



# Mechanical Engineering Department

Spring 2016

## ME Industrial Advisory Board

**Casey Allen, ME94, MSME01,**  
H.F. Webster, Rapid City, SD

**Wayne Baumberger, ME96,**  
Caterpillar Inc., Rapid City, SD

**Dave Berg, ME73,** Rapid City, SD

**Pete Birrenkott, ME71,** Rapid City, SD

**Randy Clarksean, ME83, PhD,** Kevin Kennedy &  
Associates, Inc., Ottertail, MN

**Don Cuperus, ME95,**  
Rosenbauer America, Sioux Falls, SD

**Paul Gnirk, MINE59, PhD,**  
Table Top Ranch Inc., New Underwood, SD

**Brian Goetsch, ME98,** Lockheed Martin Space  
Systems Co., Littleton, CO

**Patrick Hallauer, ME76,**  
EAD Incorporated, Omaha, NE

**Steven Henning, ME89,** Boeing Co., Kent, WA

**Erin Heupel, MET88,**  
Biogenic Reagents, Sioux Falls, SD

**Tim Holleman, ME71,** Medtronic Inc./Retired,  
Ham Lake, MN

**Ritch Larsen, ME75,** Chillicothe, IL

**Mike Mueller, ME85,**  
Rapid City Medical Center, Rapid City, SD

**Larry Pearson, ME72,** Bennington, NE

**Scott Reisenauer, ME94,**  
SR Solutions, LLC, Rapid City, SD

**Mike Rizor, ME90,** Agspring, Kansas City, MO

**Matthew Schulte, ME09,**  
Burns & McDonnell, Overland Park, KS

**Paul Sheets, ME91,**  
Mechanized Design, LLC, Wichita, KS

**Meredith Silberstein, ME05, PhD,**  
Cornell University, Ithaca, NY

**Ralph Wagner, CE75,** Las Vegas, NV

**Daniel Weinacht, ME84, PhD,**  
Ares Corporation, Richland, WA

**Dale Wilen, ME85,** City University, Cheyenne, WY

**Mike Wood, ME03,** Halliburton Wireline and Perfo-  
rating, Midland, TX

## Nucor Mentor Scholars Program Supports Three ME Students

Three South Dakota School of Mines & Technology students have been selected to participate in the Nucor Mentor Scholars Program, each receiving a \$3,000 scholarship.

Mechanical engineering students Spencer Johnson, a junior from Lakefield, Minn.; Chandler Monk, a senior from Cheyenne, Wyo.; and Eric Holmgren, a senior from Rapid City, were selected as this year's mentors.



From left to right, Dan Tiede of Nucor Steel with SD Mines Nucor Mentor Scholars Eric Holmgren, Chandler Monk, and Spencer Johnson

The mentoring program, created in 2013 and partially funded by industry partner Nucor Steel, places students in the mechanical engineering department's manufacturing lab teaching fellow students machining, welding, and fabrication.

Mentors are selected based on their ability to work with other students of varying backgrounds and fabrication skill levels and their ability in the areas of design for manufacturing and employee interaction. Students at the sophomore level or higher can apply for the program.

The goal of the program is to enhance student skills in the areas of design and resource planning, better preparing them for transition into industry through training beyond their mechanical engineering curriculum.

Aaron Lalley, a lab coordinator and instructor for the Department of Mechanical Engineering who will be overseeing the program, believes the support provided by Nucor this year will not only benefit mentors, but will also make every mechanical engineering graduate a better engineer.

"The support that Nucor and the mechanical engineering department provides the mentors allows them to dedicate their time to training incoming freshman in design for manufacturing, manufacturing and team building," Lalley said.

Lalley and Adam Kuenkel, a fabrication technician for the mechanical engineering department, will work with the mentors to provide the freshman class a design and manufacturing experience that will prepare them for their upper level courses and ultimately for industrial design projects.

## In Memory of Former ME IAB Member

It is with great sadness that we learned of the passing of ME department Industrial Advisory Board member Denny Deinert. Denny passed away on Tuesday, April 12, 2016. He enjoyed his time serving on the board, actively participating and advising the direction of the department for the last five years. Denny graduated from SDSM&T in 1970 with a degree in mechanical engineering. For the last 35 years, Denny engineered with Tessier's Inc. in Mitchell, SD. He is survived by his wife of 40 years, Linda, and three children Chad, Ryland, and Tara. We will greatly miss his kind and supportive presence.

