

South Dakota School of Mines & Technology

Legacy News

March 2014



SOUTH DAKOTA

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SCHOOL OF MINES
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Mines team lands nearly \$1M grant from Department of Defense to extract rare metals

A faculty team at the South Dakota School of Mines & Technology has been awarded \$999,998 in funding from the U.S. Department of Defense – Army Research Lab through a subaward from the University of Alabama.

Focusing on novel extraction technologies for rare earth ores, the research will use a multidisciplinary approach to develop new leaching and concentration techniques and strategies for recovery of rare earth metals. The School of Mines has a long tradition of research related to the metallurgy associated with mineral concentration and metal recovery.

Rare earth metals, derived from their ores, have been deemed critical to the nation's economy and defense. End uses for rare earth elements include applications in petroleum refining, cell phones, laptops, wind turbines, jet fighter engines, missile guidance systems, antimissile defense and hybrid vehicles.

For years, China has been the largest supplier of rare earth metals due to a generous supply of resources and economical extraction techniques. However, in recent years, China announced a halt in production of some of its major rare earth mines. This reduction in exports placed increased pressure on the global market to meet the explosive demand.

With fears of a shortage, mining, extracting and refining these rare earth metals became a top priority, even lending the resource a new moniker: critical strategic metals. Adding to the challenge is the difficulty of the extraction process. Many easy ores – ores where metal is readily visible – have already been processed, and as the grade of ore deteriorates, extraction technologies must become inversely advanced.

As of now, there is only one active source in the United States and four universities researching extraction techniques – the School of Mines among them.

"Mines is one of the few universities in the nation that still teaches and does research in extractive metallurgy – getting metals from rocks. The supplies of these rare metals are currently dominated by China, and, as a nation, we need to develop secure sources of supply in North America. Our researchers have made progress in this area already, and I'm glad we will continue to do so through the effort funded by the Defense Department," said Mines President Heather Wilson.

Faculty members involved at the School of Mines are Jon Kellar, Ph.D., Michael West, Ph.D., William Cross, Ph.D., Sadegh Safarzadeh, Ph.D., Kenneth Han, Ph.D., Department of Materials & Metallurgical Engineering, and David Boyles, Ph.D., Department of Chemistry & Applied Biological Sciences.

Hardrocker athletes outperform on and off the field



Balancing academic demands with team practices and competition schedules requires a deep commitment and desire, and Hardrocker student athletes continue to exceed expectations.

With an overall 2.943 grade point average in the fall semester, Hardrocker athletes outperformed the Mines student body as a whole. Additionally, each athletic team earned a higher grade point average than the overall student body, which earned a 2.734 GPA.

	ATHLETIC GPA	ALL STUDENT GPA
WOMEN	3.173	2.798
MEN	2.859	2.716
ALL	2.943	2.734

Best and brightest young scientific minds heading to Mines for March 21 fair



Erupting volcanoes? That's practically elementary compared to today's science fair entries. The public will get to see mini recreations of thermal wonders and more at the 59th annual High Plains Science Fair hosted by the School of Mines on Friday, March 21.

This year's projects presented by more than 250 middle and high school students from throughout western South Dakota and the Newcastle, Wyo., area tackles topics such as how to make aircraft invisible to radar and the microevolution of *Bacillus subtilis* in response to isopropanol stress.

Attracting the best and brightest young scientific minds, entries span all engineering disciplines, as well as the biological, physical and social sciences, according to Shawna Delaney, Youth Programs director.

Last year's fair attracted the likes of Conrad Farnsworth of Newcastle, Wyo., who went on to receive international attention for the nuclear fusion reactor he built in his parents' garage. Farnsworth, who won last year's fair, is believed to be just one of a handful of high school students in the world to have achieved nuclear fusion. Now an electrical engineering

major at the School of Mines, and with his reactor safely housed in a campus laboratory, Farnsworth is expanding his research horizons.

Farnsworth will speak about his experience with the Mines science fair and the Intel International Science and Engineering Fair (ISEF) at the afternoon award ceremony.

"The encouragement and support provided to all students by their parents and science teachers is crucial in developing the desire and skills to prepare a project for the fair. Behind the scenes, many of the SDSM&T faculty and staff are working hard to ensure that each year the science fair is a success and that all student participants have a unique experience that will inspire them to choose a profession in science or engineering for their future," said Donna Kliche, Ph.D., Mines' Institute of Atmospheric Sciences faculty member and co-chair of the science fair committee.

