ready to encapsulate, in about 30 seconds, your goals, what you are passionate about, and what you've accomplished.
- 4. Keep perspective:** Know where you want to end up in your career, and make sure your next move brings you closer.
- 5. Keep moving:** Nothing will come of nothing. If you are stuck, find help and get moving.

Dave White, Leslie O'Connor and Becky O'Rourke shared ideas on how to take the next career step.

 Listen to a recording of the subsequent event in the series, "Developing Your International Career," at [minesmagazine.com](http://minesmagazine.com).

## ALUMNI ASSOCIATION

# Meet the Colorado School of Mines Alumni Association Board of Directors

Have you ever wondered what the CSMAA board does? In this third of four installments, we highlight each director and his or her service to the alumni community.



**Jafar Tabaian '00**  
Crested Butte, Colo.  
Secretary

Jafar is a member of the executive committee, which meets regularly to discuss critical strategic and budgetary issues. He earned a bachelor's degree in engineering, mechanical specialty, and a minor in economics from Mines, where he played football and served as assistant football coach under Bob Stitt from 2001 to 2004. Jafar is

now principal of North Arrow Consulting, which serves the extractive, financial services and renewable energy industries.



**Darek Bruzgo '95**  
Littleton, Colo.

Director, Alumni Programming (Colorado)

A life member of the alumni association, Darek has volunteered for the CSMAA Denver Metro Committee since 2008 and helped to create the annual Bike Bike Que event. On the board, he works to expand alumni engagement throughout Colorado. In 1996, after earning his bachelor's degree in engineering, mechanical specialty,

he started D&R CNC Machining with his brother, Robert Bruzgo '95. He has taught Senior Design at Mines as an adjunct instructor since 2010.



**Matthew Showalter '99**  
Parker, Colo.

Director, Communications

Matt earned a bachelor's degree in petroleum engineering from Mines. With 20 years of experience in technology and engineering, he is now a co-founder and CIO for Swiftpage, a software development company focused on email marketing, social media and contact management. His experience in this field is helping structure

CSMAA's approach to communications and promoting two-way dialogue among alumni and the university.



**William Warfield '75**  
Sacramento, Calif.

Director, Alumni Recognition

When he graduated from Mines with a professional degree in mining engineering, Bill was following in the footsteps of three relatives, including his father. Today, he looks for opportunities to recognize alumni who have distinguished themselves in their industries or through notable contributions to the university or alumni association.

He has worked in the mining industry for more than 30 years, most recently for Atlas Copco CMT USA, where he is manager of business development—geotechnical drilling and exploration.



Find full bios for board members online at [minesalumni.com/board](http://minesalumni.com/board). Interested in getting involved with the alumni association? Learn about the opportunities at [minesalumni.com/volunteer](http://minesalumni.com/volunteer).



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President  
James R. Larsen '65  
President-elect  
Jafar Tabaian '00  
Secretary  
Paul Roamer MS '97  
Treasurer  
Anita Pariseau  
Executive Director

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Oliver Dewey '12  
Tracy Gardner '96, MS '98  
Susan Evers Matsushima '97  
Brady McConaty '78  
Mohan Misra PhD '86  
Paula Nolan '05  
Raymond Priestley '79  
Matthew Showalter '99  
Cooper Swenson MS '04  
Mark Taylor  
Mahesh Vidyasagar MS '00  
William Warfield '75  
Rachel Wiechman

## STAFF

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Deputy Director  
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Editor, *Mines* / Director of Communications  
Amie Chitwood  
Managing Editor, *Mines* / Assistant Director of Communications  
Ruth Jones  
Associate Director, Programs  
Heidi Boersma  
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Michelle Carrera-Hutchins  
Linda Nothnagel  
Jo Marie Reeves  
Nancy Webb  
Administrative support (part-time)

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[minesalumni.com](http://minesalumni.com)



# CLASS NOTES

1959

**John Stout** 

1960

**Gerald L. Askevold** is a realtor for West Venture Real Estate and lives in Whitefish, MT.

1966

**Charles R. Arnett** is a partner for Silver Lake Analytical Services and lives in Durango, CO.

1967

**Stephen P. Collings** is a director for Cameco Resources and lives in Morrison, CO.

**Stephen H. Maytag** is a chemical engineer for RT Patterson and lives in Carnegie, PA.

1968

**Neil Murdock** 

1969

**John A. Geis** is working for Hukari Ascendent and lives in Arvada, CO.

**Thomas O. Hiscox** is a technical advisor for Unimin and lives in Payson, AZ.

**George Quinn** retired from the Idaho Dept. of Water Resources and lives in Bamberg, Germany.

1970

**David Scriven** 

**Robert D. Stimson** is a superintendent for Wilcox & Contracting and lives in Sedona, AZ.

1971

**James R. Black** is working for Kestrel Engineering and lives in Nine Mile Falls, WA.

**Anthony L. Morroni** is a SVP for Carollo Engineers and lives in Littleton, CO.

1972

**Richard A. Cadle** is a senior process consultant for Freese and Nichols and lives in Arlington, TX.

**John Darrow** 

**David J. Love** is the president of Belt Collins and lives in Louisville, CO.

**Raymond Lowrie** 

**Clyde H. Peppin** is a senior operations manager for Coeur d'Alene Mines and lives in Hayden, ID.



**MAKING MERRY** Almost 300 guests attended CSMAA's annual Denver Metro Holiday Party in December, which was held in the Geology Museum. Here former CSMAA president Roger Newell MS '71 (center) chats with George '53 and Susan Mitchell.

**Bruce H. Pike** is a project manager for Haliburton and lives in Houston, TX.

**James E. Pittinger** is a metallurgist – copper – for Pittinger Services and lives in Evergreen, CO.

**Robert K. Spangler II** is a metallurgical engineer for ArcelorMittal USA and lives in Saint John, IN.

1973

**Joel S. Forrest** is a senior technical staff member, analytical auger lab for HGST, a Western Digital Company, and lives in San Jose, CA.

**Thomas B. Huzzey** is a waterflood advisor for Chevron and lives in Sugar Land, TX.

1974

**Javier A. Arce** is a process engineer for FMC and lives in Green River, WY.

**Albert C. Compton** is a director – project engineering for Chesapeake Energy and lives in Shreveport, LA.

**Carol V. Fuchs** is a business manager for Better Homes & Gardens Realty Partners and lives in West Linn, OR.

**Stanley J. Gradisar** is of counsel for Sheridan Ross and lives in Castle Rock, CO.

**Richard M. Karcich** is a development engineer for Microsoft and lives in Centennial, CO.

**Richard P. Mignogna** is a principal consultant for Renewable & Alternative Energy Management and lives in Golden, CO.

**Peter A. Nielsen** is the president/mine manager of Camino Real Fuels and lives in Dallas, TX.

**Andrew J. Pfaff Jr.** is a country manager for EOG Resources and lives in Silverthorne, CO.

**John A.L. Rense** is a sector leader, engineer for Nana Development and lives in Anchorage, AK.

1975

**Thomas L. Breninger** is a facilities engineer for Marathon Oil and lives in Edmond, OK.

**Alberto Orozco** is working for WSN and lives in Houston, TX.

1976

**Dennis L. Casto** is a VP of engineering operations for AKA Energy and lives in Durango, CO.

**William B. Goodhard** is a member of the board of directors for Gryphon Gold and lives in Centennial, CO.

**Robert Morroni** 

**Donald B. Tschabrun** is the COO of Gryphon Gold and lives in Reno, NV.

1977

**James M. Gindelberger** is an environmental scientist for the EPA and lives in Denver, CO.

**Claudio Manzolillo** 

**Frank H. Merrill** is a senior programmer for WillPoint and lives in Denver, CO.

**Mark J. Norden** is an assistant to the president for E. Dillon & Co. and lives in Abingdon, VA.


**William A. Sargent** is a China Energy commercial consultant for Chevron and lives in San Ramon, CA.

**Sidney J. Stone III** is a maintenance engineer for BP America and lives in Temperance, MI.

**William H. Strickland** is a project engineer for Hecla Mining and lives in Columbus, MT.

1978

**Thomas Flaherty** 

 denotes an individual who has recently posted photos at minesalumni.com



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**Chris R. Roberts** is a manager – synthetic chemistry for Corden Pharma Colorado and lives in Berthoud, CO.