### ME Faculty and Staff

Dr. Duane Abata  
 Dr. Jason Ash  
 Dr. Cassandra Degen  
 Dr. Daniel Dolan  
 Dr. Marius Ellingsen  
 Dr. Shaobo Huang  
 Dr. Vojislav Kalanovic  
 Dr. Lidvin Kjerengtroen  
 Dr. Umesh Korde  
 Mr. Adam Kuenkel  
 Mr. Aaron Lalley  
 Dr. Michael Langerman  
 Dr. Bamdad Lessani  
 Ms. Leslee Moore  
 Dr. Karim Muci  
 Dr. Albert Romkes  
 Mr. Charles Schilling  
 Dr. Khosro Shahbazi  
 Dr. Benjamin Simmons  
 Dr. Andrea Surovek  
 Dr. Christian Widener

### ME Professors Emeritus

Dr. Gregory Buck  
 Dr. C.W. Chaing  
 Dr. Paul Gnirk  
 Dr. Wayne Krause  
 Dr. Richard Pendleton

### Departing Faculty

Dr. Mark Bedillion  
 Dr. Ali Heydari

### ME Staff Addition

Adam Kuenkel joined the Department of Mechanical Engineering at the South Dakota School of Mines and Technology in June 2015 as the department's fabrication technician. He served in the United States Air Force from 1992-2014. Prior to enlisting in the USAF, Mr. Kuenkel worked as a welder/fabricator for Wisconsin Structural Steel. While in the military, he worked on fabrication and installation of airframe repairs on numerous models of aircraft.

Mr. Kuenkel holds a welding diploma from Wisconsin Indianhead Technical College, an AS in metals technology from Community College of the Air Force, and an AS/BS in professional aeronautics from Embry Riddle Aeronautical University. He is originally from Cumberland, Wisconsin, but relocated to the Rapid City area in 2010.

Other interests include spending time with his wife, Tara, and two children, Alyssa and Braden. Additionally, Mr. Kuenkel is active in community service, including coaching youth sports and serving on the Box Elder Volunteer Fire Department.



### Industrial Advisory Board Member Spotlight

Born and raised in Dell Rapids, SD, Dr. Dan Weinacht attended SDSM&T from 1980-1984, receiving his BSME degree in 1984. After a short stint as a summer student at Los Alamos National Laboratory (LANL), he attended the University of Illinois from 1984-1986 for his MS degree. Returning to LANL, he worked at the Laboratory in various roles including technical staff member and project leader. Selected for the Laboratory's Advanced Study Program, Dr. Weinacht completed his Ph.D., also from the University of Illinois, in mechanical engineering in 1992. Since leaving LANL in 1998, Dr. Weinacht has served in various roles in ARES Corporation, an engineering consulting firm that supports the Department of Energy, Department of Defense, NASA, and commercial nuclear power clients. Dr. Weinacht currently leads ARES Energy Services Division, which specializes in support for the nuclear industry in both the government and commercial sectors. Over the last five years, he has also participated in the SDSM&T ME Industrial Advisory Board, currently serving as the president of the IAB.



### Remember Your Alumni Association

The South Dakota School of Mines & Technology Alumni Association promotes communication and interaction among alumni, students, faculty, and administrators of the South Dakota School of Mines and Technology, with the objective of strengthening the school's academic, research, and service roles. Whether through the *Hardrock* or the *Hardrock E-News*, area meetings or reunions, the Alumni Directory or award programs, they are here to help you and to help our alma mater. So please consider supporting your Alumni Association with your contributions and your time. Learn [more!](#)

## Baja Off-Road Track Offers New Challenges for Team



A new off-road track behind the SDSM&T campus offers more realistic training conditions for the SDSM&T Baja SAE team.

Student members of the Baja team redesigned the track during the summer of 2015 to provide new challenges. Training with obstacles comparable to what the team faces in national competitions will lead to an improved design for vehicle performance as well as driver handling.

