

MINES MAGAZINE

For Colorado School of Mines Alumni and Friends • Winter 2025

*Ring*ing in *h*istory

A new campus bell honors
Mines' legacy and builds
on tradition

PLUS:

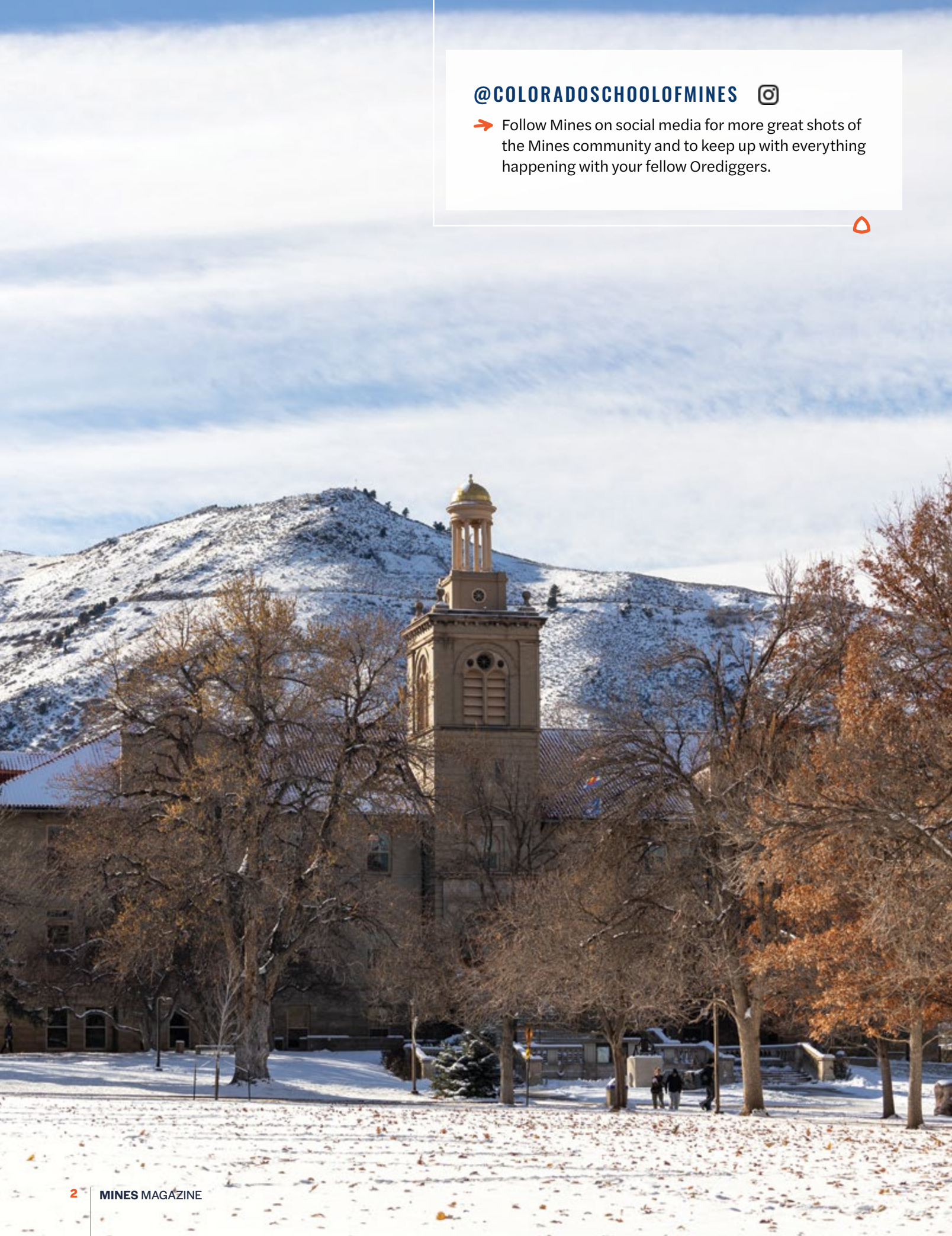
Mines graduates are developing new apps and businesses that create new opportunities and build community.

Mines' honors and scholars programs consistently prepare scientists and engineers to navigate a complex world.

MINES EDU

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➔ Follow Mines on social media for more great shots of the Mines community and to keep up with everything happening with your fellow Orediggers.





GREENTECH TAKES ROOT

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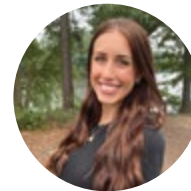


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On the cover: Mines added a restored bronze bell to campus in 2024 to commemorate the university's 150th anniversary and kick off a new tradition where graduating students can ring the bell to signify their achievement and Mines pride.

LEVERAGING E&I RESOURCES: FROM IDEAS TO REALITY



Jalen Thomas '23, MS '24 never wants to grow up. So he founded a company to create childlike fun that's accessible and enjoyable for everyone.

FUNtastic LLC is a themed entertainment company that emerged from the Theme Park Engineering and Design Group, which Thomas started in 2022 after a Walt Disney Imagineering Internship. The company's first product is a portable escape room. It's designed and engineered by Thomas and his four cofounders, all of whom are Mines students or alumni.

From the spark of an idea to building prototypes to setting up and running the business, Thomas and FUNtastic have **leveraged the Mines Entrepreneurship and Innovation Ecosystem.**

"Mines engineers are great problem solvers," Thomas said. "The E&I education and resources at Mines teaches students how to bring their solutions to life, to the market and to the world."



LEARN

The McNeil Center for Entrepreneurship and Innovation is home to innovation and business education at Mines.

"The McNeil Center is the most important part of innovation at Mines. Students learn they can become an entrepreneur, or they can just be innovative."

MAKE

Centered at the Labriola Innovation Hub, Mines boasts one of the country's largest makerspaces—specialized workshops, labs and meeting rooms.

"If we did not have the space and tools to build the portable escape room components, there is no way FUNtastic would exist as it does today."

LAUNCH

Mines offers a rich resource for students and alumni business founders: the Beck Venture Center.

"Beck gives us professional-level meeting space, a community that asks, 'What do you need?', mentors who understand the struggle of bringing a company to life and inspiration at every forum."

INVEST

Mines-affiliated startups have a unique opportunity to raise the capital they need to develop and grow with Mines Venture Fund I.

THE CAMPAIGN FOR

MINES

@150

GET INSPIRED BY FUNTASTIC'S ORIGIN STORY

And learn how Mines is prepping students to innovate now and past graduation.





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630 DEGREES OF EXCELLENCE

A new group of graduates becomes Mines alumni

Closing out Mines' 150th anniversary year, the university conferred a total of 290 bachelor's degrees, 265 master's degrees and 75 doctoral degrees at the December 2024 commencement ceremonies, welcoming a new group of graduates into the alumni community. Graduating students also had the opportunity to participate in a new tradition this year: ringing the sesquicentennial bell in front of Guggenheim Hall to mark the accomplishment of finishing their degrees. **Read more about this new tradition on page 26.**

→ Hear from Mines undergraduate students who graduated in December 2024 as they reflect on how they embraced academic challenges, celebrate traditions and create lifelong memories.



→ Watch a video of Mines graduate students sharing how their experiences are transforming industries and shaping futures.



ADAPTING, LEADING AND THRIVING

Mines is empowering the Oredigger community to succeed in ever-changing landscapes

We are in an era of rapid change and growth—in technological advancements, in engineering processes, in scientific breakthroughs and even in education practices and career preparation. This means Mines must stay on top of its game if we are to lead and thrive in this ever-changing landscape. Luckily, with the work and investments we've all put in through the MINES@150 efforts, we have positioned Mines to do just that, and we are focused on ensuring that we provide the unique education and experiences that set Mines graduates up for success regardless of what the future may hold.

We also need to strive to increase Mines' impact on and value to the world. We do that through you—our alumni—and our innovations and unique expertise. With our new programs and facilities, we are better able to help students, faculty and alumni turn their ideas into reality. From groundbreaking research to entrepreneurial ventures, our community's creativity knows no bounds. But innovation doesn't happen in isolation—it thrives on collaboration. That's why we are working on expanding professional development opportunities and



signature experiences that connect current students with alumni leaders across industries. Through initiatives like mentorship programs, workshops and networking events, we aim to empower every Oredigger to reach their full potential.

Leadership growth is at the heart of these efforts. Whether it's students leading real-world projects, teams and organizations; faculty shaping the next generation of engineers; and scientists or alumni driving change in their fields, leadership defines the Mines spirit. We're committed to providing resources and opportunities that cultivate this vital skill across the Mines community.

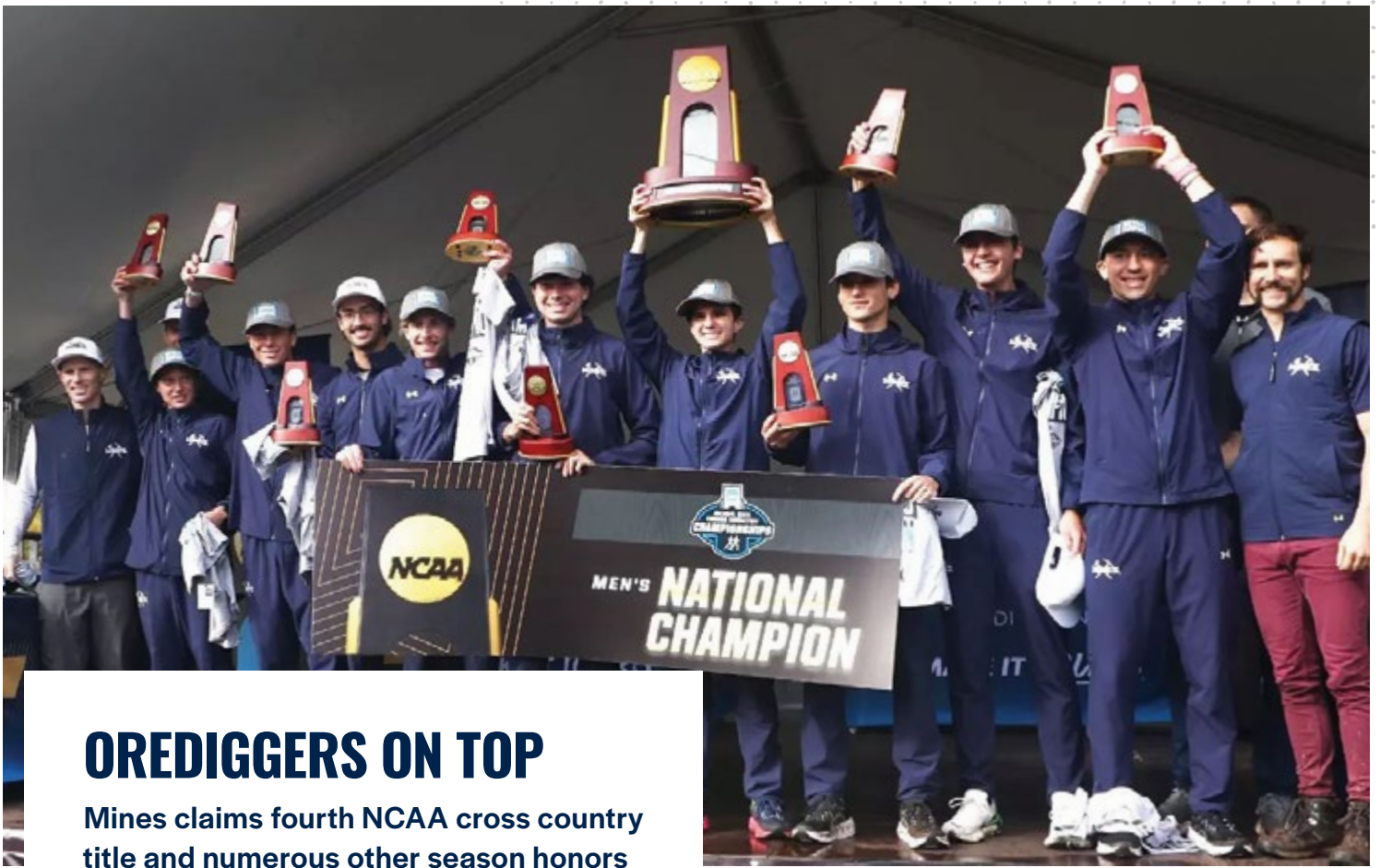
This collaboration includes Mines alumni—those who know what it's like to be an Oredigger and a Helluva Engineer in the professional world best. In the near future,

we hope to bring your expertise, industry knowledge and professional experiences to current students so they can be more highly valued and competitive as they seek their first career opportunities. As you'll see in the stories throughout this issue, you are role models and trailblazers, demonstrating how a Mines education can make a difference in the world.