**Michael S. Ryan** is a senior principal consultant for NTT Data and lives in Gloucester Point, VA.

**Jeffry P. Sattler** is a SVP, engineering for West Engineering Services and lives in Houston, TX.

**Francine D. Schlaks** is working for the IRS and in private practice and lives in Las Vegas, NV.

**Mitchell R. Whatley** is a VP of engineering for Sidewinder Drilling and lives in Southlake, TX.

**Janice D. Williams** is a deputy director of waste removal and tank closing for CH2M Hill and lives in Pasco, WA.

### 1979

**Catherine E. Armstead** is a principal engineer for Landmark Environmental and lives in Pine, CO.

**George T. Dunn** is a SVP/development executive for Newfield Exploration and lives in The Woodlands, TX.

**Dwayne H. Edington II** is a senior hydrogeologist for Schlumberger and lives in Highlands Ranch, CO.

**Nancy J. House** is a geophysical advisor for Chevron and lives in Littleton, CO.

**Laurence G. Martin** is a VP, exploration for Comstock Mining and lives in Sparks, NV.

**Bruce A. Neuschaefer** is a program director for ERM – West and lives in Laguna Niguel, CA.

**Dennis Pieters** ☒

**Paul J. Plante** is a project manager for Maine Yankee and lives in Yarmouth, ME.

**Jerry Rotz** ☒

### 1980

**Timothy A. Barbari** is an associate provost for graduate affairs for Boston University and lives in Brookline, MA.

**Roger C. Carter** is a project engineering manager for Lyondell-Basell and lives in League City, TX.

**Terry L. Mead** is a global wellsite connectivity manager for Schlumberger and lives in Austin, TX.

**Javan D. Ottoson** is the president and COO of SM Energy and lives in Eaton, CO.

**Michael H. Partin Jr.** is a drilling engineering team leader for BP and lives in Houston, TX.

**Donna M. Rillings** is a materials engineer for Lockheed Martin and lives in Conifer, CO.

**Mustafa H. Sagiroglu** is working for Infobionic and lives in Bellevue, WA.

**Rose M. Wheeler** is an accounting manager for PreCheck and lives in Houston, TX.

**Editor's Note:** Alumni from the classes of 1981 to 2012 who have recent updates online or have uploaded photos to minesalumni.com over the last four months are listed below. In addition, all class notes published in *Mines* magazine in the last four years are available on the site. When you visit, if you take a few moments to enter your latest information and upload some photos, we'll list your name here in the next issue. For online viewing instructions, click on Class Notes at minesmagazine.com.

### 1981

Mark E. Flatland  
Alan C. Harrison  
Frederick C. Heneman  
Claude H. Joseph  
Susan M. Perrell ☒  
Candace S. Sulzbach

### 1982

Judith L. Bolis  
Daniel R. Boltz  
Graham W. Clark  
Richard L. Foss Jr.  
Barbara L. Ganong  
Ramona M. Graves  
Daniel E. Kelly  
W. Charles Kelly III  
Eric J. Lauber  
Michael L. Troyer

### 1983

Mobashir N. Ahmad  
John D. Applegate  
Joel A. Eacker  
Lance R. Hardesty  
Marianne Holleman  
Norma I. Mozee  
Karl M. Nelson  
Michael D. Orosz  
Warren M. Rehn  
William S. Schneider  
Diana L. Visser ☒  
Patrick K. Worrell

### 1984

J. Patrick Adcock  
Peter R. Bierbaum  
David H. Brown  
Kelly E. Cook  
Steven C. Gallington  
Gerald S. Lane  
Mark B. Mathisen  
Ty S. McKercher  
Gregory Norman  
Smallwood  
Kevin L. Stansbury  
Richard R. Van Dok  
Steven W. Yopps

### 1985

Margaret A. Bierbaum  
Jeffrey R. Blackwell  
Charles B. Czarnecki  
Robert P. Daniels  
James P. Flahive  
Guillermo M. Grossi  
John D. Harkrider  
Michael A. Jahnke  
Carl E. Lakey  
Martin K. Lange



**FUTURE MINER BORN** Darek '95 and Serena Bruzgo welcomed Annabel on October 19, 2012. Serena is CSMAA's deputy director, making Annabel an official member of the alumni association family.

Mari Angeles Major-Sosias  
Mark O. Reid  
David-John Roth  
John R. Schwappach  
Rick Sisk ☒  
George H. Wayne Jr.

### 1986

Andrew J. Bond  
Peggy Christie  
Mark A. Degenhart  
Bennett D. Edgar  
Susan Flynn ☒  
Masami Hato  
Elizabeth L. Heatwole  
Hugh B. Miller  
Mark L. Peak  
Samuel D. Urton

### 1987

Deborah H. Beck  
Christopher M. Chima  
Kelly P. Coleman  
Teresa L. Nealon  
John A. Starck  
Thomas E. Street  
Richard G. Weber

### 1988

Charles S. Baxter  
Wayne Belcher ☒  
John J. Cambuzzi  
Timothy M. Deignan  
Robert D. Lawler  
Jamin B. McNeil  
James L. Mueller

Thomas A. Riccio  
J. Scott Sammons

### 1989

William R. Arnold  
Brad G. Baker  
Gregory L. Davoll  
Anthony R. DeVito  
Colin M. Engle  
Paul E. Pastore  
John H. Rheinheimer  
Richard J. Schepis  
Jeffrey C. Thomas  
Allyen E. Wilson III ☒

### 1990

John H. Marino  
Albert B. Schwarzkopf IV  
Shirley A. Smuda

### 1991

Colin J. Basye ☒  
Kristin M. Corash  
Keith E. Cusack  
Glenn T. Eavenson  
Michael A. Fleming  
Robert J. Golden Jr.  
Shawn Olson  
Karen Vallance Peterson  
Scott M. Plummer  
John T. Sanchez III  
Suryan Wirya

### 1992

Brett K. Brunk  
Debra K. Brunk  
Peter A. Christnacht

John J. Dugas  
John B. Fairbanks  
Francesca Fazzari  
Oguz Gunduz  
Edward D. LaFehr  
Jonathan S. Miller  
Damon T. Parker  
Alisa L. Ramey  
Susan D. Rankin

### 1993

Richard E. Clark  
Darrell H. Eldridge  
David A. Gratson  
Mark R. Gwaltney  
Brett R. Hoopes  
Kenneth W. Rillings Jr.  
Raymond R. Sanchez  
Khanh Q. Vu

### 1994

Robert N. Ball  
Brenda Cockson  
Christopher L. Coil  
Thomas E. Collings III  
Victoria L. Cooney  
Brenda E. Head  
Larry E. Johnson  
Taras Y. Makogon  
Karen Maley  
Jack L. Oskay  
Katharine B. Sawrey  
Joel M. Sobol  
Charles P. Torres  
David Webster ☒  
Eric Douglas Wilson

ALUMNUS PROFILE

# A Miner's Century

Graduating in the middle of the Great Depression, members of the Class of 1935 faced bleak job prospects. But E. Keith Staley '35, who celebrated his 100th birthday on January 13 in Oro Valley, Ariz., points out that life had been tough for some time. For example, to return home to Clayton, N.M., from Golden at the end of each semester, he would hop a freight train heading south out of the Denver rail yard. "Sometimes there were as many as 300 people jumping into different cars," recalls Staley, who relied on woolen underwear and a heavy sheepskin coat to stay warm during the long winter trips.

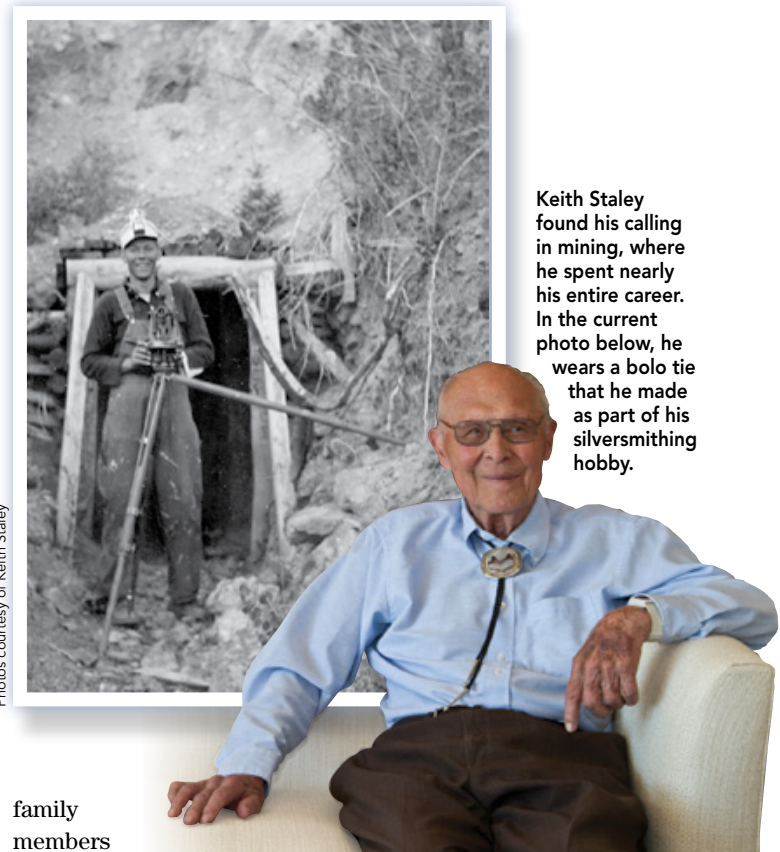
After graduating with a professional degree in mining engineering, he hitchhiked around the country in search of work—any work. It wasn't until 1937 that his luck really changed. At an intersection far from Denver, he had a chance encounter with classmate Chuck Michaels '35. The two were hitchhiking in opposite directions, both chasing rumors of work. After comparing notes, Michaels' sounded more promising—Phelps Dodge was opening a new open pit mine in Morenci, Ariz.—so the two teamed up and headed south.

The first skilled job he was assigned involved surveying the rail line that took ore from the pit to the mill. Quickly earning his bosses' confidence, he was supervising a team of 60 by 1940.

During World War II, stationed in Alaska with the U.S. Army Corps of Engineers, he rose to the rank of major, building, among other things, a 20-mile stretch of railroad, a sawmill and a wastewater system.

Unlike his graduation a decade earlier, the economy was booming when he emerged from the military after World War II. He decided to reenter the mining industry, this time going underground. Staley says that sinking mine shafts gave him more satisfaction than anything else in his professional life. The first was in Eureka, Nev., in 1945, and the deepest was a 5,000-foot shaft in Arizona. He was 63 when he retired as general manager of one of the largest underground copper mines in the world, located in San Manuel, Ariz.

