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About the Cover
Wade Hatch (EE 00) is helping convert the islands of American Samoa from diesel generators to solar power. (More on page 22)
Dear Alumni and Friends,

I am enjoying the opportunity to serve as President of the SD Mines Alumni Association and honored to represent SD Mines and all the successful graduates of the university.

The Alumni Association has been working hard on its strategic plan—one that incorporates past work, learnings from other universities, how we can help meet the university’s goals, and feedback from you. A survey shows many of you look to the Alumni Association to stay informed and connected with students, the university, and each other.

A lot has happened in a little over a year. The Alumni Association has:

- Hired a new Executive Director—Dr. Larry Simonson
- Hired a new Executive Assistant—Sarah Von Eye
- Moved to a new office location—lower level of Foundation building
- Conducted an alumni survey and a student survey to get valuable feedback
- Developed a strategic plan based on alumni feedback and commissioned committees focused on engaging and supporting students, alumni, and SD Mines
- Integrated our strategic plan with the Foundation
- Updated our Constitution & By-Laws

But there is still more work to do! We are in the process of working on:

- Engaging and supporting students through
  - Setting up social and technical interactions with alumni on campus
  - Setting up student-alumni social events at student competitions
  - Supporting departments in alumni volunteer activities
  - Helping students transition from campus to their new job location
- Engaging alumni through
  - Establishing Area Chapters and organizing regional events
  - Providing recognition and professional development to our alumni
- Providing communication to our stakeholders through
  - Improving E-News and Hardrock Magazine
  - Posting on social media (Facebook, Twitter, LinkedIn)
  - Updating our website

We have a great staff, an engaged board, and proud and active alumni. We ask that you make sure you are part of the fun—support the school, join events and activities, and if you have a talent, let’s be tapping into it to support our alumni and our students. Let’s keep the momentum going!

Go Hardrockers!

Karen (Nelson) Swindler (ChE 88)
2017 President
SD Mines Alumni Association
SD Mines officials formally kick off the establishment of the Center of Excellence in Advanced Manufacturing and Production (CAMP). A press release issued at the kick-off reads “CAMP will integrate students, faculty, and industry partners into a Center whose purpose will be to develop a unique approach to manufacturing education that simultaneously addresses explicit needs of industry.” Twenty years later CAMP is all this and much more, see page 12 for an article on CAMP.

130 years ago
1887
On Wednesday, February 16, 1887, the Dakota School of Mines held opening ceremonies for the new school. The crowd overflowed the school’s one building with a celebration of speeches, song, and prayer. Students were told to report on Monday, February 21; eighteen showed up, thirty more submitted applications. Classes began on February 24, with four instructors.

100 years ago
1917
SD National Guard troops, including thirty-two Mines students and alumni return from active duty on the Mexican border. Following attacks by Mexican guerrilla Pancho Villa on US properties in 1916, the National Guard was activated to protect the border. South Dakota Governor Byrne mobilized state troops who spent 6 weeks of training in Aberdeen before traveling to the US/Mexican border. Troops established a permanent camp near San Benito, Texas, complete with mess halls and tents with stoves and cots. They returned home in the Spring of 1917.

60 years ago
1957
A formal dedication ceremony was held on April 25, 1957, for the new Chemistry/Chemical Engineering Building. The dedication coincided with the annual South Dakota Academy of Sciences meeting that was held on campus. Dr. Thomas Chilton of E.I. DuPont delivered the keynote address. When first opened, the biology department occupied the third floor, chemical engineering was located in one wing, and chemistry was housed in the remainder of the building. Sixty years and ten days later a ribbon-cutting on the renovated CBEC building included Governor Dennis Daugaard and Mines President Heather Wilson.

20 years ago
1997
SD Mines officials formally kick off the establishment of the Center of Excellence in Advanced Manufacturing and Production (CAMP). A press release issued at the kick-off reads “CAMP will integrate students, faculty, and industry partners into a Center whose purpose will be to develop a unique approach to manufacturing education that simultaneously addresses explicit needs of industry.” Twenty years later CAMP is all this and much more, see page 12 for an article on CAMP.
Dear Hardrocker Friends,

This spring I became the interim president at SD Mines. As some of you may remember, I spent many years as a professor in the chemical engineering department. I’m happy to take on this short-term role as president while maintaining my current position as vice president of research.

My goal is to make the transition as smooth as possible and most importantly to continue to support student success, retention, and recruitment and to make sure faculty and staff have the resources they need to continue the excellent work this university is known for.

Mines faculty, students, and alumni are involved in a wide range of research and engineering projects that are changing the world. This issue of the Hardrock highlights a few examples among many: Lori Groven’s work on new tools to combat biological weapons, Robert Anderson’s work with a new microscope that produces real-time 3D images from inside a living cell, and the effort of Mines alumnus Wade Hatch to help bring solar power to a remote chain of Pacific islands.

This year Mines also celebrates the 20th anniversary of the Center of Excellence for Advanced Manufacturing and Production (CAMP). Over the last two decades, CAMP has given hundreds of Mines students the kind of a hands-on engineering experience that employers seek.

I will be president only for a little while, but during the coming months I will strive to continue the excellent work and programs started by past president Heather Wilson and to pave the way for new leadership at this university.

Warm Regards,

Jan Puszynski, PhD
Interim President
South Dakota School of Mines & Technology
Where is the boundary in the petroleum industry between being responsible to shareholders and respectful to the environment? Are these two things mutually exclusive?

This is a question on the minds of many people on both sides of the issue. The short answer is yes, it is possible to extract oil and gas resources in an environmentally responsible manner, while remaining profitable to shareholders. It requires commitment by the operators to do this, however, and not all of them are on board.

Still, from a strictly economic standpoint, there are two reasons for producers to exercise environmental responsibility.

The first is that spills, leaks, and other contamination cost money to remediate. The last thing a drilling company wants to spend money on is groundwater cleanup or remediating a spill in a stream, but if they get cited for an environmental violation, they have no choice.

The second reason for environmental responsibility is known as a “social license” to operate. There are East Coast states, notably New York and Maryland, where horizontal drilling and hydraulic fracturing to produce shale gas have been banned because the populations were so afraid of “fracking” that they would not allow the industry into the state. This has caught the attention of many operators nationwide. Any environmental incident related to oil and gas wells gets major coverage in the media, and generally reflects badly on the entire industry. The social license issue is becoming more clearly recognized by industry.

If you want to read more on these issues, see Daniel Soeder’s book on this topic: *The Development of Natural Gas from the Marcellus Shale*, Geological Society of America Books.
On the afternoon of May 8, 2017, Heather Wilson left her office in the O’Harra Building for the last time as SD Mines President. Earlier in the day she stood at her desk tallying the votes as the United States Senate confirmed her appointment as the next Secretary of the Air Force. She was openly pleased at the confirmation, but admits this was not a job she sought.

Wilson was first asked to consider the post in January in a phone call from the United States Secretary of Defense, General James Mattis. “I said ‘Sir, you do realize that being a university president is the best job in America, right?’” she later noted. But with a little persuading, Wilson agreed to accept the nomination.

“I live in the shadow of Mount Rushmore, in a state known for humble service and hard work. Like thousands of alumni from this school, I have been called to service. And so, as my family has done for three generations, I must go,” she wrote.

Wilson left Mines in a better place than she found it. The improvements during her tenure included construction of new student housing, like Rocker Square, improvements to the King Center, the renovation of the Chemical & Biological Engineering/Chemistry Building, and the groundbreaking upgrades to O’Harra Stadium.

While the infrastructure improvements on campus are achievements worthy of praise, the impact Wilson made on students is arguably more important. “During President Wilson’s time here, she was much more than just a president to us as students,” said Aaron Campbell, president of the Student Senate at Mines. “She was a role model, a friend to us all, and, above all, an inspiration. She truly was a member of the Hardrocker family. We are thankful for the time she dedicated to us, and look forward to watching her serve our country,” he says.

When Wilson arrived at Mines, the students gave her a freshman beanie, which she wore with pride during her initial weeks in office. Four years later at a going-away event, students and faculty presented Wilson with a senior hat. “I have loved being the President of the School of Mines,” Wilson wrote. “There is a part of my heart that will always be here, in the Black Hills, with the engineering and science students who have brought me such joy and satisfaction over the past four years.”

Wilson is now responsible for organizing, training, and equipping the US Air Force of over 600,000 active, guard, reserve, and civilian airmen as well as managing its $124 billion budget.
KILLING ANTHRAX
In the weeks following the September 11th attacks, a series of letters containing anthrax spores arrived at media outlets and the offices of US Senators Tom Daschle and Patrick Leahy. The acts of bioterrorism gripped the nation in confusion, anger, and fear. Scores were hospitalized and five people died. It was a senseless tragedy. But, it could have been much worse.

“Ten grams of anthrax spores could wipe out all of Washington, DC, and the surrounding area,” says Lori Groven, (BS ChE, MS ChE, PhD Nanoscience and Nanoengineering). “Biological weapons are scary for everybody, because it takes so little to do so much damage,” she adds. “The minimum lethal dose for anthrax is estimated to be 5-10,000 spores, and 1 gram of anthrax contains well over a trillion spores.

