

THE HARDROCK™

SUMMER/FALL 2021



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SOUTH
DAKOTA
MINES

THE HARDROCK™

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About the Cover

**Alumni forming an M at the 2021
reunion.**

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THE HARDROCK™



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DEAR HARDROCKERS,

It has now been a year since the merger of the Alumni Association and Foundation and the creation of the Center for Alumni Relations & Advancement (CARA), during which time we have continued to honor our history, traditions and achievements while advancing the quality and stature of South Dakota Mines. We have spent the last year working on a strategic plan, which we look forward to sharing with you in the coming months, strengthening the governance of our organization, meeting with alumni & friends, and working on an increased level of collaboration with the university. In May, Paul Krueger, our new CEO, took the helm and along with the CARA team and board, is committed to serving our alumni and the university.

In July we celebrated Reunion 2021 Lite, which turned out to be one of our biggest all-school 5-year reunions ever with more than 1,100 people attending. A special thank you to **Scott (EE 75)** and **Linda (ChE 75) Rausch** for the time, energy, and passion they put in to planning the reunion. They worked tirelessly to plan an event that kept getting bigger as it got closer. Thank you also to the other numerous volunteers who played a role. Enjoy the pictures in this issue and plan now to come home to campus July 10-13, 2025 for our next reunion!

We celebrate our Hardrocker traditions during the annual Rocker Days (M Week) including climbing M Hill. **Dr. Scott Kenner (CE 77)** is spearheading an effort to replace the M, add a new trail and rock garden and restore the plaques. The project has a \$125,000 fundraising goal. Please consider helping us restore this important landmark. Learn more in this issue on page 10 how you can help.

Congratulations to this year's Distinguished Alumni Award winners, **Bill Betten (Phys/EE 77)**, **George (Rusty) Gray (MetE 76)**, **Tim Klaus (ChE 87)**, **Steve Vanderboom (CE 75)**, and **Lisa Zacher (Chem 85)**. We celebrate your successes and look forward to recognizing you at commencement on December 18th!

Our Hardrocker family is strong, but we need to continue to support our alma mater. Please tell a prospective student about the excellent education provided at South Dakota Mines and encourage him or her to attend. Continue supporting CARA and the university with your time and financial gifts. Participate in a virtual session from campus or in person if we are in your area.

We look forward to the academic year ahead and hope to see you at an upcoming alumni event. Enjoy the final months of 2021.

CENTER FOR ALUMNI RELATIONS & ADVANCEMENT



Julie Carver

JULIE CARVER (GeolE 86)
Chair, Board of Directors



Jeff Allen

JEFF ALLEN (ChE 77)
Honorary Alumni President

LOOKING BACK



100 years ago

1921

The first radio broadcast is sent from South Dakota Mines. The weather report, in morse code, becomes a daily message.

70 years ago

1951

The first annual military ball is held on campus in the school gymnasium.

(photos here)

45 years ago

1976

The new Goodell Physical Education Complex is completed. The facility includes an Olympic-sized swimming pool; handball, squash, and basketball courts; a music room; and rifle range.

10 years ago

2011

The "Old Gym" is transformed into the new Music Education Center.



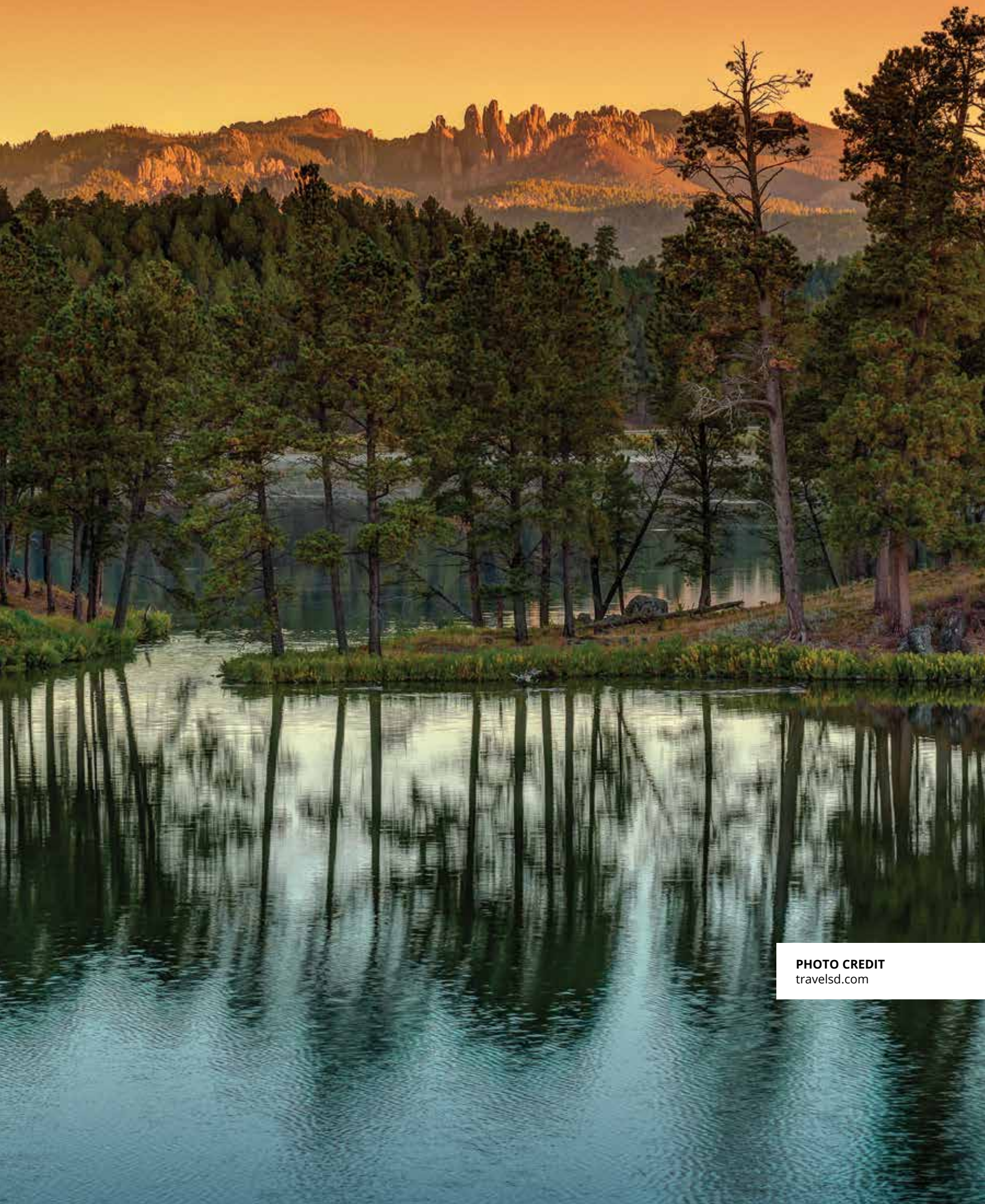


PHOTO CREDIT
travelsd.com



DEAR HARDROCKERS,

Our campus is in the beginning phases of some very exciting growth. The initial survey work for the new Mineral Industries Building is underway. The facility will be a national hub for cutting-edge research and economic development. The Devereaux Library renovations are taking shape; the modernized space will serve the students and the campus community for decades to come. The city's Vision Fund committee is considering our proposal for major renovations to O'Harra Stadium. Plans to expand the Surbeck Center are also moving forward. I should not fail

to mention that M Hill is getting a face lift; read the story in this issue. All of this is thanks to the generous donations made by so many of you. We have great momentum with more good news and announcements on the horizon.

The reunion was a record-setting success, with more than 1,100 alumni celebrating on campus and around the Black Hills. It was wonderful catching up with old friends and making new ones. If you missed this event, consider coming back for one of our future homecoming Rocker Days celebrations. Join us for the picnic, climb M Hill with the students, take in the football game, and don't forget your senior hat.

This year, Elevate Rapid City held a new Advanced Manufacturing Symposium on September 23. The event highlight world-class manufacturing capabilities in the Black Hills. The event is the first in a series of annual symposiums that will coincide with the homecoming celebration at Mines. These yearly events will highlight opportunities for university and industry partnerships.

Mines faculty, staff, and students have navigated the challenges of the past year and a half and are emerging stronger than ever. More challenges undoubtedly remain, but thanks to the hard work and innovation of so many Hardrockers, the future is very bright.