As we move forward, I invite you to join us in ensuring Mines continues to lead and inspire. Together, we can ensure the value of a Mines education grows even stronger, leaving a legacy that reflects the very best of our community.

Go Orediggers!

Paul C. Johnson
President and Professor



OREDIGGERS ON TOP

Mines claims fourth NCAA cross country title and numerous other season honors

Mines' men's cross country team claimed the 2024 NCAA Division II title this fall, marking their fourth national championship in program history. The victory came down to a dramatic final push as the Orediggers overtook the No. 1-ranked Wingate in the last half-kilometer to win by just three points. The title joins Mines' previous championships in 2015, 2019 and 2022, all led by head coach Chris Siemers.

Key performances secured the victory for the Orediggers, with Logan Bocovich, Loic Scomparin and Ethan Grolnic finishing together in seventh, eighth and ninth places. Scomparin's late surge was pivotal, as he climbed from 31st place at the midpoint to finish in the top 10. Bocovich also made a decisive move into the top 10, improving on his 16th-place finish from last year. Paul Knight (21st) and Dawson Gunn (25th) rounded out Mines' scoring, ensuring the team's narrow win.

The women's team also delivered a historic performance, finishing fifth overall, led by Jenna Ramsey-Rutledge's standout run. Ramsey-Rutledge captured third place individually, the highest finish ever by an Oredigger woman at the national meet. Her time of 20:34 in the 6K race secured Mines'

third-ever top 10 individual result. Emily LaMena (57th), Grace Strongman (63rd), Lexi Herr (70th) and Imani Fernandez-Gorbea (75th) completed the scoring for Mines.

In recognition of their outstanding performances, seven Orediggers earned All-America honors from the U.S. Track & Field and Cross Country Coaches' Association. Mines' men placed six runners in the top 40—Bocovich, Scomparin, Grolnic, Knight, Gunn and Vaille—while Ramsey-Rutledge represented the women with her bronze-medal finish. In addition, Scomparin was named the 2024 RMAC Academic Athlete of the Year for men's cross country, extending Mines' streak of top honors to four consecutive years.

Head coach Chris Siemers also was named the 2024 NCAA Division II National Men's Coach of the Year, receiving the prestigious Joe Vigil Award for the fifth time in his career. Siemers' leadership guided the Orediggers to an unbeaten season, which included wins at the South Central Region Championships, RMAC Championships and several invitational meets.



HISTORIC GIFT TO AMPLIFY ECONOMICS AND BUSINESS EDUCATION

Lowell Shonk MS '79 and his wife, Cheryl, made a transformative \$5 million gift to establish the Lowell and Cheryl Shonk Endowed

Chair for the Head of the Economics and Business Program—the first named gift of its kind for the department. The Shonks' aim to help advance business education for all Mines students, ensuring they gain critical business acumen to thrive in a rapidly evolving global economy.

The Shonks also expanded their support for students by doubling their previous \$500,000 investment to create a \$1 million endowed fellowship for Mines' renowned Mineral and Energy Economics program. Lowell Shonk's experience as a Mines graduate student in the Mineral and Energy Economics program and his successful career with international mining and minerals companies highlight the intersection between business and technical expertise.

"With our endowed chair gift, Cheryl and I want to make a permanent difference in the ability of the department to advance its mission. In addition, with the fellowship, we hope to lighten the financial burden of students and propel them to make a difference in their academic success," Shonk said. "Both gifts are designed to further enhance the world-class Mines education that we believe in and that contributes to the next generation of minerals, energy and environmental leadership."

The Shonks' gift helps ensure that Mines students are not only prepared to solve complex technical problems but also to lead the organizations that will solve tomorrow's global challenges.

VALVE ACCESS PROJECT WINS FALL 2024 CAPSTONE DESIGN SHOWCASE




A team that created a solution to simplify seasonal water release operations at a Jefferson County park won the top prize at the Fall 2024 Capstone Design Showcase.

Jefferson County Open Space staff regulate Pine Valley Ranch Park's water levels and comply with water rights directives by operating a gate valve 15 feet from the shoreline. The staff access and manually operate the valve from a canoe, which comes with risks and is inconvenient. Valve Access Project created a custom gearbox with a 15-foot-long extendable drive shaft that allows park staff to use the extendable shaft to turn the valve from shore. The team's design requires minimal maintenance and prevents environmental contamination, as well as being vandalism resistant.



MINES NAMED CAREER CONNECTED CAMPUS

 Mines is one of seven institutions in Colorado to receive the new Career Connected Campus Designation from the Colorado Department of Higher Education. The designation recognizes a commitment to empowering students with the knowledge, skills and resources needed to succeed in their chosen careers and make meaningful contributions to their respective industries.

Mines joins Colorado College, CSU Global, Pueblo Community College, Regis University, CU Denver and the University of Denver in this inaugural class. The selected institutions prioritize professional development, workforce readiness and practical learning alongside academic excellence.

“By focusing on practical skills and career readiness, these campuses equip students to thrive in the exciting and innovative sectors of the future, helping us meet the evolving needs of our thriving economy,” said Colorado Gov. Jared Polis.

“The Mines Career Center is honored to have received the inaugural Career Connected Campus Designation from the Colorado Department of Higher Education,” said Wendy Winter-Searcy, director of the Mines Career Center. “Mines prioritizes career-connected learning and invests in students’ career success at every level. From hosting the largest career fairs in the Rocky Mountain region, to positive career outcomes of over 90 percent, the results of a Mines education are evident.”

The Mines Career Center forges partnerships between premier STEM talent and top employers by integrating career support into the student experience with career-exploration tools, skill-building workshops, mentorship opportunities and the largest bi-annual college career fair in the Rocky Mountain region.

The Valve Access Project team looked at their challenge holistically, tackling the problem of water management as well as taking the park’s main function into account.

“The project was more than just simplifying safe operation of the valve,” said team member David Hansbarger. “Pine Lake is often used for recreation, and we wanted to keep the landscape as beautiful as it is now.”

“It is always nice to see a result of all the hard work that was done,” said team member Andrew Merz. “We were excited to win just as much as we were excited to install the gearbox. We hope that the gearbox can be helpful for the Jeffco employees for years to come.”

Second place at this semester’s showcase went to the Mines Park Greenhouse Thermal Management team which made a series of improvements to the Mines Park greenhouse, including installing thermal regulation, overhead trellises and replacing faulty components, to increase use by residents.

Third place went to the Autonomous Lunar Cargo Rover team, which designed and built a lunar cargo rover with the autonomous ability to aid astronauts on the Moon.



Students in the Thorson First-Year Honors program participate in a design expo where teams demonstrate creative design concepts to address a real-world challenge.

SUPPORTING WELL-ROUNDED ENGINEERS

Mines' honors and scholars programs are preparing scientists and engineers for an increasingly complex world

BY CYNTHIA BARNES

At first glance, food, humor, the history of human thermodynamics and the philosophy of the Constitution seems to have little relevance to a STEM education, which historically focused on mastering the “hard sciences.” However, this narrow focus often produced technically proficient yet insular engineers, less prepared to integrate their professional talents with the complex world around them. In the late 1970s, Mines was one of the first institutions to take on the challenge of graduating students who were not only prepared to succeed in their chosen fields, but

who were also equipped with an interdisciplinary, global education that would allow them to lead rich and rewarding lives both personally and professionally.

Today, Mines prepares undergraduate students through eight honors and scholars programs—including the Thorson First-Year Honors, Grandey First-Year Honors, Undergraduate Research Scholars, Engineering Grand Challenges Scholars Program, Teach@Mines, Nationally Competitive Scholarships, and the brand-new Future Energy Scholars program. These followed the signature student experience set by the McBride Honors Program in Public Affairs, which celebrated 45 years in 2024. Originally funded by the National Endowment for the Humanities, the program was a passion of then-Mines president Guy T. McBride and was renamed in his honor upon his retirement.

“I was a very junior member of that seven-member cadre of folks who envisioned this program,” recalled E. Dendy Sloan, university emeritus professor of chemical and biological engineering at Mines. “President McBride recognized that leading a good life required connecting with a broader context than technical engineering and science could provide. It meant addressing larger human problems, ones that were not answered in the back of the book, such as the questions encountered in classic literature and the liberal arts.”

“It was a revolutionary concept at the time,” said Toni Lefton, assistant provost and executive director of the Honors and Scholars Programs. “President McBride wanted our graduates to be good global citizens, to explore culture and place beyond our own

backyards, to understand policy, politics and public affairs through an interdisciplinary, humanities lens.”

The McBride Honors program has a long-established ethos of exploring the world and investigating the human condition. The program has evolved a vision for providing students with a holistic and humanistic education into a dynamic program for students and faculty to challenge the limitations of their perspectives and education.

“Every semester, I see how the transformative experiences our students and faculty have during their time in the program carry over into their various communities and other classes,” said Melanie Brandt, director of the McBride Honors program. “Not only do students report that McBride allows them to see the interconnectedness of knowledge in their education, but that it fundamentally expands their minds as they move through the world. Similarly, faculty have embraced the explorative and collaborative space of McBride to develop new pedagogical approaches and innovative courses that they bring back to enrich their home departments.”

“The McBride program gives students today an opportunity I didn’t have, to get a perspective on the world into which their new technologies and new learnings will apply,” said Bruce Henry ’61. Henry described his perspective on the world as “very shallow” before participating in the White House Fellows program in 1973, when he was working as an executive at Polaroid. “We traveled to South Africa, to Russia. It opened up my view of the world and what was going on in the world around me.” Henry thinks programs like McBride allow students to gain those experiences earlier in their professional lives and have an advantage when entering the workforce with those skills.

Current scholars agree. Emma Khorunzhy will graduate in spring 2025 with a minor in public affairs through McBride as well as having participated in the Teach@Mines and Undergraduate Research Scholars programs. She said the experiences have been invaluable. “These programs help develop other parts of people, how you communicate, write, think about the world and how you interact with other people,” she explained. “I really feel like it's necessary that everyone has some experience that deviates from a strictly STEM education to really just develop themselves as people. And the honors programs really helped develop that.”

Julianne Stevens is a junior who has participated in the Grandey First-Years Honors program, McBride and the Grand Challenges Scholars program. She appreciates being involved in a community that is both supporting and challenging. Stevens has particularly enjoyed courses that examine modern America through a food and cultural lens or those that explore what humor shows about different societies and cultures around the world.

