Greetings,

It has been a busy year and we could fill a Calculus sized textbook with all the news from it, but we are fortunate to have good editors that have reduced the highlights into this newsletter. The campus continues to grow and the full-time enrollment for Fall 2014 was up 9% over last fall. This situation produces a lot of students that need to take classes in mathematics and computer science, which makes for a busy year. The Computer Science program has also grown by over 15% this year and currently has around 180 students in the major. Our B.S. in Applied and Computational Mathematics degree has remained steady in enrollment, and our M.S. in Computational Sciences and Robotics degree has managed some slight growth after graduating a large percentage of the students in the program last year.

This year should include a special note regarding Dr. Travis Kowalski. Every year, the campus honors a single faculty member for their outstanding contributions in teaching. Dr. Kowalski was honored with the Bernard A. Ennenga Teaching Award last April. Those that have had the privilege of taking a Kowalski class can certify the excellent example he gives in terms of teaching. Travis is an energetic instructor that demands from his students a deep understanding of the subject and is also very innovative in his approach to teaching. Travis always jokes about how he is secretly a liberal arts teacher that is teaching at an engineering and science college. But in reality Travis embodies the best that engineering and science has to offer. The study of engineering and science is completely centered on the activity of problem solving, creativity, communication, and understanding. Every student who has had Dr. Kowalski can readily identify these characteristics in the class. Congratulations to Dr. Kowalski for some well-deserved recognition. I hope you enjoy this newsletter.

Sincerely,

Dr. Kyle Riley, Department Head
**New Professor**—Fall 2014 brought a new member to the MCS team. Matt Leonard is our newest instructor and comes to us from Georgia. Matt has a bachelor’s degree from Berry College and a master’s degree from the University of Wyoming. Matt is excited to be back in the west and has been busy hiking and exploring the Black Hills. He has been teaching Calculus 1 and Calculus 2 during the fall semester, but will be expanding into Calculus 3 along with Probability and Statistics in future semesters. Matt devotes an incredible amount of time to his students and his classes which makes him a wonderful addition to the department. Welcome Matt!

**Promotions**—Spring 2014 semester brought about the successful promotion for both Dr. Karen Braman and Dr. Jeff McGough. Both faculty members earned the distinction of Professor, which is the highest rank a faculty member can hold at the university. Dr. Braman joined the School of Mines as an Assistant Professor of Mathematics in 2004. Dr. Braman has earned a good reputation as an instructor and has taught a variety of courses over the years. She has also been active in service and acted as a co-chair for the High Plains Science Fair for several years, but one true area of distinction is her accomplishments in research. Dr. Braman has earned two publication awards from the Society for Industrial and Applied Mathematics and she has been invited twice to participate in the Householder Symposium, which is a world renown gathering of the top mathematicians in numerical linear algebra. Dr. McGough joined the School of Mines in 1998 and made the difficult transition from being part of the mathematics faculty to joining the computer science faculty. Dr. McGough has built a strong reputation in teaching and can teach classes at almost any level. Dr. McGough was a driving force for curriculum renovation that transformed the old math program into the current program of Applied and Computational Mathematics. He is also a founding member of the department’s effort to build research in the area of robotics and was program coordinator for the graduate program for several years. Dr. McGough is a continuous innovator that has transformed our Senior Design course into the capstone experience that it holds for the CS major’s today. Dr. McGough has also advised countless numbers of students and he is a tireless force in the lab with our Robotics Team, the Unmanned Aerial Vehicle Team, and our new 3D printing club. Congratulations to both Dr. Braman and

**Achievements**—Kyle Caudle, Ph.D. assistant professor received accreditation by the American Statistical Association (ASA) as a professional statistician. The ASA recognizes professionals who have a demonstrated record of competently and ethically applying advanced statistical training and knowledge. In addition, they also must show the ability to effectively communicate the tools of statistics within all scientific disciplines.

Accredited professionals must complete a portfolio application that is peer reviewed by other statistics professionals. They also must demonstrate 60 hours of annual professional development in order to keep their certification current. Although relatively new in the United States, it was modeled after similar programs in Australia, Canada and the United Kingdom. Working with an accredited statistician provides employers, contractors and collaborators a measure of assurance that a statistician is capable and competent in the discipline of statistics.
Andrew Pierson of Brooklyn Park, Minn., was part of a senior design team that was selected to represent the South Dakota School of Mines & Technology at the 2014 Student Research Poster Session. The senior computer science major was among 13 undergraduates from colleges and universities statewide who showcased their research endeavors before state lawmakers in the State Capitol Rotunda on Thursday, March 6, 2014.

Pierson with his knowledge from SDSM&T, combined with his hands-on industry experience, 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, sponsored 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 graduated in May with a B.S. degree in computer science. Faculty advisors were Jeff McGough, Ph.D., of the Department of Mathematics & Computer Science, and Randy Hoover, Ph.D., of the Department of Electrical & Computer Engineering.

