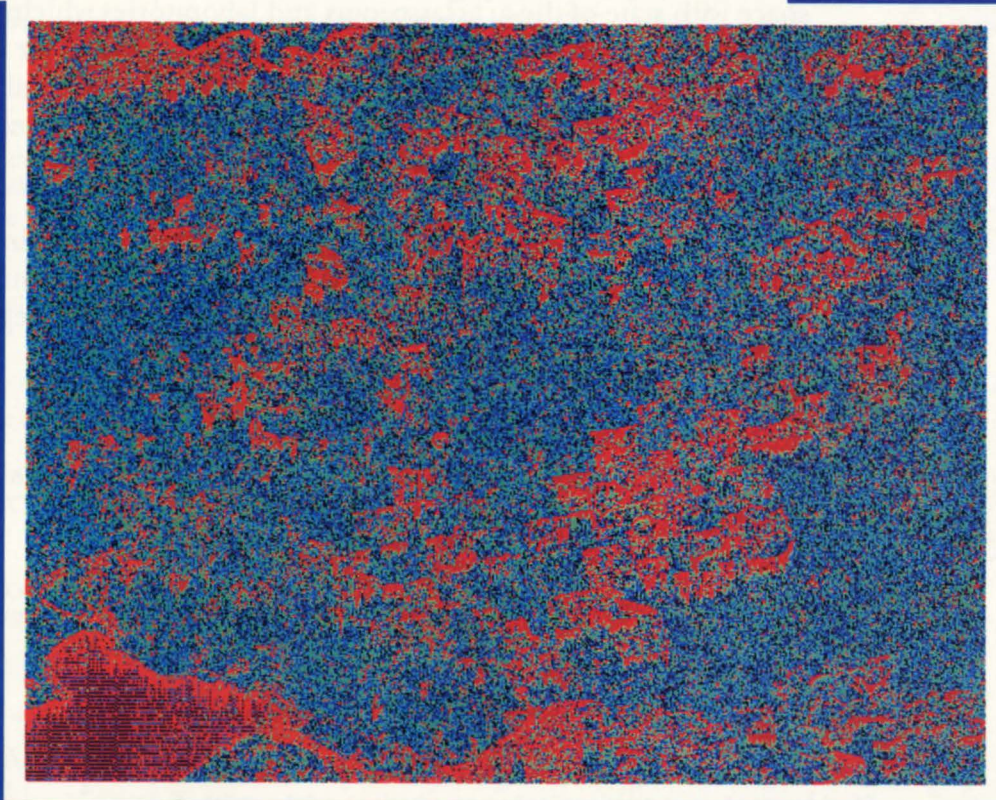
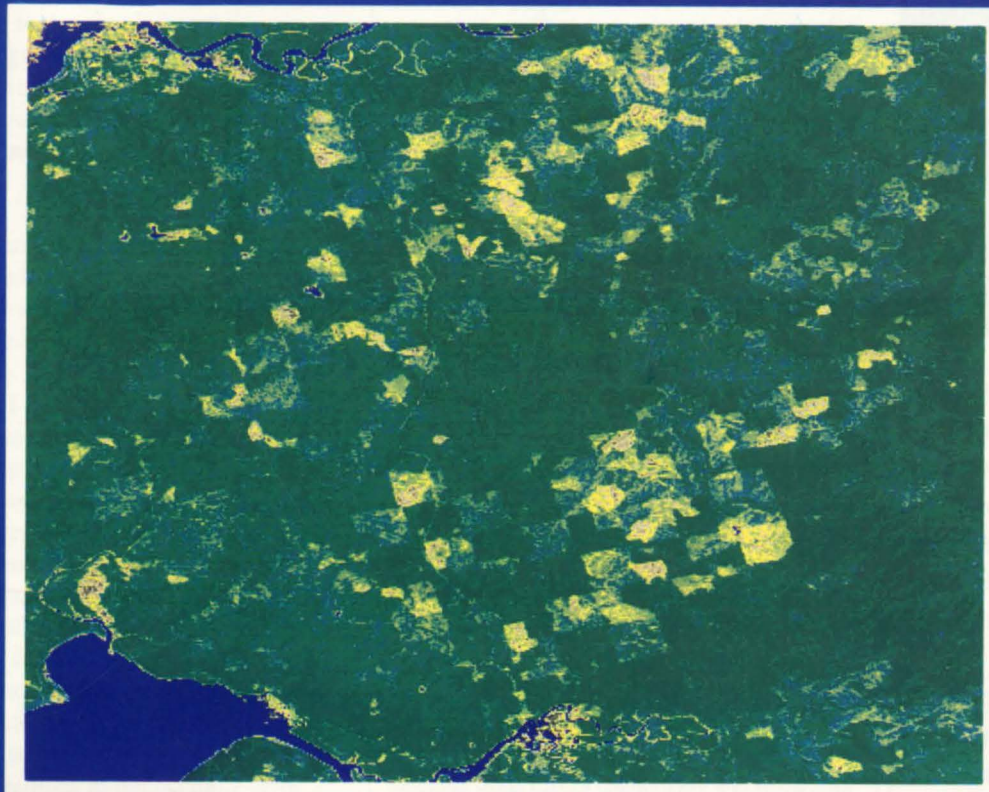


A DYNAMIC FORCE THAT INITIATES MOTION TO A BODY OR SYSTEM

IMPULSE

SUMMER 1994



SOUTH DAKOTA STATE UNIVERSITY
COLLEGE OF ENGINEERING, BROOKINGS



Dear Alumni:

The year 1995 will make 110 years of engineering at SDSU! The first engineering course, drafting, was taught in 1885. This IMPULSE illustrates the diversity which has occurred since 1885 when our one and only program was mechanical engineering. We now have 11 undergraduate programs and a graduate program that includes the master's degree and our just approved Ph.D. in atmospheric, environmental and water resources.

