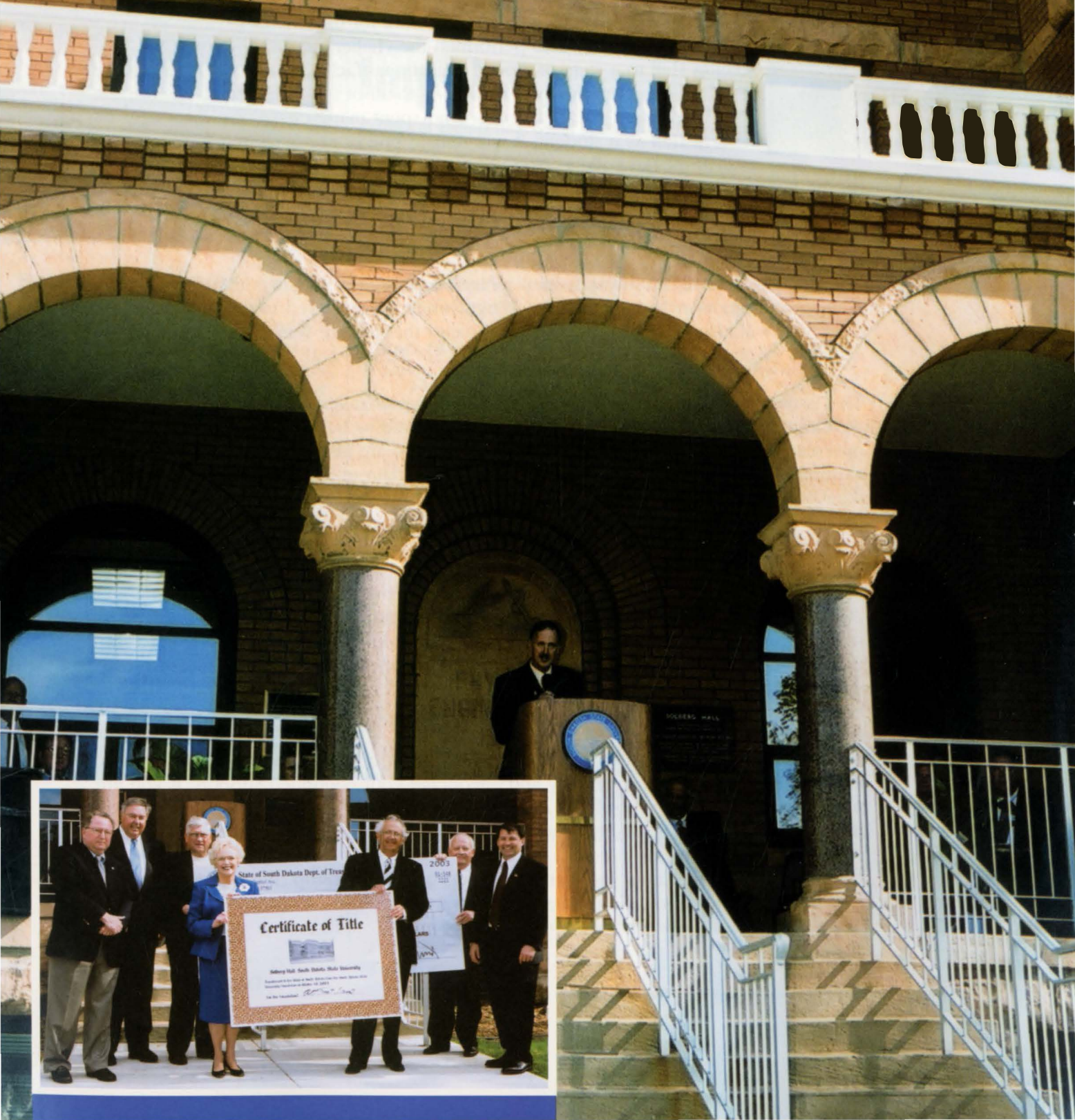




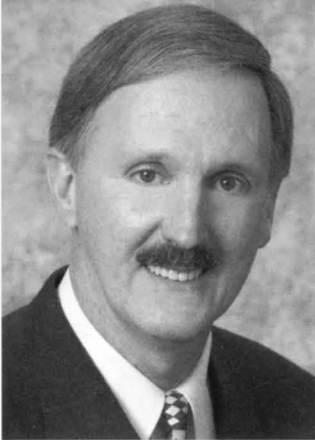
Impulse

College of Engineering
South Dakota State University

Winter 2004, Vol. 2, No. 1



FROM THE DEAN



Dear alumni and friends:

This issue reaches you after just completing an historic 2003 for SDSU and the College of Engineering!

Many thanks go to our friends and alumni for their financial support, and to the SDSU engineers, who performed the challenging task of restoring Solberg Hall to a state-of-the-art educational facility. The October 10, 2003, rededication ceremony was marked with all of the formality of this truly historic moment. As an alumnus who spent many classroom hours in Solberg Hall as a student, it will remain one of my most treasured activities as dean of our college. You will really enjoy reading the article that reflects on the history and legacy of Solberg Hall, the technical challenges faced by engineers responsible for its renovation, and the important new role it now plays for the College of Engineering.

You will also read about the important roles that College of Engineering students, alumni, and our own Assistant Dean of Engineering, have played in the war in Iraq. I think you will also be impressed with the articles that feature some of the numerous activities involving the students and faculty we are blessed with.

This issue also explains how we are becoming more engaged in the economic development of our state. We have always contributed to our state's development by providing the best graduates we can prepare, but we are also doing substantially more to support those students who feel the calling to remain in South Dakota and pursue their own entrepreneurial activities. It is our hope that we can assist more young people with developing their creative ideas into successful businesses that will keep them in South Dakota and one day employ other graduates of our programs.

You have heard me offer many comments related to our preparation for the September, 2003 ABET accreditation visit of our engineering programs. In this issue you will learn that our campus visit went well and for the first time in decades, we were able to show off our facilities of Solberg Hall and Crothers Engineering Hall, instead of defend their decrepit state! You will also read an article that updates our progress on the Jerome J. Lohr Structures Laboratory in Crothers Engineering Hall.

We highlight our donors in this issue as you can see from the impressive list. I want to thank all of you for your generosity and encourage your continued support. If you are not already a member of our Dean's Club, please consider becoming one and helping us continue to produce the best graduates in engineering, science and technology.

I hope you enjoy this latest issue and will drop us a line or stop in for a visit if you're in our area. Remember, Jackrabbits are always welcome!

Lewis Brown, Ph.D.
Dean of Engineering



Serving half a world away in the sands of Iraq made the green of the SDSU campus and the familiarity of its landmark icon all the more attractive. Page 6.

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Dean Lewis Brown addresses dignitaries and donors at the Friday, October 10, 2003, rededication of Solberg Hall, originally built in 1901. (Inset) President Peggy Gordon Miller presents the certificate of title to the restored engineering building to Harvey Jewett, president of the South Dakota Board of Regents.

Cover photos by Eric Landwehr.

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SDSU engineers

restore Solberg Hall to active duty

Students can once again stand under the Solberg archway and gaze out at the Coughlin Campanile while pondering their engineering future.

"Thousands of engineering alums walked these halls, studied in the classrooms, and like me, first imagined what it was going to be like as an engineer in the real world," says Dean Lewis Brown. "This is where our passions and commitments to engineering started. As we begin this new century, we have state-of-the-art programs in a state-of-the-art facility."

Solberg's ranking in the state was equaled only by the list of dignitaries assembled to speak. Joining Brown were SDSU President Peggy Gordon Miller, Governor Mike Rounds, United States Senator Tim Johnson, Board of Regents President Harvey Jewett, Al Tuntland, Jerry Lohr, Conrad Solberg, and Lon Stroschein, aide to United States Senator Tom Daschle.

The \$3.93 million renovation project was totally funded with private gifts

from alumni and friends through the SDSU Foundation.

"We are celebrating the outcome of what happens when you do the right thing," says Miller, referring to her decision in 1998 to close the building when architectural studies found the structure to be unsafe. "We have graduates and members of this great university family who are always willing to step up to their responsibilities.

"Many great universities have a motto that goes 'We are touching tomorrow today.' That's exactly what Solberg Hall does. It's touching tomorrow today in the way that it needs to be done."

Built from inside out

The restoration put a high-tech building inside the structure of a building more than 100 years old, while faithfully restoring the external structure to its original appearance. Indeed, Solberg Hall was literally rebuilt from the inside out.

"Let us not forget, this building was built before cars, before rural electric lights, before fire codes were developed," points out Tuntland, a 1962 mechanical engineering graduate and chair of the SDSU Foundation Board. "Restoring it on the outside while simultaneously rebuilding it on the inside was an engineering and construction feat of the first magnitude."

Jack Marshmann, 1955 civil engineering graduate and chairman of Sioux Falls Construction, directed his engineering company to a building that was the cornerstone of his education.

"The Solberg renovation was a particularly satisfying experience," he says. "I attended all my engineering classes there. Restoring that old engineering building to better than new condition, and using special legislation to allow it to happen, gave me a wonderful feeling of accomplishment." (*See separate story on the legislation.*)

Rounds was quick to laud Solberg Hall as a perfect example of people coming together to make a difference.

"We are celebrating the outcome of what happens when you do the right thing," says President Miller



In the final scheme of things, it's about engineers taking care of their own. It could be said that Solberg Hall was designed, built, and paid for by SDSU engineers. With that in mind, it was indeed a special time when past and present gathered for the re-dedication of the building October 10, 2003.

"This facility will service our children in the future," he says. "It gives them a world class opportunity for a great education. The people here today have done more than just talk. They have stood up. They have put their resources where their beliefs are. They have actually taken the time to make a difference.

"I want to say thank you to the individuals who have been responsible for making this project a reality," Rounds adds. "And to share with everybody how important it is to our young people that individuals who have had an education here, and who could have gone any place in the world and decided to come back here, really do make a difference."

Engineering challenges

Little did the public realize or comprehend, but Solberg Hall was the beneficiary of important engineering "firsts" and a few "anxious moments" during the sixteen months it took to finish the project.

The engineer that he is, Brown for one, was fully aware of what Sioux Falls Construction was up against. "There were days when I walked across the street on windy days and I thought, boy, 'I hope those guys know what they are doing over there.' But, I never had any doubts that we would be standing here today."

The site superintendent was Jared Gusso, a 1998 civil engineering graduate, who was immediately faced with the daunting task of how best to extract the material from inside the building.

Rather than demo everything into pieces and carry them through the front door, which "would take too much time and expense," Gusso opted for plan B, which meant using a crane to lift large pieces out through the roof and conveyor belts to run debris out through the windows.

"We cut out floor sections, but only took fifteen feet at a time so we didn't

expose any more than we had to," Gusso explains. "We put our steel framework back in its place and basically kept leap-frogging that way."

The engineers were also confronted with the fact that Solberg was constructed without a true footing and foundation. Instead a two-and-one-half foot wide trench served as the bedding for more than a century.

The basement was lowered two feet and a whole new foundation system was installed around the exterior and interior. Making the foundation secure was a nerve-racking experience in itself, Gusso says.

"The soil is really good, but once we took one side of the soil away, we had a two-foot sidewall that the weight of the building could have forced that soil out and brought the whole thing down. It was a tricky situation that we fixed with the installation of the foundation system."

Gusso adds that he wouldn't have anticipated five years ago that he would be leading the restoration efforts. "This is very special and quite an honor for me. It's a wonderful thing to finally see it completely done. It's a one of a kind job."

Department finds home

Solberg Hall was originally known as the Physics and Engineering Building when it was built in 1901 for \$40,000, still a hefty sum at the turn of the century.

In 1966, it was renamed in honor of long-time professor Halvor Solberg, who introduced the mechanical engineering program to SDSU. When the building was being planned in 1900, it was Solberg who drew up the plans and specifications and he supervised its construction.

When Crothers Engineering Hall was built in 1957, Solberg Hall continued to be used for classrooms, laboratories, and offices. When it was shut down, the Department of Engineering Technology

and Management was forced to relocate and use offices, classrooms, and laboratories around campus.

The department's programs that are returning to a "new" Solberg are construction management, electronics engineering technology, and manufacturing engineering technology.

"It has been a long-standing goal of mine to see Solberg Hall, SDSU's original engineering headquarters, returned to a center of engineering excellence," addresses Lohr, SDSU Foundation Board member who chaired the reconstruction project. "A lot of other people shared this passion for this project and working together we made it a reality.

"The programs that this building now house are a major advance for South Dakota," adds Lohr, a 1958 civil engineering graduate. "These are the shop-floor engineers who are very important to our future in this state."



Unique funding spawns new Solberg Hall

The renovation of Solberg Hall introduced a new approach to improving campus facilities.

It marked the first time that state lawmakers and the governor authorized the Board of Regents to lease a building to the SDSU Foundation for renovation purposes.

