

A DYNAMIC FORCE THAT INITIATES MOTION TO A BODY OR SYSTEM

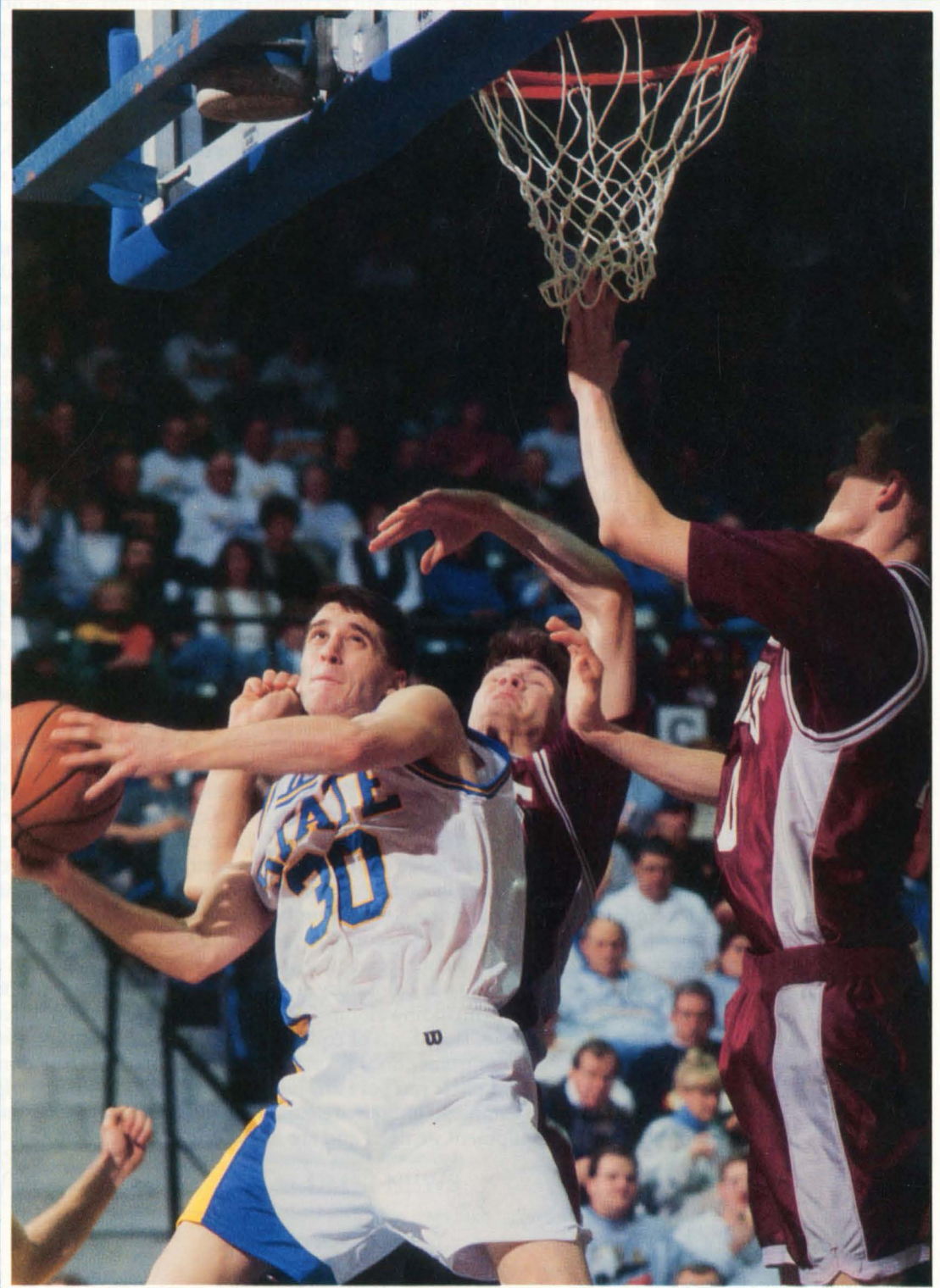
# IMPULSE

SOUTH DAKOTA  
STATE UNIVERSITY

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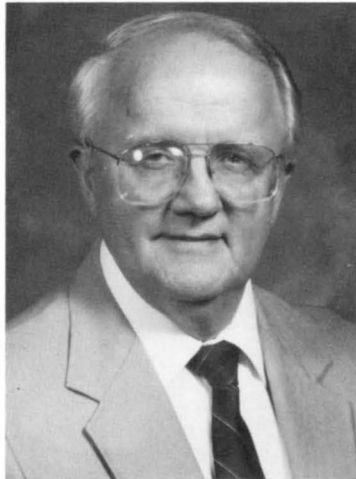
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SUMMER 1996



**SOUTH DAKOTA STATE UNIVERSITY  
COLLEGE OF ENGINEERING, BROOKINGS**





## Dear Alumni:

Many exciting accomplishments and ongoing projects have occurred and continue to build on the excellence our College has enjoyed since its inception. Our space study will be completed this summer, we are now authorized to offer the Manufacturing Engineering Technology program starting this Fall semester and our VISIONS alumni, faculty and student volunteers are organizing the processes to let all interested parties know of our needs and how to help. With your help as volunteers, advisory board members and contributors and your continued interest in developing responsible leaders, we will not only continue to graduate technically well trained people, but also conscientious engineers, technologists and scientists from our College.

This IMPULSE highlights projects and activities our students have been involved in over the past few months. As you will realize when you have browsed this IMPULSE, our students are involved, competitive and competent individuals. The practical projects proposed and supported by our regional industries have given our students practical experience as well as provided useful information and suggestions to those industries. The wide breadth of activities demonstrates the advantages of a university environment which provides access to many different views and opportunities outside the technical fields in which our students concentrate their study efforts. Our students compete well in national contests and when they graduate are sought by employers and graduate schools because of an excellent work ethic and technical training our dedicated faculty provide.

The space study has identified the space needs for our College and proposes a \$6 million addition to Crothers Engineering Hall as the first of a three-phase plan. This first phase will provide additional space for Civil, Electrical and Mechanical Engineering and a computation laboratory for the College. The study indicates that we are presently housed in 11 buildings across the campus. Our goal is to provide adequate space for our programs and consolidate the College into adjacent buildings near Crothers Engineering Hall. The next two phases will remodel or replace a portion of Solberg Hall, demolish and replace the remaining parts of Solberg Hall and, finally, add space adjacent to Solberg Hall. As part of the VISIONS campaign, we will be approaching our alumni and friends for financial help as we move into the first phase project.

The Manufacturing Engineering Technology program will begin this Fall 1996. Equipment is being ordered for up-to-date, modern laboratories to provide training in machining, manufacturing systems, quality control, modeling, molding, jigs and fixtures, computer aided manufacturing, etc. The program will also emphasize management skills needed to direct technical manufacturing processes. This program will provide a graduate with the skills and technical knowledge needed by our manufacturers in this area as their processes become more technically complex. It will also be an important consideration for industries contemplating expansion or relocation in South Dakota.

As our profession of engineering becomes more complex and more dependent on computer and communication technologies to assist in design, coordination and process control, we continue to upgrade our laboratory and computer equipment. We continue to look to many sources of help, including alumni, corporations and friends who have a special interest in our College. Donations of equipment, funds, matching or discount arrangements have all been of tremendous help. In some cases, used but functional equipment has worked very well. If you have any ideas or are interested in helping, please contact us. Our VISIONS campaign alumni are gathering a needs list and case statements indicating the specific equipment we need and are anxious to visit with you.

Sincerely,

Duane E. Sander  
Dean of Engineering

# IMPULSE

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**ABOUT THE COVER:** Jason Sempsrott, a senior electrical engineering and engineering physics major from Champaign, Ill., puts up a shot during an SDSU men's basketball game. Sempsrott is one of many College of Engineering students who participate in collegiate sports.

## IMPULSE

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# Sports & engineering

*important to student-athletes*

From throughout the University system, there emerges a group of students who have accepted the challenge that comes with the pursuit of an engineering degree. Within that group surfaces a cluster of students who have taken on an additional challenge — participation in collegiate sports.

Nearly 60 of the student-athletes participating in sports during the 1995-96 season were enrolled in the College of Engineering.

One student in the spotlight was **Jason Sempsrott**, a senior electrical engineering and engineering physics major from Champaign, Ill. Sempsrott was a starting guard for the men's basketball team that was 24-5 on the year and first place in the North Central Conference (NCC). The team finished second in the NCAA Regional Tournament, losing to Ft. Hays State, the national champion.

Sempsrott was named to the All-NCC team, NCC Co-Defensive Player of the Year and Academic All-NCC. He said the season was very enjoyable.

"It wasn't just because we won the conference," Sempsrott said. "Our team had a lot more fun. Coach (Scott) Nagy made playing more relaxed, so it was easier to play."

Nagy is looking for good things from Sempsrott next year.

"Everybody knows Jason's going to be the go-to guy next year," he said. "I would expect him to be an MVP-type guy, one of the best guards in the league. We're counting on his leadership and experience to take us a long way."

Although he expects the team to do well next year, basketball isn't the only reason Sempsrott attends SDSU. The recipient of a Briggs Scholarship, the most prestigious scholarship at

SDSU, he likes the combination of majors he chose.

"Electrical engineering is more directly usable information, where physics has more theory and background — the deep-down guts of how everything works," he said. "I find that very interesting."

Sempsrott is working for an electrician this summer and is leaning toward the power aspects of electrical engineering for a career.

Another basketball player in engineering is **Dawn Hull** of Sisseton. The senior civil engineering major had an outstanding junior year, receiving All-NCC honors and other awards. This season started well as she helped her team toward its 25-3 record and second place conference finish to national champion North Dakota State.

Hull's plans underwent a major

change Jan. 6 when she severely injured her knee during a game against Northern Colorado. She came back for the last few games of the season and the NCAA North Central Regional, but couldn't put much pressure on her knee. She has since had reconstructive surgery and is healing well.

The academic side of Hull's life has continued to flourish despite the physical injury. She was named Academic All-NCC this season. With plans to graduate in December, Hull is spending her second summer working for the City of Sioux Falls Utility Department.

"I like analyzing water quality," she said. "My job now is analyzing sewer systems. I feel like I can really help towns by improving their water quality."

Hull intends to go to graduate school and study environmental engineering. She said her dual roles took a lot of time and effort, but were worth it.

"When I had to practice from 5 p.m. to 7 p.m. and do my homework in the afternoon or at night when I was tired from practice, it was hard," she said. "I can't see having gone through school and not having been in basketball."

Another athlete who was injured during the season was volleyball player **Tria Smith** of Wabasha, Minn., a sophomore computer science major. During a game against St. Cloud in late October, a teammate landed on her arm as they both went for the ball. Smith dislocated her elbow and was out for the rest of the fall season.

Although the team had a 17-16 fall record, Smith said the team improved dramatically during spring tournaments because it had so many

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*"We are proud of all of the students who participate in athletics and in the College of Engineering," said Duane Sander, dean of the College. "They are great examples of the type of hard-working students who are found throughout our College."*

first- and second-year players who began learning how to play together. Coach Mary Byrne is looking forward to next year.

"Tria made tremendous strides in the spring season," Byrne said. "We're looking for her to be an impact player for us in the fall."

Even though volleyball drew her to SDSU, Smith said the computer science program convinced her this was the right college for her.

"I liked the fact that it isn't very big, so you get more personal attention," she said. "The placement rate for graduates is high. The atmosphere is nice. Everybody seems very comfortable."

Another first-year athlete, **Ryan Bosanko**, a mechanical engineering major from Aberdeen, participated in the indoor and outdoor track seasons in individual running and relay events. He placed seventh in the 500 meter in the indoor NCC meet and fifth in the mile relay during the outdoor conference meet.

Year-long training helped improve his times from high school, so Bosanko plans to keep improving next year. He also wants to continue to do well in his major.

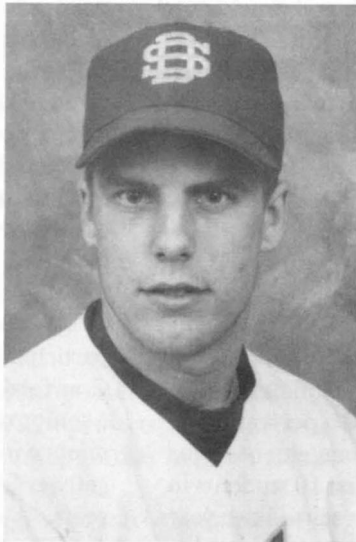
"I like the engineering field because I've always been curious as to how things work," Bosanko said. "I know this is the right field for me. I want to end up designing machines or something else along those lines."

Bosanko has spent the last two summers working for the grounds crew at 3-M in Aberdeen, and he hopes this experience will lead him to a job in the engineering office there next year.

**Jeff Eckerle** of Bloomington, Minn., is spending his summer working in a civil engineering firm in his hometown. The fifth-year senior, who will earn his civil engineering degree next May, is the starting right fielder for the SDSU baseball team.

Eckerle, the team co-captain, holds two unusual honors. He holds the school record for the most times hit by a pitch (29) and is tied for an NCAA record for having three hits in one inning.

The team won the NCC Southern Division title with a 12-4 conference record, 34-13 overall. Eckerle had a strong conference tournament going 6 for 13 with two homeruns.



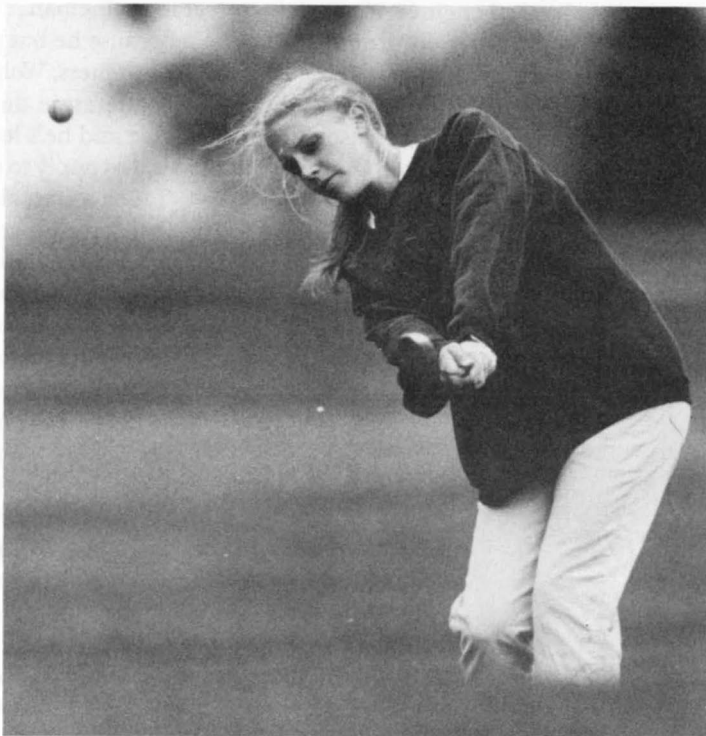
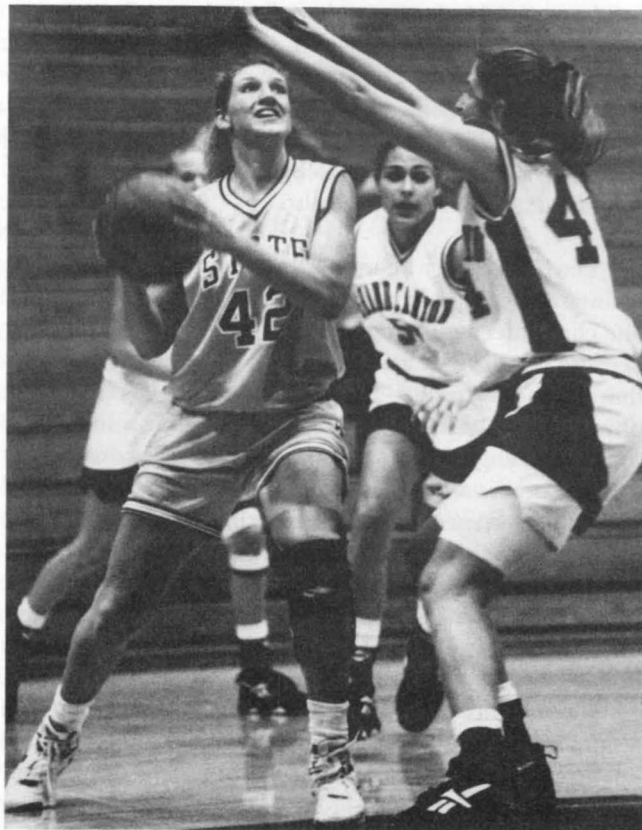
Eckerle wanted his college years to include both baseball and an engineering program. He found the right combination at SDSU.

