12 REKINDLING THE FIRE  Mines junior Travis Davis embarked on his third NASA internship in Huntsville, Alabama, and, unbeknownst to him, the opportunity of a lifetime.

20 EYE IN THE SKY  From Wall-E’s whimsy to Doctor Who’s daleks, robots have long transfixed and transformed us. We’ve always known what robots are made for. Now, Mines researchers are asking what they’re meant for as they change the face of rescue.

14 ENGINEERED FOR THE GREATER GOOD  A team of multi-disciplinary students traveled to a remote, mountainous location in Vicuña, Chile, to put the problem-solving skills they’ve honed at the School of Mines to work building an orphanage.

22 A NEW ERA  Heather Wilson brings a diverse background and high profile to her new position as School of Mines president. This Rhodes Scholar and Congresswoman gets down to business with a no-nonsense approach.

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Dear Alumni and Friends,

This Hardrock welcomes the eighteenth president of SDSM&T, Heather Wilson, DPhil, who represents an impressive number of firsts as our next president: first woman, first Air Force Academy graduate, first former U.S. House of Representatives member, and first from the great state of New Mexico. Her experience, energy, and leadership offer a great balance in her new role as our next president. We offer Dr. Wilson the full support of the Alumni Association throughout this next chapter in our alma mater's history.

The Alumni Association is in the “Memories Business.” A major part of our energies and resources are focused on engaging Mines alumni through memories of experiences. As students, we remember the experience of rigorous classes, favorite professors, fellow students, and various activities. These memories create our initial link to the School of Mines.

Before you have a memory, you need an experience. Our Alumni Association adds to those memories by sponsoring other experiences: Five-Year All School and Fifty-Year Class Reunions, semi-annual edition of The Hardrock magazine, weekly Hardrock E-News, alumni award programs, area gatherings, and the annual Alumni Recognition Dinner, to name a few. The challenge is to involve more of you in these experiences.

Accordingly, the Alumni Association has focused on three areas this year:

• 2013 Dedicated Mines Alumni—The goal is to realize financial support from 2,013 alumni for Alumni Association activities. Fresh approaches with videos, updates via the E-News and webpage, and new marketing approaches are presenting a new face. Your generous support is critical to ensure that our Alumni Association activities continue.

• Strengthening area gatherings—Our area vice presidents represent the interests of alumni in a geographic area and work with the Alumni Association to schedule get-togethers and activities. The Relationship Committee is working to increase the number of area gatherings and alumni involvement. Your participation is the key to making these events successful.

• Enlisting students as new alumni—In April, the Student Committee scheduled the first “Zero Year Reunion” for graduating seniors, which was jointly sponsored by the Alumni Association and the SDSM&T Foundation. It was an informal gathering of May grads and alumni with the specific intent of initiating a long-lasting alumni relationship.

Our Alumni Association has existed for 78 years of our alma mater’s 128-year legacy. An ongoing priority is to continue exploring new experiences for building alumni memories into the future.

Thank you for the privilege of being your Alumni Association president for the past year. Our incoming Alumni Association president, Carmen (Pauling) Adams (ChE75), has played an active role this year and will do a great job.

All the best,

Keith Mutchler (ME71)
2013 SDSM&T Alumni President
Known today as the McLaury Building, the School of Mines’ iconic university structure with its white pillars was originally named the Engineering Building when constructed in 1921. McLaury is now home to the Department of Mathematics & Computer Science, laboratories, and no doubt many a late-night Hardrocker robot-designing frenzy.

100 years ago
Summer 1913
The School of Mines opened its baseball season on May 9 with a twin bill. The Miners were victorious in both games, defeating the Spearfish town team 9-3 and Spearfish Normal 23-0 after five innings. In May, Professor Christian Trygstad facilitated a lecture by polar explorer Capt. Roald Amundsen; the lecture, “How I discovered the South Pole,” delighted a large audience at the Elks Opera House (currently the Elks Theatre). On June 5, the Regents of Education established majors in civil engineering and electrical engineering at Mines.

75 years ago
Summer 1938
The Regents of Education of the State of South Dakota approved preliminary plans and specifications for the proposed new O’Harra Memorial Building. The School of Mines marked the fiftieth anniversary of its first commencement. The first graduate, John Hancher, delivered the baccalaureate sermon. Col. Willard Chevalier, internationally prominent civil engineer and vice president of McGraw-Hill, delivered the commencement address.

50 years ago
Spring 1963
On April 25 a formal dedication was held for the new Mineral Industries Building. The ceremony was held during the forty-eighth annual meeting of the South Dakota Academy of Science. Nearly 250 people attended the annual meeting which included geology field trips and a banquet in Connolly Hall. Commencement ceremonies were held in the Rapid City High School Auditorium on June 7, with Mines President Fay Partlo delivering the commencement address.

25 years ago
Summer 1988
Ground is broken and construction begins on the new Classroom Building. Commencement ceremonies were held May 7 at the Rushmore Plaza Civic Center Arena, with William Norris of Control Data delivering the commencement address. SDSM&T participated in the first national ASCE Concrete Canoe competition. The School of Mines team captured the annual Rocky Mountain Regional championship, which was held at SDSM&T in April, and went on to compete in the national finals in June, finishing tenth overall.
Dear Hardrocker Friends,

When I came to Rapid City to interview for the position of president of the School of Mines, I spent some time chatting with students and graduates. My husband and I walked around town, poked into shops and restaurants and talked with people. We talked with faculty and staff. We drove through the Black Hills.

The students were serious about their studies but didn’t take themselves too seriously. There are no easy degrees at Mines, and that isn’t going to change. We demand excellence of our students because we know they can achieve it. And, in reaching for it, they will find the satisfaction that comes from doing something to the best of their ability. And while they are pushing themselves, they make friends, share laughter, and prepare for rewarding lives.

The graduates I spoke with were universally proud of being Hardrockers and grateful for the opportunities a Mines education had given them. Many were the first in their families to have gone to college. Some had never traveled far from home and have gone on to professional lives of leadership in major multinational corporations. Their message to me was clear: Mines changes lives.

The faculty and staff were refreshingly direct and down to earth. Anyone who has visited many college campuses knows that isn’t always the case.

And the people we met? There is a reason South Dakota has a reputation for being nice. Everyone, without exception, was nice.

There were several moments during our introduction to Rapid City when my husband and I had the same reaction: something special is happening here, and it is worth being part of it.

At a time when many Americans are questioning the value of a college degree, the School of Mines, and other schools like it, prepares leaders in science and engineering at a price families can afford. Industry has figured out the value of the education we provide, and with average starting salaries higher than Harvard’s, Mines graduates are in high demand.

Over the coming years, we will expand the student body and increase the research that we do. Growth will require a close relationship with the community and our dedicated alumni. We will build those relationships and continue to strengthen the Mines legacy of excellence.

We should spend our lives working on things that matter. Mines matters. I’m very proud to be the newest Hardrocker.

Sincerely,

Heather Wilson, DPhil
President
South Dakota School of Mines & Technology
LEGACY NEWS

Cargill pledges $580,000 gift to Mines

Cargill, Inc., has pledged $580,000 to the School of Mines for laboratories, scholarships, and curriculum development in several departments. The gift in large part will support student opportunities for practical application of biological engineering within the chemical and biological engineering department. It will also support the mechanical engineering, mining engineering, and electrical engineering departments.

Including the more than $1.1 million in previous gifts, Cargill’s investment in Mines programs and students totals nearly $1.7 million since 1987. SDSM&T is one of the top engineering talent providers to Cargill, an international producer and marketer of food, agricultural, financial, and industrial products, and services.

Hardrockers find new home in NCAA

The Hardrocker athletics program has been accepted for full membership into the National Collegiate Athletic Association following a four-year transition. Beginning Sept. 1, the School of Mines will join nearly 300 other Division II members. Student athletes will now be eligible for post-season competition, academic, and athletic awards.

Additionally, the football program has accepted an invitation to become an affiliate member within the Great Northwest Athletic Conference (GNAC) beginning the 2014 season. The Hardrockers will become the seventh football-playing member of the GNAC.

Mining students prove their mettle

A South Dakota School of Mines & Technology student team placed third internationally behind teams from Australia and England at the spring International Mining Games Competition. Mines finished as the top overall university in the United States. In competing with forty-one collegiate teams from sixteen universities on individual events, Mines students earned two first places, a second place, and three third places.

Acclaimed bio-artist installs newest exhibit

World-renowned bio-artist Joe Davis, MIT and Harvard Medical School research affiliate, created his newest exhibit, “Hidden Knowledge,” at the School of Mines through a new visiting artist program. On permanent display with nature outside the Chemical and Biological Engineering/Chemistry Building, his art is a prototype for a larger-scale installation at Harvard Medical School.

For more Mines news visit news.sdsmt.edu.

Friends in high places

When Chief Warrant Officer 4 Fredrick Ellwein lead the Old Guard Fife and Drum Corps up Pennsylvania Avenue for President Barack Obama’s second inaugural parade, the commander-in-chief greeted him with a smile and salute.

“As the Fife and Drum Corps trooped-in-review, which has happened numerous times during my tenure, (President Obama) was always paying attention and smiling broadly! I always considered the smile of my boss as the tacit mark of approval,” said the former Mines music faculty member. While the parade marked the beginning of President Obama’s second term, it was the crescendo of Ellwein’s career. He retired earlier this year after thirty-four years of serving with the Army National Guard. “Final missions for those of us in the military have a special meaning to begin with, and to have had the honor of leading that organization … is pretty unbelievable,” he said. “I’m truly blessed to have been in such a position.”

Before leading the Old Guard, which averages 500 performances a year, including welcoming heads of state and foreign dignitaries to the White House, Ellwein was director of bands and jazz activities at SDSM&T from 1998 to 2003. He and his wife, Dianne, re-enlisted in the Army National Guard after the September 11 terrorist attacks.

“I thoroughly enjoyed working with students engaged in various majors in the SDSM&T band as they were earning their humanities credits,” Ellwein said. “It was a delightful group of students. The symphonic band and jazz band performed challenging repertoire each semester. I was very proud of the groups and what they accomplished musically. It was also quite wonderful to work for Dr. (James) Feiszli (Mines music program director) … he is an amazing musician and educator. I really enjoyed being on his team.”

The move to Washington, DC, set the stage for a series of events in which Ellwein demonstrated his strength as a leader. He served as commander of the 147th Army Band, as well as two tours in Iraq, and was named commander of the Old Guard Fife and Drum Corps, just the fourth that group has had since its establishment—a lyrical swell to the grand finale of his career.

“It was an amazing experience. Being a part of an historical event of such prominence is always a bit surreal. I performed in the 1981 inaugural parade (Ronald Reagan) with the SDSU Band and had an important role in George W. Bush’s 2005 inaugural parade,” Ellwein explained. “But the role of commanding a presidential escort unit certainly was the pinnacle moment for me.”
Concrete design soars to new heights

School of Mines students made aeronautical history in the spring when the concrete airplane they spent a year designing took flight. Flight time was a matter of mere seconds, but it was enough for the record books. The 18-pound plane held its own during a crash landing to become the second known concrete plane to fly and the only one to stay intact upon landing.

The only other concrete airplane known to have flown was designed at the prestigious Embry-Riddle Aeronautical University (ERAU) in Daytona Beach, Florida. That plane crashed and was destroyed, according to Mines advisor M.R. Hansen, PhD, an expert in concrete design who retired in June. “My friend, Dr. Mark Fugler, concrete advisor at ERAU, was my inspiration to try this project. Their concrete airplane did fly first and proved that it could be done. Our goal was to do that and have it land safely.”

