South Dakota School of Mines Gears Up for Fall Semester

The South Dakota School of Mines & Technology is welcoming students to campus as the 2016-2017 academic year kicks off with a new residence hall, academic programs and other campus improvements awaiting students.

Hundreds of new freshmen also participated in the fourth-annual Day of Service, deployed in groups on campus and throughout Rapid City and Black Hills locations for service projects. In all, new freshmen gave about 1,500 hours of community service before they sat down for their first Mines class.

The School of Mines campus was busy with a number of construction projects over the summer. Among the new improvements:

- Placer Hall, a new residence hall for 202 students at Maple and East Saint Joseph streets – The 51-unit apartment building was built by the School of Mines Foundation.
- The Department of Industrial Engineering returns to campus – After several years off campus, the department has returned and is now located in the renovated garden level of Devereaux Library.
- New chemistry classrooms and laboratories – The Chemical & Biological Engineering/Chemistry Building has been undergoing a $6.5 million renovation which includes new teaching and research laboratories, classrooms, offices and a south-side façade.
- King Center renovations – New construction at the King Center includes a facelift for the north entry and additional athletics offices on the north side of the building.
- Outdoor recreation and fitness equipment and covered bike racks at the March/Dake Plaza near the Grubby statue.
- 400 mailboxes and an expanded mail center to accommodate a growing student population.
- 244 new seats in the main lecture hall of the Classroom Building.

New academic programs and initiatives that will be in full implementation this semester include:

- A Master of Engineering degree, which offers advanced engineering, applied management and leadership courses with an emphasis in civil and environmental engineering, electrical engineering and materials engineering and science. The degree is a professional management program aimed at working engineers with a combination of delivery methods that includes face-to-face instruction and hybrid and online courses.
- The first full year of the Pre-Health Pathways initiative announced last spring. This new initiative is designed to boost support for the increasing number of South Dakota Mines students entering medical school or advancing on to other types of professional health career programs.
- The Student Success Center, which is designed to augment students’ academic advisors and bolster academic success. To be offered are supplemental peer instructors, free tutoring from upperclass and graduate students, workshops on time management and learning strategies and a place for students to study.

On the cover: Computer science major Nathan Ducasse, from Hilo, Hawaii, interned with the U.S. Geological Survey at the Hawaiian Volcano Observatory on Kilauea volcano in Hawaii, writing code for the website and bringing instruments to the volcano caldera to measure the harmful gasses being released by the lava lake.
WELCOME WEEK
$200,000 Grant Supports Mines Research, Economic Development

SD Mines has been awarded a $200,000 grant to develop projects with a high potential for economic development in the state.

Over the past decade, SD Mines has been supporting efforts at the Sanford Underground Research Facility (SURF) in nearby Lead and building a strong expertise and infrastructure toward synthesis of high-value organic products from biomass.

The new grant will enhance existing projects, including two research endeavors at the Sanford Lab. Another project will expand on the university’s current success to commercialize a biomass liquefaction process.

Matching commitments and additional funding sources bring the total to $342,424, which will purchase essential scientific instrumentation.

“Enabling more research-based economic development is now a major issue for the state. We teach and impart knowledge to the next generation, but we also develop new knowledge through research that can spin off ideas for businesses and connect with places like the Sanford Lab,” said Heather Wilson, SD Mines president.

Projects to receive the new research and development funding:

• Development of a novel system reducing the radon concentration underground at the Sanford Lab, enabling future experiments in this facility. This project is being led by Richard Schnee, Ph.D., associate professor in the Department of Physics.

• Development of two low-background detectors that will provide new capabilities important not only for planned underground physics experiments but also for industrial applications, especially in semiconductor and nuclear security sectors. This project is being led by Juergen Reichenbacher, Ph.D., assistant professor in the Department of Physics.