The Baja team is one of 13 competitive student groups within the Center of Excellence for Advanced Manufacturing and Production (CAMP), where students engineer a variety of vehicles for national and international competitions.

## New South Bend Lathe in ME Machine Shop



From left to right, David Rohlf (ME sophomore), Alex Krigen (ME freshman), and Adam Kuenkel (fabrication tech)

As part of freshman training in ME 125L Design for Manufacturing, students use department lathes for building a press fit top. Initially, students used a 5 HP Kent gearhead lathe for one of the components, but the results were not ideal; it is not designed to achieve the sub .001 tolerance required for the part. Being a high-power gear-head lathe utilizing a chuck, it is not an ideal training lathe from a safety standpoint. The cost of a new belt drive precision lathe is in excess of \$30,000. The ME department acquired a used South Bend Heavy 10L, manufactured in 1949, through the Federal Properties Depot at a cost of \$650. The Heavy 10L is an ideal addition to the shop's resources. It is a 1Hp belt drive lathe with a collet, which makes it very forgiving and

ideal for training purposes. It also has an uncommon tapering system. This system, along with the long bed and inherent precision of a tool room lathe significantly added to the department's manufacturing capability.

Mechanical engineering technician Adam Kuenkel and student mentors, Alex Krigen, Eric Holmgren, and David Rohlf undertook the project of overhauling the lathe. A quick change tool post and a collection of new tool holders and tools were added, as well as a few replacement parts. The lathe was outfitted with a magnetic scale digital readout. Magnetic scale is a developing technology which offers a lower cost than traditional glass scales and is less susceptible to contamination. Cargill, Inc. provided the funds for the upgrades. The South bend can easily achieve tolerances of less than .001in. It has become an important part of our training and turning capacity at a total cost of less than \$2,000.

## SDSM&T Moonrockers Compete in NASA Robotic Mining Competition

The SDSM&T Moonrockers participated in the NASA Robotic Mining Competition on May 16-20, 2016, at the Kennedy Space Center. The objective of this competition is to collect as much simulated Lunar or Martian regolith (soil) within a 10 minute time period. NASA is interested in the mineral oxides contained within regolith as a means to generate oxygen to support future habitats and create rocket fuel. The two main goals this year for the team were to speed up the delivery system and to implement autonomous operation.

The team switched from a hopper dump-truck delivery system, which took about 60 seconds, to actuate to a conveyor system, speeding the delivery time to approximately 10 seconds. For autonomous operation, the team originally planned to orientate the vehicle manually via remote-control operation and switch to partial autonomy to pass through the obstacle course, collect regolith, and deliver that to the collection bin. After a successful demonstration during the practice run on May 16, the *(Continued on page 7)*



## Outstanding ME Juniors



Austin Maus is from Dickinson, North Dakota, where he grew up working in agriculture. He has a passion for heavy machinery, which he pursued in two internships—one with CNH Industrial and the other with Caterpillar. His first internship was a field test engineering position with CNH Industrial where he traveled to collect data with prototype combines. His second internship was a transmission development engineering position with Caterpillar where he

worked on transmission-bearing improvements. This upcoming summer, he will return to Caterpillar in a research engineering role.

Austin has been involved with many organizations on campus including: Baja SAE, Phi Eta Sigma National Honors Society, Hardrocker Baseball Club, American Society of Mechanical Engineers, and Tau Beta Pi National Honors Society. He currently serves as president of the Hardrocker Baseball Club, vice president of Tau Beta Pi, and recruitment chair of the American Society of Mechanical Engineers.



Chad Buse is from Lennox, SD, where he graduated in 2013 from Lennox High School. Chad's family consists of his parents Gary and DeeAnna Buse, along with a younger sister, Emily. Chad owned and operated his own lawn care business for 6 years. He worked at Masaba Mining Equipment in Vermillion, South Dakota as

a Sales Engineering Intern during the summer of 2015. Chad has an upcoming Test Engineering Co-op at Kinze Manufacturing in Williamsburg, Iowa.