Mission accomplished: The plane sustained a crack in the fuselage and wing but otherwise remained intact. “So, you could say this is the first concrete airplane to fly and land,” Hansen said. Students applied the same light mixture with extra carbon fiber reinforcement used in the university’s award-winning concrete canoe design.

The plane, with a wingspan of 40 inches, was designed and built by three SDSM&T seniors who recently graduated. David Haberman (ME13), Tyler Pojanowski (ME13), and Seth Adams (CEE13) worked on the plane for their senior design project. They had just one shot to test a year’s worth of work. “I was really nervous. ...The numbers said it would fly, but numbers and actually seeing it fly are two different things,” Pojanowski said.

Hansen said the next challenge will add servo-controlled ailerons to control turning and help with a smooth landing.

Mines professors change the world

Each year the Yellow Dragon, a series of ferocious sand storms, sweeps through northeast Asia, its sun-blotting blasts shifting millions of tons of sand, spurring desertification as the land’s top soil—and farmers’ livelihoods—are blown away. Sookie and Sangchul Bang, both PhDs at the School of Mines, share more than a marriage. They share a common pursuit, which has led them from South Korea to South Dakota where, along with research teams, they have invented the potential for halting desertification. Like any good David and Goliath tale, the hero is small. In fact, microscopic.

Enter bacteria. When bacteria extract carbon dioxide and ammonia from urea in the presence of water and calcium, limestone is formed. This process not only occurs sporadically but at a sluggish rate, as bacteria become dormant when nutrients cannot be found. By adding nutrients to resuscitate the bacteria, Sookie Bang has followed a cascade reaction, ensuring that the process is continual and dramatically faster. In essence, Bang can grow limestone directly within cracks in concrete blocks, creating a self-healing concrete. Pollution-free, this selective microbial plugging seals from the inside out, integrating with the porous concrete rather than simply filling space.

The applications are monumental. From the Empire State Building to Mount Rushmore, Bang’s bacterial cement restores national landmarks devastated by cracks and the elements. This concept so drastically altered the scientific landscape that Reuters Entrepreneurial blog enshrined her invention in the post “Baby Boomer Inventions that Changed the World,” in 2010, sandwiching it among the World Wide Web, rechargeable lithiumion batteries, and the artificial heart. When bacterial cement and soil fibers are incorporated into soil, a hardened surface forms that weighs down soil particles, preventing them from being airborne. This airborne dust control has practical and immediate application in landfills, open pit mines, quarries, and construction.

But its power lies in its potential. Applying this technology to Mongolia, home to the worst dust storms in the world, the Bangs could not only mitigate global desertification, but prevent it.

In July, the Bangs began conducting full-scale field testing on Mongolian desert sands in partnership with the National University of Mongolia and the Mongolian University of Science and Technology. They plan to use biodegradable fibers instead of synthetic ones, layering vegetation atop the bacterial spray to augment the effect, which will keep the soil in place long after the bacterial cement degrades.
There are nearly 7.1 billion people on the planet. Sheryl Sandberg, COO of Facebook, and Marissa Mayer, Yahoo’s President and CEO, are among those who matter most. The face of power is changing, driving dialogue about an issue increasingly at the forefront of our rapidly-industrializing world—women in science, technology, engineering, and math (STEM).

Globally, women constitute the largest percentage of the population, yet comprise only one in seven engineers. The School of Mines aims to change the tide, building a pipeline of female talent that paves the way from the classroom to the boardroom. Ramp up efforts are beginning to show real-time results.

In February, Mines’ Toni Logar, PhD, (CSc85), became a featured engineer in the first ever Institute of Electrical and Electronics Engineers (IEEE) Women in Engineering eBook. Her selection hints at something deeper than professional accolades. Logar’s portfolio is diverse. She’s moved seamlessly among careers as a professor, law alumna, researcher, and dean. Positioning women in STEM careers is critical, but enabling them to successfully pivot across other sectors builds a more dynamic working world.

For the School of Mines, that change begins in the classroom. Last fall, a quarter of Mines students, 608, were women, and the university is striving to increase that number.

March marked the first annual Women in Science and Engineering Symposium and Girls’ Day, where Mines students partnered with middle and high school girls for a day of departmental demonstrations, networking, mentorship, and insight, as industry leaders shared their experience and advice. Among the leaders were South Dakota Board of Regents then-President and Mines alumna Kathryn Johnson (PhD Geol86) who traced her journey from engineering and consulting to business and education. In May, the Women in Science conference connected nearly 400 middle school girls with regional professionals who helped them acquire skills integral to success.

Last fall, the mechanical engineering department launched a mentoring program to support female students, an effort spotlighted in the latest issue of PE magazine, published by the National Society of Professional Engineers. The result: a record number forty-two female mechanical engineering students enrolled this year.

As these initiatives unfold, a paradigm begins to shift. The perspectives of both men and women as engineers translate into a broader and more versatile reserve of intellectual capital critical to innovative capacity, global competitiveness, and economic success.

Enrollment on upswing at Mines

Against the grain, School of Mines enrollment has increased from 2,061 to 2,424 over the last five years, and an ambitious strategic priority aims for a 3,500 headcount by 2020. New freshmen enrollment this fall is expected to be up again compared to fall 2012.

The growth plan is bold, as sustainability requires wheels churning in many areas, including in the housing and facilities arena. The university is now leasing the new privately owned Rocker Square II apartment building for student use, and a master housing plan calls for constructing new residence halls. In order to maintain one of its most attractive qualities, a low student-to-faculty ratio of 14:1, new professors and instructors will be needed.

Besides the small, more personable qualities the university offers, the student population growth is being attributed to indisputable outcomes such as a $62,696 average starting salary and a 98 percent placement rate. But a key reason a student applies to Mines is because he or she talked with alumni and old-fashioned word-of-mouth marketing that ultimately traces back to positive student experiences.

“When one student from Texas likes it and tells his friends back home then all of a sudden you have four students from Texas, then eight, and sixteen,” said Mike Gunn, PhD, associate provost for academic affairs and enrollment management. The university has been successfully recruiting from California, Texas, Arizona, Illinois, and is starting to see an increase in students from the Northeast.

Once students arrive on campus, they stay. Retention was 79.8 percent last year.
CAMP: A unique freshman attraction

The South Dakota School of Mines & Technology has many qualities that make it stand out from the rest. With a focused field of study in science and technology, intimate class sizes, and excellent job placement after graduation, SDSM&T is competitive with other major universities. However, one feature is often cited as helping to seal the deal for most incoming freshmen when it comes to accepting their admissions letter: CAMP.

The Center of Excellence for Advanced Manufacturing and Production, or CAMP, gives students, even freshman, an opportunity to dive headfirst into hands-on learning. From designing and building a Formula One car, a human powered vehicle, robotics, video games, or a super mileage car that can go over 1,000 miles on a single tank of gas, CAMP is where the rubber meets the road in terms of bringing theory from the classroom into real-world problem-solving.

Emilee Basta, a mechanical engineering senior, has participated on the Baja team since she was a freshman and says CAMP played a major part in why she decided SDSM&T was the right fit for her.

“CAMP, and especially the Baja team, is what attracted me to SDSM&T. No other school I was considering had this kind of program. I thought how absolutely cool it would be to be a part of one of these teams,” Basta said. “The passion that the faculty, staff, and students have for this program shows through. I wanted to be a part of something like that. CAMP is what sets us apart from every other school.”

Dan Dolan, PhD, director and mechanical engineering professor, says he considers CAMP as more of a learning philosophy and larger piece of a holistic educational experience than an extra curricular activity for students.

“The heart of CAMP is the coupling and integration of our student’s course work with vocational training,” Dolan said. “These students are class acts and they are very focused on their course work and projects, and they have to be to be successful here. But CAMP is also about developing values, ethics, and character. We want them to look at the human aspect of their projects as much as the technology. This is a body, mind, heart, and spirit experience. We really work hard at helping our students find their balance.”

Balance may be difficult to find for some participants, as CAMP is completely student driven and not a required aspect of the curriculum. Students like Basta say CAMP provides an outlet from the classroom as well as an opportunity to be creative and competitive.

“By the time CAMP students graduate from this school … they have essentially been in industry and practiced their trade. CAMP doesn’t just promote thought; it promotes doing and trying new things, and failing often in order to succeed sooner,” Basta said. “We expect our students to excel in the classroom and to learn their technical skills as well as they can,” Dolan explained. “And, we want to give them freedom to learn, experiment, and grow. But, at CAMP, we don’t use the word ‘perfect.’ What we do here is strive for excellence.”
The Hardrock

The Hardrock

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NASA has awarded a team of Mines researchers a $750,000 grant to develop new materials and technologies for space applications, including artificial skin for astronaut suits and sensors that can be integrated on the surface of spaceships. These would be lightweight, conformable, flexible and stretchable electronic devices and sensors based on inorganic and organic materials.

Research involves a multi-disciplinary approach, as well as collaboration with NASA centers. The School of Mines’ technique is to grow semi-conductors and transfer them to flexible substrates.

“Flexible electronics are the next big wave at NASA,” grant reviewers commented about the proposal of Zhengtao Zhu, PhD, Mines associate professor of chemistry and applied biological sciences. Grant reviewers also said there is significant “potential for NASA spinoff technology.” Zhu’s project is directly related to the mission of the Exploration Technology Development Program within NASA’s Exploration Systems Mission Directorate: develop long-range technologies to enable human exploration beyond Earth’s orbit.

The grant will be funded through the South Dakota Space Grant Consortium/NASA EPSCoR. South Dakota State University is a co-institutional investigator on the research project.

Professor unearths new dinosaur species

A South Dakota School of Mines & Technology assistant professor and his team made international headlines earlier this year with their discovery of a new species of herbivorous dinosaur and publishing of the first fossil evidence that prehistoric crocodyliforms fed on small dinosaurs.

Research by Clint Boyd, PhD, provides the first definitive evidence that plant-eating baby ornithopod dinosaurs were a food of choice for the crocodyliform, a now extinct relative of the crocodile family. While conducting their research, the team also discovered the prey was a previously unrecognized small dinosaur species, which is expected to be formally named later this year.

Evidence found in southern Utah dating back to the late Cretaceous period shows bite marks on bone joints, as well as breakthrough proof of a crocodyliform tooth still embedded in a dinosaur femur. The findings are significant because historically dinosaurs have been depicted as the dominant species. “The traditional ideas you see in popular literature are that when little baby dinosaurs are either coming out of a nesting grounds or out somewhere on their own, they normally have to worry about the theropod dinosaurs, the things like raptors or, on bigger scales, the T. rex. So this kind of adds a new dimension,” Boyd said. “You had your dominant riverine carnivores, the crocodyliforms, attacking these herbivores as well, so they had it coming from all sides.”

Until now, paleontologists had direct evidence only of “very large crocodyliforms” interacting with “very large dinosaurs,” but based on teeth marks on bones and the large amounts of fragments left behind, it is believed the crocodyliforms were also diminutive in size, perhaps no more than two meters long. A larger species of crocodyliform would have been more likely to gulp down its prey without leaving behind traces of bone fragments.

