Cargill, Inc., has pledged $580,000 to the South Dakota School of Mines & Technology for laboratories, scholarships and curriculum development in several departments.

The majority of the funding will support the Department of Chemical & Biological Engineering, including support for programs which provide students opportunities for practical application of biological engineering. The gift will be administered over the next five years and will fund laboratories and curriculum development, scholarships, field trips and other professional development opportunities.

Cargill’s gift will also support the mechanical engineering, mining engineering and electrical engineering departments.

Including the more than $1.1 million in previous gifts, Cargill’s investment in School of Mines programs and students totals nearly $1.7 million since 1987.

The new gift is the result of continuous, active involvement of Mines alumni within the company, as well as the direct result of collaboration between the university, the SDSM&T Foundation and leadership within the Cargill Foundation.

SDSM&T is one of the top providers of engineering talent to Cargill, an international producer and marketer of food, agricultural, financial and industrial products and services. The privately held company, which employs 142,000 people in 65 countries, began a relationship with the university in 1971 when the first Mines graduate was hired. Today, more than 60 South Dakota School of Mines & Technology graduates work for Cargill, many in key leadership positions from the vice president level down.

Currently, 21 students have a working relationship with Cargill in the form of full-time employment awaiting them upon graduation, summer internships or semester co-op positions at company facilities.

South Dakota School of Mines & Technology students have made aeronautical history with their concrete airplane.

The flight was quick and wobbly with the landing equally erratic, but it was enough for the record books. The 18-pound plane held its own during a crash landing to become the second known concrete plane to fly and the only one to stay intact upon landing.

The only other concrete airplane known to have flown was designed at the prestigious Embry-Riddle Aeronautical University (ERAU) in Daytona Beach, Fla. That plane crashed and was destroyed, according to Mines advisor, M.R. Hansen, Ph.D., an expert in concrete design. “My friend, Dr. Mark Fugler, concrete advisor at ERAU, was my inspiration to try this project. Their concrete airplane did fly first and proved that it could be done. Our goal was to do that and have it land safely.”

Mission accomplished: “Ours flew and sustained some damage on landing but was not destroyed. So, you could say this is the first concrete airplane to fly and land,” said Hansen, who notified Embry-Riddle of the School of Mines’ milestone.

News of the improbable success quickly turned viral, with it being featured in the print and online editions of The New York Times, as well as in U.S. News & World Report and Popular Science.

The plane, with a wingspan of 40 inches, was designed and built entirely by three SDSM&T seniors who recently graduated. David Haberman and Tyler Pojanowski, both mechanical engineering majors, and Seth Adams, a civil and environmental engineering major, worked on the plane for a year as part of their senior design project. Hansen and Lidvin Kjerengtroen, Ph.D., advised them throughout.

The group had just one shot to test a year’s worth of work.

Watching the concrete plane taxi 200 feet at the Central States Fairgrounds parking lot was a bit unnerving, said Pojanowski. “I was really nervous. We put a lot of time into it to see if it would work or not, and once it took flight I was shocked. The
Research conducted by a trio of School of Mines students may help the city save more than $151,000 at its Water Reclamation Facility. In their novel approach to figuring out how to combat elevated concentrations of nitrogen compounds, Mines seniors Marshall Davis, Kyle Doerr and John Ostheimer discovered the city’s wastewater is being over aerated and that the practice could be significantly reduced, potentially saving up to 61 percent of that operating cost, as well as fossil fuel emissions, and still be within environmental guidelines.

A certain amount of aeration is necessary to remove high levels of nitrogen compounds because they present serious problems and challenges to ecosystems, including low dissolved oxygen, fish kills, murky water and depletion of desirable flora and fauna.

But aeration is an expensive and energy-consuming process with an environmental impact. While Bob Druckrey, environmental process supervisor for the city, said the exact amount of savings potential is “dependent upon additional study,” students cited $151,513 over a five-year period in their final report.

The approach provides the chance to control aeration in the nitrification cell upon reaching a predetermined ammonia concentration.