The stakes are high, with the overall winner in the senior division (high school) and his or her teacher receiving an all-expense paid trip to present their project at the international fair (ISEF) in Los Angeles in May. Additionally, an eighth through tenth grade student and

their teacher will be selected to travel to the ISEF and participate as a student observer.

Travel to the international fair for the senior winning team will be sponsored by the School of Mines, while travel for the student observer team will be sponsored by South Dakota EPSCoR. Both the senior winner and student observer will present their projects at the state EPSCoR conference in May.

Volunteer judges are being sought for the campus fair on March 21. Anyone interested in judging or volunteering to assist with set-up, student check-in and other needs may do so at www.sdsmt.edu/sciencefair. No prior judging experience is required, guides are provided to assist with judging.

The fair will be from 8 a.m.-4 p.m. in the Surbeck Center ballroom and King Center. The public is invited to view entries from 1:30-2:30 p.m. and attend the 2:30 p.m. award ceremony in the King Center.

In addition to the prizes offered for each category, students may also win special awards provided by many professional organizations.

E-Week 2014



Students host nearly 200 for regional industrial engineering conference

The South Dakota School of Mines & Technology will host the 2014 North Central Region 6 Student Conference for the Institute of Industrial Engineers (IIE), attracting nearly 200 people to the Black Hills.

Most of the 189 attendees are engineering students from universities in eight states. The conference will be Thursday, March 6, through Saturday, March 8.

In a unique kick-off event Thursday night, SDSM&T Industrial Engineering professor Carter Kerk, Ph.D., will lie between two beds of nails as a concrete block is crushed on his chest. The demonstration will illustrate some of the scientific principles underlying safety engineering.

The agenda also includes a Friday afternoon community service-oriented competition in which student teams design workstations and assemble pedal tractors in a timed event. Teams from 10 universities will compete in the Kaizen/manufacturing efficiency

competition, building tractors provided by Scale Models & Dyersville Die Cast. The competition finals will be held on Saturday evening, and all 10 tractors will be donated to Rapid City Youth and Family Services at the final banquet held at Mount Rushmore.

Most events will be held at the Alex Johnson Hotel in downtown Rapid City.

The School of Mines Department of Industrial Engineering is conference host and has organized Friday morning tours of Rapid City Regional Hospital, RPM and Associates, GCC Dakotah cement plant and Nash Finch Distributing Center.

Other conference events include a Student Paper Competition sponsored by John Deere and breakout sessions with industry speakers Anna Boyd of 3-M, Ben Mollman of Polaris, Dennis Oates of FedEx SmartPost, Paul Elder of Strider Bikes, and Dan Thury of Andersen Corporation.

"Breakout sessions provide a chance for industry professionals to connect with each student and provide insight to making that transition from student to professional," says Terry Nguyen, Mines senior industrial engineering major who is conference co-chair.

Mines' Roger Johnson, Ph.D., of the Department of Mathematics and Computer Science, will speak about his statistical prediction models of NFL games at the noon luncheon. Johnson developed a mathematical model he has used for many years, and this year predicted the Super Bowl winner.

Among the 189 registered attendees are representatives from the University of Chicago, the University of Illinois at Urbana-Champaign, Northern Illinois University, the University of Iowa, Iowa State University, the University of Nebraska, North Dakota State University, Montana State University, the Milwaukee School of Engineering and both the Madison and Platteville campuses of the University of Wisconsin.

Andrew Pierson represents university at state research poster session

Andrew Pierson of Brooklyn Park, Minn., has been selected to represent the South Dakota School of Mines & Technology at the 2014 Student Research Poster Session.

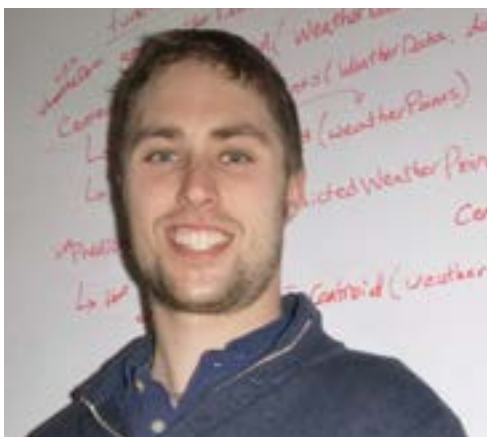
The senior computer science major is among 13 undergraduates from colleges and universities statewide who will showcase their research endeavors before state lawmakers in the State Capitol Rotunda on Thursday, March 6.