Groven is a research scientist and assistant professor in the chemical and biological engineering department at Mines. She and her team are part way through a five-year half-million-dollar grant from the Defense Threat Reduction Agency. The research has led to new materials and methods for combating bioterrorism.

One challenge Groven and her team have faced is the instability of the chemicals currently used to neutralize biological weapons. These compounds, or biocides, are made up mostly of a fuel and oxidizer (iodate) powder. They have a very short shelf life. “This stuff doesn’t age very well,” says Groven. “If you put it out on the counter, it literally melts into a puddle.”

To overcome this problem, Groven has found a novel approach that utilizes 3D printing. Her team is embedding the normally unstable iodates into a mix of metal powder and melted plastics. The mixture protects the iodates and keeps it from degrading. The material can be formed into a long thread or rope and spooled. The resulting biocidal filament can then be run into a 3D printer and layered into any shape needed.

“It’s a game changer, no one is doing this in the research community,” she says. “We can now take a spool of this biocide, it’s stable and protected, and print anything we want.”

The 3D-printed biocide is flammable, and when it burns it gives off a gaseous form of iodine that can potentially neutralize a biological agent such as anthrax. Because it can be manufactured in any form, the biocidal material can be made to fit inside munitions, like bunker busting bombs, that are used to penetrate and destroy stashes of biological weapons stored deep underground.

Groven says the material may also be useful in combating an act of bioterrorism. Take for example, an anthrax attack on a subway. One possible scenario Groven’s team envisions is a 3D-printed drone, made from biocidal material, that is flown into a subway car and ignited. The resulting cloud of iodine gas would neutralize the anthrax and make the area safe.

The team is still in the testing phase and several questions remain unanswered, including the amount of printed biocide needed to neutralize a given amount of anthrax and the right mixtures needed to ensure proper rates of combustion. So far, the results are very promising.

In her lab on a warm spring afternoon, Fidel Ruz-Nuglo, PhD candidate, and Nicholas Ritchie, a sophomore in industrial engineering and an expert on 3D printing, ignite a small strand of biocidal filament inside a ventilation hood. There is a pop and a quick flash of light followed by a small purple cloud of smoke.

“That’s the iodine,” Groven says.

Groven and her team have published several papers on this work. But she says documenting this research is just the first step; more challenges are ahead. “It’s very difficult to turn something you develop with your students in a laboratory into a product that is actually manufactured and used.” For Groven, success in the lab isn’t enough. There is too much at stake when it comes to a possible biological attack. She is now in the process of patenting this work though Mines’ Office of Research and Economic Development. “Let’s develop something that can actually be implemented and help keep the public safe,” she says.
MAMMOTHs
UNDER LA
Under Los Angeles’ streets, the clinks and clangs of construction meld with the rumblings of the subway line—an echo of rumblings tens of thousands of years old. Back then, LA teemed with life of a different sort. Saber-tooth cats, ancient camels, and mastodons roamed, many meeting their fate in the sticky pools of the La Brea Tar Pits or dying of natural causes, remaining undisturbed beneath the shimmer of LA. That is until paleontologist Ashley Leger (PhD Geol GeolE 16) got a call from a colleague working on the Purple Subway Line.

A skull had been discovered.

Fresh from her PhD at Mines and now serving as the lead paleontologist for the Purple Line Extension, Leger took one look and knew it likely belonged to a young and/or female mastodon or mammoth, the Ice Age’s ancestral relative of the elephant. From there, the fossils poured forth. A mastodon tusk. Tooth fragments. Thigh bones. And an extremely rare forearm from a now-extinct camel. While LA is fertile ground for fossils, boasting thousands of dire wolves and saber-tooth cats, Leger says only about forty camels, or *Camelops hesternus*, have ever been unearthed from the tar pits.

The fact that anything was unearthed still astounds Leger. “Paleontologists estimate less than 1 percent of life on earth fossilizes.” A staggering amount of that fossilized life is found in LA. This area, anchored by the LA County Museum of Art, has one of the largest collection of Ice Age fossils in the world.

As paleontological field director and assistant safety director for Cogstone Resource Management, Leger leads the excavation of specimens and helps with identification, extraction, transport, and preparation before delivering them to the museum for permanent display.

Before LA, Leger spent ten years at South Dakota’s Mammoth Site while pursuing her PhD, learning about these animals, their size, their interactions, when and where they lived—stories that could only be told by their bones.

“The proboscideans, [which includes elephants, mammoths, and mastodons], have captivated me since I was seven years old, and to find proboscidean bones as our very first fossil specimens on the job was unreal. I couldn’t have imagined a better first discovery.”

For Leger, preserving LA’s prehistoric past goes hand-in-hand with building its future.

“I’ve been told I’m the closest thing to a time-machine people have encountered. But paleontology is also the closest thing to a crystal ball. Everything we can learn about extinctions, environmental factors, and climate change can help us look into the future of what is to come.”
BRIDGING THE BRAIN DIVIDE
CAMP’S mission to create a whole new engineer
Sitting adjacent to the CAMP lab, the team leaders talk in hushed tones. School has just begun, and the group hasn’t yet developed the easy jocularity of close friends. CAMP Associate Director Kim Osberg breaks the ice. She asks them to stand and share three things: their name, where they grew up, and the most difficult childhood challenge they overcame.

Stillness. A few uncomfortably shift their weight. Then a young woman punctuates the silence.

“Mental illness. I have depression, and I’m bipolar. It was hard to explain, to people in high school,” a pause, “to my friends.” The answers tumble out. A young man watched his mother battle cancer, helping raise his younger brother as his father was consumed by her care. Another feared never living up to his father’s legacy.


Now in its twentieth year, CAMP, or the Center for Advanced Manufacturing & Production, is a place where more than Formula cars are built, where more than tensile strength is tested. Here, values are welded into character, grit sharpened by experience, and from the rough sketches of adolescence, an adult emerges.

This is CAMP’s transformative power.

CAMP Director Dan Dolan knows that journey firsthand. As a college senior, he rebuilt his ’62 Chevy engine from scratch, for drag racing. The feat earned him a spot in General Motors $1 million test cell. But the cutthroat culture soon began to tarnish his dream career.

“Within a year, I left” to pursue an engineering doctorate and to “hang out with a different type of people, musicians, psychologists, and sociologists,” before coming to teach at Mines.

He launched CAMP in 1996, and four years later the teams were gaining traction. Yet something was still missing—the same absence that moved him to leave GM.

“We knew we were missing something. We knew it involved people. By the end of 2001, we knew what it was.” Just like at GM, technical proficiency wasn’t enough. Values—responsibility, respect, empathy, and understanding—had to be woven into teams for them to thrive. “We consciously began with behaviors and grew them into values over the next few years.”

The move changed CAMP’s trajectory.

In 2005, Aero Design took first nationally, a win it repeated the next year. In 2006, the Unmanned Aerial Vehicle team was the highest-scoring in the International Aerial Robotics Competition, and the Baja, Formula, and Steel Bridge teams all headed to nationals. “Everything turned around.”

And not just for the students. Under Dolan’s guidance, the new Unmanned Aerial Vehicle team served in a competition and research role, garnering $1 million and a partnership with the Army Research Laboratory and the Defense Advanced Research Projects Agency (DARPA), which had developed a radar system for soldiers to detect movement inside buildings. Dolan and his team would develop the first technology that allowed the sensor to work attached to a moving drone.

Osberg arrived in 2008, a sociologist hired expressly to help shape this new whole engineer. “I know I’m different, and that’s why I’m here.” She teaches students to understand their values and strengths, and those of their team. She helps them question things and embrace failure, place themselves in others’ shoes, and seek a worthwhile calling not simply a lucrative career.

As it turns out, those skills are exactly what industry demands. Dolan has visited companies from Graco to Caterpillar, asking “What do you look for in a young engineer?” Everything circled back to two things: hands-on experience (or design for the real world) and communication without ego.

CAMP’s integrated manufacturing specialist and Mines PhD candidate, Ryan Koontz, would pick up that thread. Built on fifteen years working with students in the machine shop, his dissertation looks for correlations between emotional intelligence and how students tackle design. Students who score high on interpersonal relationships spend more time brainstorming, while those with high emotional expression spend more time modeling. Those with high emotional self-awareness transition frequently during a design problem—from brainstorming to modeling to testing and back. Notably, expert engineers do the same.

“It can show students how they might attack a design problem knowing where they are on the emotional intelligence scale.” It moves them from a cerebral understanding of the end user to designing with empathy for their context in the world.

CAMP’s two-decade evolution has molded engineers who’ve made that world brighter, and those shaped by its next twenty-year arc will make it even better still.
While her peers back home at the School of Mines were suffering double-digit negative temperatures and ankle-deep snow, Kailey Anderson (ABS 17) was in short sleeves trekking through the jungle of the Western Ghats mountain range in India on the lookout for venomous snakes, notoriously aggressive sloth bears, and scary carnivorous predators.