Warm regards,

A handwritten signature in black ink that reads "James Rankin". The signature is written in a cursive, flowing style.

JIM RANKIN, PhD PE (EE 78)

President

South Dakota Mines

Ask the Mines Expert

Dan Stanton (CE 01)

Mines Entrepreneur in Residence and author of *Supply Chain Management for Dummies*



Why is diversity important for the supply chain industry?

Every person, and every company, buys products and services. Engineers and scientists know these products are the outputs of a supply chain—a complex series of processes and transactions that depend on people, businesses, and technologies from around the world. Here's how professor Martin Christopher explains it:

"We are now entering the era of 'network competition' where the prizes will go to those organizations who can better structure, coordinate and manage the relationships with their partners in a network committed

to better, faster and closer relationships with their final customers."

A recurring theme that emerges from studying supply chain best practices is the importance of collaborative relationships. Internal collaboration improves the financial performance of a firm, and external collaboration with customers and suppliers makes companies more innovative and adaptable. That's why it is often not sufficient for businesses to hire people based strictly on technical competence; in order to compete successfully, companies need employees who can build and maintain strong relationships with other people in their supply chain.

Research shows that trust is one of the most important ingredients in a collaborative relationship. But trust is hard to build, and easy to destroy. Trust in an entire company can be eroded through the words and actions of individuals who offend others, even accidentally. By incorporating diversity and inclusion into the corporate culture, companies can build stronger relationships with customers, increase their attractiveness to skilled talent, build brand loyalty, accelerate innovation, and decrease business risks.

No matter where they work, scientists, engineers, and managers depend on others for their success. Helping our students develop the skills to collaborate with colleagues from different backgrounds is a critical part of preparing them for success in today's global supply chains.

SAVE THE DATE

HARDROCKER FIVE-YEAR REUNION

JULY 8-13, 2025



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**HIGH IMPACT
HARDROCKERS**

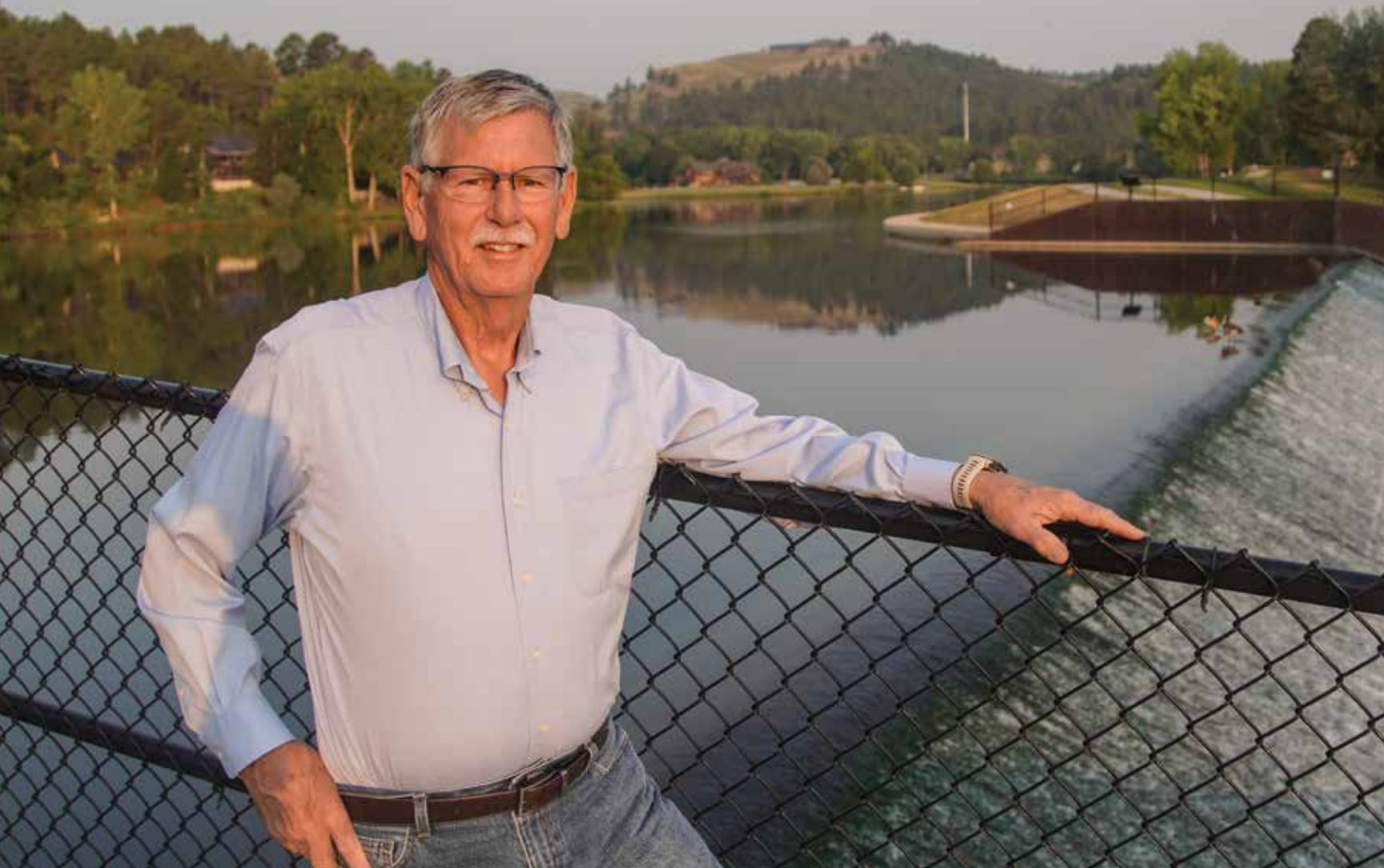
Dr. Geraldean Fluke

In 1997, **GERALDEAN FLUKE** (Phys 48) became the first person to earn a PhD in atmospheric, environmental, and water resources at South Dakota Mines. This remarkable accomplishment is made more notable that Fluke was in her early 70's at the time and among the oldest people to be awarded a PhD. at Mines. This achievement is only one of many in her long and illustrious career that epitomizes a life of humble service and giving back.

In the early 1940's, Fluke taught in rural school before entering college at Mines. In 1948, she completed her degree in physics becoming one of the first 10 women to graduate from Mines. She went on to contribute to the development of nuclear power at General Electric, and also worked at Boeing, Aerojet General and the US Air Force on aerodynamics, rocketry, and thermodynamics. In 1970, she and her family moved back to the Black Hills, she spent 12 years teaching math and physics at Edgemont High School, giving her students a solid foundation needed to thrive at Mines. While teaching in the Black Hills, she passed the professional engineering examination at the age of 47. She returned to the aerospace industry in 1982 and retired a decade later, when she enrolled in the PhD program at Mines.

Fluke received the Guy March Award for professional accomplishments in 1999. During her adult life, she spent ten years as a student, thirty years as an engineer and nearly twenty years as a teacher. In 2010, she was inducted into the South Dakota Hall of Fame. She remained professionally active into her ninth decade and passed away in 2019 at the age of 93. For more information on this remarkable alumnae, please visit sdsmt.edu/News/Releases.





The Water Ambassador:

Mark T. Anderson

IN MANY WAYS, THE LIFE OF MARK ANDERSON (Chem 74, MS CEE 80) has been shaped by water. He grew up along the banks of Rapid Creek and played in the Madison springs of his grandfather's homestead at the headwaters of Little Spearfish Creek. As a Mines student, he was a first-hand witness to the devastation of the 1972 Black Hills Flood. The tragic event is part of what inspired him to pursue a career in hydrology and water resources. In the 1980's, early in his career, Rapid City was facing a water supply shortage. He worked with the city to develop a more sustainable strategy of conjunctive use—a combination of surface water and groundwater. As a result, the city has a network of wells drilled into the Madison Aquifer, off the Rapid Creek flood

plain, which is a critical part of the local water supply today.

Anderson's career included leading research for the United States Geological Survey (USGS) in Arizona and the Dakota Water Science Center in Rapid City. He led and coordinated the first controlled flood in the US on the Colorado River through the Grand Canyon. He even did a stint as the director of the USGS-EROS Data Center in Sioux Falls. The massive archive of earth images begat Google Earth. While at the Dakota Water Center, Anderson developed an international program to help other countries around the globe deal with water supply challenges with technical training and capacity building. By these efforts, he was named a water ambassador



as part of a US State Department program and spent time in countries like Armenia, Mongolia, Zambia, and South Africa.