Since then he's had plenty of time to enjoy his family and friends. Keith and his first wife, Edith, had three sons. His second wife, Frances, died several years ago; she is survived by two daughters. His ties to Mines run deep: Several



Photos courtesy of Keith Staley

Keith Staley found his calling in mining, where he spent nearly his entire career. In the current photo below, he wears a bolo tie that he made as part of his silversmithing hobby.

family members have attended, including an uncle, George W. Mitchell '23, and cousins J. Harold Mitchell '36 and George W. Mitchell Jr. '53.

He's also had lots of time to pursue his hobbies: gardening, lapidary and silversmithing. To this day, he spends time in his workshop, cutting and polishing rough stones for silver bolo ties, bracelets and pendants.

—Nick Sutcliffe

## DISTINGUISHED CENTENARIANS

According to our records, Staley joins this elite group of Mines alumni centenarians: **Edward Carter '38**, born May 1912; **John Tower '35**, born August 1912; **Herbert Heckt '36**, born December 1912. Candidates up for induction this year include **Lee Talbert '36**, born August 1913; **Donald Cadwell '39**, born September 1913; and **George Jenkin '38**, born October 1913.

### 1995

James W. Barron  
Andrea R. Castle  
T. Jasper Fai  
Brian W. Fehr  
Paul W. Gaasbeck  
Jhairo J. Garcia  
Barry J. Gaston Jr.  
Steven N. Graese  
Patrick T. Hogelin  
Douglas L. House  
Donald M. Landry

Francois J.M. Laurans  
William M. Moss  
Richard M. Wenzel III

### 1996

Pedro Alvarado  
Eric J. Bengtson  
Douglas P. Collins  
Peter A. Frazier  
T. Scott Geiser  
Peter A. Gotseff  
Matthew K. Johnson

Kristin D.H. K'eit  
Ilya Kats  
Kendra L. Lema  
Aaron E. Macarelli  
Stafford R. Maheu Jr.  
Adrian Peinado  
Sarah R. Pietraszek-Mattner  
Ryan D. Ricks  
Craig F. Wickstrom  
Ryan E. Zorn

### 1997

Tammerin K. Bishop  
J. Larry Breckenridge  
Matthew J. Buckley  
Brian R. Deurloo  
Randy G. Edelen  
Jamie J. Happ  
Wm. Mark Hart  
Benjamin S. Hoffner  
Frederick W. Hood  
Gregory P. Lafave  
Susan Evers Matsushima

Cassandra K. Quaintance  
Devin B. Ray  
Mark E. Slusser  
Elizabeth J. Young-Dohe

### 1998

Randy R. Anway  
Donald W. Conley  
Jerome R. Edwards  
Shane A. Holecek  
Letitia B. Knott  
Michelle M. Lamb

Raul E. Lema  
Travis T. Moore  
Robert B. Smetana  
Brett W. Thompson  
Amber T. Vail

### 1999

Keith I. Dougherty  
Jacob M. Hoban  
Steven T. Kendrick  
Andrew P. Lathrop  
Tathagata Tota  
Mukherjee

Gordon L. Olson  
Frank M. Spinuzzi Jr.

**2000**

Jennifer Ayers Brasher  
Ryan G. Fisher  
John R. Gregg  
David J. Livesay  
Heidi L. Morrow  
Eric A. Olson  
Jared M. Purdy  
Joshua M. Thomason  
Carlos Toribio  
Williams-Rojas

**2001**

Adam E. Douglas  
Matthew C. Douglass  
Andrew M. Haney  
Jaclyn B. Haney  
Ryan R. Hansen  
William D. Harrop  
James Dustin Mars  
Gwenola Michaud

**2002**

Jiny V. Carrera  
Ryan J. Countryman  
Jeramyn J. Feucht  
Chad L. Goerzen  
Jeffrey L. Hampton  
Agung Hariyadi  
Kazuhiro Kawahata  
M. Zachary Knarr  
Eric P. Lamphear  
Alan L. LeJeune II  
Michael A. Martinez-Schiferl  
Michael M. McKee  
Eric R. Miller  
Wesley E. Reynolds  
Robert C. Sawaya  
Kyle C. Tingle

**2003**

Shawn A. Begay  
Brian P. Flannery  
James Johnson  
Nathan J. Lewis  
Peter M. McCarty  
Matthew L. McKenna  
Christopher M. Mnych  
Nicholas Alexander Podolak  
Zane T. Prickett  
Suzanne E. Reilly  
Meghan C. Waterbury

**2004**

Katelyn E. Baker  
Clayton R. Brown  
Scott S. Brown  
Daniel M. Cichy  
Timothy Clem  
John T. Desens  
N. Jordan Dimick  
Russell J. Dow  
Tony Hahn  
Raymond L. Hill III  
Joshua R. Lamb  
Jennifer M. Lazetera  
Emily M. LeJeune  
Angela K. Lemmerman  
Patricia B. Moran  
James M. Mosby  
Laura E. Pate  
James H. Read  
Jennifer L. Schenkman  
Nancy L. Schur  
Daniel J. Trapp  
Ryan P. Trunck  
Virginia G. Willett

**2005**

Christopher M. Aasted  
Amanda E. Adams  
Jonathan E. Chan

Mark P. Chung  
Trenton C. Clerkin  
David R. Farrar  
Nicholas D. Fetig  
John A. Harvey  
Casey L. Hensley  
James R. Hutchison III  
Jonathan T. Moe  
Jolene Mulumba  
Adam T. Ringler  
Jedidiah D. Rust  
Christopher W. Schaumberg  
Andrew P. Schmid  
Richard S. Vigil

**2006**

Ryan W. Butacan  
Sean T. Cavanagh  
Andrew N. Cavendor  
Austin R. Christensen  
Ryan M. Collett  
Patrick A. Cordova  
Huub Douma  
Jeremy D. Fields  
Jared M. Heath  
Kyra R. Long  
Dmitriy M. Mestetskiy  
Derrick R. Rodriguez  
Brandon L. Segura  
Wade W. Simmons  
Andrew R. Stolzmann  
Ross T. Wagle  
Thomas A. Wagner  
Chad T. Weaver  
Patrick R. Wieck  
Ryan Zarkesh

**2007**

David R. Bernard  
Robert H. Blanchard II  
Michael T. Dermyer  
Justin Green

Jeffrey M. Hammer  
Nathan T. Hancock  
Donald C. Hazen  
Jesse E. Hensley  
Matthew P. Hergert  
Dylan C. Klaus  
Kelly N. Kloosterman  
Ulrich K. Koberg  
Ronald Jason Livesay  
Allison M. McCormick  
Spencer G. Mills  
Jonathan M. Mullen  
Lilia Paradis  
Elliott B. Petri  
Amanda E. Rebol  
Robert B. Riley  
Caleb A. Ring  
Christopher M. Seick  
Bryce R. Shaffer  
Daniel K. Steele  
Garrett J. Whipp  
Craig W. Wilcox  
Kristine Wille  
Shiu-Hang Yueh

**2008**

Richard D. Barnes  
Wendy E. Brost  
Sarah E. Casias  
Alexis G. Dobrinen  
Brian D. Gillingham  
Matthew T. Hartmann  
Dustin J. Haynie  
Michael Hoban  
Benjamin W. Juba  
Noelle A. Jupille  
Jeffrey M. Kramer  
Aaron D. Krening  
Rachel R. Miller  
Elizabeth F. Newton  
Hayes  
Thomas L. Papiernik  
Michael Phillips

Osama M. Raba  
Antonio M. Reyes  
Franklin J. Ryk  
Zachery J. Swanson  
Zachary J. Thompson  
Julia Turelli  
Danielle Uhl  
Joel T. Walden  
Daniel L. Whitenack  
Rachel B. Yee

**2009**

Kevin A. Alkema  
Diron H. Baker  
Hamish K. Bala  
Jacob A. Ball  
Matthew D. Bokan  
Thomas L. Boyles  
H. Scott Bromley  
Ryan A. Cline  
Jason H. Decker  
Theodore H. Decker  
Steven D. Easter  
Sherif M. El Khatib  
Erin M. Fagan  
Taylor C. Fisher  
Grant M. Gunhus  
Christina L. Hadad  
Alex Hamilton  
Levi E. Harris  
Vincent J. Hecker  
Theron J. Hoedel  
Nicholas J. Libertini  
Kyle D. Lieurance  
Jaron J. Lucero  
Michael McMonigle  
Sarah McMerney  
Luca Morandi  
Kenneth C. Nygaard  
Andrew I. O'Loughlin  
Tyler Robbins  
Joseph D. Schneiderwind

Kevin W. Smith  
Kale A. Stanton  
Ian A. Storz  
Craig M. Thompson  
Zachary C. Waite  
Michael A. Walls  
Zachary R. Wertemberger  
Brian P. Wilson  
Nathan D. Work  
John R. Zisch

**2010**

Scott M. Ardeel  
Robert J. Beach  
Kinzie C. Beavers  
Heather E. Bergren  
Terrance R. Birdsall  
Steven J. Bjornseth  
Adam F. Botts  
Peter D. Bucknam  
Karen L. Canter  
Kaitlyn C. Clark  
Scott W. Cochran  
Chad A. Daigle  
Noel B. Dillman  
Taylor H. Embury  
John C. Fischer II  
Kevin M. Fisher  
Jonathan P. Garlick  
Lillian I. Giddings  
Jessica C. Grainger  
Judson T. Greenwood  
Aaron H. Gremmer  
Jeffrey D. Harrell  
Sarah E. Henderson  
Dylan S. Hoback  
Silver C. Ibenye  
Raymond Y. Kim  
James W. Klingler  
Kristianna Koelmel  
Joseph R. Kovacich  
Evan J. Lindenbach