Pierson's studies at SDSM&T combined with his hands-on industry experience have led him and the rest of his senior design team, Jonathan

Richardson of Douglas, Wyo., and Derek Stotz of Sioux Falls, to the research area of computer vision. Raven Industries, an industry leader in high-tech agriculture equipment, is sponsoring the team whose research may eventually be implemented in semi-autonomous agriculture equipment.

The group developed a method to accurately test and compare technology which could make the current labor-intensive, multi-step hay-making process more efficient. Using a different type of distance sensor along with clever edge-detection and guidance algorithms, an inexpensive alternative can be achieved allowing tractor drivers to minimize the amount of overlap on each pass and maximize the amount of crop they can collect over a period of time.

Pierson will graduate in May with a B.S. degree in computer science. Faculty advisors are Jeff McGough, Ph.D., of the Department of Mathematics & Computer Science, and Randy Hoover, Ph.D., of the Department of Electrical & Computer Engineering.



Mines Myth Busters



An eager audience of local school children and their parents, along with other members from the community, packed a Surbeck Center room to be part of the first Mines Myth Busters event during E-Week 2014. Among the myths tackled by School of Mines faculty and students: liquid nitrogen causes matter to shatter, everyday household items are not radioactive and concrete doesn't float.



Clarkson, Pioneer Bank, Davis gift to benefit Mines freshmen



From left: Earl Davis, Davis FLP; Jeb Clarkson, senior vice president and senior trust officer, F.L. Clarkson Family Foundation; Ferman Clarkson and Mary Buchholz, Clarkson Foundation; Jim Morcom, senior vice president of Pioneer Bank & Trust and manager, Rapid City West branch; Kevin Whitlock, president and chief executive officer of Pioneer Bank & Trust; Brad Johnson, vice president of development, South Dakota School of Mines & Technology Foundation; and Rick Messer, senior vice president of Pioneer Bank & Trust and manager, Rapid City South branch.

The F.L. Clarkson Family Foundation and Pioneer Bank & Trust have joined with Davis FLP to commit \$50,000 to freshmen scholarships at the School of Mines.

The commitment will help support the university's growing enrollment. With 553 first-time students, this year's freshman class increased by 20 percent compared to the previous year. Mines' overall enrollment is 2,640.

One of the university's strategic priorities is to increase enrollment to 3,500 by 2020, and offering scholarships to incoming freshmen is key to achieving that goal. One of the deciding factors on whether students of potential will be able to enroll at Mines is scholarships.

"In an effort to follow two of the Clarkson Family Foundation's tenets, one being to promote education and the other being to champion the rights and liberties guaranteed by the Constitution, we are pleased to be able to support students seeking higher education in South Dakota's universities and trade schools. Youth are the future of this state and of this nation and the goal is to help them to become hard working, taxpaying, contributing members of society," said Jeb H. Clarkson of the F.L. Clarkson Family Foundation.

Mines President Heather Wilson thanked the Clarkson Family Foundation, Pioneer Bank and Davis FLP for their gift and said a scholarship is a great investment in student success.

"A freshman scholarship can mean the difference between a family deciding they can afford college or deciding to choose another path," Wilson said. "We continue to get applications from highly qualified students who will be able to do the hard work to succeed at Mines, and if we can narrow the gap between what an education at Mines costs and what a family can afford, then we all benefit."

Once students enroll, chances are they will stay throughout their college careers. In fall 2013, the first- to second-year retention rate from fall 2012 was 79 percent.

With a 98 percent placement rate for its graduates, the School of Mines continues to prepare leaders for the high demand in science and engineering fields. The average starting salary for a Mines graduate is \$62,400.

Inaugural 5K Diamond Dash set for April 12

Alpha Delta Pi sorority at the South Dakota School of Mines & Technology invites runners to compete in the inaugural 5K Diamond Dash on April 12.

The dash will consist of a 5K run/walk and a ¼ mile kids run, starting in the School of Mines Quad. Registration forms may be found at etaeta.jimdo.com or through Cheryl Dillon in the university's Student Activities and Leadership Center office, lower Surbeck Center, on the School of Mines campus.

Early registration continues through April 4. Early registration costs are:

- 5K run/walk – \$20 for community participants, \$15 for Black Hills Runners Club members and Mines students
- ¼ mile kids run – \$15 for all participants

Race day registration costs will be:

- 5K run/walk – \$25 for community participants, \$20 for Black Hills Runners Club members and Mines students
- ¼ mile kids run – \$20 for all participants

Race check-ins will begin at 9:15 a.m. in the Quad, with the 5K starting at 9:30 a.m. and the ¼ mile children's run starting at 10:30 a.m. The maximum age for children runners in the ¼ mile race, which will be held entirely on campus, is 12. The 5K run extends from campus and follows bike paths through the city.