“One of the most satisfying parts of my career has been helping others solve their water supply challenges by sharing the technology we have developed here in the US”, says Anderson.

The problems of water availability and water quality are universal. What’s true in Tucson, is true in Cape Town. “You can’t believe what an impact you can have in some of these other countries by helping them to secure adequate access to clean water,” says Anderson.

That impact is not just on the health and wellbeing of local

inhabitants; water is often a key ingredient needed to spur local economic development in isolated and impoverished areas.

“You look at a situation where women and children in many places in Africa spend half of their day fetching water. And the reality is when they are doing this, they aren’t in school or producing goods and services for the benefit of the local economy. So, securing a well can make a big difference beyond just drinking water,” says Anderson. Solving the water needs of rural towns in the third-world may seem like a small problem, but Anderson says though different, these challenges can be just as complex as securing water for a major city like Los Angeles.

The needs for large cities to manage water in times of drought are paramount, especially as climate change continues to contribute to an increased frequency of extreme weather events.

“What always happens in times of drought is communities turn to drilling wells. This is happening in many cases in South Africa,” says Anderson. Cape Town gets most of its drinking water from rivers and streams stored in reservoirs. “During the last major drought, the city basically ran out of water. For Cape Town and elsewhere in Africa they need to know if local aquifers can sustain pumping at adequate levels,” Anderson says.

The issue is not just one that impacts foreign nations. Water security is a critical concern in the American West. “Whole towns are going without water right here

in the United States. Managing groundwater is a complex problem, here and around the world,” says Anderson.

Breaking down that complexity, in the American West or in the rural areas of Zambia, is a task Anderson is well suited for. His experience in water issues ranges from a stint as a hydrologist in Oregon’s Siskiyou National Forest in the early 1980’s to three years at the White House as a Senior Policy Analyst in the Office of Science and Technology Policy under Presidents Bill Clinton and George Bush.

Though his work has been global, Anderson says he has one regret about a local change that has not yet happened. “We have not been able to move the USGS onto the Mines campus.” Anderson worked for years to replicate the example of the University of Arizona and Colorado School of Mines, where USGS offices are co-located on university campuses to bolster collaboration and research.

The USGS is critical for maintaining a database about the local climate and hydrology. USGS data on the changing climate indicates that it’s the coming generations who will face the biggest challenges in water. Fortunately, for Mines students, Anderson is giving back to his alma mater by serving as an adjunct professor of civil and environmental engineering. He is using his life experience to inspire this next generation of problem solvers. For those young people considering a career in STEM Anderson has one message, “Come to Mines and make a difference.” ■■

OPERATION: M HILL

An engineering effort to return M Hill to its proper glory

M HILL HAS BEEN A BLACK HILLS ICON FOR LONGER THAN ALL SOUTH DAKOTA MINES ALUMNI HAVE BEEN ALIVE - AND THE YEARS HAVEN'T BEEN KIND TO IT.

Dr. Scott Kenner (CE 77 MS CE 81), professor emeritus at Mines, is heading a team effort to fully restore the beloved university symbol. An alumnus himself, he is dedicated to its preservation.

"I have nine family members up there, so this is very important to me," he said.

The first M was constructed in 1912 by a group of 75 students and faculty members toting picks and shovels, leading two teams of horses with plows and wagons. The horse teams plowed the soil, which the students and faculty removed, to create the M shape. Then the horse teams pulled more than 100 wagon loads of rock up the steep hill, and the students and faculty placed the boulders by hand. The laborious process resulted in an M that could be seen from 12 miles away. According to the book compiled for the university centennial, concrete replaced the stones in 1922.



The letter S has 17 plaques from 1959 to 1975. On the opposite side, the letter D has 44 plaques from 1976 to 2020. Both the S and the D have minor plant growth in the concrete block joints and corrosion on metal plaques, but are overall in good condition.

“The S and the D can really be maintained and cleaned up, but the M is in a poor situation,” Kenner said.

The M features 37 plaques from 1922 to 1958. Some of the oldest plaques only display graduation years, without student names. Through a donation from **William (ME 82)** and **Diana McMillan** to honor Diana’s relatives – **James Hally, Jr. (MinE 1905)** and **Mark Lintz (MetE 1921)** – a new plaque has been created that has all graduates from 1988 to 1927 and will be placed on the new M. Kenner said he hopes to work with student organizations to identify missing names of graduates from each class year since 1927 and combine those names into a new plaque, which will be placed on the M after it is restored.

“*To think that we could continue to just maintain this is really putting a Band-Aid on a deep incision,” Kenner said. “It’s going to continue to deteriorate.”*

Almost a century’s worth of wind, precipitation, and seasonal temperature fluctuations have taken their toll on the M. Many plaques are not legible due to erosion, corrosion, and years of whitewash – a decades-long homecoming tradition. The 1955 plaque is almost completely covered in soil and grass. The concrete is deteriorating and cracking severely, with 10 to 12 inches of concrete separation in some places.

“To think that we could continue to just maintain this is really putting a Band-Aid on a deep incision,” Kenner said. “It’s going to continue to deteriorate.”

Kenner worked with a South Dakota Mines senior design team consisting of

Emily Sande (CEE 2019), Jamie Smith (CEE 2019), Zach Foust (CEE 2020) and Caleb Hansen. The restoration team determined:

- All plaques on each letter should be cleaned, repaired, and re-set.
- Plant life should be removed and cracks in the concrete should be repaired on the S and D.
- The existing concrete of the M should be removed and new concrete should be poured in the same shape.
- Lighting should be upgraded.
- A rock garden and benches should be installed in the reunion plaque area.
- The trail leading to the top of the hill should be rehabilitated.

The senior design team used the 1986 plaque to study different methods of cleaning the plaques and determined that power washing is most effective and least abrasive.

To determine how to best rehabilitate the trail, the team worked with the City of Rapid City, local biking groups, and Hanson-Larsen Memorial Park, which owns the land. The existing trail is steep and erodes in rain, creating safety issues. The trail will be redone to include switchbacks and benches for resting.

Brighter, higher efficiency lighting is currently being installed, with donated materials and labor.

The restoration team’s goal is to raise \$125,000 by December 2021 to allow project completion by September 2022. \$50,000 has been raised at the publication of this article. M Hill restoration will be the focus of Giving Tuesday fundraising efforts on November 30, 2021 said Lucas Lund, annual giving director at CARA.

If you would like to donate to the restoration fund, please visit bit.ly/3A3Ho8e, send a check to CARA designated for the M Hill Restoration, or email Lucas Lund at lucas.lund@sdsmt.edu. 🍷





Two Mines graduates, Joseph Updike and William Smith (far right) were invited to join tribal officials during the official groundbreaking for the new fire station on Pine Ridge.

Answering the Call

Mines Students Assist Oglala Sioux Tribe in Designing First Structural Fire Station on Pine Ridge

A team at South Dakota Mines is about to see their hard work turn into reality. **Mark Cedar Face (CEE 2021), William Smith (CEE 2019), Zachary Darling (IEEM 2019), Ellie Burczek (EE 2021), Cody MacLake (Stephen) (CEE 2021), Chase Storgaard (CE 2019), Joseph Updike (CEE 2019), Tyler Jensen (CEE 2019), and Jason Maiden** worked with tribal and federal officials to help research and design a new structural fire station in the town of Pine Ridge.

It is the first time the Oglala Sioux Tribe has had a fire station dedicated to protecting structures located on

their reservation. The senior design team served at the request of Oglala Sioux Tribal officials after they reached out as part of a memorandum of understanding between the university and the tribe that helps connect experts at Mines with tribal needs. The project was funded through a technical assistance grant from USDA Rural Development that seeks to help improve infrastructure in rural communities.

The teams at Mines met with tribal officials to determine their needs and to verify the long response times for fire emergencies on the Pine Ridge Reservation. Students then toured fire

stations in the area and interviewed fire officials to garner ideas for the new design. “We talked with firefighters at many different stations to ask them what they liked about their building and what they would like to improve,” says Smith who acted as a project manager and coordinator for the student team while pursuing his master’s at Mines. “A lot of people think engineers just sit at a desk and crunch numbers. This project showed me that a big part of engineering is communication and coordination between different groups. This includes the client, regulators, contractors, and third parties. It’s been incredibly rewarding and beneficial as a student.”