Alex Wulff, Computer Science undergraduate student and accelerated CSR major, competed in the South Dakota Academy of Science (SDAoS) 99th annual meeting and presentations in March of this year. Alex presented two of the research projects he was working on. The first which is part of his Master’s degree focus: Variability in Micro-Computed Tomography Images for Non-Destructive Evaluation of Friction-Stir Weld Quality. The second of which was The Application of Micro-Computer Tomography and 3D Printing to the Study of Fossils, and was to support paleontologists to create a novel approach to fossil transport, research and collaboration using modern technologies.

Both presentations were very well received, and the Friction-Stir Weld Quality presentation was awarded first place in the oral presentation category. After the award ceremony, he was presented with a $100 scholarship for the first place award. Alex’s abstract for his second presentation will be printed along with the full paper of his presentation in the 100th year of SDAoS’s Proceedings.

The experience was invaluable to him. He’s gained a healthy appreciation for sessions such as these, as well as interdisciplinary collaboration. He would like to thank all of the authors, editors and advisors that have helped him with the research, presentations and myriad drafts that followed. Thanks also to the South Dakota School of Mines and Technology and SDAoS for the opportunities to present his research.
The SDSM&T Programming Team turns in a strong performance at the ICPC North Central Regional

The SDSM&T Programming Team was among the 290 teams from eight states and two Canadian provinces who competed in the North Central Regional of the ACM International Collegiate Programming Competition on Saturday, November 8. With 290 teams, this was the largest North Central regional competition in history and was also one of the largest in all of North America.

The SDSM&T Team collectively consists of four Varsity Teams (Red, Blue, White, and Silver) and is coached by Dr. Ed Corwin, Dr. Toni Logar, Prof. Roger Schrader, and Dr. Larry Pyeatt. In addition, a JV team, the Green Team, trains along with the Varsity. SDSM&T turned in a strong performance with all four of its Varsity teams placing in the top 20. “We were hoping all four of our teams would be in the top 20%”, said Coach Schrader, “but we didn’t dare to hope that all of them would place among the top twenty teams. That is an amazing achievement – one that no other university in our region can claim this year, or in most years.”

1.) The Red Team, which finished in 11th place, consists of Rachel Krohn, Daniel Andrus, and Jaysen Spurlock. 2.) The Blue Team, which finished right behind them in 12th place, consists of Paul Blasi, Joseph Lillo, and Daniel Nix. Members of both teams will receive scholarships from Microsoft for their outstanding work. 3.) The Silver Team, (16th place) was a top 5 team for most of the competition, is composed of Matthew Dyke, Shaun Gruenig, and Adam Meaney. 4.) The White Team, which took the lead in the region early in the competition, finished in 19th place with members John Brink, Bryon Glass, and Dylan Geyer. 5.) The Green Team, consisting of Elliott Rarden, Weston Silbaugh, and Dicheng Wu finished in 47th place, in the top 20% of the region. The highest placing team in South Dakota not from SDSM&T finished in the 85th spot. Full results can be found at http://cse.unl.edu/~upe/contest/.

“The ICPC continues to grow in recognition and prestige, which means the regionals become more competitive every year. Some countries have farm teams starting at a very early age and take this competition as seriously as they do Olympic athletic competitions”, Coach Corwin said. “Our teams have to work harder every year and they continue to impress us with their passion and their skill – particularly their ability to work as a team”.

SDSM&T has earned a spot at the World Finals five times in the past, but this year’s winner is the University of Wisconsin, Madison whose team turned in an astonishing performance – getting all nine problems correct with a margin of over 400 minutes. Congratulations to the team and coaches from the University of Wisconsin!

The World Finals will be held in Marrakech, Morocco in May 2015. Dr. Ed Corwin will be in attendance as the Chief Judge for the North Central Region as will Dr. Toni Logar as Deputy Director of the North American Super-region. Both coaches will continue to work with the SDSM&T team as well as with the ICPC leadership in an effort to bring the World Finals to Rapid City.

“This was an impressive result for our team - we are very proud of them. And we’re already planning for next year...”, said Coach Logar.
New Course Offered—CSC 170

We are excited to launch a new course of Computer Programming for Engineers and Scientists. For many years, we have had several majors taking our Computer Science 1 class (CSC 150). However, the focus and emphasis on an introduction of C++ for Computer Science majors was never a great match for many of the other majors on campus. This spring, we plan to introduce a new course: CSC 170—Programming for Engineers and Scientists. This course is developed to serve the needs of students that are not in the computational sciences and it is primarily developed for the Mechanical Engineers since they are a large portion of the population that will be taking the class.

