



Department of Mechanical Engineering

Summer 2017

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 Dr. Umesh Korde
 Dr. Michael Langerman
 Dr. Benjamin Simmons

Newly-Formed Team Competes at 2017 VEX Worlds

Three SDSM&T students did not expect to compete in an international robotics competition at the beginning of Spring 2017 when they discussed developing a VEX Robotics club on campus. But that is exactly what happened. Then three ambitious mechanical engineering students, Seth Arthur, Enis Sefa, and Jorge Cisneros all had some experience with VEX Robotics competitions in high school and thought the activity would fit with the culture of SDSM&T. VEX Robotics is a STEM-based competition with over 10,000 high school and university teams from 32 countries. The hallmarks of the competition are teamwork, leadership, and communication.

When the team asked ME instructor Dr. Aaron Lalley to be the advisor of their newly-formed club, he agreed and connected them with Stevens High School teacher Jason Reub. Reub has developed an active VEX Robotics team at Stevens and has partnered with SDSM&T on a number of other projects. The SDSM&T VEX Robotics team connected with the Stevens High School team and established a mentorship. Soon after, the Stevens team won competitions at the state and regional levels to qualify for the 2017 VEX Worlds competition in Louisville, Kentucky.

Stevens took two robots to the regional qualifier that met in the finals. The SDSM&T team, currently with 16 members, has been accepted as a student organization on campus. The team borrowed parts from the Stevens team's robot to re-build it, and then drove to the university regional qualifier in Minneapolis, MN. With some modifications, the SDSM&T students were able to qualify for the 2017 VEX Worlds competition at the university level. The team received funding from Caterpillar Inc.'s Black Hills Engineering Design Center, the SDSM&T Foundation, the Department of Mechanical Engineering, friends, and family to make the short-notice trip to the world finals in Kentucky. The SDSM&T team did spectacular in their first trip to this challenging international competition by placing 11th out of 62 teams. We extend special thanks Jason Reub, the Stevens High School VEX Robotics team, Caterpillar BHEDC, and the SDSM&T Foundation.



From left to right: CSC sophomore Seth Arthur, ME sophomore Enis Sefa, and ME junior Jorge Cisneros



Dr. Pierre Larochelle Joins SDSM&T as New ME Department Head

Dr. Pierre Larochelle joins the Department of Mechanical Engineering as the new department head in July 2017. Dr. Larochelle previously worked at the Florida Institute of Technology as associate dean and professor of mechanical engineering. He received his PhD in ME from the University of California at Irvine. His research focuses on the design of complex robotic mechanical systems and enabling creativity and innovation in design. He is the founding director of the Robotics and Spatial Systems Laboratory (RASSL), has over 100 publications, holds two US patents, and serves as a consultant on robotics, automation, machine design, creativity & innovation, and computer-aided design.



Dr. Larochelle serves on the Executive Committee of ASME's Design Engineering Division and will serve as Chair of the Division in 2018-2019. He serves on ABET's Engineering Accreditation Commission (EAC) and as an ABET Accreditation Visit Team Chair. Moreover, he currently serves as the Chair of the U.S. Committee on the Theory of Mechanisms & Machine Science and represents the U.S. in the International Federation for the Promotion of Mechanism & Machine Science (IFToMM) (2016-2020). He has served as Chair of the ASME Mechanisms & Robotics Committee (2010-2014) and as an Associate Editor for the ASME Journal of Mechanisms & Robotics, the ASME Journal of Mechanical Design, and for Mechanics Based Design of Structures & Machines. He is a Fellow of the American Society of Mechanical Engineers (ASME), a Senior Member of IEEE, and a member of Tau Beta Pi, Pi Tau Sigma, ASEE, and the Order of the Engineer.

ME Department Recognizes Faculty and Students



Dr. Daniel Dolan
ME Professor

During the 2016-17 academic year, the ME department hosted a couple barbecues to recognize a number of student organizations, including those associated with CAMP (the Center for Excellence for Advanced Manufacturing and Production). The CAMP Appreciation Barbecue took place on November 9, 2016. Those in attendance took some time to recognize ME professor and CAMP director Dr. Daniel Dolan for his outstanding service to SDSM&T students, while ME department head Dr. Michael Langerman presented Dr. Dolan with an award.