The students were overseen by Mines faculty and engineers at Banner Associates in Rapid City. Student advisors included Marc Robinson, PhD, in the Mines' Department of Civil and Environmental engineering (CEE) and Cheryl Chapman, PhD, PE, CEE adjunct professor. Mines partnership with Banner on the project and the hard work of the student team led Banner to hire Smith and Darling as full-time engineers following their graduation from Mines.

The senior design team built on progress made by teams of students working in Engineering Projects in Community Service (EPICS), led by Mines master's graduate Logan Gayton. "Projects like this are a great opportunity for our students to get both interaction with professional engineers and to take part in real-world engineering that benefits local communities," says Robinson. "This kind of work shows our students the importance of meeting with, identifying and understanding the needs of the client. This was also an important teaching opportunity on appropriate cross-cultural communication. Building these kind of communication skills will serve students who are working on engineering projects anywhere in the global marketplace during their career."

The new fire station will not only help save lives and property during structural fires. It will also serve as a way to continue to empower tribal based economic development. "The structural fire department enables homeowners and businesses to get fire insurance for their buildings in Pine Ridge. Without this fire station, homeowners and small businesses have trouble getting loans as there is no insurance to cover possible loss due to a fire," says Robinson.



Following the construction of the fire station in Pine Ridge Village, more substations will be needed across Pine Ridge to provide proper fire protection to the entire tribal nation.

Design teams at Mines are also continuing two other projects with tribal nations in South Dakota. This includes efforts to help design a new tribal administration building for the Cheyenne River and Rosebud tribes.

A rendering of the proposed Pine Ridge Fire Station design completed by Banner Associates and a team of Mines students and faculty.

“Projects like this are a great opportunity for our students to get both interaction with professional engineers and to take part in real-world engineering that benefits local communities.”

“Projects like this are exciting for both students and faculty,” says Chapman. “Civil and environmental engineers take pride in undertaking projects that improve communities and solve problems. This real-world and hands-on work really makes a difference. We are also fortunate to work for a fantastic group of tribal leaders and local engineers who are leading the way on critical infrastructure improvement in tribal nations.” ■



THE POWER OF WATER COOLER MOMENTS

What We Can Lose When Working from Home



IN THE RIGHT ENVIRONMENT, CHANCE ENCOUNTERS IN THE WORKPLACE CAN YIELD BRILLIANT INNOVATION.

On a cold afternoon in the fall of 2005, Todd Menkhaus, PhD, was learning the ropes during his first week on the job. The young assistant professor of chemical engineering at South Dakota Mines was climbing the stairs towards his new office when he came across Hao Fong, PhD.

"He was going one way and I was going the other," Menkhaus says. "He stopped me and said, 'Oh are you new to campus?'"

The normal small talk that ensues when two new colleagues first meet quickly turned into a discussion on each other's specialties. Menkhaus came from the pharmaceutical industry with an expertise in the complex manufacturing of anti-cancer drugs. Fong was pioneering research on a new type of filter, made of thousands of tiny randomly crossing nanofibers where each individual fiber is many times smaller than a human hair.

The pair of researchers began to connect dots. The chance encounter in the hallway turned into an intense discussion that

turned their idea into a start-up company. In 2020, that startup, Nanopareil, was acquired by Gamma Biosciences, a subsidiary of the global investment firm KKR.

It's a wild success story that may have never happened in the world of remote work. "If we were relying on Zoom you would never go through the university directory and just randomly find someone to connect with and say, 'Oh are you new to campus?'" Menkhaus says.

But it's not just about fostering random in-person connections; it's about creating the kind of space where safe and informal conversations can turn into idea generating dialogue.

"There is just no substitute for this kind of interaction," says **Mike Boucher (MS CS 91)** co-operator of Boulder New Tech in Boulder, Colo. "If you have a chance to design your office space, make sure you dedicate an open floor plan with break rooms or coffee stations that are welcoming and comfortable spaces that can spur these types of conversations." Boucher, who is an Entrepreneur In Residence at South Dakota Mines, has seen the power of random office connections create solutions time and time

will naturally end up on the whiteboard. What this does is advertise to everyone in the building what they are working on. And that invites and fosters collaboration and new ideas," says Boucher. "Someone else will see the whiteboard and add in their own notes or solutions. And later when another person comes up with the same problem, they will remember, 'Hey I saw this person doodle about this on the whiteboard so I can go to them for help,'" says Boucher.

Today, Menkhaus is continuing to lead research at his company, Nanopareil, and he is creating the space where ideas can flourish. "You can't always plan how success will happen. But you can create an environment and culture where teams of people can come together and solve really difficult problems based on their combined expertise," he says. "The work that we do, it's very hands-on laboratory work and just being able to have scientists working together and talking together all the time has brought so many ideas that would not have evolved in another environment."

At South Dakota Mines, students are encouraged to innovate from day one. The 2021 fall semester will include a full array of student organizations and activities. This

But it's not just about fostering random in-person connections; it's about creating the kind of space where safe and informal conversations can turn into idea generating dialogue.

lasted a few hours. "When I started thinking about all the things you could do with Fong's nanofibers, I realized they could be used to solve a lot of problems I had been working on in the pharmaceutical industry over the previous five years. I had the problem, and he had the solution," says Menkhaus.

That single encounter opened the door to a 15-year collaboration that resulted in a revolutionary new type of filter, which significantly reduces the cost and manufacturing time for lifesaving vaccines and medicines. The pair of professors

again in his career. Today he is working on his third tech company start-up, Scripta LLC. His first two start-ups, Dakota Legal Software and Dakota Scientific Software, were acquired by Fortune 500 companies. In the late 1990's, Boucher spent time at Sun Microsystems as a software engineer. He says his time at Sun also taught him the importance of one more addition to every break room: a whiteboard.

"If you put three or four whiteboards in your break room, what people will do is go to have coffee or lunch and then get to talking. The problems they are working on

means classes that incorporate science and engineering teams who are tasked to tackle problems with in-person hands-on collaboration and cooperation. Mines programs like Center of Excellence for Advanced Multidisciplinary Projects (CAMP) gives student teams hands-on engineering experience. CAMP actively encourages participation, personal growth, emotional intelligence, organization, and leadership starting in the freshmen year. ■■



Researchers Evaluate SURF Extremophiles in Effort to Trap Carbon Dioxide Deep Underground

South Dakota Mines Researchers Study Microbial Acceleration of Carbon Mineralization with Extremophiles Found at SURF

WRITTEN BY
Erin Lorraine Broberg, SURF

PHOTO BY
Adam Gomez, SURF

When first learning about the Sanford Underground Research Facility (SURF), it can help to imagine it as a vast, inverted apartment complex. Experiments move into the large, underground caverns. And SURF provides the usual amenities: electricity, running water, elevator maintenance, radon mitigation, liquid nitrogen deliveries and, of course, shielding from cosmic rays.

But amidst the facility's 370 miles of tunnels, shafts and drifts, there is one group of tenants who pay no rent at all. At SURF, billions of microorganisms—known to biologists as “extremophiles” for their ability to carve out a living far from sunlight and with limited oxygen—live deep underground.

This summer, a research group from South Dakota Mines retrieved a core sample—a smooth cylinder of grey rock—from 4,100 feet below of the surface of SURF. Under a microscope, it wriggled with SURF's hardiest inhabitants.

From this sample, the research group hopes to find a microbe with a distinct set of characteristics that could help store excess greenhouse gases deep underground.

Locking away carbon dioxide

While extremophiles have slowly evolved to withstand their adverse habitat, scientists are on a mission to keep the Earth's atmosphere as hospitable as possible. And so, a global effort is underway to store carbon dioxide (CO₂) emissions in deep underground reservoirs. One promising method to keep it locked in place is called “carbon mineralization.”

“Carbon dioxide gas is captured from the atmosphere, then pumped in liquid form deep into underground rock formations,” said Bret Lingwall, a geotechnical, bio-geotechnical, and earthquake engineering researcher, who leads the Mines research group.

Deep underground, a chemical reaction transforms the CO₂ into a stable, solid carbonate mineral—effectively trapping it for millennia.