The special arrangement provided significant cost savings and efficiencies. When construction was finished, Solberg Hall was sold back to the state for \$1.

"We congratulate the SDSU Foundation for taking the initiative to rehabilitate this historic structure on the Brookings campus," says Board of Regents President Harvey Jewett. "The Foundation conceived this project and carried it forward to a very successful conclusion. The State of South Dakota has a beautiful and functional building to show for it."

The U.S. Senate Appropriations Committee provided a \$640,000 federal grant to purchase computers, equipment, and furnishings.

"This extraordinary building is one of the most historic buildings on the SDSU campus," says U.S. Senator Tim Johnson. "This, along with the multi-millions of dollars for research, initiatives, and other things that we are doing to make sure we continue that strong SDSU-federal relationship, is heartening to me."

The Solberg tradition

Two pieces of furniture in the \$3.93 million project came free of charge.



From the construction financing arrangement to the conference room table, the project broke new ground.

Using carpentry skills reminiscent of his great uncle, Halvor Solberg, for whom the building is named, Conrad Solberg constructed two conference tables from the original wood taken from the flooring during the demolition process. They are each four feet wide, with one measuring six feet long and the other ten feet long.

Taking the pieces back to his home in White Bear Lake, Minnesota, Solberg took his time in making the tables, which are butted together and reside in the conference room on the first or main floor.

"After taking out all the nails and removing the varnish, the wood inside was beautiful," he says. "It's old growth fir, because the growth rings are very close together. It means the tree probably grew in the shade of another

larger tree. It's hard to find nice wood like that.

"The table is a real tribute to Halvor," he adds. "He was a very experienced wood worker and so was his brother, Lars. It's great to make something in honor of them."

The Solberg brothers were eighteen when they arrived from Norway in 1880. Halvor worked his way through college building desks for the SDSU professors at a time when only the president had a desk. After earning his doctorate from Purdue University, Solberg returned to SDSU to head the mechanical engineering department and later plan for the building that would bear his name.

Conrad Solberg called Brookings home until he graduated from SDSU in 1958. His memories run deep, especially with the return of Solberg Hall.

"My sisters, mother, and uncle all graduated from State," he says. "We have scholarships here . . . we are very close to the college. In fact, east of Clear Lake in Deuel County, I lived on a farm before moving to Brookings and all the farm buildings there were built by Lars."

"It's great to come back and see the finished project," Solberg adds. "This building is absolutely beautiful and I'm sure Halvor would be proud."

Gathering around the conference table made from flooring in the original Solberg Hall are Solberg family members, from left, Ryan Solberg, Conrad Solberg '58 holding grandson Tryg Solberg, Barbara Murphy, and Lu Simpson.

Solberg Hall restoration reflects Renaissance

The architecture of Solberg Hall is representative of the northern Italian mode of the second Renaissance Revival, popular between 1890 and 1920.

During the restoration process, the brick-and-stone facade was tuck-pointed, cleaned, and washed, and the mortar joints were all replaced. The focal point of the building's design is the arcaded and recessed gallery, which serves as the entrance.

The basement houses laboratory and classroom space for the manufacturing engineering technology program. The

Great Plains Rapid Prototyping Consortium, an applied research center assisting South Dakota companies with quick production of prototype products, also has a home in the lower level.

The first floor consists of the department head's office, a conference room, an engineering hall of fame, and faculty offices for manufacturing engineering technology.

Classrooms and faculty offices for electronics engineering technology and construction management are on the second and third floors.



A brand new feature was the construction of a 3,260-square-foot addition on the north side of Solberg Hall that houses a three-story elevator tower and stairs. Extending north thirty-seven feet, eight inches and measuring twenty-four feet, four inches wide, the addition allows for access to all levels of the building for persons with disabilities as well as providing exits.

New department head sees big future for **Solberg Hall**



Teresa Hall comes to work every day donning a big smile. Her enthusiastic demeanor is due for a good reason.

The new head of the Department of Engineering Technology & Management

is glad to be on the SDSU campus. After all, why wouldn't she be?

"This was an important incentive to come," she says. "It was a huge draw to know that I would be working in an excellent, new facility. It has been a good transition for me."

Hall was referring to Solberg Hall, the original engineering building that opened its doors to students for the first time since it was closed for safety reasons in 1998. It had been the target of an SDSU Foundation \$3.93 million renovation project completed in time for the fall 2003 semester.

During the intervening five years, the ETM department's programs relocated, using offices, classrooms, and laboratories around campus.

A new Solberg Hall means construction management, electronics engineering technology, and manufacturing engineering technology are housed under the same roof. It also is home for the industrial management and safety management programs.

Hall was the manufacturing program coordinator in the Department of Industrial Technology at the University of Northern Iowa prior to joining the SDSU staff. She experienced a short preview of what her colleagues faced before moving into Solberg Hall.

"I spent three weeks in Wenona Hall in August and I thought 'As a department, how did they survive being housed all over campus?' I mean, it was okay working there, but it wasn't good having our programs so spread out. We can now walk down the hall and see our colleagues as well as have our classrooms in the same building."

Indeed, Hall sees the ETM department as the "little sister" that has grown up. "We are all together in this great facility, and as a result, we can really be a much stronger contributor to the success of the College."

One of Hall's top priorities is to seek ways in which the department can expand its

outreach to industry, especially since Solberg Hall is also home to the Great Plains Rapid Prototyping Center.

"It's really important for this department to serve as a liaison to South Dakota industry," she says. "We intend to collaborate with the College's other programs on outreach projects that serve the needs of South Dakota."

"Our department and the College as a whole have such a broad variety of things we can do. We have talented faculty and staff with the capability to do research, outreach, and service to benefit South Dakota business and industry. The possibilities are endless."

"Funding the renovation of Solberg Hall was an investment in our future by SDSU alumni and supporters," adds Hall. "Their faith in us is well placed."



Solberg Hall *a valuable recruiting tool*

Solberg Hall now serves as an important recruiting instrument for the College, according to Assistant Dean Richard Reid.

"Last fall we gave the admissions staff a tour of Solberg Hall and one of the first things they said was that they need to include the building on their campus tour," he says. "When you walk through Solberg it screams with technology."

"The building says past, present, and future. It's an historic package on the exterior, but on the inside, it really represents the new and modern things, and what's happening in the future of technology."

Tours of the College usually begin at Crothers Engineering Hall, where high

school students are first struck with the large addition built onto the east end of the building that houses new classrooms, laboratories, and the expansive Jerome Lohr Structures Lab.

Their final stop ends at Solberg Hall, which also boasts the best in technology and modern computer equipment on the market.

"Solberg Hall leaves a good and final impression of the College of Engineering when students walk through it," says Reid.

"Many of them are going to come here regardless, but there is a lot of them, especially on the engineering and technology

side, where facilities, classrooms, and labs are going to make a difference.

"To compete for students today the campus facilities still have to look nice," he adds. "It's not that it makes us teach any better or any worse, it's like looking at a new car and buying it. Making a good impression is the key to attracting new students."



BACK FROM

Three Guard members share their perspectives

The top story of 2003 in America also was the biggest happening in lives of many from the College of Engineering.

Last year 142 SDSU students and six faculty members were called up by Uncle Sam to serve their country during Operation Iraqi Freedom. Within the College, Assistant Dean Rich Reid and thirty-nine students went on active duty. This does not include scores of alumni who served.



This fall's visit to the College by an accreditation team created some tension for Assistant Dean Rich Reid, but by no means was it his most stressful event of the year.

It certainly doesn't compare with the four months he spent in Iraq.

"Every day, especially early on, was just a lot of stress," the Air National Guard major said in December from his SDSU office, four months and one world away from his tour of duty.

Reid, a civil engineering officer with the 114th Civil Engineering Squadron based in Sioux Falls, was activated with fifty-one others in February.

The original plan was that the squadron would go to Turkey to expand bases to stage attacks against Iraq. But

Squadron members with SDSU ties are, from left, SSgt Brian Welch, Lt. Col. Dick Gustaf, Major Rich Reid, Major Kim McLaury, SSgt Todd Mergen, SSgt Jody Page, and SSgt Josh Horstman.

that plan was cancelled when Turkey didn't allow an increase in American troop strength there. As American forces quickly advanced, the U.S. military then gained the option of using Iraqi bases.

Building a base in Baghdad

The first U.S. air strike was March 19, 2003. Three weeks later, April 9, the United States had advanced into Baghdad. Less than two weeks later, April 21, the day after Easter, Reid recalls, he was in that nation's capital as the first Air Force base civil engineer at Baghdad International Airport.

"From the minute you get up until you go to bed, you're trying to make do without enough equipment," he says.

The thirteen-year active duty veteran was responsible for designing an Air Force base at the airport and starting construction.

When Reid arrived, the Army was securing the area and the Air Force had just begun to conduct operations with

one useable runway. "Nothing had happened yet to establish a base," says Reid, who has served in the Guard since 1996.

Architect of Tent City

Using a laptop computer, Reid and his staff designed the location of sleeping tents, office buildings, the mess tent, power and water lines, motor pool, fuel storage, aircraft maintenance hangars, and other facilities needed to support a military city of 1,200.

Initially, Reid had an engineer and three surveyors to help him. By the time he was replaced by an active duty commander in three weeks, the civil engineering squadron had grown to 150.

The operation was set alongside the Iraqi military air base at Baghdad Airport.

"Typically, the existing buildings were in such bad shape, it was just easier to put up tents" than use the buildings, Reid says.



Paired with alums in Tallil

The remainder of Reid's stay was at the Iraqi base of Tallil, which is ten miles from Nasiriyah in the southern quarter of the country.

"Tallil was in much worse shape. Baghdad was their international airport. Tallil looked like a place that had been heavily damaged in the first Gulf War (1990) and just sat ever since," says Reid, who was then involved in stateside research and was not deployed.

At Tallil, Reid served as deputy base engineer. Lt. Col. Dick Gustaf ME '73, a mechanical engineering graduate and fellow member of the 114th Civil Engineering Squadron, served as squadron commander and base civil engineer.

Other Jackrabbit alumni serving with the 114th at Tallil were Major Kim McLaury CEE '87, SSgt Todd Mergen CEE '99, SSgt. Jody Page CEE '99, SSgt. Josh Horstman Agronomy '02, and SSgt. Brian Welch CEE '94.

Challenged by lack of supplies

The most challenging part of the work was "the environment, trying to survey during a sandstorm, and trying to get the work done with the equipment we had. We didn't have the most sophisticated equipment right at first," says Welch, who also does computer-aided drafting for the military as well as in his job at TSP engineers in Sioux Falls.

Reid agreed that not having the right tools and equipment was the biggest challenge.

For instance, three compressors would arrive, but no air hoses. Concrete saws would show up without blades, Reid says.

While such shipments did cause some head scratching, he understands that with ten to twelve air bases "being built or torn down at the same time, it's just a lot of stress on the logistics system. . . . In the early stages, it's not going to

be smooth and seamless. You have to get kind of innovative."

Second deployment for EE student

Tonja Jorenby, an electrical engineering student from Volga, can testify to that. A fellow member of the 114th Civil Engineering Squadron, she was deployed to Kirkuk in northern Iraq, far from the Syro-Arabian Desert where Reid and Welch labored.

In Jorenby's words, the biggest challenge was "trying to do something with nothing. We had a lot of nothing."

For example, mosquito netting was used for window screens.

Iraq was Jorenby's second deployment in a year and a half. She was sent to Qottar, Afghanistan, on October 10, 2001, less than a month after the Twin Tower terror attack. Like her Iraq assignment, she was in Quatar for four months.

Looking for hazardous waste

"Kirkuk was even more of a bare base than Quatar (a small country surrounded by Saudi Arabia and the Persian Gulf). When we got to Quatar we were all sleeping in a warehouse. When we got to Kirkuk we were sleeping in a shelled out building," says Jorenby, a single, non-traditional sophomore.

The master sergeant and former active duty surgical technician serves as a readiness technician in the Guard.

Her unit is responsible for emergency planning and training as well as detecting the presence of nuclear, biological, and chemical contaminants. The only finds were some industrial waste and general medical waste, Jorenby says.

"By far the biggest threat was unexploded [Iraqi] shells left over the from the Gulf War," she adds.



Good experiences with Iraqi people

Contacts with the Iraqi people were generally positive. "Most of them were not unhappy to see us," Jorenby says. The town of Kirkuk was right over the wall from the base and Iraqis would come onto the base for work.

In addition to groundskeeping jobs, Iraqi put glass into base windows, welded screens on the buildings, and put fuses into fuseboxes. Iraqis had looted the buildings right down to the fuses and electrical outlets, Jorenby says.

Welch, who left his southern Iraqi base to help establish a water line from the Euphrates River, says the Iraqis he talked to were "very happy we were there and doing what we were doing. I never felt unsafe. There's always a sense of unease when you're out there, but I never felt threatened."

