

MINES MAGAZINE

COLORADO SCHOOL OF MINES ALUMNI MAGAZINE

Winter 2018 Volume 109 Number 1



FROM POINT A TO POINT Z

Mines alumni are looking to new technology to improve urban infrastructure and meet society's demand for better transportation.

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GROWING UP WITHOUT LIMITS

Mines students and alumni help inspire younger generations to reach their full potential.

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Mines students and alumni participate in several K-12 outreach activities to help promote STEM and introduce a wider variety of career possibilities to young students.

Photo by Colorado School of Mines



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Cover image: Eight Mines alumni worked on a new interchange at the entrance to the Mines campus that lowered U.S. 6 below 19th Street and created a parkland “lid” with paved trails, park space and a small amphitheater. The interchange’s unique design not only provides a safer way to cross U.S. 6 but also serves as a model for similar projects in the future. (Photo by Agata Bogucka)

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Mines alumni are looking to new technology to improve transportation in urban areas.

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TO VIEW WEB EXTRAS, PLEASE VISIT MAGAZINE.MINES.EDU

 **A CONVERSATION WITH DYKE HOWELL ’63**
Dyke Howell ’63 had a significant impact on some of the nation’s most well-known infrastructure, working on projects that included the I-70 tunnels through Glenwood Canyon and the visitor center at the Hoover Dam. Read our Q&A about his career and how underground construction and tunneling has changed over the last 50 years.

 **CELEBRATING I-DAY**
Every year, Mines celebrates the diversity of our community at International Day, hosted by Mines’ international students. The event features performances and international cuisine to represent the various cultures that make up the Mines community. View photos from this year’s event on our website.

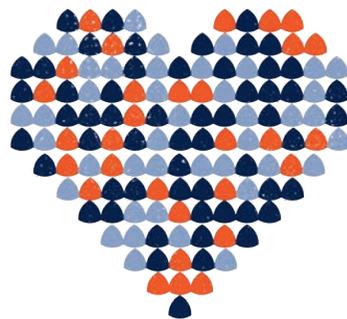
 **PARADE OF LIGHTS**
Mines played a small part in the 9News Parade of Lights, an annual holiday parade through downtown Denver. An electronic holiday carol by two Mines professors served as the soundtrack for a new parade float built and designed by Independent Electrical Contractors Rocky Mountain. Listen to and read more about the composition on *Mines Magazine’s* website.

 **MINES CYCLING TEAM**
The Mines Cycling Team competed in the USA Cycling Collegiate MTB National Championships in October 2017, placing second overall as a Club D2 team. Check out this issue’s Miner’s Pic to learn more about the competition, and visit our website to see more photos from the event.



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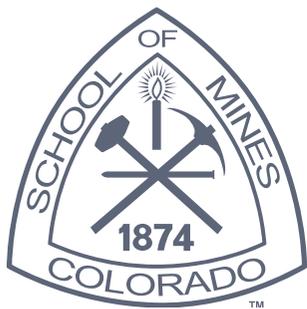
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Mines Magazine is published by Colorado School of Mines and the Mines Alumni Association for alumni and friends of the school. *Mines Magazine* is a critical communication serving the Colorado School of Mines community. Its mission is to keep readers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

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

ALUMNI NOTE

After meeting Joan Stratton '74 and learning the historical foundations of the McBride Honors Program, current student Madison Anderson shared her gratitude for the honors program, which has allowed her to embrace being part of the Mines community.

Photo by Ashley Spurgeon



SHARING EXPERIENCES, EMBRACING OPPORTUNITIES

Each year I've been at Mines, I've attended the Mines Send-Off Party, coordinated through the Office of Alumni Relations, near my hometown just east of Sacramento, California. This past July, I met an alumna, Joan Stratton, from the class of 1974. Joan visited Golden this semester and remembered I mentioned being in the McBride Honors Program, named after Mines' president from 1970 to 1984. She wanted to meet up to share more about the McBride family, as she lived with Guy and Rebekah McBride for some time and got to know them both very well.

Joan shared a story about her first interaction with President McBride. When Joan was a student, he gave a speech to the incoming class, much like President Paul C. Johnson did with my class. She recalled him saying that if students needed help and his porch light was on, they were welcome to knock on his door. She said the light was on at least 29 out of the 30 days of the month, more often than not.

Joan also recalled talking with President McBride when he was starting to develop the honors program, and I was able to share more about what we do.

Joan's stories, I think, stuck out because I could see how President McBride influenced the honors program's culture and community. His willingness to help students at any time speaks to the type of students in the program, who are willing to go out of their way to help and support others. Similarly, the reliability of Mr. McBride's light shows his dedication to academia and the Mines community. I've seen many of my fellow McBride students show similar dedication.

Joan also shared that President McBride was a skilled woodworker, which I think encapsulates the program's motto "Explore Your World." I think you can only truly find a passion as great as President McBride had for woodworking by exploring a variety of activities and experiences. The McBride Honors Program pushes students to do this in and out of the classroom. The practicum requirement also forces students to explore the world in different ways, which was definitely true for me when I traveled to Nepal in summer 2017 with Hike for Help and the service learning class.

Talking with Joan made me step back and really appreciate that I've been so lucky to be part of the McBride community and have the opportunity to embrace everything the program is dedicated to.

Madison Anderson

Civil Engineering and Applied Mathematics, Class of 2020

PRESIDENT'S CORNER

3 QUESTIONS WITH PRESIDENT JOHNSON

QUESTION #1

WHAT DO YOU LIKE TO DO IN YOUR FREE TIME?

Anything that helps clear my mind from daily events, appreciate how wonderful it is to live in Golden and be part of the Mines community and spend time with Elyse. For example, jogs along Clear Creek or bike rides up Lookout Mountain address the first two. Cheering on Oredigger sports teams, attending Mines Little Theatre performances, feeding pizza to students and Tuesday date nights eating out in Golden with Elyse combine the latter two. During a holiday break, Elyse and I might binge-watch a TV series, and if I have a few minutes of free time late at night, I might reach over to one of my guitars and see if I can wake up some of the freshmen in Maple Hall.



President Paul C. Johnson with students from the Mines Robotics Club.

Photo courtesy of the Mines Robotics Club

QUESTION #2

WHAT HAS INSPIRED YOU RECENTLY?

John Coors' speech at the CoorsTek Center dedication during Homecoming Week was inspirational to me:

"I believe in value creation. Taking what we have been given, what we have achieved and leaving something greater behind. There should be something more for those who come after us. As I think about what we are celebrating today, I consider this an investment in people we will never meet, who will live better lives because of what we are seeing today."

Imagine what the world would be like if we all lived by this philosophy.

QUESTION #3

IN WHAT WAYS HAVE YOU SEEN MINES ALUMNI GIVE BACK TO THE SCHOOL, AND WHY IS GIVING BACK TO YOUR ALMA MATER IMPORTANT TO THE SUCCESS OF AN INSTITUTION AND ITS STUDENTS?

Mines would not be the top-tier institution that it is without the support and involvement of our alumni. As you walk across campus, you clearly see the impact of Mines alumni everywhere—our world-class facilities, the amazing students and faculty we attract, our signature degree programs and our new strategic initiatives. Alumni give back financially, they are engaged on campus in our programs and they help recruit and mentor students.

I'm particularly excited now about our new alumni interest groups and what they are doing to grow our connections to the aerospace industry, provide opportunities for student entrepreneurs and innovators, recruit more women to Mines and mentor students. I'd love to see the formation of more of these focused alumni interest groups.

One of our strategic goals is for Mines to be the exemplar for all universities with respect to alumni affinity and involvement. We are heading there. We can do it. Go Orediggers!

EXPERIMENTING IN MICROGRAVITY

MINES RESEARCH INTO COLLOIDAL CHAINS IS HEADED TO SPACE



Research by Mines faculty on the behavior of colloidal molecules was recently sent to the International Space Station on a SpaceX flight.

Photo courtesy of SpaceX

Research by Mines faculty on the behavior of chains of colloidal molecules headed to the International Space Station on a SpaceX flight on December 4, 2017.

Professor David Marr and Associate Professor Ning Wu, both of the Department of Chemical and Biological Engineering, have been researching colloidal molecules for medical and other applications for several years. Now, they have the opportunity to learn how chains of these beads just several microns wide behave in microgravity.

“We’re trying to understand the basic dynamics of these chains,” Marr said. On Earth, “they’re kind of heavy—they sink very quickly, which makes them very hard to study. In microgravity, they’re freer to do what they do, and we can observe that.”

Mines’ experiment is one of three—all colloidal in nature—to be delivered to the International Space Station by SpaceX CRS-13. The samples will likely sit for a couple of months. After some simulations and plenty of video communication with scientists,

the astronauts on board will conduct the experiments and observe them using microscopes already on the ISS.

After establishing a baseline for their behavior, Marr and Wu hope to conduct experiments with electric and magnetic fields in microgravity as well, although equipment for that could take years to bring up.

Previously, Marr and a team of researchers developed a method for creating “microbots” that could be used to treat blood clots in humans. The tiny particles would be injected into the bloodstream and assembled into a wheel using a magnetic field which also directs the wheel to the site of the clot and spins it to break up the blockage.

Marr, Wu and other researchers are exploring using a similar technique to create “microlasos” that can pick up and transport medication and other substances throughout the body. Wu is also conducting research into assembling nanoparticles using electric, as opposed to magnetic, fields.

By **Mark Ramirez**

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ATHLETICS

A BRIEF LOOK AT ANOTHER
SUCCESSFUL SPORTS SEASON

By Tim Flynn



Photo by Kristoffer Parker

MEN'S SOCCER

The men's soccer team had a historic fall, capturing both the RMAC regular-season and RMAC Tournament championships on the way to an appearance in the NCAA Sweet 16. Mines went 17-4-1 behind the play of all-American forward Johnny Haist, who tied the program record with 22 goals scored, and all-American midfielder Niki Grotz, who set the Mines career assists record as a senior with 41. The season was highlighted by a heart-stopping 2-1 win over rival Colorado Mesa University on Nov. 5, 2017, to win the RMAC Tournament (pictured), as second-half goals by Trevor Amann and Haist rallied the Orediggers back from a 1-0 deficit. Mines ended the season ranked ninth in the nation by the United Soccer Coaches organization.



Photo courtesy of University of Southern Indiana



Photo courtesy of Shaun Wicen

CROSS-COUNTRY

The men's cross-country team won the RMAC team championship for the second straight season and took third place at the NCAA Division II Championships meet on Nov. 18, 2017. Senior Grant Colligan (pictured second from right) won the RMAC individual championship and went on to place fifth at nationals, the best finish ever by an Oredigger. Colligan was also named the RMAC Runner of the Year and Academic Runner of the Year. In addition, Logan Ramlet, Ricardo Ocampo and Josh Hoskinson were named all-Americans.

The women's team had arguably their best season in its history, recording a second-place team finish at both RMAC Championships and NCAA South Central Regional Championships before going on to finish 11th at nationals, their best showing since 2014. Molly Reicher (pictured) earned an all-American finish and was later named the RMAC Academic Runner of the Year, marking the first time the Mines men and women swept the conference awards.