"I've always been fascinated with roads and transportation," he said. "I had a real interest when no one else seemed to care. Everyone else drives on them and I wonder why they're there."

Eckerle's goal is to work for the Department of Transportation in a major metropolitan area — and help people get where they're going faster and safer.

**Amy Lewis** of Huron isn't sure what her career goal is yet, but her athletic goal is to perform well at next year's NCAA golf tournament. Lewis, a junior mechanical engineering major, was co-champion during the NCC golf tournament last fall and participated with her NCC champion team at the national tournament.

Since Lewis participated in three sports in high school, she wanted to



*Clockwise from top left: Jeff Eckerle, senior civil engineering major, was co-captain of the SDSU baseball team. Dawn Hull, a four-year starter for the SDSU women's basketball team, drives to the basket. Amy Lewis swings through during a golf tourney. Lewis tied for first place at the North Central Conference meet last fall.*

continue an athletic pursuit in college. She had the most success in golf, so that was the sport she chose.

"Amy is very dedicated and organized," golf coach Steve Randall said. "She's very committed to being successful. Academically, she also excels."

Lewis is a Briggs Scholar who maintains a 4.0 grade point average. She chose mechanical engineering because her brother graduated with that major and her dad had degrees in physics and calculus.

"Some engineering classes I really like and others are a challenge," she said. "I picked mechanical engineering because I can do a lot of things with it. It teaches you to think and solve problems, which is going to be valuable no matter what I decide to do."

Lewis wants to attend graduate school in business, math or biomedical engineering so she can teach at a university someday.

Lewis' roommate, **Erika Quam**, a junior mechanical engineering and engineering physics major from Huron, also participated in several sports in high school, so she joined the SDSU swim team. This past season was her first at the long-distance 500 and 1,000 meters. Quam performed well at some meets, but intends to work hard to improve her times for next year.



*Ryan Bosanko, a sophomore mechanical engineering major, prepares to start a relay during the North Central Conference outdoor championships at Howard Wood Field in Sioux Falls.*

Interests in math and precise work led Quam to the field of mechanical engineering. She has excelled in her classwork so far and plans to continue that success in the bioengineering field.

"I wanted to be a doctor, but I didn't think I could handle all the years it would take to get there," Quam said. "But if I could be in the medical field through engineering, that would be the perfect combination."

**Jeff Wolgamott**, a junior from Lincoln, Neb., found a perfect fit in the construction management major. He was one of the first 10 students in the program when it started two years ago.

Wolgamott works hard to keep up with his studies and his starting position as defensive end on the football team. The team was 6-5 overall, but won the intrastate rivalries against the University of South Dakota and Augustana. Wolgamott had three sacks in the North Dakota game and an interception in another, an unusual feat for a lineman.

Because he has built houses for seven summers, Wolgamott has a strong interest in the construction field. He said he's learned a lot in his classes that apply to the job site.

"I took a class about scheduling and cost accounting, so I talked to my boss this summer about how that works in a business," he said. "I ask as many questions as I can, so I can get as much career information as possible."

Wolgamott eventually wants to own his own construction company.

**Aaron Althoff** of Watertown, a sophomore mechanical engineering major, hasn't thought that far ahead.

Althoff was a walk-on to the wrestling team last season. He wrestled at 142 and 150 pounds with a season record of 14-16. The team placed second in the NCC and fourth at the NCAA national championship.

Althoff spent the school year learning how

to improve both in wrestling and academics.

"When I started buying cars, I decided I wanted to work with mechanical objects," he said. "I know it will be fun to design things with moving parts in the future. It took a lot of time to participate in sports and go to school, but I really enjoyed it. I plan to be on the team again."

Another student planning to participate in sports again is **Jennifer Crawford** of Belmond, Iowa. Crawford, a senior math major and computer science minor, has been the starting catcher for the softball team for three years.

The team placed second in the NCAA Regional tournament in Brookings in May. Crawford was named to the All-Tournament team. Since the team did not graduate any starters, she expects to have a chance to compete for the national title next year.

Crawford chose a math major because the subject came easy to her.

"The problem-solving aspect of math intrigues me," she said. "There's always an answer and it's usually cut-and-dried. I also know computers are important in this day and age, so I thought that would complement to my major."

Crawford wants to work with statistical analysis for a business or industry after she graduates.

"We are proud of all of the students who participate in athletics and in the College of Engineering," said Duane Sander, dean of the College. "They are great examples of the type of hard-working students who are found throughout our College."

# Senior engineering design conference

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*To prepare students for work in the engineering industry, the SDSU College of Engineering held its Second Conference of Senior Engineering Design Projects April 10.*

Every year senior engineering students are required to participate in senior design projects. The conference takes these projects one step further in that students present them in a professional setting.

Ideas for the project designs come from a variety of sources, said Don Froelich, engineering professor and conference coordinator. Some come from local industry who request help solving a problem. Others are based on campus for laboratory use. Some are an extension of faculty research. All provide the students a valuable experience.

"This conference provides seniors one of the last opportunities to hone their skills for professional work," said Steve Hietpas, electrical engineering professor and conference coordinator. "It allows them to develop communication skills and it serves as a tool to help them become more prepared for the industry."

Students taking part in this year's design engineering

projects received financial and technical assistance from B&N of Winner, the Center for Power System Studies, Cleghorn Springs Trout Hatchery, Daktronics Inc., Falcon Plastics Inc., Feterl Manufacturing Company, Graco Inc., Hendrickson Trailer Manufacturing, J.S. Windows, Larson Manufacturing Company, the South Dakota Space Grant Consortium, SDSU College of Engineering departments and faculty, the SDSU Rodeo Club, the Society of Automotive Engineers and the South Dakota Game, Fish and Parks Department.

Financial assistance was also provided by Harvey M. and Doris A. Owren, whose annual contributions support the Owren Engineering Instructional Improvement Fund.

Following are stories on some of the projects presented at the design conference in April.

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## AC/DC transformer

Chad Rasmussen of Sisseton and Matt Fults of Sanborn, Minn., created a new transformer that will help train other students in the future. They designed and created an AC/DC power electronic voltage transformer that will be used in the SDSU Energy Laboratory.

"Conventional transformers use magnetic cores and windings and are large and expensive," Fults said. "The goal of our design was to eliminate the magnetic transformer and build a smaller, lighter and versatile converter using only transistor switching technology."

The new transformer can be used for research in the areas of harmonic voltage attenuation, industrial heating, lighting control, motor start up and power system control.

"We learned a lot about the design process from beginning to end," Rasmussen said. "You really have to pay attention to the small details. It was a very worthwhile experience."

The project was sponsored by the Center for Power Systems Studies, a power industry group headquartered at SDSU.

## Southdale Addition

When a new housing addition is planned, someone has to decide where the roads should go and where sewer lines will be placed.

Janele Heyer of Madison, Marcy May of Sioux Falls and Kristin Jorgenson of Waubay developed a comprehensive plan for 160 acres south of Brookings called the Southdale Addition.

"We had to do research and contact the city engineer, utilities and anybody who'd have something to do with planning a sub-division," Heyer said. "We had to decide lot sizes, where streets went and many other aspects. We were acting as consulting engineers. A developer would hire us to do this type of work in the real world."

May said, "It was really interesting to see the need for different types of housing and where each should be placed. In the southern part of the addition, we had multiple family housing because we couldn't have basements due to the low elevation. We also found the city likes to include a park within walking distance of most children, so we had to plan one."

The team also did a cost analysis, final plans and plats, bid proposals and cost alternatives. The project was completed as part of a municipal engineering class assignment. All three women graduated in May and planned to go into the municipal engineering field.



## Balloon particle sampler

A high-altitude balloon to be launched in late April will bring back some important information about air pollution.

Chris Benning of Madison and Jerad Whitaker of Brookings created a particulate sampler for the balloon project co-sponsored by South Dakota State University, the South Dakota School of Mines and Technology and the South Dakota Space Grant Consortium.

"At the right altitude, the sampler will be triggered so the samples can be collected," Benning said. "The proper time and altitude were determined by SDSU physics professor Steve Schiller. Our samples will be taken as the balloon ascends."

The sampler will measure which pollutants are present in the atmosphere and at what

levels. This is the third year the cooperative balloon project has taken place.

Whitaker and Benning were invited to present their project at the National Space Day Convention in Albuquerque, N.M., June 1 through 8.

"Major aerospace companies will be watching our presentations," Benning said before the convention. "We will have a poster presentation, a booth and an oral presentation. I'm excited about the opportunity to present to the some of the best minds in this industry."

## Day care study

Children at play in a day care center don't have air quality on their minds, so others have to think about it for them.

Scott Vander Heiden of Mitchell, Clint DeVries of Chandler, Minn., Jon Frank of Renville, Minn., and Kevin Reker of Glenwood, Minn., studied the heating, ventilating and air conditioning system and energy use in a Brookings day care center.

"The board of the day care center wanted to respond to employee complaints about poor indoor air quality, high humidity and temperature imbalances," Vander Heiden said. "Our objective was to address those concerns and also look at everything to see if they could make improvements in energy reduction."

Group members analyzed air flow in each room, the conditions of the ducts, humidity and other quality issues. After the analysis, they presented three options to improve air quality, ranging from simple to more complex.

"We recommended a planned maintenance schedule on a monthly basis," Frank said. "Filters needed to be checked and vents changed around. We gave them a list of tasks and a schedule to follow."

The project was a good learning experience and applicable to their future careers.

"We had to work in a group and go from start to finish on a proposal," DeVries said. "For us to come up with a solution would have been simple, but we had to keep in mind both the national standards for heating, ventilation and air conditioning and the board's budget."

The project was sponsored by the Engineering and Environmental Research Center at SDSU.

## Refurbished engine

When an engine company decided it didn't need an experimental engine anymore, the SDSU Mechanical Engineering Department was happy to take it.

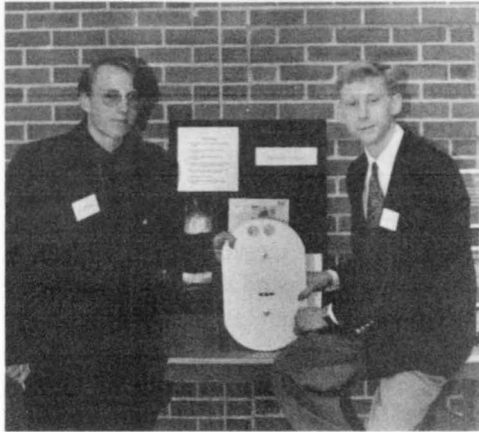
Brent Jordan of Redwood Falls, Minn., Robert Lutz of Clear Lake, John Lehman of Faulkton and Chuck Lehn of Loretto, Minn., worked on the engine to make it useable for SDSU engineering classes.

"Our objective was to get the engine set up for a classroom setting," Jordan said. "Mainly, it will teach the operating characteristics of most engines in service. People who want to be engineers need to know the relationship between the engine performance variables while the engine's in use."

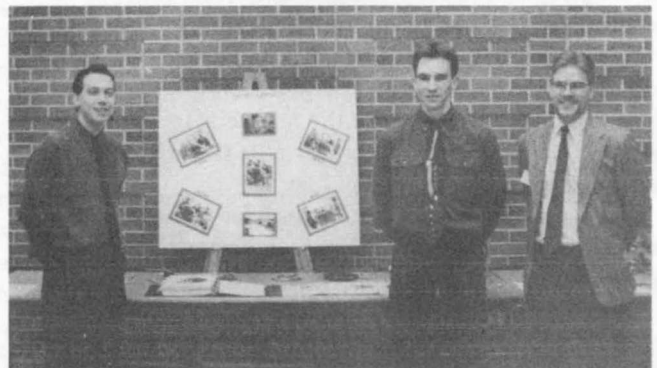
Located in the Agricultural Engineering Building, the engine has many attachments that show temperature, fuel and air flow, revolutions per minute and torque.

"The engine could also be used beyond the classroom, like for testing of alternative fuels," Jordan said. "Someone could also study a turbocharger to see how much that enhances engine performance."

The engine was donated by Cummins Engine Corporation of Columbus, Ind., with help from Mike Beyer, a 1990 SDSU alumnus.



Senior engineering students Jerad Whitaker of Brookings and Chris Benning of Madison present their project on a particulate sampler to be carried on a high altitude balloon.



Rob Lutz, Brent Jordan and Chuck Lehn stand by their presentation during the Second Conference of Senior Engineering Design Projects in the Student Union at SDSU April 10.



## Home security system

Burglars beware! If an SDSU senior design project hits the market, robbers will have a harder time breaking into homes.

Keith Folske of Bowman, N.D., and Chris Bates of Wabasso, Minn., created a home security system that prevents burglars from entering a house through the garage door.

"Some places in this country are having problems with burglars using a machine to transmit the garage door combination or recording an actual transmission from the homeowner's garage door opener and replaying it when they're gone," Folske said.

A regular garage door system uses an eight bit code that has 256 combinations. The SDSU students created a 56-bit number that has 70 million billion combinations. With the machine they use now, burglars can crack a garage door's pass codes in about 30 seconds. It would take 17 years to crack the codes on the new system.

"To avoid a person recording the signal, we came up with a system that changes transmissions each time," Folske said. "The receiver will not accept the same code again within 64,000 tries."

The group has a working prototype that Folske hopes to show to garage door companies in the future.

Folske said the entire process has been educational.

"I learned about digital programming in the past, but the radio transmission portion was something we had no classes in," he said. "We had to learn it on our own, which was a great experience."

## Simplified process

Simplifying a manufacturing process can be a time saver and keep plant workers safer.

Steve Jensen of Marshall, Minn., and Chad Merchant of South Sioux City, Neb., studied how a three-step manufacturing process could be reduced to one step. Falcon Plastics, an injection molding company in Brookings, sponsored the project.