“It’s not often that you get events from the fossil record that are action-related,” Boyd explained. “While you generally assume there was probably a lot more interaction going on, we didn’t have any of that preserved in the fossil record yet. This is the first time we have definitive evidence of this kind of partitioning, of your smaller crocodyliforms attacking the smaller herbivorous dinosaurs,” he said, adding that this is only the second published instance of a crocodyliform tooth embedded in any prey animal in the fossil record.

Additionally, the high concentrations of tiny dinosaur bones led researchers to conclude a type of selection occurred, that crocodyliforms were preferentially feeding on these miniature dinosaurs. “Maybe it was closer to a nesting ground where baby dinosaurs would have been more abundant, and so the smaller crocodyliforms were hanging out there getting lunch,” Boyd added.

Mines team shoots for the stars

Clint Boyd, PhD, of the South Dakota School of Mines & Technology, points to a crocodyliform tooth embedded in the femur of a young dinosaur.

Professor unearths new dinosaur species

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New research centers prompt economic growth

Two new Governor Research Centers are headed to the School of Mines, answering the call for industry demand and bringing the potential for significant economic development within the state.

Chosen among a competitive field, each was awarded $2 million over the next five years to focus on advanced manufacturing techniques with ultimate application in the automotive, aerospace, energy, construction, and other industries.

The new centers are Advanced Manufacturing Process Technology Transition & Training (AMPTEC), under the direction of Christian Widener, PhD, and Composite & Nanocomposite Advanced Manufacturing (CNAM), under the direction of David Salem, PhD.

Widener has brought Mines to the cutting-edge of cold-spray technology, involving accelerating particles at super-sonic speed, saving millions of dollars in refurbishments to the B-1 bomber.

Widener’s new center will focus on continuing to develop advanced manufacturing technologies but with a focus on direct industry partnerships to commercialize specific applications and processes. AMPTEC is developing an advanced six-axis manufacturing center that will be capable of both additive and subtractive processes, and “will bring unique world-class capabilities in advanced manufacturing to the state,” Widener said.

AMPTEC has secured matching funds commitments from industry for a total of $4 million to jointly develop, license, and commercialize technology from the School of Mines.

CNAM is poised to meet the urgent commercial need for strong, lightweight, multifunctional composite and nanocomposite structures at high volume and low cost, said Salem, adding recent advances make the commercialization feasible on an aggressive timetable.

In the automotive industry, this could include structural and engine components that will meet the 54.5 miles-to-the-gallon vehicle standards. In the energy industry, research could lead to a new generation of wind blades, tidal turbines, storage vessels, and pipelines. In the construction industry, results could yield lightweight composite building materials, including building blocks, beams, and panels.

Crude awakening: Bio-energy one molecule at a time

Home to less than 5 percent of the world’s population, the United States consumes around a quarter of the world’s oil supply. As concerns mount over environmental impacts of fossil fuels, the US is turning to renewable resources to meet energy demands.

In bioprocessing, South Dakota leads the way, generating bio-based products to replace gasoline with alcohol from organic waste. However, the efficiency of commercial processes is still low and the costs high.

“Commercial bio-processing is largely based on empirically-determined processes,” explains physicist Steve Smith, PhD, professor and director of the nanoscience and nanoengineering program.

Smith argues that “we could accelerate a lot of this technology if we had an understanding of how the technology works at the molecular level.”

To do this, Smith’s group has developed advanced imaging methods to look at these processes one molecule at a time. Funded by the National Science Foundation, Smith’s research team images single carbohydrate binding modules (CBMs) and their interactions with cellulose. A key component of all cellulase enzymes, CBMs govern the first step in the decomposition of cellulose, the most abundant biopolymer on earth, and the primary constituent of biomass, such as wood chips and agricultural waste.

In nature, when a tree falls, fungi or bacteria grow over it, metabolizing enzymes which decompose the wood over the course of years and release simple sugars that can be fermented to produce alcohols, such as ethanol.

Traditionally in industry, enzymes are chosen based on the rate and yield of batch processes. But those metrics don’t reveal important details that determine the outcomes. “If you understand the process and know how it works, you are better able to modify the enzyme to work better or determine which enzymes are best.” In other words, replace trial and error with molecular-level vision.

This wouldn’t be the first time a breakthrough came from looking at things on a molecular level, Smith adds. Look at the many health benefits which have evolved from the molecular level knowledge of another important biopolymer: DNA.
Rekindling the fire
On May 25, 1961, an idea pervaded the American conscious. Poised on the tip of every tongue, tingling from every pore, it swept the nation. Eight years later, humankind leaped, and with one man’s footprints, an entire country forever left its mark.

Now, Mines junior Travis Davis is rekindling the fire that ignited a generation when, more than a half century ago, President John F. Kennedy laid out an ambitious goal to land a man on the moon.

This past spring, Davis embarked on his third NASA internship in Huntsville, Alabama, and, unbeknownst for him, the opportunity of a lifetime. His mission: resurrect the F-1 rocket engine of Apollo fame and help facilitate the first hot-fire test conducted at the Marshall Space Flight Center in more than 50 years.

Sprawled at the foothills of northern Alabama, Huntsville was built around NASA. Nicknamed “The Rocket City,” it boasts a long, storied history with the final frontier. After being on display at the Smithsonian for forty years, the most powerful engine ever designed, with 1.5 million pounds of thrust, went home in 2012. The F-1 was so powerful that Davis says, “the first time they tested the F-1 engine it broke windows and set off car alarms all over the city.”

Why resurrect a rocket engine that last flew before Davis was even born? To mine its secrets and inspire new advanced, affordable propulsion systems in future launch vehicles.

“The first week there, I got to take off the gas generator. It’s a small rocket that turns the turbines” and is responsible for supplying power to drive the giant F-1 turbopump. Running off kerosene and liquid hydrogen, the whole thing is only about the size of a microwave. But don’t let that fool you. It puts out 30,000 pounds per square inch.

Davis and his group needed to get the entire gas generator back up and running so they could hot fire test it. But they were concerned about the aged valves, and refurbishing them would be a formidable task. There are only six in the entire US, all left over from Apollo. Davis was able to take apart three. The rest had to be tracked down in museums or the junkyards around NASA.

History presented issues of its own. Designed in the 1960s, the valves’ seals had deteriorated and were no longer produced.

So they decided to create technology of their own, using the 1960s manual as a starting point. For the self-proclaimed history buff, merely holding a relic that had inspired a nation was exhilarating. “It was incredible. The last time people looked at it was in the ‘60s when they went to the moon.”

The group partnered with a company to fabricate the seals but soon found the need to make a multitude of in-situ adjustments to the manual’s instructions along the way. “We had to be really careful since no one does this anymore. What the paperwork said and how they were put together was completely different, because when technicians found problems during the line, the change was made through word of mouth,” which is the very way Davis heard about NASA in the first place. Suggested by an old high school classmate and current employee, once the idea of working for NASA took hold, he couldn’t shake it. As Davis notes, there is no better place to learn cutting-edge technology.

And Davis has had a lot of firsts, most recently, in direct metal laser sensoring, a new process rapidly gaining in popularity. NASA expressed interest in the technique for use in vehicles heading to Mars. “I had to learn everything about it and had to teach at conferences before I left. When summer ended, I was one of only three that knew how the process worked.”

He was also given clearance to watch the shuttle launch of Discovery from Kennedy Space Center and had an opportunity to tour the center, an honor usually reserved for dignitaries and the press. And, this past summer, he earned his pilot’s license.

Davis has made a highway out of the road less traveled. But some sites have remained the same along the way. “Growing up on a ranch, I’d always been a gearhead. I always designed stuff when I was little. I built motorcycles, put wheels on snowmobiles.” After being accepted into the School of Mines, Davis took a 3D modeling course, and suddenly it clicked. “Finally I could take all of these ideas in my head and measure it, and they would be right the first time. I’d always designed stuff, but now I understood all the analysis.”

He was eager to transform more of his ideas into impact. At the end of Davis’ sophomore year, he seized opportunities to work at John Deere and Caterpillar. He decided to take a year off to work and never looked back. “A lot of people teased me about not going to college, but companies don’t have any problem with it. I like people to approach me and ask how I got there. During that time, any opportunity that came up, I just took it.”

Davis credits his real-world experience with giving him insight into his classes and making him study harder along the way. “If your boss asks you something and you don’t know it, you work harder to find out. I’ve always believed that there’s a huge difference between being book-smart and hand-smart, and these opportunities have made me both.”

On January 10, 2013, Marshall’s two F-1 engine gas generators roared back to life as Davis, by now on the Mines campus, kept tabs from afar. And as the 100-foot-long flames seared hot-white into the sky, a generation’s imagination was ignited once again.
Bridget McDougall (CE11) leaned into the lectern in room 311 of the civil engineering classroom, preparing students for their next task. “The tank just arrived today. We want to come up with an alternate design that is simple but has a better effect than the plan they have,” she said of a septic system blueprint. The Mines team wasn’t about to engage in any ordinary pen-to-paper calculations, and McDougall wasn’t exactly teaching. This alumna and a team of multi-disciplinary students were readying for a trip abroad where they would put the problem-solving skills they’ve honed at the School of Mines to work building an orphanage in a remote, mountainous location of Vicuña, Chile.

It wasn’t McDougall’s first time at the site on the edge of the Andes Mountains in South America nor her first time lending her engineering ingenuity for a good cause. In 2011 she helped pour concrete for the same orphanage dormitory, which, because it has been built solely by volunteers like the Mines group, has taken several years to near completion. In 2010 her senior design project involved a working trip to Mongolia.

On her most recent trek in May, McDougall and five students spent four days installing a couple of septic systems they had designed back home in Rapid City, constructed a loading ramp and tested a water purification system that a previous team of Mines students installed five years ago.

They represented Engineers and Scientists Abroad (ESA), a Mines organization which, since its inception in 2008, has traveled to work on-site at eleven international projects, including three times at the Chile orphanage. Though it has struggled somewhat with raising funds, the Mines team pays its own way, with financial support from a variety of donors.

Key among those whose generous contributions have enabled Mines engineers to travel abroad are Irma and Richard Frank (ME63). The Franks’ past donations and future commitments to fund international experiences play a pivotal role.

In March, the ESA team of graduate student Tony Kulesa (CE12) and undergraduates Cole Bedford, Rebecca Ceremuga, and Traci Gibson, traveled to Bogota, Columbia, on a reconnaissance mission to scout for future projects. They visited with university students from Pontificia Universidad Javeriana, building on a relationship initiated and nurtured by the Franks. The Mines group returned with a laundry list of possibilities and whittled it down to four with plans to return in January for a working trip. Projects will address landslide-critical areas caused by groundwater flow and surface water drainage; rainwater quality studies; structural integrity of low-income, urban housing; and recycling warehouse organization and safety.

No matter to which location their labor of love takes them or the sacrifices made, for those involved the payback is rich in ways that may not be realized for years.

Before traveling to Chile, students researched and designed septic system solutions based on the best information provided, knowing well that “other things might come up” along the way, said Kulesa. Indeed, the very nature of engineering requires the ability to adjust on the fly to unanticipated problems.

“Just being involved in ESA, you get to see your engineering in its simplest form,” said McDougall, who is employed as an engineer at FourFront Design Inc. in Rapid City. “You don’t have all the resources you would normally have. You might build a solar oven out of wood and aluminum paint. It’s just that fundamental stuff.”