• Selective liquefaction of lignin and biomass wastes, recently discovered at SD Mines. The quantity of available lignin and biomass wastes generated by the paper industry, bio-refineries and agricultural facilities every year exceeds hundreds of millions of tons. The new approach allows synthesis of high-value organic products in a continuous flow tubular reactor under supercritical carbon dioxide conditions. By using this new continuous flow reactor, this approach may become feasible for industrial applications. This project is being led by Alevtina Smirnova, Ph.D., assistant professor in the Department of Chemistry & Applied Biological Sciences.

“These research and development projects will provide unique training for students and attract external funding to secure continuous economic growth of the region,” according to Jan Puszynski, Ph.D., vice president for research at Mines and principal investigator of the grant. “SURF is an internationally recognized asset with the capacity to generate high-value research outcomes and applications that cut across all target industry sector markets.”
Phil Ahrenkiel, Ph.D., of the South Dakota School of Mines & Technology Nanoscience and Nanoengineering Program, has been awarded $179,000 through the U.S. Department of Energy SunShot Initiative to research next-generation solar cells.

Ahrenkiel, associate professor, will develop a novel approach to using earth-abundant and widely available metal aluminum to improve commercializable photovoltaic (PV) solar cells for low-cost renewable energy.

This research could lead to an expanded industrial presence in the United States for production of next-generation III-V solar cells, which use emerging nanoengineering approaches to enhance efficiencies and reduce manufacturing costs.

Current solar-cell technology can reach very high efficiencies by using many stacked, interconnected solar cells made with expensive semiconductor substrate material.

The ultimate goal of Ahrenkiel’s project is to boost the efficiency of single solar cells with optimal properties for converting sunlight into electricity, while lowering costs by depositing thin layers of cells on inexpensive aluminum substrates.

If the research is successful, it will lead to the fabrication of solar cells on thin, flexible and lightweight aluminum ribbons or sheets, which could be transferred to glass and integrated with residential or commercial buildings. This technology would be adaptable to a roll-to-roll semiconductor deposition process for mass production of inexpensive solar cells.

“Research like this can reduce the capital cost of solar energy – one of the barriers to wider use,” said Heather Wilson, president of South Dakota School of Mines & Technology.

The research will be performed using existing device-processing, electron-microscopy and optoelectronic-characterization capabilities available at the South Dakota School of Mines & Technology, which is partnering with the Rochester Institute of Technology and Lakewood Semiconductors on this project.

The SunShot Initiative works with academia, national laboratories, industry and government agencies to drive down the cost of solar electricity to $0.06 per kilowatt-hour or $1 per watt (not including incentives) by the end of the decade. The office’s photovoltaics research and development work aims to lower manufacturing costs, increase efficiency and performance and improve reliability of PV technologies.
More than 500 South Dakota School of Mines & Technology students spent the summer building their résumés through valuable work experiences with 240 employers in 39 states.

One of the key factors in the 98 percent job placement rate for South Dakota Mines graduates is its strong internship program, and this summer 510 students put their science, technology, engineering and math skills to work at companies big and small, earning an average $17.16 per hour.

Cargill was the top employer with 23 students in 12 states.

Of the internships, co-ops and paid research experiences, 199 were in South Dakota with 84 employers in 25 communities. The SD Department of Transportation hired the largest number of Mines students in the state, with 10, followed by Innovative Systems with nine and Trail King with six.

EchoStar was the top Colorado intern employer with five students, and Hutchinson Technology was the top Minnesota employer with six students.

Other top employers with numerous Mines interns were Nucor with 10 students, Rockwell Collins with 10 students and Bobcat with nine students.

Nearly 80 percent of Mines students have at least one internship on their résumé by the time they graduate, and many students have multiple paid work experiences in their field.

“Our internship program is second to none,” said Mines President Heather Wilson. “For employers, it is a chance to engage and assess talented young people. For our students, it is the kind of real-world experience that makes their classroom work come alive.”

Internships often lead to full-time job offers, and several Mines students have reported receiving standing offers from their employers for full-time positions upon graduation. SD Mines has consistently ranked among the top returns on investment in America due to its average starting salary of $63,500 for graduates with bachelor’s degree.