An appreciation barbecue for the SDSM&T chapter of American Society of Mechanical Engineers (ASME) and the Students for the Exploration and Development of Space (SEDS) took place on April 11, 2017. The ME department took a moment during the barbecue to give Dr. Jason Ash, faculty advisor for the two groups, an award for his service to ME students.



Dr. Jason Ash with ME students

Student Competitions

Spaceport American Cup 2017
New Mexico



For the inaugural Spaceport America Cup 2017 held in New Mexico, a team of students from the Mines Association of Rocketeers (MARS) entered the competition as the Rowdy Rocketeers. The MARS student organization was formed in 2014 with the intent of competing in the Intercollegiate Rocket Engineering Competition (IREC) that was held annually in Utah starting in 2006. The team has been progressing the past couple years with students receiving National Association of Rocketry Level 2 certification through rocket builds and launches in Wyoming. With that experience, the students assembled a nearly 12 ft. fiberglass rocket with an 8 in. diameter during the 2016-2017 academic year. This year, IREC was moved to the inaugural Spaceport America Cup that took place near Las Cruces, NM, from June 20-24, 2017. This was an exciting event and the first for the MARS team in launching a rocket with an N-class rocket engine (760 lbs. of max thrust and 3,100 lbs. of total impulse). The objective is to launch an 8.8 lb. payload to 10,000 ft. The Rowdy Rocketeers came close, reaching an altitude of 7,000 ft. on a successful launch. A competition judge noted it is rare for a team to have a successful launch the first year in attendance. A total of 115 teams participated in the event, and overall results have yet to be released. The Rowdy Rocketeers are pictured (above) from left to right: Mitchell Kramer (MET), Derek Neubert (ChemE), and Nathan Trence (ME). The team is advised by Dr. Jason Ash (ME), Dr. Lori Groven (ChemE), and Dr. Charles Tolle (ECE).

The SDSM&T Moonrockers participated in the 8th Annual NASA Robotic Mining Competition held at the Kennedy Space Center in Florida from May 22-26, 2017. The team optimized and built a new chassis, collection, and delivery system this year for the competition, whose objective is to collect as much Lunar or Martian regolith simulant in a 10-minute time period. A total of 24.4 kg. of regolith simulant was delivered, which placed the team 13th in mining points and 20th place overall out of 46 teams. Those attending the competition are pictured (right) from left to right: Lowell Kolb (ECE faculty advisor), Sean Kittler (ME), Yun Gwon (ME), Dakotah Rusley (CENG), Charles Hartman (ME), Mark Wathen (ME), David Donahue (CENG), Sam Struck (ME), Nick Reynolds (ME), and Dr. Jason Ash (ME faculty advisor). The team was led by Charles Hartman this year and is also advised by Dr. Charles Tolle (ECE).



SDSM&T Moonrockers at Kennedy Space Center

2016-17 Outstanding ME Juniors



ME junior Austin Kaul is from Springfield, SD. He grew up working in a family-owned mechanics shop, developing a fascination with machinery and how they work. This and an affinity for math and science led him to a mechanical engineering degree at SDSM&T. At Mines, he is heavily involved in extracurricular

activities including the American Society of Mechanical Engineers, Tau Beta Pi Engineering Honors Society, Hardrocker Pep Band, Hardrock Baseball Club, and the music program. Most of his time in college has been devoted to academics and extracurricular activities. His hobbies include spending time with friends, working out at the gym, and intramural sports.

He is currently accepted as an accelerated master student in ME starting in Fall 2017. He will be working and researching with ME assistant professor Dr. Albert Romkes in his field of computational solid mechanics. After completing his masters degree, Austin would like to continue his education.

ME junior Emmy Dressen is from Green Bay, WI. As a future mechanical engineer, she wants to pursue a career in project management. During this summer, Emmy is on co-op with Cargill, Inc. in Hammond, IN, as a production management engineer co-op. She is excited to see what engineers do on a daily basis and to use her technical skills in industry.



In Emmy's free time, she keeps active running and playing soccer with friends. She is a loyal Packers fan and babysits frequently. She is an active member of the Society of Women Engineers (SWE) and Tau Beta Pi. In addition, Emmy is a mentor for the Women in Science and Engineering (WiSE) program on campus. As a mentor, she helps ME freshmen with academic support and quickly becomes a friendly face on campus to new students.