Anderson traveled to India on the Primates & Predators scholarship during her winter break to study species not found in North America. The scholarship was provided by Field Projects International, a nonprofit organization focused on wildlife research and tropical biology training in the jungles of Peru and India.

Anderson joined other students from the US, Mexico, and India to do field research on the local wildlife. Participants spent the winter break collecting data in the field, including setting up hair snare traps and camera traps. They learned forest navigation, plant identification, biodiversity monitoring, tree climbing with the proper equipment, animal tracking, and much more.

“The trip was a big influence in solidifying my decision to stick with wildlife research for the future,” she said.

The team didn’t just work in the daytime, they also conducted research at night. Anderson says to observe nocturnal animals, the group would take strenuous night hikes, occasionally encountering frightening wildlife.

“On one night hike, we were walking down a hill with a tree near our path. Everyone kept putting their hands on it. Then, one girl looked and there was a Malabar pit viper on the tree! They are extremely venomous. So, there were a lot of interesting moments.”

Despite this, she wasn’t too scared to walk around at night.

“Just don’t touch the trees,” she joked.

Anderson graduated in May with a bachelor’s in applied biological sciences. She intends to pursue a master’s degree in wildlife research.
Cows, as many people know, have four stomachs. Cows also generate lots of methane. So, if your goal is to describe a machine that turns food waste and cardboard into methane gas, the bovine digestive system is an analogy that makes some sense.

“Our reactor is some ways a two-stomach cow,” says Jorge Gonzalez Estrella, PhD, a post-doctoral research associate in the chemical and biological engineering department at Mines. Gonzalez Estrella is one of the researchers working on the Gas Cube project. The portable reactor fits inside a shipping container. It’s one of the projects in development at Mines aimed at turning a variety of waste into energy thanks to a $4.8 million grant from the United States Air Force. The Air Force seeks to save waste handling and fuel costs at mission-based remote bases. This is a challenge that the Gas Cube is designed to overcome.

How does it work? Back to the cow analogy. At the Gas Cube’s input, or mouth, a shredder grinds up the solid cardboard or food waste and deposits it in chamber number one. This is sort of like a cow chewing and swallowing its food. Then in that first chamber, or stomach number one, hydrolytic microorganisms break down the mix of food waste and cardboard into sugars, and fermenting microbes then break up those sugars into smaller parts called volatile fatty acids. Next in a vertical chamber, or second stomach, a set of methanogens turn the fatty acids into methane gas. Then in a separate chamber, any leftover solids are given more time to react and give off any remaining methane. The gas is piped out to run generators or other equipment needed to power the base.

Two challenges on this project are making the reactor portable and user-friendly. Jim Schultze (ChE 81) is helping construct the gas cube. “Usually these things take up acres if they’re industrial, we put it in a twenty-by-eight-foot space,” he says. The Gas Cube can be carried on a truck bed, and multiple units can be added together as an operation grows. “It’s going to be transported to remote places, and it needs to be easy to run for the operator,” says Gonzalez Estrella.

Like many technologies initially developed for the military, this project may have wider applications. The Gas Cube could be used in disaster areas when waste-handling infrastructure is down. The reactor could also be used to process agricultural waste or waste from microbreweries.

Testing on the working prototype is now underway.
For most of human history, the existence of living cells was a complete mystery. Anton van Leeuwenhoek is credited with being the first person to view single-celled organisms. In 1674, he peered through a handmade microscope and described the algae Spirogyra. The subsequent publication of his work helped form the foundation of microbiology.

The science continued to advance alongside the microscope, but for hundreds of years much of the inner-workings of living cells have remained elusive and unknown. Cells exist in three dimensions, microscopes only produce images in two.

Today, that’s changing thanks to new techniques in optical microscopy, such as the 2014 invention of Lattice Light-Sheet Microscope (LLSM) by Nobel Laureate Eric Betzig, PhD. This breakthrough technique provides high-speed real-time 3D moving images from inside living cells without damaging them. This tool has the potential to push the boundaries of cellular biology and advance breakthroughs in medical science and biotechnology. The LLSM allows researchers to view cellular processes in a way they could not before.

Currently there are only a handful of these microscopes in the world, and one of them is at SD Mines.

“SD Mines is very proud of the many successes of our faculty and students who are working on the frontiers of science and engineering,” says SD Mines Interim President Jan Puszynski.

The LLSM uses a rapid succession of lasers formed into a 2D plane to excite various fluorescent proteins that are infused into the cells. The microscope captures images plane by plane, and then a computer stacks those images to build a three-dimensional picture.

“The Lattice Light-Sheet Microscope constructed at Mines with the help of Dr. Betzig will provide unique capabilities for researching cellular dynamics and biophysics,” says Robert Anderson, PhD.

Anderson, a professor in the nanoscience and nanoengineering graduate program, helped solicit a $300,000 development grant from the National Science Foundation to create new computer hardware and software so the moving images generated by this powerful tool can be properly studied. The effort includes a new web portal so scientists in different parts of the world can use the internet to share images.

“This grant will aid us in making the best possible use of the microscope with the broadest possible impact for researchers throughout the region,” says Anderson.

One challenge is the huge amounts of data generated by the LLSM push the limits of modern computer hardware. For example, a single smartphone photo averages about one megabyte in size; the Lattice Light-Sheet Microscope produces enough data to equal about 500 smartphone photos every second.

Processing this imagery requires the expertise of fellow researcher John Weiss, PhD, a computer science professor in the Department of Mathematics and Computer Science. Weiss is an expert in the use of computer graphic cards. “Modern graphic cards are like little computer subsystems, with hundreds of graphics processing units (GPUs) that can be harnessed to perform massively parallel computational tasks in far less time than a single CPU. We call this approach GPGPU: General Purpose Computing on Graphics Processing Units,” says Weiss. With specialized hardware, the graphic cards can be stacked together, in a similar way that multiple computers can be networked to form a supercomputer, and used to process large amounts of data.

“The field has just exploded in the use of these cards to process images, including the medical imaging field,” says Weiss.

The NSF grant not only includes the Mines team but also researchers from the University of South Dakota and South Dakota State University. These institutions are working together through the statewide BioSystems Networks & Translational Research Center.

The team’s work on this three-year project is already underway. Researchers are taking imagery and working to program software and build hardware.
For three days, giant digital clocks in the Rushmore Plaza Civic Center Ice Arena ticked down. At 9 a.m. on May 24, 2017, the countdown turned positive. For the next five hours, the world watched as more than 130 teams of computer programmers tried to solve twelve problems. The 41st annual International Computer Programming Contest (ICPC) was underway. Mines “Red Team” members, Matthew Dyke, Alexander Iverson, and Matthew Schallenkamp needed to quickly decide which problem to tackle first. “We chose the one that looked least impossible,” Iverson says with a laugh.

Dyke describes the initial premise of the problem. “A lady named Sheila had an old car, and the speedometer needle fell off. She glued it back on in the wrong position.” The team would spend part of the next hour working on the remainder of the problem. (More on this story later in the article.)

How Mines Got Here

The ICPC includes about 300,000 students from across six continents who compete for spots on 2,736 university teams that progress through regional competitions. In the end, 133 teams from 70 countries earned the right to attend the international competition this year in Rapid City.

Just getting into the world finals is hard enough. Every Saturday at 10 a.m., a McLaury Building classroom fills with students. They break into small groups and spend the day drilling practice problems. Thanks to the internet, Mines can take on other teams around the country on the same problem sets. The 2017 Mines “Red Team” members including Iverson, Schallenkamp and Dyke were competitively selected before the regional contest. The trio went on to become the seventh Mines team to qualify for worlds.

“I’m very proud of my team. They’ve put in a lot of effort and they definitely deserved their spot in this competition” says coach Larry Pyeatt, PhD, professor of computer science at Mines and a former third place ICPC world championship finisher.
ICPC Chooses Rapid City

The list of cities to host the ICPC World Finals over the last fifteen years includes Shanghai, Stockholm, Tokyo, Saint Petersburg, and Marrakesh.

Thanks largely to Toni Logar (CSC 85) and Ed Corwin, Rapid City is now on this list. “The people of Rapid City helped tip the scale,” says Logar.

The husband and wife pair of Mines computer science PhDs have helped bring all seven Mines teams to the world finals, an impressive feat for a small school like Mines.

Shelia’s Road Trip

Back on the contest floor the clock nears the five-minute mark. The Mines team is working the problem of Shelia and her broken speedometer with the needle glued in the wrong place.

Here is some of the wording:

When the speedometer reads $s$, her true speed is $s + c$, where $c$ is an unknown constant (possibly negative).

Shelia made a careful record of a recent journey and wants to use this to compute $c$. The journey consisted of $n$ segments. In the $i$th segment she traveled a distance of $d_i$ and the speedometer read $s_i$ for the entire segment. This whole journey took time $t$. Help Shelia by computing $c$.

“We had to work backward to figure out the time of the individual speed segments using some average speed calculations and then do a search to figure out the exact offset,” says Iverson.