Mechanical engineering major Luke Malsom is among those who have already secured a standing job offer. Malsom, who will graduate in May, received an offer from his intern employer, Mettler Sichmeller Engineering of Aberdeen, a mechanical and electrical engineering consulting company.

During his summer internship, the Aberdeen native designed heating, cooling, ventilation, hydronics, radiation and plumbing systems on projects in the tri-state area ranging from nursing homes to libraries. Most of his time was dedicated to the multimillion dollar new Redfield School project.

Check out our gallery of Mines summer interns on Instagram at #SDMinesInternships or on our Flickr album.
The South Dakota School of Mines & Technology and Rapid City Area Schools are partnering on a new math initiative designed to engage more middle school students in math.

Under the new partnership, supported by the South Dakota Board of Regents for submission to the governor for possible inclusion in his FY18 budget, SD Mines would partner with Rapid City Area Schools to expand math activities in middle schools throughout South Dakota. The math partnership approved by the Regents is budgeted at $53,500.

“Middle school is when some students start to be turned off to math. But it can actually be a lot of fun. By working more closely with public schools, we think the enthusiasm of Mines students and faculty for math and science can have a positive impact on the next generation of South Dakota students,” said President Wilson.

Rapid City Area Schools Superintendent Dr. Lori Simon said, “We are so excited about the prospect to partner with the School of Mines & Technology and expand co-curricular math activities for our students. This is an incredible opportunity to engage our students in math and show them just how fun it can be!”

The partnership would employ a middle school math teacher during the summer and a School of Mines math faculty member part time to significantly expand the number of middle school students engaged in co-curricular math activities in South Dakota. SD Mines and the Rapid City Public Schools would:

- Collaborate with Technology and Innovation in Education (TIE) to develop extracurricular programs and supplemental materials that engage middle school students in mathematics.
- Help establish more middle school math clubs by supporting and training MATHCOUNTS coaches for a national math competition for students in middle school.
- Increase the number of middle school math competitions hosted at SD Mines from one a year to four.
- Enhance the West River Math Contest, an annual contest that attracts over 350 students in middle school and high school.
- Start a MathCircle that is focused on engaging middle school students in mathematics [http://www.mathcircles.org/](http://www.mathcircles.org/).
- Coordinate guest visits of mathematicians to local middle school classrooms.
- Coordinate mentors from the School of Mines student body for math research projects that feed into local science fairs.
- Develop workshops and provide additional participation opportunities in the American Mathematical Competitions.
- Support seminars and workshops on the William Lowell Putnam Mathematics Competition, a national collegiate competition.

Rapid City math teachers worked with SD Mines math faculty to develop the proposal.

Math is the basis for science and engineering careers, and in South Dakota about 17 percent of students in 7th through 12th grades have selected a personal learning plan connected to science, technology, engineering or math (STEM) jobs. At the national level, 28 percent of incoming college freshmen select a STEM major.

Once in college, however, the substantial math requirement is often cited as a primary reason for students dropping out of STEM majors.

If supported by the governor and the legislature, the project would start in the summer of 2017.
In preparation for the 2017 International Collegiate Programming Contest World Finals, known as the Olympics of computer science, the SD Mines Programming Team trained at the renowned Russian programming boot camp – the site that has trained the world champions for the past five years.

Few U.S. teams are invited to train at the boot camp, and the opportunity for the Mines team was made possible thanks to an anonymous donor. The team was challenged at a level it has not yet experienced in regional competitions, working 12 hours a day writing programs and learning algorithms. After a week and a half of rigorous instruction in Russia, the team returned, jumping into regular 15-hour-per-week practices.

“The benefit of sending a team to the Russian boot camp is that these students received the most advanced training in the world and brought those techniques and algorithms back to SD Mines where we can integrate them into our local training program and courses,” said programming coach Antonette Logar, Ph.D.

Her co-coach Larry Pyeatt, Ph.D., accompanied the six students on an adventure that sharpened their skills and broadened their perspectives. “Not only have I gained skills and experience that will help my education and career, but I experienced for the first time living in a culture overseas,” said team member Andrew Stelter.