Photo by Tim Flynn

WOMEN'S SOCCER

The women's soccer team advanced to its second straight NCAA Sweet 16 and third in four years with a 17-4-1 record. The Orediggers were led by one of the nation's best defenses, captained by All-American Emily Garnier (pictured), who also led NCAA Division II with a Mines-record 15 assists. The Orediggers ranked in the national top-20 in almost every category, with an offense led by all-region honorees Jennifer Kendall (nine goals) and Brooke Stoermer (nine goals). Kendall and Devon Dunmire earned Academic All-American honors, and Kendall was named the RMAC Academic Player of the Year, the first in Mines women's soccer history.

VOLLEYBALL

Mines volleyball continued its run of success in 2017, earning a share of the team's fifth RMAC regular-season title since 2012 with a 25-6 overall record and 17-1 mark in conference play. Their record helped them make yet another appearance in the NCAA Division II Volleyball Championship tournament, where the Orediggers beat Angelo State University to advance to the second round for the third consecutive season. All-American setter Marina Hansen set a new Mines record averaging 12.96 assists per set, and the Mines offense ranked in the national top-10 in kills and hitting percentage. Mines had six all-RMAC selections, including freshman outside hitter Lindsey Jin, who went on to be named the regional freshman of the year, and first-team all-RMAC middle blocker Abby Tiesman.



Photo by Tim Flynn

FOOTBALL

Mines football fans saw something in 2017 that hadn't happened in their lifetimes—maybe even in their parents' lifetimes. Sophomore running back Cameron Mayberry ran for an incredible 1,565 yards, breaking the Mines single-season record that stood since 1939, when Lloyd Madden ran for 1,316 yards. Mayberry powered one of the nation's best rushing offenses with 18 touchdowns, and his 312 yards at Adams State University snapped the program single-game record that stood since 1992. Overall, the team went 7-4, their 11th consecutive winning season dating back to 2007, and earned 17 all-RMAC selections, including first-team picks Mayberry, wide receiver Brody Oliver and linebacker Dean Wenger.



Photo by Steve Oathout

► For more on Mines athletics, visit minesathletics.com



I-DAY CELEBRATING CULTURE

Mines' international students hosted International Day in November 2017, a celebration of culture and diversity, where the local community enjoyed food, performances and learned about the various cultures represented at Mines. More than 1,300 people supported Mines' students, making the event one of the largest I-Days in the history of the event.

Several cultural acts performed at the celebration, including the Denver-based Jasmine Flower Chinese Dance Academy (at right).

Photo by Utkarsh Srivastava



MINES ALUMNI GOLF TOURNAMENTS



34th Annual Golden Scholarship Golf Tournament

June 8, 2018 | West Woods Golf Club

M Club Denver Connect

June 7, 2018



9th Annual Endowed Oklahoma Scholarship Golf Tournament

Spring 2018 | Location TBD

M Club Oklahoma City Connect

TBD



4th Annual Dallas Scholarship Golf Tournament

May 18, 2018 | Bear Creek Golf Club

M Club Dallas Connect

May 17, 2018



18th Annual Houston Endowed Scholarship Golf Tournament

April 27, 2018 | Gleannloch Pines Golf Club

M Club Houston Connect

April 26, 2018

GOLDEN GLORY: HOMECOMING 2017

A ROUNDUP OF SOME OF OUR FAVORITE HOMECOMING TRADITIONS

NOVEMBER 15, 1924:

THE FIRST HOMECOMING

The Mines Alumni Association held a reunion, with 74 participants. Golden business owners closed their stores for the afternoon to encourage attendance.



SEPTEMBER 30, 2017

2,056 people filled Marv Kay Stadium for the homecoming football game.

FINAL SCORE:
MINES 41 • FORT LEWIS 7



65 WOODEN PALLETS

were used to build the bonfire, which took **1.5 HOURS** to build.



17 FLOATS

made up this year's Homecoming parade.

8 of them were on trailers and the rest were carried on foot or transported along the **0.75-mile parade route** on other vehicles.



10

STUDENTS

on the Mines Activities Council planned and implemented Homecoming events. **40 other student volunteers** helped coordinate events over the weekend.



REUNIONS CELEBRATED IN 2017:

Golden Miners: 1966 AND PRIOR

65TH: 1952

50TH: 1967

40TH: 1977

25TH: 1992

10TH: 2007



► See more photos from Homecoming 2017 online at magazine.mines.edu

ASSESSING RISK

AN INTERNATIONAL ENGINEERING EXPERIENCE IN GUATEMALA

Landslide risk is a fact of life for hundreds of thousands of Guatemalans residing in settlements on the slopes of steep ravines. How well the available tools, techniques and programs manage that risk is the subject of a Mines graduate student project—research that got an infusion of help from a group of Mines undergraduate students.

Six students studying geological, civil, environmental and humanitarian engineering traveled to Guatemala in August 2017, helping conduct field interviews in impacted communities and analyzing data at the local university, Universidad de San Carlos de Guatemala in Guatemala City.

Mines graduate student David LaPorte has been in Guatemala since last January, thanks to a 10-month Fulbright grant, and worked with Mines faculty and staff to make the international engineering experience possible.

LaPorte's work is focused on evaluating current landslide risk management initiatives put in place by the Guatemalan government and NGOs. That has meant a lot of field work, talking with local residents and stakeholders to better understand how they perceive risk.

"One of the biggest things for me has been to learn how to work in another culture, the difference in time, the importance of relationships, the way things are organized and managed," LaPorte said. "It's been a steep learning curve, but I'm really going to take away a lot."

So did the undergraduate students who helped with the research. "I can't stress enough how great of a trip it was and how wonderful it was to see an actual connection, a tangible connection between engineering and humanitarian work," said Vy Duong, a junior studying civil and humanitarian engineering.

A key component of Mines' Humanitarian Engineering program is the importance of community engagement and how to utilize it in a meaningful way as part of engineering projects. While in Guatemala, the students spent five days in the field, conducting interviews and meeting with residents of three different communities. Another five days were spent at the local university, analyzing data and building landslide susceptibility maps.

One thing the students didn't do during their trip is build something. "Our goal wasn't immediately tangible. Our goal was to help them help themselves in the coming years and help the different organizations work together," said Matt Kelly, a junior studying geological engineering. "It was hard not getting



Mines students David LaPorte and Jake Weems interview a mother and son about their perception of landslide risk in El Durazno, Guatemala. Photo courtesy of David LaPorte

to say, 'Oh, I built that retaining wall and those five homes are good.' But what we did in the end was much more helpful."

That difference was part of the appeal of sending students to Guatemala, said Juan Lucena, professor and director of Mines' Humanitarian Engineering program.

"Different than the more popular humanitarian engineering projects where students build gadgets—water pumps, bridges, wheelchairs, etc.—this project was about applying risk mitigation research on vulnerable communities in Guatemala," Lucena said. "This shows that humanitarian principles and criteria can also guide engineering research and its application."

A central part of LaPorte's project is working out how to package science in a way that can be used by the local population, and tracking and improving how they actually use it, said Paul Santi, professor of geology and geological engineering.

"Our earlier work in Guatemala City focused on developing and validating methods of mitigation that those in poor communities could actually implement with limited means," Santi said. "David's goal is to figure out if people are actually doing this, why or why not, and how to best educate and encourage them to take appropriate actions to reduce landslide risk to their homes."

For Kelly, the trip cemented his desire to find ways after graduation to use what he has learned at Mines on engineering projects that help people in a sustainable manner. "There's no engineering project that happens in a vacuum. It affects everyone and everything around them," said Kelly. "Now that I have real-world experience being in another country, examining landslide hazards and risk assessment, it will help me with future courses and future employment."

By **Emilie Rusch**

COMMUNITY SOLAR

MINES STUDENTS HELP INCREASE ACCESS TO RENEWABLE ENERGY TECHNOLOGY

Mines students are helping make solar power more accessible to low-income Coloradans. The Mines Energy Club recently volunteered with GRID Alternatives to help build two community solar arrays in Colorado.

The new array in Fort Collins, the 2-megawatt Coyote Ridge Solar Farm, is the largest ever built by GRID—by a factor of 10. Volunteers installed the entire system in a matter of weeks between August and September, and it's already generating power for the Poudre Valley Rural Electric Association.

Mines volunteers drove up to Fort Collins to lend a hand on two of the Coyote Ridge build days. Closer to home, Mines students spent a day in October working on another 2-megawatt array, near Denver International Airport for the Denver Housing Authority. DHA will be the first housing authority in the country to develop, own and operate its own solar garden. Throughout construction, GRID will also provide training, certification and employment in the solar industry for affordable housing residents.

Evan Wong, a mechanical engineering senior, said volunteering with GRID Alternatives was a great opportunity to get hands-on experience with photovoltaics and supplement the academic instruction he's received on



The Mines Energy Club volunteered to help GRID Alternatives build two solar community arrays in Colorado. Photo courtesy of GRID Alternatives

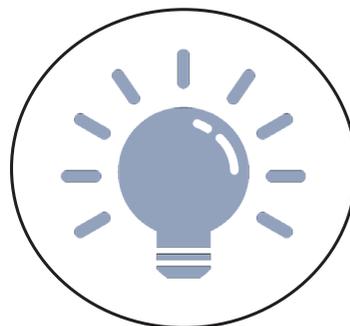
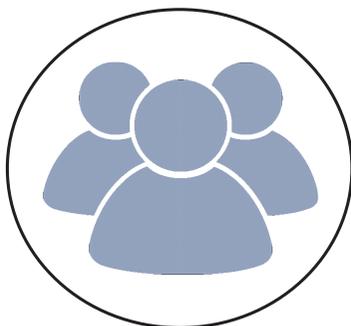
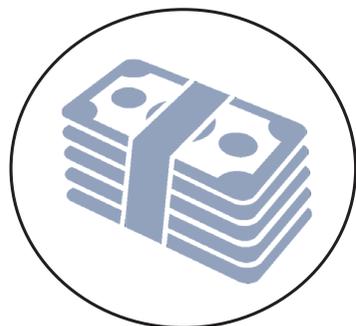
campus. "Although there's a bunch of advanced physics in the crystalline structure, installing solar panels isn't really that hard," he said. "The entire process probably took around five minutes at most for each solar panel."

Tim Ohno, associate professor of physics and co-director of the Energy Minor Program, hopes the GRID Alternatives experience will also help motivate students and faculty to push for more solar on the Mines campus. A solar garden could be an efficient and cost-effective option at Mines, too, he said. "Right now, we're really trying to accommodate the growth in students, but if groups are interested, I can imagine this might be a push in the not-too-distant future," Ohno said.

"It's a direction that's probably going to become more and more common," he continued. "When you install panels on someone's roof, whatever direction the home's roof faces, that's where it's installed and that's not always optimal. If you build a solar garden, the cost of solar—even without subsidies—is very comparable to traditional coal and natural gas power plants."

By **Emilie Rusch**

There are many smart and easy ways to make an impact at Mines. Our new website puts gift planning tools at your fingertips.