Mines Red Team gets the solution part way through the first hour. “It was insane how difficult these problems were,” says Iverson.

Global Competition

In the early years, the United States dominated the ICPC. But in the last two decades, the rest of the world has come on strong. The USA has not won an ICPC World Championship since 1997. In 2017 the US didn’t even make the top ten.

The Russians have won the ICPC for the last six years straight. In Russia, computer programming is taught in grade school. In the US most students don’t code until college. For Richard Gowen, former SD Mines president and current president of the group Excellence in Computer Programming, the ICPC shows that the US needs to up its game. “It’s like any Olympic athlete, to be the best in the world you need to start when you’re young.”

Students at Mines are no less brilliant than others around the world. They just haven’t had the same training. “I’m in awe of students like Matt Dyke,” says Toni Logar. “The thing that is astounding about him is that he had not programmed before he got to college, and he made up for the lack of background. In just three short years, he was one of the best in the world. Just imagine who he would be if we had a system of education in this country where he had started programming in grade school,” Logar says.

Dyke graduated in May of 2017 and is now an employee at Microsoft. His teammates Iverson and Schallenkamp will be back next year to try again.

If Mines qualifies for the 2018 world finals, the team will travel to the contest at Peking University in Beijing, China.
Ring in your sweet 16 with a driver’s license? Not Adrian. He spends the day nailing his first solo flight. In a blizzard.

Selected as a Davis-Bahcall Scholar, Adrian visits Sanford Underground Lab in SD, Fermi and Argonne National Labs in IL, and Gran Sasso and Frascati National Labs in Italy—one-upping your “How I Spent My Summer Vacation” essay.

Adrian lands a programming internship at Innovative Systems. Just your typical high school summer job.

Needing cross-country solo experience to get his pilot’s license, Adrian flies to SD Mines for an open house. After talking with computer engineering faculty and seeing the hands-on robotics lab, he knew—“That’s what I wanted to do.”

Adrian dives in day one with professor Charles Tolle, PhD, and Conrad Farnsworth, on control systems for the Office of Naval Research. “Everyone told me you can get involved as a freshman, and that’s really accurate,” he casually explains.

Landing an internship at startup Dataware, he begins work on infrastructure for a new data center. “They said here are the keys to the kingdom. Go have fun. And that was the most enjoyable internship I ever had.”

Dataware gets acquired by Midco. He still lands an internship, with even greater latitude. “I had even more autonomy! I was making changes to their production environment the second day.”

Oh, and his senior year? Bankrolled by NASA. Earning a $200,000 NASA grant, alongside students Conrad Farnsworth and Joree Sandin, Adrian takes team lead, developing a multispectral camera to take pictures of land and characterize crop health trends. They’re now working with Raven Industries to put the device on a balloon.

Adrian accepts a job at Omnitech for software and network infrastructure. “South Dakota’s been really good to me. I was a legislative page, served on the school board, got a full-ride scholarship, and had a lot of opportunities at Mines. Why would I want to go anywhere else?”

“My dream job? Managing infrastructure or data centers for IBM or Argonne National Lab. They have a huge building full of supercomputers. That’s the coolest thing I’ve ever seen.”
"My family would have bets on how long before I took my toys apart. So that was early Conrad."

As a high school senior, Conrad successfully builds a nuclear fusion reactor, in his parents’ garage, for a science fair.

"Electrical engineering offered me lab space for my reactor, and I was sold on Mines. I picked electrical engineering because it was the only thing I couldn’t teach myself. The wizardry! Now I feel like a very low-level wizard."

Conrad co-founds a startup developing portable nuclear molten salt reactors for emergency power after disasters—and wins the SD Governor’s Student Business Plan Competition.

Two weeks into his Los Alamos Lab internship, Conrad is offered a job, a feat made more impressive by his unusual training regime. "I’d run on the property and armored vehicles would stop me to see my badge. That all ended after bears got in and rummaged through the trash. So I started going to the fitness center."

An explosion shakes Newcastle, WY. Conrad takes out a newspaper ad. "I would like to apologize for the scare as a result of my non-nuclear scientific testing. It was not my intent to convince Newcastle that WW3 was happening—"

Current projects? The NASA grant, plasma for the reactor and soon fusion. I made a rifle mount to track the rounds left in a magazine. I’m building the world’s smallest FM transmitter and a cost-effective radiation detector that identifies specific elements." No big deal.

He joins the world’s explosives experts at Los Alamos. And he hits the ground running (figuratively this time), building a wirelessly triggered pressure sensor to collect explosion data before school ends.

At Los Alamos, he’ll design experiments to verify, say, North Korea’s nuclear testing. Because who doesn’t love the smell of fresh coffee and fraught geopolitics in the morning?

“I believe nuclear energy is the future. My dream job? I’m more interested in seeing a nuclear reactor in every city.”
Wade Hatch (EE 00) has a better commute than you. His drive to work hugs the coastline of Tutuila Island in American Samoa, and is often completed on a 1969 Honda CB 350. The motorbike purrs along, the island breeze ripples his cotton shirt, the tropical sun shines down and warms the pavement—and thanks in part to Hatch, that same tropical sunlight is now helping power these islands.
Hatch is helping convert this chain of seven islands and atolls from the old system of diesel generators to solar power. He moved to American Samoa in June of 2015. These tiny islands in the South Pacific are among the most isolated places on earth. Maintaining a power grid in any rural area comes with challenges. Hatch says these challenges are compounded on a remote island.

“We have huge fuel costs,” he says. Shipping the barrels of fuel to run the generators can be a challenge. “On an isolated island chain there are any number of reasons why you can’t get fuel—the weather is too bad, or the boat is broken. At times we’ve run out of fuel and had to go dark on some of the islands,” he says.

Today on Tau Island the diesel generator sits idle. Tau, the second largest in American Samoa, is 100 percent solar. Blocks of solar panels that charge a bank of Tesla batteries provided by the company SolarCity can last for three days without sun before the diesel backup kicks in. “That has never happened,” says Hatch.

Hatch’s experience in South Dakota helped make this happen. Out of high school he joined the military and spent twelve years in active duty. After finishing at Mines, Hatch worked for three South Dakota energy companies, including Black Hills Power. He landed the job in American Samoa thanks to his range of experience and skills bringing power to rural areas.

“I’m a field engineer by nature as well as trade,” says Hatch. In a place like American Samoa, engineers need to be able to solve problems with limited resources. “Here you have to make back of the envelope decisions and have the comfort level to do that,” says Hatch.

The next challenge Hatch hopes to help tackle is the conversion of Tutuila Island, the largest in the chain, to renewable energy. The system on Tutuila is more complex. It includes a distributed power grid that combines solar farms, rooftop solar and wind power all into the same grid. This means multiple inputs to the grid each add varying amounts of power.

“The grid in inherently designed to be a one-way system, and now its evolving into a two-way system, says Hatch. “The more distributed your grid gets, the smarter it needs to be so it can handle all this without human interface,” he says.

The islands of the South Pacific enjoy ample sunlight, but they are also among the first places on earth to see the impact of rising seas and climate change. For Hatch the conversion to renewable energy is not only good for the environment, it’s the right thing economically. The solar power saves islanders the major annual costs incurred buying and transporting diesel fuel.

“This makes you feel good, any way you can think about it,” says Hatch.

Hatch is the only licensed professional engineer on the electrical team, but he stresses that he is just one of many on the project. He says locals are being trained on every aspect of the grid, so it can be run by members of this community well into the future. “It’s self-perpetuating that way, which is the part I feel best about,” says Hatch. American Samoa has a goal of being 100 percent renewable by 2040. Thanks to the support of the island community, this is a goal that remains well in sight.
BUILDING THE BACKBONE OF
THE BLACK HILLS TECH BOOM

From (L to R) Back Row: James Loverich, Colin King (EE 15), Bill Haag, Alesha Huppler, Bob Weidrick, Quintin Larson (ME 95), Jim Aldren (EE 70), Jay Pond, Nathan Stryle (ME 17), Kelsey Allen (ME 15) Front Row: Gene Ensor (ME 92), Jamie Hale (CEng 00), Will Dions Not Pictured: Brian Hemmelman (BS EE 92, MS EE 96 PhD ME 98) Bill Hitchcock, Tim Gack, Denny Henrickson
You know you’re in an engineering firm when a framed picture on the conference room wall features Mr. Spock, Captain Kirk, and the entire cast of Star Trek.

With the photo of the Enterprise crew over his shoulder, Jamie Hale (CEng 00), leans forward and says, “You can engineer from anywhere.” His successful business, in Rapid City, SD, proves this statement true.

Hale is the founder of DARCEO. He says the company will top $4 million in revenue this year. This small firm is a beehive of activity, with Hale at the center. His cell phone is never quiet for long. He paused for an interview between calls and emails to clients around the world. DARCEO started full operation in 2011 and now has sixteen employees, a majority of them are Mines graduates.