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Patent Attorney, Principal  
B.S., Petroleum Engineering,  
1981



**Doug Swartz**  
Patent Attorney, Principal  
B.S., Mining Engineering,  
Minor in Metallurgical  
Engineering, 1982



**Brad Knepper**  
Patent Attorney, Principal  
B.S., Electrical Engineering,  
1998



**Matthew Ellsworth**  
Patent Agent/Technical Specialist  
B.S., Engineering, with honors, 2003  
M.S., Engineering Technology  
Management, 2005  
Top Graduating Electrical Engineer

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## ALUMNA PROFILE

# Work in Nuclear Reactor Fuels Earns Alumna Presidential Award

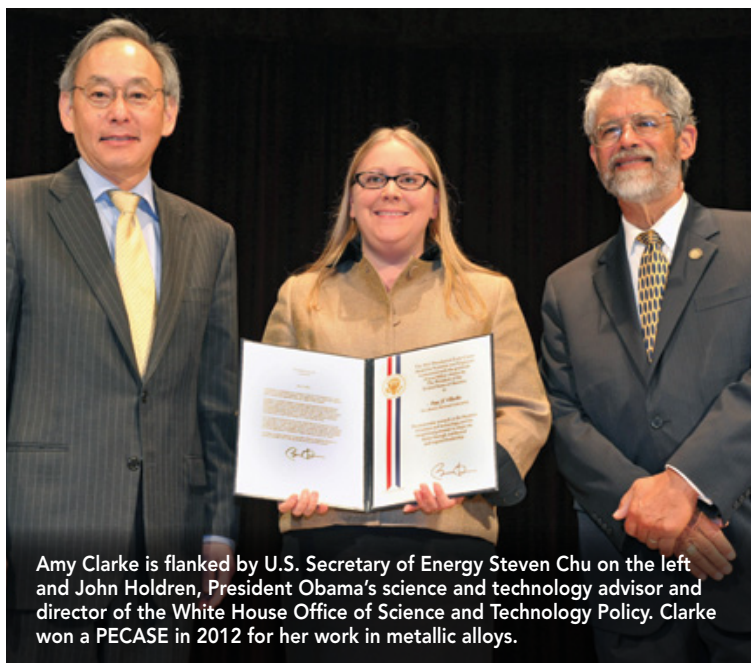
In 2012, Amy Clarke MS '02, PhD '06 produced a metallurgical first: movies that show bulk metallic alloys in the process of crystallizing. It might not sound like blockbuster footage, but it helped earn her a trip to the White House and one of the nation's top awards for young scientists—a Presidential Early Career Award for Scientists and Engineers (PECASE). Clarke is currently a research and development scientist at Los Alamos National Laboratory.

In addition to recognizing Clarke's groundbreaking research on how the strength of a uranium-niobium alloy varies depending on the orientation of the crystalline structure, the award cites her work "using in-situ solidification and proton radiography with potential to finally resolve liquid-solid processing questions." Clarke explains, "We're now able to see inside a material while it's solidifying. We're able to see the microstructure develop, which ultimately can tell us a lot about how processing parameters will influence properties; it has a lot of potential for industrially important materials." Her work in this arena also earned Clarke a United States Department of Energy Office of Science Early Career Research Program Award in 2012.

Processing microstructure and property relationships in materials is an extension of Clarke's investigations at Mines in the Advanced Steel Processing and Products Research Center, where the Michigan native helped pioneer new processing techniques in sheet steel.

"The physical metallurgy of steel has a lot of similarity to the physical metallurgy of uranium," she says. "I was able to take my experience working with steel and apply it to uranium."

Clarke began working with steel as an undergraduate at Michigan Technical University, where she graduated magna cum laude in 2000. She chose Mines for her graduate studies because the steel center was one of the few places in the



Amy Clarke is flanked by U.S. Secretary of Energy Steven Chu on the left and John Holdren, President Obama's science and technology advisor and director of the White House Office of Science and Technology Policy. Clarke won a PECASE in 2012 for her work in metallic alloys.

Sandy Schaeffer

country where she could conduct the type of research she wanted to pursue. Her Mines dissertation won the prestigious Willy Korf Award for Young Excellence in 2007.

"Amy is a natural collaborator, and has already established a strong track record," says John Speer, a professor of metallurgical and materials engineering at Mines who served as Clarke's dissertation advisor. "She's enthusiastic, thoughtful, and not afraid to address new challenges in research."

In addition to honoring her research skills, the PECASE award recognizes Clarke for mentoring future metallurgists. She remains active in the steel center (of which Los Alamos National Laboratory is a sponsor), traveling to Mines routinely to collaborate with graduate students.

"That's something I truly appreciated about the steel center," she says. "As a student, I had the unique opportunity to interact with scientists from industry and Los Alamos National

Laboratory. I've been really lucky to collaborate with these individuals."

Clarke is hardly through investigating steel: The next step, she says, is using feedback from real-time monitoring to make in-process parameter changes that modulate microstructure evolution to achieve a desired set of properties. Her PECASE—which comes with five years of funding—will help her

continue this work. And she will almost certainly remain a familiar face at the steel center, mentoring students and continuing her collaborations.

"The steel center is one of a kind," Clarke says. "It integrates academic, industry and lab activities in a way that no other center really does."

—Larry Borowsky

"We're now able to see inside a material while it's solidifying... to see the microstructure develop..."

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James O. Vickery  
Jacob F. Weigel  
Nicholas Zehring   
Abdel Zellou 


### 2011

Tariq A. Al-Ghamdi  
Kristopher M. Alley  
Koehler B. Anderson  
Jeffrey C. Arneson  
Marcus B. Baltazar  
Angela G. Barber  
Joel D. Barber  
Baharak Barzegar Alamdari  
Mark J. Cahill  
Daniel W. Chin  
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Kevin P. Franzen  
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Eric W. Garner  
Monica L. Grigg  
Kristin R. Guerin  
Levi P. Gustin  
Jacob T. Guynes  
Bradley W. Harju  
Christopher R. Harper  
Dru F. Harrison  
Sidra Hussain   
Kathryn Johns  
Gregory M. Jones

Samuel T. Kenkel  
Christopher D. Kramer  
Joshua T. Kroschel  
Michael J. LeBaron  
Adam P. Lockard  
Ann M. Lott  
Regeena R. Martinez  
Robert K. May  
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Mark L. Moyer  
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Cassidy E. Pangell  
Graham W. Patton  
Marco E. Pena  
Siarhei A. Piletski  
Michael J. Pollachek  
Bruno Protti  
Benjamin E. Reisinger  
Tatiana Reyes Hernandez  
Nicolas W. Ricca  
Gianna D. Ricotta  
Graham R. Riddile  
Bryce A. Robbins  
Devin J. Roswold  
Devin C. Sammon  
Jesse M. Sewczak  
Ravi Sharma  
Jeffrey D. Shoffner  
Nathan L. Shultz  
Todd E. Sibelius  
Andrew W. Smallin  
Andrew Smith  
Jordan S. Smith  
Tyler B. Smith  
Theresa L. Sung  
Desiree N. Tan  
Jeffrey B. Tattershall  
Matthew A. Taylor

Jessica N. Thompson  
Jamee G. Thurlow  
James A. Tucker  
Daniel C. Vagasky  
Zachary D. Vaughn  
Brian Wagner  
Alec D. Westerman  
Denver C. Williams  
Essau J. Worthy-Blackwell  
Rustem K. Yermekbayev

### 2012

Nicole M. Bacovcin  
William O. Boyer  
Amir Chamanifard  
Kevin D. Coleman  
Abigail R. Dewsnap  
Patrick D. Eddy   
Fatima Azzahra El Azzouzi  
Mohammad M. ElBaharia  
Cory J. Forgrave  
Midowa D. Gbededo  
Robert W. Hoefler  
Heather B. Hunt  
Joel D. Igli  
Emily C. Kuhr  
Jordan S. Larsen  
David C. Lipp  
Taylor J. Lowe  
Gordon V. Lu  
Kirtland I. McKenna  
Jose A. Molina-Galeano  
Chelsea L. Newgord  
Melanie Newman  
Travis M. Pitcher  
Benjamin L. Rosen  
Leanne M. Stember  
Mariah R. Stettner  
Anil Tokcan  
Nathaniel D. Walker  
Bree Waltman  
Blair L. Wendt  
Christy A. Woodward



### SERVICE AWARD

Stephen Coryell MS '10 (right) received the Emerging Professional Achievement Award from ASM International in 2012, according to *Advanced Materials & Processes* magazine. The award, established in 2010, "recognizes and honors extraordinary ASM volunteers ... [with] 0-5 years of experience post-graduation, who have made a significant impact on ASM International through devoted service and dedication to the future of the Society."

## ALUMNUS PROFILE

# Engineer by Day, Fighter by Night

At 6'2" and 275 pounds, with a slick, bald head, neatly trimmed goatee and several tattoos stretching across his biceps, Shane Carwin '04 looks the part of an Ultimate Fighting champion. But get him outside the metal cage, where he is known for his hard, tactical punches, and you discover a soft-spoken engineer and a dedicated family man.