Team members include junior computer science major Chris Navarro, Sammamish, Wash.; junior computer science Andrew Stelter, Mankato, Minn.; junior computer science major Micah Picasso, Sioux Falls; senior computer science and math major Bryon Glass, Rapid City; sophomore computer science and math major Matthew Schallenkamp, Brookings; and senior computer science and math major Matt Dyke, Hartford.

The Excellence in Computer Programming organization, led by former SD Mines President Richard Gowen, Ph.D., is hosting the World Finals in Rapid City May 20-25, 2017.
Mines Student Selected for NAGT-USGS Field Training Program

South Dakota School of Mines & Technology geology major Tait Earney, from Whitney, Neb., has been selected for the National Association of Geoscience Teachers-United States Geological Survey (NAGT-USGS) Cooperative Field Training Program, the longest continuously running internship program in the earth sciences. He has been working in Menlo Park, Calif., on geophysical investigations related to geothermal, mineral and water resources and to natural hazards in the western United States.

Over the past 50 years, more than 1,800 students have participated in this program nationwide, with a large number becoming fulltime employees of the USGS.

39 Hardrocker Scholar-Athletes Recognized for Academics

Thirty-nine South Dakota School of Mines & Technology scholar-athletes recently earned the D2 Athletic Directors Association (D2 ADA) 2015-16 Academic Achievement Award, an award that recognizes the academic accomplishments of student-athletes at the NCAA Div. II level.

In order for a student-athlete to receive an Academic Achievement Award, the student-athlete must have a cumulative grade point average of 3.5 or higher on a 4.0 scale; have attended a minimum of two years (four semesters) of college level work; and have been an active member of an intercollegiate team during his/her last academic year.

“What a tremendous accomplishment by these 39 Hardrocker scholar-athletes,” said SD Mines Athletic Director Joel Lueken. “I couldn’t be more proud of these young men and women. All 39 of these scholar-athletes exemplify what NCAA Div. II athletics is about.”

Local High School Students
Research Orthopedic Implants, Waterproof Paper & Friction Stir Welding at Mines

Holly Gerberding examines titanium nanotubes with the goal of modifying the surface of orthopedic implants to aid bone growth and prevent the need for revision surgeries.

Gabrielle Smith develops super-hydrophobic coatings for security printing applications, with the idea this waterproof paper could be used in passports.

Hawky Cummings works on friction stir welded high-strength steel for automotive applications.
Local high school students from Rapid City and Sturgis spent their summer immersed in research, collaborating with SD Mines graduate students and faculty on titanium biomedical implants; waterproof coatings for paper used in security printing; and friction stir welded high-strength steel for automotive applications.

Sponsored by the Army Education Outreach Program, SD Mines hosted the Research and Engineering Apprenticeship (REAP) program, which provides opportunities for high school students to conduct research for five to eight weeks.

“I have been involved with the program for five years and have been lucky to work with some very talented students. This summer’s students were outstanding!” said Program Director Michael West, Ph.D., who is also the head of the Department of Materials & Metallurgical Engineering.

Sturgis Brown High School senior Holly Gerberding developed titanium nanotubes with the goal of modifying the surface of orthopedic implants to aid bone growth and prevent the need for revision surgeries.

Her interest in Mines was piqued when she competed at the 2016 High Plains Regional Science Fair, hosted on campus, and placed second in the biology division. Gerberding’s project focused on the rising resistance to antibiotics. By separating the basic, neutral, and acidic compounds of tea tree oil to see which would inhibit the growth of Staph, Strept, or E. coli, she found the neutral compound stopped the growth of E. coli – a project she’s developing for this year’s science fair.

A sophomore at Central High School, Gabrielle Smith was a veteran of the Materials, Metallurgy, and Forensics summer camp at Mines when she joined the REAP program. During the apprenticeship, Smith worked to develop super-hydrophobic coatings for security printing applications, with the idea this waterproof paper could be used in passports.