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FROM POINT A TO POINT Z

Mines alumni and new technology play an important role in meeting society's demand for better transportation

By **Emilie Rusch**

I The future of transportation has always been fun to imagine.

One hundred years from now, will we be zipping around on jetpacks or soaring in flying cars? Will we be heading to the ski slopes via Hyperloop pod or teleportation?

But such transformative technology isn't just the domain of science fiction.

Fully autonomous vehicles could be on the road by 2020, setting up the possibility of major changes to the way we transport both people and goods. Mines alumni are already playing an important role in figuring out how to best meet society's demand for better transportation, particularly within growing cities.

"The reality is we're at a crossroads," said Butch Waidelich '84, executive director of the Federal Highway Administration (FHWA). "The interstates were first built in 1956—we're 61 years past that timeframe, and populations tend to grow exponentially. We're talking 70 million more people by 2045. The autonomous vehicle and connected vehicle are going to be game-changing."

What those changes will look like remains to be seen, however, posing unique challenges for the engineers tasked with designing transportation infrastructure today to last decades.

"There is one end of the spectrum that says we'll need a lot fewer vehicles because there's a lot of cars that just sit around right now. But on the other end of spectrum, maybe everyone has an autonomous vehicle—even people who can't get driver's licenses today," said Joshua Laipply '97, chief engineer at the Colorado Department of Transportation (CDOT). "We don't know what we don't know, but we can do things to start getting ready. Communications and interoperability are going to be key. We want to future-proof our infrastructure by installing the capacity and technology out there today that will be adaptable and flexible with what the future may bring."





TURNING TO TECHNOLOGY

At CDOT, planning for the future means some construction to increase capacity, but also a stronger emphasis on using data to maximize operations, Laipply said.

“We do a lot of maintenance, and we do a lot of design, engineering and construction,” Laipply said. “We need to do a lot more data science and data mining. Infrastructure and transportation is the backbone of our economy, but it’s been slow to adapt from a technology perspective.”

The North Interstate 25 expansion, between Johnstown and Fort Collins, and the Central 70 project through Denver will both include the installation of fiber-connected roadside units to facilitate vehicle-to-vehicle and vehicle-to-infrastructure communication.

All new cars could soon be required to have digital short-range communication capabilities under a proposed National Highway Traffic Safety Administration (NHTSA) rule, enabling vehicles to talk to each other and share speed, heading, brake status and other information. NHTSA estimates that vehicle-to-vehicle and vehicle-to-infrastructure applications could eliminate or lessen the severity of up to 80 percent of non-impaired crashes.

“Right now, most vehicles have a computer in them but it’s not talking to anything. If I could hear that vehicle

and understand when your windshield wipers come on, I know there is rain or snow. When I figure out when your traction control comes on, I can say, ‘Let’s send out some plows and put more deicer on,’” Laipply said. “All of that information is valuable. The faster we can get it and analyze it, the faster we can dispatch our maintenance forces, the safer the roads become.”

Another CDOT initiative, SMART 25, will put traffic sensors along roughly 13 miles of I-25, from RidgeGate Parkway in Lone Tree to University Boulevard in Denver. The data collected will be used by a computer algorithm to meter the cars merging onto the interstate in real time, with the potential to improve the efficiency of I-25 in that section by 20 percent. The effort could potentially expand to variable speed limits further south—slowing down the traffic coming up from Colorado Springs before it hits a backup further to the north.

“When you think about traffic flow on a roadway, it’s like laminar and turbulent flow when you talk about fluid mechanics,” Laipply said. “Under laminar flow conditions, you can move a lot of fluid—vehicles—with a smaller system, but under turbulent conditions, when you introduce roughness—accidents, backups, people jumping from one lane to the next—flow breaks down and you need a larger system to convey the equivalent amount of vehicles. If we can smooth out the flow of vehicles a little bit, you can minimize the turbulences and maximize throughput.”

On the national level, the Federal Highway Administration recently conducted tests in Virginia on truck platooning—freight trucks equipped with cooperative adaptive cruise control so they can work and communicate with each other as they travel. That connectivity could mean reduced headways between

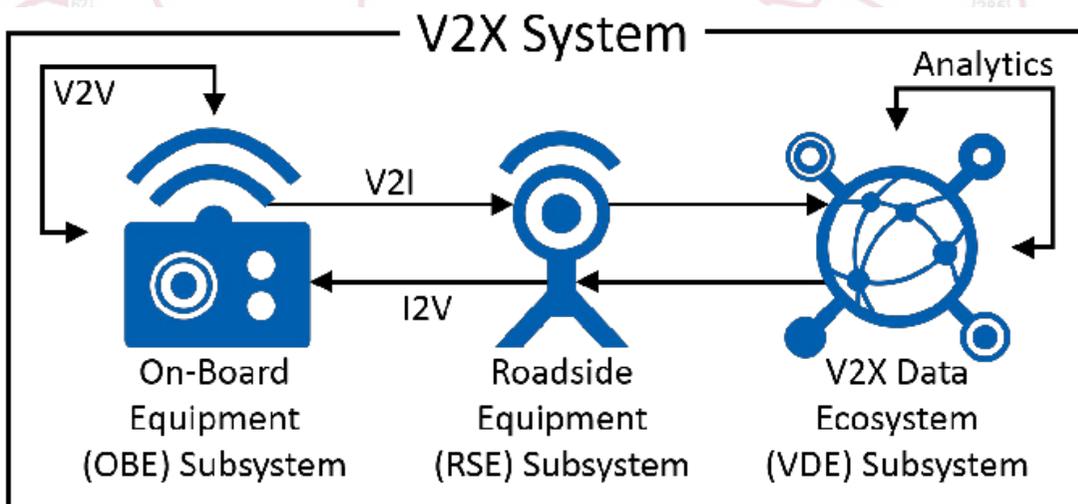


“We need to do a lot more data science and data mining. Infrastructure and transportation is the backbone of our economy, but it’s been slow to adapt from a technology perspective.”

Joshua Laipply '97
Chief Engineer
Colorado Department of Transportation

In the near future, cars and roadways could have the capability of communicating with each other to improve safety and efficiency.

Image courtesy of the Colorado Department of Transportation



trucks and faster, smoother freight transport, potentially in dedicated truck lanes, although there are still a lot of questions to be answered, Waidelich said.

“Think about our interstates—the intent was interstate commerce and national defense as far as mobility within our country. But if you’re trying to get from New York to San Francisco and get bogged down in I-80 traffic around Chicago, how can we do that in the future?” Waidelich said. “The vast majority of freight today moving around our country is on our highways.”

AN UNDERGROUND SOLUTION

Underground construction is growing in popularity as a transportation option, particularly in dense urban areas, said Mike Mooney, Grewcock Distinguished Chair of Underground Construction and Tunneling at Mines.

“We have this big urbanization movement in the world where people are moving more and more from rural to urban environments. That means you have congestion and the need to build infrastructure, whether it’s transportation or water,” Mooney said. “Underground is the next frontier—it’s the place you can go. All the surface area is taken.”

Cities including Boston and Seattle have undertaken large-scale projects in recent years to bury roadways and restore green space to the urban core. In Seattle, a double-decker downtown viaduct is being replaced with a 1.7-mile tunnel, making way for new public space along the city’s downtown waterfront. The Central 70 project in Denver will also lower a section of the interstate, removing the existing viaduct and adding a 4-acre parkland cap.

At Mines, home to the first U.S. Department of Transportation-funded University Transportation Center dedicated to underground infrastructure, led by J.R. Paden Chair Professor Marte Gutierrez, researchers are working to make tunneling an even more viable option in urban areas. They are developing techniques to image ahead of tunnel-boring machines and collaborating directly with contractors to solve technical challenges on projects. Mines is home to the only graduate program in underground engineering in North America.

“One of the things society has done somewhat wrong in the past is inadequate thought to quality of life in urban environments. Cities are realizing that people really need space, green space,” Mooney said. “Urban centers worldwide are now revisiting the blending of infrastructure, of the flow of people and goods, while preserving quality of life in urban environments. Underground is a great solution to regain surface space and improve urban quality of life.”



“The interstates were first built in 1956—we’re 61 years past that timeframe, and populations tend to grow exponentially. We’re talking 70 million more people by 2045. The autonomous vehicle and connected vehicle are going to be game-changing.”

**Butch Waidelich '84
Executive Director
Federal Highway Administration**



This illustration shows how highways and streets can be made to connect wirelessly so driverless vehicles can get through urban areas safely and easily.

Image courtesy of the U.S. Department of Transportation

This rendering depicts the National Western Center, which will transform 250 acres in north Denver into a year-round tourism, event, education and agricultural innovation center.

Rendering courtesy of City of Denver



GROWING COMMUNITY IMPACT

As more and more people move to cities, the transportation industry is also becoming increasingly mindful of the impact that new infrastructure projects can have on local communities, said Karen Furlani MS '05, risk director at the engineering firm CH2M.

"There's a lot of discussion around a more holistic approach to transportation and looking at it not just from an economic capacity model but also a social placemaking perspective, to ensure the community around these transportation projects are places where people want to live," Furlani said.

In Colorado, CH2M is the program manager on the National Western Center, a decade-long project to transform 250 acres in north Denver into a year-round tourism, event, education and agricultural innovation center.

Overhauling the site's infrastructure is an important component, and it's all about multimodal mobility—cars, bikes, pedestrians, public transit and, yes, even livestock trucks. "Animals are not going to come on the light rail," Furlani said. "You want to enable biking but you have to enable the big trucks and trailers as well."

Infrastructure changes will also help make way for a revitalized and accessible South Platte River, a top priority for the project.

"Few people are aware that a river is there," Furlani said. "One of the criteria is making that into an enjoyable space that people could come and use even outside of events—how do you enable access? What remediation actions and infrastructure improvements need to be taken so it can be a safe place for folks to use?"

In the urban environment, those technical challenges go hand in hand with the challenges of stakeholder

engagement and buy-in, she said. That includes not only the funding entities but also impacted residents and business owners, a constituency that will only grow as urban areas continue to densify.

"From an engineering perspective, the challenge is getting those inputs and being able to incorporate them into the scope of work and technical basis of design to ensure it's translated and accounted for as we work through conceptual development, design and on into construction," Furlani said. "There are best practices that you can go by, but it's not black or white. We know when a material will fail under certain conditions, but this has much more gray area around how you define success."

No matter what the future of transportation holds, though, Mines graduates should be well positioned to play an important role.

Waidelich, who manages the daily operations of FHWA as its senior career employee, said he still relies on the "third gear" he developed during his time at Mines, that ability to work hard to solve problems.

"To think about the next 30 years and the graduates from Mines, it should be a pretty exciting time," Waidelich said. "There's going to be a lot of change and a lot of new ways of doing things."



"The challenge is getting inputs and being able to incorporate them into the scope of work and technical basis of design to ensure it's translated and accounted for as we work through conceptual development, design and on into construction."

Karen Furlani MS '05
Risk Director, CH2M

MINES ALUMNI LEND THEIR SKILLS TO U.S. 6-19TH STREET PROJECT

When James Sapegin moved into Mines Park his sophomore year, the walk to class wasn't a particularly inviting one.