“[The programs have] given me a space to have really neat and more abstract conversations, as well as a place to explore the beauty of different parts of the world, in ways that it's hard to hold time for,” she said. “I enjoy the way that I’m challenged to think in more of a literary rather than technical mindset and also encouraged to bring those kinds of knowledge together and have them turn into something else that’s new and exciting.”

From the flagship McBride Honors program to the newly launched Future Energy Scholars, Mines continues to lead the way in offering students experiences that will help them succeed long after their undergraduate days are behind them.

➔ Learn more about the University Honors and Scholars Programs at mines.edu/honors.



WORK WITH US

Did you know Mines alumni can engage with the Career Center in many ways?



Hiring for internships or full-time positions?

We can connect you with current students to meet your business needs.



Interested in volunteering?

The Career Center would love to hear your career journeys and how they might inspire students.



Looking for your next career move?

The Career Center serves recent graduates for the first two years beyond graduation and partners with the Alumni Job Center to serve alumni for a lifetime, including full access to our renowned Career Days.

Save the date for Fall 2025 Career Days, Sept. 16-17

➔ [MINES.EDU/CAREERS](https://mines.edu/careers)



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THE MINE OF THE FUTURE

To meet critical mineral demand, the mining industry is adopting advanced technology and new best practices that support a sustainable future

BY ASHLEY SPURGEON

Many of the minerals necessary for powering the future—copper, lithium, nickel, cobalt and rare earth elements—are found underground. These are essential components of clean energy technologies, medical devices, defense systems, even cell phones. Global demand for these critical minerals has surged in recent years, requiring more mining.

However, the practices and technologies to source and extract these minerals—and those being considered for the future—are diverging from traditional methods. Modern mining techniques are taking what's been described as a laparoscopic approach, emphasizing minimally invasive processes, for both the environment and surrounding communities.

"In response to an increasing demand for minerals, mining in the future will adapt and apply many new and developing technologies that drive increased productivity, enhanced safety and minimization of environmental impact," said Bill Zisch, the J. Steven Whisler Head of Mining Engineering at Mines.

By proactively addressing these challenges, Mines is helping guide the industry forward and shaping a new era of resource extraction.

LEVERAGING ADVANCED TECHNOLOGIES

Advanced technologies are propelling the mining industry forward—to keep up with the critical mineral demand but also to improve processes and keep the industry economically viable. Mines researchers are working on many of the components of these advanced technologies, making them more efficient, more

accurate and overall better tools for resource extraction and processing.

Some of the technologies being applied in the mining industry today include:

- Autonomous equipment and self-driving trucks to revolutionize haulage operations, increase efficiency and reduce operational costs.
- Remote-controlled machinery and robotics to enhance safety by minimizing personnel in hazardous environments.
- Advanced sensors to predict equipment failures, reducing downtime and maintenance costs.
- High-precision GPS and blast-movement monitoring, combined with machine learning, to improve the grade of material processed while minimizing dilution and ore losses to tailings.
- Artificial intelligence (AI) and machine learning to enhance ore sorting accuracy and increase efficiency. AI is also transforming exploration by improving geological data analysis, making it easier to identify potential mineral deposits.
- Digital twin technology, which is being deployed in mineral processing, allowing for the evaluation of control strategies in response to variations in feed and operating conditions, leading to improved efficiency.

"Meeting the materials challenge will require virtually every discipline at Mines," Zisch said. "Autonomous mining equipment is designed and developed by engineers in the mechanical and electrical engineering

field along with expertise from computer science. Solution mining advances requires expertise from petroleum and chemical and hydrogeologic engineering. Permitting of future projects requires contributions from environmental and humanitarian engineering. Tailings design, development and management will require geotechnical expertise from civil engineering. Mineral economics provide a unique contribution based on their understanding of markets, resource availability, policy development and economics. Advanced power systems help to solve the challenges associated with providing power to mining operations that will likely have to be self-sufficient anywhere in the world where they operate. Mines, as a university and across campus, is in a unique position to meet this challenge.”

UPDATING ENVIRONMENTAL CONSIDERATIONS AND BEST PRACTICES

The mining industry is also updating and implementing best practices that emphasize responsible mining, community engagement, transparency and social license to operate. This holistic approach ensures that mining operations are not only economically viable but also environmentally and socially responsible.

Researchers at Mines are leading this work by collaborating across disciplines to ensure extractive industries play a critical role in contributing to sustainable development in and around the communities in which they operate. As examples, researchers are working on projects that address the opportunities and challenges of small-scale gold mining in Colombia and Peru and projects that look at how industry can better assess and standardize their contributions to sustainable development.

Mines has also evolved its curriculum to reflect these priorities.

Starting at the undergraduate level, students focus on sustainability, responsible mining and community engagement in their courses. This ensures that future engineers are equipped with the knowledge and skills to address the industry’s most pressing environmental and community challenges.

DEVELOPING A HIGHLY SKILLED WORKFORCE

It’s estimated that half of the U.S. mining workforce, about 220,000 people, will retire by the end of the decade, and the talent pipeline is not sufficient to replace experienced mining professionals or meet demand. This challenge, combined with the need for engineers capable of leveraging advanced technologies and addressing environmental and social considerations in future projects, is one Mines is rising to meet.

“Mines is continuing to adapt to a rapidly changing world,” Zisch said. “First, and perhaps foremost, students are learning basic engineering and problem-solving skills that are preparing them to meet these challenges. Additionally, significant, broad and creative research is helping to address these challenges and to prepare students for future challenges.”

Mines’ industry partners consistently look for talent from various disciplines, including expertise in mechanical, electrical, civil, environmental, chemical, petroleum and humanitarian engineering. But they’re also needing skills in economics, computer science, data science, risk management, statistics and mathematics. As a result, Mines graduates are highly sought after by industry, academia and government and serve in roles that include mine planning, extraction and processing, mine remediation and reclamation, community engagement, business and finance, public policy, regulatory compliance and more.

COLLABORATING WITH INTERNATIONAL PARTNERS TO ADDRESS MINING CHALLENGES

In addition to domestic partnerships, Mines works globally to responsibly address critical minerals demands while being socially, economically and environmentally conscious. A few examples include Mines’ partnerships and projects in areas such as:

North America

Mines is engaging with Canadian universities and the Global Institute for Energy, Mines and Society (GIEMS) in Saskatchewan to further research and innovation initiatives in the mining and energy sectors. The institute is projected to be a hub for the universities involved to collaborate on research and innovation to address global critical minerals demands with student engineers, scientists and tradespeople benefiting from its learnings.

South America

Involving more than 40 Mines faculty and researchers, the Institute for Initiatives in Latin America (IILA) equips Mines with the cultural and administrative resources to build research connections and serve the populations of Latin America through applied research and education. Since launching in 2022, IILA has managed more than \$15 million in projects that increase the research capacity and research culture at partner academic institutions and bring positive environmental and social impacts to local communities in Latin America.

Africa

Mines researchers are working with local and indigenous communities in Central Africa on issues related to artisanal and small-scale mining, corporate social responsibility and other partnership projects related to sustainable development.

POWERING FUTURE LUNAR EXPLORATION

Mines students' startup wins NASA challenge for a breakthrough in power transmission and energy storage on the Moon

BY JASMINE LEONAS

Orbital Mining Corporation, an early-stage space mining startup started by two Mines graduate students, won \$500,000 in NASA's Watts on the Moon Challenge for its lunar power transmission and storage system.

Chris Tolton and Ken Liang, who are both pursuing Master of Science degrees in space resources, are the founders of Orbital Mining. Tolton serves as CEO, while Liang is CTO. Together, they created the solution to the NASA challenge that earned them this honor.

"We're thrilled with our engineering team and the solution's incredibly resilient performance," Liang said. "Using only passive thermal techniques, the system maintained safe operating temperatures and provided uninterrupted power for the entire 48 hours in lunar night. No active heating, no mechanical actuation, no valves, no failures."

The NASA challenge solicited "breakthrough power transmission and energy storage technologies that could enable long-duration Moon missions to advance the nation's lunar exploration goals." Orbital Mining's solution was one of only two systems that successfully operated in the simulated lunar environment at NASA's Glenn Research Center in Cleveland, Ohio. The solution provided uninterrupted, continuous power for 48 hours across a 3-km simulation in hard vacuum and cryogenically cold (-190°C) temperatures.

Orbital Mining developed the lunar power transmission and storage system, named "No Replacement for DC-Placement," over the course of two years. The system includes high-voltage direct current cable transmission, ultra-high performance silicon carbide power electronics, a large lithium-ion battery bank and a passive thermal management solution.

During the final round of competition, four finalist teams refined their hardware and delivered a full system prototype for testing in lunar conditions. The test simulated a challenging lunar environment with two cycles of six hours of daylight and 18 hours of darkness, while the user is three kilometers from

$$+ \int \left[\sigma_r h \frac{\partial z}{z} \right] dr - \int \left[\left(\sigma_r h \frac{\partial z}{z} \right) dz \right]$$

the power source. Orbital Mining was the runner-up to a team from the University of California Santa Barbara's Space Research Laboratory. Between the two winning teams, this challenge initiated the first ever successful demonstrations of high-voltage power transmission in cryogenically cold vacuum in a NASA facility. Prior stages of the NASA Centennial Challenge granted \$600K in addition to the final prize, resulting in total winnings of \$1.1 million for Orbital Mining.

The company came together when Tolton and Liang met through a shared class at Mines and decided to combine forces to create their startup. Mines' entrepreneurial ecosystem, from the Innov8x class where the two first met to the varied support the team utilizes at the newly opened Beck Venture Center, helped launch Orbital Mining, and the company continues to be supported by resources at the university.

"As one of the founding members of the Beck Venture Center, Orbital Mining Corporation is a shining example of what is possible for student and alumni entrepreneurs here at Mines," said Zack Bennett, director of the Beck Venture Center at Mines. "We are proud that we have been able to support their success, and we are excited to see how they inspire even more Mines students to build amazing companies that literally shoot for the Moon."

What's next for Orbital Mining? Tolton and Liang have their sights set high—the sky is not the limit.

"We want to power the Moon to enable the new space economy," Liang said.

Orbital Mining Corporation's leadership team with its lunar transmission and storage system. From left to right: Chris Tolton, CEO/co-founder; Ken Liang, CTO/co-founder; Raymundo Medina, chief technical adviser.

Photo courtesy of Orbital Mining





CENTRAL PLAYERS IN THE FUTURE OF CRITICAL MINERALS

Mines is helping keep Native American sovereignty at the heart of the energy transition

BY SARAH KUTA

The energy transition is a major undertaking that requires collaboration from all corners of industry—from oil and gas to solar and wind.

But some of the most important—and potentially overlooked—stakeholders are Native Americans in the West. The majority of critical minerals in the United States, like nickel, cobalt, copper and lithium, which are important components of future energy technologies, are located on or near Native lands, which means Native leaders play an essential role in the country's energy future.

Historically, however, mining on Native lands has been harmful to Native American communities, with injustices ranging from environmental disasters to deadly health problems and more. The relationship between mining companies and Native nations needs to change.

That's where the new Native American Mining and Energy Sovereignty (NAMES) Initiative at Mines comes in. The initiative, which launched in August 2023 as part of the Payne Institute for

Public Policy, aims to help carve a new path forward by supporting the self-determination of Native nations, fostering dialogue and advocating for more collaborative partnerships.