Over these 110 years, our space needs were first accommodated in Solberg Hall, which was built in 1901 through the efforts of Halvor Solberg. Next, Crothers Engineering Hall was built in 1957 to house the expanding College academic programs and our research and extension activities. Since then, we have utilized many spaces throughout the campus, such as Harding Hall, which many of you may recognize as a former dormitory. We are presently in 11 different locations.

We now need to again increase classroom and laboratory space in order to better serve our undergraduate and graduate students and accommodate research needs. We will not only add new space, but we will update existing space with state-of-the-art classrooms and laboratories which will be critical for continued accreditation of our academic programs. Our plan is to continue the use of Crothers Engineering Hall, Harding Hall and Solberg Hall and provide additional needed space for our water research and academic activities in a new building.

We will be asking for your help in raising the critical matching step forward for the College of Engineering as we continue to improve our undergraduate and graduate training and serve the state, region and nation.

Sincerely,
Duane E. Sander, P.E., Ph.D.
Dean of Engineering

ABOUT THE COVER:

The green image, a Normalized Differential Vegetation Index data set of Washington state in June 1978, is a common product obtained from remote sensing satellites. Plant vigor is measured by ratioing the energy received in the near infrared wavelengths to the energy received in the red wavelengths. Colors ranging from brown to yellow to green and dark green denote increasing plant health and growth.

The colorful blue and red image denotes errors that occur when the NDVI image data is lossily compressed using Differential Pulse Code modulation (DPCM). Black denotes no error, blue denotes 1 percent error, through green and red to dark red which indicates at least 10 percent error. Lossy compression techniques are being considered for high resolution imaging instruments now under development that require extremely large data transmission rates. By analyzing imagery such as this, which indicates where and to what extent errors occur, it is hoped that effective measures of image quality can be developed that allow scientists to put accurate error bounds on their analysis of these data sets.

IMPULSE

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College of Engineering moves into 21st Century with new building

The SDSU College of Engineering will be ready to move into the 21st Century when it completes a new engineering facility on the campus green across from Harding Hall.

The new building is the top construction priority at SDSU and is part of the University's \$50 million "Visions for the Future" campaign.

"A central purpose of the building is to expand and develop our Northern Great Plains Water Resource Research Center activities and provide a central location for its research," said Duane Sander, dean of the College of Engineering.

Sander said the building will also provide research space and facilities to support the new doctoral program in atmospheric, environmental and water resources. (See related story on page 21)

"The biggest advantage of the new building is that it will give us the opportunity to design lab space to meet our research needs rather than renovating space to make do," said Vernon Schaefer, head of the water

research center and coordinator of the Ph.D. program. "Also, having graduate students, faculty and laboratories all together will enhance the program."

Construction is set to take place in two phases. In the first phase, after the building is finished, the Mechanical Engineering Department and the Civil and Environmental Engineering Department will move into the new building from Crothers Engineering Hall. The Computer Science Department will move from the Administration Building. The water research center will move from Grove Commons and Crothers Engineering Hall. The final part of phase one will be to move the Department of Visual Arts from Solberg Hall to Grove Commons.

In the second phase, Crothers Engineering Hall will be renovated. Projects which may be funded by a \$500,000 grant are a thin/thick film lab, upgrading the image processing lab and aiding astronomical and superconductor research.

When the renovation is completed, the Electrical Engineering Department will move to Crothers Engineering Hall, where the Physics

Department will remain. Engineering Extension and the Engineering and Environmental Research Center will consolidate in Harding Hall, where the Mathematics Department will remain.

Phase two would be completed with the renovation of Solberg Hall to include a resource room for math and science teachers and a discovery center. (See related story on page 13.) General engineering and the engineering technologies would move into Solberg Hall from Wenona Hall.

So far, preliminary plans for the building are complete. This fall SDSU will engage an engineering and architectural firm to develop the plan for the entire project. The building and renovation projects are expected to be completed by 1999.

Sander said the goal is to generate a \$6 million fund through donations which will be used to match funds from

federal and state sources. The total estimated cost of the project is \$18 million.

"We are the top building priority on the SDSU campus and we are optimistic that we will have alumni and corporate support to enhance our college through this building project," Sander said.

"Water is the most important commodity to the future of South Dakota," Schaefer said. "The establishment of the center and the development of a Ph.D. program is felt by this College to be the cornerstone to the fulfillment of our role to enhance the economic development of the state. Therefore, investment of federal, state and private funds can provide tremendous benefits for the future of the state."

A fund is being established at the SDSU Foundation for the engineering building.

"There is significant interest in the new facility by the alumni," Foundation director Orin Dahl said. "It will be a major component in the new campaign. We're very interested in seeing the project get underway."

Dahl said fund raising should begin this fall.

PHASE 1

Construct new building

Move Mechanical Engineering and Civil Engineering from Crothers Engineering Hall

Move Computer Science from Administration Building

Move Northern Great Plains labs from Grove Commons

Renovate Grove Commons and move Department of Visual Arts to Grove from Solberg Hall

PHASE II

Renovate Crothers Engineering Hall

Move Electrical Engineering from Harding Hall to Crothers

Consolidate EERC/Engineering Extension in Harding Hall

Renovate Solberg Hall (display area, lecture hall, resource center)

Move General Engineering and Technology programs to Solberg Hall

"A central purpose of the building is to expand and develop our Northern Great Plains Water Resource Research Center activities and provide a central location for its research."