"When a plastic coating is molded around copper tubing, a piece of the tubing is left uncoated," Jensen said. "They are currently using three steps to remove the extra copper. Using a CNC milling machine, they can change that to one step. All the operator has to do is push one button."

Merchant said, "By comparing the time it took previously to what it would be with the new machine, there would be nearly 400 percent time reduction. This will reduce cycle time, decrease handling time and reduce human interaction with a dangerous situation."

The project served an educational purpose, as well.

"We learned that there are hundreds of ways you can get small savings and that all adds up," Merchant said. "This design idea can be used in other processes throughout the plant, also."

## Ramp extension

Workers who don't want to dig a permanent hole to unload grain into an auger can use a movable hopper modified by South Dakota State University students.

Lance Malenke of Worthington, Minn., James Stout of

De Smet, Brian Rabenhorst of Salem and Jim Johnson of Tyler, Minn., created a ramp extension for a drive-over hopper sold by Feterl Manufacturing Company of Salem.

"The hopper currently sold by Feterl is made for dumping a truckload of grain into an auger," Malenke said. "The problem is, the hopper drags underneath some of the newer and longer semi-trailers. We created a ramp to eliminate this problem."

Farmers and elevators use the portable hopper for outdoor grain piles and in places where a permanent auger hole would be impractical. The ramps designed by the SDSU students will be manufactured by Feterl and sold to people who have had the dragging problem.

"This is the first semester we've been working with Feterl," Malenke said. "Next semester, we will work on a new design to modify the hopper so new ones won't need the extension ramp."

## Mini-Baja dune buggy

Seven South Dakota State University students not only built a vehicle, they get to race it.

Travis Duis of Canby, Minn., Doug Knox of Highmore, Bart Brost of Murdo, Travis Smith of Castlewood, Tami Schumacher of Aberdeen, James Eckhardt of Mitchell and Gary Dunbar of Whiting, Iowa, created a mini-baja vehicle that is similar to a dune buggy.

This is the fourth year an SDSU team built a mini-baja vehicle to compete in the Society for Automotive Engineers Mini-Baja Competition.

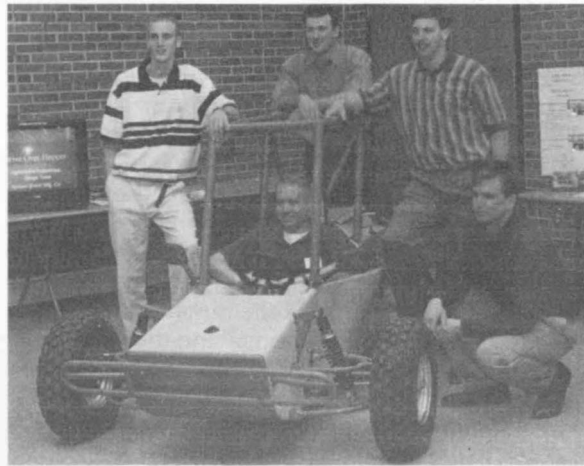
"We refabricated the whole vehicle," Knox said. "We modified everything except the engine and the transmission."

Smith said, "The main thing we kept was the frame. We had a major concern with the front suspension and steering. Now it's easier to turn and handle."

They learned a lot about cooperation and communication during the process.

"It was fun to work in a group," Smith said. "Everyone had a different idea, so you could pick which would work the best, which is what engineering is, in general."

The group also competed in the national mini-baja race in Milwaukee, Wis., in June.



The 1996 SDSU College of Engineering dune buggy team: standing: Travis Duis, Bart Brost, Travis Smith; in buggy: Jim Eckhardt; kneeling: Doug Knox.

## Portable calf weighing unit

Ranchers will be able to more easily weigh their newborn calves with an instrument created by Stacy Nelson of Winner, Drew Schellpeper of Fairmont, Minn., Jason Schuetz of Verona, Wis., and Kirk Scott of Sioux City, Iowa. This team of students created a portable calf weighing system called the Working, Weighing Transport Unit.

"All purebred cattle breeders have to weigh their newborn calves," Nelson said. "Quite often now they just estimate the weight. This system is easily transportable and measures the amount of pressure on the metal loops. When the pressure increases, the weight is displayed through a microprocessor."

Nelson has been working on the project for two years. The other team members came on board this year.

"Nothing like this is on the market now," Nelson said. "If we sold it to only one percent of the purebred breeders, we could bring in approximately \$1 million."

The machine will help producers by showing them which cows are producing the best calves.

A patent is pending on the unit. Nelson hopes to have one on the market within a year through his company, B&N Inc. of Winner.



*Kirk Scott, Stacy Nelson, Drew Schellpeper and Jason Schuetz present their design of a portable calf weighing unit system called the Working, Weighing Transport Unit.*

## Football down indicator

The next time you watch a night football game, you may easily see what down it is thanks to two SDSU students.

Nicole McMullen of Brookings and Cheryl Holen of Volga developed a football down indicator that uses light emitting diodes to better illuminate the numbers.

"The down indicator currently being used is good for day games and good lighting situations," McMullen said. "In our design, we increased the size of the numbers from 10 to 13 inches. Plus, since it will be emitting light, there will be a better view of it by both spectators and coaches."

Daktronics, a Brookings electronic manufacturing company where both students work, sponsored the design. The indicator is battery operated and the downs changeable with the push of a button.

"Since Daktronics makes scoreboards for many sports, the number (digit display unit) we worked with already existed — we just had to modify it to fit our application,"

McMullen said. "The down indicator has to be durable, reliable and safe because it could be dropped at any time during the game. It's exciting to think that I might see something I designed being used during high school, college or pro football games."

## Power quality study

Computers and other electronic equipment are an important part of life, but they can cause problems for consumers and power companies.

Rick Enger of Stratford and Ted Smith of Fulda, Minn., studied power quality problems in selected buildings in Brookings.

"Electronic equipment that is now being used, like personal computers, can cause power quality problems," Smith said. "Voltage is a sine wave when it is applied to a system. These machines distort it and send the distorted waves back through the system. These distortion problems can cause the machines to malfunction."

The Center for Power Systems Studies, a power industry group headquartered at SDSU, sponsored the research.

"We studied the amount of distortion present in typical buildings on-campus and off-campus," Enger said. "It was a fact-finding mission. In order to determine what problems harmonics may cause in the future, we need to find what's present now."

Enger and Smith graduated in May; another group will take their results and proceed with the proposal next year. "It was a very good, real world project," Smith said. "This is a problem that will probably continue to get worse. Any engineer is going to have to have knowledge about this."

## Trout raceway cleaner

Trout in a Rapid City hatchery will be healthier once a new raceway cleaner is installed. Scott Wambeke of Granite Falls, Minn., Shane Espeland of Fairmont, Minn., and Jeff Fondy of Anchorage, Alaska, created a device to clean the raceways, or channels, in which the trout are raised.

Five raceways that are eight feet wide, four feet deep and 102 feet long house the fish.

"Right now they are cleaning the raceways manually," Wambeke said. "They are pushing the sludge around with a shop broom. This is causing environmental gill disease and fin deterioration. We devised a system in which one person can clean the raceways in one day."

Their system is basically an underwater vacuum cleaner with a 10-foot long wand.

"The next part we've studied is how to filter the solids out and put the water back in the raceway," Fondy said. "Currently, they are putting it into settling ponds. At 22 cents a gallon, it costs about \$62,000 to pump the sludge. If we can separate out the solids, we can cut that cost down to \$6,000."

The project was sponsored by the South Dakota Game, Fish and Parks Department and the Cleghorn Springs Trout Hatchery in Rapid City.

## Bull riding safety device

Rodeo bull riders may have a safer ride with a device created by three SDSU students.

Dan Nesthus of Huron, Rick Wagner of Estherville, Iowa, and Brant Mathiason of Hartington, Neb., created a safety release latch for the ropes around a rodeo bull.

"When a bull rider is on the bull, his hands are under the ropes so he can hold on," Nesthus said. "When riders get their hands stuck, clowns have to come in and help them. We created a latch like a seat belt that can be released by remote control."

The safety system will be evaluated by the SDSU rodeo team.

"We talked to SDSU rodeo coach Tom Richter about it," Nesthus said. "He thought it was a really good idea. They are really open for something to make the sport safer, as long as it's not inconvenient."

The latch doesn't release with the normal shock of a bull ride, so it won't interfere with a rodeo rider's performance.



*Rick Wagner, left, and Brant Mathiason were part of a three-man team that developed a device that will give rodeo bull riders a safer ride. Designed like a seatbelt, the latch can be released by remote control. The SDSU rodeo team is evaluating the device.*

## Production process review

Efficiency in production can help a business reduce costs and save time. Dale Henning of Watertown, Neil Andal of Viborg and Anba Rathnam of Malaysia analyzed the Magneview production process at Daktronics, an electronics manufacturer in Brookings. Magneview is a reflective display pixel used for sports scoring and information displays.

"We analyzed the current process flow of the plant," Henning said. "We found more efficient ways to put the pixels together and cut down on time."

A study was also done to help determine plant capacity

and automation options.

"We presented a proposal to Daktronics to improve the plant layout," Rathnam said. "If we design a better process flow, we hope to save them both time and money."

The Magneview pixels will be used extensively in the 1996 Summer Olympics scoreboards in Atlanta, Ga.

## Other SDSU seniors and the engineering design projects they presented were:

Larson Manufacturing Time Studies of the Core Department: Doug Knox of Highmore, Jereld A. Meiers of Sinai and Travis Smith of Castlewood

Electrostatic Paint Gun Test Bench: Bruce Gillen of Brookings, Dusty Trent of Trent, Steve Jensen of Brookings and Tim Ackman of Faribault, Minn.

HVAC and Energy Analysis: Kevin J. Reker of Glenwood, Minn., Scott Vander Heiden of Mitchell, Clint DeVries of Chandler, Minn., and Jon Frank of Renville, Minn.

J.W. Window Tilt Assembly Industrial Design Project: Scott Wambeke of Granite Falls, Minn., Tim Ackman of Faribault, Minn., and Chuck Lehn of Loretto, Minn.

Larson Manufacturing Time Study of Classic View Door: Bart Brost of Murdo, Jim Eckhardt of Mitchell and Travis Duis of Canby, Minn.

Hendrickson Trailer Suspensions: Drew Schellpeper of Fairmont, Minn., and Bruce Gillen of Brookings

Daktronics Lamp Painting Production: Jon Frank of Renville, Minn., Yun Huang of Brookings and John Lehman of Brookings

Disney Addition: Janelle Heyer of Brookings, Kristin Jorgenson of Waubay and Marcy May of Sioux Falls

Intelligent Battery Charger: Quentin Flippin of Brookings, Bryce DeClercq of Milbank and Cory Huber of Huron

Spectra View Imaging System: Andy Bommersbach and Dawn Arnold of Brookings

Power Quality and Harmonic Analysis: Rick Enger of Stratford and Ted Smith of Brookings

# Students stir science excitement in *second graders*

Smiles were everywhere as second graders from Medary Elementary School in Brookings witnessed balloons shrink in liquid nitrogen, watched light bend in water and saw marble magnets stick together in a line.

Members of the SDSU Society of Physics Students and the Society of Women Engineers (SWE) demonstrated experiments in electricity, magnetism, sound waves, lasers and others to the second graders this spring.

"We wanted to impress science education on the younger grades," said Sarah Ebsen, SWE member and event organizer. "So often in later grades, students think of science as work. We wanted to catch them early and get them interested as soon as possible."

The interaction Erin Jensen, who thought the experience was "neat."

"I liked the experiments because when the tube was inside the cup of oil, you couldn't see it," Jensen said. "Then we heard different noises coming out of warm air in big tubes. I liked to see how the cold air (liquid nitrogen) could freeze things."

When she grows up, Jensen said, she wants to be a scientist or an artist. Her teacher, Bev Neiles, said this was the reaction she was hoping for.

"This experience offered these children a real opportunity to not only see the experiments, but perhaps open avenues for career choices in the future," Neiles said. "Plus, it's interesting and fun."

Ebsen said the SDSU students hope to coordinate similar projects in other Brookings schools and area school districts next year.

"Our hope is to get second graders excited about science because it's never too soon," said Madeleine Andrawis, SDSU assistant professor of electrical engineering and SWE advisor. "We want to show these kids that both men and women are pursuing careers in science and engineering."



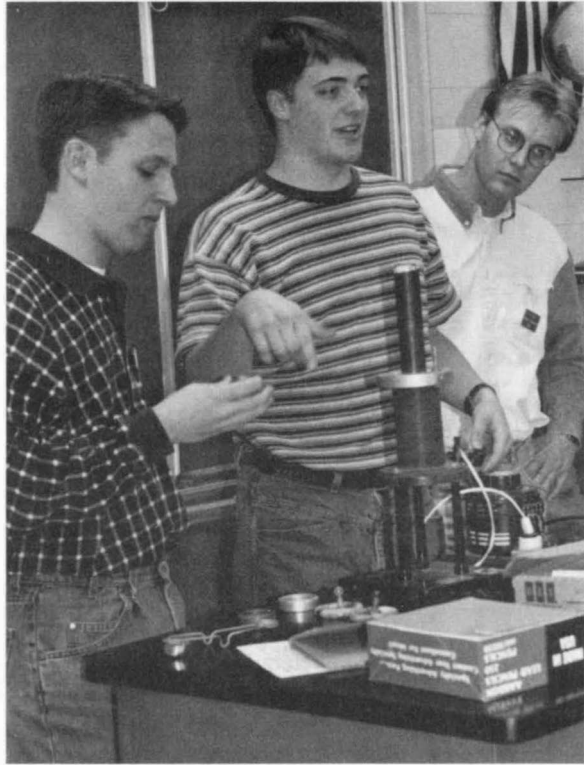
*Engineering student Michael Benjamin shows Medary second graders how filters can block light.*



*Second graders listen and watch as Steve Fox demonstrates that sound cannot travel in a vacuum.*



# SDSU team introduces area students to engineering



The team also gives scientific demonstrations. They create smoke rings. They light up a pickle with electric current.

That impressed Volga Sioux Valley High School freshman Adam Sokolowski. "I really liked watching the pickle experiment and the smoke rings," he said. "The way they talked about science made it sound neat. I think I might like to do that in the future."

That's what it's all about: turning kids on to science and getting them thinking about careers in engineering.

"When I was in high school, I didn't know what engineering was," team member Alisa Prunty said. "The only way I knew civil engineering was available in

college was that my older brother was in the program at SDSU. It's also important to let students know about the options they have after graduation."

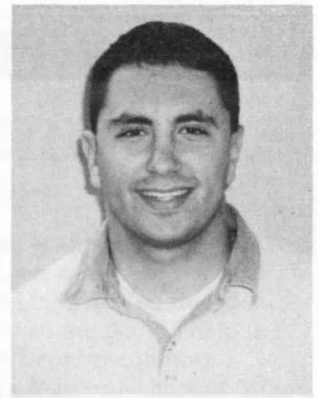
Hearing this information from the college students themselves is most effective, said Mark Dorhout, Sioux Valley physical science teacher.

"It's a good idea for students to get a different perspective on things," he said. "When they see people using this information toward the goal of graduation, they pay attention to it."

The team also visited schools in Brookings, Chester, Hamlin, Waverly, De Smet and Tracy, Minn., this year. For more information about a team visit, contact the College of Engineering at (605) 688-4161.