"In talking with tribal leadership, what we've realized is that they are not against the opportunities that come with energy and mineral development but that there has to be a new way to go about it that's very different from how things were done in the past," said Rick Tallman '85, MS '93, the initiative's program manager. "And part of that is just recognizing the absolutely horrific, full history."

As the name suggests, Native sovereignty is the initiative's primary focus and the starting point for any and all conversations about energy, mining development and finance on Native lands.

"This initiative isn't pro-mining or pro-energy development—it's pro-knowledge," said Tallman. "We're focused on empowering the tribes so they can make the most informed decisions, to do whatever they want to do, as is their sovereign right."

But Tallman and other partners believe that knowledge should flow in both directions—to and from Native nations. To bring more Native insights to campus, the initiative hopes to facilitate the creation of a president's council on Native American affairs during the next school year. NAMES also organized a symposium that brought together industry and Native leaders on the Southern Ute Indian Reservation in Ignacio, Colorado.

In the future, NAMES also hopes to launch a fund to support research and development in energy and minerals that's relevant to Native nations, as well as develop more STEM activities, curriculum and programs for Native American students. Another goal is to set up a process for offering technical assistance to Native communities.

The initiative is still in its infancy but, already, several industry partners have signed on, including Ivanhoe Electric, Resolution Copper and BHP. NAMES is still looking for additional external partners to join its efforts, including industry executives who are interested in participating in collaborative discussions and sponsors that can provide financial support.

The Payne Institute also appointed Richard Luarkie as the director of NAMES. Luarkie's career spans roles as a tribal leader, entrepreneur and business strategist, including serving as a two-term Governor for the Pueblo of Laguna in New Mexico. His expertise encompasses competitor analysis, business capture strategy, technology transfer and commercialization.

"The idea isn't to try to prescribe an answer," Tallman said. "It's to understand the power of the process, and, if it's an inclusive process from the beginning, it actually provides better results."

➔ Learn more about NAMES and how to get involved at payneinstitute.mines.edu/names.

*This story was first published in the 2024 issue of the Mines Research Magazine.

SCIENCE AND SOLUTIONS FOR THE ENERGY FUTURE

Energy thought leaders joined the Mines community for the inaugural Global Energy Leaders Summit

In Fall 2024, Mines brought together global energy thought leaders, decision makers and Mines faculty, alumni and students for the inaugural Global Energy Leaders Summit. The event explored ideas, solutions and actions while connecting the university's science, engineering and data expertise with global conversations on the future of energy.

We selected a few highlights from the Global Energy Leaders presentations:

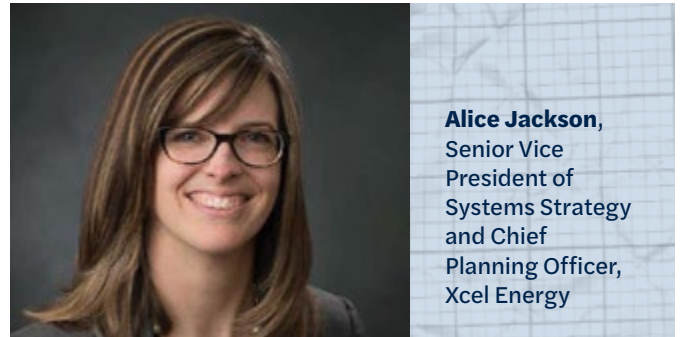


Jared Polis
Colorado
Governor

Polis outlined Colorado's ambitious journey toward achieving 80 percent clean energy by 2030 and 100 percent clean energy by 2040. He highlighted innovations in geothermal energy, carbon capture and hydrogen technologies, as well as Colorado's leadership in clean tech employment and electric vehicle adoption.

"We're proud to be one of the leading clean energy technology states. We're fourth nationally in clean tech employment. Right now, we're third in electric vehicle sales. Our utilities are going to be 80 percent emission-free by 2030. And, of course, we're also leading the way from the policy side on the next iteration of the regulatory structures to empower and bring about that future.

"I know that our energy future is bright, powered, of course, in part by the critical work here at Colorado School of Mines, as well as by Colorado School of Mines alumni that are across the sector, both here in Colorado and nationally and internationally."



Alice Jackson,
Senior Vice
President of
Systems Strategy
and Chief
Planning Officer,
Xcel Energy

Jackson shared insights on transforming the energy industry with a discussion on modernizing infrastructure, breaking down organizational silos and fostering a culture of innovation to achieve a zero-carbon energy system by 2050.

"My team inside Xcel Energy is known as integrated system planning. The reason we pulled it together was exactly because of infrastructure and the questions we have outstanding. Our world as a utility was simpler 20 years ago. [...] But then about 20 years ago, some things started happening. Technology evolved. Things came forward. Customers started putting rooftop solar on, having batteries in their homes, having demand controllers in their homes, changing the way that they were consuming energy. Now we had people pushing things onto the system from the opposite direction that changed the dynamic in which our systems were operating, the loadings of our load curves, what those feeders were looking like, the power that needed to move through it, the integrity of it, how it was impacting volatility on the system. [...] This industry, what we have built over all this time, is incredible. And what we are evolving to and figuring out and how to integrate is amazing.

"We have a remarkable opportunity to change the way that energy is not only consumed by people around the world, but to do it in a way that offers us the outcomes of prosperity and health. That is what we are tackling as our challenge. I am more than thrilled to work with every single person that I have on my team in order to help them see the path forward, solve the problems and find a solution that's going to make a difference.



Martin Keller,
Director,
National
Renewable
Energy
Laboratory



Timothy Coors '01
Co-CEO, CoorsTek

Keller discussed innovative strategies for achieving a clean, resilient and affordable energy future, including equitable energy transitions, and collaborations with Mines and global partners to address the pressing challenges of our time.

“As an applied laboratory, our goal really is to accelerate the energy transition and specifically do this in partnerships with universities like Mines but also with a lot of industrial partners in moving this forward. In 2023, we had more than 1,100 active partnerships from industry to universities to other federal agencies. This problem is bigger than one lab, bigger even than one state, bigger than one country.

“A very exciting opportunity we have in our country is the equitable energy transition. How do you do this so you bring everybody along in this transition? If you’re living in Beverly Hills in Hollywood, you probably have the money to buy a test line and a battery storage for your garage. But how do you do this in other areas? How do you do this in rural America? How do you make sure that our core communities are making this transition?

“And how can we do this so that everybody benefits from this transition? If not everybody profits from this transition, we will not be successful. [...] The problem that we’ve seen is that a lot of people right now want to make this transition, but they don’t have the resources and the knowledge to do this. They don’t have the expert inside their environment to help guide them through this transition. This is why equitable projects are so important.”

Coors sat down with Mines President Paul C. Johnson to discuss CoorsTek’s leading advancements in material science and its critical role in energy innovation and Mines’ collaborative efforts in driving sustainable solutions for the future.

“There are things that traditional metals and plastics can’t do, so we’ve been really thinking about how do we get ceramics as a more common material that people are talking about? And you see it in industry as we’re iterating and developing, but it’s usually engineers who come to us and say, ‘We have this drawing, and we’ve been doing this in metals or plastics and it’s not working.’ So we have to work with them on redesigning, reiterating. Part of it is we’ve had more influx of people that understand ceramics and what ceramics can do from a material science side that they start off designing things with ceramics in mind. It’s not the right solution for everything, but if you at least have that as a tool in your tool belt, we feel that we can get faster to solving some of the very large, complex problems we’re having. We’ve worked with Mines over a number of years, and this is the second year that you have had a ceramics engineering program, but you have other courses built around materials science and ceramics is a key portion in that. We thank you for that and have enjoyed that partnership.”

**Quotes have been edited for length and clarity.*

➔ Learn more about the Global Energy Leaders Summit and watch the recorded presentations at mines.edu/global-energy-leaders.





GREEN

TECH

takes root

BY SARAH KUTA

Many Mines alumni are leading innovative projects within the rapidly growing cleantech industry to develop new technology and solve real-world challenges

A manicured lawn is a thing of beauty. The lush, uninterrupted carpet of grass stretching from sidewalk to sidewalk, the tidy rows of emerald-green stripes, the crisp edges—and not a dandelion in sight.

But hidden behind this dreamy scene is an army of loud, gas-powered lawn mowers emitting heat-trapping greenhouse gas into the atmosphere. And, to run the machines, a crew of hard-to-find employees who must spend hours sweating in the summer sun.

But it doesn't have to be this way. Landscaping can be cleaner, quieter and more efficient, according to Scythe Robotics. The Longmont, Colorado-based startup is developing the commercial mower of the future: an all-electric, fully autonomous, robotic vehicle called the M.52.

"We're using advanced technology to foster a greener, more sustainable future," said Alex Gall '22, MS '23 a field service engineer at Scythe Robotics.

Gall is one of the many Mines graduates who are pursuing careers in "cleantech," short for clean technology. He's currently working in a role that seamlessly combines his passion for robotics with his desire to be part of the climate solution.



Scythe Robotics is working on an all-electric, fully autonomous commercial mower called the M.52.

Image courtesy of Scythe Robotics

"I was predisposed to wanting to be an environmental steward coming into Mines, but the university definitely gave me the tools to be a good engineer so that I can be the best steward I can be," Gall said.

Cleantech, also known as "greentech," is a fast-growing sector that encompasses universities, laboratories and industry, all working to develop new, sustainable technologies. These eco-friendly products and services are meant to help slow environmental impacts and protect the health of the planet. Examples include improving water treatment processes, making meat substitutes out of fungi, electrifying recreational vehicles, transforming waste into building materials and cleaning contaminated dirt, just to name a few.

With the industry's emphasis on innovation and real-world problem-solving, it's no surprise that Mines graduates are flocking to cleantech roles—and thriving.

"We're facing some of the biggest, hardest, most technical challenges of our time, and Mines graduates and faculty are at the forefront of trying to solve them," said Zack Bennett '99, director of the Beck Venture Center at Mines. "They embrace the challenge of figuring it all out—it's just incredible."

COLORADO IS A CLEANTECH HOT SPOT

The cleantech industry has grown rapidly as the United States works toward its environmental and climate goals. In recent years, more and more scientists, engineers, entrepreneurs and other innovators have teamed up to create new products and services that are better for the environment.

With more than 30 federal scientific laboratories, multiple research universities and a robust startup scene, Colorado, in particular, has become a cleantech hot spot. The Centennial State ranks fourth in the nation in cleantech job concentration and eighth in cleantech venture capital investment, according to Colorado Cleantech.

“Coloradans don’t need to look far to see the impact of climate change. More erratic weather. Less snowpack. But so many of the solutions that we need to tackle climate change are born right here in Colorado,” said U.S. Sen. John Hickenlooper. “Thanks to our cleantech sector and research hubs, Colorado is at the center of advancing the great transition.”

Mines is uniquely positioned to help propel this burgeoning industry in Colorado and beyond. Mines faculty and students are conducting groundbreaking research to help solve environmental challenges, and the Office of Research and Technology Transfer is helping commercialize their inventions. In addition, the new Beck Venture Center is supporting cleantech startups as they develop new technologies and bring them to market.

The 31,000-square-foot center is a hub for entrepreneurs, mentors, investors, service providers and related experts. The three-story building boasts ample networking, classroom and event space, which Mines-affiliated entrepreneurs can use as they build and grow their businesses. The center also provides office space for nine, federally funded cleantech entrepreneurs from West Gate, the National Renewable Energy Laboratory’s Lab-Embedded Entrepreneurship Program.