With a future goal of pairing neurosurgery with a doctorate in biomedical engineering, Smith saw a natural extension of her lab research in patient care.

“I think when you’re taking research and technology from the lab to your patient’s bedside, you can definitely help them a lot more. If you could take this sort of concept in metallurgy, you could potentially create self-cleaning surgical tools,” Smith said, as super-hydrophobic coatings prevent mold, fight bacteria and self-clean from contamination by fingerprints and natural oils. She added the valuable experience and connections gained would give her a competitive edge in the college application process.

Stevens High School senior Hawky Cummings worked with shape memory alloys, which revert to their original shape when heated and allow for a more economical welding process. He also analyzed powder to be used in the laser processing of metals and samples for friction stir welding high-strength steel for automotive applications.

Mentors are a key component of the REAP program. Gerberding, Smith and Cummings were all paired with graduate students and professors who interfaced continually with the students, allowing them to observe, assist and be taught at the same time.

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Student mentors included biomedical engineering master’s student Jevin Meyerink; materials engineering and science doctorate students Lelia Sorkhi and Jacob Petersen, and civil and environmental engineering undergraduate Logan Gayton. Faculty mentors included Grant Crawford, William Cross, Jon Kellar and Bharat Jasthi, Ph.Ds. in the materials and metallurgical engineering department.

Around 120 students at over 50 universities nationwide participate in REAP each year. Up to 90 percent of REAP participants pursue science, technology, engineering, and math studies at the post-secondary level.
Even though they are out of season, the South Dakota School of Mines Men’s Basketball team is making news. The National Association of Basketball Coaches (NABC) recently announced its fourth annual Team Academic Excellence Awards.

The Hardrocker hoopsters received this award in recognition of outstanding academic achievement by a team. The requirement is a cumulative team GPA of 3.0 or better.

“SD Mines is an incredibly demanding institution off the court, and we have very high expectations on the court as well,” said Hardrocker men’s basketball head coach Jason Henry. “It is a wonderful accomplishment to have our team meet this standard.”

The NABC also recognized several SD Mines players on its 2015-16 NABC Honors Court. The following Hardrockers were awarded a spot on the NABC Honors Court:

Philip Schanilec, senior, civil engineering; Justin Schock, senior, mechanical engineering; Konor Kulas, junior, industrial engineering; Joe Newkirk, junior, mechanical engineering; and Marco Pascolo, junior, electrical engineering.

“I am extremely proud of the individuals who were recognized for this achievement,” said Coach Henry. “It is really an impressive feat to succeed in the classroom as they have while trying to balance a very demanding basketball schedule.”

To be eligible for this award a player must be in their junior or senior year, and have a GPA of 3.2 or better.

The South Dakota School of Mines & Technology held Hardrocker Night at Main Street Square and at the Central States Fair’s German Tent.

The first Hardrocker Night featured the band Crash Wagon, liquid nitrogen ice cream, a chemistry magic show and a variety of student-designed vehicles like the Formula race car. Student athletes and the university mascot Grubby interacted with families and distributed game schedules.

Hosted by the Rushmore German Club, the second Hardrocker Night featured German food, music and dancing at the Central States Fairground. The Society of Physics Students also competed in the pig wrestling contest at this year’s fair, which you can watch here.
Mines in the News

Mines Opens Its Doors to 400 Freshmen

RCAS and Mines Partner Up to Increase Interest in Math

Dr. Dreyer Talks the 10 SD Ballot Initiatives

Retired Rancher Focuses on Fossil Hunting, Opens Ranch to SD Mines Students

Girl Scouts of the Black Hills Celebrate 100 Years, Lauds Mines As STEM Centerpiece

Tinker, Hardrockers Set for a New Season

Placer Hall Helps SD Mines Keep Pace with Enrollment Growth

SD Mines Recognizes Campus Fire Safety Month

Innovation: Dr. Phil Ahrenkiel & Next-Generation Solar Cells

Sullivan Leads Hardrockers to Wild Win Over William Jewell

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