"I am just an average, normal guy who goes to work every day," says Carwin, 38, during a January lunch break from his day job with the North Weld County Water District in Greeley.

Since entering the ring for his first mixed martial arts (MMA) competition in 2005, Carwin has led a double life: creating maps and computer models of water systems by day, and climbing the ranks in what is considered one of the nation's most brutal professional sports by night. In March 2010, he was awarded the interim title of the nation's Ultimate Fighting Heavyweight Champion, and during the fall of 2012, he starred in the hit FX reality show, "The Ultimate Fighter," which averaged 850,000 viewers over 11 episodes.

But unlike his fellow fighters—many of whom don't have jobs outside the sport—Carwin sees himself first as an engineer, and even credits his schooling for his athletic success.

"Just being mentally strong is one of my best attributes, and that was definitely tested at Mines," he says. "There was a ton of pressure. I had to fight for what I wanted."

The youngest of three boys, Carwin was raised by a single mom in Greeley, where he developed a love of sports and an interest in engineering at an early age. After he applied to Mines from high school without success, he went to Western State College, where he quickly became a wrestling and football star.

He was considered a hot prospect for the NFL draft in 1998 until he injured his back, but still had the opportunity to play professionally for the New England Sea Wolves. However, urged on by his mother, he opted instead to knock on Mines' door again.

"By the time I got to Mines, I figured I was done with athletics," says Carwin. "I just buckled down."

One year after graduating and landing a job with Weld County, Carwin had a friend invite him to step in for an MMA fighter who had to back out last-minute. "I'd never really even been in a fight," he recalls. "Everyone thought I was crazy and I was going to get killed. It was the big joke around the office."

Before a screaming crowd at an American Indian reservation in California, a nervous Carwin stepped into the cage and found his new calling. "I loved it. I felt like an athlete again," he says.

He won his first 11 fights in the first round.

A technically challenging mix of wrestling, boxing and martial



"The Engineer," as Shane Carwin is known in MMA circles, balances his training and fights with his day job at North Weld County Water District.

Trevor Wittman

arts, the sport was once banned from venues across the country due to a barbaric anything-goes reputation. But thanks to new rules and a cleaner image, it is now one of the fastest-growing professional sports in the country. In 2010, 1.16 million pay-per-view buys were recorded for UFC 116, where Carwin was one of four headlining fighters.

With his rare combination of massive physique, agility, sharp intellect and calm demeanor, Carwin—known as "The Engineer"—quickly became one of its golden boys.

"When it comes to training, he catches things so quickly because he is just so intelligent," says Trevor Wittman, owner of Grudge Training Center in Denver, where Carwin trains. "And he is the most laid-back guy ever."

Maintaining two careers at once leaves his schedule anything but laid back: He works in Greeley from 7 a.m. to 4 p.m. and then drives to Denver to train from 5 to 9 p.m. Most nights he arrives home around 10:30 p.m.

When FX called to see if he could come to Las Vegas for six weeks to star in the reality show, Carwin was able to clear it with his board of directors, but it was no vacation. During production, while others in the show settled in for the evening after a day of filming, he was updating hydraulic models and

designing pump stations on his laptop.

Why not just fight for a living?

With six bulging discs, a bum knee and a litany of surgeries behind him, Carwin knows better.

"I have a wife and two kids, and I have to make sure they are taken care of," says Carwin, who has their three names, along with a cross in honor of his faith, tattooed on his arm. "I don't think that any type of professional sport is a lifelong career. Besides, I went to school for a reason. I love my job."

—Lisa Marshall

"Everyone thought I was crazy and I was going to get killed. It was the big joke around the office."



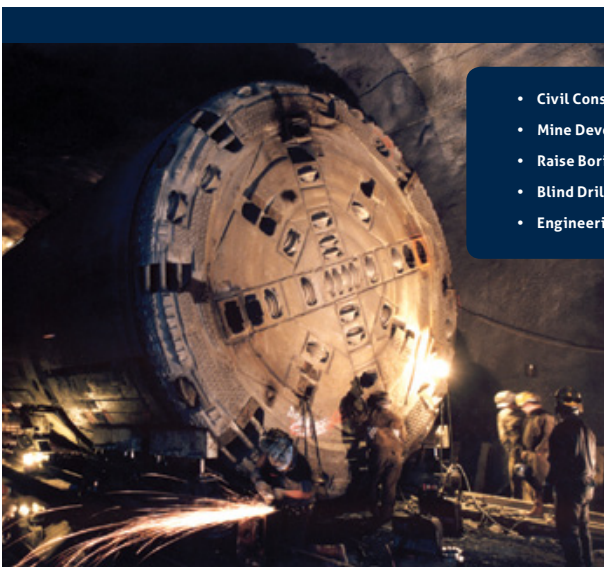
**RELATIONSHIP RENEWED** Erika Jonson, who attended Mines 1995–1997, and Grant Miller '99 were married on September 9, 2012, in Castle Rock, Colo. The couple met in 1995 during their freshman year, but only began dating in 2008. Three Mines alumni were in the wedding party—groomsmen (left to right) Graig Crawford '99 and Barrett Friesen '99 and bridesmaid Julia (Kremer) Greb '00.



**WEDDING BELLS** Josh Morin '10 married Merissa Reeder on August 13, 2011, in Colorado Springs, Colo. Josh's sister, Julia Morin, currently a junior at Mines (see "The Best Gigs on Campus," p. 18), was in the wedding party and Sean Zeek '10 attended.



**HIGH-FLYING HOBBY** Steve Anderson '75 says it took him four years to build "Miss Mimi," a Van's RV-7A experimental sport plane. With a cruising speed of 200 mph, it can perform aerobatics and land on primitive grass airstrips, which is great for camping (what he and his dog, Cherie, were up to here). He says that given the time and effort required to build a plane, enthusiasts refer to these projects as "aluminum mistresses," but he named the plane after his biggest supporter, his wife.



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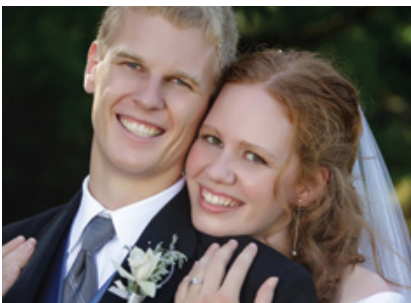


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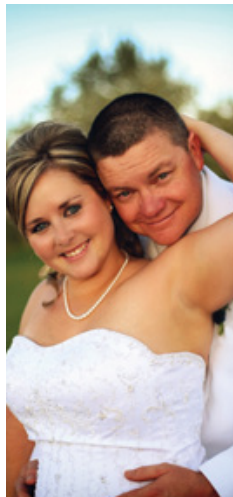
**AIRPLANE ROMANCE** After falling in love on the plane ride to their research trip abroad in Norway, Matt Bergren '09 and Heather Oertli '10 were married in Littleton, Colo., on May 19, 2012, exactly three years after they began dating. Three Mines alumni were in the wedding party: Robert Bergren '06, Clifton Oertli '07, MS '09 and Alexandra (Swanson) Clymer '10.



**THEY GO WAY BACK** Ashley Young '10 and Tom Begley '10 met in high school and sealed the deal at Mines, marrying on July 24, 2010, in Loveland, Colo. The wedding party included several Mines alumni, including Daniel '10 and Diana (Goodrich) '10 Houghtaling, Keith Stevens '11, John Dibble '11, Katie Mills '11, Alison Brinton '10 and Kathryn Chinn '10. More than 30 Mines alumni attended.



**HONORING DIVERSITY** Chontel Trujillo '00 (pictured here with IBM General Manager Adalio Sanchez) received the 2012 Society of Hispanic Professional Engineers' Diversity Award for her work in the advancement of Hispanic individuals through job promotions, business development and community activities at IBM. Trujillo is manager of IBM's Boulder Planning, Facility Contracts and Environmental Engineering team and is a mentor to a Mines student. Her husband, Gordon Trujillo '00, was present to see her receive the award.



**WESTERN SLOPE WEDDING** Danielle R. Sheffield '08 and Eugene Uhl were married May 19, 2012, at the Adobe Creek National Golf Course in Fruita, Colo. Melissa Van Baalen '07 was in the wedding party, and Colin Fitzgerald '07, Mariya (Lein) Miller '08 and Matt Frohbieter '10 attended the ceremony.



**NEW SAUDI CHAPTER** In mid-December, the inaugural gathering of the first CSMAA section established in Saudi Arabia took place at a restaurant in Dhahran.



## FUTURE

Bequests are an important part of charitable giving at Mines. Give wings to the future by naming the Colorado School of Mines Foundation as a beneficiary of your will, trust, life insurance policy or IRA.

Discover more details by contacting:

**Chris Wenger**  
*Senior Director, Gift Planning*  
 303.273.3275  
 cwenger@mines.edu  
[giving.mines.edu/giftplanning](http://giving.mines.edu/giftplanning)



Providing service and information for charitable gift planning.



**CELEBRATING SILVER IN GOLD** Habash Semimbar MS '92 of Kuala Lumpur and his wife, Ida Ekandari, celebrated their 25th wedding anniversary on February 19, 2011. Their attire is a Malay wedding costume from Central Sumatra, Indonesia.



**MOUNTAIN WEDDING** Cooper Swenson MS '04 married Brenda James on July 17, 2011, in Breckenridge, Colo. Swenson serves on the CSMAA Board of Directors.



**SMALL AND SWEET** Ryan Countryman '02 married Michelle Sprow on July 21, 2012, in Aurora, Colo., in an intimate 30-guest ceremony.