“Increasingly, as a country, we’re relying more and more on startups to drive innovation,” said Bennett. “That’s where places like the Beck Venture Center really shine. We’re creating a nurturing, fertile environment for these startups to succeed, to really push the envelope and find those cutting-edge solutions.”

Though it’s been open for less than a year, the Beck Venture Center is already making an impact: In October, cleantech leaders from across the state gathered at the venue for a Cleantech Roundtable organized by Hickenlooper.

“It was fantastic that the Beck Venture Center was his obvious choice for where he wanted to host this event,” said Bennett. “We’ve created a space for these important conversations that could affect the future of the nation’s cleantech policies.”

TINTED WINDOWS: PRIVACY AND ENERGY SAVINGS FOR HOMEOWNERS

Many Orediggers are putting their Mines education to work by contributing to cleantech research and development. They’re motivated by different reasons: Some like the challenge of solving technical problems or want to do their part to protect the environment. Others enjoy the fast-moving, all-hands-on-deck atmosphere of a startup.

Sarah Livingston '20 has always wanted to help reduce the world’s energy footprint, which is why she added an energy minor to her chemical engineering major at Mines. Now, as a senior chemical engineer at Tynt Technologies, she’s putting both of those specialties to use to help create elegant, energy-efficient windows.

Tynt is a Boulder-based startup developing dynamic windows that can transition from transparent to blackout, with any level of shade in between. The company is in the research and development stage, but once its windows hit the market, homeowners will be able to control the tint level using a wireless app.

The windows are designed to give homeowners more privacy when they want it—similar to window treatments like blinds or curtains. But, as an added benefit, Tynt’s windows can also help homeowners better control their homes’ climate, which can lead to both financial and energy savings.

“The problem is simple: windows are not as efficient as walls. However, everyone wants more windows and less walls,” said Livingston. “So the goal is to develop a product that meets both the energy requirements needed to reduce carbon dioxide emissions while also allowing homeowners to manage the light while maintaining their view.”

Tynt’s windows, when darkened, reflect more sunlight and heat than clear windows. On hot days in the summer, homeowners can darken the windows to help maintain cooler temperatures inside their homes. This means they don’t have to rely so much on their air conditioners, which not only use large amounts of electricity but also require refrigerants that are greenhouse gasses. In the chillier winter months, homeowners can make the windows transparent to let the sun in and use its natural energy for heating.

A significant amount of energy used to heat and cool homes gets lost through windows—as much as 25 to 30 percent, according to the U.S Department of Energy. So, even a small improvement can add up to big savings. Plus, Tynt’s windows may help homeowners reduce the amount of energy they use on a daily basis, without needing to make any lifestyle changes.

“Every bit counts when it comes to reducing the world’s energy footprint,” said Livingston. “Energy usage will continue to rise, so improving the efficiency of all aspects of day-to-day life will have huge impacts over time. It is estimated that nearly half of the energy we produce is lost to various inefficiencies. Tackling this problem from multiple angles is our best shot at making a tangible difference.”

“EVERY BIT COUNTS WHEN IT COMES TO REDUCING THE WORLD’S ENERGY FOOTPRINT.”

-Sarah Livingston '20

Tynt’s windows consist of a transparent electrolyte sandwiched between two panes of glass. Much of Livingston’s work centers on improving the electrolyte’s durability and manufacturability, which she described as the “most critical component” of the technology. Livingston’s work is critical towards driving a low-cost, scalable solution to windows,

which is how Tynt aims to reduce greenhouse gas emissions. Rather than being the Ferrari of windows, Tynt aims to be the Honda Civic: affordable and ubiquitously available for all.

Livingston’s time at Mines gave her the confidence and the know-how to methodically work through problems, even those she’s never encountered before.

“I often find myself working on projects that I have no direct experience to guide me, but this combination of hard work and problem solving allows me to quickly adapt and excel at new and interesting challenges,” she said.

Tynt Technologies is developing dynamic windows where homeowners can control the tint level through an app and maximize their energy efficiency.

Image courtesy of Tynt Technologies





ROBOTS COME TO RECYCLING

Kevin Ehlmann MS '19 was already several years into his career as a mechanical engineer when he realized he wanted to pivot toward “something a little bit more altruistic,” he said. He decided to go back to school to earn a master’s degree and enrolled at Mines because of its strong biomechanics and robotics research.

Initially, he thought he might get into the medical device industry. But then he heard about AMP, a company based in Louisville, Colorado, that’s using artificial intelligence and robots to help improve the recycling industry. Ehlmann appreciated the company’s environmentally focused mission, so he applied and landed a job as a senior mechanical engineer.

AMP is trying to solve some of recycling’s biggest problems. Traditionally, recycling centers have relied on human workers to sort and separate different kinds of materials, as well as remove any contaminants (like plastic shopping bags). But the work is difficult, smelly and potentially dangerous.

AMP is bringing innovation to the recycling industry by using artificial intelligence and robots to help the recycling process become safer and more efficient.

“It’s not a job that most people want to do,” said Ehlmann.

In addition, human sorters are costly and inefficient, which makes it difficult for waste collectors to break even.

“There’s not a whole lot of economic incentive to recycle,” said Ehlmann. “It costs the same to sort the material as what the material is worth.”

Enter AI-equipped robots. Robots don’t get tired, and they don’t have to worry about getting injured on the job. Using cameras, servers and pneumatic

systems, AMP's robots can sort waste quickly and accurately. They not only keep more materials out of the landfill, but they also help keep costs down, thus making recycling more economically viable.

“THERE’S A WHOLE LOT OF INFORMATION OUT THERE ABOUT HOW RECYCLING IS A BROKEN INDUSTRY—AND, IN SOME WAYS, IT IS. BUT, IN OTHER WAYS, IT CAN BE FIXED. WE JUST HAVE TO SOLVE THE RIGHT TECHNICAL PROBLEMS.”

-Kevin Ehlmann MS '19

For Ehlmann, the job is the perfect blend of hands-on troubleshooting, research and development and computational analysis. He also likes that he's able to use his engineering skillset to do something beneficial for society and the planet.

“There's a whole lot of information out there about how recycling is a broken industry—and, in some ways, it is,” said Ehlmann. “But, in other ways, it can be fixed. We just have to solve the right technical problems.”

INNOVATION IS KEY

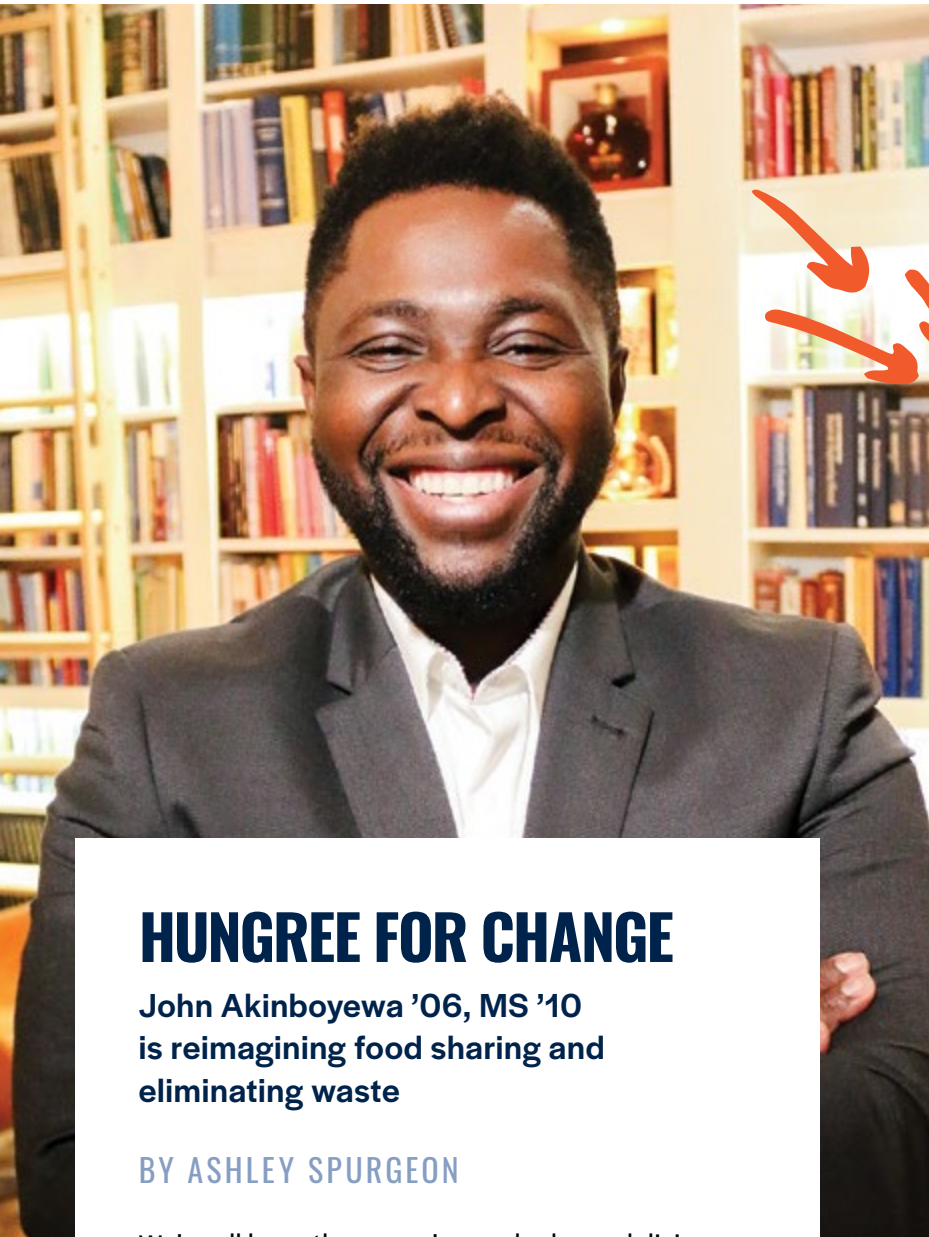
The cleantech industry is poised for future growth. If the world hopes to achieve its climate goals—such as reducing greenhouse gas emissions and sequestering carbon dioxide—it will need savvy, outside-the-box innovators who aren't afraid to push the boundaries of what's possible.

“Cleantech requires tons of innovation,” said Gall. “As it stands, I don't think we have the technologies necessary to solve the climate crisis. There are a lot of technologies that still need to be invented and brought to market. But I believe we are trending on the right path, even if the change is a bit slower than I would like.”

The view inside of AMP's recycling system as material gets sorted.

Images courtesy of AMP





HUNGREE FOR CHANGE

John Akinboyewa '06, MS '10 is reimagining food sharing and eliminating waste

BY ASHLEY SPURGEON

We've all been there—we've cooked up a delicious meal for dinner but have some leftovers that get stuffed into a Tupperware and shoved into the back of the fridge. We've had every intention of heating it up and finishing it off tomorrow, but inevitably, for one reason or another, we haven't followed through, and those leftovers become forgotten until they become unrecognizable relics and have to be thrown out. Fortunately, John Akinboyewa '06, MS '10 has a solution to avoid that waste while offering a new way for us to connect with our communities.