Longing for family, food

But with a wife and two-year-old son back home in Sioux Falls, Welch did feel homesick.

Reid left behind a wife and three children.

In addition to being separated from family, there is a sense of global isolation. "We hardly knew what was going on in Iraq, let alone the rest of the world, or visa versa," Reid says. And, of course, meals ready to eat (MREs) don't include baked chicken, fresh milk, or pizza.

When he sat down at holiday meals this past season, he could earnestly say, "Yeah, I appreciate this.

"In the back of your mind, when you start to think of how bad something is here, you think, 'yeah, but remember when you were in Iraq.'"



Barnett

Inquisitive nature leads Barnett to 'quality' career

Albert Einstein he is not, but an inquiring mind has elevated Andy Barnett to the upper echelon of his field.

Ever since his curiosity about the location of a hole in the ground, Barnett's career has been about solving problems with some of the best-known manufacturing companies in the country.

During the last ten years, Barnett's leadership skills, manufacturing experience, and educational background have saved his employers more than \$50 million. And, along the way, he has gained the admiration and respect of some of the top executives in the business world.

"Simply put, I enjoy solving problems and seeing results," he says. "It is such a great feeling to see the results of a successful improvement effort. Once I achieved a few major breakthroughs early in my career, it was no longer satisfying for me to merely meet expectations. I'm constantly searching for new opportunities."

The 1985 mechanical engineering graduate is the statistical quality manager at Longhorn Glass, an Anheuser Busch company in Houston.

Barnett, who has a patent and other major awards to his credit, says his career is about combining engineering, quality disciplines, and statistical methods to identify opportunities for improvement.

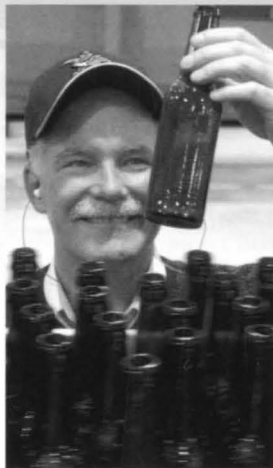
"I use my engineering skills and my knowledge of statistical methods to solve problems. I'm most successful when I work with teams of people who are open to new ideas and approaches. Once in a while, I need the help of a technical expert like a chemist, but most problems can be solved using experimentation."

Leads rising company

At Anheuser Busch since December 2000, Barnett is responsible for ensuring

that bottles shipped to customers meet the company's high standards for quality.

A database system is linked to nearly every sensor and piece of



It's all in a day's work for Barnett, who could be classified as the million-dollar expense saver. Still, he has never lost sight of where it started.

machinery in the plant and queries the equipment every fifty milliseconds. Data is captured on about 25,000 variables, including temperatures, pressures, flow rates and speeds.

"I use this information to generate reports and analyze the process to optimize it," says Barnett. "I have written an extensive series of Excel programs that summarize the data and highlight key processes and prioritize improvement activities."

Under Barnett's guidance, the data systems have fueled the success of Longhorn Glass, which was formed three years ago, and now ships about 800 million bottles per year.



Longhorn is a relatively small player in the market, yet other glass suppliers are taking notice, according to Barnett, who points out that after eighteen months the company leads the industry in quality in terms of vendor ratings. "Vendor ratings indicate the frequency and severity of defects per ten million bottles," explains Barnett, who cites productivity improved 3.9 percent in nine months, saving \$2.2 million annually.

"We have the highest housekeeping score ever achieved by a glass plant. That's important because we are expected to live up to many of the same standards that are required in food processing plants."

Philosophy to engineering

A Sioux Falls native, Barnett originally went to the University of South Dakota where he earned a philosophy degree in 1979. Looking at either law school or the seminary, he opted for the latter and joined the Franciscan Order.

A few days before leaving the seminary, the monastery where he was living lost all electrical power to the building, which was located on 600 acres in a western suburb of Chicago.

A repair crew came to the property, spent a few minutes at the transformer pole, and drove about a half-a-mile across the field. It was at that moment when Barnett's life changed forever.

"They started digging a hole out in the middle of nowhere and found the exact spot where the underground power cable had shorted," recalls Barnett. "I asked one of them how they knew where to dig the hole. The engineer showed me a wheatstone bridge and explained how it worked. I was so impressed with the power of

engineering that I decided to enroll at SDSU and make engineering a career."

Ten years later, Barnett added a business degree to his liberal arts and engineering degrees when he earned a master's degree in business administration from the University of Michigan in 1996.

"Philosophy taught me how to think logically and how to write effectively and persuasively," he says. "Engineering is a technical field geared to problem solving. I feel very fortunate to have two undergraduate degrees and a master's degree. I was poor for a long time, but it was worth it."

Making an impact

Barnett admits that early in his career it was difficult to get support for some of his radical ideas, but as time passed, his growing reputation cast any doubts aside.

"I became more effective at persuading others to join the effort," he says. "It's very gratifying to look back and know that I made a difference. More than once, I have solved problems that had been nagging the company for many years."

A case in point was the Rain Bird Corporation, where Barnett was the quality engineering manager prior to Anheuser Busch. Located in Tucson, Arizona, Rain Bird is the world's leading irrigation products company.

Barnett found the quality systems were "poorly structured," documentation was "practically nonexistent," and costs "were high." His team immediately implemented numerous quality disciplines, focusing initially on defects, and eventually shifting most of the energy to preventing defects and improving processes.

He also started regular training sessions, teaching a series of two-hour classes to all of the engineers on quality disciplines and statistical methods. When he left two years later, the company's warranty claims had decreased by 70 percent, saving Rain Bird \$1.8 million annually.

Shortly after starting at Rain Bird, Barnett joined a team responsible for improving valve quality. In eleven years of making valves, a small percentage of them leaked, which forced the plant to test every one to make sure no leaky ones were shipped to customers.

Since testing added time and cost to the operation, Barnett designed and executed an experiment to understand the

cause of the leaks. After his analysis, he directed the plant to change parameters to optimize the process set-up.

"We tested the next 30,000 valves and did not have a single leak," he says. "We stopped inspecting every valve. Switching to an audit plan saved us more than \$50,000 per year.

"Statistical methods are an extremely powerful tool in my career. I cannot overemphasize how important this has been. Time and again, I have found effective solutions using highly efficient statistical techniques."

Earning a patent

Barnett came to Rain Bird after twelve stellar years with the Ford Motor Company.

He was a senior advanced engineer at Redford, Michigan, from 1997 to 1998, after four years as a senior quality engineer in Dearborn, Michigan. After SDSU he had two positions in Allen Park, Michigan. His first was an automation systems engineer from 1986 to 1989, followed by four years as the quality control coordinator.

Patent ideas run rampant for Barnett, although only one has been officially recognized. According to him, Ford was reluctant to pursue patents for process-related work because they are a public document.

"Once a patent is issued, the whole world knows how to replicate the results," Barnett reasons. "I have had numerous ideas for patents, but most of them have remained competitive secrets."

Barnett's patent was for the design of a waviness measurement system that solved a weld joint problem on the exterior surface of the Ford Escort.

"We could not get a smooth joint and the waviness in the metal at the joint was clearly visible, especially after the car was painted," he says. "My device floats along the curvature of the sheet metal and the differences in depth correspond to what the human eye perceives as waviness. It was also used to measure the distortion in window glass.

"It felt great to be recognized for inventing something that no one had ever thought of before. Engineers invent things all the time, but many never take the time to pursue a patent. I had extra incentive because Ford paid \$3,000 for every patent that was implemented within the company!"

CONTINUED ON PAGE 11

BARNETT BIO

Andy Barnett

Work experience

December 2000 — present: Statistical quality manager, Longhorn Glass, an Anheuser Busch company in Houston.
1998-2000 — Quality engineering manager, Rain Bird Corporation, Tucson, Arizona.
1997-1998 — Senior advanced engineer, Ford Motor Company, Redford, Michigan.
1993-1997 — Senior quality engineer, Ford Motor Company, Dearborn, Michigan.
1989-1993 — Quality control coordinator, Ford Motor Company, Allen Park, Michigan.
1986-1989 — Automation systems engineer, Ford Motor Company, Allen Park, Michigan.

Education

1979 — Philosophy degree, University of South Dakota
1985 — Mechanical engineering, SDSU
1996 — Master's of business administration, Michigan State

Achievements

- Holds a patent for the design of a waviness measurement system for use on the exterior of the Ford Escort.
- Developed a sample plan for the launch of the redesigned 1994 Ford Mustang that produced a net savings of \$1 million per month.
- Received the Henry Ford Technology Award, of which only fifteen are given annually.

Miscellaneous

- Joined the Franciscan Order after earning his philosophy degree and attended seminary in a Chicago suburb.
- His brother, Mark, served twelve years as South Dakota attorney general.

Life-changing day

• While at the seminary, a repair crew came out to fix a power outage and located a short in an underground power line "out in the middle of nowhere." The inquisitive Barnett asked workers how they knew where to dig. Barnett says that after getting the explanation, he was "so impressed with the power of engineering that I decided to enroll at SDSU and make engineering a career."

Personal

Native of Sioux Falls.
Family: Wife - Angela (Berger) Barnett; Children: Christopher, 16; Rachael, 14; Elizabeth, 12; Victoria, 7; Edward, 4.
Parents: Tom and Dorothy Barnett, both deceased
Eight brothers and three sisters: Jeanne Kangley, Thomas C., Max, Mark, Ed, Mary Pierce, Jerry, Carol Nesbitt, Michael, deceased; Jeff, and Greg.

Mobile classroom

brings science to students



It's not your favorite circus coming to town or even supplies for the local grocery store. On the contrary, it's the best that science can offer, all on an eighteen-wheeler rumbling to a community near you.

Science on the Move, which took form during the administration of former Governor William Janklow and now fully supported by Governor Mike Rounds, is the first real effort in the country to integrate technology and science in large mobile classrooms.

Two fifty-three-foot semi-trailers serve as state-of-the-art moving laboratories. Launched in fall 2003, they travel from school-to-school throughout South Dakota during the school year, bringing the best that science

technology can offer in the physics, chemistry, biology, and earth science fields.

Equipped with science equipment that small schools in the state generally have little access to, the project was developed to create more interest and exposure to science in South Dakota's school children, especially the younger grades.

"It's amazing to see the excitement of the students," says SDSU Physics Instructor Judy Vondruska. "It sparks an interest in the students and it opens up their curriculum because it allows them to do things in science that they have never done before.

"It's also designed to bring more science education and exposure to South Dakota's young people in time to shape their career choices," she adds.

High-tech moving labs

Both science tractor-trailers were built for less than \$600,000. It took the inmates at Mike Durfee State Penitentiary in Yankton nine months and 6,000 hours of labor to construct their interiors. Mitchell Technical Institute and the Dakota Digital Network did most of the wiring.

Each tractor-trailer has twelve student workstations, which is enough room for twenty-four students to work at the same time.

They are equipped with Gateway computers; biotechnology tools for DNA analysis; lasers to study light and optics; probes and sensors to measure respiration, heart rate, acceleration, force, radiation, sound, and light; dissecting and binocular microscopes for analysis of tissues and water analysis; spectrophotometers for chemical analysis of water and soil; global positioning system devices; Internet access; and

wheelchair accessibility. Activities that involve wind, solar, nuclear, and bio-fuels as sources of energy are planned for the future.

Retired high school teachers Jerry Ophroek of Mitchell and Bob Vanderlinde of Elkton were hired as instructors. They also drive the units and are constantly on the road during the school year. Vanderlinde handles the eastern part of South Dakota, while Ophroek takes care of the west and central portions.

Vondruska is a member of an advisory board that oversees the project. There are also representatives from the University of South Dakota, Black Hills State University, and a high school teacher.

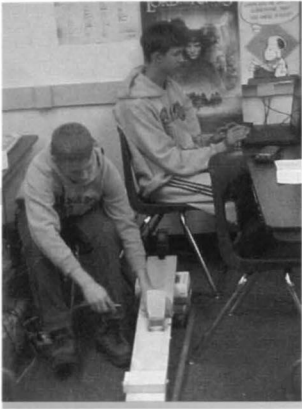
During the school year she is continually developing curriculum for the lab exercises in physics and physical science. She also meets the mobile classrooms and conducts on-site astronomy sessions with newly purchased GPS guided telescopes and binoculars. Recent sessions have been in Langford, Elkton, Great Plains Lutheran in Watertown, and Brookings.

Workshop training

In addition, she is director of summer workshops for teachers across the state so they have a working knowledge of the truck's lab equipment. Last summer, seventy-five teachers participated in workshops at SDSU, Black Hills State, and USD.