Senior Kati Johnson’s on-site work did not require the high-tech laboratory equipment and chemicals she is used to dealing with as a chemical engineering student but rather her analytical acumen.

“A lot of it is just using our problem-solving skills and adjusting to the need once you get to the job. I think that’s why we come to this university, to learn those skills—because when you get to a job, it’s not going to be just about using everything you’ve learned but also about how to solve problems,” Johnson said.

Indeed, one of the biggest challenges in Chile was the quality of the raw materials. Installing a septic system requires a layer of rocks for filtering, but because students had to fetch them off a mountainside a mile away, they were large and ungrated. The team was able to enlist the “gift” that was the backhoe, which was on site for a few
days. But the boulders were simply too much weight for the tiny pickup truck, causing the emergency break to lock up in a blind spot on a narrow one-way road that curled around a mountain. Eventually, they had to cut the truck's break line in order to drive it back to the adobe house where they stayed.

Because the rocks were so large they had to be delicately placed and positioned around the pipes in the trenches. “A lot of them were foot-long boulders that would just crush the pipe so that’s something we had to be aware of when putting them in,” Kulesa said. Ultimately, students dug trenches and laid 315 feet of perforated pipe in the drain fields to connect with 1,000-gallon septic tanks.

“The orphanage is built from teams like us, and the money is donated, so you have to find the cheapest solution possible,” said Kulesa, who explained that for one project student engineers turned empty cement bags into filters to create a barrier for dirt and moisture. “We assumed pretty worse-case scenario conditions.”

At the orphanage site, water flowed directly from the PurePak purification system—capable of producing 500 gallons of water a day—designed and installed by Mines students several years ago. Food was slow cooked in the sun for hours. The light by which they read at night was solar powered during the day. In the middle of the night power would run out but would regenerate with the next day’s sunlight.

More than just good deeds, student Janelle Strampe said ESA trips are a great opportunity to apply project management skills, too. “Obviously, we all have separate little projects when we go down there, and that’s very important because that’s what we will be doing when we are employed with industry.” Other Mines students in Chile were civil and environmental engineering students Janile Lewis and Kevin Barry.

The ESA group is also exploring future trips to Africa, India, and Ecuador.

On the Chile trips, Mines students have followed the lead of philanthropists Sandi and Dale Boe of Belle Fourche who have dedicated their lives to helping orphans worldwide through Vocations for Orphans. Theirs is a non-profit organization they founded in 2000 to help older orphans who are close to “aging out” of institutions learn to support themselves. “The sacrifices Dale and Sandi have made, they hardly get to reap the benefits because after they finish one site they turn it over to a manager and go on to the next,” Kulesa said. “It kind of sets you in your place.”

Yet, it’s a natural application of a Mines-grown skill set.

“It’s an awesome experience to be able to help people who are less fortunate than me, and I think that engineers in general should take advantage of these trips because, you know, we will make the big salaries. It’s really cool to help out people in other countries who don’t have the same opportunities that we have here,” Johnson said.
Top: The Mines team installs one of two septic systems at a Chilean orphanage. Bottom: Civil and environmental engineering student Kevin Barry and alumna Bridget McDougall (CE11).
Reflections from the Chile travel journal

Tony Kulesa kept a travel journal of the group’s trip to Chile. His excerpts describe the impact of engineering efforts Mines students and an alumna dedicated toward building an orphanage.

Day 1: After traveling many hours to Vicuña, Chile, we were met with a warm welcome at La Serena’s city airport on the Northwest coast of Chile. There was an unusual crowd of people on that airport’s patio as we walked on to the tarmac—come to find out we had just flown in with a candidate for the Chilean presidency.

We were met by Sandi Boe from Belle Fourche, South Dakota, who, along with her husband, Dale, are constructing the orphanage site through Vocations for Orphans, and her helper for the day, Mar-Loos, a Dutch-Chilean who lives very near Dale and Sandi there. The twelve-mile trek to the orphanage takes over forty-five minutes by truck to wind up to roughly 6,200 feet, but the road is well grated and not traveled by many.

Day 2: Monday was a full day of work at Casa Montana, starting with breakfast at 8 a.m. and working through sunset. The backhoe and operator arrived around 11 a.m., and we got straight to work digging in the larger of the two septic tanks at the Unity Building. We dug over one hundred feet of trenches for the drain field and ate lunch. After lunch we continued digging and installed the other tank for the smaller septic system behind the shop. This tank actually took longer to set level but went in quickly nonetheless. We also dug forty feet of perforated pipe for the smaller tank. Next we began digging an area out for the building near the shop, and we also dug in 120 feet of water line to that same site. We will continue all of this Tuesday, as well as haul rock from one mile away to bed the pipe in the trenches.

This morning there were some farmers passing by on the road with two trucks and four horses. They stopped for breakfast and then loaded their horses up into the back of the truck for the trip down the mountain. They were very friendly and spoke briefly with us before passing on—a truly Chilean experience.

Day 3: Tuesday was a nonstop battle to complete more of the septic systems, especially the drainfields. We layered loose rock around the pipe, then cement bags, and then native soil as fill. The cement bags act as a barrier for the fine materials so that only moisture can permeate through the layers.

We had Fransisco, our backhoe operator, busy all day again. We hauled rock from a pit one mile away using both trucks and the backhoe. … We made approximately ten trips to the gravel pit, and Fransisco took a couple more himself in the backhoe. At the orphanage, we installed two more branches of the drain field at the Unity Building, built lids and manholes for the septic tanks, finished digging the waterline trench, and worked on the Purepack water purification system.

Fransisco ate lunch with our crew at the adobe house, and it was delicious. Fransisco was very cautious and seemed to enjoy it. We presented him with a Rowdy Rocker T-shirt, and while embarrassed/gracious, he was happy and took a photo with the group. Fransisco helped today with troubleshooting the truck’s issue and some other odds and ends. He is opening up and speaking more Spanish and letting me interpret. The connection is interesting and fun, and I enjoy communicating with him, however choppy it may be.

Day 4: Wednesday I spent almost the entire day digging out a plot for Casa Maria with Fransisco and his backhoe. We cut nearly two meters worth of dirt on the high side and made a sixty-foot-by-forty-foot square for the house and yard to sit on for the future. There was roughly 225 cubic yards of dirt moved by the small backhoe. The work was long and relentless. The rest of our crew made reinforcement cages for the columns of this new house and also lids for the two septic tanks. We used every minute of the day for the backhoe to be productive, and we accomplished much of what we wanted to. All that is left for Thursday is to backfill all the trenches and a few more odds and ends jobs.

After we finished working for the day we went immediately down the mountain fifteen minutes to the Observatorio del Pangue for a tour. The two researchers there were very great hosts and showed and explained some amazing sights in the southern sky. The stars in the sky and the nebulas and planets in the telescopes were amazing. We even caught the International Space Station flying by early in the night. We also talked to people from Colorado, California, and France. Impressively, the two guides knew English, Spanish, French, and one other unrecognizable language. After the late night at the observatory, we were all spent and went straight to bed.

Day 5: Thursday morning we began packing and cleaning before beginning work around 8 a.m. Fransisco and I focused on backfilling all the remaining trenches and around the septic tanks carefully. We had filled each with water to keep the tanks from collapsing or moving. We also constructed and installed a manhole to reach the lid of the first half of the larger septic tank. Next, Fransisco touched up the approach into the orphanage area and dug out a loading dock for trucks to back up into a large set of doors on the side of the shop.
Embedded in the pop culture landscape, robots have long transfixed and transformed us. From Wall-E's whimsical charm to the pitiless daleks of Doctor Who, we see reflected in their burnished sheen a distorted mirror of ourselves. We've always known what robots are made for. Now, Mines researchers are asking what they're meant for.

Every day, people risk their lives in danger zones such as improvised explosive device (IED) checkpoints and forests consumed by flames. Their courage is immense, but in the future their risk might not have to be. With donation and collaboration, the South Dakota School of Mines & Technology is changing the face of rescue.

In late January, Charles Tolle, PhD, a professor in the Department of Electrical & Computer Engineering, received a phone call from his alma mater, Utah State University (USU). Its Center of Excellence had closed, and it was looking to make a sizeable donation: a major military-grade unmanned ground vehicle (UGV).

Developed by USU and employed in a variety of capacities, from military scout missions to remote surveillance and sensor deployment, autonomous unmanned ground vehicles are a critical component of US Army infrastructure.

Built in the late 1990s, the UGV was originally designed for scout work in military operations. With the emergence of IEDs throughout field operations, the vehicle was repurposed by the military and reengineered to work with smaller inspection vehicles that detect IEDs at checkpoints, government installations, and parking lots.

Highlighting the vehicle's impressive capabilities, Tolle explains that, “with this robot's wheels and their ability to turn 360 degrees, it can literally slide left or spin on a dime.”

Its guidance system boasts noteworthy credentials of its own. Far more advanced than most robots in the field today, the system shifts focus from simply arriving at a destination to driving within a lane.

This donation offers something more powerful than a battle-hardened UGV. It offers potential, as Mines professors and students alike gain access to a top-of-the-line, field-tested vehicle for advanced autonomous guidance and cooperative robot research.

And while Tolle navigates the world of ground robotics, Mines professors Mark Bedillion, PhD, and Randy Hoover, PhD, are looking to launch that explosive potential into the stratosphere.

A joint venture between the mechanical and electrical engineering departments, Bedillion and Hoover are attempting to “fuse information between ground and air robots in order to combine a large payload carrying capacity with an eye-in-the-sky view.”

Hoover's specialty is computer vision. Bedillion looks at formation planning and control. Until now, research on ground robots has been conducted indoors with a motion capture system, which tells them everything they need to know about robots acting in unison.

Once robots are moved outdoors, keeping them in configuration while avoiding obstacles becomes significantly more difficult.

So Bedillion and Hoover took a look through a different lens—literally. Affixing a QR code to each ground robot, they employ air robots to scan the codes and determine the orientation and scale of those on the ground, enabling operators to triangulate position and determine where everything is going, even when the unexpected arises.

The crux of their work centers on simultaneous localization and mapping, meaning that if “you put a robot in a building and it doesn't know a map, it can simultaneously make a map while figuring out where it is in the map,” Hoover explains.

Historically, robots have used a laser scanner to measure distances to landmarks. As the robot advances, it measures how much that scan moved and begins to piece a map together, which could work beautifully, except when it doesn't.

Certain environments lack features. Think of the straight homogenous hallways in a building's basement. To the robot, everything looks the same. Here's where leapfrogging comes in: Bedillion's and Hoover's approach transforms the robots themselves into landmarks.

“The idea sort of spawned from how civil engineers do surveying and for thousands of years, all the way dating back to the Egyptians, how others have surveyed,” Hoover says.

Upon entering a space, a stationary robot measures its relation to the others, and then measures again as the robots move. It, in turn, leapfrogs past those robots, and can thus begin to formulate a map.

Hoover says “the research has opened up a bunch of questions: localization accuracy, how we can integrate air and ground, and in the long-term how to go underwater in terms of submarines.”

Potential applications are extensive, ranging from search-and-rescue to helping forest fire fighters obtain valuable information in areas that pose grave risks. Bedillion and Hoover have also talked about the mitigation of pine beetle infestations and the creation of autonomous ground harvesters to increase yield—and industry interest has already been piqued.