The engineering design and service company takes on a wide range of challenges from a project for General Electric designing and building sensors that monitor the health of locomotive parts to building a machine that spins nanofiber mats for a local tech start-up. The DARCEO team is a bit of an anomaly in Rapid City. Firms that help businesses meet their engineering, product development, and manufacturing needs are more often found in bigger metropolitan areas.

But Hale says limits to tech-sector growth in the Black Hills in past decades are withering away. This is not only due to the better internet connectivity and expanding infrastructure but also thanks to a new symbiosis between key players in the business community, local government, and SD Mines.

“This kind of cooperation and collaboration between these local players is something that didn’t exist in the Black Hills a decade ago,” Hale says.

He touts Mines’ emphasis on graduating engineers who are also innovators as one example of this positive change occurring in the area. Hale says young engineers who want to start their own businesses don’t just need the technical know-how, they also need the creative drive to continue capitalizing on new opportunities.

Hale also points to the Mines’ Entrepreneur-in-Residence program that uses a team of proven business experts who volunteer their time to help turn the ideas generated at Mines into successful start-ups. He cites the creation of Mines’ Office of Economic Development led by Joseph Wright as yet another example of how the university is turning research and ideas that come from the school into real jobs and new successful start-ups.

Wright agrees. “The relationship between Mines and DARCEO is the perfect example of a local company and university working together to create opportunities for highly skilled engineers to be educated in our community and then to find a job and stay in the community,” he says.

Two of those companies are Nanopareil and VRC Metal Systems. Both were recognized as being among the top 40 university start-ups in the nation in 2017.

Hale adds that new levels of cooperation between local tech-based businesses are also critical for tech growth in the Black Hills. He touts what he calls vertical partnerships, in which his company DARCEO works side by side with other local businesses to get a new start-up off the ground.

DARCEO provides the engineering and design support needed to successfully build manufacturing capacity, while other local businesses aid in the process. Black Hills Business Strategy offers the business plan and management support. Pixel Pines offers software, and Black Hills Information Security keeps private information from the wrong hands.

“There should be no fear in starting a tech business in the Black Hills today with all of the support available,” Hale says.

Hale says Mines acts as a reservoir of talent and innovation that local companies can continually source. DARCEO and this group of businesses are helping a handful of start-up companies launch. DARCEO maintains customer relationships with many tier one companies such as GE, Honeywell, and Eaton to keep large projects in place allowing the support of smaller companies.

After graduating from Mines in 2000, he spent years as the staff level engineering manager at Sanmina-SCI. When the company closed its plant in 2008 and laid off hundreds of employees, Hale saw what this loss meant to the community. He says this experience is part of his drive to see his business succeed today.

“My goal in founding this company was to create engineering jobs in Rapid City,” says Hale.

If the current positive economic and collaborative environment continues, Hale says this is a goal that will continue to bear fruit in the years to come. Not only in DARCEO but in many tech-sector companies in the Black Hills area.
In the summer of 2006, a high school student, Kevin Gray (MetE 11), did something that could have landed him in trouble. He toured the Mines campus with an eight-inch knife in his backpack. Gray had no malicious intent, rather he was excited to show the Damascus steel blade that he had forged in his garage to a professor of metallurgy. Little did Gray know that his actions would spark a series of events that would change the face of the Department of Materials and Metallurgical Engineering at Mines and earn the program international acclaim.

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At the end of the tour for prospective students, Jon Kellar PhD, (MetE 84), who was department head at the time, asked Gray why he was interested in Mines. “He pulled this knife wrapped in cloth out of his backpack,” says Kellar. Damascus steel blades have been around for centuries. They’re easy to identify by the swirled steel patterns that result from a labor-intensive process of repeatedly heating, hammering, and folding the steel. Kellar became intrigued. “We were low on student enrollment at the time,” he says, “We were trying to find a solution, and this seemed like a good way to reach.” Kellar and professors Dana Medlin, PhD, and Michael West, PhD, developed a plan to integrate more hands-on experiences into the curriculum. Students could make items out of metal, like Damascus steel blades, and study the scientific properties of the steel they were working along the way.

Later that year the department secured a $10,000 grant from the John Deere Foundation to fund a new blacksmith lab including a forge anvil and equipment. Faculty members then met with Jack Parks who runs Fire Steel Forge in Piedmont, SD. Parks, a master blacksmith, became instrumental in helping set up and sustain the Mines club. Students began to meet each Friday at “Hammer Ins.”

As the Blacksmith Club gained popularity, so did the materials and metallurgical engineering program. The club allows students to explore their creative side and to bring the art of blacksmithing and science of metallurgy together. Recognizing this potential Deborah Mitchell, curator of Mines' Apex Gallery, took note. Works created by Mines' Blacksmith Club are now part of an annual student exhibit.

The Secrets of the Samurai Sword

One evening in the fall of 2007, Kellar was surfing TV channels in his living room when the PBS NOVA program “The Secrets of the Samurai Sword” flashed across the screen. He noticed that his son was captivated by the show, and he had an idea. “We could do this at Mines.” The department then launched an ambitious project, to make a samurai sword out of Black Hills iron ore. The idea ran parallel to a $150,000 grant from the National Science Foundation to integrate blacksmithing into the program. The sword-making effort gained the attention of South Dakota Public Broadcasting and other news outlets. Media coverage of the project added
publicity that Kellar and West believe helped boost enrollment. That coverage also led Mines Alumnus Charles Parks (EE 57) to donate an authentic samurai sword to the department, which Kellar later had appraised on PBS Antiques Roadshow. Experts dated it to the 17th century. By 2008 the department was on the upswing in enrollment, and Nucor Steel, one of the top companies hiring Mines grads, donated $1 million to support department activities.

By 2010, Kevin Gray, the student bladesmith who helped to spark the changes in the department, encountered some hardships that forced him out of school when he was only a handful of credits away from graduating. Gray was disillusioned, and left Mines for lucrative employment in the coal mines of Wyoming. But, the professors in the metallurgy department would not give up on him. “We reached out to him,” says Kellar. Professors designed an independent study that allowed Gray to gain the credits he needed to graduate. “We put together a summer design project for him to understand the science associated with bladesmithing,” says West who is now department head. The result was an exquisite sword currently on display in the Surbeck Center. Gray labored for weeks on end on the assignment, not just in the blacksmith shop, but also in the lab documenting the scientific properties of the steel he was hammering and folding. “He went way, way beyond what was needed for this project,” says West. The hard work paid off, Gray went on to graduate in 2011 and was quickly hired by Nucor Steel.

All the while the Mines Blacksmith Club continued to grow. A collaborative effort of Mines professors and local officials helped bring the national meeting of the Artists Blacksmiths Association of North America (ABANA) to Rapid City in 2012. Michael West and Kevin Gray gave the keynote address. The following year West and others in the department approached The Minerals, Metals & Materials Society (TMS) about hosting an international collegiate bladesmithing contest. Other schools around the world were developing their own hands-on curriculum around bladesmithing and metallurgy, inspired in part by success demonstrated at SD Mines. By 2015 the first contest was held in Orlando, FL, drawing in 20 schools.

A Viking Victory

The TMS contest, envisioned in part by Mines faculty, has its roots in the idea that incorporating more hands-on work in the metallurgy curriculum at Mines would benefit students. Over a decade later, the biggest pay-off is more successful graduates, but these students are also leaving trophies in their wake. The “Viking Sword” Mines students took to the 2017 TMS competition brought home first place out of thirty teams. The thirty-four-inch, single-edged blade is based on the Arhus Farm sword from 10th century Norway. It has a handle of Finnish Masur birch. This award-winning sword is being put on display in a special case in the Mineral Industries Building.

“The best part about our education at SD Mines is the level of autonomy we get as undergraduates,” says Jackson Ade (MetE 17). “This autonomy allows us to pursue most projects we want to do, as long as we are willing to put the work in. This bladesmithing project is an example of that.”

Ade, and other senior members of the winning bladesmith team, Kevin Noto (MetE 17) and Luke Shearer (MetE 17) have now graduated. These recent graduates say they hope the sword they've left behind is an inspiration for future students; there is little doubt that it is. The current Blacksmith Club is concentrating local iron ore and working to have a samurai sword ready for the next TMS Bladesmithing competition.
SD Mines students, faculty, and alumni have a long history of stepping up when called to serve. This includes all branches of the military, government employment, and political office. We asked just a few to answer a simple question:

What does a life of public service mean to you, and why is it important?

Craig Tieszen (ChE 71) joined the Peace Corps after graduating Mines. In 1975 he returned to Rapid City and joined the police department. He became police chief in 2000. Tieszen has been a state legislator since 2008. “I consider public service to be both a tremendous honor and a huge responsibility. My service has been very rewarding, and I am grateful for the support my family and community have offered,” says Tieszen.

David Johnson (CSc 83) joined the military in 1986 and served for many years. In 2016 he became a South Dakota legislator. “The choice to serve in statewide politics was based on my belief that every citizen of a free society is obligated to keep a watchful eye on (if not actively participate in) their government—at all levels,” says Johnson.