That solution is a free app called TheHungreeApp. A user who wants to get rid of a food item—whether

it's leftovers or even an unused pantry staple nearing its expiration date—can post it on the app for another user to request and pick up. Users can share their food with the public within a small geographical area or they can create “villages” that confine their post to a specific group, such as a neighborhood, organization or college

“WHEN WE LOOKED AT WHAT PROBLEMS WE’RE TRYING TO SOLVE WITH THE APP, WE REALIZED IT’S NOT AN INDIVIDUAL PROBLEM—IT’S A HUMANITY PROBLEM.”

campus community. Restaurants and food banks can also join TheHungreeApp and cut down the amount of food that gets thrown away every day while fighting hunger. It's a win-win for everyone involved.

“We're addressing food waste. We're addressing food insecurity, pollution, mental health and social isolation,” Akinboyewa said.

Akinboyewa was first inspired to find a solution to these social issues when he was a Mines student. He remembers digging in the couch for change to afford a meal off Taco Bell's dollar menu while still having enough money in his account to pay his other bills at the time. He also

knew it was likely that there was leftover pizza going to waste somewhere on campus and would just end up in the trash can at the end of the day. An idea like TheHungreeApp could help bridge that gap.

But TheHungreeApp's mission extends beyond satisfying hunger and preventing food waste—it's about fostering meaningful connections. Akinboyewa wanted to provide opportunities for users to form new relationships with their neighbors and feel more integrated into their communities without the social taboo that often comes with food insecurity and asking for help.

“It’s not a thrifting platform,” he said. “It’s a sharing platform.”

TheHungreeApp is ultimately a nonprofit aimed at building stronger communities, but Akinboyewa quickly realized that the technology and algorithms he was developing to create the best user experience needed to be supported with more robust funding.

“We realized we were coming up with algorithms that needed a lot more investment, and we wouldn’t get that with nonprofit grants,” he said.

He decided to turn the technology side of the app into a for-profit model that would allow TheHungreeApp to continue to grow and innovate on what they’ve already established. And if all goes to plan, Akinboyewa said they are in a “unique position to really develop something that five, 10 years from now becomes a mainstream part of society.”

He’s already on his way to making that dream a reality by opening the app up to global integration, with

multilingual support and implementation in several countries beyond the United States.

“When we looked at what problems we’re trying to solve with the app, we realized it’s not an individual problem—it’s a humanity problem,” Akinboyewa said.

“It works anywhere. It’s something any human being with a smartphone and internet can get on and share with their community instantly. That’s a powerful thing.”

→ Learn more about TheHungreeApp at hungreeapp.com.

→ Watch a video where Akinboyewa describes how he transformed his Mines experiences into actionable leadership.



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RINGING IN HISTORY

A sesquicentennial bell to honor Mines' legacy and build on tradition

Mines marked its 150th anniversary with a meaningful new addition to campus: a restored 300-pound bronze bell, steeped in history and tradition. This commemorative bell was unveiled during Blaster's Bash at Homecoming in Fall 2024, as Mines students, alumni, faculty and staff all came together to celebrate the milestone.

The idea of adding another bell to campus for the university's anniversary originated with former Metallurgical and Materials Engineering Professor Jeffrey King. When King left Mines, fellow MME professor Stephen Midson stepped in to see the project through to completion. Midson contacted McShane Bell Foundry and found they had a bell

already cast around the time Mines was established. Originally cast around 1890 for a Baptist church, the bell was weathered and discolored when it was eventually salvaged by the McShane Bell Foundry after the church was reconstructed into a private residence years later.

Mines Hot Shop Manager Sarah Harling, in collaboration with Western Foundries and Art Castings of Colorado, stepped in to help refurbish the bell. Harling and her husband, Adam Zimmer, designed and cast a new yoke for the bell by scanning the original yoke and adding the commemorative dates for Mines. A 3D-printed sand mold was made from the design and poured at Western Foundries.

The bell itself was cleaned and a new patina was applied by Art Castings of Colorado.

The Class of 1974—which celebrated their 50th class reunion in 2024—dedicated the bell to Mines and helped fund the restoration and installation on campus. The bell now stands in its permanent place in front of Guggenheim Hall, and graduating students can ring the bell to signify their achievement and Mines pride.

“I hope the bell will be a tradition for Mines where all students can feel a sense of pride and accomplishment when they ring the bell to tell the world that they are done and are a graduate

of Colorado School of Mines,” said Jeff Epstein ’87, a director on the Mines Alumni Board and metallurgical and materials engineering graduate who played a role in bringing the bell to campus. “Traditions connect students and alumni from one generation to the next, so I hope the bell will be a bridge where students will become active alumni for Mines. As a small school, Mines depends on alumni to engage and help build the Mines community.”

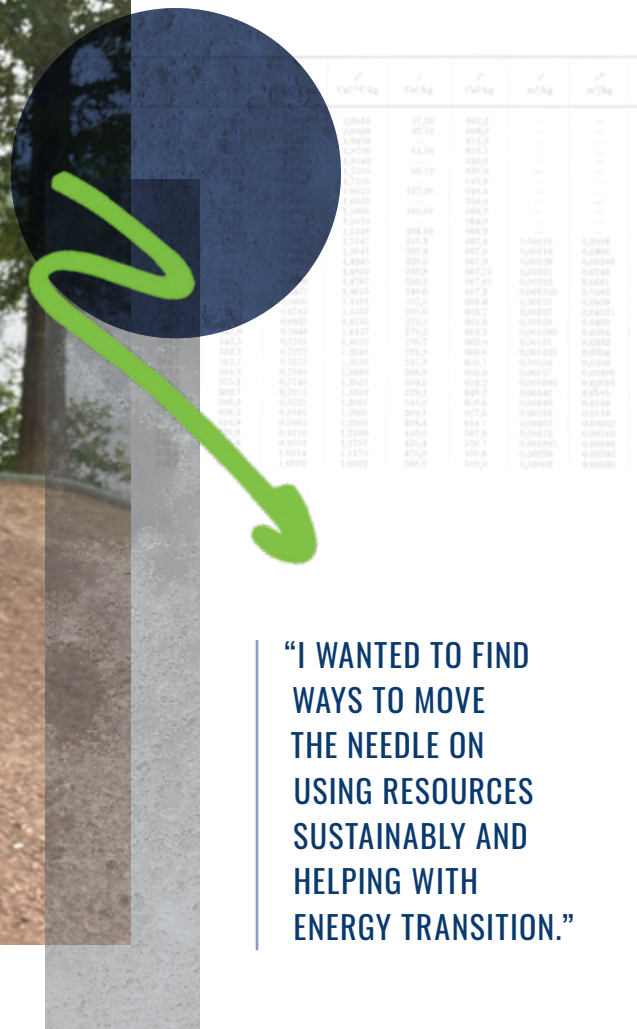
CRAFTED FOR THE AGES: A COMMEMORATIVE SWORD FOR 150 YEARS OF MINES

Another unique project to mark Mines’ sesquicentennial was a commemorative blade forged by metallurgical and materials undergraduate student Bryn Russell. Russell has honed his bladesmithing craft over many years and has participated in the bladesmithing course at Mines since Spring 2022 where the idea of commemorative blade first took shape.

Taking more than 500 hours to design and build, Russell forged a blade featuring more than 5,000 folds to achieve a distinctive Damascus-style pattern on the blade.

Both the guard and pommel are crafted from Damascus-style forge-welded steel. The guard is adorned with a 2-carat tanzanite gemstone in a trillion cut, resembling a Reuleaux, and set within sterling silver. The handle is crafted from blue-dyed mango wood wrapped in twisted sterling silver wire, and the blade fits snugly within a matching sheepskin leather scabbard.





“I WANTED TO FIND WAYS TO MOVE THE NEEDLE ON USING RESOURCES SUSTAINABLY AND HELPING WITH ENERGY TRANSITION.”

UNEARTHING ENERGY SOLUTIONS

Savannah Rice MS '21 uses her enthusiasm for geology to maximize the value of mined materials for future energy projects

BY JEN A. MILLER

Savannah Rice MS '21 has been fascinated with what's in the ground since she was a kid. She grew up in a military family, which meant a lot of travel—including trips to national parks.

“My mom would always talk about rock layers and how old they are,” she said. When it came time to choose a college major, geology stood out. “I loved the earth. I loved history. It was the perfect combination of both.”

Rice is now putting that geology background to work as a geoscience R&D lead at Fortescue, a global metal mining company. There, she spearheads different forward-thinking, clean energy-related projects, including how to get more value out of materials coming out of mines and how to maximize

the resources already available in those developed mines themselves.

With that focus, Rice hopes to continue to find resources to enable new kinds of energy creation through things like wind, solar and geothermal power. These projects often rely on critical elements and materials that the U.S. either does not mine on its own or would otherwise require often expensive new mining projects to obtain.

Rice chose to pursue a master's degree at Mines after she was presented with the opportunity to do a field-based degree that looked at structural geology and salt tectonics. She did some “crazy hikes up road cuts along I-70 to look at these 250 million plus-year-old rocks that had been deformed by salt tectonics prior to the Rocky Mountains being formed,” she said.



As a student, Rice completed two internships at oil and gas companies, but that work never quite felt like the right fit. So, after graduating from Mines, she became a policy fellow at the U.S. Department of Energy, where she worked on projects to look at potentially unconventional sources for critical minerals, like coal fly ash and waste from historic mines, that could be transformed into materials that could enable alternative energy. She also identified potential research projects and partnered with colleges and universities on that work.

Her time with the U.S. Department of Energy was the perfect opportunity to “find those minerals we need for clean energy technology and also do it in a way where we can clean up mine waste and not have to go after new sources, which is environmentally intensive,” she said.

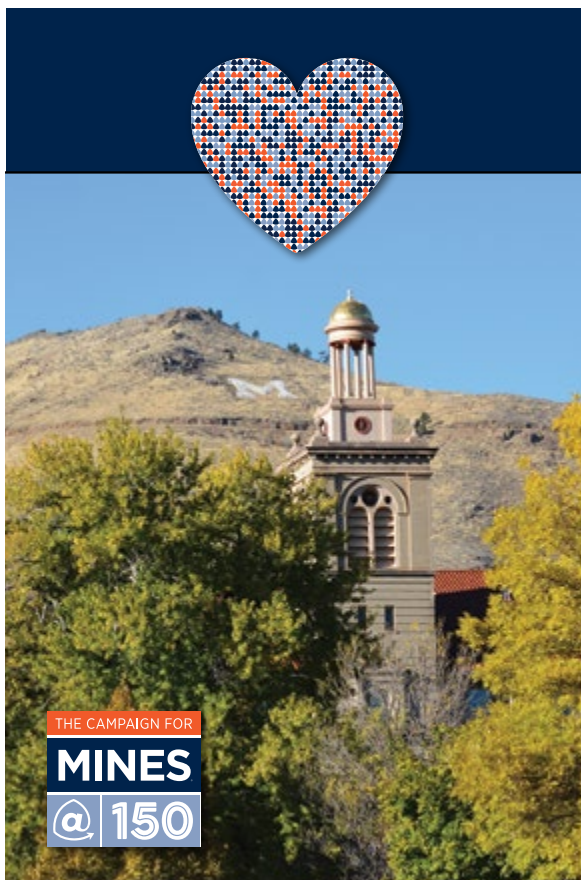
That fellowship led her to Fortescue, which in many ways continues that work. There, she meets with people across the company’s business to see what projects they think have potential but may not have time to work on themselves. She also comes up with research ideas and identifies ways to carry those research projects

out. That sometimes includes partnering with colleges and universities—including, of course, Mines.

Rice said her experience at Mines gave her a chance to grow as an independent researcher and challenged her. As a student, she had a “lot of creative freedom and space to independently develop a project to see it through.”