Druckrey, a Mines alumnus, called the students’ method novel. “Usually when you control an aeration process you measure the dissolved oxygen concentration. The thing the students did was measure the amount of ammonia in the water as an indication of where we could reduce the oxygen feed.” When ammonia has been completely converted to nitrate, the need for additional aeration is greatly reduced.

“I heard about this approach at the annual Water Environment Federation Technical Exhibition and Conference in New Orleans last fall and put it on my list of interesting things to look at,” Druckrey said.

The environmental engineering majors designed a procedure in which they sampled and measured the amount of nitrogen ammonia every 10 feet of the activated sludge aeration basin. They traveled to the reclamation facility weekly to take samples and measurements.

Student findings showed aeration occurring at levels “well over the need for ammonia removal. They’re over aerating at the moment so they can reduce,” Lew Christopher, Ph.D., civil and environmental engineering department associate professor, faculty advisor and instructor of the undergraduate laboratory research course.

“Currently the blowers are operating at full operation capacity throughout the entire basin. However, the information gathered from this study proves this practice unnecessary and suggests that the aeration rate be reduced to provide only mixing past the nitrification stage,” according to the report.

While reducing aeration may seemingly require a turn of the valve, Druckrey points out “you need to know which valves to turn down, when to turn them down and at what parts of the process. The next step will be to purchase process instrumentation to give us a better handle on the data the students collected and then go from there.”

Druckrey suspected aeration levels were higher than they needed to be “but we didn’t have anything in hand to indicate it. When they came back with their results I was surprised and then some.”

Christopher approached city officials looking for “real-life” experience for his students, and this study was among several Druckrey and his colleagues suggested. “I called them and proposed that we work together on something practical for our hands-on lab. This was a very beneficial exercise. They were very happy and we were very happy with the results,” Christopher said.
Mines grads cross the threshold

Nearly 270 candidates received their Associate of Arts, Bachelor of Science, Master of Science or Doctor of Philosophy degrees during the 167th commencement ceremony hosted at the South Dakota School of Mines & Technology.

Gov. Dennis M. Daugaard delivered the May 4 commencement address. Carlos A. Beatty, Jr., an industrial engineering and management graduate, delivered the senior class message, and Vernon L. Bump, a 1961 graduate in geological engineering, received the Guy E. March Medal award.
M Week at the South Dakota School of Mines & Technology has been set for Sept. 14-22 with a theme of “Rocker Days.”

The celebratory week will kick off on Saturday, Sept. 14, with the annual president’s M Hill breakfast. The highlight will be M Day’s Hardrocker football game against Jamestown College at 5 p.m. Saturday, Sept. 21.

Activities throughout the week include a picnic at Dinosaur Park, coronation of the king and queen, whitewashing the “M” on M Hill, the Wharton Memorial Run and parade.

The full M Week schedule
Saturday, Sept. 14:
President’s breakfast
Students mow and clean around letters on M Hill
Sunday, Sept. 15:
Senior/frosh picnic at Dinosaur Park
Monday, Sept. 16:
Introduction of candidates
Professional attire fashion show
Dance
Tuesday, Sept. 17:
Armadillo’s ice cream and Elks Theatre movie night
Wednesday, Sept. 18:
Theme night – Illusionist Joel Meyer
Thursday, Sept. 19:
President’s coronation reception with candidates
Coronation
Bonfire
Friday, Sept. 20:
M Hill picnic and hill climb
Whitewashing the “M”
Saturday, Sept. 21:
Wharton Memorial Run, 8 or 9 a.m.
M Week parade, 1 p.m.
Soccer game, 2 p.m.
Football game, 5 p.m.
Traditional frosh run at halftime
Sunday, Sept. 22:
Student/alumni connection golf scramble at the Executive Golf Course

Hansen pledges $40K endowment

A fixture on the South Dakota School of Mines & Technology campus for 28 years, M.R. Hansen, Ph.D., a soon-to-be-retired professor of civil and environmental engineering, teaches as naturally as he breathes.