SDSU could be one of three geothermal training centers in the nation

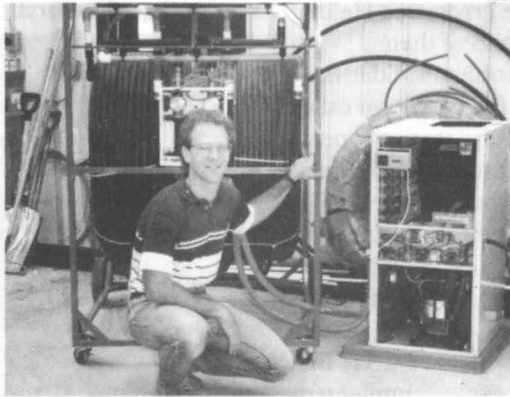
If Congress approves funding this summer for promotion of geothermal (ground source) heat pumps, SDSU has excellent potential of becoming one of the first three Department of Energy sponsored training centers in the nation.

Charles Remund, associate professor of mechanical engineering at SDSU, is the director of the Ground Source Heat Pump Training and Research Laboratory located in the new industrial park east of Interstate 29 in Brookings.

"The idea is to provide training, aid in marketing and continue research for geothermal heat pumps," Remund said. "Over the next six years, the Department of Energy would contribute \$35 million and utilities would contribute \$65 million. The goal is to take the geothermal heat pump industry from 40,000 units a year now to 400,000 units a year by the year 2000."

This is an important step for a program located in a building that didn't even exist until earlier this year. The project has been a joint effort between SDSU, the State of South Dakota, the City of Brookings, the Brookings Area Development Corporation, electric utilities and heat pump associations.

The program has been in



development for more than two years. Starting in March Remund and his staff moved into a facility the Brookings Area Development Corporation built in the new industrial park east of I-29.

Since then nearly 100 people have been trained in three-day certification workshops which show people the proper procedures for designing, installing and servicing ground source heat pump systems. More than 70

people have attended one-day seminars that give utility personnel an overview of how the systems work and how to better market them.

Those attending have come from North Dakota, South Dakota, Wyoming,

Montana, Nebraska, Iowa, Minnesota and Wisconsin.

"If the Congressional bill passes, it would mean more personnel, more people coming to town for training and potentially more research," Remund said.

Charles Remund, associate professor of mechanical engineering at SDSU, is director of the Ground Source Heat Pump Training and Research Laboratory located in the new industrial park east of Interstate 29 in Brookings.

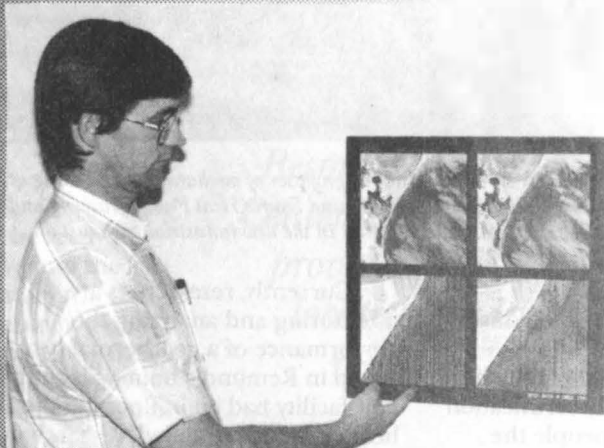
Currently, researchers are monitoring and analyzing the performance of a geothermal heat pump in Remund's home. Since the new facility had an in-floor geothermal heating system installed, researchers can now study the effects of different underfloor insulation on heat loss to the ground and compare the efficiency of distributing heat in the floor system to a traditional duct system.

On July 1 Remund and his staff began a research project to revise a grouting manual for the International Ground Source Heat Pump Association. Grout is the material used to fill the holes created when pipes or wells are installed for a geothermal heat pump. SDSU will also begin a project that uses fly ash, a coal waste product, as an additive to enhance heat transfer from buried pipes.

"Because we have this building, we're starting to have people come to us and ask us to give them a research proposal they may be interested in funding," Remund said. "We're doing research that the industry wants and needs. It's very valuable to them."

"The idea is to provide training, aid in marketing and continue research for geothermal heat pumps."

Helder's research helps NASA and EROS



Dennis Helder, associate professor of electrical engineering at SDSU, looks at a French spot satellite photo of Lake Thompson. The photos on the right have been debanded, meaning that much of the banding, stripes that appears uniformly throughout the image, have been removed.

Sometimes, what you see is not what you get. Associate professor of electrical engineering Dennis Helder knows that all too well.

Helder has worked with EROS (Earth Resources Observational Satellite) Data Center since 1988 and recently with NASA. His area of expertise is dealing with Radiometric Calibration of satellite images at both institutions.

Helder's work with radiometric calibration is more of a quantitative look at imagery rather than qualitative. There are many sources of radiometric errors and Helder has tackled several of them.

One problem Helder has combatted is a condition called banding, where stripes appear uniformly throughout an image after the satellite has collected it. He has addressed this with a number of

techniques that he and his students can take credit for.

He first implemented a debanding technique for the thematic mapper (a highly technological 'camera') using a Wiener filter. The Wiener filter was actually introduced in the 1940's with a top

secret classification and is named after the scientist who developed it.