2016-17 Outstanding ME Seniors



ME senior Karli Mattson is originally from the Twin Cities area of Minnesota. She has been an active member and vice president of Society of Women Engineers (SWE) for the past two years and a mentor for Women in Science and Engineering (WiSE) for the past year. Karli will graduate in December 2017. She is currently completing her fifth internship in the summer of 2017 with

Union Pacific. Karli hopes to pursue a career working on failure analysis. She anticipates obtaining an MBA online while beginning her career, working her way into a management position.

ME senior Jeremy Simmons was born in Deadwood, SD, but grew up in the southwest US. He returned to South Dakota to attend the SDSM&T as a non-traditional student. His interests within mechanical engineering are in dynamics, controls, and mechatronics.

While at Mines, Jeremy has been an active member of the SDSM&T Baja team, where he served as the design lead and vice president. He has assisted with research in the department and is an active member of Tau Beta Pi. He has also taken two co-ops with Hutchinson Technology and Kimberly-Clark, and he has been an engineering practicum with Caterpillar Inc. These experiences have given him a well-rounded set of skills that he looks forward to applying throughout this career.



Following graduation, Jeremy will begin his PhD studies in the mechanical engineering at the University of Minnesota in the Twin Cities. With a doctorate degree in mechanical engineering, Jeremy wants to conduct research and teach.

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.

2016-17 Outstanding ME Graduate Student (Aaron Lalley)



Aaron Lalley is the recipient of the 2017 Outstanding Graduate Student Award for the Department of Mechanical Engineering. He received his BS in mechanical engineering in 1991 and his MS in mechanical engineering in 1993, both from the South Dakota School of Mines and Technology. He received his PhD in mechanical engineering in May 2017. Aaron has been working in the Department of Mechanical Engineering since 2013 as an instructor.

His current research includes machining chatter modeling, and his previous research includes manufacturing process development for advanced solar cell production, ion implantation for enhanced tooling performance, and nano-fiber composite modeling. Aaron's 23 year engineer work history includes 18 years with Hutchinson Technology as an engineer in manufacturing, machine design, and tool design, working in the process areas of laser welding, shearing, forming and coining. In addition to Hutchinson Technology, Aaron has worked for Caterpillar; Midwest Precision Tool and Die; Unified Theory Inc.; and Manufacturing Works, an agency of the State of Wyoming, in the areas of machine de-

sign, product design, CNC programming, HVAC, MRP, process development, and product development.

2016-17 Outstanding Recent ME Graduate (Chris Vickery)

Chris Vickery, BSME 2008, is this year's Outstanding Recent Student for the ME department. While attending SDSM&T, Chris was active with CAMP and participated as a leader of the Aero Design Team, where he learned the value of working with a diverse team and having defined goals and values to help drive towards success. In his junior and senior years, Chris went on co-op and obtained an internship with Cargill, Inc. These experiences developed into his current career with Cargill. In January 2008, Cargill employed Chris as an Engineer in Training at the Blair, NE, facility, where he learned how to utilize his college experiences in food processing facilities. In the 9 years since he graduated from SDSM&T, Chris has worked at 9 Cargill facilities across the country. During his tenure with Cargill, he has worked as a process development engineer, department supervisor, senior engineer, and, currently, department manager. In those positions, Chris has helped roll out several new technologies, worked on multi-million dollar projects, participated and lead the SDSM&T recruiting team, and helped to build and start up a new corn processing bio campus.