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*Matthew Asche, a member of the SDSU College of Engineering High School Visitor Team, explains physics principles to students at a South Dakota high school.*



## Conde native named outstanding SDSU student

**W**ade Taylor of Conde was recognized during the spring College of Engineering Banquet as SDSU Outstanding Electrical Engineering Technology (EET) Sophomore for the 1995-96 school year.

Taylor earned his associate degree in electronics from Lake Area Technical Institute, then started working at Daktronics in Brookings in May 1995. He began the SDSU EET program last fall to take advantage of the Daktronics college tuition reimbursement program.

"I had strong motivation to do well in my classes because Daktronics will only pay for classes that pertain to work and that you get an A or B in," he said.

Taylor works as a technician in the Customer Services Department of the electronics manufacturing company.

"We repair all makes and models of equipment Daktronics produces," he said. "Ever since I was a little kid, I liked to take things apart and put them back together. Now I get paid to do it."

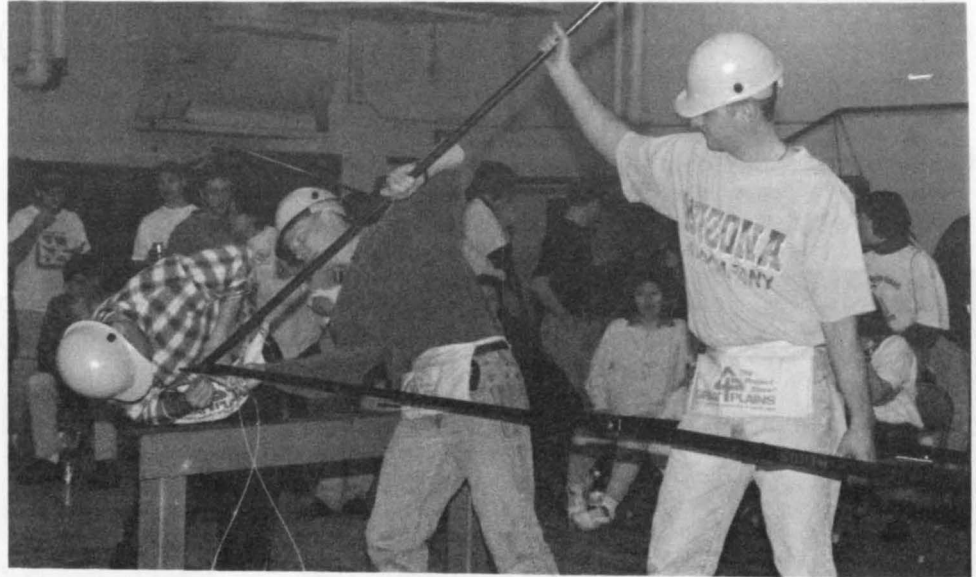
The difference between electrical engineers and electrical engineering technologists is that electrical engineers design the products while technologists repair them, Taylor said.

**H**igh school students often wonder what college is really like, what classes they should take and how hard it is to be an engineer.

Members of the SDSU College of Engineering Visitor Team, started in fall 1994, answer such questions and more when they travel to area high schools and middle schools.

"We get the word out about what college has to offer the students," said team member Chris Sluiter. "It's easier for kids that age to hear information from college students as opposed to hearing from the institution or from their teachers."

Team member Travis Rasmussen said it's also a fun way to get the kids excited about science. "I try to provide some comic relief during the presentation to show them that we're just normal people and they don't have to be scared of the field of engineering," he said.



# Bridge building: *athletic competition*

*“Each guy has to remember his responsibility in the construction and be aware of what the other builders are doing at the same time. You also have to run fast to try to get the best time.”*

Imagine an athletic contest that involves running, teamwork, communication — and steel construction.

The American Society of Civil Engineers (ASCE)/American Institute of Steel Construction Steel Bridge Building Competition took place Feb. 18 in Brookings as part of the ASCE Midwest Regional Student Conference. Bridge building teams were from host SDSU, the University of Minnesota, the University of Manitoba, North Dakota State University, the University of Iowa, Iowa State University and the University of North Dakota.

The objective of the competition

was to build, as quickly as possible, a 19-foot bridge that could hold 2,500 pounds with minimum deflection or bending. The bridges were also judged on the weight of the bridge components and how economical they were.

Students designed and created the entire project.

“This is kind of like an athletic event,” said Jason O’Mara design leader for the SDSU team. “Each guy has to remember his responsibility in the construction and be aware of what the other builders are doing at the same time. You also have to run fast to try to get the best time.”

O’Mara designed the bridge using a computer program that simultaneously solves hundreds of equations and determines the structural force and displacements.

“It took me 80 hours of design time and drafting,” he said. “If I would have had to design it using classical techniques, it would have taken forever.”

The SDSU team bridge withstood the 2,500-pound load, had a good total weight and took five minutes and 48 seconds to build. Unfortunately, its turnbuckles, the pieces that connect the cables, were a half inch longer than the maximum allowed.

“The judges were firm, fair and

consistent,” O’Mara said. “It was just a small design detail that slipped by me. I learned that I need to go back and check over things more thoroughly for the smaller details.”

Win or lose, SDSU ASCE advisor Charles Tiltrum said the contest is a worthwhile experience.

“It gives students the chance to work with a project from design through construction and competition, as a team,” Tiltrum said. “Students need to get involved with teamwork and design projects rather than just individual tests and grades. This gives them more training for the real world.”

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*South Dakota State University civil engineering majors Jason O’Mara of Lyons, Neb., Bruce Marinchek of Sioux Falls and Steve Soupir of Milroy, Minn., participate in the American Society of Civil Engineers Steel Bridge Building Contest in Brookings in February.*

# Students receive Space Grants

Three SDSU students will use space technology to improve things here on Earth.

Amy Fowler of Huron, Sarah Ebsen of Madison and Fred Cribbett of Riverton, Ill., were awarded South Dakota Space Grant Consortium Undergraduate Research Assistantships funded, in part, by NASA. The assistantships encourage students to pursue careers in fields related to aeronautics or space.

Fowler, an SDSU junior electrical engineering major, is working with sensors that can be used to detect vapors inside a space shuttle, measure relative humidity for things like grain drying and climatology and for a variety of other purposes. Her research is in a groundbreaking area.

"In the world of sensing, a critical aspect is understanding what's happening on the surface of the sensor," said David Galipeau, SDSU associate professor of electrical engineering. "Amy is developing a better understanding of the interaction of water on the surface of a dew point sensor. Once we understand this, we can apply this knowledge to other gas sensors."

Ebsen, a senior electrical engineering and engineering physics major, is working with sensors that can be used to detect structural problems in new materials called carbon fiber-reinforced composites. Lightweight and very strong, these composites are perfect for aerospace and airplane construction.

"The problem with these materials is that they can fail without being easily detected," said Lewis Brown, head of the SDSU Electrical Engineering Department. "Research underway for the past 15 years has shown internal flaws can be found with ultrasound, but current detectors are bulky and hard to use in tight spaces. The sensor we are studying could be imbedded into the material and easily scanned to find flaws."

The sensor's applications extend beyond aerospace materials. Ultrasonic sensors can be used for medical purposes, like examining unborn babies and locating plaque deposits in

arteries.

Cribbett, an SDSU senior landscape design student, will create a Geographic Information Systems (GIS) digital map of the N.E. Hansen Research Farm northeast of Brookings. He will use aerial photography and satellite-derived remote sensing data to determine the precise location of the soil types, structures, vegetation and other existing land uses.

"My goal for this project is to take the existing base maps and combine all other existing information in order to produce an accurate plan to help the Horticulture Department more efficiently use the farm," he said. "If we know the soil type, ground water and land slopes, we can look for the right soil, moisture content and location for new test plots. This is wise, sustainable land use management."

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## Clean water priority of civil engineering student

It may be water under the bridge, but Michelle (Buffalo) Knuppe is still concerned about keeping it clean. "I'm not interested in bridges," said Knuppe, who will be a junior civil engineering student at SDSU this fall. "I want to work on the water aspect of civil engineering. We'll always need water, and as the population grows, we will have to be even more concerned about it."

Concern about environmental issues fits in well with Knuppe's campus activities, as well her choice of major.

Knuppe is president of the campus American Indian Science and Engineering Society (AISES), an organization designed for Native American engineers, although anyone is welcome to join, she said. She went to Detroit for the 1995 National AISES Convention, where students can make contacts with corporations. She enjoyed meeting other convention attendees. "It's like having another family," Knuppe said.

In July 1995, Knuppe attended an AISES summer camp in Colorado. "We met in the mountains, where we learned about the environment and about environmental jobs," she said.

This year she attended a Leadership Conference in Colorado Springs, Colo. One person from each local AISES chapter was chosen to attend. "It was a close-knit group," she said.

In addition to her involvement in AISES, Knuppe is vice president of the SDSU Native American Club, a member of the volleyball club and ex-officio member of the Student Association.

"Michelle is a good representative for the University," said Larry Browning, associate professor of physics and advisor for the local AISES chapter. "She is involved in a number of activities on campus, including helping with the powwow held at SDSU last February."

Last year Knuppe received the Brede and Siri Sander Family Scholarship, which is awarded only to Native American engineering majors. She also received travel money from the Dean's Fund to attend the AISES conference.

On June 15 she married Jay W. Knuppe of New Underwood. The couple will move to Brookings this fall.

Knuppe graduated from Rapid City Central High School in 1993, then attended the South Dakota School of Mines and Technology for three semesters before transferring to SDSU in spring 1995.

Her parents are Michael and Ruby Buffalo of Rapid City. Her hobbies include biking, hiking and learning to bead.

# Engineering students tour two South Dakota industries

*“The tour demonstrates the fundamentals students learn in class and gives them a chance to see the uses and limitations of what they are learning... In class we talk about simpler models, but the reality of mechanical engineering is more complicated.”*

Senior mechanical engineering students are preparing to face the professional world.

In March, 19 SDSU engineering students toured Midcom Inc. in Watertown and the Big Stone Power Plant in Milbank. The inspection tour fulfilled a requirement for graduation. “The tour demonstrates the fundamentals students learn in class and gives them a chance to see the uses and limitations of what they are learning,” said Ross Wilcoxon, mechanical engineering instructor and faculty representative for the tour. “In class we talk about simpler models, but the reality of mechanical engineering is more complicated.”

At Midcom Inc., the largest manufacturer of small transformers in the country, students watched robotics worth millions of dollars wrap wires on plastic spools.

At Big Stone Power Plant, students saw the automated rotary dumper that is used to empty coal cars. The way it works is: a train enters the power plant between two huge wheels. Clamps grasp one of the cars holding 100 tons of coal, turn it over, dump out the coal, then return the car to the upright position. When that car is upright, a large arm descends between the next two cars and moves the train forward on a track. In less than four hours, the rotary dumper empties 115 cars filled with coal and alternative sources of energy.

“The power plant and Midcom were fun to see,” said Kevin Reker, senior mechanical engineering major. “We chose those two places because Midcom Inc. demonstrates industrial engineering and the power plant demonstrates thermodynamics. “Industrial and manufacturing engineering are common around here, so students are interested in seeing them in operation.”

Big Stone Power Plant is operated by Otter Tail Power Company, which also owns the plant with Montana Dakota Utilities and Northwestern Public Service. The plant produces 450 megawatts per hour. One megawatt, which is equal to one million watts, lights 10,000 100-watt bulbs, plant engineer Dean Pawlowski said.

The plant offers eight-month

internships to engineering students who have completed their sophomore year. Graduates must have a bachelor's degree in engineering to qualify for a position at the plant, Pawlowski said.

The tour was arranged by students who are members in the SDSU American Society of Mechanical Engineers (ASME). Other ASME activities include spending a day at Brookings Middle School, where ASME members help sixth, seventh and eighth graders design a science project. ASME provides the supplies and the students design a specific project.

ASME members attend the Regional Student Conference (RSC) where they participate in speaking, design and poster competitions. In preparation for the RSC, the students compete at Engineering Exploration Days held at SDSU every year. This year the RSC will be held in Lincoln, Neb.

Other important aspects of ASME include offering scholarships and loans to students and arranging opportunities for students to meet engineering professionals.



# ME student makes your name his business

As if studying for a mechanical engineering degree weren't enough to keep a guy busy, Andrew Stadheim decided to start his own business, too.

"Some of my friends told me it would never work, when I asked them about starting the 'You Name It' business," said Andrew, a senior. "But I decided to try it anyway. I like to show people that you can make an idea work if a person is willing to put time and effort into it." It wasn't easy, he said, but now, a year later, the business has paid for itself.

Andrew and his brother, Scott of Sioux Falls, are partners in the computer-based business they call "You Name It." Here's how it works: Customers request a specific name, the Stadheims type it into the computer and a certificate is printed bearing the name and eight comments about it.

In business since April 1995, each brother has a specific job to do. Andrew promotes the business; Scott does the bookkeeping. They both set up and run the business in such places as the SDSU Student Union Breezeway and at craft fairs in Huron, Brandon, Brookings, Beresford and the Western Mall in Sioux Falls. Sometimes they hire friends to run the business when Andrew has class and Scott is at work.

Scott works full time selling air filtration devices for Climate Systems in Sioux Falls, a business owned by their father.

With such busy schedules, why spend weekends running a business? "To make money," Andrew said. "And it's fun. It's a learning experience. We have learned about keeping supplies stocked, getting tax information and obtaining a state license. It all helps in learning how the business world works."

Designing and building a practical, appealing way to display samples of their certificates presented a challenge for Andrew and Scott. "We started out using wood," Andrew said, "but when that was ruined by rain, we decided to make a Plexiglas cover for the display. It turned out to be more durable and more visually appealing."

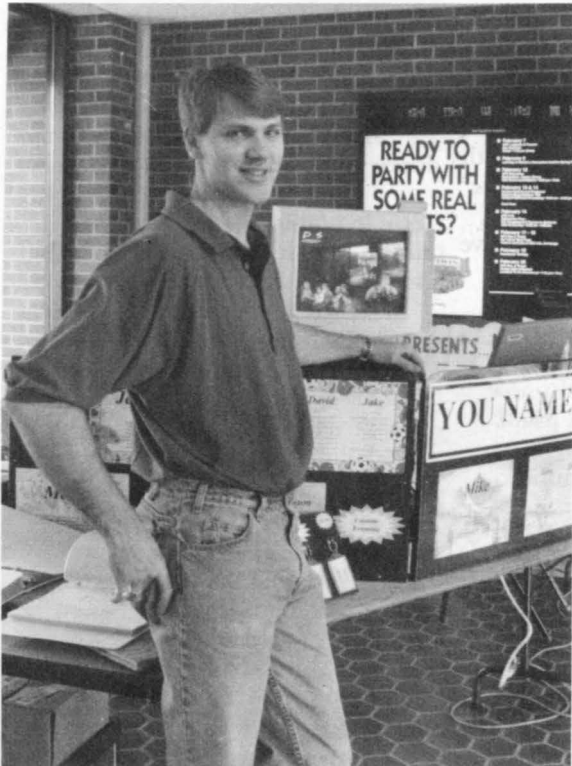
Andrew said he is surprised when he finds unusual names, such as "Sunil," in the computer. "It's neat when I can help people who request certificates with names I haven't heard of before."

The comments accompanying the names are always positive. "They help build up our customers' self-esteem," Andrew said. "Everybody can use a few encouraging words."