Being at Mines also taught her how to work with people from other fields of study, which is critical at her job now. Rice is the only geologist at Fortescue’s Golden, Colorado, office, but she’s able to effectively work with people across disciplines. “Every day I’m interacting with chemical engineers, a former patent attorney, a physical scientist,” she said. “I was really prepared for being able to do that by being at Mines versus just having my head down in geology and going out into a company and only working with geologists.”

Rice sees this work as matching her childhood fascination with rocks and the subsurface and wanting to protect those valuable resources. “I wanted to find ways to move the needle on using resources sustainably and helping with energy transition,” she said.



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Photos courtesy of Infinite Outdoors

INFINITE OPPORTUNITIES FOR OUTDOOR ENTHUSIASTS

An app developed by Mines graduates simplifies access to private land for hunters and anglers

BY JEN A. MILLER

When Sam Seeton '16 and David Rhine '19 enrolled at Mines, they both did so to earn a high-quality education, but also because of the entire package the university would provide. Seeton wanted to play football, and Rhine wanted to spend his weekends on the slopes.

They were able to do those things and, at the same time, create Infinite Outdoors, a website and mobile app that connects property owners with hunters, anglers and other outdoor enthusiasts seeking private outdoor experiences—a concept similar to AirBnB but for outdoor recreation.

Infinite Outdoors seeks to fix a problem of supply and demand. Many landowners will lease out the hunting or fishing rights on their land to a third party. When they do so, the lease doesn't guarantee they'll allow people to hunt or fish responsibly, which could lead to someone's land being trashed. Because they could lose that control, some landowners don't lease out those rights at all.

Because of this hesitancy which pushes down supply, this system has also made hunting and fishing on private property prohibitively expensive for many people. It was something Seeton, who is now Infinite Outdoors' chief executive officer, saw when he was a student at Mines and the football team wanted to go pheasant hunting on one of their off days. It wasn't easy to find an open and affordable space for a single group for one day.

Seeton started connecting landowners to people for these short kinds of outdoors experiences while he was a student at Mines "in a very manual way" he said, by seeking out landowners who wanted to allow people to fish and hunt and then working as a go-between with people who were looking for these kinds of outdoor experiences. It was time consuming but "laid the groundwork for this new DIY, short-term hunting and fishing market."

He knew it could be more though. “He had the idea but just needed engineers to build it,” said Rhine, who happened to be roommates with one of Seeton’s football teammates and jumped at the opportunity to be one of those engineers.

They started laying the groundwork for Infinite Outdoors in early 2020 and launched the app and website in August of that year with a focus on Colorado. “We thought it would be something good enough to plug and play,” Seeton said, meaning that they’d get it up and running and leave it at that. But the business took off. “We truly pivoted, and we were suddenly a full-blown tech company.”

Since that 2020 launch, Infinite Outdoors has been a hit with both outdoor enthusiasts and landowners. Users can search for opportunities based on location or what they would like to hunt or fish. Through the app and website, they’re gaining access to land that was not previously leased out before.

“From the technology side, it’s making things frictionless and making access as easy as possible,” Rhine said.

But Infinite Outdoors doesn’t just make that connection and facilitate payment between parties. It’s also built on an advanced digital mapping platform that automatically downloads maps and boundary lines. Plus, the app includes user reviews and even photos from trail cameras or user-uploaded images of game from previous trips to spots featured in the app.

Seeton and Rhine also make sure to only work with the eco-minded. “One of the caveats is landowners have to work with our biologists to do conservation work,” Seeton said. “We won’t just let them open the flood gates and abuse nature.”

Since its inception, the app has grown beyond just outdoor spots in the Mountain West and now includes locations in Texas, Oklahoma, South Carolina, Mississippi and Oregon, with opportunities sometimes costing less than \$100 per person, plus a reservation fee. To support this growth and increase their engineering budget, the company received an investment from the Mines Venture 1 Fund in 2024.

Not only will the funding help Infinite Outdoors grow their business, but Seeton and Rhine also have been



attending the Mines Venture Fund’s events and forums and found them to have “great information and also networking opportunities to meet and talk about other startups and solve problems together,” Rhine said. “It’s been a great resource.”

Seeton and Rhine see their work as something that will lead to better land use in a way that is easy for everyone involved. “Conservation and access are our core focuses as a business,” Seeton said. “But the only way to accomplish those goals, at scale, is to double down on great tech and processes that are sustainable at a macro level.”

A COMMITMENT TO SERVICE

Jesus Salazar '01, MS '02 merges entrepreneurship with social impact

For Jesus Salazar '01, MS '02, social impact isn't just a part of his professional journey—it's the driving force behind it. After building a successful career as a software consultant, Salazar channeled his expertise into entrepreneurship, founding Prosono, a company dedicated to accelerating the United Nation's 2030 Agenda for Sustainable Development. By helping organizations across North America unlock their social impact potential, Prosono was named one of the top 50 most civic-minded companies of Colorado—a testament to Salazar's commitment to supporting meaningful change.

But his impact doesn't stop there. Salazar has lent his leadership to a wide range of organizations, serving on the boards of Rocky Mountain Public Media, Colorado Succeeds, Pinnacle Assurance, Elevate Quantum, Empower Mutual Funds and the Business Experiential Learning Commission. He also just finished an eight-year term on the Colorado School of Mines Board of Trustees.

We talked to Salazar about his entrepreneurial journey, his passion for social impact and his work to empower future innovators at Mines. Here's some of what he shared.

MINES MAGAZINE: YOU'VE BUILT AN IMPRESSIVE CAREER AS BOTH A CONSULTANT AND AN ENTREPRENEUR. HOW DID YOU END UP ON THAT CAREER PATH?

Jesus Salazar: I always had a sense that I wanted to be an entrepreneur and have my own business, but there was no support back when I graduated for that type of work. I decided to start out in consulting, because I wasn't sure exactly what I wanted to commit the rest of my



life to doing. Consulting seemed like a great way to look at a bunch of different industries and challenges and learn a lot and explore what you're really good at and want to do.

I figured I'd do that for three years and then go do whatever that was that I figured out that I wanted to do. But it turns out I ended up liking

consulting a lot more than I thought I would, so I ended up doing that for about 20 years. Then, in 2015, I was at a sort of precipice where I had to decide whether to stay with a business that was being acquired and travel internationally nonstop or go off on my own. That's when I chose to jump into entrepreneurship. I took all those skills and started my first company, Prosono, eight years ago. Now, I've sold Prosono and launched a new tech company that brings me back to my software roots.

MM: IN ADDITION TO YOUR BUSINESS EXPERIENCE, YOU SPEND A LOT OF YOUR TIME VOLUNTEERING ON A NUMBER OF BOARDS. WHY IS THAT AN IMPORTANT COMPONENT OF YOUR PROFESSIONAL LIFE AND HOW HAS THAT SHAPED YOUR BUSINESS APPROACH?

Salazar: A lot of folks wait until they retire and then join all these nonprofit boards. That's why there's an age discrepancy on many of them. I did it backwards. I started early, and it has paid so many dividends for me in my professional career.

As a consultant, I realized that the people we ultimately wanted to speak to and partner with were sitting on these nonprofit boards. What if I volunteered and built friendships with them on something we're all passionate about and they get to know me and see how I think and work? And then, when the time presents itself and it's appropriate, I can talk to them about helping them with their big IT initiatives in their companies. It ended up being quite a good strategic play from a business development standpoint.

I've also always had a lifestyle of impact and philanthropy and being engaged in the community. For me, I'm sitting on a lot of boards and don't have a lot of time to give to them. It forces you to, in a short amount of time, really focus on what really matters and what is going to make a difference. It forces you into a pattern of efficiency.

MM: SOCIAL IMPACT IS AT THE CORE OF YOUR WORK— BOTH IN YOUR BUSINESSES AND BOARD SERVICE. WHAT INSPIRED THAT PASSION FOR YOU?

Salazar: I grew up in a small farming community and was top of my class. I was valedictorian, did all the sports, all the clubs and honors courses. I was accepted into Mines, however, I needed remediation to go there. I remember thinking, "How odd—how can you be number one in your class and need remediation to go to college?" There were kids that went to city schools that were so far ahead and taught differently than me. That was my first glimpse into the inequity of education—great grades does not necessarily equate to a great education. That was when I said, "I'm going to work on education—we need to get more resources and access to this type of quality in rural schools." That's really what spurred my interest in social impact and being on all these boards.

MM: YOU'VE BEEN A STRONG ADVOCATE FOR ENTREPRENEURSHIP AND INNOVATION AT MINES. WHAT EXCITES YOU MOST ABOUT HOW THE UNIVERSITY SUPPORTS THESE EFFORTS TODAY?

Salazar: One of the first observations for me when I got on the Mines board was the lack of support for entrepreneurs, and students going to college today have such an entrepreneurial bent. It's been a dream come true for me to have the McNeil Center, the Labriola Innovation Hub and then the Beck Venture Center to really support a student from day one who comes in with an idea and help them learn about startups and entrepreneurship. It's been eight years of advocating and helping shape that ecosystem. I'm glad I was able to be a part of it—my term on the board is up in December 2024, so it's been nice to grow with the E&I ecosystem and step away as it's released into the wild.



participated in the fellowship in summer 2024. We asked her about her experience, what she learned and how the fellowship has shaped her future career.

MINES MAGAZINE: WHAT MOTIVATED YOU TO PARTICIPATE IN CSEPF?

Makenna Straka: My interest in CSEPF was initially driven by a desire to translate the science I'm passionate about into a tangible, real-world solution. I really value an interdisciplinary education and want to go to law school after undergrad, so the fellowship seemed like a great fit for me.

FROM DISCOVERY TO DECISION-MAKING

Mines students are learning how to shape science-driven policy to make lasting change

Science and engineering research often drives solutions to the world's most pressing challenges, but ensuring those solutions are effectively integrated into society is key to creating meaningful change. The Colorado Science and Engineering Policy Fellowship (CSEPF) provides undergraduate and graduate students—including those from Mines—with a unique opportunity to bridge the gap between technical expertise and public policy by engaging directly with real-world issues.

Each year, Mines sponsors a small group of students to participate in CSEPF, immersing them in the legislative process and connecting them with policymakers. Through hands-on experience, students gain invaluable insights into decisions that impact energy, sustainability and technological innovation. The fellowship not only equips them with the tools to advocate for evidence-based policies but also positions them as leaders ready to influence the future of science-driven governance—a critical step toward addressing the complex issues of our time.

Makenna Straka, a Mines undergraduate student studying quantitative biosciences and engineering,

MM: CAN YOU SHARE AN EXAMPLE OF A POLICY ISSUE/PROJECT YOU WORKED ON DURING THE FELLOWSHIP?

Straka: My policy was a tax incentive and loan guarantee program for investors and businesses in the precision fermentation space. Precision fermentation is a process that produces proteins from plants that are bioidentical to animal proteins. When scaled up, these operations are incredibly cost effective and have potential to have a profound stabilizing effect on the food supply.

MM: WHAT WAS THE MOST VALUABLE THING YOU LEARNED ABOUT THE POLICYMAKING PROCESS?

Straka: The most valuable lesson I learned from this process was that state government is well within the reach of influence for every citizen. In speaking with senators, I was surprised how many of their bill ideas were directly sparked from constituent communications. Even though government can seem intimidating and untouchable, it's much more accessible than I could ever have imagined.

MM: WHY DO YOU THINK IT'S IMPORTANT FOR ENGINEERS AND SCIENTISTS TO BE INVOLVED IN SHAPING POLICY?