"Schools can't have the mobile science lab unless they went through a training program," notes Vondruska. "The nice thing is that not all the labs have to be done in the truck. When it sits at a school, some of the equipment can go into the classrooms of the school





Technology in a trailer

A project of the State of South Dakota, Science on the Move brings the best of science technology to schools around the state. There are twelve workstations in each of the two fifty-three foot semi-trailers that were built in the state penitentiary.

because the teachers we trained know how to use the equipment themselves.”

Ervin Gebhart, science teacher at Elkton High School, was impressed with the mobile lab when it rolled into town for a week in October. About 120 science students, from seventh to tenth grade, along with thirty chemistry students, and twenty each from fifth and sixth grade, participated.

“Going to the summer training session and working with some high-tech equipment was well worth it,” says Gebhart. “I would highly recommend it to other teachers.

“The lab was a great learning experience for the kids,” he adds. “It gives them a chance to do hands-on exercises with equipment that a small school like ours can’t afford.”

A variety of South Dakota science teachers, from elementary, middle school, and high school, provided the initial input for the lab’s curriculum framework. Technical assistance also came from higher education professors and researchers.

“This group kept an eye toward what could be learned from the few other mobile science classrooms in other parts of the country, but none as all-

inclusive and spectacular as Science on the Move,” says Vondruska. “This project is truly a unique result of a creative enterprise and collaboration of talent and financial resources from many entities.”

The project is operated under the South Dakota Department of Education and Cultural Affairs. Financial support comes from the Governor’s Math, Science and Technology Council, Governor’s Office of Economic Development, higher education, and the private sector.

BARNETT CONTINUED FROM PAGE 9



Saving big bucks

Barnett had access to a complaint database at Ford and he made corporate history in the process.

He studied old data and found that vehicle quality deteriorated up to 20 percent for several months when new models were introduced.

So he designed the launch sampling plan, which was a statistically based inspection program to ensure that quality would not deteriorate during launching of new vehicles.

“We started the program on the redesigned 1994 Mustang, and instead of seeing yet another drop in quality, we achieved a 30

percent improvement in quality,” cites Barnett.

“This was one of the most successful launches in the history of the automotive industry. Our net savings was more than \$1 million per month!”

Barnett was the recipient of the Henry Ford Technology Award. It’s considered more prestigious than a patent because Ford has about 325,000 employees and is annually awarded about 400 patents, compared to fifteen Henry Ford awards given out by the company every year.

The award was for work he did to estimate measurement error in torque readings on bolts and screws.

“Ford installs millions of fasteners every day, and once a bolt or screw is tightened, there is no accurate way to measure how tight it is,” he says. “No one in the world had ever developed a reliable method before.

“I can’t give out the specifics on how I solved the problem because it’s a

company secret. But, based on the study, Ford’s fastener-related warranty [squeaks, rattles, loose connections] decreased by more than 50 percent, saving the company \$3 million per year.”

It’s all in a day’s work for Barnett, who could be classified as the million-dollar expense saver. Still, he has never lost sight of where it started.

“Attending SDSU was a great experience,” he says, “I am so grateful for the knowledge I gained. My engineering degree opens a lot of doors and provides the foundation for my success.

“It’s very satisfying to work on a problem and achieve breakthrough levels of performance. To accomplish something that has never been done before, and to tell your team that they are among the best in the world, is truly a tremendous feeling.”

'A perfect match'

Dentist works with SDSU professor on better dental technology

Patients surely aren't thinking about the workings of a dental vacuum system while anxiously sitting in a dental chair.

Little do they realize that thanks to teamwork between a South Dakota dentist and SDSU, significant advancements have been made in dental vacuum system technology that benefit millions of patients in the United States every year.

Other than the slurping, hissing noise, and occasional lip, cheek or tongue grab, a dental vacuum is usually the furthest thing from a patient's mind. However, the right system does affect the pocketbook, safety, and the efficiency of the dental treatment experience.

"Competent dental vacuum speeds treatment, improves visibility of the operating field, and creates a safer environment for patients and operators by controlling aerosols," says Spearfish dentist Robert Meyer. "A dental vacuum is one of the dental office's most expensive utilities. It can also affect the cost of dental treatment."

Now, dentists and patients have the extra advantages of RAMVAC, a dental vacuum system designed for high operating efficiency, rock-solid reliability, and decades of longevity.

RAMVAC is the brainchild of Meyer, who collaborated with SDSU Mechanical Engineering Professor Alex Moutsoglou on research in defining the credibility of the system for marketing purposes.

At the time, Moutsoglou called it a "perfect match for my interests," when Meyer contacted the University in spring 1993, searching for a colleague who would be interested in pursuing work on vacuum pumps.

"It was great working with him, especially since he actually studied at SDSU," says Moutsoglou. "To see the enthusiasm and knowledge he had about engineering and science was

pretty amazing, because I didn't expect to see that from a dentist!"

Meyer grew up in Mt. Kisco, New York, and graduated from Clarkson College in Potsdam, New York, with a degree in industrial distribution.

He was in the United States Air Force for four years and ninety days, including two years as a Minuteman launch officer at Ellsworth Air Force Base near Box Elder.

Discharged in 1967, he attended SDSU for biological science courses he needed for dental school. In 1972, he graduated from the University of Nebraska and has been in Spearfish ever since.

How they work

The most common dental vacuum pump during the last three decades is the water ring pump, according to Meyer. The pumps use an electric motor to swirl water around in a circular path, trapping the air and pushing it out of the pump, leaving a vacuum. Since the water used to create the "water ring" also leaves the pump, fresh water continually needs to be let in.

Instead of using water as the air mover, RAMVACs use an oil lubricated,



Dentist Robert Meyer leans on the Bulldog model of his RAMVAC dental vacuum system in the pump test room of his Spearfish operation. He worked with SDSU Mechanical Engineering Professor Alex Moutsoglou to make the system marketable.

rotary vane pump to push air through the system.

"An obvious advantage of waterless pumps is they are less expensive to run since you don't pay any water or sewer charges," Meyer explains. "Nowadays, it's common for water ring pump users to pay many times the cost of the pump for the water to run it for a few years."

"RAMVACs have the advantage of being about twice as efficient as water ring pumps. Plus, they are considerably more durable. A typical water ring pump lasts six years, compared to thirty years for a RAMVAC."

Not pleased with the available commercial devices at the time, due to a short service life and the fact that they could not be easily repaired, Meyer built his first dental vacuum system in 1972, which was a forerunner to RAMVAC.

For the next fifteen years, Meyer worked on the RAMVAC design until a factory model was produced in 1987. During the development period, he sold



Spearfish dentist Robert Meyer needed research from an independent, credible third party in order for his invention to gain acceptance with federal regulators. That's where Professor Alex Moutsoglou came in.

and installed about two dozen hand-built pre-production models.

The SDSU connection

Meyer conducted extensive tests on his vacuum system that yielded more than 100 sets of performance data. Not satisfied with the overall results, he turned to SDSU and Moutsoglou.

"I had done quite a bit of performance evaluations myself during the years before contacting SDSU," says Meyer. "However, my measuring techniques and equipment were limited by my expertise and finances. The SDSU project was considerably more sophisticated than any of my previous efforts."

Meyer acknowledges that one of the primary motives for seeking help from SDSU was because U.S. Government dental vacuum specifications were making it difficult for him to sell equipment to federal purchasers.

"I was running into government specs that I knew were outdated and incorrect based on my own performance testing," he says. "In order to get the specs changed, I felt we needed research performed by an independent, credible third party who could get results published in a referred journal."

Moutsoglou and Meyer obtained a grant from the Governor's Economic Development Office. During their two years of research, the money was used for travel expenses, testing equipment purchases, and salary for graduate students.

Their first venture was setting up a four-chair dental operation in SDSU's heat and power laboratory. They examined flow rates and pressures of RAMVAC and compared those measurements with data from three different pump manufacturers. They also conducted tests using the three- and

four-chair setups at the facilities of two Brookings dentists.

Looking to see how RAMVAC stacked up with bigger operations, they ventured to the Air Force bases at Ellsworth and Minot, North Dakota, where pumps are hooked to twenty-two dental chair units.

"Bob wanted to check on the performance of his pump with larger setups," notes Moutsoglou. "First we ran the system with their own pump, took data, and then we put Bob's pump on line. We found that his pump outperformed that of Ellsworth's with a similar motor, and almost matched the capacity of the one at Minot, which had a motor twice as big as that of RAMVAC's."

Tops in the nation

Meyer and his wife, Linda, formed RAMVAC Corporation in 1982. DentaleZ Group of Malvern, Pennsylvania, acquired RAMVAC in 2002 and Meyer currently serves as company president.

Starting from relative obscurity, RAMVAC has grown to be the best

selling waterless dental vacuum system in the United States. "We have many glowing reports and testimonials," notes Meyer.

Depending on the system size, dental facilities pay between \$5,000 and \$40,000 for RAMVAC systems. "We build equipment for a wide scope of applications, from single dentists, dental schools, and large military clinics," he says.

Meyer gives much of the credit to Moutsoglou's published research for eventual changes in the *Mil Handbook 1191*, the U.S. Corp of Engineer's guideline for medical facility equipment. Two papers were also published in *IMech, Journal of Engineering in Medicine*, in 2000.

"Alex did a great job," he says. "The bid specifications promoted by the handbook reflect Alex's work and RAMVAC now enjoys a major part of the federal dental vacuum market."

Dentist Robert Meyer stands with a long line of Bison models of his RAMVAC dental vacuum system in the pump test room of his Spearfish operation. That model is used for facilities with three to nine dental chairs. The Bulldog model is used in facilities with one to two dental chairs.



Experimenting at NASA



Josephine Santiago is finding out that America is still the land of opportunity.

Just two years ago, she was headed to Brookings from the Philippines with her nephew, Kenzo (then three), to take him to his parents, Christopher and Kristina Mateo here. The Mateos had been admitted to the SDSU animal range science program the summer before.

"I hadn't seen snow before that, so it was pretty exciting to see," Santiago says of her initial Brookings experience.

Well, that excitement was just beginning. By the summer of 2003, Santiago was working at Kennedy Space Center at Cape Canaveral, Florida, with her graduate program advisor.

"I was going to go to Purdue for grad school," but decided Brookings was to her liking, says Santiago. And that was even before an opportunity with the National Aeronautic and Space Administration entered the picture.

"I was just thinking I would go through grad school like I went through undergrad, all academics. NASA was a bonus for me," says Santiago, who is pursuing electrical engineering.

A valuable connection

She holds a 2001 undergraduate degree in electronics and communications engineering from the University of Philippines, and was paired with Alfred Andrawis as her advisor because "he's very good at fiber-optic communications," Santiago says.

Professor Andrawis is the fiber-optic lab coordinator at SDSU and this past summer made his eighth trip to NASA in ten years.

In April 2003, she found out about an opportunity to work with Andrawis as an intern at Kennedy Space Center. By June 9, she was at Cape Canaveral using funding from the Space Grant Consortium – Workforce Development to provide living expenses for her ten-week stay on the island less than fifty miles east of Orlando.

Andrawis has been able to have undergraduate students accompany him in the past, but Santiago is the first graduate student to do so.

"It's usually hard to get security clearance for non-U.S. citizens" and most of the Department's graduate students are internationals, he reports.

But Santiago, who holds dual citizenship, was born in America.

Deskwork and hands-on experiments

At Kennedy Space Center, she spent half her time working in a lab and half working in a cubicle near Andrawis at the headquarters building, where she would write reports and document results of experiments in developing a fiber-optic leak sensor.

This is a new area for Andrawis, and was designated by Kennedy Space Center as its top technology need.

The sensor's function is to detect propellant used in the space shuttle rocket, Andrawis explains. The gases that the sensor are to detect are "very poisonous for humans and harmful for the environment," Andrawis says.

A potential problem

Santiago explains that NASA now uses electronic detectors, "but that may cause sparks, and for explosive gases, that's not good."

Hence, NASA wants to use fiber-optic sensors. In 2002, a chemist developed a primitive sensor and a substance that was sensitive to both nitrogen dioxide and hydrogen, gases used in the propellant, Andrawis says.

"We used the solution that had been developed," he says. Santiago adds, "And we incorporated an alarm system that would actually tell you which of the two gases was being detected." The goal was to create better designs for the sensor and automate the process.

Conducting research at NASA's Kennedy Space Center has become customary for Alfred Andrawis. For a Filipino grad student who joined him this past summer, it was a rare opportunity.

More work to be done

Andrawis shares, "This is the first phase of design. It's still four to five years before use in a space shuttle. It must be tested extensively. We just proved the concept that the solution would work."

Recently, Andrawis received funding from NASA EPSCoR to develop a more advanced fiber optic sensor based on the same concept, he adds. Furthermore, Santiago has been accepted in the Graduate Student Summer Program at Kennedy Space Center for this summer to perform testing on sensors using hydrazine.