Helder's use of the Wiener filter was unique to debanding satellite imagery.

Another radiometric problem that has been addressed is called detector striping and it occurs in the French S.P.O.T. satellites. Helder has two approaches. The first is a standard linear filter technique. The other is a wavelet decomposition that isolates and removes the unwanted 'noise' in the images.

The goal of researchers in this field is to improve absolute radiometric calibration so that error is minimized, essentially down to three to five percent or less. This procedure involves converting the digital numbers sent by a satellite into

physical units of energy.

Helder's approach involves extracting calibrated information from the EROS archives for the last 10 years. Knowing that every scene has calibrated information, Helder wants to link that information to what the satellites are producing now.

"No one has taken the time to see how the image data has changed over the last 10 years," Helder said. "We want to characterize the detector's response as a function of time at three different time scales."

Helder also hopes to do ground based calibration which compares the data collected by instruments on the ground with on board satellite calibration. This work is in collaboration with SDSU associate professor of physics Steven Schiller.

Away from EROS, Helder's work with NASA is still with imagery, but in a much different way. Initially sensors in satellites, implemented in the 1970s, recorded very large, coarse resolution pixels that required only low data transmission rates. The sensors being developed today have much higher resolution and demand higher data transmission capability.

The problem here is that there is not enough capacity for transmission and/or storage of the data. Because of this, techniques which reduce data volume are being considered. Unfortunately, these lossy compression methods have scientists worried how this will affect their analysis of the imagery.

Helder is working on ways of measuring the effect lossy compression (compression of an image with the loss of some detail and data) will have on data with respect to common remote sensing applications. Today most qualitative assessments of an image are done in human vision application, but Helder's qualitative metrics are based on machine interpretations of the imagery. "In other words," Helder said, "we are judging the images the computer sees and it may not correspond to the way the scene appears visually."

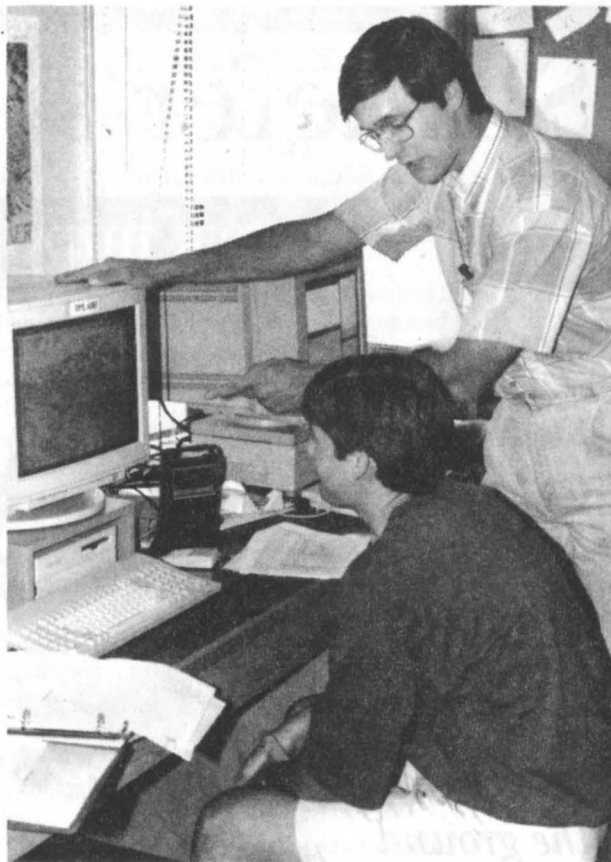
As an example, Helder is working with digital elevation models that are formed from stereo image pairs. Digital elevation models provide a

3-dimensional view of the Earth's surface and are often used for timely and accurate maps.

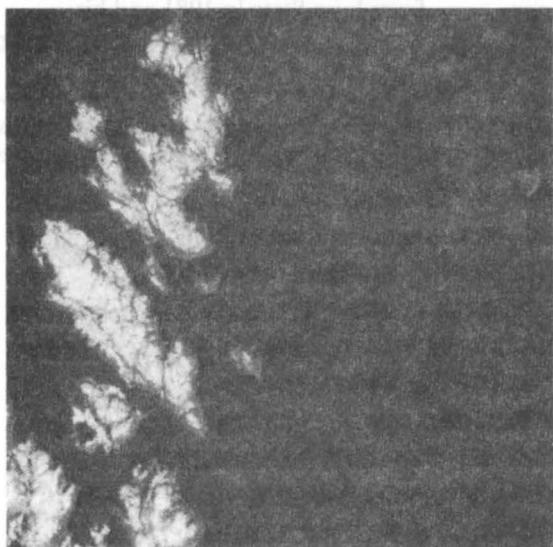
Analysis of the degradations to these models is helping him to determine the effects of lossy compression accurately. The ultimate goal is to develop an efficient way to assess the quality of an image for use in digital elevation models as well as other common remote sensing applications.

"It's a very difficult problem," Helder admits. "But I think we're making progress."

Helder and his wife, Susan, have five children and live in DeSmet. He has worked at SDSU since 1985. He earned bachelors degrees in animal science and electrical engineering, his master's in electrical engineering at SDSU, and his doctorate at North Dakota State University.



Dennis Helder and a student view a map of Russia borrowed from the EROS archives. Helder has worked with EROS Data Center since 1988 and recently with NASA. His research with radiometric calibration is a quantitative look at imagery.