**BACK IN THE U.K.** Charlotte Coates '07 and Kevin McNamee '05, MS '07 married on August 22, 2012, at Drumtochty Castle in Auchenblae, Scotland. Nine alumni attended. The couple met at a Greek event at Mines—she joined Pi Beta Phi and he Sigma Alpha Epsilon. They now live in Scotland.



**HAPPY IN HOUSTON** Jenny LaGessee MS '05 and Larry Mortazavi were married on October 27, 2012, in Houston, Texas, where Jenny is a petrophysicist for Chevron and Larry is a psychiatry resident at Baylor School of Medicine.



**HONORARY THIRD DEGREE** Jim Payne '59 (center) delivered the commencement address and was awarded an honorary doctorate in April 2012 by Golden Gate University, where he earned a master's degree in 1974. Also photographed: GGU President Dan Angel (left) and Al Johnson, a former dean. Payne is CEO and chairman of Shona Energy in Houston, Texas.

**ALUMNI:** What in the world are you doing? Send us your photos and a brief description of your activities (for instance, getting married, growing your families, traveling, meeting other alumni) to [magazine@mines.edu](mailto:magazine@mines.edu).

# THANK YOU FOR FUELING MINES' INCREDIBLE MOMENTUM.

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## COLORADO SCHOOL OF MINES RECENTLY\* RECEIVED 15 OUTSTANDING LEADERSHIP GIFTS AND COMMITMENTS:

**The Adolph Coors Foundation** contributed a total of \$200,000 in support for the William K. Coors Distinguished Chair in Chemical Engineering and the Herman F. Coors Professorial Chair in Ceramics.

A bequest distribution of \$252,500 from the estate of **Robert J. Andersen '54** will provide valuable support for Mines.

**Steve '64** and **Dollie Chesebro'** made a \$1 million commitment to the Clear Creek Athletics Complex.

**Chevron** contributed \$330,000 in support of several departments and initiatives through their University Partnership Program.

**Jerry '68** and **Tina Grandey** contributed more than \$3 million to establish the Grandey University Chair in Nuclear Science and Engineering.

**Halliburton** committed a total of \$2,041,000 to support Marquez Hall, the Halliburton Advanced Technology Graduate Fellows Program, the Multicultural Engineering Program, the Making the Connection outreach program and the Halliburton Professional Development Series.

**Al Ireson '47** made current and deferred gifts totaling \$421,000 toward the Ireson and Family Endowed Scholarship Fund and The Mines Fund.

**Harold R. '68** and **Patricia M. Korell** gave nearly \$300,000 to the Clear Creek Athletics Complex.

**Francis J. '52** and **Mary Labriola** made gifts totaling \$1,025,000 in support for the Labriola Endowed Scholarship Fund and The Mines Fund.

**Marathon Oil Corporation** gave \$120,000 to support the Marathon Center of Excellence for Reservoir Studies.

**Robert E. III '68** and **Ann McKee** contributed \$987,183 toward the Clear Creek Athletics Complex.

**Newmont Mining Corporation** made gifts and commitments totaling \$450,000 in support for scholarships, the College of Earth Resource Sciences and Engineering, the College of Applied Science and Engineering, and the Center for Innovation in Earth Resources Science and Engineering.

**Shell Oil Company** contributed \$104,000 in support of the Leadership Summit and several academic departments and programs.

Bequest distributions of \$495,000 from the estate of **Marian K. Van Kirk** will support scholarships at Mines.

**Jeff '82** and **Gina Vaughan** contributed \$100,000 to establish the Vaughan Scholarship Fund.

## Other generous gifts and commitments of \$25,000 and more:

**Anadarko Petroleum Corporation** contributed \$25,000 in support for the Petroleum Engineering Department.

**Aqua-Aerobic Systems, Inc.** contributed \$30,000 in support for the Advanced Water Technology Center (AQWATEC).

**ArcelorMittal** contributed \$50,000 to support the Metallurgical and Materials Engineering Department, Senior Design, the Multicultural Engineering Program and the campus chapter of the Society of Women Engineers.

**Tim '71** and **Barbara Bartshe** contributed \$25,000 to the Bartshe Endowment, which supports graduate students in geology.

**Dan W. Bench '58** contributed a mineral specimen to the Colorado School of Mines Geology Museum.

**Marshall C. III '67** and **Jane Crouch** contributed \$35,000 toward geology teaching and research, as well as scholarships for geophysics students.

**Robert P. Daniels '85** committed \$25,000 toward the Robert J. Weimer Distinguished Endowed Chair in Sedimentary and Petroleum Geology.

A bequest distribution of \$55,996 from the estate of **Genevieve A. Darden** will support the Darden Scholarship Fund in memory of her husband, longtime Mines coach **James W. Darden**.

**Paul '74** and **Terri Dorr** increased their funding for scholarships with an additional \$56,000 commitment through their family's **Hope's Enduring Flame Foundation**.

**The Energy Cup** gave \$40,000 in support for the Energy Cup Scholarship Fund.

**ExxonMobil** made gifts totaling \$55,000 to support several departments and the Don L. and Patricia Warner Scholarship Fund.

**Tim '70** and **Mary Haddon** contributed \$25,000 to The Mines Fund.

**Howard E. '76 '77** and **Cherine Janzen** contributed \$25,000 to The Mines Fund.

**Larry Johnson '74** established an endowed fund benefiting physics with a \$25,000 gift.

**Thomas Jorden '80** contributed \$25,000 to The Mines Fund.

**William F. '52** and **Marilyn W. Oline** made a gift of \$29,855 in support for the Harry C. and Sheila K. Kent Petroleum Geology Graduate Scholarship Fund.

**Oxy** gave \$45,000 in support for the chemical and biological engineering, geology and geological engineering and petroleum engineering departments.

**Peabody Energy** gave \$25,000 in support of the mining engineering department.

With personal and memorial gifts totaling \$25,000, **Becky Pearson** established the Bob Pearson Endowed Soccer Scholarship Fund in honor and memory of her late spouse **Robert W. "Bob" Pearson '59**, former Mines coach, teacher and mentor.

**Andy '79** and **Suzanne Peterson** contributed \$25,536 toward Mines' Admissions to create outreach initiatives with STRIVE Preparatory Schools in Denver.

**Thomas W. '53** and **Mary M. Rollins** committed \$25,000 toward the Robert J. Weimer Distinguished Endowed Chair in Sedimentary and Petroleum Geology.

**Frank** and **Ellen Schowengerdt** contributed \$26,799 in to establish the Schowengerdt Endowed Scholarship Fund benefiting physics students.

**Chuck '61** and **Louanne Shultz** contributed \$55,000 in support for the Charles and Louanne Shultz Athletic Scholarship Endowment Fund.

**SM Energy Company** committed \$25,000 in continued support for Marquez Hall.

**Michael R. '83** and **Patricia K. '83 Starzer** contributed \$25,000 to The Mines Fund.

**Joan V. Stratton '74** contributed \$25,775 to establish her second gift annuity at Mines.

**The Viola Vestal Coulter Foundation** contributed \$35,000 toward the Coulter Chair for Mineral Economics.

**Don L. '56 '61** and **Patricia Ann Warner** contributed \$30,000 to establish the Warner Scholarship Fund.

**James R. Weber '71** gave \$35,000 in support for the Jack R. and Mary D. Weber Endowed Fellowship Fund.

**Nearly 20 former students of Dean Ramona Graves** contributed gifts totaling \$25,000 to establish the Ramona M. Graves Endowed Scholarship Fund in her honor.



COLORADO SCHOOL OF MINES  
FOUNDATION

\* The CSM Foundation received the gifts and commitments listed here between 8/16/12 and 12/31/12.

# 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



**WILLIAM J. ARBEGAST JR.** '74 of Rapid City, S.D., died November 28, 2009. Born in 1951, Bill received a bachelor's degree in metallurgical engineering

from Mines, where he was a member of Kappa Sigma fraternity. From 1974 to 1990, he was a senior staff engineer at Martin Marietta Astronautics Group, Space Launch Systems Division, and later worked for the company when it became Lockheed Martin; there he became the principal friction stir processing investigator. In 2001, Bill was appointed director of the Advanced Materials Processing and Joining Laboratory at the South Dakota School of Mines. He also became director of the National Science Foundation's multi-university Industry/University Cooperative Research Center for Friction Stir Processing when the center was established in 2004. He served as the director of the AMP Lab and CFSP until his death. Bill published more than 50 papers in national and international journals, held six patents and generated millions of dollars in research funding related to friction stir processing. He is survived by his daughters, Leanne Stover and Kati Patterson; former wife and friend Christine Arbegast; close friend Mary Basoco; and four grandchildren.



**VALENCIA L. BARREE** '86 of Littleton, Colo., died August 6, 2011. Born in 1957 into an Air Force family, she moved often; homes included Texas,

Greece, Montana, South Dakota and, ultimately, Denver. Val studied classical cello performance at Colorado

State University and the University of Denver, and then earned a bachelor's degree in mathematics from Mines, where she was a member of Tau Beta Pi. After graduation and a brief stint as an instructor at Arapahoe Community College, she focused on software development for core test analysis and instrumentation under the company name Custom Scientific Tools. The software she developed included tools for the acquisition and analysis of relative permeability and capillary pressure data, as well as other customized testing procedures. In 1999, Val and her husband, Bob Barree PhD '84, formed Barree & Associates. In addition to her role as managing partner, her primary duties included well test analysis and software development for the Stim Lab Proppant Consortium and GOHFER. Along with her husband, Val is survived by her daughter, Mikaela; her sisters, Anne and Margaret; and her mother, Madge.