All proceeds from the Diamond Dash will benefit Ronald McDonald House, the national philanthropic organization supported by Alpha Delta Pi. The Ronald McDonald House offers housing for families to be near their children during their medical care and sometimes helps with basic dental and medical needs.

The sorority hopes to turn the Diamond Dash into an annual event.

The Higher Learning Commission invites third-party comment on the South Dakota School of Mines & Technology.

The South Dakota School of Mines & Technology seeks comments from the public about the university in preparation for its periodic evaluation by its regional accrediting agency. The university will host a visit April 14-16, 2014, by a team representing the Higher Learning Commission of the North Central Association. The South Dakota School of Mines & Technology has been accredited by the Commission since 1925. The team will review the institution's ongoing ability to meet the Commission's Criteria for Accreditation.

The public may send third-party comments to the following address:

Third-Party Comment on the South Dakota School of Mines & Technology
The Higher Learning Commission
230 South LaSalle Street, Suite 7-500
Chicago, IL 60604-1411

The public may also submit comments on the Commission's website at

www.ncahlc.org

Comments must address substantive matters related to the quality of the institution or its academic programs. All comments must be in writing. All comments must be received by March 28, 2014.

University Relations, WiSE bring home Black Hills American Advertising Awards



The School of Mines won three awards at the recent Black Hills chapter of the American Advertising Awards gala.

The awards represent the true spirit of creative excellence by recognizing all forms of advertising across a multitude of media sources. All of Mines' winning entries will advance to the regional level of competition, where they will be judged with other winning works from Iowa, Minnesota, North Dakota, Wisconsin and eastern South Dakota.

Mines' winning entries were:

- Adventure Weekend logo by Madison Zimmerman, University Relations – Gold, Elements of Advertising, Logo Category. This logo was designed last spring for use by Residence Life in digital promotional materials for the annual fall Adventure Weekend, which offers a weekend of bonding activities for incoming freshmen.
- Alumnus Merle Crew portrait by Fran LeFort, University Relations – Silver, Elements of Advertising, Photography Category. This portrait of 1942 Mines graduate Merle Crew was featured in the winter 2013 edition of *The Hardrock* magazine. Then 92, Mr. Crew holds a tattered National Geographic Society flag that flew during a 1940 Badlands expedition in which he participated.
- STEMInist campaign by Jon Michaels, Dani Doran, Madison Zimmerman-Dusek, all of University Relations, and Lisa Carlson of Women in Science and Engineering (WiSE) – Judges' Choice. This collaborative effort produced last fall's STEMInist collateral that included T-shirts, brochures, and a digital sign to help promote Mines' efforts to educate, mentor and retain female engineering students.

Mines' associate professor selected for fellowship in India



Rajesh Sani, Ph.D., South Dakota School of Mines & Technology associate professor in the Departments of Chemical & Biological Engineering and Applied Biological Sciences, has been selected as a fellow to deliver a short course in India.

The American Society of Microbiology Fellowship and the Indo-U.S. Science and Technology Forum awarded Sani the fellowship for "Interactive Short Course on Anaerobic

Microbial Processes for Energy and Environment." The four-week course will be delivered in December 2014 to graduate students at Guru Nanak Dev University in Punjab, India hosted by Professor B. Chadha. Graduate students from Jaypee University of Information Technology in Himachal Pradesh, India, will also participate in the course.

The main goal of the course is to introduce master's and doctoral graduate students to current topics in anaerobic microbial processes, emphasizing critical evaluation of published peer-reviewed scientific literature as well as hands-on experiences in anaerobic processes, which occurs in the absence of free oxygen. Today, most of the sustainable and environmentally friendly processes – including conversion of lignocellulosic biomass to liquid and gaseous biofuels; food processing; and site remediation – rely on anaerobic microbiological systems. For example, to develop a consolidated bioprocessing for economical cellulosic biofuel production, unique saccharolytic fermentative microbes are needed. To isolate and work on such unique microbes, hands-on experiences in anaerobic processes are needed.

Additionally, the visit to India will develop strong Indo-U.S. collaborations (research, student exchange and Indo-U.S. networking projects).

Cultural Expo to feature international food, entertainment



International students from the South Dakota School of Mines & Technology and a variety of community groups will celebrate their cultural diversity with food, entertainment and displays during the annual expo Thursday, March 27, and Saturday, March 29. Approximately 20 countries will be represented.