This imagery of islands in the Prince William Sound area of Alaska indicates a radiometric calibration error called banding that produces horizontal striping observable in the water regions. The second image shows the results of applying a "debanding" algorithm developed at SDSU that effectively removes this error.

Helder's work with NASA is still with imagery, but in a much different way. Initially, sensors in satellites, implemented in the 1970s, recorded very large, coarse resolution pixels that required only low data transmission rates. The sensors being developed today have much higher resolution and demand higher data transmission capability.

Schaefer's

pumping into the aquifer when it mixes with the ground water. Laboratory and field

glacial till hydrology. Glacial till consists of clay, silt and sand and water moves through it slowly. However, desiccation cracks, root holes, etc. provide a pathway for water to move

work important for the environment

"Instead of putting water into a reservoir behind a dam, we are putting it back with the ground water."



tests have been conducted to ensure that no adverse effects to the ground water occur as a result of the recharge. The Environmental Protection Agency has closely scrutinized the project to prevent contamination of the ground water.

Another area of Schaefer's research is with clay liners in

agricultural systems and solid waste landfills. Here they look at how the environment plays a

role in clay liner systems, used to keep liquid from garbage from seeping into the ground water. The clay liners, usually two to three feet thick, are at the bottom of landfills or waste storage ponds. Two areas of importance are the effects on the liner of wetting/drying cycles and freezing/thawing cycles. These cycles affect the flow of liquid through liners because the clay soils tend to crack during both cycles.

Schaefer has been working with the USGS and the City of Sioux Falls to better understand the flow regime of the Big Sioux Aquifer, the primary water source for Sioux Falls. Schaefer and his graduate students use a computer program to model the ground water. Field data is collected to determine how thick the sands are and how the water table fluctuates with time. Historical measurements are used to calibrate the model, which is then used to predict the effects of various stresses on the flow in the Big Sioux Aquifer.

A final area of research involves

through the till more quickly. At the Sioux Falls Runge landfill, Schaefer and colleagues are collecting soil samples, mapping crack patterns and measuring how fast water moves through the till. This work should help to understand how water actually moves in glacial till, with significant benefits to understanding how to prevent ground water contamination.

In addition to working on these areas of research, Schaefer is excited about the recent approval of a doctoral program in atmospheric, environmental and water resources in a joint venture with the South Dakota School of Mines and Technology.

"This new Ph.D. program will allow us to expand our research base," Schaefer said, "and provide the academic counterpart to our research efforts."

Schaefer, a native of Miller, has spent the last six years at SDSU. He earned his bachelor's degree in civil engineering from SDSU in 1978, his master's in geotechnical engineering from Iowa State in 1981 and his doctorate in geotechnical engineering from Virginia Tech in 1986.

He taught at the University of New Mexico for a year and a half before his wife, Ruth, was offered a job as a nurse practitioner for the SDSU Student Health Service and they moved back home. Schaefer has three sons: Scott, 13, Michael, 8, and Daniel, 2.

Schaefer is excited about the recent approval of a doctoral program in atmospheric, environmental and water resources in a joint venture with the South Dakota School of Mines and Technology.

Vernon Schaefer's knowledge runs deep when it comes to ground water in South Dakota. And well it should, after four long years of testing, calibrating and sampling.

Schaefer is an associate professor of civil and environmental engineering at SDSU and acting director of the Northern Great Plains Water Resources Research Center.

His main area of ground water research deals with artificial recharge. Schaefer and his colleagues take surface water from the James River in Huron and treat the water in the city's water treatment plant, pipe the water to the Huron well field west of town and inject the water into a glacial aquifer, where it is stored underground.

"Instead of putting water into a reservoir behind a dam," Schaefer said, "we are putting it back with the ground water."

Schaefer also tries to predict what will happen to the water they're

Hurricane drives Van Lent from Florida to SDSU

When Dr. Thomas Van Lent, a new civil engineering professor at South Dakota State University, was working in Everglades National Park doing research on the wetlands, he didn't realize just how wet he would get.

Van Lent, his wife and son had been living in Homestead, Fla., for three months when Hurricane Andrew hit Aug. 24. They rode out the storm beneath an oak table in their house as the roof and rain came down upon them. By the time the storm was over, Van Lent said, the house was destroyed.

"The aftermath was almost surreal," he said. "It was like being in a war zone. The place looked like it had been bombed, wiped out."

After the hurricane, Van Lent sent his son and wife, two months pregnant at the time, back to her hometown of Miller to stay with her parents. For the next two months, Van Lent camped out in front of the shell of his house to help the ripped-up community in any way he could. "It was like an extended camping trip, but it wasn't as much fun," he said.

When Van Lent joined his wife in South Dakota, they considered remaining, but no jobs were open. So that December they moved back to Florida.

But with time the Van Lents were given the opportunity to return to South Dakota. Van Lent began his position at SDSU Jan. 1 teaching courses in water resources engineering. He has also continued research in wetlands/hydrology and water resource pollution.

Van Lent continues wetlands hydrology research

Dr. Thomas Van Lent's experience with Hurricane Andrew is a perfect example of why he studies wetlands hydrology. Wetlands are highly susceptible to heavy rains and flooding, which can cause a significant amount of human suffering.

As a result, in the 40s, 50s and 60s engineers started building dams, canals and levies to control flooding. Van Lent said these constructions worked very well, but had tragic consequences for plants and animals in some parts of the country.

"When you change the hydrology of an area by digging up a canal or dam, you're cutting off the water supply to an ecosystem of plants and animals," he said.