But this process has a severe limitation: speed.

The crippling pace of the method's chemical reaction is measured—not in weeks or months—but in years. Currently, the largest carbon mineralization project on Earth can sequester 10,000 tons of CO₂ each year—barely a drop in the bucket when climatologists measure carbon emissions by the gigaton (one billion tons).

Meanwhile, Earth is in a bit of a rush.

For carbon mineralization to have an effect, the process desperately needs some added speed.

“What we are trying to do is to accelerate that timescale from a couple of years to a couple of weeks,” Lingwall said.

“How we propose to do that is through microbial acceleration.”

Scientists have identified certain microbes that, at the surface, produce enzymes that can greatly accelerate carbon mineralization. “However, these microbes can’t stand the temperatures, pressures and acidic pH of the deep subsurface,” Lingwall said.

At depths of 4-8 kilometers deep, pressures are intense and temperatures climb to 60-90 degrees Celsius (140-194 degrees Fahrenheit). While these conditions are ideal for carbon storage, they aren’t hospitable to most microbes.

But most microbes weren’t born on the 4100 Level of SURF.

Enter: Extremophiles

Rajesh Sani, a microbiologist with the Mines research group, has studied various SURF extremophiles for 15 years. In that time, he’s worked with “thermophiles,” a type of extremophile that can survive temperatures from 54 to 70 degrees Celsius (130–158 degrees Fahrenheit).

Sani will examine the gene expressions of microbes found in the core sample. “This process will give us an idea of how these microorganisms function, what are they eating, how they are breathing, how they are producing biomass, and how they are interacting with rock samples underground,” Sani said.

It will also help researchers determine if SURF’s extremophiles can produce the sought-after enzyme that hastens carbon mineralization.

“Our project will sample and survey extremophiles from SURF, looking at their enzymatic genes to determine if any of them have the right profile to both survive deep underground and accelerate carbon mineralization,” Lingwall said.

Magan Vaughn, a chemical and biological engineering master’s student at South Dakota Mines, crushes a core sample from 4,100 Level of Sanford Underground Research Facility, preparing the sample for DNA extraction.

Determining the rate

While the team’s microbiologists are sifting through microbial samples, other researchers are trying to establish just how quickly carbon mineralization takes place without extremophiles.

“Currently these types of experiments were replicated in the field, but not in laboratory environment. When you are conducting large-scale investigations in the field, you are limited to the conditions (composition, pressure temperature, biological activity) that field site can offer,” said Gokce Ustunisik, a petrologist and high-temperature geochemist at Mines. “The beauty of experimental work is that you are the one—not Mother Nature—putting the controls on the system. You systematically change parameters, so that you can right away see the contribution of each parameter in a multi-component system.”

When her biology and engineering colleagues first described the temperatures and pressures needed for this research, Ustunisik thought, “High temperatures and pressures? Those are low temperatures and pressures!”

For Ustunisik, who studies the formation and evolution of the Moon, Mars, and Earth, those parameters are quite low. In her experimental petrology lab, Ustunisik can easily replicate conditions comparable to the Earth’s lower crust and upper mantle, where temperatures begin at 1,400 degrees Celsius (2,552 degrees Fahrenheit).

But for this research, both the microbes and the deep subsurface create

strict limitations for each other. The extremophiles must be hardy enough to survive the upper limits of life, while the rock formations must be deep and vast enough to store gigatons of carbon, without killing the extremophiles.

The key is finding an overlap.

Earlier this summer, RESPEC researcher Brian Bormes and Ustunisik took initial observations of the core sample on the 4,100 Level of Sanford Underground Research Facility.

Layers of expertise

Currently, the two major inquiries—understanding the extremophiles and pinpointing carbon mineralization rates—are being done in parallel. In 2022, the group will introduce the microbes to the carbon mineralization process to see if the rate ticks up.

Many questions will guide the next phase of the research: Can SURF extremophiles accelerate the carbon mineralization process? If so, by how much? Can they adapt to different rock environments? Or are they limited to their native rock formations?

The effort, funded by an Eager Award from the National Science Foundation, brings together experts in geology, engineering, chemistry, petrology, and microbiology.

“The novelty of this project is not necessarily the microbial acceleration of carbon mineralization. The real innovation is the bringing together of a team of different backgrounds to study this new, interesting, complex problem in a different way,” Lingwall said.

The current NSF grant supports two years of initial research. If, by the end of that period, the experiment’s results are promising, a larger experiment will be undertaken.

And, perhaps, these extremophiles might be worth their back rent after all. ■■

MINES STUDENT WINS PRESTIGIOUS NASA GRANT

South Dakota Mines student Kaytie Barkley (ME 20) is researching a process called ultrasonic welding that utilizes low amplitude, high frequency vibrations to fuse two pieces of plastic together. This type of welding could someday be used to build things like spaceships out of lightweight but strong polymer or composite material.

"The sonic welder we use operates at 20 kilohertz. This frequency makes the plastic target vibrate so fast that it melts the material and fuses it together," says Barkley.

NASA has recognized Barkley's work with a prestigious Space Technology Graduate Research Opportunity award of \$68,924. Barkley finished her undergraduate degree in mechanical engineering at Mines in 2020, and this research is part of her master's degree.

Cassandra Birrenkott, PhD, an associate professor of mechanical engineering at Mines, is Barkley's major professor. "Kaytie is very deserving of this prestigious NASA Space Technology Graduate Research Opportunity," says Birrenkott. "This year, only 58 awards were made throughout the US, and we are very proud that Kaytie's research was selected to be supported by NASA. It is great to see Kaytie's hard work and high level of commitment to her graduate education and research recognized by NASA through this award."

Barkley's research could yield new methods for building everything from automobiles to spacecraft and other items needed in space. "It costs about \$10,000 to ship a pound of weight into space. So, if we can come up with lightweight materials to replace heavier weight metals, there would be a lot of cost savings," says Barkley.

The process of ultrasonic welding of plastics is still being understood. Two ultrasonic welds often

come out different, even when completed under the same conditions. "Right now, the flow of the material in an ultrasonic weld is unpredictable. So, we are trying to figure out a joint design that will yield more consistent high-quality welds," says Barkley. "There are additional challenges when changing materials, such as moving from a simple uniform polymer to a composite material which may include imbedded glass fibers. So, there are a lot of exciting challenges to tackle in this research."

Barkley credits her success to inspiration and support from her advisors -- Birrenkott and Prason Diwakar, PhD, an assistant professor of mechanical engineering at South Dakota Mines. "I immensely appreciate both of my advisors. They saw potential in me and encouraged me to pursue a master's degree. They are great at challenging me to do difficult tasks and encouraging me to expand my knowledge, but also patient with me as I go through the learning curves associated with doing research," says Barkley.

Barkley became interested in studying mechanical engineering thanks to encouragement from her father and her brother, who is also a Mines alumnus. "I love math and I enjoy a challenge," she says. "Especially challenging problems that continue to evolve during the process of solving them. I think STEM is great for anyone who finds satisfaction in pursuing a good challenge, and who enjoy working with others of the same mindset." ■







Building a Legacy of Study

Mines Constructs Living Laboratory

SOUTH DAKOTA MINES

is home to a new living laboratory that is located on a hill above the main campus. This long-term study will help students and the community understand how vegetation and ground cover impacts soil erosion, water quality, ecosystems, and our shared natural resources.

The study area is a steep exposure of the Belle Fourche Shale rock formation that had

been a problem area for erosion and contained little-to-no vegetation. The living laboratory includes over 20 small plots in a grid that have different erosion control treatments, ranging from engineered products to low-tech solutions such as hay cover or mulch. Each treatment option was designed and built by undergraduate student researchers with the assistance of faculty and instructors. The study is

funded by the West Dakota Water Development District (WDWDD). The elected board is one of seven water development districts in the state, organized for the purpose of promoting conservation, development, and management of resources.

Each year, students in the Department of Civil and Environmental Engineering will collect data on the treatments laid out in the living laboratory. Over the



coming years, the data collected by students will help determine how each ground erosion control method impacts the landscape. Students will have the opportunity to actively participate in this ongoing research effort.