Double name certificates and certificates for anniversary and wedding gifts are the most popular, Andrew said. Parents have their kids' names put on certificates, and grandparents buy certificates for their grandchildren.

Andrew finds relating to people of all ages a rewarding part of the business. "It's a great way to learn people skills," he said.

After graduation this December, Andrew plans to join his brother and father at Climate Systems.



Andrew Stadheim, senior mechanical engineering major at SDSU, sells name certificates from his "You Name It" business, shown set up for Valentine's day in the Student Union breezeway. His brother, Scott, of Sioux Falls, is his partner. Together, they also sell certificates at area craft fairs.

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*"They help build up our customers' self-esteem. Everybody can use a few encouraging words."*

## Clifton awarded space grad assistantship at SDSU



**T**ammy Clifton of Lake Norden won a 1996-97 Space Grant Consortium Graduate Assistantship.

Clifton received a \$7,500 graduate research assistantship from the Consortium. The assistantships were established to encourage students to pursue careers in fields related to aeronautics or space.

"I hope to learn much about the atmosphere in regard to such things as pressure and solar radiation. We can also learn about cosmic rays and sun spots," Clifton said. "I would also like to involve middle and high school students in the project to get them interested in science."

Clifton feels her research will be important for many reasons. "When we learn about the atmosphere," she said, "we can also learn about pollution and radiation. It is important for biological reasons as well as scientific study."

The assistantships are open to graduate students from all majors. Besides filling out an application, Clifton submitted an essay about her goals and how she would apply what she learned.

Clifton is the first student in South Dakota to receive both undergraduate and graduate assistantships. "This is because of excellent teachers who have been enthusiastic about what I've

done," she said. "When you have an opportunity, it doesn't hurt to try, even if you don't get it."

In summer 1994, the Consortium awarded Clifton an undergraduate research assistantship, which allowed her to investigate spectroscopic eclipsing binary stars. The graduate assistantship, she said, will enable her to expand on her expertise in the areas of geology, meteorology and Global Information Systems.

Clifton received her bachelor's degree in physics from SDSU in 1996 and will start her master's program this fall.

The South Dakota Space Grant Consortium program is funded in part by the National Aeronautics and Space Administration. Consortium members are SDSU, the South Dakota School of Mines and Technology, Augustana College and the EROS Data Center. Industrial affiliates are Raven Industries, Hughes STX Corp. and Horizons Inc.

## Channeling through RDTN

Brookings High School students came to SDSU in February for a satellite feed of the Faraday Lecture. The SDSU Institute for Electric and Electronics Engineers sponsored the lecture, highlighting the English Channel Tunnel between Great Britain and France, in order to get students excited about science and engineering.



# Gritzner wins faculty summer research grant at EROS



"The wetland environment at Devil's Lake is similar to what is in South Dakota," Gritzner said. "I will work with the Devil's Lake data and my data set of Lake County for parallel processing. It will give me a better sense of whether the data is real."

Gritzner has done research on the prairie pothole wetlands for about four years. Pothole wetlands are an integral part of the hydrology of the region, serving as recharge sites for groundwater, sources of soil moisture and nutrient filters. The freshwater depressions, called potholes, were formed when glaciers of the Pleistocene Era advanced and retreated across the Dakotas, Minnesota, parts of Canada and Montana, and into north central Iowa.

Through her research, Gritzner hopes to help develop management

schemes for wetlands in agricultural settings. The management units are unusual because they are fields and farms, she said. Working on the agricultural aspect of the research project is Diane Rickerl, an associate professor in the SDSU Plant Science Department.

Data sets for Gritzner's project and the EDC project are both based on computer modeling. EDC has developed digital drainage models for North America and Africa and will start one for Europe, Gritzner said. "EROS Data Center has outstanding equipment and personnel."

Gritzner earned her bachelor's and master's degrees at the University of Maryland in College Park and her doctorate at Louisiana State University in Baton Rouge. At SDSU she spends half her time teaching geography and half researching for the Engineering and Environmental Research Center. She became a full professor July 1.

This summer Janet Gritzner will use her research on prairie pothole wetlands in southern Lake County to help EROS Data Center (EDC) with a project at Devil's Lake, N.D.

Gritzner, a South Dakota State University associate professor of geography, is the recipient of this year's South Dakota Space Grant Consortium (SDSGC) faculty research grant.

The SDSGC is a coalition of SDSU, the South Dakota School of Mines and Technology, EDC and NASA. One of its major goals is to enhance research interests and capabilities of science and engineering faculty members. The summer faculty appointment is for approximately 10 weeks from May through August, during which the recipient is given the opportunity to participate in research at EDC.

"This is an opportunity to work with scientists who are working on projects similar to mine and to meet scientists I don't know," Gritzner said. "It's also a way to keep up our good relationship with EROS. SDSU has a number of students working at EROS and we want to make sure that relationship continues."

The EDC is developing a digital elevation model for the vicinity of Devil's Lake, Gritzner said. The study area will include a portion of the Devil's Lake watershed, a source of flooding in that area. The goal of the project is to find the best solution to the local flooding problems.

## Math professor's program helps South Dakota businesses

A little change really can add up. Just ask Joel Osbeck. He saw a small change turn big results at Larson Manufacturing in Brookings, where he's production supervisor. It all started when he discussed one of Larson's production areas with Robert Lacher, SDSU mathematics and statistics professor. Lacher spent part of last school year as a Total Quality Management consultant for the Procurement Technical Assistance Center at the University of South Dakota.

"We designed an experiment that was conducted over an entire day's run of product on that line," Osbeck said. "The data we obtained were analyzed using a sophisticated computer program. The result of that analysis proved statistically that Larson could substantially enhance its success by changing the shape of a part used to assemble the product."

That change in shape lowered the defect rate from 17 percent to less than 2 percent, enabled the company to cancel its order for a \$100,000 piece of equipment and reduced the time it takes to make the doors by 40 percent. Lacher consulted with several other companies, including Citibank, Toshiba and Landstrom/Black Hills Gold.

"What's fun about doing this kind of work is that I don't have to know how to make the product," Lacher said. "I just have to have a keen eye to notice things that others may not notice."

South Dakota businesses benefit from their higher education partnership. "We need to listen to each other and have vision for more business development that could turn into more opportunity for good-paying jobs close to home for our graduates," Lacher said.

Free consultations will not be available during the 1996-97 academic year because no state matching funds were provided for the PTAC Program. Lacher and others in the state, however, will be available for private consultations.

## Quality is part of industrial management program

The same skills that helped save a manufacturer from buying a \$100,000 piece of unnecessary equipment will be taught in a new course offered by SDSU.

The Quality Control course will be taught this fall by SDSU mathematics, statistics and mechanical engineering professor Bob Lacher. The class will be offered in Sioux Falls, Rapid City and Pierre via the Rural Development Telecommunications Network at SDSU.

"I've had quite a bit of experience consulting with business, industry, governmental agencies and schools in this area," Lacher said. "What I hear from management is that quality is no longer an option, it's the competitive tool."

"This is a pertinent topic, not only to people in an industrial setting, but for people working in government,

human resources and inventory control," said Virgil Ellerbruch, assistant dean of the SDSU College of Engineering. "Anyone who works with people can use the information this quality course gives them."

This class is part of the Master of Science in Industrial Management (MSIM) Program SDSU offers in Brookings, Pierre and Sioux Falls.

The purpose of the MSIM program is to provide the knowledge, skills, techniques and analytical tools necessary to effectively manage and understand the financial and technical aspects of an operation. Areas of study include quality control, materials handling, production equipment design, management leadership styles and safety.

John Miller of the Department of Environment and Natural Resources in Pierre started taking MSIM courses in

fall 1991. The classes have helped him in his current position and may help in career advances. Were the course not offered in Pierre, he said he would not have been able to earn his master's degree by next fall.

"I think it's important that these courses continue to be offered in Pierre to help people continue to develop, whether it would be in personal satisfaction, to improve their job skills or in other aspects," Miller said. "Many of my classmates, as well as myself, have families. This makes moving to another community to get the education out of the question, without a good job to assist in the expense."

For more information about the class or the MSIM program, contact Virgil Ellerbruch at (605) 688-4161.

## Galipeau chairs Society of Plastics Engineers session

David Galipeau, associate professor of electrical engineering, moderated a session he co-organized at the Society of Plastics Engineers Annual Technical Conference in Indianapolis, Ind., in May. This was the first time a conference session was devoted to "Polymers in Sensor Applications."

"Sensors are becoming more and more important in our everyday lives," Galipeau said. "Cars have sensors for climate control, anti-lock brakes, engine temperature, emission control and so on. Homes have sensors for air conditioners, refrigerators and humidity controls on dryers. Industry has an even greater need and greater opportunities for energy savings."

Because sensors have such wide applications, Galipeau said it's important to improve their

performance and the use of polymers may allow this. His paper "Hydrocarbon Gas Detection Using a SAW/Polymer Microsensor," co-authored with two graduate students, Patrick Story and Russell Mileham, undergraduate student Dan Nesthus and chemist Claudius Feger from IBM Company, T.J. Watson Research Laboratory in New York, dealt with using polymers on surface acoustic wave sensors (SAW). The work focused on inventing better sensors for the petroleum industry.

For example, when oil is refined, several components result. In the fracturing process, two materials, heptanes and octanes, have similar boiling points, so it's difficult to tell which one you have, Galipeau said.

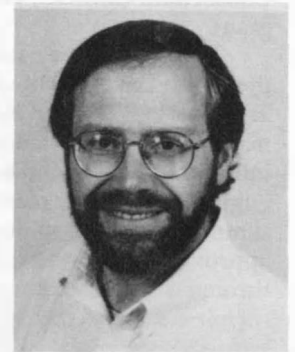
"Our work is focusing on using a surface acoustic wave sensor, which is

known to be one of the most highly sensitive techniques for

measuring mass changes in polymers," Galipeau said. "We've used these a lot as humidity sensors, so working on hydrocarbon gases is a newer application for us."

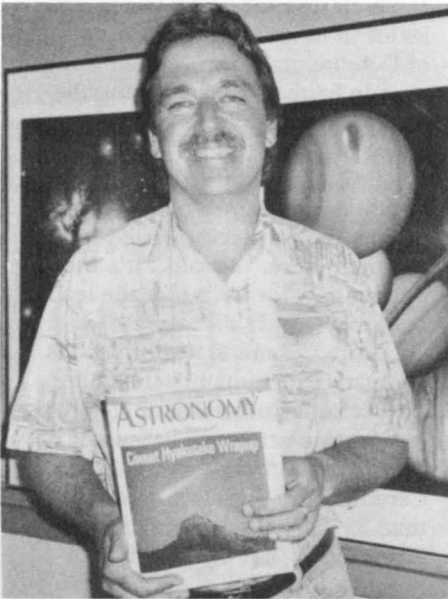
"One of the things that enables us to do this work is the Equipment Infrastructure Grant we received in September 1994 from the National Science Foundation," Galipeau said.

Story will present a paper on their latest work in this area at the 1996 International Symposium on Microelectronics in Minneapolis, Minn., in October.





# SS Lacertae: SDSU professor writes of 'Cosmic Billiards'



If you were born 10,000 years ago, the stars you would have seen in the sky then would essentially be the same stars you'd see today. However, Stephen Schiller and fellow astronomers made a startling discovery in the behavior of one star.

Schiller, associate professor of physics at SDSU, recorded a changing pattern in a star called SS Lacertae. An article about Schiller's discovery was published in the July issue of *Astronomy*, a popular magazine with 300,000 readers worldwide.

"When something unexpected happens in the universe, it's something that intrigues our readers," said associate editor Richard Talcott. "This is kind of a mystery story, so it's interesting to read the reasons why the star may have changed."

The article, "Cosmic Billiards," describes how a normally eclipsing binary system, observed on Earth as one star, suddenly stopped eclipsing.

A binary system has two stars that orbit around the same central mass. In the case of SS Lacertae, astronomers could tell there were two stars because twice every 14 days SS Lacertae looked dimmer as one star passed in front of, or eclipsed, the other.

The star was seen in the 1890s, but wasn't discovered to be a binary until 1921. Researchers at the Harvard College Observatory in the 1930s took photographic plates showing the star's eclipses. By the 1950s, however, the

eclipses stopped.

"Most things you see in the sky are the same as they were 5,000 years ago," Schiller said. "Astronomers believe collisions between stars play big roles in the nature of our universe, so they get excited when they see a change like this. It's important because we can reproduce this collision in computer simulations and use actual observations to confirm our theories."

Schiller began studying SS Lacertae as a doctoral student at the University of Calgary in the early 1980s.

"I observed several binary systems that did as they had previously, but this one didn't," he said. "I thought there was an error in the star chart, so I ignored the data until Russian astronomers asked if we had observed eclipses, because they hadn't."

Comparing data from the 30s to current data, Schiller and other astronomers found the binary system had been disrupted. They theorize that a third star could have collided with the others, causing them to change their orbit.

"We now believe the reason we only see one is because they are moving apart from each other, perpendicular to our line of sight," Schiller said. "We're hoping that there has been enough time since the collision that two stars can be seen with the Hubble telescope."

## Knabach named Person of the Year

He may be retired, but honors continue to mount for an SDSU professor emeritus.

Wayne Knabach retired last spring after nearly 40 years in the Electrical Engineering Department. Now he has been named Person of the Year by the South Dakota Electrical Council.

"Wayne was chosen for his outstanding dedication to the electrical industry in South Dakota," said Jerry Freeman, Electrical Council president. "His devotion to the South Dakota Electrical Council has been essential to the success of the organization."

The council includes members

from the various facets of the electrical industry, like suppliers, manufacturers, consulting engineers, educators, contractors, electricians and vendors.

"I consider this to be a very special award because the organization includes not just educators or electrical utilities, which was my primary emphasis during my teaching career," Knabach said. "When I look at the list of previous recipients, I feel particularly privileged to be added."

After graduating from the SDSU electrical engineering program in 1949, Knabach worked for Northwestern Public Service. He started teaching at SDSU in 1957 and

earned his master's degree from SDSU in 1961. He was appointed director of the Center for Power Systems Studies in 1971 and still serves in that capacity. He has received numerous awards, including 1991 Siouxland Institute of Electrical and Electronics Engineers Teacher of the Year and 1994 East River Electric Eminent Service Award.



## Grant to enable study of chemical-structure of advanced electronic ceramics materials

Research funded by one of the largest grants in SDSU's history may result in a better understanding of the chemical and electrical properties of acoustical sensor materials. Such materials are found in medical ultrasonic imaging, underwater military search operations or even fish finders.

The Department of Defense notified three SDSU faculty members that, subject to the successful completion of negotiations, they will receive a five-year, \$1.68 million grant under the University Research Initiative Support Program. The grant will enable them to study electronic materials of importance to national defense. SDSU's proposal was one of 15 selected from 50 submitted.

Lewis Brown, associate professor of electrical engineering, John Fitzgerald, professor of chemistry, and Jay Shore, assistant professor of chemistry, wrote the grant proposal. They will study a new class of ceramic materials which the Department of Defense feels will improve the understanding of and possibly replace the sonar materials currently used.

The size of the grant alone makes it impressive, but it is also important for other reasons, said Christopher Sword, director of research and dean of the SDSU Graduate School.

"It represents a collaboration between two departments and faculty members in different disciplines who are working together to solve a complex multidisciplinary problem," he said. "Each of these people brings to this his unique experience."