The Everglades in Florida experienced an ecosystem collapse as a result of this, Van Lent said. For example, the bird population there is only about five to 10 percent what it was 50 years ago. The alligator population is two percent what it was a century ago.

The interest today, Van Lent said, is to see how the ecosystems can be restored. Researchers need to define how a specific ecosystem worked, he said, and figure out how to get back the assemblage of plants and animals that were so profoundly abundant.

Van Lent intends to continue research in the Everglades and begin research on the prairie lakes of eastern South Dakota, which face similar problems.

Van Lent also plans to explore ways to predict sources of underground water pollution. Engineers, he said, are faced with the problem of figuring out where pollutants will go in an area based on the type of soil and aquifers deeply embedded in the ground.

"South Dakota is heavily dependent on ground water supplies for drinking water," Van Lent said. "There is a great deal of interest when water is polluted in how to go about cleaning it up and finding the source of pollution."

Born and raised in Beresford, Van Lent earned his bachelor of science degree in civil engineering and his bachelor of arts in French from SDSU in 1980 and his master's in civil engineering from the University of Minnesota in 1983. He worked for the State of Florida as a water resources engineer working on computer modeling of the Everglades. In 1992 he earned his doctorate in civil engineering from Stanford University, then worked for the University of Virginia as a research associate in hydrology.



Tom Van Lent continues his research on wetlands hydrology at South Dakota State University, where he has been teaching courses in water resources engineering since Jan. 1.

Skorseth

roads and combat high shoulders on road edges.

Shaping the surface of the roads is a very serious matter. Too little crown

produced. There is a need to get the right combination of the three substances.

“There is very little information on gravel roads and 75 percent of all local roads are gravel

has unlikely enemy. . . S.D. roads

South Dakota T3S's Field Services Manager Ken Skorseth has seen thousands of miles of rural South Dakota roads, many of which aren't very good, in his mission to keep a consistent mix in the gravel and adjusting the crown in the gravel surfaced roads.

It may sound easy, but each road is different and conditions vary from area to area. Skorseth works for the Transportation Technology Transfer Service (T3S) at SDSU and he knows all too well what can go wrong with roads if proper care and thought aren't taken.

Skorseth provides advice on blade maintenance with the use of a motor grater to shape the surfaces of gravel

doesn't allow for proper drainage, while too much crown can cause unsafe driving surfaces, especially in the winter. Through his four years of research on the subject, Skorseth has found that a 2.5 percent slope is adequate for drainage and driving.

Crowns are not the only problem, though. Skorseth also hates high shoulders.

He often recommends use of a shouldering disk, which mulches the dirt and vegetation prior to bringing it across the road. He also recommends a windrow pulverizer, which allows people to go out in the spring and pull in the shoulder material, including vegetation in the road, so people can drive on it.

Maintaining adequate crown and combatting high shoulders are a problem that began when gravel roads were first made. Another problem is determining what kind of gravel (a generic term that could include any number of rock, sand and fines combinations) works best.

A common gravel problem is too little fines, or clay, which bind the combination of stone and sand, which makes for very dangerous driving. Rocks can fly and the loose material lying on the surface makes driving risky. These roads are also hard to maintain and their shapes may change with the weather.

“The motor grader operator gets blamed for too many road conditions when the blame should go to the surface material,” Skorseth said.

The loss of fines due to rain, wind or driving is a big problem, but Skorseth said the single biggest problem is paying attention to the quality of the surface material when it's

surface,” Skorseth said. “Virtually all township roads and most small towns have a number of gravel roads.”

Not only is there little information on the subject, but there are even fewer people working on it. Skorseth and his four co-workers, of which only one is full-time besides himself, are rarities in the United States. They have given gravel maintenance seminars in five states in front of more than 3,000 people. They've also presented their findings in Puerto Rico at an international meeting on rural roads.

Skorseth and company also help local departments calculate the quantity of gravel needed to achieve certain depths on the roads. They advise on the percentage of fines to use when regravelling a road. Often the rock and sand are still present, but a higher percentage of fines is required.

For what he does, Skorseth garners gratitude and the highest respect of his peers.

“Ken is extremely knowledgeable and has done it all.” Aurora County Highway Department Superintendent Don Kuyper said. “We really look up to him.”

Heine Junge, Codington County Highway Superintendent, also respects Skorseth. “He's an incredibly good teacher who can explain things in layman terms,” Junge said. “He looks at a problem and then all the alternatives and always finds the most cost efficient solution.”

With this kind of experience, it's no wonder Mick Kreutzfeldt, McCook County Highway Superintendent, praises Skorseth's work. “If Ken doesn't know the answer, he'll tell you and then go out and research until he does know.”

Skorseth has worked at SDSU for four years. He and his wife, Dianne, live in Astoria. They have three children: Paul, 19, who attends Lake Area Technical Institute in Watertown; Kendra, 17, and Glenda, 15, both Deuel High School students.