Between the apartment complex and main Mines campus were four lanes of cars zipping by at 50-60 miles per hour—which pedestrians and cyclists had to cross at grade.

Things look a lot different today, thanks to a recently completed \$25 million infrastructure project that lowered U.S. 6 below 19th Street and created a parkland "lid" with paved trails, park space and a small amphitheater at one of the main entrances to campus.

"In terms of safety, it has definitely gotten better," said Sapegin, a senior studying biochemical engineering. "And now we don't have to wait for a light there."

Mines' connections to the major infrastructure project, though, go beyond current and future students. Eight Mines alumni worked on the new interchange as engineers and project managers for the Colorado Department of Transportation (CDOT), general contractor Kraemer North America, civil engineering firm IMEG and subcontractor HTM Construction.

"It was so cool being able to go back and have a positive impact on the school," said Neil Ogden '08, a CDOT project manager involved in the design phase.

In Colorado, it's actually not that unusual to have multiple Mines graduates on major infrastructure projects, said Mike McNish '03, project manager for Kraemer North America, which specializes in heavy highway construction. But this one was special, given the tie to their alma mater.

"When we originally got this project, at least within our company, all of our Mines grads, myself included, had a desire to be a part of this project because Mines and the City of Golden meant so much to us," McNish said. "We wanted to put our stamp on something that improves the school and community."

McNish was involved in the project's design phase, working with the city, CDOT and Mines to get the project in budget, address constructability concerns and come up with a plan



for construction phasing. Funding for the project came from all three public entities.

Kraemer also sponsored two Mines Senior Design projects during the design phase, one where students analyzed some of the drainage and water quality features and another looking specifically at the bridge design.

"When I was in school, Senior Design was one of the most valuable classes that helped me prep for my professional career," said McNish, who studied civil engineering at Mines. "Being able to go back and from a different perspective, from a client side, and help guide students on what industry and the real world is really like was a rewarding experience."

Nathan Corbin '98, also a project manager at Kraemer, said he relies on the problem-solving skills he gained during his time at Mines. "Mines does a great job of building a foundation for the future engineers of the world," he said. "It's really that foundation and the general problem-solving skills you get in those first few years in Mines, along with the work ethic they instill—I leverage that more than anything else, just the ability to work through an open-ended problem, working in a team setting and putting your head down and doing what it takes to solve the problem."

The project's design is unique not only for Golden but the state of Colorado, Ogden said. "The lid concept is something CDOT has not done before, but it's something we're working on for the I-70 Central project," he explained. "The structural challenges were very interesting, both in terms of the loading and the utilities up top, some of things you don't think about."

Having Mines students walking through the job site every day while they tackled those challenges was pretty fun, too, Corbin said. "We ended up hiring a new grad who worked on the project for the last year," he said. "It was a real pleasure to get to be a part of that generation again and be reminded of how smart and driven and focused they all really are."

GROWING UP WITHOUT LIMITS

Mines students and alumni help K-12 students realize the opportunities of a STEM education

By **Ashley Spurgeon** and **Emilie Rusch**

From a young age, children are often asked what they want to be when they grow up. Answers typically include something along the lines of firefighter, teacher or doctor. Less common are answers like chemist, physicist, web developer or mechanical engineer.

Yet, with the push to prioritize science, technology, engineering and math education earlier in schools, children are introduced to new fields and career paths, opening up the opportunities for their futures. STEM programs teach students not only about science and math, but also about the future of our society and economy. Such programs enable students to acquire more of the knowledge necessary to achieve success in today's increasingly competitive job market and lead society in the future.

The Department of Commerce's Economics and Statistics Administration projects STEM occupations will grow 8.9 percent between 2014 and 2024, compared to 6.4 percent projected growth for non-STEM occupations. Kindergarteners through seniors in high school will lead the charge in that growth, entering the workforce with a cross-disciplinary education and comprehensive skill set.

Mines has played a large part in encouraging this outreach to K-12 students and inspiring younger generations to pursue interests in STEM. From events geared toward supporting girls and young women to enter STEM fields to teaching a classroom of elementary students how math can be fun, Mines helps K-12 students achieve their highest potential and be whatever they want to be when they grow up.



To inspire others to pursue engineering, Mines students share their experiences with middle schoolers during tutoring sessions.

Photo by Joe DelNero



Kate Smits, assistant professor of civil and environmental engineering, tutors a local middle school student to help her succeed in math and science.

Photo by Joe DelNero

College View, part of the Denver School of Science and Technology network, is 85 percent minority and 90 percent low income. Students attend tutoring based on need, teacher requirement or interest.

PRIMING THE PIPELINE

Kate Smits' time as an engineering student at the U.S. Air Force Academy in Colorado Springs sparked her passion for STEM education. The assistant professor of civil and environmental engineering at Mines had great professors and a great experience overall, but she never found that mentor, that woman engineer she could look to and say, "There's someone who looks like me. I want to be like that."

"I started looking into that discrepancy of why people are or aren't going into engineering," Smits said. "What the literature shows is there's a critical age—middle school—where students either get really excited about STEM or their interest completely drops off. You either grab them or you don't."

When Smits received a National Science Foundation CAREER Award three years ago, it felt natural to dedicate the educational outreach portion of her grant to reaching potential future scientists and engineers on their own turf—a middle school classroom.

Twice a week, 12-15 Mines students visit College View Middle School, a public charter school in south Denver, for math and science tutoring and mentoring. Recently, that meant helping the middle schoolers go over their last test, on linear equations.

"I hypothesized that if we introduced STEM to these students in a sustained way at a critical time in their development, they would be more likely to go into it," Smits said. "A lot of what we do, the decisions that we make, are based on what we're exposed to."

In addition to tutoring, Mines students are encouraged to talk to the middle schoolers about careers, college and life. Some of the tutors are interested in pursuing a teaching career, while others like working with young people or just want a break from their own schoolwork.

"It's a great way to give back to the STEM community. Education is so important, so any opportunity I can help out is important," said Madison Webster, a sophomore studying chemical engineering. "I've really enjoyed it."

Three years into a five-year grant, the tutoring program is already seeing results, too, Smits said. Students who have never tested at grade level on standardized math and science tests are passing for the first time, and their own survey data shows increasing confidence and interest in math and science.

"We talk a lot at Mines about preparing the pipeline. If we actually want to do that here in the state of Colorado, we need to start a whole lot sooner than the freshmen who walk through our door," Smits said. "We need to start back when they're a lot younger to be able to capture that incredible talent pool that's not currently being captured."

From left to right: John Osborne '66, Dr. Terry Brewer, Karen Degel (6th grade teacher), Michelle Head (3rd grade teacher), Jenifer Elser (middle school teacher) and Eldon "Chad" Johnson (high school principal and district superintendent).

Photo by
Taryn Johnson and
Jovi Rosselott



GIVING BACK TO A NEW GENERATION

When John Osborne '66 retired from the microchip industry after 35 years and moved to Twin Bridges, Montana, he and his wife decided to offer scholarships to local students interested in pursuing engineering or science in college. One of the scholarship winners, a young woman who had been valedictorian in high school and was interested in pursuing a career in biomedicine, was accepted into a prestigious university on the East Coast. However, despite her high SAT scores and a 4.0 grade-point average in high school, the young woman found herself falling behind in math, chemistry and physics and dropped out of the biomedical program in favor of a different discipline.

"I thought, if someone with that amount of intelligence and drive struggled with their collegiate career, then giving them a scholarship wasn't as much help as looking at the infrastructure of the K-12 system itself," Osborne said.

He read about a nonprofit organization called Project Lead the Way (PLTW) that empowers students to develop and apply in-demand, transportable skills by exploring real-world challenges and learning how to problem-solve and think critically. Inspired by the organization's model to help prepare students for collegiate life and their professional careers, Osborne thought a STEM program might be a good fit at Twin Bridges School, a local K-12 school with a total of 225 students. The Twin Bridges school system is thought to be the smallest K-12 district in the U.S. known to have implemented the PLTW program at the elementary, middle and high school levels.

Osborne approached the school district's superintendent, Chad Johnson, about starting up the program, and Johnson was immediately on board. "K-12 STEM education is important for all students, simply because it encourages and promotes critical thinking skills, problem-solving, asking questions and teamwork," Johnson said. "These are the traits employers are seeking in today's competitive global job market. Twin Bridges schools, especially due to

their small size, need to provide the skills to our students so they can be competitive in whatever endeavor they choose upon graduation."

After approval from the school board, the program was implemented in sixth-, seventh- and eighth-grade classrooms. Students got hands-on experience with projects such as designing, building and testing orthopedic boots. The program also features a medical detective initiative and even a robotics section, which has enabled some students to participate in statewide robotics competitions.

Osborne was able to procure additional startup resources, including funding and program mentoring from Brewer Science, a microchip material company in Rolla, Missouri. Brewer Science has since offered a summer shadow/internship program to expose students to the working environment of an advanced technology company.

Students' enthusiasm for the program enabled the program to expand to third- through fifth-graders and into high school in fall 2017. "We have been able to effectively implement the program at the middle school level then branch out this year to grades 3-12," Johnson said. "This is an exciting time for Twin Bridges' schools."

At the beginning of the current school year, Osborne donated additional funds to purchase iPads for kindergarteners to use an app specifically designed to teach STEM to that age group. "The focus went from thinking that high school students would benefit the most from the program, to watching 6-year-olds learn shape recognition and associations," he said.

"Everyone saw this as an approach to improve the educational quality and really engage in preparing students for collegiate life, as well as a more challenging industrial career," Osborne said. "We provided some financial assistance and program oversight, but the teachers, administration, school board and students are really the enablers that made this initiative work. The number one thing is to make sure we're doing an effective job."



Mines partners with the Denver Museum of Nature & Science and CBS4 for the annual Girls and Science event for young girls to meet women scientists and learn about STEM opportunities.

Photo by William Ciccone

HELPING GIRLS FULFILL THEIR DREAMS

While the gender gap in higher education across the United States has become nearly nonexistent in 2017, there is still some catching up to do when it comes to women working in STEM fields. According to the National Girls Collaborative Project, an organization working to bring together organizations throughout the U.S. to inform and encourage girls to pursue careers in STEM, “Women make up half of the total U.S. college-educated workforce, but only 29 percent of the science and engineering workforce.”

To help fill this gap, Mines has several programs in place and hosts events to support young girls in kindergarten through 12th grade in their pursuits of STEM education and careers.

Mines’ outreach program, DECTech, is one of the most well-known programs at Mines designed to foster and continue girls’ interests in science and engineering through creative and interactive activities. DECTech—short for “Discover-Explore-Create Technology”—was originally implemented for 3rd–6th grade students but has since grown to include middle and high school students. In October 2017, the program was awarded the Mayor’s 2017 Gold Mine Award for Excellence. City officials said the program was chosen “for their efforts to make an impact on local girls, and show them the fun and importance of science, technology, engineering and math.”