Remarkable history, experience

Andrawis' track record in being selected for work at NASA truly is impressive. Only twenty professors from throughout the United States are selected for the program at Kennedy Space Center. Last year, there were 754 applicants with about 120 selected for program at various NASA installations.

And Andrawis has gone eight times in ten years. "It's unusual that someone goes that often," he humbly concedes.

It's also unusual for a Filipino student to culminate her first year of graduate school by having a cubicle in the Kennedy Space Center headquarters and work in restricted area labs.

"It was overwhelming for a couple reasons. You get to handle equipment you've never seen before and you get to meet people who are specialists. They became my mentors, both in academics and in my career.

"I'm still in constant communication with them," Santiago says.

Only in America.

Josephine Santiago in a lab at NASA.

Workshop puts fun into physics

None of the participants were wearing uniforms, but one look at Ron Frary's T-shirt could tell you what this workshop group was about.

Spread on cotton across the Chamberlain school teacher's chest was the periodic table of elements, and a writing pen dangled from the nametag attached by a lanyard around his neck. Another participant wore a T-shirt with an enlarged depiction of sodium's (Na) information from the periodic table.

This summer the College hosted twenty-six high school science teachers from South Dakota, Iowa, Minnesota, and North Dakota.

They were participating in a weeklong Physics Teacher Resource Agents workshop conducted by fellow high school science teachers Robert Shaner of Grand Rapids, Minnesota, and Steven Ethan of Burnsville, Minnesota.

SDSU Physics Professor Larry Browning coordinated the training, which was at SDSU for the third year.

"The workshop gives teachers ways for students to have ownership in the ideas and concepts of physics," he says, citing an example of how physics affects the human body in singing, and how a record can be played with a straight pin and a cone shaped out of paper.

Big, small schools benefit
SDSU "does a good job with bringing in people with lots of examples," participant Craig Caselli shares.

This was the second year for the Sioux Falls Roosevelt physical science teacher to attend the workshop. Barb Newitt, a Roosevelt physics teacher, also returned to the workshop for a second year. The workshop also drew teachers from tiny school districts.

This fall, Loren Wipf is teaching at Conde, which last year had a graduating class of five.

In the tiny northeast South Dakota school district, Wipf will be teaching chemistry, biology, physical science, earth science, physics, and physical education. It was the State graduate's first time to attend such a workshop.

"I needed to get a lot more training in physics. That is the part of my science training that is the weakest," says Wipf, an Iroquois native who earned degrees in chemistry and biology in 1991 and a master's in biology in 1994.

The facilities in Conde won't handicap him in presenting ideas used at the facility, he says.

"A lot of the things they've presented here you could pick up at a dollar store or order through the Internet. It is fairly inexpensive equipment and not dependent on a well-supplied or equipped lab," Wipf reports.

Newitt adds, "I've been particularly impressed with the activities we did on light." Caselli interjects, "Especially the spectroscope. The one we made today

for \$10 is comparable to the one we've used that costs hundreds of dollars."

Using cardboard, Styrofoam, a scale and defraction grading, the V-shaped spectrometer shows the wavelengths represented by the colors within light.

Wipf says, "Putting these together and working with these in my own classroom would be great."

Participating in small groups, the teachers spent five days creating "make-and-take" projects that they could use in their classroom.

A measuring stick for activities

Some of the projects fall into the "don't try this at home" category while others could be lab activities. Newitt says she might not have a classroom of students dissecting a cow's eye to measure the index of refraction of the fluid inside, but such activities serve as valuable demonstrations.

"Anything that gets them thinking about physics is great," she testifies.

Good vibrations

Using a straight pin and cone-shaped paper, Craig Caselli of Sioux Falls Roosevelt creates a primitive version of the Victrola. The lesson was one of many demonstrations taught to 26 participants in the Physics Teacher Resource Agents workshop July 7-11, 2003. Keeping a close eye on the spinning Mozart platter are, from left, John Walker, of rural Colman, a teacher at Flandreau Indian School; Ron Frary of Chamberlain; and Barb Newitt, also of Roosevelt.



NSF bankrolls physics training

The National Science Foundation provides funding for the Physics Teacher Resource Agents workshops in order to provide better teacher training in the SDSU region. The NSF grant provides meals, housing and a stipend for participants.

The type of training varies and graduate credit is available for those who enroll in an optional parallel course.

For information on this summer's program, contact Professor Larry Browning, 605-688-5428 or Larry_Browning@sdstate.edu.

Developing Native American Scientists



Faculty member helps Lower Brule student on math project

It may seem as simple as $2 + 2$, the answer to how often people use math in their daily work surprised even Associate Professor Christine Larson of the Math Department.

Larson was a mentor during the past summer to Lower Brule Community College student Kay Koster, who undertook the project "Motivating Native American Students to Learn Math."

It was under the auspices of the Developing Native American Scientist program, which each summer links SDSU faculty mentors with tribal college students interested in science, math, engineering and technology. The students, drawn from the five tribal colleges in South Dakota, have all expressed interest in coming to SDSU to complete baccalaureate degrees.

Koster interviewed people—business owners, teachers, and even local bead

and quilt makers—in her community to see how they used math in the jobs they perform, Larson explains.

"She wanted to show her K-5 students how people use math in their jobs and daily lives, jobs outside their community need math skills as well," Larson says.

The subjects were asked, "On a daily basis, how often do you use math skills to fulfill the duties of your job?"

Koster, who has worked at Crow Creek Elementary School for thirteen years, interviewed dozens of people and also asked some of her elementary students "Do you like math?" "Do you think math is necessary?"

A poster session, featuring all of this past summer's projects, was held September 12 in the SDSU Student Union. "The DNAS project is a wonderful way that SDSU faculty are

collaborating with tribal college colleagues to ensure that more Native American students complete baccalaureate degrees," MaryJo Benton Lee, diversity coordinator at the College, says.

This was Larson's first experience with the Developing Native American Scientists program, inheriting the mentoring of Koster after long-time faculty member Jan Vandever retired and took a position in Alaska.

Koster already had a project in mind. "We just kind of refined it," Larson says. She worked with Koster via e-mail and over the phone. "Were I going to do it again, I'd make a trip to give some physical support. Kay did a wonderful job by herself," Larson adds.

Associate Professor Christine Larson, left, with Kay Koster at the September 2003 poster presentation at SDSU.

ADVERTISING SPACE

Our intent is to advertise local and regional companies that employ graduates of the College of Engineering. It is our hope that we might use this as a way of informing alumni who are from out of our region, about possible employment opportunities "back home." We welcome company ads from business card size (\$100) to full page size (\$1,000) for a

circulation of approximately 8,500 readers. For information, contact the Dean's Office:

College of Engineering
Box 2219
Brookings, SD 57007
Phone 605/688-4161
Fax: 605/688-5878

NEW FACULTY

DELVIN DEBOER, professor of Civil & Environmental Engineering, was named director of Northern Great Plains Water Resources Research Center, effective January 2003. DeBoer has been a professor and researcher in the department since 1981.

TERESA HALL, professor and head of the Department of Engineering Technology & Management and director of the Polytechnic Center of Excellence, effective August 1. Hall came from the University of Northern Iowa at Cedar Falls, where she served as coordinator of the manufacturing program in the Department of Industrial Technology. Hall received her doctorate in industrial education and technology from Iowa State University.

DENNIS HELDER, professor of Electrical Engineering, named head of Electrical Engineering & Computer Science Department effective July 1, 2003. Helder had served as acting department head the past two years as well as director of research for the College. He has taught in the department since 1991.

JOHN SCHEMME, professor and head of Civil & Environmental Engineering Department, effective August 1. Schemmel came from the University of Arkansas in Fayetteville, where he served as associate dean for Academic Affairs in the College of

Engineering. He received his doctorate in civil engineering, concrete and structures, from North Carolina State.

FRANK ATUAHENE, assistant professor of Construction Management in the Department of Engineering Technology & Management, effective August 1. Atuahene came from New Jersey. He received his doctorate in geotechnical engineering from Rutgers University.

GUY BERNARD, assistant professor of Math & Statistics, effective August 15. Bernard was assistant professor of math at the University of Central Arkansas. He received his doctorate in math from the University of Minnesota.

MATTHEW BIESECKER, assistant professor of Math & Statistics, effective August 15. He came from Utah State University, where he received his doctorate in math.

ROBERT FOURNEY, assistant professor of Electrical Engineering and Computer Science, effective August 15. Fourney came from the University of Maryland, where he was an instructor in Electrical Engineering. Fourney received his doctorate in electrical engineering from the University of Maryland.

DWIGHT GALSTER, assistant professor of Math & Statistics, effective August 15. He

came from Dakota State University, where he was assistant professor of math. Galster received his doctorate in statistics from North Dakota State University.

ALLEN JONES, assistant professor of Civil & Environmental Engineering, effective August 15. Jones came from the University of Washington, where he received his doctorate in civil engineering.

PATRICK PANNELL, associate professor and coordinator of Construction Management in the Engineering Technology & Management Department, effective August 15. He came from Fort Collins, Colorado. He has a master's degree in construction from the University of Florida.

BEVERLY STEINMARK, instructor of Electrical Engineering and Computer Science, effective August 15. She came from the University of South Dakota, where she was an instructor in computer science. She has a master's degree in computer science from USD.

FACULTY NEWS

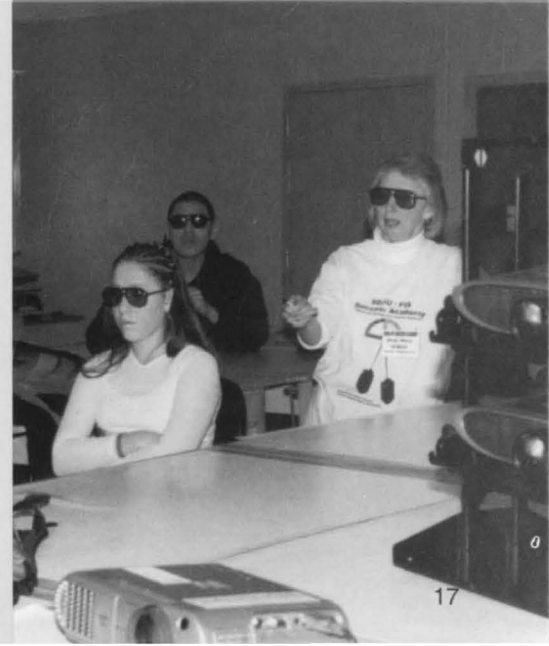
MaryJo Benton Lee, College of Engineering diversity coordinator, presented "A College Preparatory Program for Native American Students: SDSU-Flandreau Indian School Success Academy" at a meeting of the American Sociological Association in Atlanta. She was also chosen to attend a day-long Professional Workshop for Young Scholars in Sociology of Education, which preceded the ASA meeting and was sponsored by the National Science Foundation and the Spencer Foundation.

Associate Professor **Daniel Schaal** teamed with Arie and Guy Bialostocki to write the article "A Zero-Sum Theorem" that appeared in the *Journal of Combinatorial Theory – Series A* in 2003. Among the seventy articles that

appeared in that journal between January and May 2003, their article was the fourth most downloaded. Arie Bialostocki, of the University of Idaho, is Schaal's former doctoral advisor. Guy Bialostocki is Arie's son and was an undergraduate at Carnegie Mellon University at the time.

Dennis Loban, fabrication technician in Engineering Technology & Management, died Sunday, October 5, 2003, at the Brookings Hospital. He began work at the College in 1978. Loban, 65, spent his entire life in rural Bruce, graduating from Bruce High School in 1955. He married Dorothy Pierce on August 31, 1956. Loban is survived by his wife and three sons.

SDSU's Mary O'Neill, far right, and Flandreau Indian School students view images of the Grand Canyon via 3-D glasses at a session of the SDSU-FIS Success Academy last spring.



Holding hands with economic development

*Entrepreneurial ventures
considered a logical extension
of College's mission*

Educating a new generation of engineers is only part of the College's mission. It also is working to create jobs for its graduates.

Through ventures like the Enterprise Institute, the Independent Inventor's Institute, and the SDSU Growth Partnership, the College and the University in general are becoming more aggressive in economic development.

"We think the College of Engineering has a unique role to play in entrepreneurship and economic development in the state of South Dakota. We believe that is part of our land-grant mission.

"Much of successful economic development comes from entrepreneurship, science, and technology," Dean Lew Brown says.

He points to the benchmark example—Daktronics, an international scoreboard manufacturer that was formed by a couple College faculty members and now employs 1,238 people and generated \$177.8 million in sales during fiscal year 2003, which ended last April.

The principals were Aelred Kurtenbach, the long-time company president who served as joint dean before Brown was selected, and Duane Sander, who was dean from 1987 to

1999 and went to work for the SDSU Foundation after retiring from the College.