Jerry Wright (BS CE 71, MS CE 74) spent years in military service and worked for Rapid City as an engineer and served on the city council. “Public service takes many shapes and sizes. It is important to follow our interests and talents as they will take us to a meaningful and successful life. I always had an interest in making this world a little bit better than it was when I came into it. My degrees from Mines helped me do this. I’ve thoroughly enjoyed my journey,” says Wright.

Colonel John Henderson (BS CE 94, ME CE 02) became the Commander of the Omaha District, US Army Corps of Engineers, in 2015. “Selfless service is one of the seven Army values. To me, this means serving our nation with integrity and humility, treating everyone with whom you serve with absolute dignity and respect, and exercising the highest levels of competence in order to earn the trust of others on our team. This culture of trust and respect in our units is the fundamental building block for strong teams who consistently accomplish our missions, win our wars, and therefore earn the enduring trust of our nation,” says Henderson.

Steve Pirner (CE 72) served in the military and joined the South Dakota Department of Environment and Natural Resources (DENR) in 1979 where he became secretary in 2000. “A life of public service in an agency such as the DENR means you have the opportunity to make a difference every day by protecting public health and the environment, maintaining a business-friendly climate, and treating everyone as your customer,” says Pirner.

Past Mines President Heather Wilson served the George H.W. Bush Administration during the Cold War and then spent ten years representing New Mexico in Congress. Today she is the US Secretary of the Air Force. “We all have gifts. Using those gifts in the service of something bigger than oneself is one of our obligations as citizens and human beings. That is why public service is important,” says Wilson.
South Dakota School of Mines and Technology
From Social Media: What is your favorite Mines tradition?

Erin E. Meyer (IS 03)– Whitewashing was always an enjoyable time, but I remember the Frosh/Senior walk from campus to the Hill as most memorable/educational.

Ray Hespen (MinE 09)– Whitewashing M Hill was always a great time. Sadly, TOTH (Tower On The Hill) was also one of my favorites.

Tony Oehlerking (EE 93)– Bombing freshmen with water balloons as they walk up M Hill. But I remember another one that stood for many years. Not sure it is still done. Please Dean Pete and Dr. Simonson forgive me, but it is painting an M on Dinosaur Hill. Quarts at the Hall will never be forgotten. Miss all my brothers and sisters.

Will Murray (EE 85)– Hall Inn

Greg Hintgen (EE 99)– Climbing M Hill during homecoming! It's great to see the newest faces at Mines as well as alumni who have come back to celebrate! It's a favorite tradition for sure!

Karen Swindler (ChE 88)– Branding your senior hat with your degree, putting it on and wearing it with pride!

Susan Ray (CE 16)– Has to be teaching the Big Wheel song to the frosh when you're a senior!

Ann Syverson Touhey (ChE 89)– Placing the names of all the graduates on a plaque on M Hill. So fun to see the names and recall friends from the past years later!

Martin Estes (CE 15) – Studying

Gary Hinkley (ChE 67)– M Hill!

Monte Besler (GeoE 79)– Clandestinely painting an M on the dinosaur each year.

Carl Crews (GeoE 85)– Homecoming, bonfire, M Hill, the Mudslide, the Spring Daze, and drinking beer out of cowboy boots at the Hall Inn. Bam!

Thad Thome (IS 00)– Grubby Days!

50 YEAR GRADUATES

The Hardrock
IN MEMORIUM

The names below include those who have passed in the last three years but who were not listed in a previous *Hardrock* issue.

Don Thorson (CE 44) 6/8/17
Jerome Stratman (ME 52) 1/23/2017
Jack Garhart (GeolE 53) 3/30/2017
Eugene Skinner (GeolE 53) 5/8/2017
Orville Dobson (ChE 54) 6/24/2015
Robert King (MS GeoE 54) 3/19/2014
Earl Hagen (ME 56) 3/12/2017
Harold Nuss (CE 56) 12/18/2016
Raman Briggs (ChE 57) 5/22/2016
Willard Potter (CE 57) 1/25/2017
Charles Elrod (ME 58) 8/11/2015
Reuben Rieger (EE 58) 11/28/2016
George Bjerke (MinE 59) 3/16/2017
Delmer Brown (GeolE 59) 12/12/2016
Jerome Popowski (EE 59) 5/24/2017
Don Schoessler (ChE 49) enjoys receiving and reading the Hardrock. “Articles from graduates prior to 1950 are becoming very rare. He would like to encourage the older alumni who are still surviving to provide updates. Don and his wife Oliva, are now located in Waverly Gardens senior living center in St. Paul, MN. “It provides a very comfortable living environment as we age out. Both of us are doing okay in spite of health problems. Best wishes to you.”

Don Peterson (ME 50) says he is in good health and has relocated to Collington, a retirement center about 30 minutes from DC. “Lots of activities!”

George Parson (CE 52) is just 1 year older. Now 90!

Raymond Clancy (EE 53) is impressed with the format and the newy Hardrock provided by the Alumni Association. He is now 91 years old. “My wife was diagnosed with dementia in 2012 and is now in hospice care extending beyond six months. We have been married for 69 years and our six children are still living.”

Stu Ulfers (EE 58) says they are enjoying retirement. “Our health is good, but are at the point where we need to limit travel. Enjoy learning about school activities. Our grandchildren are all grown up. We are really enjoying our four great granddaughters.”

Charles Speice (GeolE 57) had a nice visit with Brad Johnson (EE 92) in Branson. “Talked of Mines graduates of the past and others. We enjoyed the afternoon together.”

Bruce Johnsen (CE 59) says, “Work continues to be a fulfilling part of my life, with one vacation per month, small or large, on the calendar to look forward to. Good health is a great gift.”

Rick Maki (MetE 59) is enjoying Arizona retirement. He had a recent visit from his son Jon (MetE 82). Rick says, “It is getting easier to golf my age.”

Dave Uherka (Math 60) and his wife, Dorothy are still in good health and are active cross-country skiers in the Cedar City, Utah, area. They volunteer for the US National Forest and Cedar Breaks
National Monument, helping with Nordic Ski trails and with Cedar Breaks Winter Yurt. They live at 6000 feet elevation and usually ski at 9,500-10,500 feet.

Don VandenBerge (EE 60) is retired after 20 years and enjoying the easy living in Arkansas. “We’re usually planning some kind of camping trips. In 2016 we spent a total of 13 weeks away from home. God bless you all!”

Jon Spargur (ME 61) is now completing his first year in a new house in Carolina Arbors between Raleigh and Durham, NC. “Life is currently full of travel, fitness, clubs, volunteer activities, time with granddaughters, etc. I enjoy the articles on R&D and current activities of the ME department.”

Daniel Lee (CE 62) has been retired for several years from a career in aircraft/space stress analysis, primarily with Lockheed Martin but also with Boeing, McDonnell, Bell, and starting out at General Dynamics. “We were impressed by the quality of the work and presentation of the gang at the national concrete canoe competition in Tyler last year. They were continuously courteous to us and excellent representatives of SD Mines.”

Doug Aldrich (ChE 62) says, “We’re downsizing by year-end, like everyone else; professors are profiting from my donations to their departments (stuff I couldn’t unload to Salvation Army). We’re trying each year to visit someplace fun and enjoy the countries where I built labs in the past.”

Larry Ayres (CE 64) says he is now by default, retired! “Never thought this day would occur; I enjoy life far too much to become a fulltime coupon clipper and a soap opera fan. I got my last payment from the buyer of my company, so officially I have nothing to do but find more enjoyment. Travel is becoming our prime project.”

Mike Fischbach (ME 64) says, “The big news for 2016 is my marriage to Maureen on July 23! 92 friends and family from around the US celebrated with us at Masa and a dinner-dance reception that followed.”

Duane Malde (ME 65) is still living on the farm near Mt. Vernon with Mary. He has eight grandchildren to watch and keep track of. One grandson, Zib Parsons, plans to enroll at Mines in 2017.

Jerry Pekarek (ChE 66) enjoyed the 50 Year Reunion greatly. “Judy and I keep busy with volunteer work; park stewards for the neighborhood park, food bank, and removing hazardous and downed trees at picnic areas and trails in Sandia mountains.”

Larry Brusse (ME 66) said he “Enjoyed the 50th anniversary of graduation!”

Herb Reichert (Math 66) says, “My wife and I attended my class of ’66 reunion in Rapid City in early May of 2016. Both of us enjoyed the many activities that were planned. I was able to reconnect with several of my classmates and we appreciate all the hard work that went into this effort; this really is a very nice thing that is being done to honor 50-year graduates!”

Larry Rohl (EE 66) flew around the world in a single engine Bonanza on 55-day adventure (160 hours flying time) with a friend who wanted to be the first Chinese woman to fly around the world and land in China. “We did accomplish that. I will end my flying career in the next couple of years with 60 years as a pilot logging over 45,000 hours, all in private aircraft.”

John Synhorst (EE 68) says, “Last September, we spent time in Germany visiting family with a new niece. The family appears to be expanding with a second niece on the way. Also, visited Paris for a few days before taking a river cruise to the Normandy Coast. Seeing Omaha Beach where the D-Day landings took place was a very emotional time.”