However, as Hoover notes, the greatest satisfaction comes from the pursuit. “These are problems we've been trying to solve in the robotics community for a long time.” And when purpose meets potential, those powerful solutions make a safer world.
MOUNT RUSHMORE—With the reflective silence of rainfall against the backdrop of the nation’s monument to its leaders, Heather Wilson hesitates little when asked of her favorite presidents. Abraham Lincoln and Thomas Jefferson.

It’s easy to admire a man like Lincoln and the leadership qualities required to restore the union, she says, adding Jefferson was a Renaissance man who still inspires. “He was a remarkable human being, not only as a leader and the author of the Declaration of Independence but also as a musician, a scientist, an agronomist. It’s hard to believe that in that period so many remarkable leaders existed in these far-flung colonies on the edge of the Atlantic Ocean.”

Impressive in her own right, the new South Dakota School of Mines & Technology leader is making history, too. President Wilson, DPhil, is the first female president of the university, the first Rhodes Scholar, and the first to have served in Congress. She is the second Mines president to have graduated from a military institution— the US Air Force Academy, in the third class to include women. Named eighteenth president in April, replacing the late Robert A. Wharton, Wilson assumes the reins at a time when enrollment is on an upswing and research funding is a challenge.

She concedes her challenges are great but the potential even greater, with the expectations of students and staff equally high.

“Families are wondering if a college degree is worth it. Students are graduating with degrees costing them hundreds of thousands of dollars. But the School of Mines will lead the nation, providing a great education at a price families can afford,” Wilson says.

Educated at one of the world’s most prestigious institutions, Oxford University in England, Wilson comes across as grounded and unassuming. “I’m pretty down to earth, accessible, honest. I’m not a micro-manager but I’m very interested in what faculty and students are doing, and how staff and administrators are making progress.”

Her approach: let individuals focus on their areas of expertise while she focuses primarily on raising money and growing research.

“The amount of research has gone down here in recent years, and there are a few big projects that are not here anymore. I think we need to rebuild research in ways that students can engage in.

“There is always difficulty in balancing a professor’s time teaching and a professor’s time doing research that will push back the frontiers of knowledge, but we’ve got to increase the amount of research being done on this campus so that we can attract master’s and PhD students to this university,” said Wilson, explaining a three-pronged approach which includes leveraging the university’s unique core strengths and traditions such as its mining and metallurgical heritage, as well as pushing grant applications to organizations like the National Institutes of Health and National Science Foundation. “We’ve got to turn this corner and bring research back.”

One key component to increasing the university’s research stature, she believes, is capitalizing on the School of Mines’ geographic proximity and existing connections to the Sanford Underground Research Facility in Lead, which is conducting groundbreaking research in the pursuit of dark matter. “How can the university play a key role in the research that is being done there? It is a strategic asset for the nation, the world, and we need to be doing cutting-edge research and be part of it.”

She applauds enrollment growth over recent years and is eager to take on the Mines 2020 strategic initiatives that call for continued growth to 3,500 students within seven years. “It’s a nice problem to have because some schools are not growing … and that means we’ve got to stay ahead of growth so that the School of Mines has the resources and space it will need for the 21st century.”

Increased research and enrollment will bring other needs, such as new laboratory facilities, additional housing, and more faculty, all integral to sustained, healthy growth. All of this requires resources, and a significant amount of Wilson’s time will be spent on fundraising “so we can do the work that the community, state, and nation expect us to do.”

Though her schooling at Oxford focused on international relations, Wilson hasn’t strayed far from leading-edge science and research arenas. As a Congresswoman from New Mexico for ten years, she chaired a committee on technical and tactical intelligence which required stewarding some of the nation’s most advanced scientific research. After leaving Congress she owned her own consulting business, which immersed her in the research affairs of Sandia, Los Alamos, Oak Ridge, the Nevada Test Site, Battelle Memorial Institute, and other top-tier national laboratories.

Perhaps not an agronomist, but, like Jefferson, Wilson is a scholar, national leader, and musician (she grew up with the tenor saxophone and plays the banjo) with her own scientific ties. “I’m very glad to be here to bring my life experience to the leadership of the university. Colleges and universities need different things at different times, and I think some of the gifts I have for strategic leadership, working very closely in my career with scientists and engineers, and fundraising can be very helpful.”

Get social with President Heather Wilson on Twitter @HeatherAnWilson

A New Era
Q: There are those who may think of you as a politician, for better or worse. How do you respond, and what is your approach to bringing people aboard?
A: I’ve done a lot of things in life, and I am a part of all that I have met and have done. I was in the third class of women to graduate from the Air Force Academy. I attended Oxford, was in Congress, administered a large state agency, and now I’m very glad to be here to bring that life experience to the leadership of the university. Colleges and universities need different things at different times; and I think some of the gifts I have for strategic leadership, for working very closely in my career with scientists and engineers can be very helpful to the university.

Q: How has your work as a senior advisor to top-tier national laboratories such as Sandia, Los Alamos, Oak Ridge, the Nevada Test Site, Battelle Memorial Institute, and others helped prepare you for the School of Mines?
A: Throughout my career I’ve worked with scientists and engineers. I have often been the person able to understand what science is being done and explain why it matters to people who are not scientists and engineers. At a more strategic level, in addition to working with the national laboratories, I also chaired a committee in Congress responsible for stewarding technical and tactical intelligence, which includes some of the most advanced scientific research in our country. My job was to understand the long-term needs of the nation and steward research to meet those challenges. I look forward to doing that here at the School of Mines.

Q: You and the Regents both have talked about the importance of fundraising. Can you elaborate on your plan regarding this?
A: A significant amount of my time will be spent on fundraising. We need to make sure we have the resources from the state, from private donors, from people sponsoring research so we can expand the student body and do the work that the community, state, and nation expect us to do. Our alumni are a wonderful resource for this university. They know that Mines changes lives. In addition there is a large cross-section of companies that come here to recruit our students. That tells us that industry values what we’re doing here. They do they need to be asked to help support the school, and I think there is a willingness to support our mission.

Q: What School of Mines traditions have you heard about that you are most looking forward to?
A: I’ve heard some good things about M Week and the camaraderie that’s built, hiking “M” hill and those sorts of things. I think you’ll have to ask me after the first year.

Q: What is something about yourself that might surprise people?
A: Lots of things! My husband and I love musical theater. I rode a unicycle as a kid. I rowed for Oxford against Cambridge and continued to row until I moved to New Mexico where there is not enough water! I’m serious about my work, but I don’t take myself too seriously. Laughter makes a lot of stressful situations easier to deal with. Life is full of reasons for joy and gratitude.
Nearly 270 students crossed the threshold to become proud Hardrocker alumni during the South Dakota School of Mines & Technology 167th spring commencement held in May at the Rushmore Plaza Civic Center Ice Arena.

Candidates received their Associate of Arts, Bachelor of Science, Master of Science, and Doctor of Philosophy degrees.

South Dakota Gov. Dennis M. Daugaard delivered the commencement address, providing inspiration to students and insights to his career in politics, financial services, the nonprofit sector, and law. Prior to becoming South Dakota’s thirty-second governor, Daugaard served as South Dakota’s lieutenant governor from 2002 to 2010 and as a state legislator from 1996 to 2001. He received a bachelor’s degree in government from the University of South Dakota in 1975 and a law degree from Northwestern University in Chicago in 1978.

Carlos A. Beatty, Jr., (IEEM13) delivered the senior class message. Beatty was an active member on the Mines campus and in the local community and was inducted into the prestigious School of Mines Leadership Hall of Fame. Following graduation, Beatty began his professional career as an operations associate engineer for Peabody Energy at the North Antelope Rochelle Mine in Gillette, Wyoming.

Vernon L. Bump (GeolE61) received the Guy E. March Medal award for his positive interaction with students, the institution, and alumni. He has been a highly active alumnus, serving two terms on the SDSM&T Alumni Association Board, from 1991 to 1994 and then again from 2003 to 2006, becoming a Lifetime Contributor to the Alumni Association in 2008. He has assisted in planning reunions, and has represented SDSM&T in presenting scholarships to Riggs High School students. He worked his entire career at the South Dakota Department of Transportation and remained there until his retirement in 2001 as chief geotechnical engineer. He received his professional engineering license in 1968 and was inducted into the South Dakota Transportation Hall of Honor in 2003.

In addition to Bump’s recognition, graduates from the class of 1963 celebrated their fifty-year anniversary.
**1930s**

**MEMORIALS**

Walter “Paul” P. Wells (ChE38)

**1940s**

Warren Finch (GeolE48) turned 88 on October 27, 2012. In 2012 he published his 165th uranium paper, titled “Uranium in the Northern Gulf Coast.” He concluded his scientist emeritus position in the USGS this year, which he started in 1948.

Doug Fuerstenau (MetE49) was recognized at the 2011 annual meeting of the National Academy of Engineering (NAE) as a 35-year member of the Academy. The NAE class of 2012 consisted of sixty-six new members and ten new foreign associates. Of the seventy-six persons inducted at the seventy-six persons inducted into NAE at the recent annual meeting in Washington, DC, were two former graduate students of Fuerstenau, receiving both their MS and PhD degrees under his supervision in the department of materials science and engineering at the University of California at Berkeley. Seven of Fuerstenau’s Berkeley PhD graduates have been elected to NAE, including Emeritus Professor Ken Han of SDSM&T. Doug and his late brother, Maurice Fuerstenau (GeolE55), were one of only four sets of brothers who were members of NAE.

Marvin Heck (CE48) and his wife, Dorothy, are now living in an assisted living apartment in Sioux Falls.

Marvin Petersen (Phys48) is enjoying life in Freedom Plaza but claims he is beginning to slow down. Carolyn suffered a stroke in March but is recovering nicely in a rehabilitation program.

Morry Tideman (CE49) claims that all is well in California. He took a trip back to Rapid City last summer with his brother in law and his sister, Mary Jo.

J. Keith Carriere (ME57) and wife, Phyllis, travelled in June to the Black Hills for a reunion gathering of Buffalo High School graduates of the 1950s.

Arling Christensen (EE50) is retired and enjoying life.

John Anderson, Jr. (GenE53) claims that San Diego, California, is as good as it gets for him and Frances, so they decided to stay. They just sold their home after forty-three years and moved into a retirement home with all the bells and whistles in Paradise Village.

Bob Annett (ME56) emailed that his wife, Linda, died of lung cancer last year. She made their home the center of the family universe, and they miss her. They met at General Electric in Schenectady, New York, and were married in 1961. After living all over the US for twenty-plus years, they landed in San Diego in 1980. “Great place to land!”

Eugene Bradshaw (ChE59) sadly lost his wife, Barbara, in April 2012. He spends four months in the summer at his cottage on a lake near Seneca Falls, New York, and the rest of the year in Florida. He proclaims that it was a great advantage to have been able to attend college at SDSM&T.

Dale Bridenbaugh (ME53) claims that all is well in California. He took a trip back to Rapid City last summer with his brother in law and his sister, Mary Jo.

**1950s**

George Detlof (MinE53) retired after thirty years with Schlumberger, mostly in South Africa and the Middle East.

Al Dougal (CE50) lost his wife to a battle with Alzheimer’s on January 15 while living in a nursing home for the last three and a half years. Al is in Texas.

Paul Fenske (GeolE50) and his wife, Deloris, enjoy being with their grandchildren most in their senior years, including two granddaughters in California and two grandsons in Louisiana. The entire family is with them at Christmas and special birthdays.