**CARL N. BIDINGER** '50 of Sun City West, Ariz., died August 25, 2011. Born in 1925 in Denver, Carl lived in the city until beginning

service in the Army Air Force as navigator and bombardier during World War II. After the war, he earned a professional degree in petroleum engineering from Mines, where he was a member of the Beta Theta Pi fraternity; later, as an alumnus, Carl supported the school as a member of the President's Council for several years. He spent 30 years with Union Oil, working in California, Texas and Oklahoma. Carl was widowed in 1965 when his first wife, Elinor, died. He retired to Arizona in 1984 with his second wife, Lillian Ruth Grider. In addition to Lillian, he is survived by his son,

Curt; daughter Beth Kinsey; and four grandchildren.



**JAMES H. BUTLER III** '52, PhD '72 of Houston, Texas, died April 30, 2012. Born in 1928, James joined the U.S. Army Corps of Engineers and

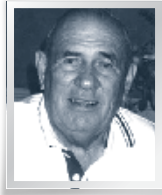
served in the Philippines at the end of World War II. He went on to earn a professional degree in geology from Mines, and returned 20 years later to earn his doctorate in the same field. As a student, he was a member of Sigma Alpha Epsilon fraternity, and later, as an alumnus, he remained close to the school, serving as a student mentor through CSMAA and as a member of the President's Council for several years. During his career, James worked for Bakke Oil, where he was instrumental in the discovery of the Bakke Field in Andrews County, Texas. After a year of teaching geology in Mexico City, he became an independent explorer in Midland, Texas, and later established the company Tri-Star Petroleum. In 1977, as part of a joint venture with Gulf Oil, he drilled a well reaching a record depth of 29,622 feet in the Delaware Basin. He is survived by his wife of 60 years, Emma; his sons, James and John; and six grandchildren.



**STEVEN C. DUNN** '84 of Anchorage, Alaska, died December 23, 2011. Born in 1962 in Salt Lake City, Utah, and raised in Colorado and Japan,

Steve was enrolled in the McBride Honors Program at Mines, where he graduated with a bachelor's degree in chemical engineering and petroleum

refining. Immediately after graduation, he embarked on a 25-year career in the oil and gas industry. Steve is survived by his wife, Laura McArdle; daughters Victoria Suhay, Olivia Reep-Dunn and Annaliese; sons Alexander Dunn and Preston Reep; his parents, Carol and John; brother Andy; and sister Karen Barnhart. His brother, Mike, preceded him in death.



**JACK F. EARL** '53 of Georgetown, Texas, died July 5, 2012. Jack was born in 1927, attended Glendale College, and then

earned a professional degree in geology from Mines, where he was a member of Sigma Alpha Epsilon fraternity and ROTC. He was also part of the local volunteer fire department. Jack received scholarships to Mines for basketball and football (playing quarterback), and he was also on the baseball team. He served in the U.S. Navy in World War II and as a first lieutenant in the U.S. Army Corps of Engineers in the Korean War.

Following graduation, Jack worked for Shell Oil as a petroleum engineer; he was also editor of World Oil Magazine and eventually became an independent oil operator. He is survived by his wife of 64 years, Mildred; daughters Susan Porter, Cynthia Alford, Shelby Riemer and Victoria Weil; nine grandchildren; and six great-grandchildren.



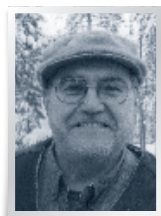
**GEORGE H. FENTRESS** '49 of Tekamah, Neb., died June 15, 2012. Born in 1920, George served as a second lieutenant in the U.S. Army Air Corps, later

graduating from Mines with a professional degree in geology. At Mines, he was a member of Beta Theta Pi fraternity, and he became an honorary member of the school's alumni association in 1968. He served for 10 years in the Colorado House of Representatives. George was also a member of the American Association of Petroleum Geologists. He is survived by his three children, and 21 grandchildren and great-grandchildren.



**WILLIAM L. HARVEY** '55 of Parker, Colo., died January 16, 2012. Born in 1932, he joined the Marine Corps Reserve group at Buckley Naval

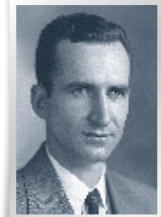
Air Station in 1949. A year later, he enlisted in the Marines and was sent to study telephone technology in San Diego. While earning his professional degree in geophysical engineering at Mines, Bill was a member of ROTC, Tau Beta Pi and Sigma Gamma Epsilon fraternity. In 2004, he was a member of the President's Council. He had several careers, including geophysical engineer in Montana and quality test engineer for Martin Marietta, writing and testing specifications for the Titan I Intercontinental Missile Project. Bill also worked on the Viking Lander, the Gemini VII/VI Launch and Project Dinosaur (a military version of Skylab). Bill was predeceased by his first wife of nearly 50 years, Marilyn. He is survived by his second wife, Joanne; son William; daughters Veronica McKay, Colleen Farmer and Teresa Brandon; and six grandchildren, including Connor McKay, currently a student at Mines.



**DAVID H. HEBB MS** '73 of Spokane, Wash., died October 13, 2012. Dave was born in 1942 and grew up in Waterbury, Conn., where he attended the University of

Connecticut and earned a bachelor's degree in geology in 1964. He worked for several companies as an exploration geologist before his commission as a second lieutenant in the U.S. Army Corps of Engineers in 1968; in this capacity, he was sent to Vietnam to research mineral deposits, especially materials for road surfacing. In 1971, Dave and his wife, Barbara, moved to Golden. Two years later, he graduated with a master's degree in mineral economics from Mines. Dave started two small businesses in Colorado—a coal bagging company and an antler buckle, button and jewelry business. He also served as a section coordinator for the alumni association. In 1987, he and his family moved to Spokane, where he

searched for alternative uses for industrial waste products bound for the landfill. He is survived by his wife of 44 years; daughter Jennifer; son Nicholas; and five grandchildren.



**THOMAS E. HOWARD** '41 of Wheat Ridge, Colo., died September 29, 2012. Born in 1919, Thomas ran for the cross-country team at Mines, where he earned a profes-

sional degree in mining engineering. He worked for Anaconda Copper Mining in Montana prior to serving in the U.S. Navy from 1944 to 1946. After being discharged, he worked for St. Louis Smelting Refining, Union Pacific Railroad and the U.S. Army Corps of Engineers. In 1951, he began a 20-year stint with the U.S. Bureau of Mines in Spokane, Wash., during which he designed a patented continuous shovel loader and became the agency's first director of mining research. In 1971, Thomas joined Joy Manufacturing as director of research in Galt, Ontario, and retired five years later to Wheat Ridge. He received the Daniel C. Jackling Award from AIME (now The American Institute of Mining, Metallurgical, and Petroleum Engineers) in 1975 for his work in rapid excavation. Thomas also invented a continuous mining machine, for which Joy Manufacturing received a patent in 1982. He was preceded in death by his wife of more than 70 years, Betty, and is survived by his son, Michael Howard, and six grandchildren.

**ALEX R. JACOBS** '62 of Sierra Vista, Ariz., died January 5, 2010. Born in 1932, Alex attended the U.S. Military Academy at West Point prior to earning a professional degree in mining engineering from Mines. During his career, he managed a uranium mine in Wyoming, a molybdenum mine in Idaho and a potash mine in New Mexico. He also had engineering and mining services posts in Charlotte, N.C.; Denver, Colo.; and Brisbane, Australia. Alex served as chairman of the Arizona Mining Association. He is survived by his wife of 47 years, Margaret; daughters Penny Cloonen and Annie Brady; sons Paul and Fred; and eight grandchildren.



**JAMES C. LAUGHRY** '76 of Bartlesville, Okla., died August 23, 2012. Jim was born in 1953. At Mines, he played football and participated in track

and field while earning a degree in geophysics. As an alumnus he was a member of the President's Council in 2001. During his 33-year career in the petroleum industry as an exploration geophysicist, he became a specialist in seismic interpretation software. Jim was member of the Society for Exploration Geophysics and wrote articles for its publications. He also volunteered as a youth mentor for the Tulsa school district. Jim is survived by his wife, Shirley; son Nelson; daughter Cheryl Essex; stepdaughter Sinda; granddaughter Katelyn Bisacky; his father, Arthur; brothers David and Richard; and sister Janet Parrett.



**PHILIP L. LAWRENCE** '49 of Richardson, Texas, died July 9, 2012. Born in 1923, Phil served in World War II in the 759th Field Artillery Battalion. He earned

a professional degree in geological engineering from Mines and went on to work for Mobil Oil as a geophysicist from 1949 until his retirement. A member of the American Geophysical Union during his career, he remained involved in many organizations throughout his life; his favorites were Zane Grey's West Society and Numismatics International. He was also a member of the Mines Century Society, Copper level. Phil was predeceased by his wife of 62 years, Jacqueline; he is survived by daughters Sheryle Hodapp and Debra Taylor.

**JAMES W. LEMM** '69 of Sugar Land, Texas, died August 8, 2011. Born in 1947, Jim earned a professional degree in petroleum engineering from Mines. After spending 36 years with Union Oil in California, he retired as general manager and later served as a consultant for IHS in Houston. He was a member of the Society of Petroleum Engineers. Jim is survived by his wife of 42 years, Gail; daughter Wendy Rives; son William; grandson Phillip Rives; and brother Thomas.