Ralph Heinert (ME 67) retired from Forest Products Industry after many years. He has 6 grandchildren, with one in college so far. His son is serving a tour of duty in the Middle East. “Rita and I are enjoying leisure time, with the kids and grandkids. Fishing, hunting, outdoors, and gardening along with some travel.”

Bashir Master (ME 67) is currently involved with the design and support of equipment’s for the Solar Power Projects (CSP). Bashir’s wife Barbara, offers coaching for complimentary healing options through her practice as a ND (Naturopath Doctor). “Life is good, as we keep ourselves involved in improving lives arounds us!”

Duane Utech (CE 68) has just finished the last tasks in March to phase out his consulting business. “I am now joining the fully retired–some would say finally! Linda and I had a fantastic cruise in February along Chile, around Cape Horn, to the Falkland Islands, Uruguay, and ending in Buenos Aires. Those penguins really are a treat to watch.”

David Hammond (GeoE 69) is currently in his 5th and final term as commissioner on the Engineering Accreditation Commission of ABET. During the past two years he has chaired review teams to universities in Colombia, Spain and twice in Saudi Arabia. He continues grad level teaching relationships with the University of Arizona and the University of Colorado Denver, where he is involved with establishing the new J.P. Morgan Center for Commodities in the Business School. David was the recipient of the 2016 Mineral Economics Award from the American Institute of Mining, Metallurgical & Petroleum Engineers, presented at the SME Annual Conference in Phoenix.
Ron Albertson (Phys 69) retired in 2015 after 30 years as a flight department manager/chief pilot of Moyle Petroleum in Rapid City. After 15,000 flight hours, many months away from home and family and numerous business jet acquisitions he is looking forward to motorhome road miles with his wife.

Jeanette (Chem 69) and Richard (Chem 70) Salverson moved to CO to be closer to their grand kids; Nathan (9), Emily (7) Aaron (3) and their daughters Elizabeth and Maria.

1970’s

Dave Jackson (ME 70) says, “I still live in the Houston area, work 4 days a week and am moving toward retirement. I now have 10 grandchildren and we all live in the area.”

Carlos Calderon (MS MinE 71) is living in Arlington, TX, so that he and Sofia can help their youngest son finish university and graduate as an aerospace engineer. They will soon return to Honduras to develop housing opportunities and a pig farm there.

Ken Nelson (GeoE 71) had a good time last September in Deadwood for his 50th reunion of Bowman High School in Bowman, ND. “The First Gold did an awesome job for us. We did a bus tour of the hills which was a good time. I’m still in Belle Fourche if anyone can stop when passing through, that would be great!”

Keith (EE 71) and Cindy Bratberg celebrated their 50th wedding anniversary on April 14, 2017.

Dagfinn Pedersen (EE 72) is in the process of retiring and closing the company, or selling it, within a year or two. “Some of us from SD Mines, being there around 1969-73, got together on and off for a few years. Bjorn Solheim (EE 72) ended up with a summer house close to my home and he had a group (5-6 from 1970-72) that met regularly.”

Ted Iverson (ME 73) has finally completely retired. After his 1st retirement, he returned for three additional stints as a consultant. “The plant was closed and I took care of utility shutdown and dispersal of all ammonia, biomass and miscellaneous environmental items. Just golf and grandkids for the future.”

Bob Heier (ME 73) and Madonna are still living in Akaska, SD. “Where walleye fishing is great. We enjoy winters in New Orleans, LA. We always look forward to the 5-year reunions.”

Paul Ching (MS GeoE 73) says, “Bainbridge Energy Resources is a startup E & P oil and gas company. We initiated the company April 1, 2017. We are looking for oil & gas asset development opportunities for acquisition. If any Hardrockers are in the Dallas area, please give us a call.”

Clair Menning (CE 73) retired from paid employment at the end of 2013. “My wife and I have been operating Macario Advantage Foundation, a humanitarian non-profit organization we founded to support community development in eastern Caribbean islands. Recent work has been in the Commonwealth of Dominica (not be confused with the Dominican Republic).”

Mike Gowin (CE 74) retired last year after 35 years with McGhie & Bett, a consulting firm in Rochester, MN. “Looking forward to spending more time in the Black Hills with my sons, digging for gold.”

Robert “Bob” Ringgenberg (MetE 74) retired and is living near Nixa, MO. He is now spending time with his family, fly fishing and traveling.

In April 2016, Dennis Hargens (CE 74) retired last year after 35 years with McGhie & Bett, a consulting firm in Rochester, MN. “Looking forward to spending more time in the Black Hills with my sons, digging for gold.”

Doug Schultze (ChE 78) says, “Retirement has been very good. I spend my time doing some traveling and doing my best to stay healthy and physically fit. My two daughters have been busy building their families. I’ve attached a recent picture of the six grandkids that I get to enjoy. Each daughter has 3 so I am perfectly split with 3 boys and 3 girls between them!”

Glen Giacoletto (MS Chem 78) retired in February after a 32-year career at 3M in St. Paul, MN. “At the beginning of March, three other retirees and I flew to New Zealand on a bucket list trip to tour the country via bicycle for two months. New Zealand has a system of bicycle trails called Nga Haerenga, meaning ‘the
journals’ in the native Maori language. Our trip was quite the adventure!” In September, I attended my RC Stevens HS class (’71) reunion—45 years, I can hardly believe it.”

John Chandler (MinE 79) had an enjoyable lunch meeting with Ron Jeitz (CE 69) and Lanny (GenE 58) and Camille Outlaw recently. “It was great to catch up on events at Mines especially what is going on with the new petroleum systems minor. Let’s hope oil gets back above $60/barrel, and the jobs will follow!”

Elaine Cowley (GeoE 79) says, “After 37 years of working in the oil field with Texaco and then Chevron, I retired mid-2016. My husband Bobby and I are staying in Texas but moving to the hill country. We will be closer to our 5 grandchildren plus plan to do more travel and volunteer work. I am so appreciative of the education that I received from SD Mines that set me on this wonderful path.”

Linda Pirtle (ChE 79) has moved to a small acreage outside the city of Houston and is enjoying a slower pace of life. “We have a few cows, bees, and are working on gardens this summer.”

1980’s

Gaurdie Banister (MetE 80) has a home in Houston now but will also spend time in Los Angeles. His daughter is now working in DC after 3 ½ years in South Africa as a peace corps volunteer and his son is a graduate of American University.

In 2015, Brad Ross (MinE 80) retired from Rio Tinto, where he spent his last two years at the Bingham Canyon Mine near Salt Lake City. He was brought in to the mine to help prepare for and recover from the largest mining landslide in history, the massive Manefay slide in April 2013. Since “retiring”, Brad has written a book called Rise to the Occasion—Lessons from the Bingham Canyon Manefay Slide that is published by SME. He is a Professor of Practice and Assistant Director of the Lowell Institute of Mineral Resources at the University of Arizona in Tucson.

Jake Jacobson (ChE 81) retired from work. He is taking college level astronomy/cosmology to use his brain. He is also kind of starting up a local review group of people like himself who are interested in quantum mechanics. He is mostly enjoying family exposure (mom, grandkids, etc.).

Randy Henderson (ChE 82) says, “After 34 plus years with 3M, I was blessed to retire September 2016. Janice and I look forward to having time to pursue new interests and enjoy being snowbirds, escaping the MN winters! Retirement has been great!”

John Streyle (ME 82) says, “After 32 years at Leer Siegler, Smiths, and GE Aviation, I was laid off in March. Through connections to engineers I’d worked with previously at Smiths, I was recruited to an engineering position at a very small and specialized company called ‘Consolidated Resource Imaging’. The new opportunities are very interesting and challenging. Check out CRI.us.com for more details.”

Mike Jahraus (MetE 84) is working part time at the bike shop and enjoying the Colorado high country!

Barry Banks (ME 85) says, “After working many years for the US Navy as a Nuclear Engineer, Port Engineer and Project Manager, I retired in May. I am very thankful and proud to be an alum of SD Mines and now the, US Navy. Best wishes to all!”

In March, Jim Lane (ChE 87) joined Fuller Industries in Great Bend, Kansas as the Vice President of Engineering. “It’s a great company with a great future in custom brushes and industrial cleaning products.”

Lee Marske (MetE 89) is entering his 28th year with Eaton Corporation working in our Hydraulics Division in Eden Prairie, MN. “My wife, Brandy and I have 4 kids; 2 sets of twins. Dylan and Taylor (age 14) are finishing their sophomore year at Chanhassen High School. Andrew and Ella (age 11) are finishing 5th grade at Victoria Elementary. All the kids’ activities, baseball, basketball, soccer, and dance, keep us very busy year-round.”

Larry Kramer (MetE 88) would love to announce that their son Ander, St Michael – Albertville High School, Class of 2017 will be attending Mines this fall as a third-generation Kramer. He plans on studying chemical engineering. He follows his dad Larry and his grandfather David (MetE 66) to Mines.
Jon Hauger (ChE 89) worked in the chemical industry for Celanese for 10 years in Texas. In 2000, he switched career paths and opened a branch office for Edward Jones in Dakota Dunes, SD. He holds a certified financial planner (CFP) designation.