Albert Gilles, Jr., (GeolE52) saw Kermit Kidner (EE60) at a Homestake meeting. He also recently visited with Myron Kidner (ChE50) on the telephone and visited Connie and Jim Brooks (M.S. Geol56) in Michigan last summer for a week.

Bruce Johnsen (CE59) is still consulting and enjoying it. He has taken his Navy buddy’s advice of “one vacation a month for the rest of his life.” It doesn’t have to cost anything and can be as simple as a day hike; just something special to look forward to each month.

Clark Johnson (ME59) is still working at his manufacturers’ representative company. He represents several manufacturers of commercial and industrial refrigeration equipment for the food and beverage industries. They are in their thirty-fourth year of operation in the states of California, Nevada, Arizona, and Utah.

Roger Kiel (GenE58) shared that he and Dolores continue to be blessed with good health. They exercise and eat the “right foods” most of the time, (at least Dolores does.) They try to go on a trip outside the US every year. They spend the summers on Keuka Lake in New York and the rest of the year in Sedona, Arizona. Activities include photography, US travel, and several civic boards.
of directors, including the Alumni Association Board, which gets him back to Rapid City a few times every year.

Alan Liffengren (ME57) enjoyed a Thanksgiving feast at the home of Jeri and Loren Henry (CE55) with their collection of kids and grandkids in November. All continues to go well in retirement. He and Karen are really enjoying the warmth and sunshine of the southwest.

Jon Marble (EE57) decided to downsize after thirty-seven years in the same house. They moved to a senior housing cooperative called Becketwood. Their phone and email remain the same.

Eugene Matteson (CE51) graduated sixty-two years ago, and it has been six years since he lost his wife, Mary. He has not seen campus in more than forty years but plans on visiting.

John Mohr (EE56) and Alice went to Alaska last summer to visit daughter Sara and family. They plan to visit family in Florida and California, as well. In July, they played badminton in the National Senior Games in Cleveland.

Delmar Motycka (MinE51) has been retired since 1992. He says it is the best job he’s ever had.

Roger Rasmussen (ChE58) was reflecting on his college and professional career recently and came to realize how much one person can affect another’s life. He was in the Army in 1944-1955 and was assigned to the 1st Calvary Division in Japan. He was looking forward to resuming his college career but didn’t know where to apply. He wanted a degree in chemical engineering, and being from Wyoming he knew he would have to go out of state. One of his friends in the Army, Leon Estes (GeoE53) suggested that he contact the School of Mines. He never looked at another school, and the rest is history. He claims it was the best decision he made in life, and he owes it all to another alumnus.

Reuben Rieger (EE58) and wife, Marilyn, are still enjoying retirement in North Carolina. Marilyn suffered a severe stroke in September and was in hospital rehabilitation for sixty days. She is recovering with therapy at home now and all is progressing as well as can be expected.

Donald Schlegel (EE56) and Carol moved to a retirement facility in March and they are busy and enjoying it a great deal. They have a view of the mountains and enjoy the small town atmosphere.

Lowery Smith (GeoE51) brought a grandson to Rapid City in September to show him around. They shared that he had a good time. During their visit they saw Dean Pete (GeoE50) and Bob Schwartz (ME57) and watched a Mines football game.

Robert Smith (EE54) shared that for him turning eighty stinks. He had a rough year with health issues and struggled in July last year.

Leroy Solid (ME59) is enjoying retirement on the Space Coast of Florida. He continues doing consulting work on various aerospace projects. He just finished assisting an interesting project to recover Apollo 11 (first moonwalkers) rocket engines from the Atlantic.

Robert Tagtow (Phys57) just celebrated with wife, Virginia, their fifty-fourth wedding anniversary. He recently enjoyed talking to Earl Wayne Koneche (CE56). He shares that all is well in Austin, Texas.

Stuart Ulfers (EE58) is still enjoying retirement with Frances. He reports that their health remains good. They keep busy volunteering.

Richard Warder (ME58) retired in July 2012 after eighteen years as dean at the University of Memphis. Consulting and engineering accreditation has become nearly a full-time enterprise, but it is great for him to learn about other educational programs, both in the US and internationally.

Ren Whitaker (ChE59) tells that he and Bev are living healthy at Shell Point Total Life Care Community in Fort Meyers, Florida.

Wayne Wilcox (GenE58) is still reviewing and writing fluid power and fastener standards for ASME, SAE and US TAG for ISO TC 131.

Alden Wilson (EE56) is living in and enjoying the English countryside.

Ward Zimmerman (ME50) sadly reports that he lost his partner, friend, lover, and wife a little over a year ago. He discovered that when she was alive, she definitely was not retired due to all the cooking, house cleaning and laundry, and much more. He did not realize how difficult it all can be. He has a message to all the younger married men. “Appreciate your wife while you can!”

MEMORIALS

Arthur A. Anderson (EE50)

George E. Baumann (CE53)

Earl J. Cox (GeoE51)

Wayne F. Echelberger (CE56)

Virgil R. Friebel (MetE59)

Harold L. Fitzsche (ME51)

Robert W. Heirigs (CE56)

Robert E. Johnson (CE54)

Jack W. Lehecka (CE50)

Kenneth L. Leiter (MetE55)

Robert L. Olson (GenE56)

Sheridan W. Tift (GeoE52)
1960s

Warren Barnum (CE61) updates that life goes on. There are no changes to report other than they get a bit slower as the years pass.

James Clement (ME69) and Margaret are currently living in Iowa with their daughters. They have one son and family in Wisconsin, and the other son and family are about to make a move from Guam to Virginia.

James Cox (ME69) is still working about sixty hours a week and having a great time. He and Betty pack a lot into each day. Chuck (ME00) and Tara plus two kids live in Olathe, Kansas; and Garrett has one year remaining of a five-year residency program in Springfield, Illinois. They manage to get together on a regular basis. He enjoys flying with all the high-tech devices. They just bought a motorhome in February.

Thomas Crooks (GeolE66) and wife, Treva, started another farming business raising specialty garlic. Christmas orders started to come in September. Life is good in Oregon.

James Crouch (MinE68) is the vice president at Strathmore Minerals Corp. in Riverton, Wyoming. He shared that part of the Strathmore team is Kasey Jones (CE02). Kasey has been working with Strathmore in geotechnical work on leach pads for a new proposed uranium recovery facility in Gas Hills.

Alan Freiberg (ME68) recently flew his airplane to Oklahoma City to visit his son, Trent, and family. They have finally returned to the US after spending the past seven years in Shanghai, China. He was president of the Asia Pacific division of Chalise Corp. He is now president of the Oklahoma City division.

William Green (CE61) has moved again. He is still in sunny California, near one of his daughters, Kristi, and three grandchildren. He and Kay are living in Paradise Valley Estates in Fairfield, California. They have a great view of 400-year-old trees and gently rolling hills. In two hours or less they can be with their grandkids or in San Francisco, the ocean, Napa Valley, or the Sierra Nevada mountains.

James Gross (ChE64) retired five years ago, but to him it seems like just yesterday. He recently had another US patent issued, his forty-fourth.

Ross Grunwald (Geol64) has been managing a copper exploration project on the Keweenaw Peninsula of northern Michigan for the past two years. He and Barbara are living temporarily in the home where she grew up in Calumet, Michigan. They do miss their home in sunny California. They received 311 inches of snow this past winter! He is looking forward to retiring someday.

M.R. Hansen (CE69) retired on June 21 after forty-three years of service in the civil engineering profession, nine years working and thirty-four years teaching.

Larry Hieb (Math68) sadly shares that his sister, Mary Jane Hieb (Math76), passed away on May 9, 2012, after a two-year battle with cancer.

Richard Howard (ChE64) and Carol have found that being a part of the lives of their fourteen grandchildren and one great grandson is pretty awesome, especially when they are scattered from South Dakota to Arizona to Alaska. Howard still works during the legislative session as a lobbyist for the South Dakota Association of Towns and Townships.

Andrew Johnson (MetE64) continues to enjoy their “snow bird” lifestyle, migrating between Phoenix and Cincinnati. Their primary focus in Arizona is their granddaughter Anna who just turned three. He consults for a Fortune 500 company but is winding down.

Gary Johnson (Geol63) continues to publish research results on Permian Age vertebrate fossils from Texas.

Joseph Lippert (Chem66) is a tonsil cancer survivor.

Thomas Lutz (Math60) made significant contributions to medicine, aviation, and psychiatry as an applied scientist with IBM with his degree in mathematics from SDSM&T. He served as CIO at the Mayo Clinic and led the development of the MBA in information systems management at Baylor University. During his fifty-year professional life, Tom has succeeded through five career changes; scientist, business leader, educator, consultant, and author. He has penned three books, Navigating Your Change Mazes, A Taste of Christmas Past, and A Taste of Freedom – Adventures of a Small Town Boy. For the last thirty years, Tom has headed Lutz Group International, a consulting firm that helps senior managers and church leaders around the globe lead constructive change in today’s chaotic world. Tom and his wife of fifty-five years, Cheke, have two living children and nine grandchildren. They have led executive forums across the US and he has lectured in the US, Europe, Africa, Australia, and Asia. He earned a master’s degree in operations research from New York University.

Charles Marks (CE66) still has the original text book from chemistry. It is Systematic General Chemistry. He is willing to send it to any Mines alumni who would like to have his copy.
Eugene McKay (MetE66) and Pat continue to enjoy retirement in south central Pennsylvania. With family and friends scattered from coast to coast, they enjoy seeing folks when they travel. They had a ball in 2011 with both a family reunion in Custer State Park and his high school reunion. He said 2012 was a bit slower, but 2013 so far has been fun-filled, including a trip to Las Vegas in January and Hilton Head in February.

Terrence Myers (EE60) is still enjoying working part-time.

Marvin Olson (ME69) retired in the fall of 2011 after nearly forty years with Battelle, Pacific Northwest Laboratory in Richland, Washington, where he will continue to live. He and his wife have traveled some and have been to Europe and India so far. Their two grandkids are in Spokane, Washington, with their oldest daughter, and their other daughters are in Portland and San Diego. They are happy to have family on the West Coast now.

Carol Reed (Geol66) is enjoying retirement in Rapid City. She works part time for the Minnilusa Pioneer Museum at the Journey Museum. She recently received the title of curator/archivist for the Minnilusa. Carol’s son Marcus Schock (ChE92) is an alumnus, and she has another son who graduated in ChE from the University of Missouri Rolla. Carol lived in Bismarck, North Dakota, for thirty-five years and worked for twenty years as an engineering geologist for the Bureau of Reclamation and the US Soil Conservation Service, and then twelve years as a Civil Rights Manager for the USDA. During that time, she earned her MS in Public Administration from UND.

Herbert Reichert (Math66) has a new grandson born to his daughter on September 7, 2012, in St. Cloud, Minnesota. This was his daughter’s first child. Herb now has four grandsons and two granddaughters, all of whom live in the Twin cities.

Howard Riewe (Phys63) retired when the economy took a downturn in 2009. One of his current projects is to educate people with health issues on how to use alternative health methods. Another project is a study to achieve sixty mpg with his automobiles through the utilization of hydrogen/oxygen from the electrolysis of water.

Phil Severance (EE63) retired from Zebra Technologies in 2006. His daughter and family, including two grandchildren, live in Austin, Texas.

Tom Snyder (ME62) has a son, Jon Snyder, who is currently running for a second four-year term on the Spokane, Washington, City Council. He and wife, Diane, have eight grandchildren in their combined families after twenty-six years of marriage.