In February 2017, Mines’ Society of Women Engineers welcomed nearly 200 9th- to 12th- grade girls to campus

for the annual Girls Lead the Way conference. Students attended two sessions in the morning, one a panel of Mines SWE members who spoke about their classes, internships and career opportunities in their chosen fields, and the other a fashion show-style presentation on how to dress appropriately for different professional situations. In the afternoon, students participated in two hands-on activities based on their individual interests. Agata Dean, the faculty advisor for Mines’ SWE section said adding a second session enabled them to “give more girls exposure to the types of disciplines they might be interested in.”

The Girls and Science event—a partnership between the Denver Museum of Nature & Science and CBS4—invites young girls to a day at the museum to meet women scientists and experience the diverse opportunities a future in STEM can bring. Young students and their families explored a variety of “clubhouses” where they could talk to different women and learn about what they do and what inspires them through conversations and hands-on activities. The Mines SWE section staffed the Mines Engineering the Way clubhouse. “The goal of the event is to showcase that girls can do anything and be anything, and that science and math are not just for boys,” Dean said. “By having a clubhouse (and an entire event) staffed by intelligent young women, the hope is that the girls attending will be exposed to role models they can identify with and will be able to envision themselves as part of a STEM future.”

These events, among others, help young girls reach their full potential and become future scientists, mathematicians, engineers and leaders.

A WEALTH OF HISTORY

A HANDFUL OF GOLD COINS HOLDS THE KEY TO COLORADO'S PAST

Many of Colorado's early prospectors weren't concerned with the shimmer of morning sunlight reflected off a river's surface or the flash of a rainbow trout's spotted scales breaching to snatch a mayfly. Instead, their gaze was more focused, looking for a glimmer of gold between grains of sand and silt, a fleck of fortune in the sediment of a slow-moving stream.

The mid-1800s was a period rife with rumor of wealth and the desire to fill empty pockets. Many people experiencing hard times after the Panic of 1857—the first major worldwide economic crisis—moved west in search of fortune and financial stability. Prospectors and pioneers looking to make a living followed any whisper of new gold discoveries, even if the rumors were unfounded and likely a hoax.

However, in 1859, John Gregory, a prospector from Georgia, followed a trail of placer gold nearly 80 miles from the mouth of Clear Creek at the South Platte River up to the source on a Central City hillside. There, he discovered a wealth of more than \$85 million (valued in current U.S. dollars) in gold.

Once word got out, packs of prospectors flocked to Central City, scrambling to lay claim to gold, the land and anything else of value in the area. According to the Colorado Geological Survey, "This one district alone produced over 22 million ounces of gold."

As more people moved into the area and staked out potential claims, new prospectors began to explore the surrounding areas. They established mining districts and, over time, carved a prosperous state out of the wilderness. "During the Gold Rush years, 100,000 people started for Colorado. Fifty thousand completed the journey," said Ed Raines, curator of the Mines Geology Museum. "Half of those 50,000 people who made it to the Pikes Peak territory gave up and went home. The 25,000 who stayed built the state."

Lucky prospectors gathered small collections of gold dust, flakes, veinlets and even a few nuggets. Yet prospectors often weren't as wealthy as they thought they were. During the first year of the Colorado Gold Rush, people paid for goods with gold dust, with merchants taking a literal pinch of gold dust from the prospector's pouch. This pinch was supposed to equal \$1 of gold and weigh exactly 0.05 troy ounce. However, merchants with larger fingers found

themselves with bigger pinches of gold and prospectors found themselves with smaller fortunes.

There was an obvious need for improvement and regulation to this imprecise payment method. As a response, brothers Milton M. and Austin E. Clark and their partner, Emanuel Henry Gruber, established a mint that eliminated the pinch process by turning raw gold dust into tradeable coins. They assayed and purchased raw gold dust, refined it to the desired purity, cast and rolled it to a desired thickness, cut the metal into round blanks and machine-pressed the blanks into gold coins, which were then returned to the miner. Clark, Gruber & Co. became the first private mint in Denver. In almost three years of operation, they minted \$594,305 worth of Pikes Peak gold.

Although Clark, Gruber & Co. was the most prominent mint in Colorado during this time period—and eventually was acquired by the United States Mint to become the Denver Mint—two other territorial coiners, J.J. Conway and John Parsons, were also involved in fulfilling the vital economic need in the state.

However, before coins made their way into circulation, a series of "patterns" were created from non-precious metals to show what the mint's design would look like on the three-dimensional face of the coin.

Recently, the Mines Geology Museum was loaned the Frederick Mayer Collection of Colorado Territorial Gold Coins, which is comprised of a number of such coins. Many of the pattern coins in the collection are made from copper or "white metal"—an alloy of antimony with tin, copper or lead. "Because patterns were always struck in quantities of one to perhaps three coins, they come with a built-in rarity," the exhibit explains. "Patterns should be considered relics that illustrate the story behind the development of the coins that actually found their way into circulation."

While the Frederick Mayer Collection features coins from Clark, Gruber & Co., John Parsons and J.J. Conway, it also contains patterns for coin dies from the Denver City Assay Office and are some of the most valuable coin patterns from the early gold rush. According to the exhibit, "No actual coins were ever struck, so these patterns alone remain as some of the rarest and most obscure artifacts of the Pikes Peak Gold Rush."





Milton and Austin Clark pose with their partner, Emanuel Gruber, outside their mint and bank, circa 1860. Clark, Gruber & Co. was one of the most prominent early mints in Colorado and was eventually acquired by the United States Mint to become the Denver Mint.

Photo courtesy of the Mines Geology Museum

The coins in the collection are the most important surviving relics with a direct link to the Colorado Gold Rush and the only metallurgical remnants with a legitimate provenance tied to the frontier mines. “A consequence of the coining operations is that gold specimens with a legitimate provenance tied to the Gold Rush are non-existent,” the exhibit states. “There are no known specimens from the actual 1859 Gold Rush, nor are there any ‘discovery pieces’ from any of the famous early mines.”

The collection represents part of Colorado’s origin story and the struggles and successes many prospectors and pioneers experienced as they moved west, building new lives and thriving communities all on the hope of a few flecks of gold.

“Civilization is a complicated process. It needs sound financial policies in order to grow,” Raines said. “Like it or not, money is one of the indispensable keys to civilization. You can see those historic keys to our past right here, at the Mines Geology Museum.”

By **Ashley Spurgeon**

- ▶ Visit the Mines Geology Museum to view the Frederick Mayer Collection of Territorial Gold Coins and learn more about the Colorado Gold Rush and the coins that helped establish the state’s economy.

Go to mines.edu/geology-museum for visiting hours.



LAUNCHING INTO THE FUTURE OF SPACE

THE NEW AEROSPACE ALUMNI INTEREST GROUP WORKS TO EXPAND MINES' REPUTATION

When the Aerospace alumni interest group held its first networking event in September 2017, called Trajectories, organizers hoped to attract 40 or 50 people. Instead, more than 150 signed up.

"We had to cut off registration and quit advertising the week before. The fire marshal wouldn't allow any more people," said Paul Anderson '85, a Lockheed Martin engineer who helped start the interest group last year at the request of Mines President Paul C. Johnson.

There seems to be a magnetic force drawing people to space science, at Mines and beyond, and the interest group is tapping into it. Student interest in the field has skyrocketed.

The aerospace industry has become the third-largest employment sector for Mines graduates, with 10 to 15 percent of each class entering the field, said Angel Abbud-Madrid, faculty co-chair of the interest group and director of Mines' Center for Space Resources. "We don't even have an aerospace engineering department, but the skills our graduates have are very important to employers," he said.

Anderson, who currently works on NASA's Orion project, developing spacecraft for astronauts to visit the moon and Mars, can attest to that. "Many disciplines of engineering are required to make the aerospace industry work. Only about 5 to 10 percent of aerospace professionals hold aerospace engineering degrees," he said. In fact, most people enter the aerospace industry with a mechanical engineering background.

"Think about putting together a satellite, figuring out the stresses and strains—that's a mechanical engineer's job," Anderson said. Software, electrical and chemical engineers are also well represented in the industry.

Mines graduates and its faculty have been involved in aerospace projects for over 30 years. In 1996, NASA selected the school to be one of 10 commercial space centers, drawing on Mines' expertise with high-temperature phenomena and combustion. Since then, professors have

conducted experiments at NASA facilities with an eye toward developing future products, Abbud-Madrid said.

The school is also located in an industry hotbed. With companies like Lockheed Martin, Boeing, Harris Corporation, Ball Aerospace, Northrup Grumman, Raytheon Company and United Launch Alliance within its borders, Colorado is the nation's number two state for aerospace jobs, Anderson said. The state also hosts the National Center for Atmospheric Research, the National Renewable Energy Laboratory and national research labs operated by the National Oceanic and Atmospheric Administration and the National Institute of Standards and Technology, all of which are involved in space research.

"The breadth and depth of what Colorado does in aerospace is amazing, and all of that is supported by Mines grads. Demand will continue to grow for the skills and talents they have," Anderson said.

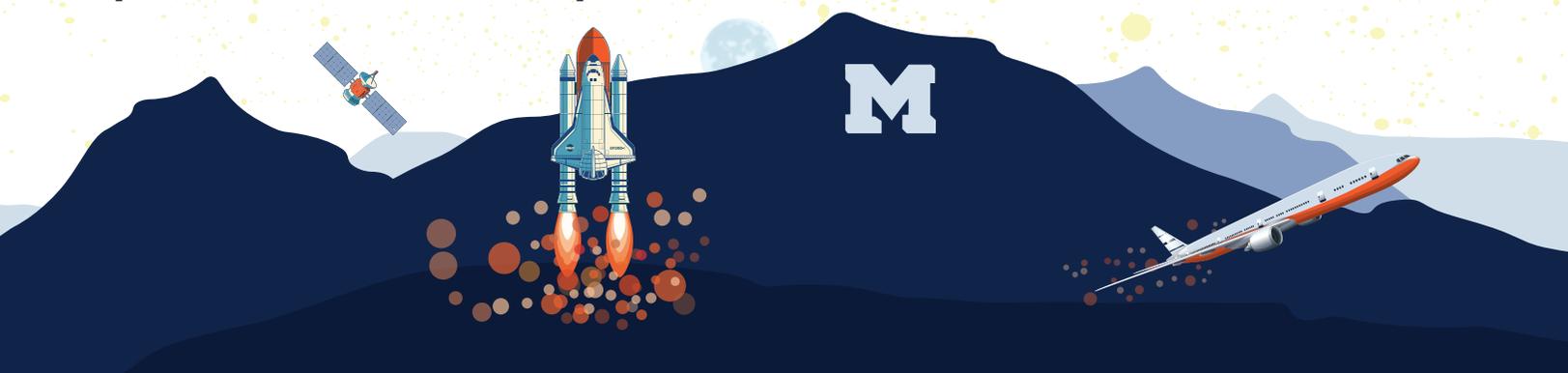
CONNECTING STUDENTS AND AEROSPACE ALUMNI

Despite its expertise and centralized location, Mines is not as well known in the aerospace community as it should be, said interest group member Tracy Copp '99, MS '01, a senior project engineer at Ball Aerospace. "Lots of alumni get into the industry, but they do it on their own. We want to make connections and show the community how compatible Mines is with aerospace," she said.