Todd May (ME 89) is really enjoying being back in Michigan after their almost three-year sojourn in Rapid City.

1990’s

Dennis Todey (MS Mtro 90) recently moved from South Dakota back to Ames, IA, to take a position with USDA doing climate and ag work. “It allows us to be closer to family. One son is now attending SD Mines.”

Joar Sande (EE 92) says, “The university college where I’ve been working since 1992 merged into Høgskulen på Vestlandet January 1. Høgskulen på Vestlandet (Western Norway University of Applied Sciences, www.hvl.no) has 1,800 employees and 16,000 students and are located at 5 different campuses. Kind regards to all.”

Joe (CE 96) and Shelly (IS 96) Cass and family have been living in North Phoenix, AZ, since 2006. “Kyle our son is 14, enjoys golf, drawing and hunting. Jenna our daughter is 12, enjoys flag football, Taekwondo, and trips to the ocean. We have owned Cass Cura, a construction materials testing and inspection firm since January of 2009. Business is good, and we are excited to see the growth as we come up on the company’s 10-year anniversary.”

Greg Hintgen (EE 99) is looking forward to coming back to Rapid City for M Week and climbing the hill. “It will be great to catch up with some alumni!” He hopes you can make it to the alumni banquet on Friday night!

2000’s

John and Sara (Hagie) Lee (ME 08) are now living near Cleveland, Ohio. “We will be welcoming our third child in September. The baby will be joining big brother, Jack (3.5) and big sister, Emma (2).”

Adam (ME 02) and Kjersti-Helene (MS Tmgt 03) Ehlers enjoyed a nice time last year when they hiked Bitihorn in Norway.

Terance Satchell (CE 09) transitioned from his seven-year career as an Engineer Officer in the US Army to an exciting new position as the design supervisor for the Nucor-Vulcraft Group in Fort Payne, AL. His two-year old daughter, Marilyn, enjoys doing “engineer work” by building castles out of toy blocks, and his wife, Jackie, will begin coursework at the prestigious Cumberland School of Law in Birmingham this Fall.

Several alumni gathered in Woodbury, MN, at the home of Holly Maudsley (ChE 95), daughter of M.R. (CE 69). and Barbara Hansen and celebrated the M.R. Hansen and Friends Endowment by raising a few more pledges. Pictured L-R are Tony Kulesa (CE 14), Michael Dollarhide (CE 16), Ben Wolf (CE 14), Chris Timm (CE 13), Katie Reed (CE 16), and M.R. Hansen (CE 69).
1: Fort Myers, FL – A good time was had by all at the first SDSM&T Alumni Gathering. Time was spent reminiscing about days at SD Mines, eating some great seafood while hearing updates from Joel Kincart, Foundation President and Ron Jeitz (CE 69) with the Foundation. Attendees were appreciative of the alumni who took time to join for some fun in the sun. Brad Pekas (GeolE 85) and Robyn, Bill Noordermeer (CE 72) and Helen Skogas, Stacie Sattler (IE 93), Jim (CE 57) and Connie Thompson, Joel Kincart, Jack (ME 63) and Pat Mallow, Brian (GeolE 82) and Marsha Powers, Al (ChE 71) and Carolyn Clark and Ron Jeitz (CE 69).

2: Pierre, SD – The 22nd “Deuces Wild” SDSM&T Alumni Association Tailgate Party was held in Pierre at the American Legion Cabin on January 7, 2017.

3: Houston, TX – Bob Chin, Lorraine Padden (EE 83), Ron Jeitz (CE 69) Jim (ME 74) and DeeAnn Schunneman, Gaurdie Banister (MetE 80), Kurt (CE 80) and Reah (CE 81) Dahl-Stames and Earnest Anoma (MinE 78).
4: April 21, 2017 – Rapid City, SD – Alumni Weekend Golf Tournament Hugh Boyle (CE 79), Josh Pappel (ME 17), Dave Berg (ME 73) and Rick Clegg (CE 73).

5: April 2, 2017 – Chandler, AZ - Hardrocker Athletics hosted an alumni golf tournament and dinner at Ocotillo Golf Course. Numerous former Hardrockers from several decades participated. All money raised went to support Hardrocker athletic scholarships. Thank you to everyone who participated and contributed. Special Thanks to Mark & Jan Lux for helping organize the event.

6: Sioux Falls, SD – Alumni and friends at the Mines on the Road event.
7: March 23, 2017 – San Antonio, TX – Will Murray (EE 85), Daryl Hegedus (EE 71), Carsyn Garcia (ChE 15), Houston Bashum (MinE 13), Don Bisson (EE 61), and June and Sam (ME 64) Begeman.

8: March 13, 2017 – Minneapolis, MN – Mary Himmler (Chem 88), Scott Fritz (IE 04), Charlie Murray (IE 03), Matt Goeden (CEng 03), Kent Hoisington (ME 88), Brad Johnson (EE 92), MaKayla and Ethan (CE 03) Swanson, Mary Jane and Gerry (ChE 68) Ries, and Tony Rea (ME 93).

9: March 12, 2017 – Rochester, MN – Todd Youngman (EE/CEng/CSc 97) and Anthony Connor (CEng/CSc 01)
**10:** President of Interstates Engineering, Dave Crumine (CE 87) visiting with two employees, Trent Jongetjes (EE 01) and Sean Bestgen (EE 13). Interstates Engineering has at least fourteen School of Mines alumni employed at various branches in Sioux Falls, SD, Cincinnati, OH, and Sioux Center, IA.

**11:** March 10, 2017 – Olathe, KS – Brad Johnson (EE 92), Jill and Ben (MetE 97) Dines, Drew Nelson (EE 02), Doug Colbert (ME 12), Mike Berglund (MinE 98), Jason Howe (CEng 05), Annette Horan-Berglund (ChE 98), Perry Dinger (ME 03), Chrystal Garstang (CE 02), Michael deStigter (CE 08), Kathy Hoffman (CSc 84), Justin Wenner (ME 06), and Jeff Hoffman (ME 84).

**12:** February 28, 2017 – Pierre, SD – Front Row: Steve Pirner (CE 72), Debbie (Bump) Hepper, Jeanne Goodman (GeolE 79), and Mike Ray (Geol 97). Back Row: Mike Perkovich (MinE 83), Mark Macy (GeolE 04), Vernon Bump (GeolE 61), Brian Hemmelman (EE 92), Craig Tieszen (ChE 71), Dave Johnson (CSc 83), and Jim Goodman (GeolE 71).
13: February 26, 2017 – Davenport, IA – Front Row: Shelly Curry, Christy Barnum, Jon (IE 06) and Jess (IS 05) Brooks, Abby (IE/Math 12), and David Cousins (MS ATM 06). Back Row: Keith Curry (ME 87), Tom Barnum (MinE 84) Bruce Halter (MetE 89), Drew (MetE 11), Owen, Dexter, and Michelle (EnvE 13) Kelley, Dave Hoffman (ME 79), Steve Hart, and Mick Dieterich (ME 85).

14: February 24, 2017 – Peoria, IL – Front Row: Nancy Frager (Math 88), Heather Shoup (CE 95), Bri Baker (MetE 06), Ben Short (ME 00), and Michelle Hayes. Back Row: David Frager (CSc 89), Kermit Velder (ME 93), Wayne Baker (ME 06), Ritch Larsen (ME 75), Sean Hayes (ME 10), and Brent Durheim (ME 89).

15: February 22 – Wichita, KS – Ashley (MetE 09) and Justin Reynolds, Marla and Rod (CE 80) Webber, Benjamin Van Kampen (ME 01), Craig Henrichsen (EE 96), Rachael Woods (CE 04), Lea (ME 83) and Steve Anderson, Catherine Rocky (GeoE 78), Chris Kroetch (ME 06), and Manny Penaloza (MetE 95).

More Photos from the 2017 area meetings are coming in the Winter 2018 Hardrock!
Elsie DuBray from Timber Lake High School won 3rd place and a $1,000 prize in the biochemistry category at the Intel International Science & Engineering Fair in Los Angeles. She took 1st at the High Plains Regional Science & Engineering Fair at Mines.

The record-breaking number of student participants at this year’s High Plains Regional Science & Engineering Fair held on the SD Mines campus.

Mines took 11th place in the VEX World Robotics Competition

The number of miles one summer camper traveled from Rwanda to SD Mines!

The total grant amount awarded in FY17 to Mines’ faculty for K-12 teacher professional development.

The number of 6-12 grade students from 15 schools who registered to take part in Engineers Week for an immersive experience in the world of engineering.
All academic and athletic scholarships at SD Mines come from the sole support of private donors. Scholarships help bridge the gap between educational costs and unmet student need. You can help make sure financial hardship does not stand in the way of a student achieving their fullest potential. To learn more about investing in the future of students please contact the SD Mines Foundation at foundation.sdsmt.edu / 605.394.2436 / Elizabeth.Sailer@sdsmt.edu