Marlyn Stubble (Chem68) was diagnosed with Parkinson's in 2005. He did some research on the effects of nicotine upon his symptoms. He published a report in 2012 and has been using nicotine for more than two years to manage his symptoms. A few months ago, he saw on television that the Michael J. Fox Foundation was researching nicotine to reduce the severity of Parkinson's. In his case, nicotine is effective in controlling tremors.

Tim Taylor (Chem63) sent a thank you note for ‘rolling it out’ for the Class of 1963. He was truly impressed by the splendid activities and the respect that was shown to those who attended. The commencement was especially touching for him. He said everything was perfect. Those who did not come missed the experience of a lifetime.

Roger Toulouse (ME63) spent three months in Sarasota, Florida, which he has done for several winters now. They have three grandsons which has been a superb experience for them. Their youngest daughter is a student in orthodontics at the University of Minnesota. Their oldest daughter is a dermatologist in Austin, Texas.

Krishnakant Vernenkar (M.S. MetE64) is in the process of retirement, possibly by the end of this year. He is grateful to have his master’s degree from SDSM&T and has done very well with his background and experience throughout his career.

John Wagner (ChE69) retired after nearly forty-four years with 3M. He and Vera have purchased a second home in Greenville, South Carolina, and they will be transitioning there this summer and fall. Their new home is about six miles from their daughter’s home, so they will get to spend more time with her.

MEMORIALS

Gerald D. Kinsley (ME69)

1970s

Kathy Ammon (Math70) is now pursuing her passion in real estate and loving every minute of it. Arizona is rebounding so it is a great time to be in the business.

Steven Birnbaum (ME74) retired from John Deere in September 2009 after thirty-four years of service. He and his wife, Peggy, went on a two-week trip through Michigan and Wisconsin and have enjoyed traveling ever since. He has three grandchildren and one more due in March. They travel three hours to see them about once a month.
Larry Bottolfson (CE70) retired from Salt River Project in Phoenix on November 2, 2012, after twenty-eight years of service. For the last eight years he was manager of Hydro Generation and was responsible for operation and maintenance of seven dams, including eight hydroelectric units, three low head hydro units and one landfill gas generating plant. He and Nita look forward to traveling, enjoying hobbies, and spending time with family and friends.

Dan Colgan (CE74) retired from Ellsworth Air Force Base in August, 2012, after twenty-five years as construction manager.

Jeffrey Dietz (CE72) celebrated forty years with CB&I Inc. in May.

Robert Erdmann (CE74) decided to retire when the opportunity presented itself. He has some vision issues due to glaucoma, and foot, leg, and hip problems due to skiing and playing rugby when he lived in Germany. He still has two girls in high school, one daughter at Southeast Technical Institute in Sioux Falls, and one daughter graduating from SDSU in May, as well as, one son pursuing a mining engineering degree at SDSM&T. He also has a foster son in medical school in Missouri. They are still living on the north shore of Enemy Swim Lake, and visitors are welcome.

Greg Farke (EE71) has been retired from Charles Mix Electric for nearly two years now and is enjoying it. They still live on the farm but are empty nesters. Their youngest son will graduate from Mines in 2014 (the third one to graduate). He spends a lot of time in his workshop doing woodworking projects and operating the ham radio. He helps friends and neighbors when they need help with farming. He planted a small vineyard four years ago and should have some wine samples in another year. Wine and beer-making are great hobbies in retirement. The tasting room is always open.

Karl Gerdes (ChE71) is easing toward retirement, after thirty-five years with Chevron, by working part time now.

Robert Heier (ME73) sends greeting from Akaska, South Dakota. He and Madonna are South Dakota residents for a while. They sold their home in Louisiana but hope to return there for winters since they are Saints season tickets holders.

John Hendrikson (ChE70) retired in April 2011 to a home on Lake Movil, which is just north of Bemidji, Minnesota. He built a retirement home there six miles north of town.

David Knox (ME75) remains in Saudi Arabia. He and his wife are proud grandparents for a second time. Grandson Kai Skytland joined big brother, Asher, last July.

Leslie McNeely (EE70) and Judy are winter snowbirds in Mesa, Arizona, and summer water birds at Mille Lacs Lake in Minnesota. Their four children have provided them with twelve grandchildren.

Clair Menning (CE73) is one year into a two-year assignment in southern Malaysia designing and building a 20,000 ton oil and gas production and injection platform. He is taking this opportunity to travel throughout Southeast Asia.

Roy Pulfrey (CE76) wrote that his daughter, Laura, graduated from SDSU in May with a degree in nursing. She will be working at the Sanford Hospital in Sioux Falls.

Vasudevan Rajaram (MinE72) said the marriage ceremony of his daughter went well at the Chicago History Museum. She and her husband are in Santa Monica, California. He is busy with part time engineering consulting and non-profit work in Chicago.

Darles Scheibe (CE76) now has grandchild number two from son, Nathan, and his wife, Lisa.

Tary Schumacher (ME72) retired from Dow in late 2009. He spent 2010 and 2011 taking care of three grandchildren while his disabled veteran son completed his MBA. His son joined a consulting firm after he graduated. All four of their children and six grandchildren (almost seven) live within four miles, so they do a lot of babysitting and swimming in their pool almost every weekend. “We are blessed!”

From left: Gary, Jeanne, Linda and Larry

Larry Pearson (ME72) emailed that Jeanne and Gary Callahan (ME70) joined Larry and Linda on a trip to Calexico, California, to visit the construction of Tenaska’s 130 MW CSolar South solar photovoltaic generating station. It was a great time to get together to see the status of the project construction, learn more about solar photovoltaic power generation, see the US Border Patrol at work, and visit with old friends.
David Shaddrick (Geol71) is still consulting and is based in Reno, Nevada. He sees many SDSM&T alumni at various places around the world.

Brett Stenson (MinE79) got his master's degree in 2012 and recently sold his business, Wool ‘N’ Stuff. He is now working at the Waste Isolation Pilot Plant in Carlsbad, New Mexico, as a consulting engineer with Sandia National Labs and Nuclear Waste Partnership. His oldest son, Sean (GeolE07), works for Barrick Gold’s Cortez Mine in Elko, Nevada. His youngest son, Seth, will attend SDSM&T in the fall.

Leo Van Sambeek (MinE72) just passed his fortieth anniversary at RESPEC. He plans to work until it’s no longer fun. He is the “old man” in seniority now at RESPEC.

Dale Westendorf (ChE71) and wife Gail are enjoying the weather and hospitality in Texas hill country. He and Gail have three grandchildren – all girls, all Texas born. Two are now living in the Pittsburgh, Pennsylvania, area.

Ronald Wiest (ME73) took the opportunity to get back into the gas industry after twenty-three years with the Minnesota Office of Pipeline Safety as regulator. He retired during the July 2011 Minnesota state budget shutdown and started working for Xcel Energy on August 1, 2011. He and Cinda celebrated their fortieth wedding anniversary in February.

Their four grandchildren are nearby and are a joy in their lives. He has a well-equipped and stocked woodworking shop for any project. His most recent purchase of a CAN AM Spyder RT-S infringes on shop time.

Michael Yeh (M.S. Mtro76) wasn’t able to receive his Distinguished Alumni Award at December graduation on campus, so Ron Jeitz (CE69) and then-Acting President Duane Hrnčir, PhD, presented the award in person during a trip to Washington, DC. Congratulations again go to Michael on this award.

1980s

James Bier (CE84) continues to work for Wolverine Fire Protection Co. in Mt. Morris, Michigan. It has recently been awarded contracts for work at new nuclear power plants. He feels that the scholarships he received in 1982 and 1983 from the Institute of Nuclear Power Operators are finally being fulfilled.

Michael Britton (GeolE82) and Cathy continue to enjoy Colorado Springs and its surroundings. Their older daughter, Erin, is a petroleum engineer with Unit Corporation in Tulsa, Oklahoma, and their younger daughter, Leanne, is an inpatient trainer at Epic Systems in Madison, Wisconsin. His wine cellar and humidor are full, and he invites guests to come visit to help free up some space in both.

Michael Yeh (M.S. Mtro76) moved his office from historic Union Station in “LoDo” to the heart of downtown after almost thirteen years in the same spot. He is

MEMORIALS

David J. Eatherton (ME72)
Mary Jane Hieb (Math76)
Donald R. Larson (ME70)
Donald C. Mickelson (ME73)

Press has published two of his novels, Toy Wars and An Eighty Percent Solution, and a book by another author. TANSTAAFL Press’ future plan includes publishing another three books in 2014 and five more in 2015. Tom plans to retire from high-tech at or near his thirty year mark and devote his energies to his wife, Colleen, and his writing.

David Grimm (ME85) works for Alliant Techsystems Inc., where he has been more than twenty-seven years. He also welcomed his first grandchild, Greta Renae Dressler, to the world in December.

Jeffery Johnson (EE86) shared that life is good. He now has three children ages five, two, and two. He has been married to Connie for ten years. He is an engineering manager of a department of fifty electrical substation engineers and designers. They are in good health, and he loves what he does and enjoys the challenges each day brings. He is thankful to Mines for giving him the tools to be in this place and time.

Bradley Jolliff (Geol85) was named the Scott Rudolph professor of Earth and Planetary Sciences at Washington University in St. Louis, Missouri.

James Ness (CE83) moved his office from historic Union Station in “LoDo” to the heart of downtown after almost thirteen years in the same spot. He is
The Hardrock

getting busier!

Ray Peterson (MetE80), technology director at Aleris International Inc., was recognized by The Minerals, Metals & Materials Society (TMS) with the Alexander Scott Distinguished Service Award for outstanding service in expanding TMS’s reach by working with other organizations and leadership in organizing multiple materials conferences. This award is typically presented for ten or more years of TMS service in one or more of the following areas: membership development, student chapters, education and professional affairs, or other Society-level activities. He was the 2009-2010 President of The Minerals, Metals and Materials Society, among other positions, and also serves as an Industrial Advisor to several Metallurgy/Materials Science Departments including SDSM&T.

Jacqueline Sargent (EE89) and Donald have relocated to Fort Collins, Colorado, where Jackie accepted the position of general manager/CEO for Platte River Power Authority. Platte River is a wholesale generation and transmission provider for the four owner municipalities of Fort Collins, Estes Park, Longmont, and Loveland. Ericka (CE04) continues to work for Bechtel and is currently stationed near Gladstone, Australia, working on an LNG terminal. Clark (ME06) and his wife, Jessica, are in Austin, Texas, where he works for Structural Integrity.

Randall Steenholdt (ME83) left Northwest Airlines in 2005 and merged his consulting company with STS Engineering Solutions. He is a partner and the vice president of engineering. The company supports approximately 85 percent of US regional carriers and 60 percent of US legacy carriers. The company also designs major aircraft modifications and STCs. It employs about 110 engineers.

Mark Wenckus (CE83) and his wife are busy with their plans to send their first child to college. Their two girls will be ready to go to college in about four years. His consulting business is now in its sixteenth year. He thanks God for SDSM&T.

MEMORIALS
Donald P. Martini (CE80)
David R. Ruth (MinE88)

1990s

Kjartan Haga (EE93) had a new grandson, Alexander, born to the family in February, 2012.

MEMORIALS
Penny J. Bristol (ChE92)

Gabrielle Brooks Hintgen

Libby and Greg Hintgen (EE99) welcomed Gabrielle Brooks Hintgen on February 13, 2013. She was six pounds, fifteen ounces, and her older sister, Clara, is calling her Coco.