Walking into his office, knowledge has a physical presence: papers scattered across his desk, forming snow-like drifts against bookshelves as pieces of concrete peek out from between stacks.

Hansen has dedicated his career to knowledge. But his life, that belongs to his students.

After taxes, Hansen’s sick leave paid out to the tune of $20,000, a sum he donated in its entirety to start an endowment for the Mines student chapter of the American Society of Civil Engineers (ASCE) and the Department of Civil & Environmental Engineering. And he has plans to raise at least $20,000 more. He’s already matched dollar for dollar $17,000 with the goal of launching the fund June 21 – the day he officially retires.

“We don’t get any money at all from the state tax payers. All of it comes from student money or fundraising, with a little bit from student fees. Every year, the ASCE student chapter needs $20,000 just to operate, for the concrete canoe and steel bridge competition, etc.,” Hansen explains.

Endowments allow the principal to be invested with the earnings funding any needs, thus enabling the fund to continue in perpetuity. Half of those annual earnings will go to ASCE and the other half to the department to help with operating costs.

Before coming to the School of Mines, Hansen worked nine years as an engineer and then took a job at a smaller engineering college. Over the next six years, “I realized or decided that teaching was the best job in the world.”

His tenure at Mines has proven that epiphany true. “And it [teaching] sure has worked out that way. It’s much more challenging than regular engineering. Working with people, that’s a much harder material than working with concrete or steel. You can never do it perfectly.”

Hansen comes awfully close. Any conversation is a teachable moment. Two minutes in and the converser is the lucky recipient of a slab of concrete – and the barrage of questions that follow, about its components, density, feel, and weight. The list is endless.

His specialty is concrete, and his love for the material is evident.

Specifically: pervious, a special type of concrete with a high porosity. It’s used for flatwork applications, such as parking lots, because it allows water from precipitation and other sources to pass directly through, reducing the runoff from a site.

Hansen did the first pervious concrete installation in 2008 at the local S.D. National Guard Camp, a cooperative effort with area residents and volunteers. He also helped with an older Rapid City landmark: the concrete fish at Founder’s Park. And a more recent one: the fabrication of Storybook Island’s new Willy the Whale.

His love knows no boundaries. Through an umbrella agreement between the School of Mines and the Mongolian University of Science and Technology, Hansen’s been taking sabbaticals and teaching processes for making quality concrete for 12 years.

He’s even started an annual concrete conference, now in its 11th year, and a professional organization that writes and provides information about building codes for concrete. Students spend two semesters learning the weighty tome, which he sees as one of the most instrumental parts of the legacy he leaves. “Before this code, there was only the Russian code or no code,” which can be disastrous in countries affected by earthquakes. But now, “if you build a structure according to these specifications, it will safe, durable and long-lasting.”

After retirement, Hansen plans to move to Mongolia where he will teach concrete and his wife, English. But he’s going out with a bang, holding a series of themed retirement parties that will double as fundraisers for the endowment, complete with commemorative engraved glasses for the cause.

Those who wish to donate to the endowment may contact the SDSM&T Foundation at (605) 394-2436 or foundation@sdsmt.edu.
Goldcorp gifts $200K to mining, metallurgical programs

Vancouver based resource firm Goldcorp Inc. has gifted $200,000 to the South Dakota School of Mines & Technology for student scholarships, as well as faculty support and departmental research.

The company and the School of Mines have revitalized their partnership following the recent expansion of the Wharf mine, a gold mine owned and operated by Goldcorp. Charles Kliche, Ph.D. and mining engineering professor, was a key consultant during the mine’s expansion application process.

“For many years, the mine was on the verge of closure. Now, with years of mining ahead, we want to rebuild the partnership with the school through participation in its Industrial Advisory Board, scholarships, faculty support, research support and hiring graduates to be the future leaders in our company,” said Bill Shand, vice president of maintenance strategy. Shand has served on the university’s Mining Engineering and Management Industry Advisory Board since 2012.