The results can help scientists like Heidi Sieverding (GeolE 99, MS GeolE 01) understand more about possible mitigation efforts that can be effective in reducing erosion and improving soil health

The living laboratory gives students hands-on experience in collecting environmental science data, from soil and vegetation health to erosion.

in both wet and dry years. Sieverding is a research scientist in the civil and environmental engineering department at Mines. “Cost-

effective methods to improve water quality and support soil retention and development are critical to ensuring the continued health of our ecosystems and communities,” she says.

The living laboratory gives students hands-on experience in collecting environmental science data, from soil and vegetation health to erosion. Bret Lingwall, PhD, an associate professor in the Department of Civil and Environmental Engineering at South Dakota Mines, is leading the project.

“One of the keys to helping engineering students understand the complexities of the real world is to have places available for them to see the short and long-term performance of different engineered interventions. In this project, our sponsors at WDWDD worked closely with us to develop a place on campus where beneficial research can occur but, more importantly, provide a space for engineering students to observe how nature may or may not respond to our interventions. This project will benefit our students for decades to come,” says Lingwall.

Research often involves unexpected turns, and this is the case with the new Living Laboratory which was hit by a grass fire just days after construction was officially completed. The fire damaged nine of the 26 study units set up in the laboratory. The damage is estimated at \$5,000-10,000.



There may be a silver lining: fire is a natural part of the landscape; researchers will incorporate the burned areas right into their ongoing study. The fire did not burn all the plots, so the study can now look at the impact of fire and fire suppression efforts on soil health and erosion control.

“We will definitely study how the test units reacted to the fire,” says Sieverding. “We plan on adding the fire-scarring into the learning experience.”

The Rapid City Fire Department needed about 700 gallons of water to extinguish the fire. This was sprayed on the area in a very short window of time, and as a result, changed the landscape. “The test units downhill from the fire captured nearly all the sediment that moved during the event. Many test units performed well in much more extreme conditions than expected,” Sieverding adds.

Mines officials give high praise to the Rapid City Fire Department for putting out this blaze so quickly. “We’re very thankful for the campus and community members who noticed the fire and alerted the Rapid City Fire Department. We also greatly appreciate the quick response by firefighters, which prevented the total loss of the laboratory,” says Mines President Jim Rankin.

Fire officials say the blaze appears to be human caused and that an investigation is ongoing by the Rapid City Fire Department’s Fire and Life Safety Division. ¶¶



2021 REUNION

More than 1,100 South Dakota Mines alumni and their families united on campus July 8-10, swapping old stories and making new friends at the traditional 2021 all-school reunion.





















In Memoriam

The names below include those who have passed (based on our database records) in the last 10 years, but whose names have not appeared in a previous Hardrock magazine. Please contact us if you know of any errors in this list. Going forward, it will be helpful if you share information about the passing of alumni you may know. The names below were received by August 30, 2021, and are listed alphabetically by year of graduation.



Bill Hoskins (ME 51) 6/7/21
Alvin Johnson (Chem 52) 4/19/21
Bob Schwarz (ME 52) 5/4/21
Jim Jensen (GenE 55) 7/20/20
Jim Bell (CE 56) 8/9/21
Bill Glover (CE 58) 7/2/21
Gil Rennhack (MinE 58) 6/6/21
John Shoemaker (CE 59) 12/6/20
Wesley Kiel (ChE 61) 6/23/21
Lowell Crawl (MinE 62) 4/18/21
Robert Minter (ME 64) 12/31/20
Krishnakant Vernenkar (MS MetE 64) 3/31/21
Dave Nelson (EE 65) 8/27/21
Roger Ackerman (ME 70) 5/15/21
Harold Young (MS CE 70) 12/1/14
Bob Jeitz (MinE 71) 3/31/21
Gary Meyer (CE 71) 4/22/21

Steve Rolf (Phys 75) 6/27/21
Wendy (Johnson) Smades (Che 78) 4/18/20
David Fernandez (ME 87) 7/20/21
Kevin Michel (CE 88) 10/1/17
Neil Musilek (MinE 89) 6/30/21
Patricia Cihak (Math 90) 5/19/21
Scott Green (IS 93) 6/15/21
Clint Foster (MetE 12) 8/14/21
Jon Nabholz (ME 15) 5/14/21
Weston Shutts (ME 19) 5/22/21
Spencer Kabran (ChE 21) 6/27/21

FORMER FACULTY/STAFF:

Dr. Stan Howard (MetE faculty) 5/15/21
David Lust (CARA Board) 7/23/21
Dr. Richard Pendleton (ME faculty) 6/17/21

CLASS notes

1940s

Doug Fuerstenau (MetE 49) has been recognized by the National Academy of Engineering as a 45-year member. He was elected to NAE in 1976 and his brother **Maurice (GeolE 55)** in 1991, being among the very few brothers in NAE. Eight of Doug's PhD graduates at the University of California Berkeley have been elected to NAE, one being Distinguished Professor Emeritus Kenneth Han. Professor Han is the only person ever elected to NAE while working in South Dakota.

1950s

Al Dougal (CE 50) "I still live at The Conservatory in Plano, TX. On my 95th birthday two years ago, my two granddaughters from Oregon and Washington came and put on a great party with over 100 guests. I am still painting every day and gave

up my car two years ago. My health is fairly good, but I use an electric wheelchair to get out of my apartment. I am sending a picture of one of my paintings."



Pete Vossos (Chem 56) "At the reunion this summer, I was able to reconnect with my old friend, **Bob Annett (ME 56)**, and we met with Pati Seefeldt, wife of another old friend, **Dave Seefeldt (GeolE 58)** at the Saturday Delta Sig banquet. An unexpected, but very pleasant surprise was meeting **Jim Richardson (Chem 52)** who graduated four years before me. We discovered that we grew up in the same neighborhood in

Sioux Falls, went to the same high school, both majored in chemistry at Mines, both went on to graduate school at Iowa State, and both did our research under the same major professor!!! Our highlight of the reunion was that Bob and I were lucky enough to have **Larry Simonson (EE 69)** drive us up to the top of M Hill. Most of my waking time was spent reminiscing. Can we do this again in four years????"



Burt Bomhoff (CE 58) "I've attached a photocopy from *The Hardrock, Vol. XXI No. 1, September/October 1954*. The copy contains this article from an orientation session at Sheridan Lake. Badger Clark, Poet Laureate, recited poetry. The reason this article is of particular importance to me is the importance of Mines in my life and career. I was

way too preoccupied with a plethora of interests to focus on my studies. But I obviously got a lot from my studies as any student who makes it to graduation does. While my grades weren't stellar, my career was. I became a registered civil engineer as soon as qualified and a registered land surveyor. I worked for the Alaska Department of Highways and held a senior management position within four years of graduation. I founded an engineering firm that became one of the largest and most varied in Alaska. Went on to hold elective office and later managed the Alaska Long Range Radar Facilities. Over \$4,000,000,000 in assets, constituting the largest military base in the Pacific. I don't relate this so much to brag about myself, as to brag about South Dakota Mines and what a fantastic learning experience it provides. Aside from my career, I found time to hunt, fish, become a commercial pilot, US mineral surveyor, raced the Iditarod Trail Sled Dog Race, and raise a family."

Bruce Johnsen (CE 59) "In 1992 a group of Mines graduates decided it would be a good idea to have an award for staff members who 'went the extra mile,' encouraging students and helping them stay engaged and relatively happy until graduation. In our minds, Dick Kitchen, publicity director for Mines during our time in college, exemplified this kind of exceptional service. So, the L. Richard Kitchen Memorial Award was established. The awardee receives recognition at an annual ceremony and a check for \$200.00. **Tom Warborg (ChE 63)** and I have now contributed to bring the award up to a more substantial level. We are hoping that others may also consider making a contribution to CARA for this worthy cause."

1960s

Jon Spargur (ME 61) "We are selling our house in our Del Webb 55+ community, downsizing, donating, selling, discarding, and moving to Cary, NC, to be closer to our daughter's family, familiar restaurants, and familiar stores. We regret not making the 2021 Reunion and will be spending another Thanksgiving time at Hilton Head, SC."



Joe Harris (ME 65) watches intently as the judge checks his 1968 Shelby GT 500KR convertible at the National Mustang and Shelby Show in Kansas City. Joe received a "Gold" Award based on a strict Standard of Excellence for authenticity, condition, and cleanliness in July. Approximately 400 Mustangs and Shelys were entered from all over the country.