In addition to highlighting the school's achievements, the interest group serves as a conduit for students.

"Every time students find out I work in aerospace, they want to know how to be a part of it," Copp said. "You can study a textbook, but it won't tell you what being a mechanical engineer in our industry looks like and what skills you need to be successful. We can provide that."

This is where the Trajectories event comes in. Students got to network with industry alumni at the event, which



was co-hosted by the American Institute of Aeronautics and Astronautics. It featured speakers on topics ranging from NASA's deep-space exploration program to the historic use of lunar cycle calendars.

In October, the interest group also hosted a lecture by astronaut Al Worden, who recounted his experience as the command module pilot for Apollo 15. The group meets monthly and is planning a speaker panel for the spring.

THE FUTURE OF SPACE RESOURCES

Soon aerospace employers may have even more reasons to notice Mines graduates. The school has proposed a new graduate program in space resources—the utilization of water, minerals and metals found in space, both for space exploration and for applications here on Earth.

Though many people aren't aware of it, outer space is full of materials that could be used for astronaut consumption or refueling spacecraft, said Abbud-Madrid, who last year gave a well-received TED Talk on the subject. "Think of an asteroid as a gas station with a convenience store attached to it. It has water for astronauts to drink and steam power to propel them to the moon," he said. Extracting resources from space also makes economic sense—it costs \$10,000 a pound to overcome gravity and launch a spacecraft into orbit. Space is also rich in metals and minerals that will eventually become depleted on Earth.

Space mining is less far-fetched than you might think—according to some, it may be just a decade away. Already, companies like Elon Musk's SpaceX, which launched 16 rockets in 2017, are working on ways to supply space settlements with water and minerals mined in situ. In September, NASA launched a spacecraft that will extract materials from a 2,000-foot-wide asteroid in 2018. Financial services firm Morgan Stanley predicts the space economy, already worth \$350 billion, is expected to grow to \$1.1 trillion by 2040.

Future Mines graduates could play a major role in this grand experiment. Space resources brings together many fields where the school has a strong presence, including remote sensing, geomechanics, mining, materials, robotics, advanced manufacturing, electrochemistry, solar and nuclear energy and resource economics. Applying this knowledge to space research could give Mines students an important edge.

"Knowing that students have been exposed to space projects could be of great value to employers in the future," Abbud-Madrid said.

The interest group needs more help to introduce students to the world of aerospace professionals and spread the word about Mines.

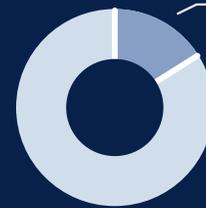
Alumni in the aerospace industry are welcome to join the group—and so is anyone else interested in space exploration, which sparks a passion in so many people. "It's about a new environment and exploring the unknown," Copp said. "It plays to the human sensibility of wanting to know what's out there, what's next."

By **Teresa Meek**

► To get involved with the Aerospace interest group or to learn more about the other interest groups Mines has to offer, visit minesalumni.com/interestgroups.

A CLOSER LOOK: AEROSPACE & MINES

EMPLOYMENT



10-15%
of each Mines
graduating
class enters
the aerospace
field.

ONLY 5-10%

of aerospace professionals hold
aerospace engineering degrees.

INDUSTRY

COLORADO: AN INDUSTRY HOTBED

Mines is located in a booming
aerospace industry.

Colorado is the nation's number
two state for aerospace jobs with
hubs for companies such as:

- Lockheed Martin
- Boeing
- Harris Corporation
- Ball Aerospace
- Northrup Grumman
- Raytheon Company
- United Launch Alliance

HISTORY

30 YEARS

Mines graduates and faculty
have been involved in aerospace
projects for over 30 years.

1 OF 10

In 1996, NASA selected Mines to
be one of 10 commercial space
centers.

OREDIGGERS GIVE BACK

IMPROVING INFRASTRUCTURE,
STRENGTHENING COMMUNITIES

The need for quality and thoughtful urban infrastructure across the nation continues to escalate, and with recent engineering technology advancements, engineers are stepping up to meet the growing demand. In this year's annual report card put out by the American Society of Civil Engineers on the state of the nation's infrastructure, America scored a D+. It's clear there is still some work to do, and Mines is poised to make big impacts as one of the premier institutions educating tomorrow's civil and underground engineers; Mines offers the only graduate degree program in underground construction and tunnel engineering in North America.



John S. Olsson '88, Jack Olsson and Matthew Olsson '16 were all simultaneously admitted to the Order of the Engineer in May 2017. All three have a civil engineering background—John and Matthew graduated from Mines, and Jack graduated from Kansas State University.

Photo by Jody Olsson

With the rapid rate of city expansions both locally and nationally, many engineers are rolling up their sleeves to tackle the jobs ahead. One such group is the Olsson family. John S. Olsson '88 received a civil engineering degree from Mines and has worked at Olsson Associates, his father's engineering and design firm based out of Lincoln, Nebraska, since 1989. John's son Matthew Olsson '16 followed in many of his father's footsteps; he, too, is a civil engineer and was even in the same fraternity (Beta Theta Pi). Matthew currently works for Kraemer North American and was part of the recent innovative highway project near campus at U.S. 6 and 19th Street.

"It's so cool to have a son who would want to practice the same field and then have him settle on the same university as you," said John. "It was fun for me to relive college. I got to spend a lot of time on campus. It is amazing how much it had changed. The culture and core are the same but the physical facilities—so much had changed."

Not only has campus transformed, but the civil engineering field has as well. When John first graduated, he was still drafting with a pencil and a T square. Now, technology is impacting their business; Olsson Associates uses drones, robotics and scanners as a way to collect data. "It is hard to fathom just the way technology is impacting our business. It used to take three people to do a site survey. Now you can do it with two people, sometimes with one guy," John said.

With the data from different surveying techniques, civil engineering firms like Olsson Associates can think long term and develop local community value through their projects.

"As a firm of about 1,100 people, our vision is to go into a community and make it better through infrastructure. Sometimes infrastructure can be a means to an end. We create the roads and utilities, which allows the community to grow," said John. He points to a large project they recently completed in the firm's home city of Lincoln as an example. The city wanted help in picking a location for a large arena. Olsson Associates supported a downtown location where the infrastructure was already in place—the area is now going through redevelopment and is becoming known nationally as Silicon Prairie.

Olsson Associates often recruits Mines graduates because of their work ethic, motivation and dedication to a project. John says those qualities can be hard to find in graduates, and he would put a "Miner" up against anyone. John is also a strong supporter of the university and gives annually to the Mines Fund, which supports innovation and new technology to spark ingenuity among the upcoming engineers of our cities.

"Mines was very good to me and has allowed me to live a good life," John said. "How can you not want to support such an institution?"

By **Anica Wong**

THE TRIP OF A LIFETIME

A FEW THOUGHTS ON A GRAND CANYON RAFTING ADVENTURE

Each year, Mines' Office of Alumni Relations offers a seven-day rafting trip through the Grand Canyon, where alumni, students and friends can learn about the landscape and enjoy the outdoors. Photo by Ray Priestley '79

"It's a trip of a lifetime. The beauty of the Canyon and the chance to be on the river for a full week was a bucket list experience. The weather was perfect, and I loved sleeping under the stars with the soothing sound of the river. My philosophy for the trip became 'no regrets.'"

Judy Schoonmaker
Former Mines faculty member

"It's hard to tell someone why they should go on this trip, because it was an almost indescribable experience. Leaving all of the 'surface world' behind and just existing and experiencing the Canyon, the river and my fellow travelers made me feel more in touch with my planet and with humankind than ever before."

Josh Day '15

"We went to the part of the Little Colorado River where you can ride your life jacket down the stream through mini rapids, and some of the group formed a train to ride through them together. Steve [Sonnenberg] and our rafting guides said they'd never seen a train that large or a group have that much fun."

Danelle Herra
Assistant Director, Alumni Relations

▶ To learn more or be added to the summer 2018 wait list, visit minesalumni.com/GrandCanyon2018.

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ALUMNUS PROFILE

FLYING UNDER A NEW CALL SIGN

During 13 deployments to the Middle East, Lt. Colonel Rob Aikman '01 was a pilot in charge of refueling fighter and bomber aircraft mid-flight. Now, he pilots Air Force Two, a military plane with the radio call sign used for the Vice President of the United States.

“It still blows me away to this day when we fly around the world and get off that aircraft and you see the blue and white, the ‘United States of America,’ and the flag on the tail,” said Aikman. “We are flying around, spreading democracy and freedom and representing the United States and all of the values that we hold dear to our hearts.”

While it might seem like an unconventional path, Aikman’s journey to this esteemed position started at Mines. An ROTC scholarship brought him to campus from Oklahoma, and then after his junior year, he was asked to sign up to be either a pilot or a navigator. He decided to give a go at being a pilot because “it sounded like fun.”

After a series of physicals and earning high test scores, he graduated from Mines and was commissioned and sent to pilot training for the next 54 weeks. He learned the fundamentals of flying on a small jet aircraft and then moved into the heavy aircraft track. Aikman earned his wings when he graduated from pilot school in 2002. “It was a great day,” he remembered. And, like many people following the events after 9/11, he was eager to serve.

Aikman was assigned to fly a Boeing KC-135 Stratotanker, a military aerial refueling aircraft. “We would do mid-air refueling with cargo planes so they don’t have to stop in another country to refuel. A lot of times in Afghanistan and Iraq, where you’re dropping munitions, our fighter and bombers need to stay airborne. Instead of an hour at a time, [with in-flight fueling], they can stay up for six to eight hours,” Aikman explained.

The process of in-flight fueling is almost like a ballet dance; two planes up around 25,000 feet flying 30 feet apart have



to match air speed first, nice and controlled. When they are in the right position, a crewman extends a flying boom with a rigid hose attached to the Stratotanker to the fighter or bomber plane. And everyone hopes that they don’t hit turbulence while the refueling process happens.

Aikman laughed as he mentioned that the first page of his flight manual warns that flying two aircraft in close vertical proximity is unsafe; practice during training and proper procedures kept Aikman and his crew safe during these missions.

“When you’re up at 30,000 feet watching the most beautiful sunrise—that’s what I love about flying,” he said. Aikman’s main goal has always been to fly for as long as he can, but as he moved through the ranks of the Air Force, those opportunities were harder to come by. With more years in the service come more leadership responsibilities and less time in the air.



Rob Aikman '01 has spent his career as a pilot in the U.S. Air Force, flying an aerial refueling aircraft. Recently, he has moved up in the ranks and currently flies under the radio call sign "Air Force Two," often transporting the vice president of the United States.

Photo courtesy of Rob Aikman '01

So he applied to the 89th Airlift Wing, which provides airlift, logistics and other support for the United States President, Vice President, Combatant Commanders and senior leaders. The application process is intense, requiring documentation of the previous five years of performance reports and recommendations from supervisors, topped off with a three-day interview with some of the highest senior commanders who ask hard tactical and situational questions. In 2016, Aikman was selected to pilot Air Force Two for four years; at the end of that term, he will have served in the Air Force for 20 years and will be able to retire.