The gift will be distributed in $50,000 increments during a four-year period, with $40,000 earmarked each year for the Department of Mining Engineering & Management and $10,000 for the Department of Materials & Metallurgical Engineering.

“One of the core funding priorities of Goldcorp’s donation program is education. Having a top educational institution like SDSM&T located within a one-hour drive of one of our operating mines is a rare partnership opportunity. Supporting the mining and metallurgical engineering faculties is a perfect fit for Goldcorp,” Shand said.

Goldcorp has hired a number of SDSM&T graduates through the years and also offers co-ops and internship opportunities for its engineering students. This year the Company hired two mining engineering and management graduates into its new Graduate Development Program, which provides numerous diverse opportunities for recent university graduates to become next-generation leaders, Shand said.

Opportunities are provided in a variety of disciplines, including: engineering, geology, environmental sciences, metallurgy, finance and human resources. Last year, an SDSM&T mining department graduate was hired by one of Goldcorp’s underground mines in Ontario.

“Every minute we have the choice to partner with the Mines,” Shand said. “It’s a choice to support engineering and education in the best way possible. This is an incredible opportunity for students and faculty alike. Shand said.

Haberman produced calculations to determine the take-off and lift distances, and what he projected is what they saw. The main goal was for the plane to take flight and to survive the landing.

Once the wheels were off the ground it was over in a matter of mere seconds, thanks to weight-balance issues associated with flying any plane. “There wasn’t much time because once it got air it just went over, it flipped over. I was freaked because I was really close to it and was worried it was going to hit me,” Pojanowski said.

Though made with carbon fiber reinforcement, it is concrete, after all, and a bold, yet fragile design to attempt to fly. And once it comes crashing down it would not be unreasonable to expect disintegration. In fact, that was Haberman’s initial thoughts when he saw a cloud of dust.

“I was initially kind of disappointed because I saw a puff of smoke and thought it had exploded. I was excited to see it all in one piece. I think the smoke was some of the concrete kind of grounded against the asphalt,” explained Haberman, remote control operator.

The plane sustained a crack in the fuselage and wing but otherwise remained intact, thanks in part to the students’ design plans and decision to reinforce the concrete to a safety factor of two, which meant it was twice as strong as it needed to be – strong without being too heavy. Adams, one of Hansen’s students, used the same concrete mixture that went into the award-winning concrete canoe. It’s a light mixture with extra carbon fiber reinforcement.

“Everything in aviation you want to be high strength and low weight, and concrete is the exact opposite. That’s why the professors did the project, to challenge engineers, to see what we could do. The thing I’m most proud of is … we did it with two MEs (mechanical engineers) and one civil (engineer),” Haberman said, pointing out their success was accomplished with a small team.

The issues with the plane flipping on its back while in flight weren’t completely unexpected. Learning to balance a remote-controlled plane while in flight is tricky and requires practice, a unique problem for students who hoped for a smooth landing so they could display their plane afterward at the Senior Design Fair.

“There is a lot more to aerodynamics and landing a plane than people realize. Even a regular remote-controlled plane of this size, which would normally weigh 4 to 5 pounds, those are hard to get up in the air and land,” Haberman said. “Landing wasn’t as big of a priority. The goal wasn’t so much to get it to land or even fly it around that much. It was more to get it up in the air and to prove that we could fly it and get it off the ground.”

Which they certainly did.

“We could’ve tried to fly this one again just to prove it flew again and to try and see if we could land it more softly, but we just wanted to leave something to the school to show what we did, and leave it in one piece,” said Haberman, adding that the history-making concrete airplane will hang on display in the SDSM&T’s Center for Advanced Manufacturing and Production laboratory.

Hansen is already looking ahead to the next challenge. “Phase III, hopefully next year, will add servo-controlled ailerons to control turning and help with a smooth landing,” he said.
The 2013 International Electro/Information Technology Conference, sponsored by the Institute of Electrical and Electronics Engineers (IEEE) Region 4, was hosted on the South Dakota School of Mines & Technology campus May 9-11.