Jim (MinE 68) and Melisa Crouch "This past June 26, our four adult children along with a number of our grandkids held an open house to celebrate our golden wedding anniversary. We had a great turnout with a great surprise. **John (MinE 67)** and Stephanie **Sittner** came up from Denver to be part of the celebration. I'm told that my jaw hit the ground when I saw John and Stephanie walk through the door!"

1970s

Karl Gerdes (ChE 71) "Pam and I enjoyed the golden reunion activities in Rapid City for the class of '71 (and '70) in May at the spring commencement. Lots of old war stories were exchanged with a number

of Hardrockers I had not seen in literally 50 years. I am now 8 years into retirement from Chevron and still have a few professional activities going. I did step down as chair of the GPA Midstream research committee in April after 30+ years on the committee and more than a decade as chair. I continue a hobby level of consulting. Among other things, I am now an instructor with PetroSkills/JM Campbell. I am also editing a book of research results from an international industrial consortium of energy companies working on limiting GHG emissions. Other than that, we are looking forward to international travel again in the near future."



Bruce Bad Moccasin (CE 71) and Jim Swartz (ChE 71) were freshmen roommates at Mines in 1967-68. They recently met in Rapid City for a trip down memory lane and to catch up with each other and their families.

Stuart Calhoon (ME 72) "Liz and I have moved to Provincetown, MA, at the tip of Cape Cod. P'town is a resort community and has proven to be a very

interesting place to live. It has great beaches – two blocks to Cape Cod Bay and about three miles to the Atlantic Ocean. While it has been getting notoriety recently for COVID issues and whale encounters, P'town is great with dozens of restaurants and special events every week. We're doing fine and having a wonderful time, especially with our son, Brian, just down the street. If anyone wants to visit the Cape, let me know, and we'll help set up your visit."

Clyde Ericsson (MetE 72) "Three years ago six classmates of **Dennis Schnabel (Phys 72)** flew to Seattle and spent a week with Dennis just before his passing. We (six couples plus Dennis' widow) met again the following year when I hosted them at San Antonio. This September, we're all meeting again for a week, this time in Rapid City."



Louis Dorland (Phys 77) "At the beginning of August, I attended the Nebraska Star Party. This was the 28th

year of the annual event. Though the skies were marred by smoke from wildfires in the northwest, the weather was pleasant and mostly cloud free. The dark skies of Nebraska's sand hills provide great views of galaxies, nebula, the planets, star clusters, and the Milky Way even casts a shadow." Louis and Susie are retired and living in Papillion, NE.

1980s

Rob (CE 81) and Corinne Sorge (CE 81) along with **Lori (CE 81) and Dave (ChE 81) Litzen** bicycled on the Katy Trail in Missouri for five days the last week of May. They had good weather (except for the last few miles), learned about the Lewis & Clark Expedition, explored many Missouri River towns (thanks to Corinne's excellent planning), and stopped at a few breweries and bars along the way.



Lori Stark-Kasley (ChE 82) "My son Sam graduated from high school last year and I moved back to Rapid City in August to be closer to family. I spent 34 years in Midland, MI,

working for Dow Corning and then consulting in silicone chemistry before joining the ranks of the retired in February. My son decided to follow in my footsteps and go to Mines and study chemical engineering. He is very happy that he chose Mines and is excited to be a sophomore."

Mike Harris (CSc 83) "I have been following the university's exciting expansion and progression. I like the new newsletters, the videos, and the tours. Keep up the great work - very proud! My oldest son is a senior at UNC Chapel Hill in chemistry and my youngest started his 2nd year (as a junior) at NC State in bio science and is already establishing himself as a researcher. I'm in my fifth year at IBM and have been working remotely even before COVID having a very distributed team. I am beginning to implement financial transition to retirement with about a three-year countdown."

Chuck Widhalm (EE 83) "It was great to see all the changes at Mines! We spent time with some good friends and I got to show Carol the area, the Badlands, and Mount Rushmore (on her bucket list). After 36 years in the Dallas area, we finally moved to Bella Vista, AR. Have retirement in sight, but not exactly defined when

yet. Got rid of one job in July and still working part time for D&W Marine Systems Management (SDVOSB). But a friend is now encouraging me to come work for him part time too. At least I'm not bored."

Lynne [Victor] Bukovic (ChE 87) "Greetings from Missouri! After decades of travelling nearly every week for work, it has been a bit strange (but nice) to spend a few months at home with no travel. To my great relief Mike and I found that we really can spend morning, noon and night together for days on end (which bodes well for eventual retirement)! Retirement isn't in the immediate plans though. I recently left Harcros in favor of a new challenge at TransChemical, Inc. TransChemical is a woman-owned chemical distributor based in St. Louis, Missouri. As their new VP of Business Development, I will be spearheading the strategy for growth, particularly for our new SQF certified, food grade (flammables) packaging and blending facility. In the past few weeks, I was also honored to join the BluePallet advisory board. BluePallet is a global, industry driven, marketplace for the chemical industry. It's interesting (and challenging) developing a platform of collaborative 'e'

enabled tools for an industry that has, for the most part, remained transacting on a one-to-one basis - largely 'off the web!'"

Ann [Barnum] Curnow (GeolE 87) "My brother **Tom Barnum (MinE 84)** and I got together in 2020 to say goodbye to our father **Warren Barnum (CE 60)**. In June 2021, we had a more joyous occasion to reunite when we celebrated the wedding of Tom's son. Tom recently moved from Iowa to Texas where he is the production class equipment specialist with RDO Equipment Company. I am still in Minneapolis and working as a senior project manager with Environmental Resources Management. I made it to the all-school reunion in July and enjoyed my time in Rapid and seeing how great the campus looked."

Reiji [Zhang] Cass (MSCSc88) "I retired last June after 30.5 years of teaching at Victor Valley College. It was a great job with the only downside of being in the High Desert area of Southern California. With retirement, I can move away. In fact, I already moved out of the desert eight years ago but still within commuting distance. Last month I finally moved into my new house after waiting for eight months while it was being built. So,

with travel still on pause, I'm content staying home and working on sprucing up the bare new house."



Doug Broz (EE 89) "After almost 30 years of working in a variety of engineering positions, I decided it was time to pursue my hobbies and travel. I fully retired in Washington state in 2018. My last ten years of work took me overseas and allowed me to travel to over 30 countries and five continents ranging from Malta to Mongolia. Since retiring, I have traveled to Tanzania and to the top of Kilimanjaro. Most recently I traveled back to South Dakota and helped my dad clean up the family farm. Next on my list is the restoration of a vintage airplane that has been in the family since 1946."

1990s

Holly [Hansen] Maudsley (ChE 95) "I am back in St. Paul, MN, enjoying my 24th year at 3M with an advanced specialist assignment for global product engineering for abrasives precision grinding and finishing

(diamond abrasives and more). Most recently, I was on a two-year Lean Six Sigma Black Belt assignment at 3M's industrial tape plant in Knoxville, IA. My son is doing well in high school, and I am excited to be back in a metro location and learning a new technology!"

2000s



Kevin Erdmann (ME 04) won the Paddle (traveling trophy) with the largest walleye (24 ½") and for being the best fisherman at the Theta Tau fishing gathering on June 10 at South Whitlock Resort.



Dan Breitbarth (EE 06) "I feel like a college student again, getting my homework in late. A few of us from the class of '06 got together for an August weekend for a camping trip in Wisconsin and were able to play a few games of cornhole on my custom set of

South Dakota Mines boards: **Benjamin Edwards (CEng/Math 06)**, **Dan Breitbarth (EE 06)**, and **Daniel Rausch (CSc/Math 06)**. Dr. Edwards is a senior data scientist for Cyentia Institute in the Twin Cities, Dan Breitbarth is an engineering manager for control products at NORD Gear Corporation in Madison, WI, and Daniel Rausch is a software developer advisor for GDIT in the Twin Cities."

Sara [Hagie] Lee (ME 08) "After having to cancel travel plans for 2020, my husband John and I rebooked the trip for this past summer. We hauled all three kids (ages 7 and under) overseas to spend a month in Greece. We spent a week in Athens and a week each on three different islands in the Cyclades. Not without its difficulties, it was an amazing trip! Despite being vaccinated, we ended up contracting COVID later in the summer. Thankfully it was mild and all five of us got through it well."

2010s



Ty (ChE 15) and Kati [Johnson] (ChE 14) Murphy welcomed a baby boy, Camden, in February.