The SDSU researchers will study the synthesis and processing, atomic structure and electronic properties of a new class of mixed metal oxide ceramic materials made of lead, magnesium, niobium, titanium and oxygen. The Navy is especially interested in these materials because they are lighter than those currently used to build sonar devices.

A particular focus of SDSU's research is to obtain fundamental atomic-level information about the materials using a technique called solid-state nuclear magnetic resonance (NMR) spectroscopy.

NMR works on the same principle as magnetic resonance imaging (MRI). Because it studies short-range atomic arrangements rather than long-range arrangements like x-ray diffraction techniques, it can be used to examine these materials at the atomic level.

Although the ceramic materials under study are already in use, they are not well understood. Using NMR, the group will examine their complex lattice structural arrangements.

Past research successes through the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR) helped SDSU compete for the Department of Defense grant, Sword said. For instance, funds for the development of SDSU's NMR lab were acquired through EPSCoR.

SDSU's state-of-the-art Microelectronics and Materials Laboratory, funded partly by a National Science Foundation academic research support grant, was another factor in its receiving the Department of Defense grant, Brown said. Brown may do further research using the materials synthesized by the chemistry researchers.

"We've got all the infrastructure to build the same kinds of acoustic devices the Navy is interested in and test them here," he said. "It's another opportunity for us to take the lead in research."

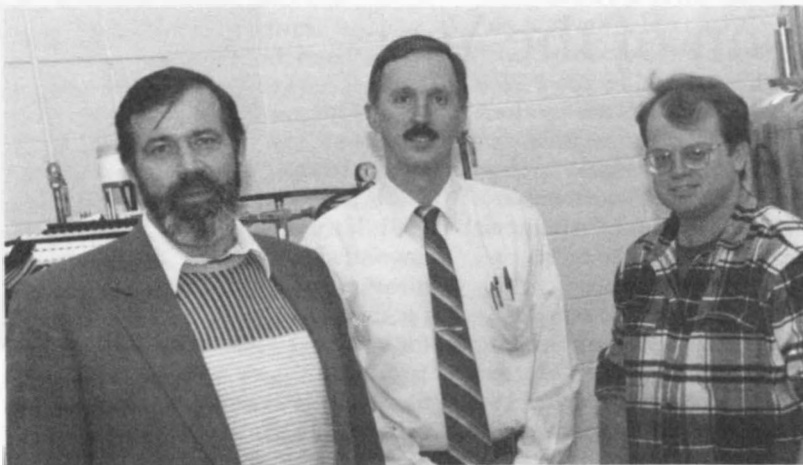
Aura Ceramics, a Minneapolis company which manufactures high-tech ceramic materials for electronic sensors and actuators, will also participate in the program. Aura Ceramics and SDSU will provide more than \$500,000 in combined matching funds to support the research.

The funds will allow SDSU to hire two post-doctoral associates, three graduate students and four undergraduates to assist with the research, Fitzgerald said. "Part of our objective is to develop expertise in the area of electronic ceramic materials," he said.

About \$370,000 will fund new analytical instrumentation to develop a multi-disciplinary center for continued study in the electronic materials and sensors area. The project will also involve some collaborative work with Colorado State University, the South Dakota School of Mines and Technology and the University of New Hampshire.

The Department of Defense research has the potential to lead to additional research grants and contacts with industry, Sword said.

"This really moves the University to another level," he said.



*A five-year, \$1.68 million grant from the Department of Defense will enable John Fitzgerald, professor of chemistry and biochemistry, Lewis Brown, associate professor of electrical engineering, and Jay Shore, assistant professor of chemistry and biochemistry, to study a new class of ceramic materials.*

## SDSU professor named to prestigious NASA science team

Future satellite images of Earth will have a special South Dakota touch.

Dennis Helder, associate professor of electrical engineering and director of the SDSU Engineering and Environmental Research Center, will be a participant on the NASA Landsat 7 Science Team.

Others involved in this science team project are Jim Vogelman, Wayne Boncyk and Chuck Wivell of the EROS Data Center near Garretson and Jim Merchant of the University of Nebraska.

The Landsat satellite program was developed to study the Earth's land characteristics. The science team will study the impact of radiometric and geometric data calibration for the Landsat 7 satellite that will be launched in 1998.

NASA reviewed many proposals before choosing the plan submitted by Helder's group.

"Participating on a NASA science team is very prestigious because you join an elite group of space scientists," Helder said. "The science teams provide NASA with important information about how to best use the data and instruments and what should be done in future applications."

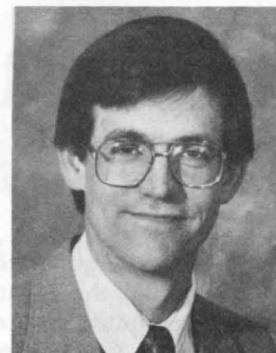
South Dakota was a prime location for finding highly qualified people to study Landsat.

"EROS Data Center has been archiving Landsat data since the 70s, so their expertise is unquestionable," Helder said. "I've been working on Landsat calibration for eight years. It seemed like putting what I do together with what EROS does could make a significant contribution to the Landsat

7 program." The stronger NASA tie will also benefit SDSU.

"This participation on the NASA science team has occurred because of a close relationship between EROS and SDSU," said Duane Sander, dean of the SDSU College of Engineering. "This allows us to impact Landsat 7 technology and develop SDSU research in areas that not only complement the Landsat 7 missions, but also our work with EROS."

The science team begin this three-to-five-year program July 1. Helder intends to involve at least three SDSU students in the project.



## SDSU professor, students investigate ferroelectric nylon

When Lew Brown presents his scientific paper on ferroelectrics at the IEEE Symposium in New Jersey in August, he will represent a Department of Electrical Engineering that places great importance on student research.

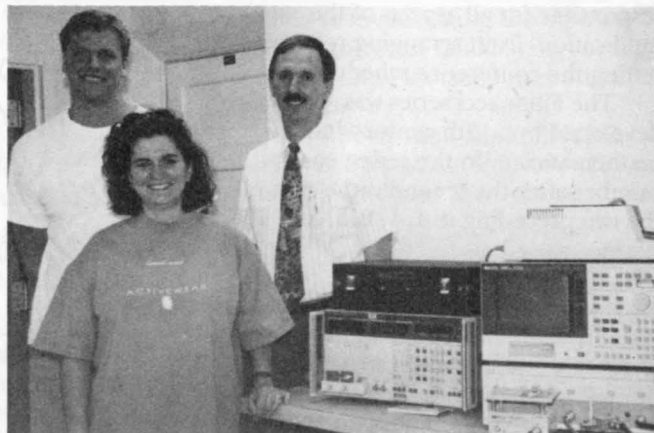
"It's unusual in the engineering discipline to have undergraduates co-author research publications," said Brown, associate professor and acting head of the SDSU Electrical Engineering Department. "Engineering students at SDSU can be proud of their high level of involvement in research."

Brown said he and associate professor David Galipeau require their students to maintain engineering notebooks, where they document all the work they do under their direction. "That work is extremely valuable," he said. "That, in essence, is the work that we publish and report to the rest of the scientific community."

Brown and Galipeau also require

their students to give regular progress reports. "This aspect helps students gain a professional polish in their communication skills," Brown said. "This is extremely valuable because, these days, a successful engineer and scientist has to be an outstanding communicator."

The majority of the students' research and training takes place in the College of Engineering's Microelectronics and Material laboratory, which is equipped with state of the art equipment for fabricating and characterizing electronic materials and sensor devices. Brown and his students are characterizing some of the electrical properties of the nylon material for Rutgers State University.



Students Sarah Ebsen (front), Monte Klinkenborg, (left) and professor Lewis Brown characterize electrical properties of materials using this state of the art network analyzer.

"Rutgers has been leading the way in the investigation of new ferroelectric nylon materials since the early 1980s," Brown said. "But they are missing someone on their team who is knowledgeable about characterizing some of their electrical properties, which are important for some of the high frequency sensor applications, such as medical ultrasound imaging and nondestructive testing."



# Bergum

*edits international journal on Fibonacci numbers*

**G**erald Bergum, professor and head of the Department of Computer Science, can explain how the stars on a pineapple are configured or why sunflower seeds occur in certain numerical arrangements. Those biological patterns represent natural occurrences of the Fibonacci series, a research interest of Bergum's for many years.

Bergum is the primary editor of the recently published "Applications of Fibonacci Numbers," the proceedings of The Sixth International Research Conference on Fibonacci Numbers and Their Applications. He has been the primary editor since the proceedings of the second conference were published in 1988 and is responsible for all aspects of the publication, from arranging referees to setting the conference schedule.

The Fibonacci series was developed by a 13th century Italian mathematician. In the series, each number after the second is the sum of the two preceding it: 1, 1, 2, 3, 5, 8, 13, 21, etc.

Fibonacci numbers have applications in various scientific fields, Bergum said. They are used in chemistry to analyze cell structures and in mathematics for finding the maximum and minimum points on curves. Statisticians are interested in them because they occur in probability. Electrical engineers use them to understand electrical wiring networks.

"Now somebody is even trying to design a microprocessing chip for the computer using these numbers," Bergum said. "They are used in almost every scientific area you can think of."

In addition to his work with the international conference, Bergum has served as editor of *The Fibonacci Quarterly*, a research journal, since 1980. He thinks Fibonacci numbers appeal to so many people because their appearance is often surprising.

"They occur in the most unexpected ways," he said.

In May, Bergum travelled to Korea

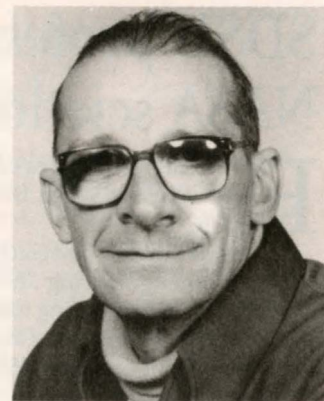
with a group of SDSU faculty to give a presentation entitled "Unexpected Encounters of the Best Kind." In the talk, he presented several mathematical problems, demonstrated their solutions and explained how every solution involves Fibonacci numbers.

"It's not high-powered math, either," he said. "Any junior or senior math major could understand what I'm talking about."

Bergum also went to Austria this summer to attend The Seventh International Research Conference on Fibonacci Numbers and their Applications.

An SDSU faculty member since 1970,

Bergum received his bachelor's degree from the University of Minnesota in 1958, his master's from the University of Notre Dame in 1962 and his doctorate from Washington State University in 1968. He taught high school in Wisconsin for three years and at Gonzaga University in Spokane, Wash., for eight years before coming to SDSU.



# Friedrich

*named SDSU College of Engineering computer specialist*

**E**xperience in the Navy helped Dan Friedrich move "full speed ahead" in his new position at SDSU.

Friedrich was appointed computer support specialist for the SDSU College of Engineering Feb. 1. He maintains computer networks, monitors computer labs, installs new hardware and does whatever is needed to support users.

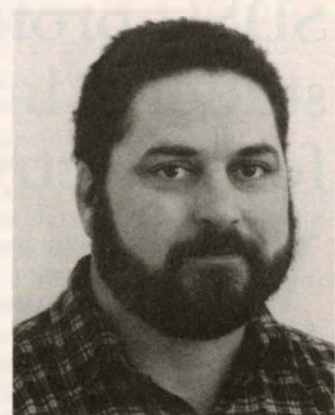
Friedrich spent 10 years in the Navy stationed in the Philippines and Mare Island near San Francisco, where he taught computer maintenance. He has worked as an engineering technician at the SDSU Mechanical Engineering Department since 1991.

SDSU Engineering Dean Duane Sander said Friedrich's helpful personality is essential in his current job.

"This position is critical for our faculty and staff as we utilize computers and networks to communicate, teach and conduct research," Sander said. "Dan's background with teaching experience and technical training in the Navy and his recent experience in network management make him highly qualified."

Graduate students have been providing computer support since the early '90s, but a full-time person was needed to maintain continuity throughout the school year. Friedrich is the first person to be hired in this position.

"It's interesting because whenever people call me, they have a problem," he said. "It's nice when you can solve their problems and help them get on with what they need to do."





# Top *entre* business plans win awards

**P**lanning a business takes hard work, creativity and determination.

Larry and Susan Holler of White, Sandy McFarland of Brookings and Joyce Olofson of Garretson were awarded for the business plans they created during an ENTRE business development class offered through SDSU.

The ENTRE program, sponsored by the US WEST Foundation, the SDSU University/Industry Technology Service and the South Dakota Marketing Alliance, provides training for people interested in pursuing entrepreneurial opportunities.

"These people completed the course on business planning, which is geared toward analyzing the market and determining whether the business could be profitable," said Kevin Dalsted, ENTRE administrator. "The judges found these three business plans to be really top-notch."

The Hollers received \$500 for their business, GRI (Glycoscience Research Inc.). They raise sheep with a genetic disease that causes some of the lambs to store chemicals called gangliosites in their brains and spinal columns. These chemicals are used in biomedical research for spinal cord injuries, strokes and Parkinson's disease.

"Because of this disease, the sheep have 30 to 40 times as much chemical in their brains as normal animals," Larry Holler said. "Currently, the chemicals used for pharmaceutical trials are being made from bovine brains."

These sheep have a disease similar to GMI-gangliosidosis in humans. Children with this disease typically live to be two years old; lambs afflicted with

it live until they're about six months old. Research done on these lambs while still in the womb may help find a cure for the human disease.

Currently they are lambing out the sheep and looking for a distributor for the chemicals.

McFarland received \$300 for her plan, the Party Animal Playhouse.

"I visited four playhouses in Minnesota that had interesting areas, like a clubhouse, a circus tent and a mine shaft," she said. "I would want to

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*"These people completed the course on business planning, which is geared toward analyzing the market and determining whether the business could be profitable."*

include educational things, too, like science experiment breaks."

McFarland's major obstacle has been with start-up funding. She said it will take \$180,000 to purchase equipment and get insurance, so she is looking for investors.

Olofson received \$200 for the plan to improve her Garretson business, Dakota Good Times Corner, which opened in 1993.

"It started as a business that provided tours of the attractions in the area, like the Palisades and Devil's Gulch," she said. "Then I felt there was a need for a bakery/coffee shop in Garretson. Now I also sell South Dakota products and have the Nancy Kentfield Art Gallery featuring works by the local watercolorist."

The ENTRE program provided the participants valuable information.

"I needed to rewrite my business plan and bring it up to date," Olofson said. "The information was top-notch and the speakers were, too. I also learned a lot from interacting with the other participants."

Larry Holler said, "I'm trained as a scientist. I have no business experience. ENTRE made me think about everything in detail and how it applied to me. Creating the business plan was the most valuable part of the course because it made me consider all the aspects."

For information about ENTRE, call Kevin Dalsted at (605) 688-4184 or e-mail him at DalstedK@mg.sdstate.edu.