Enterprise Institute

The Enterprise Institute, a nonprofit corporation, was formed by the SDSU Foundation in May 2001. It assists in developing commercially viable opportunities from within SDSU, provides mentoring and support for regional growth enterprises, and sponsors academic entrepreneurial programs.

Marcia Hendrickson '82 started as the Institute's only full-time employee when operations began and soon moved into the director's position.

Since its beginning, the Institute has been housed in the Foundation building. But early last fall construction began on an 18,000-square foot Enterprise Center at the southwest corner of Medary Avenue and Eighth Street. Completion is slated for this summer.

The Enterprise Institute, which is supported by private money, also gave birth to the Independent Inventor's Institute.

Independent Inventor's Institute

The Independent Inventor's Institute exists to provide patent searches for

inventors. Working with Sioux Falls patent attorney Ivar Kaardal, it was formed in summer 2002 to give SDSU students a job and help him with the time-consuming task of patent searching.

Jared Clark, an electrical engineering major from Armour, worked at the Independent Inventor's Institute from summer 2002 until December 2003.

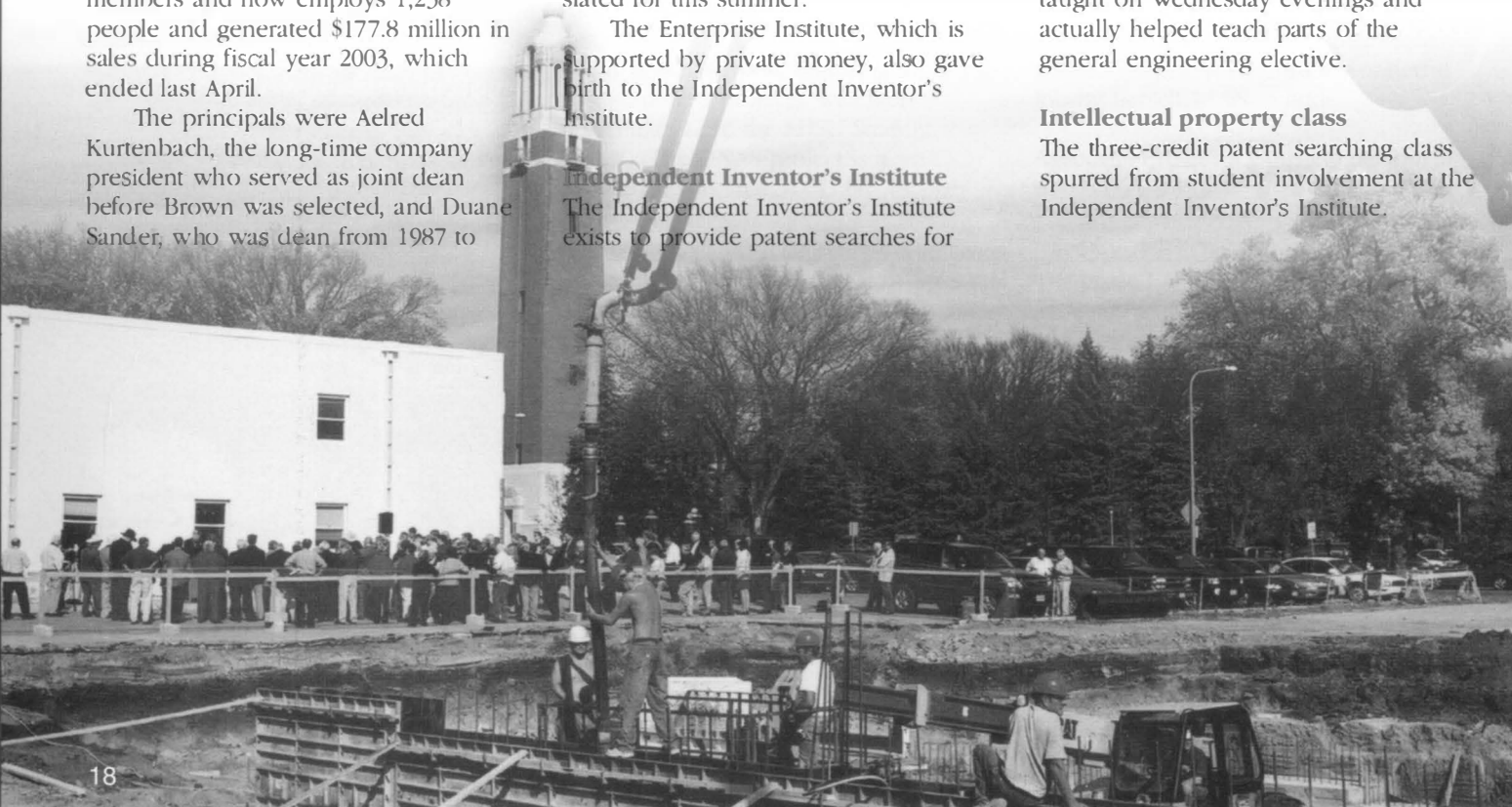
"I expressed an interest to my advisor and another instructor about going to law school after getting my engineering degree [in May 2005]. I had heard from a friend that there was a demand for patent attorneys," explains Clark, who is now spending a semester in England.

He ended up spending the summer of 2003 as an intern at the Independent Inventor's Institute.

"The internship was good because now I'm pretty sure that is what I want to do," says Clark, who also took a class on intellectual property that Kaardal taught on Wednesday evenings and actually helped teach parts of the general engineering elective.

Intellectual property class

The three-credit patent searching class spurred from student involvement at the Independent Inventor's Institute.



Brown notes that Kaardal "had an opportunity to hire a couple students in his law firm doing patent searching. We've had a number of students interested in patent law and the U.S. patent system. He put together this experimental class in the fall semester and we had a good turnout."

There were ten students that met in the renovated Solberg Hall to work on Gateway flat screen computers in the class.

One of them was Sara Daugaard, a 2003 graduate from Dell Rapids St. Mary's High School. She was recruited into the class and a job at the Independent Inventor's Institute by fellow electrical engineering major Jared Clark.

Daugaard spent twelve hours a week working at the Independent Inventor's Institute.

"The average patent search took four hours. You'd spend about an hour looking for the right patent classes and subclasses and three hours looking over comparable patents to see if anyone else had that patent," she explains. "You'd think it might be boring, but it was actually interesting because there are so many different types of patents to compare an invention with. I never got bored."

The freshman hasn't committed to a career plan, but admits to being intrigued by patent law, and calls the intellectual property class "a good thing to supplement an engineering degree with."

Instilling entrepreneurship

The testimony that the special topics course produced tickles the college dean.

"Previously we've never put any effort in to preparing students for entrepreneurial work. We've had successful entrepreneurs, plenty of them. But we've never given instruction on that," Brown says.

"I would love to see the class offered in the future. We see a definite place for patent searching in our curriculum," he adds. The class was offered before the Board of Regents approved the new entrepreneurship minor, which is offered in the economics department.

Adding classes in the permanent College schedule can be bureaucratically challenging. Brown says that rather than adding a number of classes on entrepreneurship in the College's schedule, he expects entrepreneurship to be incorporated into existing classes.

"It will be another value-added component to the students' education. What I anticipate with entrepreneurship in the curriculum is that it is going to add a lot of professional value even if students never start their own business," the dean says.

But more students might start a new business if they were in the right environment.

"All engineering students complete a one-year real world design project. Some of those projects are very entrepreneurial



and may develop into something that can be developed into a product, developed into a marketing plan. A research park will provide some space to do that development work.

"We've had some great ideas with students who didn't really know if they wanted to take that risk. We're trying to build an entrepreneurial spirit in students, and hopefully we also will soon have the physical facilities. All of that we see as part of our land-grant mission," Brown says.

Plans develop for research park

The physical facilities he refers to is a research park being proposed for Brookings by a broad coalition.

A steering committee was formed in 2002 with representatives from SDSU, the City of Brookings, Brookings County, the SDSU Foundation, the State of South Dakota, and the Brookings Economic Development Corporation.

Known as the Growth Initiative, it is head by President Peggy Gordon Miller with Brown and Fred Cholick, dean of the College of Agriculture and

Biological Sciences, also serving on the steering committee.

"We are the only state in the U.S. that does not have a university research park. I'm sure that every other land-grant university in the U.S. has some kind of research park with the idea of transferring research work into products and businesses. If you look at what kinds of business have successful spin-offs, you'll find colleges of engineering, both students and faculty.

"We intend to have a very active and fruitful relationship with the new research park," Brown says.

The Growth Initiative committee is in the process of forming a non-profit corporation for the project and will propose building a research park facility within the city of Brookings. "Somewhat



close to the SDSU campus, because we feel that is important too," Brown adds.

"We've had a number of faculty members that have been able to take their products and develop a successful business," Brown notes. "What they haven't had before is the kind of lab and mentoring resources that a research park would offer.

"Now we'll have a place where faculty members can take the results of their research that can be developed into a successful business or work with existing businesses in Brookings to develop their products."

Opposite page: Footings are poured at the Enterprise Center while the formal groundbreaking ceremony takes place October 10, 2003.

Above left: Ivar Kaardal instructs students in a special topics class on intellectual property in the renovated Solberg Hall this past fall.

Above right: Foundation leaders and project supporters dig in with their golden shovels at the Enterprise Center groundbreaking. From left, are Aelred Kurtenbach, Alyn Holt '59, Duane Sander, Errol EerNisse '62, Keith Bartels '67/74, Jerry Lohr '58, and Al Tuntland '62.

Favorable impressions

Review team tips cap to College officials at exit report

"The overall feeling is we're very satisfied."

Those seven simple words from Dean Lew Brown stem from a great source of pride and relief as the College nears the end of its re-accreditation by the Accreditation Board of Engineering and Technology.

"As a dean, it was one of those career moments," Brown says of ABET process.

Not that the process is over, but the extensive preparation and tension-filled visitation are behind the College. "Because it's so important, there is a lot of anxiety with the visit," Brown says. A seven-member team visited campus September 21-23.

Assistant Dean Rich Reid notes, "The review team comes to validate what they already think."

Brown explains that a detailed self-study is submitted by each of the four programs being reviewed. The Electrical, Mechanical, and Civil Engineering programs have been accredited since 1936. The Agricultural and Biosystems Engineering program has been accredited since 1961.

Meeting new standards

But this is the first time the programs have been up for accreditation since new standards took effect in 2000.

"Program outcomes and educational objectives all must be documented. It's gotten to be quite complex," Brown says of the new accreditation process.

Reid adds, "Now they also want to know how we are measuring our goals and student assessment."

Review team visits span forty-eight hours—from Sunday afternoon to Tuesday afternoon. On Sunday, there is a campus tour, visits with department heads, and an extensive review of course portfolios. On Monday, there are interviews with faculty members,

students, central administration and budget officials, and engineering advisory board members as well as key department heads for non-engineering courses.

The review team is a mix of private and academic engineers plus a representative of the state engineering board.

Final word comes in July

On Tuesday, the review team reads exit statements to College heads, but a written report isn't received until February, when a due process period begins. The College is allowed to respond to concerns and present additional evidence.

The review team then responds to the College's added information, and a final report is issued in July.

"We won't be able to celebrate as a group until late summer, but we will do it appropriately," Brown promises.

High expectations

And the College has reason to believe it will have reason to celebrate. At the exit report, the College was complimented for its facilities, the collegiality of faculty and students, and the positive leadership of the college's management team.

In previous accreditation reports, "the overall tone was 'you've got a good program with inadequate facilities, but you graduate good students.' This time, it was wonderful to hear them also compliment the facilities. The donations alumni made for facilities was money well spent," Brown reports.

The College's original engineering building was completely gutted and renovated in 2002-03. Solberg Hall, which dates to 1901, opened for classes in fall 2003. Crothers Hall, which was built in 1957, was renovated and expanded with its rededication in October 2002.

Four programs within the College are seeking reaccreditation. A final report won't be received until July, but the exit report from last fall's visit gives optimism that a six-year accreditation will again be awarded.

Reid notes, "I don't believe you can underestimate the role of our alumni" in this accreditation process.

The entire \$3.93 million Solberg project was done with private money and half of the \$6.95 million Crothers project was privately financed. In addition, alumni serve on industry advisory boards and responded to accreditation board surveys on college preparation.

Always room for improvement

The review team did cite areas in which the College could improve.

"The suggestions that came up were relatively minor and can easily be addressed," Brown says. "Within twenty-four hours we were already addressing some of the issues that were raised. We will address all of them before the end of the spring due process period."

Reid says, "Professional confidentiality prohibits us from releasing specific concerns before the final report is issued."