Straka: Without policy, it's hard to move science forward in a tangible way. Scientists and engineers need to be more involved in policy so that discoveries turn into solutions. Policy is one of the most powerful tools we must use to make changes, and we need science-informed change more than ever.

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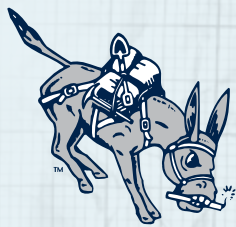
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COLORADO SCHOOL OF
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Orediggers and their families joined Blaster the Burro on campus for the third annual Holiday Photos with Blaster in December 2024. Nearly 300 people posed for photos with the beloved mascot, and the event helped collect nearly 1,000 items for Mines' food bank, Blaster's Basket.



1980s

Jon Johnson '87 was awarded DuPont's 2023 Pederson Award in September 2023. The Pederson Award recognizes innovators who have created significant value for DuPont customers and stakeholders and have contributed to shaping industries by delivering new solutions to solve some of the world's most pressing challenges.

2000s

Amelia MacSleyne '01 joined the Institute for Defense Analyses as a research staff member in the Strategy, Forces and Resources Division of IDA's Systems and Analyses Center in November 2024.



We're proud of Mines alumni. We want to cheer you on and celebrate your accomplishments. Tell us about your recent wedding, a new baby or your new job. Share a personal or professional accomplishment, volunteer activity or your favorite Mines memories. Stay connected to the Oredigger family.

→ Submit a class note at minesmagazine.com/classnote.

2010s

Kara (Ninke) Ho '14 and **Josh Ho '14** welcomed a baby girl, Lauren Elizabeth, into their family on May 19, 2024.

After reconnecting during the COVID-19 pandemic over fancy baked goods, **Jesse Weaver '14, MS '15** and **Jessica Lewis '14, MS '20** were married on September 7, 2024, in Littleton, Colo. The ceremony

was officiated by the couple's close friend, Jordan Francis '20, and 25 percent of the wedding guests were Mines alumni, including Jesse's father, Allen Weaver '75; Chris Enright '14, MS '17; Madeline Tarasar Enright '14; Jason Lingle '13, MS '15; and Ezekiel Chopper '16.

Caleb Thomas '17, MS '18 and his wife, Sammi Steele Thomas, welcomed a son in 2024. Henry

Steele Thomas was born on May 22, 2024, in Midland, Texas.

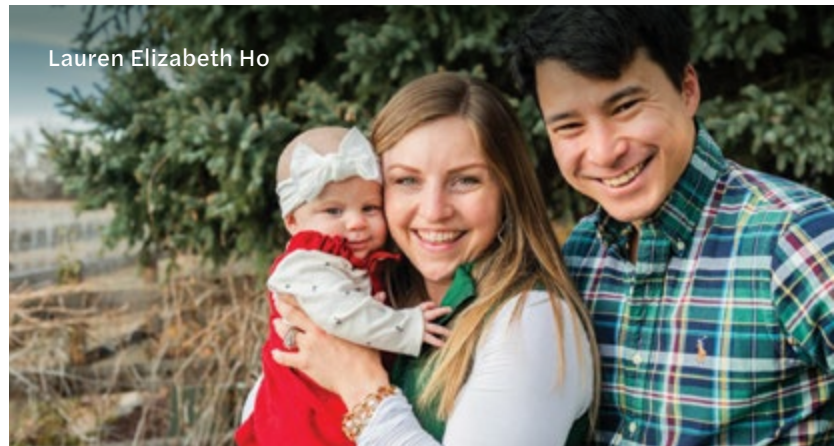
2020s

Garrett Wright '20, MS '21 and **Madelyn Smith '20** were married on September 14, 2024, in Durango, Colo. Mines alumni in attendance included Scott Kennedy '20, Jake Dehaai '20 and Carter Ortiz '20.

Henry Steele Thomas



Lauren Elizabeth Ho



Jessica Lewis '14, MS '20 and
Jesse Weaver '14, MS '15



Madelyn Smith '20 and
Garrett Wright '20, MS '21





Alumni Awardees

Mines honored the latest alumni awardees at the Denver Holiday Party at the Beck Venture Center in December 2024 for their outstanding contributions to the Oredigger community. The 2024 alumni award winners were:

David Scriven '70

Melville F. Coolbaugh Award

Sarah Chase '07

Outstanding Alum

Gary G. Hoffman '70

Alumni Academic Involvement Award

Chuancheng Duan '18

Young Alum

Robert Foster '81

M Club Leader of the Year

Jacob Moran, Class of 2026

Alum of the Future

Nearly 90 Orediggers took the oath of the Order of the Engineer on November 21, 2024.



Mines M Clubs across the United States gathered during the holidays to celebrate Oredigger pride.





IN MEMORIAM

Remembering Orediggers who have passed away but will always remain part of the Mines community

Stephen B. Batman '85 died Sept. 1, 2024. Born in 1959, Steve spent 32 years working at and managing gold mining operations and related projects in the United States, Canada, Australia, Tanzania and Surinam. He retired in late 2017.

John C. "Boz" Bozner, Jr. '75 died Oct. 16, 2024. Boz began his career working for W.R. Grace and Co. as a rig monitor for the exploratory drilling campaign that would become the ColoWyo Coal Mine. Boz then worked for a variety of companies, including as a project engineer for A.G. Wassenaar, Inc. and quality control manager for Interstate Highway Construction.

Lary G. Cahill '59 died October 12, 2024. Lary was born in 1936 and was in the ROTC at Mines. He was commissioned as a second lieutenant in the U.S. Army and spent six months on active duty in Fort Belvoir, Virginia, before serving eight years in the U.S. Army reserves. He then spent his career

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working for ASARCO at locations across the United States. He retired in 1992.

Walter S. Heffron '50 died October 28, 2024. Born in 1923, Walter served in the U.S. Navy during World War II, earning an ensign commission and becoming a communications officer aboard an escort aircraft carrier in the Pacific Ocean. He later worked as a technical advisor at Revere Copper Company before working for Yale and Towne Company in the Powdered Metal Products Division. He then spent 33 years working in industrial sales for Keystone Carbon Company until his retirement in 1989.

Roy C. Howard '56 died Feb. 16, 2024. He was born in 1935 and began his career working for Shell Oil Company. He later taught at Bella Vista High School in Fair Oaks, Calif., formed Howard Construction Company and worked for many years as an aerospace engineering for Aerojet General Corp., Hercules Inc. and United Technologies Corp.

John H. Jones '64, MS '67, PhD '69 died July 12, 2024. Born in 1942, John taught in the Department of

Mining, Metallurgical and Ceramic Engineering at the University of Washington from 1969 to 1976. He then worked as a material engineer for the Boeing Commercial Airplane Company from 1976 until his retirement in 2010.

Fred Lightner '68 died Aug. 20, 2024. Fred began his career in the mining industry as a metallurgical engineer with ASARCO. He then held positions of increasing responsibility with Tenneco, Pegasus Gold, Wharf Resources and Metallica Resources. Following retirement, Fred became a consultant to the mining industry and specialized in the evaluation, development and operation of gold heap leach projects in the United States, Mexico, Africa, South America, Papua New Guinea and Canada. A scholarship fund has been established in Fred's memory at Mines—contributions can be made at: weare.mines.edu/fredlightner.

Gary L. Nordloh '71 died Sept. 6, 2024. Gary was born in 1947 and began his career in oil and gas exploration and production with Wheatley Pumps before joining

Amoco Production Company. He later moved on to work for Hamilton Brothers as the vice president of engineering and North Sea operations before joining the Questar companies as the manager of engineering. He was named president and CEO of Questar's exploration and production subsidiaries in 1991 and held those positions until he retired in 2002.

Evalyn C. "Lyn" Wood died Nov. 2, 2024. Lyn was married to Russell L. Wood '49, a Mines alum and former Mines Board of Trustees member. Together, they were instrumental in establishing the Russell L. and Lyn Wood Mining History Archive at the Arthur Lakes Library at Mines. Lyn was also an active member of the board for the Women's Auxiliary to the American Institute of Mining Engineers.

➔ To submit an obituary for publication in *Mines Magazine*, visit minesmagazine.com/obituary.

➔ Memorial gifts to the Colorado School of Mines Foundation are a meaningful way to honor the legacy of friends and colleagues while communicating your support to survivors. For more information, call **303-273-3275** or visit weare.mines.edu/givingguide.



TWICE THE SPIRIT

The dynamic duo that represent Blaster the Burro for Mines

Being a university mascot is big responsibility, but being the beloved Blaster the Burro at Mines is quite the job. In fact, it takes not one, but two, miniature burros to rouse school spirit and embody the resilience, determination and hard work Orediggers are known for.

Burros Pepsi and Winkie currently hold the honor of serving as the Mines mascot, taking over the responsibilities in 2021 when the previous Blaster retired after more than 30 years in the role. Here are a few facts about the two burros and their on-campus handling team.

◊ PEPSI “THE SOCIAL BLASTER”

Owner: Carol von Michaelis at The Community Farm

Blaster duties: Pepsi is the “social” burro for Mines, representing Blaster at on-campus events such as Discover Mines and Commencement. He poses for photos with the Mines community and welcomes pets from his fans.

Off-duty life: Pepsi is a busy donkey on The Community Farm helping with therapy, chasing and being chased by the farm dog, greeting people in the parking lot. He loves eating snacks and doing crafts with campers. He is always around to help anyone who is having a bad day. He participates in outreach and has done many petting zoos, parades, live nativity scenes and is a “barn buddy,” where school aged kids write to him and ask for advice about social and emotional aspects of life.

“Pepsi is an amazing donkey, and he does his duties naturally well,” said von Michaelis. “He loves people and loves attention. It’s so fun to be part of the Mines community in a rewarding way (and no math homework). It’s been so much better than expected.”



◉ WINKIE “THE FASTER BLASTER”

Owner: Amber Wann at ReDONKulous Ranch Sanctuary and Rescue

Blaster duties: Winkie serves as the “running” burro for Mines, representing Blaster at football games and running the field when the Orediggers score touchdowns.

Off-duty life: Winkie regularly gets to roam and run on ReDONKulous Ranch’s properties. He also frequently participates in training runs with many other donkeys who train for the summer pack burro races. Winkie also occasionally participates in weddings—including those of Mines alumni—and other events through Wann’s business, Rocky Mountain Beverage Burro.

“It has been a wonderful experience to work with all of the Blue Key students each year,” said Wann. “Last year, there was a collaborative effort to start a ‘Blaster’s Bootcamp’ where the Blue Key students came out to meet Winkie, learn about him, how to best to take photos of their mascot with his fans. Then Blue Key learns how to handle the saddle, poop and best ways to run the Faster Blaster so he’s feeling he’s part of the team and being encouraged in the best way possible. I feel like a proud parent seeing our little Winkie so revered by the students.”



THE BLASTER PATROL

When Blaster is on campus or representing Mines at an event, Blue Key students are responsible for managing the burro and making sure he is well cared for. They monitor the public’s interactions with him and make sure both the people and burro have a positive experience, answer any questions and take photos. They also run with him on the football field and care for him on the sidelines in between touchdowns.

“In my biased opinion, I have the best executive team position out of all of the Mines clubs since I get to hang out with Blaster every time he is on campus,” said Sierra Dennis, spirit chair for Mines’ Blue Key. “I have been able to learn how to coordinate events and volunteers centered around the best burro in college sports, which has been such a positive experience for me at Mines and gives me a fun break from my class work.”



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