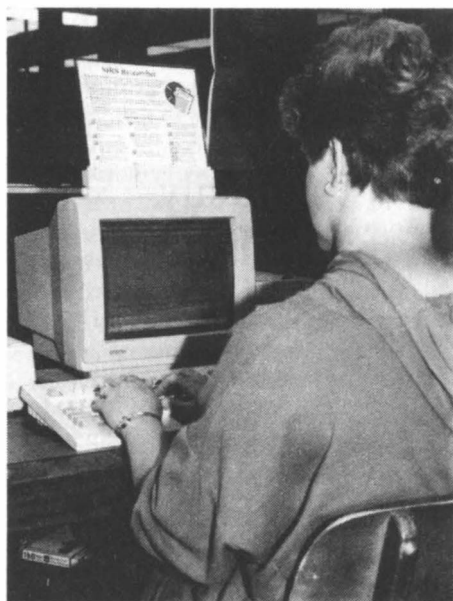


Gravel roads are nothing new to Ken Skorseth. He's seen miles and miles of them in his mission as T3S Field Services Manager at South Dakota State University.

Teachers communicate with SDSU through computer network



SDSU professors Bill Jensen, Warren Hein, Gary Peterson and Oren Quist (above) manage a computer network that links science teachers statewide to University faculty who can answer their questions. At left, Jane Syltie, Brookings High School science and math teacher, logs on to the system.



“Many high school teachers work in isolated areas where they are the only science teacher. The network provides a way for them to ask questions and get information.”

Did you ever wonder how raindrops are formed? If you're a South Dakota teacher, you can have your question answered by knowledgeable SDSU faculty or staff members on a statewide computer network.

A telecommunications network was established in October 1987 with the help of Mitchell High School, 3M and Eisenhower Funds. Twenty schools participated in the network with a total of 63 identified users connected to SDSU with computers and modems. The phone bill averaged more than \$200 per month.

Now there are more than 1,000 users, including teachers from kindergarten through high school, administrators, South Dakota Department of Education personnel and others. Users log-on by calling an 800 number and entering their password. On a busy day, more than 200 calls are made, yielding a phone bill of between \$4,000 and \$6,000 a month.

“There was a need for a mechanism to link schools to universities,” said Warren Hein, head of the SDSU Physics Department. “Many high school teachers work in isolated areas where they are the only science teacher. The network provides a way for them to ask questions and get information.”

Jane Syltie taught algebra at Brookings High School last school year and will teach physical science and geometry this year. She previously taught physics at Lennox High School.

“I sent a lot of messages on E-mail when kids would ask questions,” Syltie said. “I’d ask around and see if I could get an answer. It helped a lot, especially since I was a new teacher in physics.”

Besides answering or asking questions, users have access to bulletin boards called forums, which provide information to people in different scientific fields. The network can also be used to help teachers get college credit. Some college classes require students to become familiar with the network.

The network is primarily for science teachers, so SDSU science faculty are involved, especially Oren Quist in physics, Bill Jensen in chemistry and Gary Peterson in biology.

“It’s been a very valuable tool as a communication aid that can’t be replaced by a telephone or some other means of communication,” Jensen said. “It still has potential that hasn’t been tapped.”

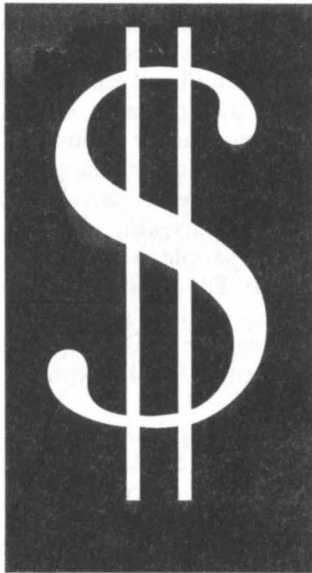
“When the National Science Foundation came to evaluate South Dakota’s first-year performance for the Systemic Science Initiative Grant, they said they felt the network was a strength of our program,” Peterson said. “It’s good when national people feel this is an important program.”

The network is currently funded by a National Science Foundation SSI grant.

For more information, contact Gary Peterson at (605) 688-6141, Bill Jensen at 688-5151 or Oren Quist at 688-5428.

SDSU

helps four reservations plan for economic development



South Dakota State University's Engineering and Environmental Research Center is involved in a 15-month project to promote economic development for three reservations in South Dakota and one in Wyoming.

The project, Planning for Economic Development at the Tribal Level, introduces the Sisseton-Wahpeton Dakota Nation, Cheyenne River Sioux, Yankton Sioux and the Wind River reservations to a software tool known as a Geographic Information System (GIS).

GIS can be thought of as a computer system containing numerous digital map layers connected to databases that describe the area contained within the map in many ways. These map layers and databases can include any type of information that has a location to it. By utilizing the spatial information and developing additional data, the reservations can use GIS analysis to evaluate ideas and plans for enhancing their economic development.

The goal is to help develop a pilot GIS application of specified data for each reservation, said Kevin Dalsted, SDSU associate research soil scientist. "We are primarily formulating data on natural resources," he said, "such as soils, streams and lakes and their relationship to land cover, roads, utility lines and land status."

To illustrate his point, Dalsted said the Sisseton-Wahpeton tribe is considering the development of projects in the Pickerel Lake watershed, but wants to maintain their high-quality water supply. By using GIS, they can define which developments and activities won't degrade the water quality.

"We hope the GIS system can help their economic development," Dalsted said. "Unemployment tends to be a chronic condition in some of these areas and GIS could make a direct and indirect difference in economic development."

Throughout the remaining period of the contract, which began in September 1993, SDSU plans to continue meeting with reservation officials to retrieve and research more

information needed for their GIS databases and development plans. "Once the project is completed," Dalsted said, "it will be up to the tribes to take it from there. But if they need our help, we'll always be here for advice."

This project is funded by the Economic Development Administration (U.S. Department of Commerce) with in-kind match by both the collaborating tribes and the EERC.