Management team well prepared

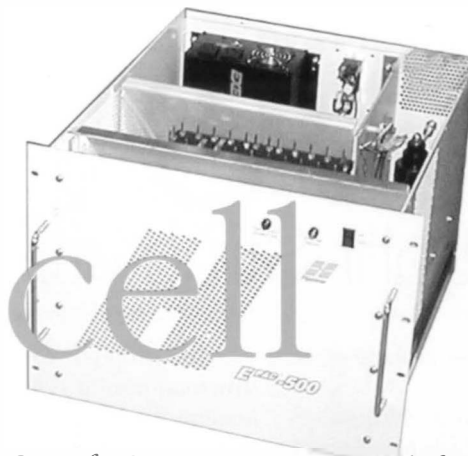
The College began preparing for the accreditation in 2000, the year before Brown became dean. Efforts intensified about a year and half later.

Three years ago, Brown became a reviewer for the Accreditation Board of Engineering and Technology to help prepare his former department (Electrical Engineering) and the College. Don Froehlich, head of Mechanical Engineering, recently became a reviewer, and Reid is training to do so.

Brown adds, "The real success falls on those four academic department heads and their staffs. The academic department head can't do it all, but they can lead it all. . . . With this new model, the faculty has to be involved."

And if the accreditation board is fully satisfied, the four departments will be accredited for six years.

Engineering students to work with fuel cell



Electrical engineering students have a chance to work with a new technology—a commercial-production fuel cell.

Fuel cells convert chemical energy into electricity without burning fuel. The fuel cell has an anode terminal and cathode terminal, like a battery. A tank of hydrogen provides the fuel supply. Through a chemical process, hydrogen molecules are split into protons and electrons, creating electron flow or electricity. The only emission from the generator is water and heat.

“Having a fuel cell increases opportunities for our electrical engineering students during senior-design projects. Many of our students have shown keen interest in renewable-energy alternatives,” says Associate Professor Steve Hietpas.

A group of Touchstone Energy Cooperatives donated the latest in alternative-energy research to the Electrical Engineering and Computer Science Department on September 16.

The donated unit, called an “E-Pac 500,” produces enough electricity to illuminate five 100-watt light bulbs. The \$5,000 device is about the size of a window air-conditioner and several units could be stacked together to increase power production.

Jim Edwards, assistant general manager of operations for East River Electric Power Cooperative, a 1983 alumnus and a board

member for SDSU’s Center for Power System Studies, presented the high-tech device to the engineering department. East River and its member electric distribution systems obtained the unit while participating in fuel cell market research.

“This fuel cell is designed to produce electricity for low-power applications,” Edwards said. “They are being installed as a power supply at remote installations that are not connected to the electric grid, such as communication towers. Also, fuel cells could be a continuous power source, with the electric grid supplying any additional power needed, or used as a back-up power supply.”

During 2001-2002, East River, its member systems and Touchstone Energy Cooperatives around the nation participated in a fuel cell research project on developing an alternative-

power supply for rural homes and other low-power applications.

The fuel cell was presented during the Department’s Center for Power System Studies annual banquet in Brookings.

“We are grateful to East River Electric Power Cooperative and the participating Touchstone Energy Cooperatives for this donation,” added Hietpas, coordinator for the Center for Power System Studies.

East River Electric Power Cooperative, headquartered in Madison, is a power-supply cooperative that delivers the wholesale power through a 2,500-mile transmission system to twenty-two-member electric distribution systems. These twenty-two-member distribution cooperatives in turn provide retail electricity to more than 80,000 homes and businesses in a 36,000-square-mile service area, covering forty-one counties in eastern South Dakota and nine counties in western Minnesota.

East River and its member cooperatives belong to an alliance of more than 600 Touchstone Energy Cooperatives in forty-four states.

East River Electric’s Jim Edwards (far right) talks about the components of a fuel cell with leaders of Electrical Engineering and Computer Science Department. This clean-energy device makes enough electricity to power five 100-watt light bulbs without harmful emissions. On behalf of a group of Touchstone Energy Cooperatives, Edwards presents the new technology to (from left) Dean Lewis Brown, Steven Hietpas, coordinator for the Center for Power System Studies; and Dennis Helder, director of Engineering Research and department head of Electrical Engineering and Computer Science.



'WOW'

It's
time for Lohr Structures Lab

The Jerome Lohr Structures Laboratory is fast becoming a reality.

Named for the College's 1958 civil engineering graduate, the lab figures to be the most unique testing facility of its kind in South Dakota and neighboring states.

"We are very, very excited about this opportunity," says Naclim Wehbe, associate professor of civil and environmental engineering. "We have the grant, so we're on the right track. Now the hard work really begins."

A grant proposal to supply the lab with state-of-the-art equipment, written by Wehbe and civil and environmental engineering Professor Arden Sigl, has been approved by the National Science Foundation (NSF).

"This lab will provide us with an opportunity that has never existed before," says Wehbe, who serves as coordinator of the lab. "We can conduct meaningful research, and improve the learning processes at both the undergraduate and graduate levels."

Sigl adds, "When we look at some of the things that Governor [Mike] Rounds is saying in terms of what the universities can do to help business and industry, we see this facility as fitting right into his plan."

The grant is a one-year project that began September 1, 2003, and ends August 31, 2004. During that time, Wehbe plans to have all the equipment purchased and tested. Once the lab is "up-and-running," an open house will be held to showcase the facility, he says.

The lab's equipment

The lab is the most visible component of the 24,000-square-foot addition built onto the southeast corner of Crothers Engineering Hall. Measuring twenty-eight feet high, forty feet wide, and ninety-feet long, the lab features an overhead crane (funded by Lohr) and a twenty-four-foot clearance for the testing of large structural pieces of material.

The proposal calls for a hydraulic structural testing system, a modular loading steel frame, a post-tensioning system, load cells, and miscellaneous tools.

The cost of the items was \$400,304, of which \$280,213 was requested from the NSF and the remainder the responsibility of SDSU.

The hydraulic testing system will have four hydraulic actuators of different loading capacities. The largest is rated at 250,000 pounds, one at 120,000 pounds, and two smaller ones of 22,000 pounds each.

The hydraulic actuator will apply desired load amounts to test the strength and endurance of certain materials. Acting like a piston pushing and pulling on a test specimen, the actuators can be mounted either vertically or horizontally on a loading frame. The frame is being designed by an SDSU graduate student and will be fabricated at Egger Steel Company in Sioux Falls.

A new hydraulic pump also will be part of the system. It will be attached to the existing lab pump to increase the fluid flow to the new, larger actuators.

Number of users

Wehbe says once the equipment is in place, the lab will provide South Dakota with much needed opportunities in research, outreach, and education.

"A host of emerging technologies and design philosophies can be researched and developed using the new facility," points out Wehbe, who cites the testing of strength and fatigue of high performance concrete girders, performance-based design of structures, and the behavior of flared bridge columns under biaxial bending.

The lab gives SDSU scientists a chance to do research in their field of expertise, and it will enhance the competitiveness of SDSU researchers pursuing national projects, according to Wehbe.



Associate Professor Nadim Wehbe, coordinator of the Jerry Lohr Structures Lab, works with a pair of hollow plunger cylinders (hydraulic jacks) to be powered by a hydraulic pump (center). The six-inch stroke jacks each have a 100-ton capacity. The jacks are only a small portion of the lab's testing equipment. The major items, the large hydraulic actuators, will be delivered this spring.

The facility also promises to increase collaborative projects with South Dakota School of Mines and Technology and out-of-state institutions, while meeting research needs of regional government agencies and private industry. It's also intended to enrich students' learning using experimental simulation.

Potential sponsors for research and educational activities include the Federal Highway Administration, the Department of Energy, the State Department of Transportation (DOT) and the NSF.

Wehbe and Sigl recently gave a PowerPoint presentation to DOT officials in Pierre and they were impressed with the project's potential.

"They were extremely pleased that we landed the proposal," Wehbe says. "In the presentation we acknowledged their strong letter of support for the NSF proposal. We made it clear to them that this is the beginning of a partnership."

Key in recruiting, retention

Research support will enable South Dakota to attract and support qualified graduate students and to provide training and research experience for undergraduate students, according to Wehbe.

"It's not only the capability of the lab in terms of research, it's also amazing how important it is in attracting new students and retaining undergraduate and graduate students," he says. "Every time I'm giving a tour of the building to a visiting or perspective student, and go into the structures lab, they just look at it and say 'Wow.'"

Wehbe calls the lab a "great selling point" and tells the story of a Sioux Falls student, who was undecided about a major, but was impressed with the structures lab. A few weeks later in

Sioux Falls, Wehbe was recognized by the student's mother, who said to him, "Since you talked to my son, he's been very excited about civil engineering and attending SDSU."

A research and development representative from NUCOR, a Nebraska-based firm that is the largest manufacturer in the U.S. of light frame steel truces, recently gave a lecture presentation to the SDSU student chapter of the American Society of Civil Engineers. During his stay, he was "awestruck" when shown the structures lab.

"When people are shown the facility and its capabilities, it's our hope that they will come back and ask us to do some work for them," says Wehbe. "We need to spread the word that here in South Dakota we have a testing

laboratory that is unlike all others in the state."

The shopping list

- Hydraulic structural testing system
- Modular loading steel frame
- Post-tensioning system
- Load cells
- Miscellaneous tools

Total cost: \$400,300

SDSU's share: \$120,100

***Other funding:** \$280,200

* From a grant from the National Science Foundation.



In November 2003, the land archive center at the U.S. Geological Survey's EROS Data Center crossed the one petabyte threshold in volume.

In layman's terms, that's equivalent to 500 billion standard-size document pages. It would also be equal to 100 times the volume content of the U.S. Library of Congress.

Impressive? Yes, so, too, is the vast informative nature of a giant wall-sized map of the United States that was donated by the EROS Data Center and installed at Crothers Engineering Hall in April 2003.

"We have thirty years of satellite data that users throughout the world use to show how the earth is changing over time, either by what people are doing to it or how it's occurring naturally," says Tom Holm, senior advisor for policy at EROS and a 1979 SDSU graduate. "Our data archive is the largest satellite archive in the world and it's right here in South Dakota."

Mark Barber, Science Applications International Corporation outreach supervisor at EROS, coordinated the

Crothers boasts new, hi-tech U.S. wall map

production and installation of the map at the request of the SDSU Foundation.

Measuring eight feet wide and twelve feet long, the colored-wall mosaic replaces a black-and-white data display from the early 1980s. EROS Deputy Chief Jim Sturdevant '78 and Holm arranged to fund the project.

The map's actual data is from the U.S. Geological Survey's national land cover data set. The information is national land cover data that's draped over elevations, which gives it almost a 3-D appearance.

Regions of colors

The map is divided into six four-by-four-foot square panels. Each panel was mounted separately on the wall. The finished product has seams or gutters between the panels, giving the creation an artistic flavor.

The regions of the country are coded by seventeen different colors, signifying the topography of the land. For example, red means commercial, industrial, and transportation areas. Yellow represents pasture and hay regions, blue for open water, green for forest, and white for ice and snow.

Each of the continental forty-eight states is outlined with a border. South

Dakota is defined with a thick black border. The words "SDSU," "Brookings," "EROS Data Center," and "Sioux Falls" are labeled with white letters. On the upper left-hand corner of the first panel are the initials USGS.

"The biggest thing that struck me was how beautiful the data set was," says Barber. "We routinely see data on a computer screen or on a plot, but when you see it actually cover an entire wall, it's pretty mind-boggling."

All the data was put on digital files and forwarded to Digi-Graphics, a Minneapolis vendor, who reproduced the information on the panels. Heading the design team at EROS was Senior Art Director and Scheduler Lee McManus, whose graphic approach differed sharply from the pasted together information contained on the old map.

"The previous display had weathered badly," says McManus. "We took images and made them into square tiles, so it worked pretty slick. Adding the colors was obviously a big leap compared to the old one, and of course, the new data really stands out. The wall itself worked perfectly. It was an exact geometric rendition of what it should have been for that particular map."

Above left: Senior Art Director Lee McManus

ASCE

continues its winning ways

What makes chapter successful? Advisor says answer dates back to 1996

Success is defined as the achievement of something that is desired, planned, and attempted.

It's also the best word to describe the SDSU student chapter of American Society of Civil Engineers, which continues to be one of the best civil engineering chapters in the country.

In May 2003, the chapter received the Vice President's Award for the most outstanding student chapter in Zone III for the fourth consecutive year. Zone III has more than fifty chapters, covering the Midwest from North Dakota to Texas.

The ASCE National Committee on Student Affairs recommended the chapter for the award based on activities cited in the chapter's 2002 annual report.

The SDSU chapter was also one of four finalists for the Robert Ridgway Award. It goes to the most outstanding chapter in the nation, which was awarded to SDSU in 1999.

"Being a finalist is quite an accomplishment as this distinction was earned by less than two percent of all ASCE student chapters," writes Don Sepulveda, chairman of the national committee on student activities.

In addition, Chuck Tiltrum, associate professor of civil and environmental engineering, was named Outstanding Student Chapter Faculty Advisor of the Year for Zone III for the third time.