He is currently the treasurer of the SDSM&T Baja SAE team. He is also the corresponding secretary of the Tau Beta Pi Engineering Honor Society, and is a member of the Society of Automotive Engineers (SAE International), Phi Eta Sigma National Honor Society, SDSM&T American Society of Mechanical Engineers (ASME), Center of Excellence for Advanced Manufacturing and Production (CAMP), and the SDSM&T Ski Club.

## Outstanding ME Seniors



Rebecca Ceremuga is from Rapid City, SD, having graduated from Stevens High School. With a passion for the medical application of engineering, she initially set her goals on a PhD in Biomedical Engineering. As a freshman in the ME department, she sought out research experiences that would complement the curriculum. For the next three years, she worked on the Individual Soldier Protection Project, funded by the Army Research Laboratory.

Ultimately, an internship at Medtronic following her junior year helped to define her career path. As an intern for a company with a dominant presence in the medical device industry, she had the opportunity to see first-hand how medical devices improve quality of life. She worked with a team of chemical engineers on designing the adsorbent cartridge for a novel dialysis machine. This machine aims to make dialysis accessible to people living in countries with limited access to clean water and dialysis centers. While she enjoyed her work at Medtronic, she also realized that her personality and personal goals were better fit for direct patient care.

She has now set her focus on acceptance into medical school. Her position as a medical scribe for an obstetrician/gynecologist in town has been a rewarding experience. As a future doctor, she hopes to help facilitate the integration of engineering and medicine. She believes that engineers would greatly benefit from solving problems in a way that mimics nature. With a background in mechanical engineering, she thinks becoming an orthopedic surgeon would be a natural transition.

Outside of school and career-oriented activities, she enjoys training and competing in triathlons. International travel is one of her favorite hobbies – it has exposed her to diversity and allowed her to appreciate difference in cultures across the world.



Chase Ketterling is from Cheyenne, Wyoming. He has been an active member of the Baja SAE team since his freshman year and

has served as the vice president and design lead for the team this year. Being a part of the team has helped him gain practical design experience, while also teaching him skills such as welding, and has fueled his passion for all things automotive.

After graduation, he will be joining the Engineering Rotation Program at Caterpillar in Peoria, Illinois. He is also a member of Tau Beta Pi and the Newman Club on campus, and has interned at Raven Industries Aerostar as an aerostat engineer and in Caterpillar's medium track type tractors large structures group. Some of his favorite hobbies include playing guitar and exploring the Black Hills trails with his truck.

### Outstanding ME Graduate Student (Elizabeth Pierce)



Elizabeth Pierce is a graduate student from Colorado Springs, finishing her masters degree in ME in December of 2016. She returned after completing her undergraduate studies in mechanical engineering at SDSM&T in 2015. During the spring semester, she aided two to four professors as a teaching assistant, working with upwards of 200 students in one semester. She particularly enjoys the thermal sciences aspects of mechanical engineering, and after completing a semester of research on emission flow through selective catalytic reduction systems and an internship working with engine cooling systems, Beth is excited to continue working with large diesel engines. Beth's graduate project focuses on Caterpillar 3500 series diesel machine and locomotive engine tear down and analysis, and she hopes to improve the processes involved during her internship with Caterpillar this summer in Lafayette, IN. In the future, Beth plans to continue working with thermal systems, improving engine systems efficiency, and reducing overall emissions. Additionally, she maintains an interest in STEM education research, using interactions with elementary to high school age students to raise their interest in pursuing science and engineering education. Her other interests include singing in the SDSM&T choirs, researching and comparing dream cars, and watching sports on her occasional free evenings.

### Outstanding Recent ME Graduate (Patricia Krugjohn)



Patricia Krugjohn (now Huntley) graduated from SDSM&T with her degree in mechanical engineering in 2005. While attending Mines, she was involved with the Society of Women Engineers (SWE), American Society of Mechanical Engineers (ASME), the Solar Car and C.A.M.P., as well as Drama Club. For her role on campus, she was inducted into the Leadership Hall of Fame.

Patricia is a home grown South Dakotan. She was born in Rapid City, raised in Black Hawk, and graduated from Sturgis Brown High School in 2001. She is the youngest of three, and her two older sisters Jessica and Sarah became nurses.