Aikman looks at his time in this prestigious position as similar to when he was at Mines. "I like to surround myself with the best and brightest people, which is another reason I went to Mines," he said. "When I'm around intelligent, driven people, it challenges me to up my game so I can help others when I get the chance."

By **Anica Wong**



Photo from Wikimedia Commons

A CLOSER LOOK: AIR FORCE TWO

- 1** Air Force Two is not a specific plane, but a radio call sign for whatever plane the vice president is using. Currently, the military plane is a C-32, a specially configured version of the Boeing 757-200 commercial intercontinental airliner.
- 2** Air Force Two was added to the presidential fleet in 1959 and similar to Air Force One, the plane's nose and tail were painted the Air Force's visible "international orange" color while block letters on the side said "Military Air Transport Service." President John F. Kennedy and his wife felt the planes needed to have a more presidential brand, so they changed the exterior design. Now, the blue paint coordinates with the American flag on the tail and a more formal typeface is used for the "United States of America."
- 3** It costs about \$30,000 an hour to operate Air Force Two, according to the Air Force Cost Analysis Agency in 2016. The aircraft is more fuel efficient than its C-137 predecessor, can travel twice the distance and can operate on shorter runways.
- 4** Franklin D. Roosevelt was the first president to have his own plane; he flew to the Yalta Conference in February 1945. President John F. Kennedy was the first president to fly in a jet specifically built for presidential use.
- 5** The U.S. Air Force asked Congress this year for \$6 million to start the planning process for replacing the C-32As, which will reach the end of their 25-year service life in 2023. The next version will have better communications, increased flying range, more room for passengers and improved private work space.

WINTER 2018 ON OUR WALL

We asked our Facebook audience, what kind of car did you drive when you were in college? If you didn't have a car, how did you to get to campus?

I drove a 1995 Mustang GT 5.0 at Mines. The first car I ever built and drove was a chopped and hacked 1931 Chevy Legend; I started on it at age 11.

-Greg Widgery '10

1958 Corvette. I bought it from a guy at University of Denver with 98,000 miles.

-Todd Brown '69

1992 Mazda Protege, a stick shift I bought in 2000 at the end of my freshman year. It was all I could afford (barely), but I didn't know how to drive a stick, so Xavia Bell '04 had to test drive it and drive it home for me.

-Glenda Bell '03

RTD.

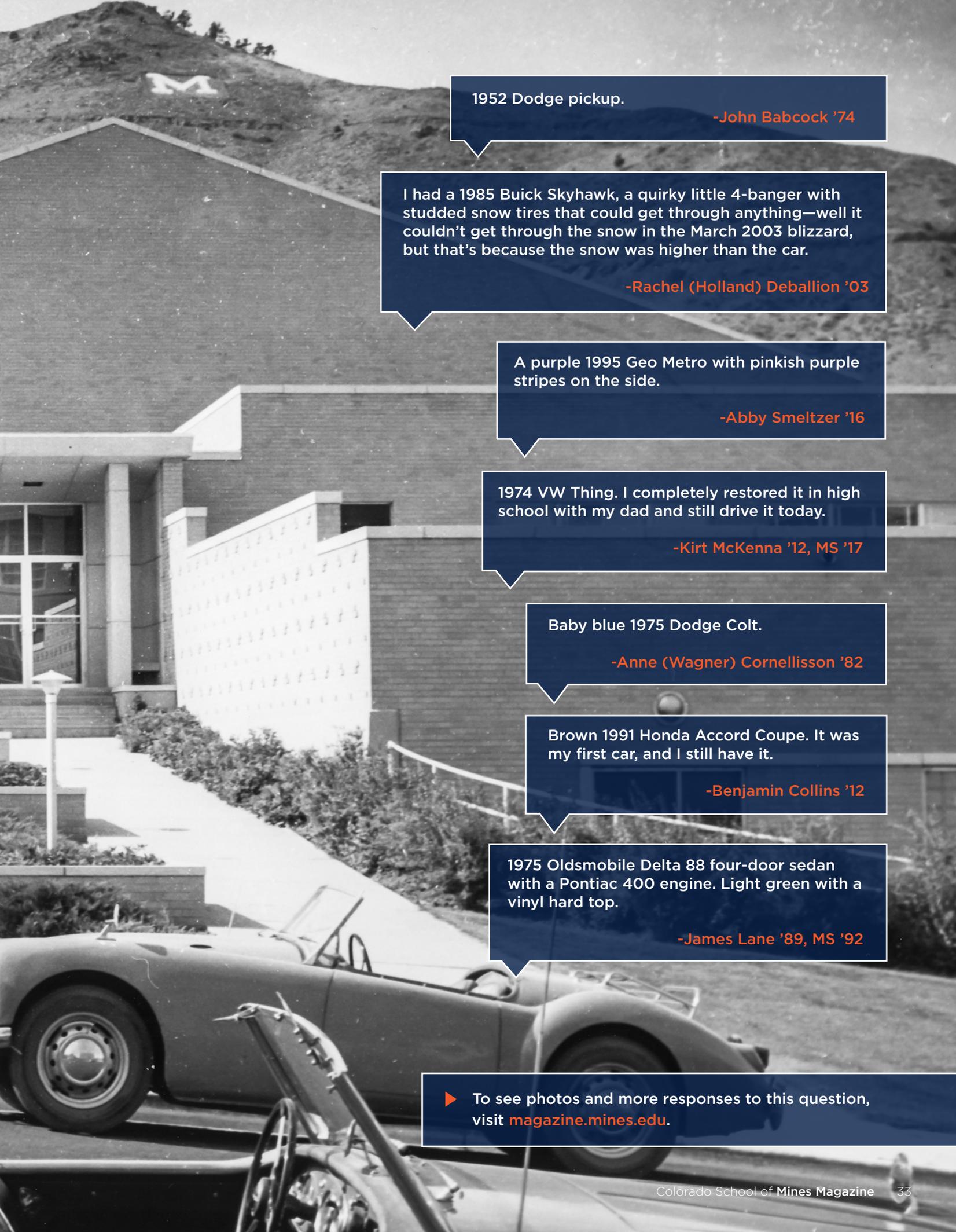
-Colin Fitzgerald '07

1993 full-size Chevy Blazer. It's still in my driveway and runs like a champ.

-Scott Hodgson '03

I walked to and from campus. No car required.

-Eileen Hartsock '13



1952 Dodge pickup.

-John Babcock '74

I had a 1985 Buick Skyhawk, a quirky little 4-banger with studded snow tires that could get through anything—well it couldn't get through the snow in the March 2003 blizzard, but that's because the snow was higher than the car.

-Rachel (Holland) Deballion '03

A purple 1995 Geo Metro with pinkish purple stripes on the side.

-Abby Smeltzer '16

1974 VW Thing. I completely restored it in high school with my dad and still drive it today.

-Kirt McKenna '12, MS '17

Baby blue 1975 Dodge Colt.

-Anne (Wagner) Cornellisson '82

Brown 1991 Honda Accord Coupe. It was my first car, and I still have it.

-Benjamin Collins '12

1975 Oldsmobile Delta 88 four-door sedan with a Pontiac 400 engine. Light green with a vinyl hard top.

-James Lane '89, MS '92

► To see photos and more responses to this question, visit magazine.mines.edu.

WEDDINGS



FRIENDS FIRST

Rachael Madland '10, MS '12 and Douglas Low '11 were married on Sept. 16, 2017, in Breckenridge, Colo. Doug and Rachael met as freshmen during their first weekend at Mines. In the midst of the hustle and bustle of move-in and meeting new people, Doug approached Rachael at the welcoming pizza party, and they hit it off. While they eventually went their separate ways, Doug and Rachael remained close friends over the next four years. They reunited in 2010 and have been inseparable since. Several Mines alumni attended their wedding, including Landon Smith (best man), Amanda Meier '10, PhD '15 (bridesmaid), Patrick Essay '12 (officiant), Scott Ardeel '10, Scott Mitzner '10, MS '12, Benjamin Seling '11, Hunter Dunham '12, Peter Turlington '11, MS '12, Stephanie (Biagiotti) Corey '12, Alex Corey '12, Kraig Weaver '10 and Robbie McGourty '10.



BLASTING INTO THE FUTURE TOGETHER

Eight years after meeting during freshmen orientation, Nicole Johnson '13 and Aaron Glauch '13 were married on Sept. 3, 2017, overlooking their favorite spot of Clear Creek at the Golden Hotel. Nine other Mines alumni and three Mines faculty were in attendance, including Ariel Bridgeman '13, MS '14 (maid of honor), Ryan Schaeff '13 (groomsman) and Shuichi Ushijima '13.



OREDIGGERS IN LOVE

Angela Dang MS '16 and Jared Atkinson MS '10 were married in Georgetown, Colo., on Dec. 31, 2016. They recently moved back to Golden, Colo., from Midland, Texas. Angela currently works for Encana Corporation as a drilling engineer, and Jared is pursuing a PhD at Mines.



SUSPENDED LOVE

Mickey Wilson '11, MS '12 married Purple McMullen-Laird on Aug. 26, 2017, over a canyon near Moab, Utah, on a net suspended by slacklines.



NEW BEGINNINGS

Logan Gee '14 married Kayla Birkhead on July 15, 2017, at Manor House in Littleton, Colo. Several Mines alumni attended their wedding, including Alex Beaman '14 (best man), Alex Nussel '14 (officiant), Brian Stack '14, Perry Marks '14, Rachel (Reinke) Bailey '14, Bill Gee MS '81 (father of the groom), Chris Herald MS '81 and Steve Zuker MS '87. The couple honeymooned in London and Scotland. Logan currently works as a satellite design engineer for Ball Aerospace.



AN ORGANIC CONNECTION

Bethanne Peters '14 and Christopher Robinson '15 were married on July 8, 2017 in Boulder, Colo. Bethanne and Chris met in Dr. Cowley's Organic Chemistry I class during their sophomore year at Mines. The couple started dating about six months later and were married after five years together. Thirteen Mines alumni attended their wedding, including Jeremy Klanchar '14, Stefan Nikodemski '10, MS '12, PhD '16 and Dan McKee '14.



A CAUSE FOR CELEBRATION

Edward Wolfram '15 married Cassandra Shade on June 3, 2017. Edward and Cassy met in Vernal, Utah, and Edward proposed at Eldorado Canyon when he surprised Cassy with a trip to Colorado. The wedding was held in Downtown Denver with several Mines alumni in attendance, including, Preston Wolfram '11 MS '13, Phillip Wolfram '08, Christopher Huter '09, Michael Rodgers '15, Kendrick Rhea '16 and Jordan (Partin) Rhea '16, Trey Winbush '16, Eli Ludtke '15, Mark Sundstrom '15, Stephen Candelaria '16, Daniel Reuter '79 and Paul Dorr '74, MS '81. Edward and Cassy now live in Midland, Texas.

BABIES



BABY CUDDLES

Adrienne (Nemanic) Bash '05 and her husband, David Bash, welcomed their son, Quinn David Bash, on Sept. 14, 2017 at 1:22 am. When he was born, Quinn weighed 7 pounds, 14 ounces and measured 22 inches long.