**EDWARD J. McDONALD IV** '99 of Littleton, Colo., died December 11, 2011. Born in 1970, Ed earned a degree in geological engineer-

ing from Mines, where he played for the Men's Rugby Club. At the time of his death, he was owner and operator of McDonald Engineering Services. Ed was a member of the American Society of Civil Engineers, the Association of Environmental and Engineering Geologists, and the Society for Mining, Metallurgy and Exploration. He is survived by his wife, Beth McDonald '98; four children, Maisri (9), Angus (6), Elsie (1) and Warren, who was born four months after his father's death; parents Pam Nolan and Edward McDonald; and brother Joshua.



**F.H. MERELLI** '59 of Conifer, Colo., died August 12, 2012. Mick, as he was called, was born in 1936. His professional degree in petroleum engineering from Mines initiated

a long career in the oil industry. He worked his way from field engineer to president of Tulsa, Okla.-based Terra Resources in 1979, where he remained until 1988, when he was named president of Apache in Denver. In 1992, he became chairman, president and CEO of Key Production, an Apache spin-off, and in 2002, he began in the same capacity for newly formed Cimarex Energy, where he remained until 2011.

Mick received the Distinguished Achievement Medal from Mines in 2001, was a member of the Century Society, Silver level, and was named Western Energy Alliance's Wildcatter of the Year in 2002 for his contributions to the industry. Mick was predeceased by his wife, Ginger. He is survived by his daughter, Cara Adams; sons Michael and Tighe; 11 grandchildren (including current Mines students Jonathon and Tessa Cummins); and three great-grandchildren.



**ROBERT W. PEARSON** '59 of Golden, Colo., died October 3, 2012. Born in 1933, Bob could see the "M" from his childhood home in Wheat Ridge, and

his connection to the school remained close his entire life, particularly in sports. While earning his professional degree in petroleum engineering, he participated in varsity track, basketball and football, as well as numerous intramural sports. After graduating, he served as an assistant basketball coach from 1965 to 1992 (during his tenure Mines won two conference championships), tennis coach from 1965 to 1977, soccer coach from 1980 to 1998, and softball coach from 1992 to 1995. In the years 1993-1996, the men's soccer team captured four conference titles and had a record of 39-26-2. Bob also served as director of intramural sports for 18 years and was on the staff of the Colorado School of Mines Alumni Association for seven years.

At CSMAA he created the sections program, recruiting more than 40 volunteer section leaders from as far away as Lima, Peru, who organized events and kept in touch with alumni in their regions. Bob also organized the first E-Days 'Round the World event, involving celebratory alumni gatherings in 40 locations around the world on the same day. After retiring from Mines, Bob coached two senior women's basketball teams that made it to the national championships in June 2005, with the 55-59 age group finishing sixth in the nation. He also coached a 70+ women's team.

Active in the Golden community, Bob served on the Colorado School of Mines Credit Union Board of Directors, and the CSMAA Board of Directors 1997-1999. He was awarded a Mines Medal in 2001, named an honorary member of CSMAA in 2003, and in 2005 he received the CSMAA Outstanding Alumnus Award. He is also a member of the Colorado School of Mines Athletics Hall of Fame. Bob is survived by his wife, Becky, and daughters Alyson and Emily.



**GORDON M. QUICK** '65 of Punta Gorda, Fla., died September 2, 2012. Gordon was born in 1942. He earned a professional degree in metallurgy

from Mines, where he was a member of Kappa Sigma fraternity and the golf team. After serving in Vietnam with the U.S. Army as a combat engineer officer, he attended the University of Kansas for one semester before leaving due to war protests on campus. He went on to spend 37 years with Pratt & Whitney in East Hartford, Conn., as a metallurgical engineer. In 2004, he retired to Punta Gorda, where he played golf regularly, and served as a director of the Burnt Store Lakes Property Owners Association from 2009 to 2012. Gordon was a 1999 member of the Mines President's Council. He is survived by his wife of 42 years, Linda; son David; and two grandsons.



**WILLIAM S. RANSOM** '60 of Oro Valley, Ariz., died August 29, 2012. Born in 1931, Bill joined the U.S. Navy after high school. After earning his profes-

sional degree in mining engineering from Mines, he traveled the world as a mining engineer for 40 years. In 1973, he moved to the Tucson area, where he served as section vice president for CSMAA. Bill is survived by his wife of almost 50 years, Emily; daughters Susan, Pat, Barbara, Debbie, Becky and Joan; sons Eric and Howard; 21 grandchildren; and 19 great-grandchildren.



**JENNIFER M. RONHOVDE** '08 of Broomfield, Colo., died October 20, 2012. Born in 1986, Jennifer earned a degree in petroleum engineer-

ing from Mines. She married Logan Ronhovde '11 five days after being diagnosed with leukemia (see story at mines magazine.com/2881/). Jennifer was a reservoir engineer and then operations engineer for Pioneer Natural Resources. She is survived by her husband; parents Ken and Shelley Rotramel; brother

Steven; uncle Brian Smith '85; and cousin Erik Smith '03. Her grandfather, William R. Smith '48, died in February 2012 (see *Mines* fall 2012 issue, p. 46).

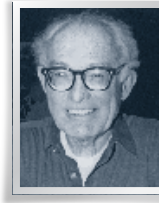


**JOE T. TAYLOR** '52 of Alamo, Calif., died August 30, 2012. Born in 1926, Joe enlisted in the U.S. Army upon his graduation from high school in

1944. He briefly attended Alabama and Auburn Universities until he turned 18, when he attended Officers Candidate School. Commissioned as a second lieutenant, Joe served in Germany until 1946. At Mines, he was a member of the 1951 football team (inducted into the Athletics Hall of Fame in 1999), and graduated with a professional degree in mining engineering. He graduated from the Stanford Sloan Program in 1969, and was a member of Mines' Resource Fund International Development Committee from 1975 to 1985. For 32 years, Joe worked for Kaiser Steel in Utah, New Mexico, Australia and California, retiring as VP of coal mining operations in 1984. He is survived by his wife of 59 years, Hannoria; son Thomas; daughters Terry and Leslie; and four grandchildren.

**JOHN E. TUTTLE** '49 of Brenham, Texas, died August 11, 2012. Born in 1926, John attended Stanford University while in the U.S. Army during World War II. At Mines, he was a member of Tau Beta Pi honor fraternity and earned

a professional degree in petroleum engineering. He worked as a licensed petroleum engineer for Shell Oil for more than 30 years, during which time he lived in five states and The Hague, Netherlands. After retiring at age 56, John spent the next three decades traveling with his wife, Dolores, throughout the United States and internationally, including golf vacations in Ireland and Scotland. A member of Mines' President's Council for more than a decade, he also belonged to the Society of Petroleum Engineers. In June 2012, Joe was predeceased by his wife of 60 years. He is survived by his son, John; daughters Donna Holt and Joy Stroud; and six grandchildren.



**JOHN H. WYATT** '50 of Denver, Colo., died November 4, 2012. Born in 1925, Jack earned a professional degree in mining engineering from Mines. In addition to his career as a mining engineer with Phelps Dodge, he served in the U.S. Army Reserve, retiring with the rank of captain. He was avidly devoted to music, and as a key organizer of the CSMAA Centennial celebration in 1995, he led the alumni band. A member of the Mines President's Council for three years, he was also a lifelong Mason. He is survived by his children, John and Karen; two grandchildren; and two great-grandchildren.

—Compiled and edited by Amie Chitwood and Nancy Webb

## ALSO REMEMBERED

<b>NEWTON M. ANDERSON</b> MS '55.....	January 4, 2005
<b>J. THOMAS BERNARD</b> '66.....	January 13, 2011
<b>CARL L. BIENIEWSKI</b> '52.....	April 4, 2010
<b>W. JEFFERSON FROST JR.</b> '64.....	February 3, 2012
<b>JOHN H.W. HAIG</b> '59.....	February 3, 2009
<b>FRANK G. HORINO</b> '44, MS '51.....	February 8, 2009
<b>BURT R. KRAMER</b> '42.....	March 25, 1994
<b>WALTER B. LEVY</b> '48.....	March 14, 2008
<b>DELWYN J. LOW</b> '45.....	June 13, 2008
<b>GALEN L. MEYER</b> '62.....	August 20, 2008
<b>ELMER T. MUSSELMAN</b> '48, MS '49.....	January 27, 2007
<b>DOUGLAS L. PEARCE</b> '42.....	May 19, 2010
<b>ROBERT L. PURSWELL</b> '73.....	January 4, 2009
<b>HAROLD A. ROGERS</b> '42.....	October 17, 1989
<b>JAMES H. WILLIAMS</b> '48.....	October 6, 2006
<b>SHAMSUZ ZAMAN</b> MS '55, MS '56.....	May 15, 2011

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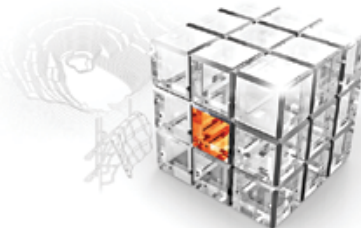
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# MINER'S PIC



## CAUGHT IN THE ACT

Our feature about the missing CU Boulder bell in the fall 2012 issue prompted one alumnus to email us these photos (see Inbox, p. 4), taken the night before the bell reappeared in 1950. His father and two uncles were in on the original heist, and two of the three are shown here helping to engrave the M. (No, we're still not naming names.)

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