After leaving Mines, Patricia spent some time living abroad in Germany. She ultimately settled in the Kansas City metropolitan area. She first worked at Black & Veatch, and currently Enercon Services, Inc. She has spent most of this time supporting the nuclear industry—most recently, with power plants near Kansas City, primarily Wolf Creek Generating Station.

Besides working in Kansas City, Patricia has maintained her role in ASME by joining the local chapter. She served as treasurer and lead, and provided the keynote address at the district student conference one year. She is also a member of North American Young Generation in Nuclear (NAYGN). Additionally, Patricia served for many years as an advisor in the Kansas City Explorer Post Engineering Chapter, helping high school students learn about the various engineering disciplines.

Patricia and her husband, Jason, live in Olathe, KS, where he works as an automotive technician. She has recently transitioned from engineering to project management. As a project manager, Patricia is becoming more established as a leader in her office at Enercon Services, Inc., where already for many years her colleagues have lovingly referred to her as “boss lady.”

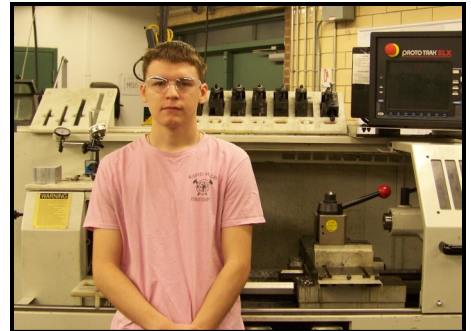
### Thank You to Our Industrial Donors

The Department of Mechanical Engineering works to bring quality service to our students during their academic career with us. Our success could not be possible without the generous support of our industrial benefactors. We would like to extend our gratitude to the following companies who have donated to our department throughout the 2015-16 academic year: Nucor Corporation; Cargill, Inc.; Neiman Enterprises, Inc.; Pauly's Pizzeria & Sub Co.; Fastenal Company; Shoener Machine & Tool Supply Inc.; and A&B Welding Supply.



## Scholars Benefit From Cargill, Inc. Support

Cargill, Inc. has long been a supporter of the ME department through student scholarships, funding, assistance in course development, and on-site training. Brandon Anderson (ME07) of the Cargill Sioux City, IA, site has delivered a lecture on the role of the engineering and safety for Design for Manufacturing (ME 125L) since before it was an official class. Brandon and other Cargill employees have also had input on course content. Cargill has provided personal protective equipment to the department labs for several years, as well as funding for lab equipment. This year, Cargill funds also helped support the Design for Manufacturing mentor scholars program. Three students received \$1,500 each for the spring semester for their outstanding performance and continued support of the mechanical engineering labs and student projects. Michael Asel of Katy, TX, David Rohlf of Belle Fourche, SD, and Crystal Ochoa of Sioux City, IA, all received the award.



From left to right, Crystal Ochoa (ME freshman), Michael Asel (ME senior), and David Rohlf (ME sophomore), received stipends for their involvement in the mentor program to support ME 125L.

## Neiman Enterprises and ME Department Donate to Suzie Cappa Art Center



In ME 125L Design for Manufacturing lab, each student builds a birdhouse out of Black Hills pine. The lab is designed to train students to use equipment relevant to subsequent student projects, and to introduce students to corporate print structures with a seven-page drawing package, including an assembly drawing, bill of materials, and work instructions. The mechanical engineering department consumes over 1,000 board feet of timber each year to support the lab. Neiman Enterprises Inc. of Hulett, WY, and Hill City, SD, generously donates all of the wood for the lab. Most of the students choose to keep their birdhouses, but, each summer, the department is left with 20 to 30 extra birdhouses. These are donated to the Suzie Cappa Art center, a division of the Black Hills Workshop. The artists paint the birdhouses and sell them in the art center store to the benefit of the center.

## ME Outreach to Hermosa Elementary School

Hermosa Elementary is a local school whose students specialize in energetic play and creative thinking. After acquiring a MakerBot Replicator and a Makerbot Digitizer, Hermosa reached out to SDSM&T looking for guidance towards the usage of their new 3D printer and digital scanner. Additionally, Hermosa sought out exciting ways to show their young middle school students the benefits and applications of 3D printing and 3D printing technology. 3D printing enthusiast and mechanical engineering sophomore Cory Mohill-Smith eagerly volunteered. At the request and excitement of the Hermosa middle-schoolers, Cory spent the last part of the school day showing students 3D modeling, prosthetic limbs, toys, and other printing conventions.