Sam Hill (ME 16) "Kari and I welcomed our second baby boy in March. Baby Chase joins his big brother Kade (2)." *[Note: Kari and Kati (previous Class Note) are twin sisters!!!]*

2020s



Manasi Paste (CSc 20) and Shashwati Shradha (CSc/Math 20) met **Jim Swartz (ChE 71)** in Menlo Park in July. Jim is Professor of chemical engineering and bioengineering at Stanford. Manasi is a software engineer at Facebook Reality Labs in Burlingame and Shashwati is a software engineer for Lyft in San Francisco. Based on his experience in the bioengineering field, Jim was able to provide guidance to Manasi and Shashwati about how their education in computational science can help advance their interest in and impact human health.

ALUMNI

Gatherings



Jeff Allen (ChE 77) "I was honored to host a Triangle gathering Friday night at the Mines Reunion Lite this year. There were over 150 alumni who attended the event. Great food, friends, beverages, and stories! A special thank you to **Jeane (CE 77)** and **John (MinE 77) Hull**, Sue and **Bill**

(EE/Phys 77) Betten, and Scott Bova for helping at the event. Judging by the many thank you notes, cards, and text messages I'd say a great time was had by all. Hope to see even more at the upcoming Reunion 2025."



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facebook.com/SDMinesCARA



Keith Beck (EE 90) “**Marty Jackley (EE 92)** was again the host of Theta Tau fishing on June 10 at South Whitlock Resort: **Randy Ringstmeyer (CE 02)**, **David Hartmann (CE 94)**, **Mark Ingalls (CSc 92)**, **Kelly Whiting (Math 89)**, **Bruce Zavesky (CEng 99)**, **Darin Hodges (CE 98)**, Lorne

Lawrence, **Sean Stucker (ChE 89)**, **Kevin Erdmann (ME 04)**, **Brandt Lyman (CE 04)**, **Don Lapp (ME 92)**, **Ben Grassel (ME 13)**, **Jay Blomster (ME 04)**, **Keith Beck (EE 90)**, **Matt Carda (IS 99)**, and **James Pulaski (IE 09)**.



Scott Fritz (IE 04) “A contingent of mostly Connolly 3rd floor east freshmen fall of 99 took a week-long trip in the boundary waters disconnected from civilization. It was a great trip with a lot of paddling, portaging, and sharing memories. **Chris Monson (ME 04)**, **Scott Fritz (IE 04)**, **Charlie Murray (IE 03)**, **Galen Goeden (Matt’s father)**, **Mathew Goeden (CEng 03)**, **John Abrams (ME 03)**, **Mathew Kafka (IE 04)**, and **Kevin McGinnis (ME 04)**.



Delta Sigma Phi Reunion Banquet – July 10, 2021. In addition to the Saturday banquet, approximately 250 Delta Sig brothers and their guests gathered at Sylvan Lake on Wednesday, July 7, for an evening social. Another event was the Delta Sig golf outing at Hart Ranch earlier on July 7 with 46 golfers and a half dozen “course marshals” to make sure “strict” rules were followed!!!

Class of 1970-71



Back Row (left to right)

Ron Grimm (Chem 70)
 Ron Feldhaus (EE 70)
 Dianne Hinsch (Chem 70)
 Craig Scott (Chem 70)
 Alan Anderson (ME 71)
 Tom Hayes (Chem 70)
 Randy Daughenbaugh (Chem 70)
 Ron Baruth (MinE 72)
 Dave Shaddrick (Geol 71)
 Leroy Foster (GeolE 71))
 Grubby
 Jim Martin (Geol 71)
 Gary Young (ME 71)
 Wayne Greaves (GeolE 71)
 John Davies (ChE 71)

Bob Deis (EE 72)
 Karl Gerdes (ChE 71)
 Greg Farke (EE 71)
 Glen Larson (ChE 71)
 Gene Quinn (CE 70)
 Randy Nelson (GeolE 71)
 Ron Revell (ME 70)
 Bob Bickett (Math 70)

Front Left (standing left to right)

Bernie Tompkins (EE 70)
 Harald Eriksen (CE 70)
 John Kelly (ChE 70)
 Lyle Steffen (Geol 70)
 Dan Sultz (ChE 71)
 Jerry Brown (MS CE 70)

Del McDonald (EE 71)
 Olav Maehle (ME 70)
 Pam Ackerman (Math 71)

Sitting (left to right)

Tom Zeller (ME 70)
 Ken Ackerman (EE 71)
 Jerry Wright (CE 71)
 Dennis Horning (ME 71)
 Jim Hutchins (ChE 70)
 Steve Obenauer (EE 71)

Standing on right (left to right)

Ray Atkins (MinE 70)
 Carlos Calderon (MinE 71)



Krueger Becomes CARA CEO

In May of 2021, Paul Krueger took the helm of South Dakota Mines Center for Alumni Relations & Advancement (CARA).

KRUEGER HAS A LONG AND SUCCESSFUL CAREER in advancement with expertise in both higher education and community non-profits. He brings a diverse skill set to the position with his background in alumni relations, development, public relations, and management.

Krueger comes from Make-A-Wish America where he served as a director and chapter relationship leader. He advised 13 Make-A-Wish chapters nationwide in strategy, execution, efficiency, fundraising, leadership, and board development.

He spent many years of his career expanding Make-A-Wish South Dakota

by growing revenue and increasing the number of wishes granted across the state. Prior to Make-A-Wish South Dakota, he served as a director of development at Augustana University in Sioux Falls. This followed leadership positions at both Augustana and the University of South Dakota with their Alumni Associations.

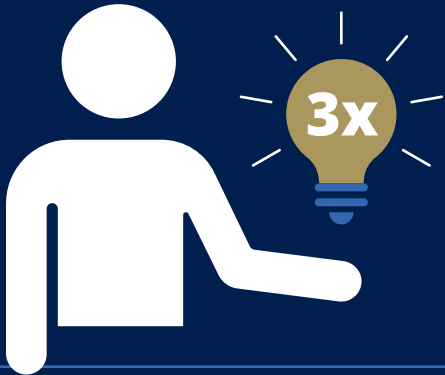
Krueger earned a Bachelor of Arts in journalism and communications from Augustana University and a Master of Science in administrative studies from the University of South Dakota. He is a South Dakota native and has been involved in the community including Lions Club and Leadership South

Dakota. He succeeds interim President Sharon Chontos (ChE 87), who led the organization through a merger and continued growth.

Under Krueger, the South Dakota Mines Center for Alumni Relations & Advancement will continue to promote traditions and alumni relationships with the university while developing financial support for the students and campus – this includes several exciting new initiatives that will be announced in the coming years. **■**

BY THE NUMBERS: RESEARCH AND INNOVATION

Mines faculty are **3 times** more inventive than the national average



Amount in research awards over the past four years:

\$63,000,000

Amount in research awards in budget year 2021 alone:

\$18 MILLION

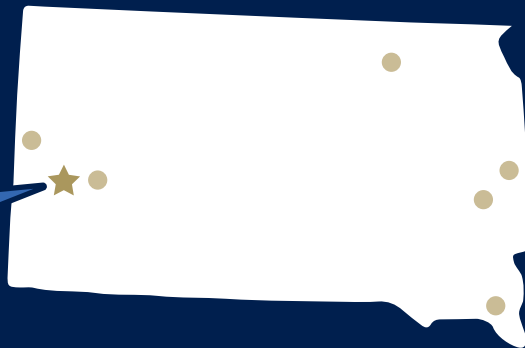


Licensing revenue received from Mines based innovation in 2021:



17 invention disclosures in 2021, more than any other public university in the state

17



Entrepreneurs in Residence:

40+



Number of Small Business Innovation Research and Small Business Technology Transfer awards to university start-ups:

13



5 National Security Innovation Network projects at Ellsworth Air Force Base



SOUTH DAKOTA MINES

501 E. Saint Joseph St.
Rapid City, SD 57701

MINES IN-STATE TUITION AWARDS =

**\$4,000
PER YEAR
IN SAVINGS**



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Children of Alumni

For qualifying students with at least one parent or legal guardian who graduated from South Dakota Mines

South Dakota Advantage

New freshmen and new transfers from North Dakota, Iowa, Nebraska, Wyoming, Montana, and Colorado pay in-state tuition

Minnesota Reciprocity

Minnesota students receive in-state rates