The class will focus on an introduction to the C programming language, which is a far simpler programming language to work with and the class will be using a very simple programming environment. The Mechanical Engineers have a curriculum that contains a substantial computing component and the development of this new course should align better with other courses in the curriculum. The course will also focus more on the use of devices to sense their environment and control mechanical systems. CSC 170 will also feature some of the latest developments in teaching computer science to include pairs programming along with using the pcDuino, which is a device that works just like a desktop computer and is smaller than a smartphone. Dr. Antonette Logar and Dr. Jeff McGough are developing the first offering of this course for spring 2015 and we are very excited to see this course get started.

Math Modeling Contest Poses Traffic Challenges

Last Spring, a trio of undergraduate students from the South Dakota School of Mines & Technology 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 and Computer Science, served as team advisor.

Teams were 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.
Expanding Pathways into Computer Science

Two faculty members from Mathematics and Computer Science are part of a large National Science Foundation grant. The lead investigator for this grant is Dr. Ben Sayler, Director of Education and Outreach at the Sanford Underground Research Facility. Drs. Antonette Logar and Jeff McGough, represent the School of Mines as the supporting partners in this project.

Expanding Pathways into Computer Science (EPCS) seeks to increase and enhance computer science learning opportunities for students within Rapid City Area Schools and neighboring school districts. This work builds on the success of an 11-year targeted NSF-MSP, involving the same core partners but focused on K-12 mathematics. The MSP precursor has built strong teacher capacity within RCAS and has improved student outcomes, including significant reduction of achievement gaps.

The EPCS partnership envisions rich, rigorous coursework at the high school level that deepens understanding of computer science, develops productive dispositions across a diverse array of learners, motivates these learners to consider additional computer science coursework later within their academic careers, and motivates increasing numbers to pursue computer science-related careers. Project partners are deeply committed to issues of educational equity - seeking to excite, engage, and prepare audiences historically underrepresented within computer science.

Collaborations with Industry

The department has long benefitted from partnerships and other collaborations with industry. One of the best current examples is the work with Innovative Systems. Innovative Systems was founded by Roger Musick (EE 71) with a focus in telecommunications. The company does the majority of their hardware and software development in Mitchell, SD, but they also have a satellite office in Rapid City. Innovative Systems recently hired Brian Butterfield (CENG 98 & TM 09) as a Software Engineer with the intent to provide support for some of the courses and curriculum development in our Computer Science program. Brian has been a valuable resource in our Senior Design class and is currently an adjunct instructor assigned to the course. Brian was crucial to the development of our new Mobile Development class that was taught in the fall of 2013.

Innovative Systems has been very active in Senior Design by sponsoring several student projects. Dr. Jeff McGough has been very successful in attracting industrial clients to Senior Design and the project sponsored by Raven Industries was selected to represent the campus during a poster session in Pierre during the last state legislative session. Dr. Larry Pyeatt and Brian Butterfield are leading Senior Design this year and they have sponsored projects from Innovative Systems, Echostar, and CHR Solutions. This type of partnership is a great benefit since students get industrial experience, the faculty members get interaction with industry professionals regarding the best practices in software development, and industry has an opportunity to work directly with our talented students. If your company is interested in pursuing a collaboration with our department then please feel free to contact us at 605-394-2471.
OUTSTANDING RECENT GRADUATES

Awards and honors are not always reserved for our students and faculty. Our department has a long tradition of alumni being honored with the Outstanding Recent Graduate Award. This award is a campus award dedicated to honoring alumni that have graduated within the past eleven years and merit recognition for their contributions to their profession and the community. This past year we had two alumni that were awarded the campus Outstanding Recent Graduate Award.

Darryn Frafford graduated from the South Dakota School of Mines and Technology with degrees in Mathematics and Electrical Engineering in 2003. In 2005, he received a master’s degree in Applied Mathematics from the University of Washington in Seattle, which he completed while working at the Boeing Company. He currently holds a position in applied mathematics research and consulting within Boeing Research and Technology where he works to creatively solve problems in network design and optimization, air traffic management and airline scheduling. Darryn’s accomplishments are not limited to his profession and this is reflected in his many contributions to the community with outreach and support to the local youth of Seattle.

John Walton graduated from SDSM&T in 2004 with a B.S. in Computer Science. He has over 15 years of experience in security including 7 years at Microsoft building and managing security engineering teams responsible for meeting cloud security challenges. Prior to joining Microsoft, he founded and managed a successful security consulting company specializing in software and hardware penetration testing. John also served as the technical lead of Avaya’s company-wide security team and pioneered/co-developed the industry’s first Voice over IP (VoIP) encryption solution. John has been a generous member in his community and has been active with several charities over the years.

The Department of Mathematics and Computer Science is proud of our alumni and welcome Darryn and John to the distinguished league of Outstanding Recent Graduates. The campus generates a citation for each Outstanding Recent Graduate and a copy of the citation is given to the department so we can display them. We have recently filled our display case and have started a Wall of Fame in our conference room. If you are ever back in Rapid City please stop by and we can show you the Wall of Fame.