"I have never seen that many middle school students raise their hands and get so excited! The whole school was buzzing ... all week," said Jayne Leusink, the teacher spearheading the 3D printing program at Hermosa. Currently, SDSM&T is working towards bringing 3D modeling to Hermosa as an elective available to middle school students Fall 2016.





(continued from page 3) team was informed that manual orientation was no longer allowed to acquire partial autonomy points.

The team then developed a start algorithm on May 16-17, to orientate the robot before conducting the partially autonomous navigation, mining, and delivery planned. This effectively made the vehicle capable of a fully autonomous run.

During the May 18 competition run, the vehicle orientated correctly, lost the AR tag for placement, did a full 360 to relocate the AR tag, then proceeded to collect regolith, and return that to the collection bin autonomously. It continued to collect more regolith autonomously and was returning when it incorrectly identified orange markings on the wall as the AR tag and backed into the wall. The team then took over manual control to deliver the second load for a total of 37.2 kg. The team earned partial autonomy points for the first 8 minutes of autonomous operation and for demonstrating a fully autonomous cycle.

During the second competition run, the vehicle straddled a rock. While moving off of it, the press fit for the articulating chassis worked itself loose, causing a mechanical failure and no regolith delivered on the second run.

Along with the mining portion of the competition, teams are also evaluated on their systems engi-

neering report, outreach paper, presentation, and social media. The team received the 2<sup>nd</sup> Place Caterpillar Autonomy Award and placed 10<sup>th</sup> overall out of the 45 teams who qualified for the competition.

Devin Kroeber (EE16) lead the multidisciplinary Moonrockers team this year. Team members include: Jacob Green (ME16); Charles Hartman (ME junior); Samuel Hill (ME16); Daniel Hodges (ME16); Alexander Muchow (CSC16); Dakota Rusley (CENG junior); and Joree Sandin (ME junior). An additional team consisting of Erik Figuracion (ME16), Mathew Gordon (ME16), Adam Holzer (ME16), and Jonathan Stelze (ME16) focused on developing an icy regolith system to collect larger pieces buried deep under the surface for consideration next year by the team. The Moonrockers are advised by Dr. Charles Tolle (ECE), Dr. Jason Ash (ME), and a Moonrockers alum, Zach Buechler (CENG '15), with special assistance this year from Dr. Jeff McGough (MCS) and Lowell Kolb (ECE). The SDSM&T Moonrockers re pictured (right) with Lee Solid (ME59), who is retiring from Rocket-dyne.





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## ME Department Head's Message

Dear Alumni and Friends:

We are all saddened by the death of Denny Deinert. Denny was a member of our industrial advisory board for several years and would attend at least one meeting each year, frequently both annual meetings. He actively participated in the discussions and brought many good ideas forward to help improve the department. We will miss him.

We are once again closing out a successful academic year. This year we had 108 BS graduates and 5 MS graduates. Our undergraduate enrollment stayed steady from last year at 621 students, as did our graduate student enrollment at 18 students. As in past years, our students are actively engaged in national and international engineering design competitions, and we place very well in these competitions. As presented in this newsletter, the Moonrockers team placed in the top 10 in their competition and received the 2<sup>nd</sup> place Caterpillar Autonomy award.



Dr. Mark Bedillion and Dr. Ali Heydari have accepted positions at other universities. Both were experts in the area of robotics and controls. Both were excellent teachers and researchers. It will be difficult to replace them. On the brighter side, we hired Mr. Adam Kuenkel. He has taken on the duties of the department technician under the supervision of Mr. Aaron Lalley, our lab coordinator.

The faculty have been very active in submitting research proposals, and these efforts are paying off. Since the fall of last year, the department faculty has received eleven research grants totaling over two million dollars. We look forward to our continued success in research.

Sincerely,

[Mike Langerman](#), PhD (BSME 72, MSME 74)

Professor and Head

Mechanical Engineering Department

SDSM&T