Andrew Farke (Geol03) just celebrated the birth of his son, Samuel Joseph Farke. Life is treating his and his family good in southern California.

Michelle (ME01) and Dominic Miller (CSc00) welcomed a beautiful baby girl, Genevieve Linda Miller, into the world on January 7, 2013.

From left: Medical students Joy McClure (MetE07), Erika Toyoda (IS11), Kelsey Koch (Chem12), Chris Milnes (Phys11)

Joy McClure (MetE07) sent a picture of four SDSM&T alumni who are currently first-year medical students at Sanford School of Medicine in Vermillion. The picture was taken on the steps of the State Capitol in Pierre and was during a class trip that included volunteering at the Pierre Indian Learning Center and working with state legislators.
Mike Grave (ME09) emailed word of his winning crew’s victory at the 2012 “Bash to the Colonies” sailboat race held at Lewis and Clark Lake. Bash to the Colonies Sailboat Regatta is a “friendly competition” between sailing enthusiasts. Trophies are awarded, and it has developed into a weekend of sailing, fun, food, music, and entertainment. All proceeds go to Special Olympics South Dakota to help those with handicaps.

Lisa Schlink
Lisa Schlink (MetE04) has been awarded the prestigious national Outstanding Young Engineer Award by the Society for Mining, Metallurgy, and Exploration (SME), which recognizes significant contributions of a young individual within the mineral processing extractive discipline. In addition to her bachelor’s degree, Lisa earned her MS in materials engineering and science in 2007 from the School of Mines. Currently, she is chief engineer for Freeport-McMoRan Copper and Gold’s Water Treatment Test Facility, overseeing the commissioning and operation of three water treatment test plants.

Angela Glanzer (IS09) now has a new last name, Angela Mason. Angela and Tobin Mason, together with their children Aidan Noah and Logun James, united their lives through marriage on January 10, 2013, at Hisega Lodge in the Black Hills. Angela is an academic research associate with National American University in Rapid City. Tobin is a certified financial planner with Modern Woodmen of America in Rapid City.

Megan Harbour (CE07) recently switched companies. Her move from Kiewit to Zachry Construction Corp. now affords her to live with her husband who has worked for Zachry in Houston, Texas, for some time. While she is not sure when her next visit to campus will be she has fond memories of campus and of working in the Alumni Association office.

Jennifer Nelson Kemp (ME00) welcomed Benton Thomas Kemp in March 2011. He is an active and curious child, and probably doomed to be an engineer, too.

Sara (Hagie) Lee (ME08) married John Lee on October 27, 2012, and they are expecting their first child on September 1, 2013.

Amanda Prines-Ablay (IS08) welcomed a healthy baby boy in October, 2012.

Brandy (CE06) and Abe Kean (CEng03) welcomed a baby girl on Sunday, January 13, 2013. Clara Sue was eight pounds, six ounces.
1. Rapid City, South Dakota 34th Annual Alumni Weekend: Hardrocker Horsemen (l to r) Rick Wass (IS96), Al Baue (MinE82), Bruce Franzen (MinE82), Mike Mueller (ME85)

2. Rapid City, South Dakota 34th Annual Alumni Weekend: Hardrock Bowlers (l to r) Joe Corbett (GeolE82), Don Roby (CSc84), Lance Mriden (ME84), Chris Walla (MinE81)

3. Rapid City, South Dakota 34th Annual Alumni Weekend: Zero Year Reunion Gals (l to r) Carmen Adams (ChE75), Emily Machado (IS13), Brittney LaDue (IS13), Susan Banks (GeolE75), Mary Brass (CE77)
4. Rapid City, South Dakota 34th Annual Alumni Weekend: Zero Year Reunion Guys (l to r) **Abe Kean (CEng03), Brad Johnson (EE92), Keith Mutchler (ME71), Eban Nordahl (MEM13), Richard Handoko (MEM13), Ron Jeitz (CE69)**

5. Rapid City, South Dakota 34th Annual Alumni Weekend: Alumni Recognition Dinner, 2013 Alumni President **Keith Mutchler (ME71)**

6. Rapid City, South Dakota 34th Annual Alumni Weekend: Alumni Recognition Dinner, 2013 Outstanding Recent Graduates (l to r) **Kyle Garstang (IE02), Jason Lamont (CSc02), Erin Landguth (Math02), Scott Larson (EE02), Dana Sander (ME02), Simon Zulu (MinE02); (Not pictured) Lori Groven (ChE02), Casey Jeffery (CEng02), Derek Rebsom (MetE02), Patrick Schwickerath (CE02)**

7. Pierre, South Dakota 18th Annual Tailgate Party: Frosh and Seniors (l to r) **Jeremy Pirner (ME12), Clyde Jundt (CE57), Wally Larsen (MinE53), Matt Johnson (CE12)**
8. Pierre, South Dakota 18th Annual Tailgate Party: (l to r) **John Childs** (CE92), **Jeanne Goodman** (GeoE79) and **Mike Perkovich** (MinE83)

9. Pierre, South Dakota 18th Annual Tailgate Party: Cooking Contest Winners (front row, l to r) **Hannah Albertus** (CE07), **Dustin Witt** (CEng05), **Paul Oien** (CE99); (back row, l to r) **Chris Jundt** (CE85), **Mike Perkovich** (MinE83), **Dale Healey** (IE06), **John Childs** (CE92), **Brian Gustafson** (GeoE81)


11. Pierre, South Dakota 18th Annual Tailgate Party: Extra Curricular Crew (l to r) **Steve Pirner** (CE72), **Tim Vottero** (Chem84), **Dale Healey** (IE06), **Paul Gnirk** (MinE59)

13. Atlanta, Georgia Alumni and Friends Dinner: (front row, l to r) Ken Graves (ChE72), Keith Mutchler (ME71), Del Gran (EE66), Dan Williams (ME66), Sherry Mutchler; (back row, l to r) Mike Weber (ME85), Silke and Scott Talsma (CSc98, IS98), Rod Sudbeck (CE79), Paige Hilton (ChE95), Sue Sudbeck (CE79), Patrick Carver (MetE94), Jennifer Carver, Jean Jeitz, Bill Jones (IE96), Snow Williams, Cammi Jones, Ron Jeitz (CE69)

14. Casper, Wyoming: Dynamic Duo John Dolan (M.S. GeolE77) and Mark Opitz (CE74)

15. Casper, Wyoming: Alumni and friends group photo

16. Denver, Colorado: Happy Hour attendees (l to r) Jan and Delmar Rumph (GeolE68), Monica Leonard (Math87), Abe Kean (CEng02), Rick Kiel (GeolE79), Tim Vottero (Chem84), Pete Aberle (GeolE61); (not pictured) Dave Shaddrick (M.S. Geol71)
17. Colorado Springs, Colorado: Happy Hour attendees (l to r) Marcia Peacore, **Steve Hinman** (EE78), **Steve Horner** (CE97), **Mario Dipasquale** (CE02), **George Peacore** (ME60), **Dale Koepp** (Math72)

18. Denver, Colorado: SME Alumni and Friends Past Alumni Presidents **Jack Goth** (MetE50) and **Ralph Wagner** (CE75)

19. Denver, Colorado: SME Alumni and Friends Past Alumni President **Doug Aldrich** (ChE62) with **Kurt O’Bryan** (MetE82)

20. Denver, Colorado: SME Alumni and Friends Social (l to r) **Barbara Nielsen** (GeolE85), **Ralph Wagner** (CE75), Molly Gribb (CEE department head)

21. Midland, Michigan: Spring Family Picnic (front row, l to r) Emily Bobby and **Travis Hoon** (ChE12); **Brandon** (CSc95) and **Tracy Johnson** (ChE97) with children Nathan and Katie; **Dan** (CSc00) and **Erin Lacher** (ChE01) with children Emily, Norah, and Julia; **Paul Adam** (ChE94), and Ruth Adam with children Katie, Tyler, William, Isaac, and John; Jon and **Anne Putnam** (ChE05) with children Alivia and Larson; (back row, l to r) **Tyler Swenson** (ChE10), **Wyatt** (ME11) and **MacKenzie Stangohr** (ChE11), **Jeff Fox** (ChE78), **Paul Vammer** (ChE83), **Dan Wynia** (ChE96), **Will Baker** (ChE09) and Mary Baker, **Timothy Luchini** (ME11) with Kayla Boespflug; (not pictured) **Evan Waddell** (ChE10)
22. Minneapolis, Minnesota: IEEM Alumni Gathering (l to r) Pete Goede (IE03), Nicole Stengle (IE03), Charlie Murray (IE03), Carter Kerk (IE professor)

23. Minneapolis, Minnesota: IEEM Alumni Gathering (l to r) Jena and Kyle Storm (IE05) holding Dylan Storm, Scott Beck (IS02), Alison Baue (IE12), Nicole Stengle (IE03), Kristine Larsen (IE10), Pete Goede (IE03), Brett Larson, Carter Kerk (IE professor)


25. Rapid City, South Dakota: Alumni attending Don Thorson’s 90th birthday gathering (seated) Don Thorson (CE44); (standing, l to r) Paul Gnirk (MinE59), LeRoy Draine (GeolE69), Lloyd Darnall CE44), Tim Vottero (Chem84), Mely Rahn (CE82), Joe Jagodzinski (CE75); (not pictured) Jerry Brown (CE65) and Ken May (CE61)

26. Rapid City, South Dakota: Class of 1963 Reunion Alumni at Grubby statue

27. Rapid City, South Dakota: Class of 1963 Reunion Alumni and guests in CAMP Lab
28. Rapid City, South Dakota: Class of 1963 Reunion attendees (l to r) Chuck Meyer (ME64), Charles Snyder (ME63), and Lucille Reilly with Dan Dolan (ME professor)

29. Rapid City, South Dakota: Class of 1963 Reunion attendee Mike Stensaas (ME63) with Department of Mechanical Engineering Head Mike Langerman (ME72)

30. Rapid City, South Dakota: Class of 1963 Reunion at commencement

31. Brandon, Florida: (l to r) Denny Cullen (ChE62), Russ Buyse (EE63) and Carolyn Buyse, Anna Cullen, Ron Jeitz (CE69)

32. Merritt Island, Florida: (front row, l to r) Royia Hrncir, Lisa (Tysdal guest), Bev Krier, Jean Jeitz, Mary Brass (CE77); (back row, l to r) Duance Hrncir (SDSM&T Provost and Vice President), Monte Krier (ChE72), Jim Kotas (EE68), Steve Miller (EE69), Tony Tysdal (Chem61), Mike Selzer (EE74), Lee Solid (ME59), Craig Jacobson (EE82) and Susan, Lorin Brass (MetE75), Scott Vangen (EE82)
The proof is in the numbers

$653,000
in athletic scholarships for 2012-2013

2.91
The grade point average of a typical Mines student athlete

13
The number of sports teams at the School of Mines

14.513
The average credit-hour course load attempted by Mines athletes

53.8
The percentage of Hardrocker teams that averaged a GPA of 3.0 or higher

3,714.75
The number of community service hours Hardrocker athletes volunteered in the 2012-2013 academic school year (the goal was 2,500)

295
The number of Hardrocker student athletes

18
The number of student athletes who earned a perfect 4.0 grade point average

21
number of home states of student athletes