ME Student Receives ASME Foundation Scholarship

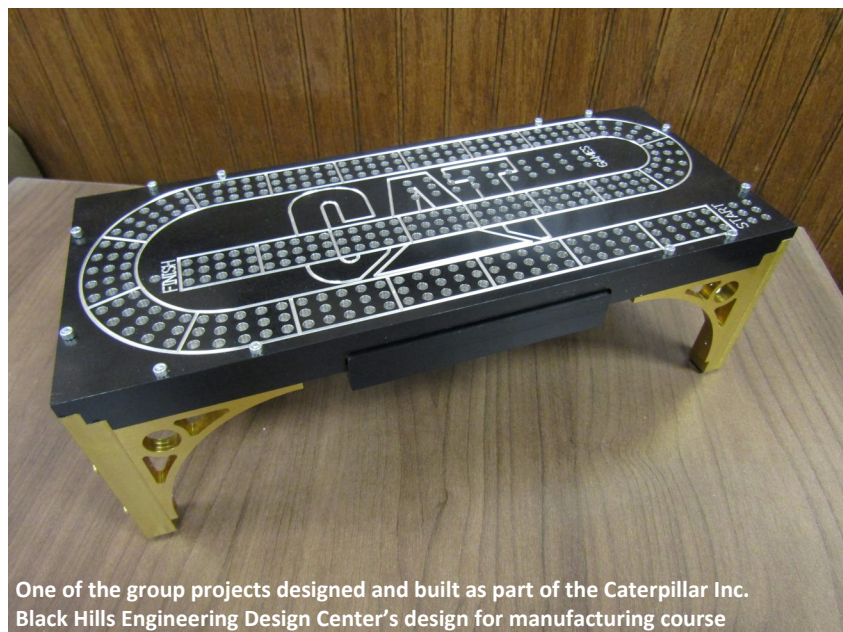


In addition to receiving one of two 2017 ME Outstanding Junior awards during the 2016-17 academic school year, current mechanical engineering senior Austin Kaul was selected as a 2017-18 ASME Foundation Scholar. The ASME Foundation is awarded based off recipients academic performance and potential to contribute to the engineering field. This prestigious award is the only renewable scholarship the ASME Foundation offers.

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!](#)

Caterpillar Inc. and SDSM&T Partnership Benefits ME Students



One of the group projects designed and built as part of the Caterpillar Inc. Black Hills Engineering Design Center's design for manufacturing course

As the largest employer of SDSM&T mechanical engineering students, Caterpillar Inc. has long been a supporter of the university. With the growth of Caterpillar's Black Hills Engineering Design Center (BHEDC), there has been an increased opportunity for on-campus interaction. A number of Caterpillar employees serve as judges on the First Lego League competition, and Caterpillar sponsors a number of First Lego League teams throughout the Black Hills area. First Lego League is a middle school STEM outreach program chaired by Dr. Jason Ash, an ME department associate professor. The regional tournament is held in the Surbeck Center's ballroom with the SDSM&T Robotics Club officiating. Each semester, Scott Knuppe, site manager for BHEDC, delivers a lecture to all ME freshmen about the role of the engineer at Caterpillar and the value of design quality. Regular interaction with Mr. Knuppe also helps to steer the ME curriculum.

The 2016-2017 academic year saw ongoing growth in the relationship between SDSM&T and Caterpillar. Caterpillar generously contributed to the purchase of a new Haas TL2 CNC lathe. This piece of equipment will significantly enhance the department's manufacturing capability. Students will train on the lathe and use it for course project manufacturing. Student exposure to industrial equipment and practices is one way in which SDSM&T has outshined many other institutions.

Caterpillar is the primary sponsor of a new student organization. The VEX Robotics team competes in a robotics challenge that requires programming, design, and teaming skills. They were able to qualify for VEX Worlds 2017 in Louisville, KY, in April 2017, and placed 11th out of 62 teams in their inaugural year.

Caterpillar and the ME department experimented with a cooperative course in Fall 2016. Ten Caterpillar BHEDC employees took part in an ME 125 Design for Manufacturing course adjusted to fit the facilities schedule. The participants were trained in hands-on and CNC-machining skills, and then tasked with designing and manufacturing a product. The value to the Caterpillar employees was an increased understanding of manufacturing processes that will improve on the job design efficiency. Feedback from the participants was very positive. There was also a benefit to the department in the understanding we were able to gain about the demands of a professional design facility like BHEDC. There was also a great deal of incidental communication between Cat employees and ME students, a fortunate opportunity for our students to gain insight into their chosen career field.

ME Industrial Advisory Board

We wish to thank our industrial advisory board members for their significant and outstanding service to the ME department!

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

Patrick Hallauer, ME76, EAD Incorporated, Omaha, NE

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

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

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 Rizer, ME90, Agspring, Kansas City, MO

Paul Schroder, ME78, Pella Corporation, Pella, Iowa

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

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

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

Dale Wilen, ME85, City University, Cheyenne, WY

New Equipment and Facilities for ME Department

Four years ago, ME department head Dr. Michael Langerman set in motion a plan to improve the industrial readiness of ME graduates. With input from Caterpillar, Cargill, and Nucor Steel, the department's goal was to create a culture of safety-mindedness and teach our students design for manufacturing. These goals became the primary focuses of ME lab coordinator Aaron Lalley and manufacturing lab manager Adam Kuenkel. This has become a continuously improving process through the cooperative efforts of the director of Facilities and Risk Management Jerilyn Roberts; project manager and assistant director of Facilities Michael Mannhalter; integrated manufacturing specialist Ryan Koontz; director of the Student Success Center Lisa Carlson; ME fabrication technician Charles Schilling; former SDSM&T ME professor Dr. Umesh Korde; Dr. Michael Langerman; and representatives from Caterpillar, Cargill, and Nucor Steel.