Sandy McFarland



Larry Holler

# IMPULSE

*magazine goes on-line*

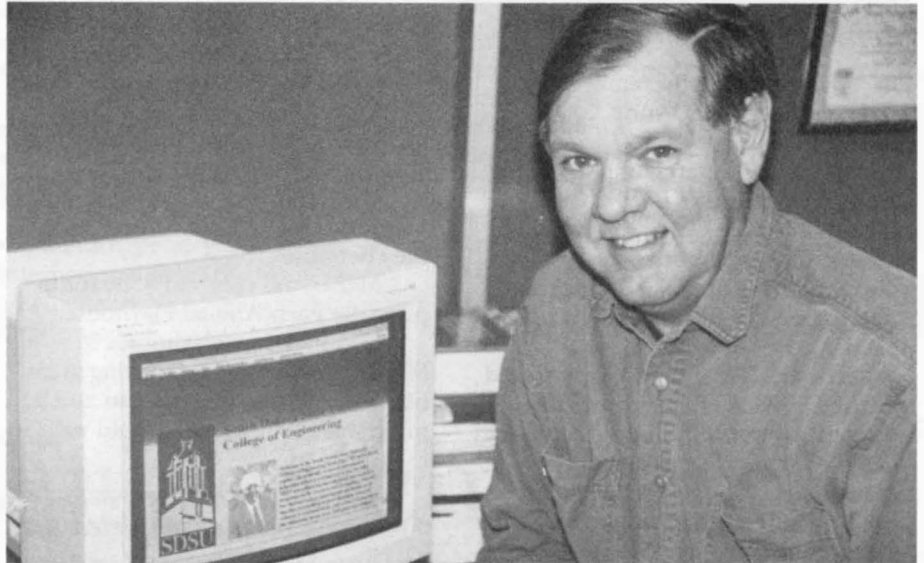
Everyone has heard about the Internet. Various estimates of the number of people who have access to the World Wide Web range between 4 million and 20 million worldwide.

Now you can connect to the College of Engineering and view the text version of its IMPULSE magazine by pointing your Web browser to the new College of Engineering home page at <http://www.sdstate.edu/~weng>.

The home page contains links to six areas relating to College of Engineering activities which are of great interest to students, prospective students, faculty, staff, alumni, industrial representatives and others. These areas can be accessed by clicking on one of the six icons in the table on the page.

A brief description of each of the six choices is outlined below. It is important to note that several pages are "under construction" and others are being updated on an ongoing basis.

- "Academic Departments" is the link to College of Engineering academic departments and a list of academic majors offered. The list of majors is in turn linked to an on-line catalog and description of the pages maintained by SDSU. Several departments, including Mechanical Engineering and Physics, have developed their own pages accessible through this choice. These pages illustrate new and innovative uses for the Internet. For example, several professors have developed course pages with course syllabi, schedules, homework assignments and sample tests and quizzes relevant to the courses they teach.
- "Graduate Programs" links to a list of graduate majors and a description of graduate courses offered.
- "Research Departments" links to the Engineering and Environmental



*Jim Manning, a safety consultant/engineer with the Department of Engineering Extension at SDSU, coordinates the SDSU College of Engineering's site on the World Wide Web.*

Research Center, Northern Great Plains Water Resources Research Center and the SDSU Image Processing Laboratory. The latter displays online computer-enhanced, remotely-sensed images ranging from fires in California to orange groves in Florida.

- "Alumni Information" links to a database and alphabetized index of SDSU College of Engineering alumni e-mail addresses. If alumni choose to do so, they will have the opportunity to fill out a form to list their e-mail address on this page.
- "IMPULSE magazine" links to a text-only version of the IMPULSE.
- "Faculty and Staff Home Pages" connects to an alphabetized index of SDSU alumni, faculty and staff and student home pages. By selecting this choice, these individuals can fill out a form to display their name and a link to their own URL home page address.

Other SDSU World Wide Web

pages of interest include the SDSU Home Page at <http://www.sdstate.edu/> and the SDSU Alumni Association and SDSU Foundation Home Pages at <http://www.sdstate.edu/~wfal/http/alumfoun.html>.

The State of South Dakota also maintains a page with numerous links to state government and tourism at <http://www.state.sd.us/>.

The College of Engineering WWW project is a joint effort coordinated by Virgil Ellerbruch, assistant dean of engineering, and James Manning of Engineering Extension. Jim Novotny, an electrical engineering student, wrote the "code" for the pages. The pages, which have had about 600 hits a month, are best viewed with a World Wide Web browser that supports HTML extensions such as Netscape™ version 1.11 and above.

# EED, Inventors Congress *successful because of student involvement*

Hundreds of high school and college students joined the public in exploring the world of engineering and invention during Engineering Exploration Days and the South Dakota Inventors Congress in April at SDSU. Both events were made possible through the behind-the-scenes work of many students, faculty and staff members.

Terry Boon, a senior electrical engineering major from Rock Rapids, Iowa, was the EED student chairman. Planning begins in October and grows at a frantic pace until the last inventor leaves Frost Arena.

"I learned a lot of time management skills," Boon said. "Besides being EED chair, I was president of the Joint Engineering Council and system administrator for the Image Processing Lab. I also learned a lot about how to communicate with people so all the tasks get accomplished."

Committee chairs formed three groups to help with promotions, college and high school contests and the inventors congress. Each committee had one or two faculty advisors and five to 10 members to ensure each activity flowed smoothly.

One activity that has taken place for several years is the bridge building contest. Civil engineering professor

Paul Koepsell has judged the contest since 1989.

"It seems to be continuously popular," Koepsell said. "People like to see stuff break. Because of the nature of the contest, many students can enter because it doesn't take too much investment, just some balsa wood and model glue."

After students build their bridge to the rules' specifications, judges apply an increasing load to the bridge until it breaks.

"We change the contest every year so the students have to read the rules and follow them," Koepsell said. "We measure to make sure they meet the width, length and other requirements. They have to follow the rules so they learn that engineers can't build a bridge any way they want to, which is the way things are done in the world of reality."

Inventors already know how things are in the real world. Kent Rufer, program manager for the University/Industry Technology Service, organized this year's Inventors Congress.

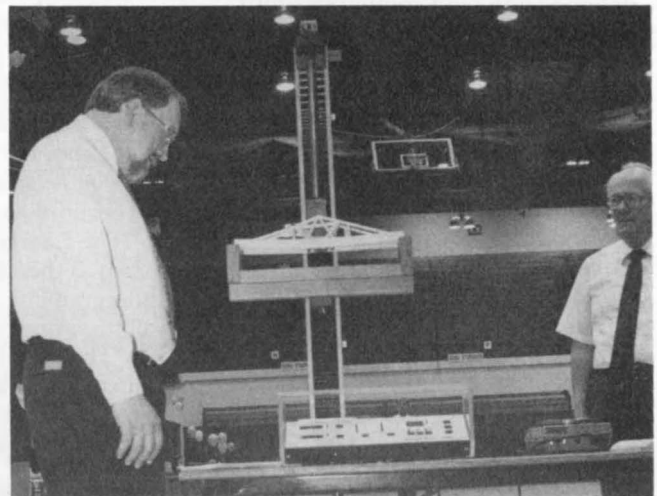
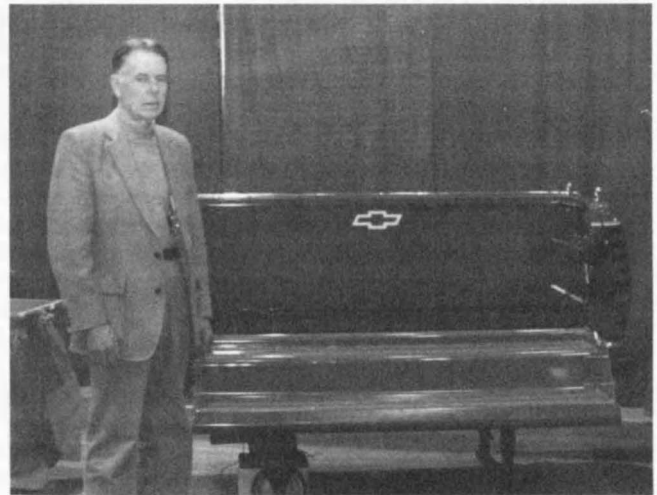
"The judges this year commented that the competition was much closer this year," Rufer said. "There were more and higher quality inventions, which made it a more level playing field."

Inventions came from South Dakota, Minnesota and Wisconsin in a wide variety of categories. Besides the public display portion, the congress included seminars and workshops with topics like patents and marketing.

"The comments from inventors indicated that this is definitely a service to South Dakota," Rufer said. "They learned a lot of

background about inventions and what to do with the good ideas."

Inventors Congress winners were: Ron Reed Economic Development Award (most marketable invention), Mark Craig of Mitchell, the Grain Watcher; Agriculture: Willie Elsing of Rushmore, Minn., Rodent Ridder, LeVerne Quam of Sinai, Step Gate; Tools: Howard Yitalo of Cokato, Minn., Math Line, Bruce Frye of Milltown, Wis., Vacu-Grip Sign Holder; Household: Carol and Cliff Kannegieter of Watertown, Funnel Tray and Kitchen Imp; Sports and Recreation: Harold Fratzke of Cottonwood, Minn., Hand-D-Ramp, Kirk Edward of Rapid City, Trapper's Alley.



*In the top photo, Harold Fratzke stands by his Hand-D-Ramp, which won him an award in the South Dakota Inventors Congress sports and recreation division.*

*In photo above, civil engineering professor Paul Koepsell, right, judges the EED bridge building contest, a duty he has performed since 1989.*



## *SDSU participates in second annual* **Space Day**

NASA Moon Rocks, freeze-dried ice cream, a high-altitude balloon and many more math and science projects brought 2,500 children and adults to South Dakota Space Day in Rapid City in March. The event was sponsored by the South Dakota Space Grant Consortium, of which SDSU is a member, and by Science Linkages in the Community, the South Dakota National Guard StarBase and Girl Scouts of the Black Hills Council.

Keynote speaker was Bill Daley of Hernandez Engineering Inc., senior scientist and geographer for NASA's Space Shuttle Earth Observation Project. Daley's presentation featured a collection of photographs of phenomena around the world as seen by the NASA astronauts from space, including prominent features in South Dakota, like the Black Hills, Missouri River, Oahe Reservoir, the Badlands and Bear Butte.

A high-altitude research balloon with a payload that holds student-designed and built communications projects, tracking and control instrumentation and a video camera system was displayed. The balloon project, a cooperative effort between SDSU, the South Dakota School of Mines and Technology and the EROS Data Center (EDC), is sponsored by the South Dakota Space Grant Consortium with funding from NASA and the South Dakota Future Fund. Raven Industries and Hughes STX, both of Sioux Falls, and Horizons Inc. in Rapid City are industrial affiliates.

Other exhibits focused on a geology program, an Internet program provided by EDC, the Starlab portable planetarium, fossil casts, a Civil Air Patrol paper airplane and balsa glider contest, remote sensing of Custer State Park, computer programs, archeology, paleontology, recycling, space food and a dehydrated food taste test, aeronautical and aerospace designs, a concrete canoe, a solar car, hands-on

geometry and challenges in math, science and technology for adults and children.

Kevin Dalsted, SDSU associate director of EERC, said Space Day is important because it helps people in South Dakota become more aware of how space technology is used in our state.

"Space Day, which is geared toward students in grade six through 12, helps create enthusiasm about science," Dalsted said. "The projects let the students see the wide variety of opportunities available in space science and aeronautics, and they also see the excitement surrounding research."

Madeleine Rose, SDSU associate professor in Nutrition and Food Science, treated Space Day participants



*SDSU associate professor Madeleine Rose, far left, dispenses information during South Dakota Space Day.*

to samples of food developed for soldiers and astronauts. She also served freeze-dried ice cream, which she said astronauts do not eat in space, but kids enjoy eating at Space Day.

"The major goal of Space Day is to interest kids in careers based on math and science," Rose said.

## **SDSU industrial program receives environmental award**

**F**or all of their hard work, several SDSU engineering students and their advisors received national recognition. The SDSU Industrial Energy Analysis Laboratory was given a certificate of environmental achievement from the National Awards Council for Environmental Sustainability, a group of businesses and organizations that have joined to help advance the environment.

The Energy Lab runs the Industrial Assessment Center Program, formerly known as the Energy Analysis and Diagnostic Center. Twelve graduate and undergraduate students visit regional industries and conduct energy reduction, pollution prevention and waste reduction assessments.

"This award was a recognition of the amount of energy savings and waste reduction that has been achieved in the industrial sector through this program," said program director Kurt Bassett. "It highlights beneficial aspects of the program and emphasizes to the students that the work they are doing is of real importance."

Since the program began in 1992, students have conducted 75 assessments at regional manufacturing and processing facilities with a total identified savings of \$1.5 million. Average annual savings per facility is \$32,000.

All information gathered that is connected to a specific company or plant location is confidential.

For more information about the program, contact Kurt Bassett at (605) 688-4817 or at his e-mail address: [bassettk@mg.sdstate.edu](mailto:bassettk@mg.sdstate.edu).



# Manufacturing engineering

*technology major to start this fall*

In response to requests from industry and economic development leaders in the state, SDSU will offer a degree in Manufacturing Engineering Technology (MET) beginning this fall. "The purpose of the program is to train perspective employees for companies that have sophisticated manufacturing processes," said Duane Sander, dean of the College of Engineering. "These individuals will be applying their skills to manage, coordinate and provide technical expertise to the development and operation of complex manufacturing equipment."

The College heard of the need for this type of employee from manufacturers like John Devine. An SDSU MET advisory board member, Devine is CEO of ENERCEPT and Benchmark Foam in Watertown.

"We struggle at this level about when to hire engineers and what type of engineer to hire," Devine said. "Sometimes we need mechanical, sometimes electrical and sometimes civil. I told Dean Sander someone needs to prepare industrial engineers who have a range of skills they can bring to employers."

"We look forward to this program being a source of manufacturing technologists, something that is not available in South Dakota right now," said MET advisory board member Jerry Luetzow, president of MTR, Inc. of Brookings. "There is a tremendous shortage of these people in the nation. The availability of them through the SDSU program will result in a tremendous growth in industry in the state."

The proposed curriculum for the

MET major includes courses in electronic engineering technology, computer science, materials, mold design, business, communication, production technology and quality control. Graduates will emphasize the practical aspects of product manufacturing rather than the conceptual process it took to get there.

*"We struggle at this level about when to hire engineers and what type of engineer to hire. Sometimes we need mechanical, sometimes electrical and sometimes civil. I told Dean Sander someone needs to prepare industrial engineers who have a range of skills they can bring to employers."*

"The program provides our students with a technical and management background so they can either solve manufacturing problems or find the information to help them solve the problem," Sander said.

## Physics workshop provides technological brush-up

Keeping up with technology instruction in their classrooms can be a full-time job for teachers these days. In an effort to enhance their overall science teaching methods, 14 South Dakota science teachers attended the "Technology and Computers Combine for Quality Physics Instruction" workshop conducted by the Physics Department at SDSU June 10 through 14.

The workshop was funded through a grant from the Eisenhower Professional Development Program, administered by the South Dakota Board of Regents.

The workshop trained teachers to combine the technologies of graphing calculators, computers, computer-based laboratory systems, computer spreadsheets and physics interactive software.

"The complementary nature of the workshop topics makes the whole greater than the sum of the parts," said Oren Quist, SDSU physics professor. "This results from the way the understanding of a physics principle is improved by investigating it by a variety of methods from different perspectives. Another outcome of this workshop is a better understanding of the role of technology in science education."

Quist and Warren Hein, professor and head of the SDSU Physics Department, directed the workshop and taught, along with Bob Tower of Sioux Falls Roosevelt High School and Justin Williams, an SDSU graduate physics student.