"It is the enthusiasm and commitment of faculty advisors like Professor Tiltrum that produce excellent student chapters," cites Sepulveda. "His continued support of ASCE student programs is truly appreciated."

In March 2003, the South Dakota Board of Regents presented the chapter with the Campus Award for Community Service. It was the third jewel to the triple crown, joining the academic

excellence and organization awards the chapter had previously received.

Continuity of leaders

SDSU has had "good student chapters" in the twenty-two years that Tiltrum has been with the University, particularly since 1996, when Alisa Prunty served two consecutive terms as chapter president. But tragically, she was killed in a car accident a week after graduating.

"Our success really began when she was president," says Tiltrum. "Her first year she told me that she figured out what she was doing, and for the second year they raised the bar and had higher goals.

"We've had good continuity and carryover of officers over the last several years. Getting our officers involved at a younger age, and letting them hold offices for a couple of years has made a big difference."

The chapter's success story, too, took shape during the four years that Tiltrum served on the national committee on student activities from 1992 to 1996. Reviewing the annual reports and activities of other chapters was a real eye-opener, he says.

"I got to know the format of the report a lot better. We have a really good guideline of what the annual report is supposed to contain and look like. Our student chapter officers have followed it with a goal to do well."

The annual report documents all the chapter's activities and they are judged accordingly. The major portion of the score is community service, which saw the chapter participate in eighteen community-related events in 2002.

Projects included civil engineering presentations to area scouts and elementary students, working on a house for Habitat for Humanity, organizing a blood drive for the American Red Cross, and giving incoming freshmen tours of the civil engineering classrooms and labs.

Points are also awarded for number of field trips, social functions, attendance at national conventions and workshops, ethics program presentations, and student newsletters.

Impressed as freshman

DJ Buthe, a senior from Sioux Falls, is vice president of the SDSU student chapter and is responsible for compiling the annual report. He says the awards reflect well on the chapter and the state.

"When we go to conventions there are people I have never seen before, but they see SDSU on my name badge and say, 'You are with Chuck Tiltrum.' And, there are so many people who say to me that they would never hire somebody that's not involved with ASCE."

Buthe's wife, Carrie, is the president of the chapter, and has been an active member since joining as a freshman.

"I didn't know a lot about the civil engineering profession until I went to the annual convention in Seattle my first year," he adds. "I learned so many things and met so people who taught me about the profession."

Attendance at ASCE national workshops has been another key for success, according to Tiltrum, who takes four to six student officers every year with him to rub shoulders and gain ideas from other student chapter leaders.

For example, at a workshop five years ago, chapter officers from Wisconsin discussed the success of their fundraising golf tournament. Taking heed, the SDSU group launched their own tournament and last year raised \$4,700.



Ryan

Research is name of game for sophomore scientist

The Brunner household in Nisland didn't always contain a typical basement.

For four years while attending Newell High School, it was home to experiments under the direction of Ryan Brunner, whose research efforts have earned him national recognition as a sophomore computer science and ag and biosystems engineering major.

The national Future Farmers of America (FFA) selected Brunner as one of four students in the nation to vvy for the title of American Star in Agriscience, one of the organization's most prestigious awards. Although he didn't win, making it that far was nearly as gratifying as the top prize.

"It's like the pinnacle of everything that I've tried to accomplish throughout high school and into college," says Brunner, who competed against finalists from California, Minnesota, and Wisconsin at the seventy-fifth National FFA Convention October 29-31 in Louisville, Kentucky.

"I've had help from tons of people along the way. My parents let me turn our basement into my own personal laboratory. I didn't do any of my research at school. I worked with both my high school science and agricultural education teachers, and Dr. Woodard [SDSU Plant Science Professor Howard Woodard]."

The FFA competition is based on Brunner's supervised agricultural experience, which includes all research projects dating from his freshman year in high school.

"It's a program that involves jobs and activities you have as part of being an FFA member," Brunner explains. "It encompasses everything together plus extra-curricular activities and grades."

Brookings to Louisville

Brunner's resume consisted of three directed laboratory science experiments in environmental science as a freshman, sophomore, and junior. He placed first each year at science fairs at state FFA

conventions in Brookings. He went onto national conventions in Louisville and placed second in his division each year.

His three experiments centered on how fertilizer moves through the soil; what fertilizer results in the best corn growth; and reversing the greenhouse affect by removing carbon dioxide from the atmosphere through photosynthesis.

Brunner kicked it up a notch as a senior with two separate projects. Teaming with three classmates, they put together a business-marketing plan for a milk vending machine. Then, through the course of their research, they earned a grant from the South Dakota Department of Agriculture and purchased six machines, which were installed at the school.

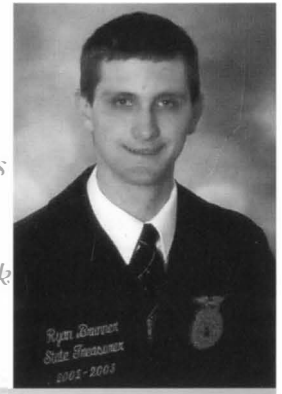
For his second senior project, Brunner created a curriculum and taught a class on the operation of hand-held global positioning system devices.

In addition to all his research, the national FFA office also took into account that Brunner raised and sold three head of cattle and that he was continually working on his family farm.

More impressively, though, has been his extensive FFA leadership positions. Now the state treasurer, he has held titles of district president, chapter vice president, chapter president, chapter reporter, and chapter parliamentarian during the last four years.

Brunner, a Briggs Scholar and a honor society member, was chosen to compete for the American Star award from a pool of 2,788 American FFA Degree winners. To qualify, FFA members must have accumulated at least \$9,000 in paid labor through their supervised agricultural experience.

Sophomore Ryan Brunner earned a trip to Costa Rica as a result of being one of four national finalists for the FFA's American Star in Agriscience award. The Briggs Scholar's honor was based on work dating back to his freshman year in high school.



Costa Rica bound

Once a degree is earned, FFA achievers can apply for four different national star awards. Brunner's options were American star farmer (a farming project), agriculture business (owning a business), agriculture placement (working for another person), and agriculture science (directed laboratory experiments).

For being a finalist, the National FFA Foundation awarded Brunner \$1,000. He also can participate in an international tour to Costa Rica. The sixteen national finalists will be in the country June 19-29 for an educational trip that will feature tours of universities and examining the nation's crops like coffee and bananas while staying with farmers.

Interestingly, Brunner became an FFA member almost by accident.

"When I was a freshman in high school I wasn't going to join agriculture education because I knew I didn't want to go strictly into farming," he admits. "I almost didn't join the class, but my brother talked me into it. Once I joined and started getting involved, I found out how much agriculture actually entails, which eventually led to agricultural and biosystems engineering.

"I've been doing science fair projects since I was a first grader," Brunner adds. "Being a member of FFA has been good to me. It has taught me a lot about life, about being a leader, about working with others to achieve a common goal, and doing research to improve ourselves."

Brunner is pursuing computer science "because it integrates computers into agriculture."

Regents back 'Children of Alumni' proposal

The South Dakota Board of Regents has endorsed the concept to provide a reduced out-of-state tuition rate for children of South Dakota public universities' alumni.

The idea was presented October 10, 2003, as a cost-effective way to attract more college students to the state and increase revenues.

The board's staff and its Council of Presidents and Superintendents are recommending a special "Children of Alumni" undergraduate tuition rate for qualifying out-of-state students. The rate assessed would be 150 percent of residential tuition.

Currently, undergraduates who pay the full non-resident tuition rate in South Dakota are charged 318 percent more than residents.

"We are bringing this proposal to the board's attention now, so a decision can be made at the time the regents finalize tuition and fees in March 2004 for the following academic year," Robert T. Tad Perry, the Regents' executive director, announced. "If implemented, the Children of Alumni program would be effective for the academic term beginning next summer."

The public universities previously offered a Children of Alumni program, but it was phased out starting in 1995. That tuition program was popular among alumni and supporters of the public university system, Perry says. "Now may be the right time to revisit this idea because the long-term demographic shifts taking place within South Dakota

mean fewer traditional college-age students in the pipeline."

Many non-residents who attend South Dakota public universities are already taking advantage of reduced tuition rates under a special adjacent-state program for Iowa and Nebraska students, as well as under the Western Undergraduate Exchange and Minnesota reciprocity programs. "It makes sense to expand those reduced tuition arrangements to include children of alumni who come from other states not covered by these programs," Perry says.

The regents will set tuition and fees at its March 18-19, 2004, meeting.

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The Dean's Club is comprised of graduates and friends who gave \$250 or more to the College of Engineering in 2003.

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Jack Marshman and his wife, Ellie, were greeted by friends and faculty members at a reception in Crothers Engineering Hall October 31, 2003, prior to a dinner honoring eight recipients of the University's Distinguished Alumni Award. Marshman '55, a civil engineering graduate, is chairman of Sioux Falls Construction.



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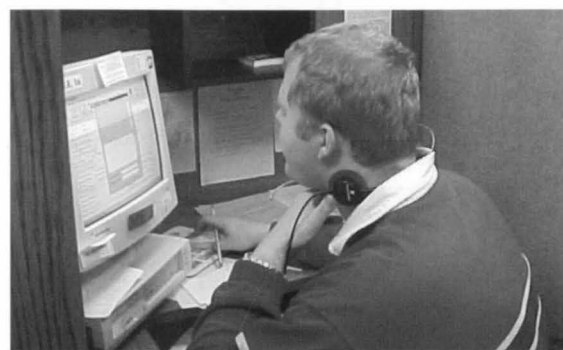
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A mechanical engineering student scans computerized donor records before placing another call during the recently completed phonathon.

Phonathon 2004

Phonathon 2004 wrapped up February 7 with a total of \$120,769 being raised for the College.

"We may not have made our [\$160,000] goal for this year; however, I feel that this year's phonathon was still successful. This year's callers were open to the new online training, called for departments that did not have callers, and overall presented themselves as professionals," according to Jay Kelley, co-chair of the 21st annual phonathon and a junior agricultural & biosystems engineering major.

James Beatty, a freshman electrical engineering major, served as the other co-chair.

With a total of nearly 600 students working two- to three-hour shifts during the evenings and weekends, a total of 1,839 alumni and supporters throughout the nation were reached from the computerized call center at the SDSU Foundation.

Calling began on Saturday, January 30.

YES

I wish to contribute to the SDSU College of Engineering through the Greater State Fund.

The College of Engineering appreciates the generosity of alumni and friends who have made gifts to the College and asks that you encourage others to contribute. All donations should be made payable to the Greater State Fund and designated for the College of Engineering. Mail to: **SDSU Foundation, Box 525, Brookings, SD 57007**

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Winter 2004

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- Daktronics currently employs over 400 SDSU students, nearly half of which are enrolled in the College of Engineering at SDSU.
- Daktronics employs 250 SDSU graduates, including 150 from the College of Engineering at SDSU.
- 200 Daktronics employees live and work outside of South Dakota in our Regional Offices.
- Daktronics is ranked 38th on the 2003 list of the 200 Best Small Companies in America by Forbes Magazine.
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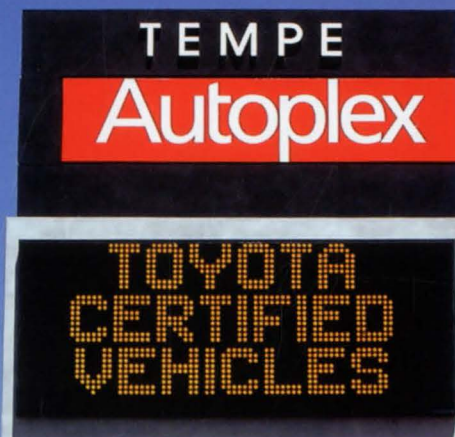


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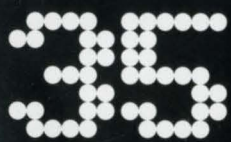
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COLLEGE OF ENGINEERING
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MAKING A LEARNING CONNECTION

College of Engineering



Egger Steel Company donated a steel teaching sculpture to the Civil and Environmental Engineering Department last summer.

The sculpture rests on the lawn outside the main entrance to Crothers Engineering Hall and was put to good use during the fall semester by Professor Arden Sigl to explain steel framing and connections to his steel design class. The steel teaching structure is a hands-on application of material normally found only in textbooks and includes all the commonly used weld and bolt connections used in construction.

Similar structures now have been installed on the campuses of more than 125 colleges.

The sculpture was installed in connection with the completion of two major building projects for the College—an addition to Crothers and the reconstruction of Solberg Hall. Egger Steel Company supplied the steel for both jobs.

Monica Anderson, left, Jason Zemlicka, center, and Matt Dailey, officers with the SDSU chapter of the American Society of Civil Engineers, gather by the College's newest sculpture this fall. The chapter plans to place landscaping around the sculpture this spring.