THIRD GENERATION OREDIGGER

Owen Michael Gower was born on June 17, 2017, to Robert Michael Gower '04 and Eileen (McFadden) Gower '04. Here, Owen is sporting his Mines pride with his grandpa, Dale McFadden '76.

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Go to minesalumni.com/wearemines



UPDATE MY INFO

All alumni who update by the end of March 2018 will be entered to win a prize. 303.273.3424

IN OTHER NEWS



A CENTURY OF EXPERIENCE

George A. Minick '53, MS '72 celebrated his 100th birthday on Sept. 2, 2017. His daughter, Renee Minick Brune '85, and son-in-law, Dr. Jürgen Brune MS '83, threw a party at their home. George received a professional engineering degree from Mines in 1953 and started his career as a “doodlebugger” on a geophysical prospecting crew. He returned to Mines to receive a master’s degree in metallurgy in 1972. George then worked for A.R. Wilfley & Sons, Inc., and was a registered professional engineer in Colorado from 1960-1994. George still enjoys attending Mines basketball games with his friend, Ray Hart.

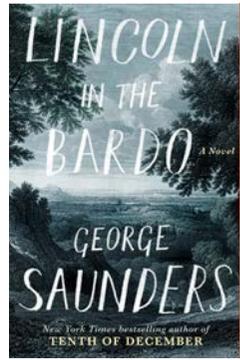
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MAN BOOKER PRIZE

George Saunders '81 won one of the most prestigious awards in English literature, the Man Booker Prize, for his first novel, *Lincoln in the Bardo*, on Oct. 17, 2017. The Man Booker Prize recognizes the best original novel written in the English language and published in the U.K. *Lincoln in the Bardo* tells the story of President Lincoln’s visit to his son’s crypt in a Georgetown cemetery, and the book has been heralded for its unconventional form.



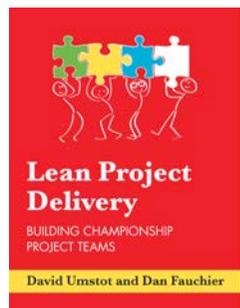
EARLY-CAREER TEACHING FELLOWSHIP

Levi Miller '12 was awarded an early-career teaching fellowship by the Knowles Teaching Fellows Program. Dedicated to improving the quality of high school science and mathematics education in the United States, the program awards young teachers with five-year fellowships, empowering them to become primary agents of educational improvement. Miller began his first year of teaching at Dos Pueblo High School in Goleta, Calif., in fall 2017.



DISTINGUISHED SERVICE AWARD

Maria Capello MS '95 received the Society of Petroleum Engineers' Distinguished Service Award at SPE's Annual Technical Conference and Exhibition in San Antonio, Texas, on Oct. 11, 2017. Capello was recognized for her work in organizing major conference events, playing a major role in attracting and retaining young people and women to the oil industry and for being an effective role model for volunteerism. Each year, SPE presents awards that recognize members whose efforts have advanced petroleum technology, as well as their professional achievements and contributions to the industry and society.



LEAN PROJECT DELIVERY: BUILDING CHAMPIONSHIP PROJECT TEAMS

David Umstot MS '88 published his book, *Lean Project Delivery: Building Championship Project Teams* in August 2017. The book shares the value proposition and mechanics of Lean design and construction, discussing the origins and history of Lean, Lean thinking and tools with specific applications and

examples in design and construction, how to effectively establish an organizational and project culture to enable and sustain Lean practices and more. The text was inspired by the need for an integrated resource for those in the design and construction industry who want to better understand how Lean can improve project performance and outcomes.

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



LAWRENCE E. “LARRY” BARRETT ’50 died Oct. 26, 2017. Larry was born in 1928 in Rifle, Colo. As a student at Mines, he was a member of Sigma Phi Epsilon fraternity and graduated in 1950 with a professional degree in petroleum engineering. He started his career working for Texaco

in Montana, western Colorado, North Dakota and eventually back in Denver. Larry joined Ladd Petroleum (now AMAX Inc.) in 1968, where he headed domestic and international operations. He retired as a senior vice president from Ladd Petroleum in 1986, though he continued investing in oil and gas interests. He was very active at Mines, where he and his wife, Charlotte, endowed a scholarship for undergraduate students.



CHARLES “SCOTTIE” BRUCE ’57 died Nov. 7, 2017. He was born in 1931 in Aberdeenshire, Scotland and was a coal miner at the Lady Victoria Colliery (now the National Mining Museum Scotland) near Edinburgh from 1949–1953. Scottie came to Mines on a scholarship in 1953 and graduated in 1957 with a professional

degree in geology. After graduation, he was hired by La Corporación Minera de Bolivia (Comibol) in 1960. Scottie then worked for M&T Chemicals of New York and on mining projects in Turkey, Iran, Thailand and Bolivia. He formed his own consulting firm, Resources Exploration International, Ltd., in Golden, Colo., until 1979 when he returned to Bolivia as the president of Churquini Enterprises, Inc. Scottie then became the executive vice president and chief operation officer of Mintec S. A. in La Paz, Bolivia. In the 1970s, Scottie visited the University of Aberdeen in Scotland and set up a fund to support doctoral geology students’ field work on mining projects. Scottie was also one of the founders of the Geological Society of Bolivia and was the president of the American Chamber of Commerce in La Paz for many years.



DAVID L. DICKINSON ’68 died Sept. 8, 2017. Born in 1945 in San Diego, David earned a professional degree in metallurgical engineering from Mines in 1968. As a student, he was a member of the Sigma Nu fraternity, played the baritone in the marching band, sang in the choir and played piano. After graduation, David

worked for P&G in Kansas City, Mont., and later attended law school at the University of Denver while working for Denver City and County’s personnel department. He graduated from law school in 1976 and worked as an assistant district attorney in Denver. He later accepted a position in Durango, Colo., as the La Plata County attorney and entered into private law practice in 1985. In 1998, David was appointed to the 6th Judicial Court District, where he served until his retirement in 2013. David was also a founding member of the Southwest Bar Volunteer Legal Aid and was an active member of the Kiwanis Club of Durango. He also held all offices of the San Juan Sailing Club.



PETER A. “PETE” DROBECK MS ’79 died Nov. 1, 2017. Born in Detroit in 1954, Pete graduated from the State University of New York at New Paltz with a bachelor’s degree in 1977 before completing his master’s degree in geology from Mines in 1979. In his career, he worked for numerous exploration and mining

companies, including Newmont Exploration, Newcrest Resources, Inc., Silver Standard Resources, Inc., AuRico Gold, Tenke Mining Corporation and Electrum Ltd. Pete had recently joined Discovery Metals Corp. as Vice President of Exploration. He also spent more than 10 years working in Mexico, Chile, Argentina, Mongolia, India, Indonesia and Africa.



CHARLES R. "CHUCK" FLOWER JR. '65 died on Oct. 12, 2017, in Sun City, Texas. Chuck was born in Boulder, Colo., in 1942 and spent his early childhood in Longmont, Colo., where he was active in the Boy Scouts, taught skiing at Hidden Valley Ski Resort and graduated from Longmont High School in 1960. Chuck received

a professional degree in petroleum engineering from Mines in 1965 and was a member of the Sigma Phi Epsilon fraternity. He made his career in the oil and gas business, starting in Casper, Wyo., and eventually moved to the Arvada/Golden, Colo., area. Chuck's career also took him to Texas, first in Amarillo and later to The Woodlands. Chuck retired from a successful second career at the department store Foley's in 2006.



ROBERT A. "BOB" PRESCOTT '61 died Sept. 26, 2017. He was born in 1938 in Torrington, Wyo. Bob graduated from Mines in 1961 with a professional degree in metallurgical engineering. While attending Mines, he participated in football and wrestling. After graduation, he became a Sloan Fellow

at the Massachusetts Institute of Technology in 1974-1975 and received a master's degree in management. Bob worked in the copper and gold mining industry for 40 years. His work for Kennecott Copper Corporation, Inspiration Consolidated Copper Company and Summo Steel Corporation took him throughout the western United States. He retired in Moab, Utah, and moved to Fruita, Colo., in 2006.



JULIO ENRIQUE LEVY '55 died Sept. 20, 2017. He was born in 1928 and grew up in Santa Ana, El Salvador. He accepted a scholarship to Mines and received a professional degree in geology in 1955. Enrique then furthered his studies at the University of Utah. In his professional career, Enrique traveled Central and

South America with Kennecott Utah Copper and the United Nations Revolving Fund, mining copper, silver, gold and chalk. He worked through the age of 85.

GORDON H. VAN SICKLE '61 of Lakewood, Colo., passed away on Oct. 14, 2017. Gordon was born in La Junta, Colo., in 1938, and grew up on a dairy farm in Manzanola, Colo. After graduating from Manzanola High School in 1956, Gordon attended Mines, where he played basketball and graduated with a professional degree in geology in 1961. After graduating, Gordon spent most of his career as a partner at Skyline Assayers & Laboratories, a geological fire assay lab.

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

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MINER'S PIC



Photo by Joshua Murdock

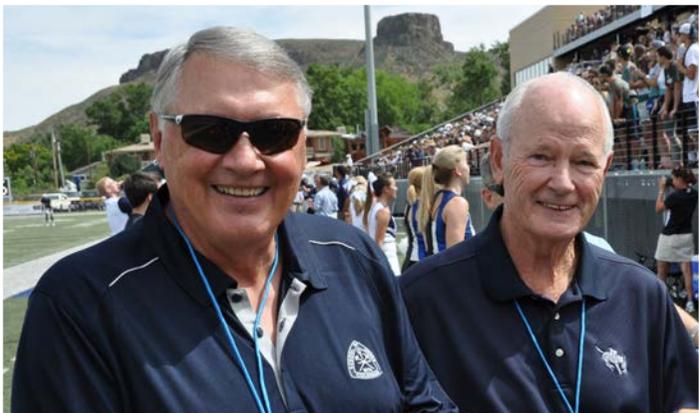
JOYRIDE

The Mines Cycling Team pedaled their way to victory this fall. From October 20-22, 2017, the team competed in the USA Cycling Collegiate MTB National Championships in Missoula, Montana. The competition consisted of several races, divided into two disciplines: cross country and gravity. The cross-country competition consisted of a short track (a 25-minute race within a half-mile circuit), a long-distance race over 10-20 miles and a team relay. The gravity competition is a timed downhill course. The Mines team ranked second overall as a Club D2 team out of 18 schools, fifth overall in all 40 club cycling teams and 15th out of all 61 club and varsity teams in the country.

"I am proud of the improvement I have seen in all our racers and their performance, because that is what got us on the podium at the end of the day," said Laura Leonard, president of the Mines Cycling Team. "All the support from our team members who did not attend Nationals, our local sponsors and Mines allowed us to get to Nationals and put all we had out into a sport we love."

The photo above shows student Caleb Reese competing in the cross-country short track.

► See more photos of the Mines Cycling Team at the National Championships online at magazine.mines.edu.



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COMING OF AGE

Golden, Colorado has changed a lot over the years. The left photo shows the city in 1888, and the right photo is what the area has grown to become today, nearly 130 years later. Photos from the Mines Archives and William Ciccone