These efforts culminated into ME 125 Design for Manufacturing, a freshman course that instructs students in the use of manufacturing equipment and product design. Students learn the value of design for manufacturing with group projects. Shop safety and OSHA, MSHA, and EPA standards are emphasized in the course. ME 125 introduces students to documentation control, marketing, graphic design, and teaming. These concepts are practiced repeatedly in ME's curriculum, specifically sophomore design and senior design classes.



Developing this course and ensuring compliance of all ME activities to trained standards helped to identify a number of necessary facility improvements, specifically in areas of safety, chemical management, dust control, and emission control. Building and policy changes have been ongoing; over the summer of 2017, a number of significant projects will move the department ahead in terms of regulatory compliance.

Additionally, ME 125 has dramatically increased student capability in manufacturing, resulting in a shortage of available manufacturing equipment. It is very common to have all manufacturing equipment running with students waiting. However, we have had significant growth in equipment inventory since the inception of ME 125; equipment for student use include three manual mills, one vertical machining center (VMC), two tool-room lathes, one gear-head lathe, and MIG and TIG welders. Future equipment goals include a motoring dynamometer for alternative fuels research and a large scale VMC to increase machining capability. Significant equipment and facility improvements to be implemented over the 2017 summer break include:

- Acra AM2AC manual milling machine
- Rong Fu RF-3I mill/drilling machine
- Haas TL2 computer Numeric Control (CNC) turning center
- Torchmate 4400 CNC plasma cutting table
- OSHA and EPA compliant Dynamometer room
- OSHA and EPA compliant paint booth
- OSHA and EPA compliant anodization process

This ongoing improvement effort is made possible by generous contributions from Caterpillar, Cargill, and Nucor Steel, as well as State of South Dakota funding.

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ME Department Head's Message

Dear Friends,

The mechanical engineering department has concluded another successful academic year. Our enrollment remained steady at about 610 students. As the spring semester comes to a close, we can look back and see another very successful academic year. As presented in this newsletter, our students once again competed well in several national and international competitions.

Our department received more research funding in 2016 than any other department (\$1.2M). The pass rate on the FE exam for ME students was 85% compared to a 78% nationwide average. We graduated approximately 90 students in the last academic year and had a spring-to-fall retention rate of about 70%. We also graduated two PhDs this spring- Drs. Aaron Lalley and Ozan Ozdemir.

There have been some significant personnel changes over the last two academic years and more to come this upcoming academic year. As reported in the last newsletter, Dr. Mark Bedillion and Dr. Ali Heydari have accepted positions at other universities. Drs. Lidvin Kjerengtroen and Umesh Korde left the school last January. Dr. Kjerengtroen, who had been a member of this department for 27 years, retired, and Dr. Korde, who had been with this department for 14 years, accepted a position at Michigan Tech. They were excellent faculty, and we will miss them. Come the end of this spring semester we will lose one faculty member due to a denial of tenure. And later in June, Dr. Dan Dolan will retire after 36 years of service. The good news is he will not be going far and will return next fall to oversee and coordinate the Center of Excellence for Advanced Manufacturing and Production (CAMP). Finally, I will be bowing out come June. I plan to retire to be closer to my family. It's been a good 25 year ride, but it's time to turn the reins over to new leadership. I am keeping my options open, maybe to return to teaching as an adjunct ME faculty.

I have many to thank for the success of the department over the years including the department faculty members and their commitment to education and research. I need to thank our Industrial Advisory Board, with special mention to the Dr. Dan Weinacht (president), Mr. Tim Holleman (treasurer) and Dr. Paul Gnirk (a man of many talents). Also Mr. Dave Berg, who has been on the board going on 30 years. I thank my wife Kristen for her support and my son David, who graduated this spring with a degree in computer engineering (what can I say?). I will miss my colleagues (especially my able assistant Leslee) and students, but after 16 years as the department chair/head, I will not miss the administrative duties.

Sincerely

Dr. Michael Langerman

[Mike Langerman](#), PhD (BSME 72, MSME 74)
Professor and Head
Mechanical Engineering Department
SDSM&T