Participants received one graduate credit for successfully completing the workshop. Teachers attending came from schools in Brookings, Castlewood, Dell Rapids, Elkton, Hartford, Ipswich, Lennox, Leola, McIntosh, Pierre, Raymond, Scotland and Summit.

# Students, industry benefit from construction management major

For Jeff Wolgamott, construction management gave him his niche in life.

"I don't know what I'd be doing without this major," he said. Wolgamott was one of the first 10 students to sign up for the program when it began in fall 1994.

Those in the South Dakota construction industry are excited to see such enthusiastic students and look forward to the day they graduate and begin working in the field.

Two chapters of the South Dakota Associated General Contractors (SDAGC) — the Building Chapter and the Highway-Heavy Utilities Chapter — each contributed half of the amount needed to assist the bachelor's degree program through its first two years.

"This degree program helps to fill a major need recognized by our Association — the requirement for additional qualified people in the construction industry to build the infrastructure of tomorrow," said James Keyes, executive vice president of the SDAGC Highway-Heavy Utilities Chapter. "This need exists at all levels of construction and is probably our industry's single greatest requirement."

Craig Kreyger, SDSU assistant professor of general engineering, is pleased with how the major is progressing. SDSU now has a student chapter of AGC and has elected its first officers.

"The major has gone above our expectations in enrollment and student enthusiasm is high," Kreyger said. "The support from contractors has continued to be very, very good. They have even offered internships and summer jobs to the students."

Graduates with construction management degrees will fill the

missing link between project engineers and construction company owners.

"This is the person who goes out and does the project," Kreyger said. "Contracting has become increasingly more complex, so the industry needs educated people who want to do it."

Wolgamott is happy to be one of those people.

"When I came to SDSU, I knew I wanted to be an engineer," he said. "But after two years, I knew I was in over my head. I found out there would be a construction management major, so I hopped right into it.

"The classes are very 'real world' oriented. I appreciate the contracting groups; without them, we wouldn't have a major. This is my niche and I can't say enough good things about the people who got it going."

The first student will graduate from the program this December. After that, Kreyger expects about 10 graduates per year.

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## SDSU lecture series gives overview of EROS Data Center

SDSU and the EROS Data Center (EDC) conducted a Technical Lecture Series at SDSU the second Thursday of every month from September 1995 through April 1996.

Scientists from a variety of EDC programs were guest lecturers. The series was one of the many activities sponsored by the South Dakota Space Grant Consortium. Approximately 50 to 70 faculty members, staff and students attended the lecture series each month.

"The purpose of the lecture series was to give an overview of activities at the EROS Data Center," said Kevin Dalsted. "For example, it gave the audience a glimpse of where EDC is going with the program 'Mission to Planet Earth,' and it also gave the faculty ideas for making initial contacts with EDC for possible collaboration.

"Sending scientists to SDSU to speak shows the solid working relationship we have with the EROS Data Center," Dalsted said. "We plan to continue the lecture series for the next school year."

Speakers and themes for the lecture series were:

- ★ "Mission and Vision of EROS Data Center" by Wayne Rohde, assistant center chief for Programs
- ★ "Challenges in Monitoring Global Vegetation" by Tom Loveland, remote sensing scientist
- ★ "Global Multi-Resolution Land Characterization Project" by Brad Reed, principal scientist
- ★ "An Overview of the International Program at EDC" by Jim Verdin, manager of the International Program
- ★ "Digital Terrain Analysis" by Sue Jensen, physical scientist
- ★ "Global Mapping with 1 km AVHRR Data" by Jeff Eidsenshink, physical scientist
- ★ "LANDSAT: Past, Present and Future" by R.J. Thompson, principal remote sensing scientist
- ★ "EOSDIS: Global Monitoring" by Lyn Oleson, computer systems analyst, DAAC manager.



## SDSU education rates high with engineering alumnus

From Ellsworth Air Force Base to the Pentagon, Lt. Col. Dick Trapp's SDSU electrical engineering degree has stood the test of time.

For nearly 19 years, Trapp has applied the engineering and Air Force ROTC training he received at SDSU to a successful Air Force career that has taken him around the world.

"I've met people with degrees from the Big Ten and Big Eight colleges," Trapp said. "I'll put my education and background against anybody's."

Trapp graduated in 1976 and, after an 11-month wait, began pilot training at Hondo Air Field in San Antonio. In 1978 he took jet training at Enid, Okla., then was stationed at Ellsworth AFB. He flew EC-135C aircraft for the 4th Airborne Command Control Squadron at Ellsworth AFB and supported the "Looking Glass" Mission at Offutt AFB in Omaha.

Also in 1978, he married SDSU alumna Kathy Metzger, who earned her degree in medical technology. The Trapps and their daughter, Melanie, 11, are living in Burke, Va., while Trapp is stationed at the Pentagon.

The Air Force has provided Trapp with a wide variety of experiences. While stationed at Ellsworth AFB, he helped launch a Minute Man Missile while orbiting 100 miles off the West Coast. He pulled alert at the Minot (N.D.) AFB and has been to Alaska and Europe. At Dyess AFB he flew KC-135s, which are used as airborne tankers to refuel Air Force and Navy aircraft.

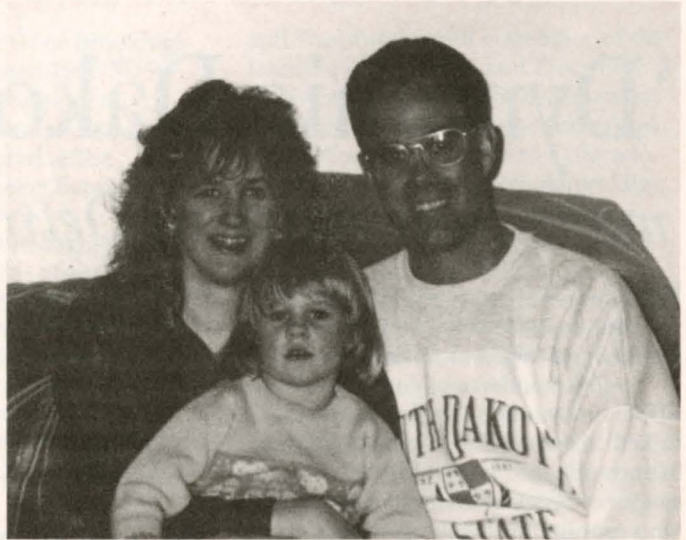
In 1984 he received his master of science in electrical engineering at the Air Force Institute of Technology. "My education at SDSU saw me through," he said. "It was hard to get a master's degree when I had been away from school that long."

In 1985 Trapp was assigned to

Wright-Patterson AFB, where he became a Division Chief for F-16 Avionics and flew research aircraft with the 4450th Test Wing. Trapp next became Chief for the Airborne Telemetry Division

of the Test Wing. In 1993 he was assigned to the Pentagon, where he works with Advanced Programs for the Air Force. In spring 1999, he will be eligible for promotion to full colonel.

Trapp's brothers, Steve, Paul, Mark and Lanny, and a sister, Shirley, now deceased, all graduated from SDSU.



Kathy and Dick Trapp relax with their daughter Melanie. Trapp, EE '76, is stationed at the Pentagon.

His sister Yvonne, attended SDSU.

One probable reason all these brothers and sisters were educated at SDSU is that their father, Lansford, was an SDSU math professor for 16 years in the late '60s and '70s.

"We have SDSU to thank for a lot of good things," Trapp said.

## Welding classes help graduate get design job

The welding class he took at SDSU gave Kirby Dickovich the edge in landing his job as a design engineer. Dickovich, a spring 1995 graduate and design engineer for Johnson Screens of St. Paul, Minn., was hired because he knew something the other job applicants didn't.

"Johnson Screens does a lot of machining and welding and one of the first questions they asked me during the interview was if I had any experience with either one," Dickovich said. "They also showed me a blueprint with mistakes on it, two of which were incorrect weld symbols. I was told later that I was the only one they interviewed who had seen the errors."

Dickovich gained that knowledge through the engineering shop classes taught by instructor Roger Svec.

"I took machine shop, welding and special problems in the engineering shop program — information you can't get with ordinary engineering classes,"

Dickovich said. "Roger was a good instructor. He put thought and structure into the class and provided good pointers for us."

Svec said Dickovich "was very inquisitive. He wanted to know everything at once. He would ask questions beyond where he was at because he wanted to learn it all."

Dickovich looks forward to learning throughout his career. And he's thankful for the edge that helped him land a job he enjoys, especially working with customers and developing the designs for their specific projects.

# 'Dynamic Dakotans'

## *make their mark in Detroit*

SDSU alumni have made a name for themselves in Detroit. They've been dubbed the "Dynamic Dakotans."

A few months ago Margot Jenkins, SDSU international student advisor, talked to Prasad Rao and Balachandra Muniyappa, two recent SDSU engineering master's degree graduates who now live in the Detroit area.

"Last year, 12 SDSU students in the process of completing their theses or design papers went to Detroit," Jenkins said. "They hadn't had as much exposure to the job market, but they all got jobs. Some Wayne State University engineers started calling them the 'Dynamic Dakotans' because they were so successful at getting jobs."

Rao, who now works for an engineering consulting firm that works with Chrysler, said they could find employment because they had a solid mechanical engineering background plus research experience, which fit better with what employers needed.

Two other Detroit area mechanical engineering master's graduates are Parijatha Kayathi and Aazer Medhora. Medhora, an associate engineer at Ford Motor Company, studies vehicle reliability, structural performance and vibration characteristics of components of a vehicle. His wife, Kayathi, worked two years at Ford and is now senior project engineer at General Motors.

"I work on automobiles to reduce noise, vibration and harshness," she said. "I come up with new designs to improve the quality of the product, thereby customer satisfaction."

Kayathi said she believes she got her current position because of the foundation she built at SDSU.

"I'm very happy I went to SDSU," she said. "My advisor was in the field of solid mechanics, so I had a lot of background in the vibration area, including my thesis. The people at Ford and GM liked the thesis and knew I could do the job."

Kayathi's advisor, SDSU

mechanical engineering professor Hamid Hamidzadeh, said Kayathi "was a very persistent student who was quick to learn. A majority of students don't have an adequate background in mechanical vibration. I feel she had a

very good knowledge base in this area, so that's why she's doing so well."

Hamidzadeh plans to submit two papers about Kayathi's thesis research for publication in international journals.

## National engineering society president speaks at SDSU

Alumnus Richard Hayter, president of the American Society of Heating, Refrigeration and Air-Conditioning Engineers, was featured speaker for the College of Engineering Spring Convocation.

Hayter, associate dean of engineering for extension and outreach at Kansas State University, presented "Engineering Your Future" at the convocation, held on campus April 3.

"His theme as president has been looking toward the future," said Kurt Bassett, SDSU assistant professor of mechanical engineering. "He provided the students and faculty with insight and inspiration about engineering careers."

Hayter received his bachelor's degree in mechanical engineering from SDSU and his master's and doctoral degrees from Kansas State. Prior to his present position, he served in the Air Force, was executive vice president of an engineering consulting firm and was a member of the Kansas governor's cabinet as director of the Kansas Energy Office. He was named SDSU Distinguished Engineer in 1991.

## In tribute

Ronald and Jeanne Schultz of Merrill, Iowa, present a portrait of their son, Brad Schultz, to Lew Brown, associate professor and head of the Electrical Engineering Department.



Brad, a 1994 SDSU electrical engineering graduate, died in spring 1995 while vacationing in Mexico.

In tribute, Brad's family and former employer — Ed Cannon, president of Cannon Technologies of Plymouth, Minn. — established the Bradley D. Schultz Memorial Fund. Each year, the fund will finance a \$500 scholarship for a junior or senior electrical engineering student at SDSU.



# Two former Brookings men named SDSU

## *Distinguished Engineers*

Two men formerly of Brookings have been named 1996 SDSU Distinguished Engineers.

Frank R. Knutson and Neil R. Patterson were honored at the Distinguished Engineers Banquet, held at SDSU April 27.

Knutson, a 1960 Brookings High School and 1965 SDSU electrical engineering graduate, has been general manager of the Tri-State Generation and Transmission

Association Inc. in Denver, Colo., since 1989. Tri-State is a generation and

transmission cooperative that supplies wholesale electric power and energy to 34 rural electric distribution cooperatives in Colorado, Nebraska and Wyoming. Prior to joining Tri-State, Knutson was manager of the Rocky Mountain Generation Cooperative.

With more than 30 years of experience in the electric utility industry, Knutson has made several contributions to engineering education. He has participated in, developed and managed various engineering training programs, including the Bureau of Reclamation rotational engineering program.

Knutson is a registered professional engineer in the states of Colorado, Nebraska, Wyoming

and Washington and a member of the Institute of Electrical and Electronic Engineers. He serves on the board of directors for several cooperatives and associations in and around Colorado.

Patterson, a 1947 Brookings High School and 1951 SDSU mechanical engineering graduate, served in the U.S. Air Force until 1953 and joined the Trane Company as a sales engineer the following year. He held several positions in product marketing with the Trane Company before being named corporate manager of application engineering. In this position, he was responsible for engineering application of all commercial and light commercial products the company manufactures.

Patterson was named the company's first director of building energy systems engineering, a position in which he was largely responsible for the development of the TRACE Computerized Energy Analysis Program and the CDS network of computer programs for the design of air conditioning systems for buildings. After several years in this position, he was named the company's first director of integrated systems and was responsible for developing the company's first Micro-based Direct Digital Control modules for products capable of communicating with the company's new building automation systems and software.

Patterson was also named corporate director of market development and new product planning, a position he held until retiring in 1994. A registered professional engineer in Wisconsin, he is active in his field and currently under contract with the Trane Company to rewrite The Trane Air Conditioning Manual, a widely used reference book on HVAC applications.

The Distinguished Engineers Banquet is held each year in conjunction with Engineering Exploration Days at SDSU.



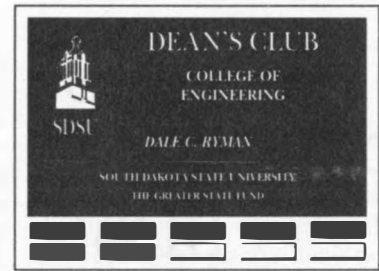
*Frank R. Knutson*



*Neil R. Patterson*

# DEAN'S CLUB

As a dean's club member, you will receive a handsome walnut and brass desk plaque inscribed with donor's name, a listing in the SDSU honor roll, invitations to special college and university functions, and updates from the college dean.



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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 SDSU Foundation and designate for the College of Engineering. Mail to: **SDSU Foundation, Box 525, Brookings, SD 57007**

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## Who am I?

You probably know this person, though appearances may be a bit deceiving just now.

All College of Engineering alumni are invited to make a guess and have a shot at winning a prize, to boot.

To enter, fill out the "We Want to Hear From You!" form on the preceding page. The form must include your guess and some news about you. Mail it to the College of Engineering. (The address is on the form.) Only submissions that include alumni news will be eligible to win.

All correct answers will be thrown into a hat. The first name drawn will win an SDSU sweatshirt. The second name drawn will win an SDSU T-shirt.. The third name drawn will win an SDSU mug. Not bad for the cost of a stamp, a few minutes time and a bit of ink.

Winners will be announced in the next issue of the Impulse – along, of course, with "the rest of the story."



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