The 2014 Cultural Expo will be from 9 a.m.-2:30 p.m. Thursday, March 27, and 10:30 a.m.-2:30 p.m. Saturday, March 29, in the Surbeck Center ballroom on campus. Admission is free. Thursday activities will primarily target visitors from area schools, but anyone is welcome to attend and view the displays and participate in the educational activities.

Saturday events will be open to the campus and community, with food and entertainment available. Tickets for a variety of international food samplings prepared by students and community groups will be \$7 for adults and \$4 for children under 10. Food will be available from 11:30 a.m.-1:30 p.m.

Free entertainment will begin at approximately 11 a.m. on Saturday only and will feature a variety of traditional music, dancing and fashion shows from a wide range of cultures.

Children from throughout Black Hills schools will attend Thursday's events for cultural activities, storytelling and traditional crafts.

Mines currently enrolls 135 international students from more than 35 countries. International students have been sharing their cultures with the community through this annual event for more than 40 years.

In addition to the Ivanhoe International Center and the university's Student Association, other sponsors of the annual festival are International Students, Inc., Black Hills Power and Pepsi.

Apex Gallery takes on the human form



The Apex Gallery at the South Dakota School of Mines & Technology will host its new exhibit, "Embodied/Disembodied," by Nathan Hurst, M.F.A., and Chalice Mitchell, M.F.A., through Wednesday, March 26.

"Hurst fills his paintings with saturated color and solidity; Mitchell's seems to dissolve as though seen through a veil or alternately as though illuminated by the staccato of a strobe light," Deborah Mitchell, director of the Apex Gallery and associate professor of humanities, notes.

She believes their starkly different styles are influenced by their respective artistic training in Alaska and Florida – two states which couldn't be further apart. "Does someone spending days in the low light conditions of an arctic winter crave color, and does an artist who seeks relief from unrelenting sun comfort themselves with low light and a muted palette?" Mitchell says.

Both artists chose the human figure as their subject, a form that has been portrayed and received differently in various cultures over time: revered in Greek art, elongated by the Mannerists and fractured by the Cubists, to name a few. This long lineage of approaches converges in the 21st century where artists are liberated from style and are free to subvert the body in many different ways, as both fleeting and corporeal.

"As I look over these paintings I see light, presence, color, solidity, impermanence, enduring, fleeting and ephemeral. Paint is a substance that can take many forms depending upon the skill and the hand of the artist and can be all of these things. Both artists are proficient in their handling of the material and the subject. The viewer will have their own take on the content," Mitchell adds.

State library e-resources training session hosted on campus

The South Dakota School of Mines & Technology will host a public training session on use of the state library's e-resources at 2 p.m. Tuesday, March 11, at the Devereaux Library on campus.

State documents such as the governor's budget, fishing, transportation and environmental impact reports, as well as other state agency annual reports, are now available online through the South Dakota State Library. Patrons may search for a state government report via the online library catalog in the same way they would search for a book or DVD. Magazine and newspaper articles, practice tests, language skills exercises, repair manuals, genealogy programs and encyclopedias are examples of other resources available online for free. The library has paper copies available of documents not issued in electronic format.

Julie Erickson, electronic resources coordinator, and Brenda Hemmelman, collection services librarian, will lead the introductory session. There is no charge. For additional information, call the Devereaux Library at (605) 394-2418.

Math modeling contest poses traffic challenges



A trio of undergraduate students from the South Dakota School of Mines & Technology recently competed in the 30th annual Mathematical Contest in Modeling (MCM).

Teams were comprised of up to three students from the same school. Representing the School of Mines this year were Erica Daniels of Lennox, Christopher Cody of Saint Peter, Minn., and Daniel Nix of Sioux Falls. Kyle Riley, Ph.D., head of the Department of Mathematics & Computer Science, served as team advisor.

Teams are given a choice between two problems. After picking their problem, teams research the question, develop a mathematical model, use a computer to simulate the model and then write a technical report about it – all within one weekend.

The Mines team chose a problem involving a rule that requires motorists to drive in the right-most lane unless they are passing another vehicle, in which case they move one lane to the left to pass and then return to the right lane. The team's challenge was to build a mathematical model to analyze the performance of this rule in light and heavy traffic. The contest also posed the idea of cars controlled by computers instead of humans and how that would affect models.

Results from the competition will be released at the end of April.

About Legacy News

Legacy News is produced by the Office of University Relations the first Wednesday of each month. The newsletter is a compilation of news releases, photos and Web articles.

To submit news or story ideas or to subscribe to the email distribution list, please contact Fran LeFort, communications manager, at 605.394.6082 or at fran.lefort@sdsmt.edu. For more School of Mines news, visit news.sdsmt.edu

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