The conference attracted more than 100 registrants and focused on research in the fields of electrical and computer engineering, physics, computer science, industrial engineering and mathematics, including cyber security, robotics and intelligence systems and renewable energy materials.

Keynote speakers and their topics were:

- David Nghiem, founder, president and CEO of Global Wireless Technology, Inc., cell phone issues and solutions.
- Richard Gowen, president and CEO of Dakota Power, LLC, and former SDSM&T president, "Trusting Autonomous Systems."
- R.J. Trew, National Science Foundation (NSF) director for the Electrical, Communications and Cyber Systems Division located in Arlington, Va., electrical and computer engineering research program at the NSF.
- Craig G. Rieger, Idaho National Lab Distinctive Signature Lead, "Resilient Control Architectures and Systems."
- Madjid Fathi, director of the Department of Electrical Engineering & Computer Science, University of Siegen, Germany, and visiting scholar with the University of California, Berkeley, "Approaching Knowledge Technology for a Significant Word Association."

In addition to providing a forum for students, researchers and industrial investigators to exchange ideas and discuss development in these growing fields, exhibitors showcased the latest electro/information technology tools and products.

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**2013 J.P. Gries Geologist of the Year award announced**

The South Dakota section of the American Institute of Professional Geologists (AIPG) has named South Dakota School of Mines & Technology alumnus Mark T. Anderson as 2013 J.P. Gries Geologist of the Year.

Anderson, a native of South Dakota, earned an M.S. degree in civil engineering and environmental sciences in 1980 and a B.S. degree in chemistry in 1974 from the School of Mines, where he also serves as adjunct faculty member in the Department of Geology & Geological Engineering.

The award is named in honor of Dr. John Paul Gries for his exceptional work in the field of geology and is provided each year by the South Dakota Section AIPG in memory of Dr. Gries, a longtime geology professor at the School of Mines. Anderson was nominated by Dr. Perry Rahn, emeritus professor of geology and geological engineering.

Anderson currently serves as director of the U.S. Geological Survey's (USGS) South Dakota Water Science Center in Rapid City. In this position, he is responsible for developing and overseeing a staff of scientists, engineers and technicians who conduct hydrologic investigations and data collection for ground water, surface water, and various water quality programs in the state.

During his career, Anderson has held several positions in the field of geology and hydrology. In 2011, he served as acting director of the USGS Earth Resources Observation and Science (EROS) Center, the world’s largest civilian storehouse of earth imagery. While there, he played an important role in the Landsat 8 satellite mission as he worked with other key USGS, EROS and NASA personnel. The satellite was recently launched this past February and was successfully placed into Earth's orbit. Since 1972, Landsat satellites have continuously acquired space-based images of the Earth’s land surface, coastal shallows and coral reefs.

In 2003, Anderson authored a chapter on US Water Policy with the President’s Science Advisor Dr. Neal Lane that set the stage for a national program on water availability.

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**Continued from page 1**

In pledging the $580,000, Cargill cited the School of Mines’ ability to produce top engineering talent, including those who contribute to Cargill’s business units “very quickly,” and SDSM&T graduates’ demonstration of innovation, particularly in the development of the bioengineering track. The company also cited Mines’ hands-on curriculum focus, a student body with rural backgrounds in communities similar to those where Cargill facilities are located, small class sizes and a dedicated faculty. The student-to-faculty ratio at the School of Mines is 14:1.

In recent years, Cargill has been the primary corporate partner with SDSM&T in the SD GEAR UP summer program for high school students from reservations statewide. Cargill provided $45,000 to the program over the last four years for curriculum and programming that otherwise would not happen due to restrictions with state funding sources.

Cargill representatives were on campus for the announcement, which was made in the Cargill Biochemical Engineering Laboratory, of the new Chemical and Biological Engineering and Chemistry Building.

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**About Legacy News**

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