"We are primarily formulating data on natural resources," Dalsted said, "such as soils, streams and lakes and their relationship to land cover, roads, utility lines and land status."

Solar energy moves into space technology

When people think of solar energy, they think of heating homes. But the technology has advanced so much, it's out of this world.

Dr. Lawrence Kazmerski of the National Renewable Energy Laboratory in Colorado was a distinguished lecturer at SDSU in March. He said photovoltaics (PV) is a renewable energy source that uses light to create electrical current. Many solar panels used now harness heat from the sun to warm the home or heat water, but they don't produce electricity.

"When satellites were first put in space, scientists powered them with batteries. PV researchers convinced them to also put in a back-up PV system," Kazmerski said. "For two and a half weeks, the satellite was powered with batteries. For three and a half years after that, it was powered by PV."

PV solar cells respond to a different spectrum of light so they can work on cloudy days, he said. For example, the Midwest has enough sun to make the cells work.

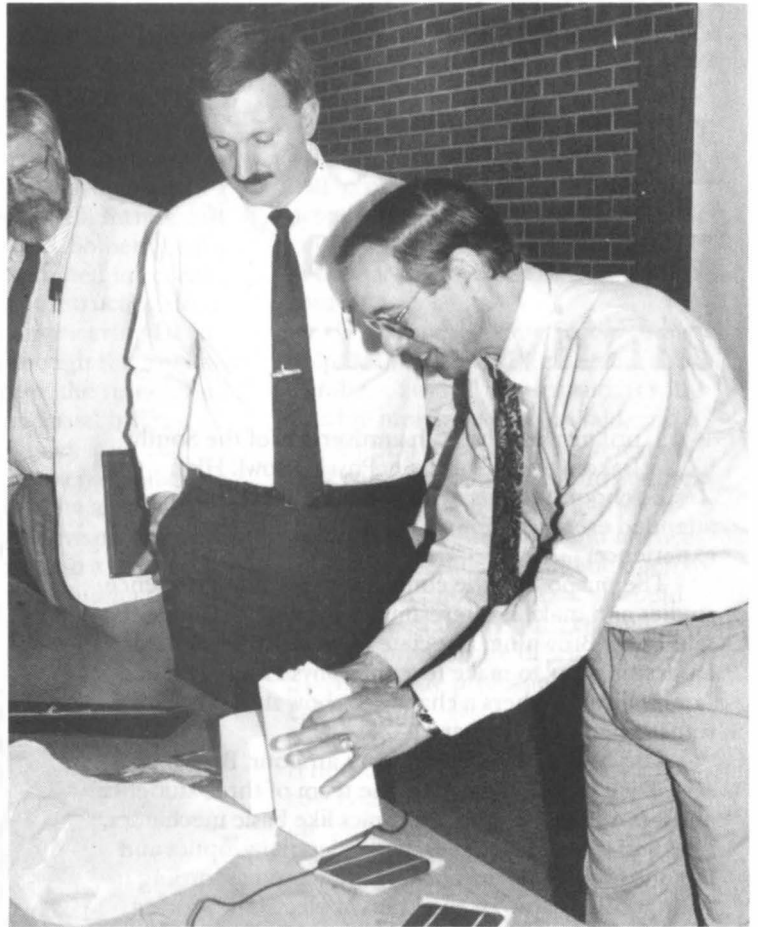
Right now, some examples of devices that can be powered by the technology include portable calculators, watches and traffic lights. In the future, PV may be available for homes.

"Environmental concerns about energy are helping push for more PV,"

Kazmerski said. "The main applications worldwide for this technology will be small installations, often for pumping drinking water."

Projections show that if the cost of the system could be lowered, the cost per kilowatt hour of electricity could be close to what it is now.

Besides speaking to the public, Kazmerski visited classes at SDSU and Brookings High School.



As distinguished lecturer at SDSU in March, Dr. Lawrence Kazmerski of the National Renewable Energy Laboratory in Colorado talked about and demonstrated photovoltaics with faculty and students.

Photovoltaics (PV) is a renewable energy source that uses light to create electrical current.

Physics Bowl marks 20th anniversary

April marked the 20th anniversary of the South Dakota State University Physics Bowl. High school students across South Dakota have attended every year for a fun, exciting and challenging experience.

The purpose of the contest is to encourage science studies and make it interesting to high school students, said Larry Browning, associate physics professor. "It is an exciting way to make teaching physics fun," he said, "and it gives teachers a chance to show students it's something not to be feared."

The contest itself takes about an hour, Browning said. Each high school, with one team of three students, answers questions based on topics like basic mechanics, heat and thermodynamics, basic electricity, optics and famous physicists. The answers are scored according to their accuracy and/or speed by an electronic scoring system, which has been used since 1987. The team with the highest score wins the competition.

The top five teams receive monetary awards and a commemorative plaque funded through the Foundation and the College of Engineering Phonathon. Each member of the first-place team receives \$40, second-place winners \$30, third-place winners \$20, fourth-place winners \$15 and fifth-place winners \$10. All teams also receive a plaque and the team sponsor receives a physics memento in appreciation of his/her efforts.

The Physics Bowl has greatly helped student enrollment in the College of Engineering, said Warren Hein, head and professor of the Physics Department. "We're in a day and age where we need to maximize the publicity of science," he said.

High school students are not the only ones to benefit, Hein said. The Physics Bowl encourages faculty to develop new demonstrations for their own classes and brings the department together to plan an event of this magnitude, he said.

SDSU Science Fair attracts young, budding scientists

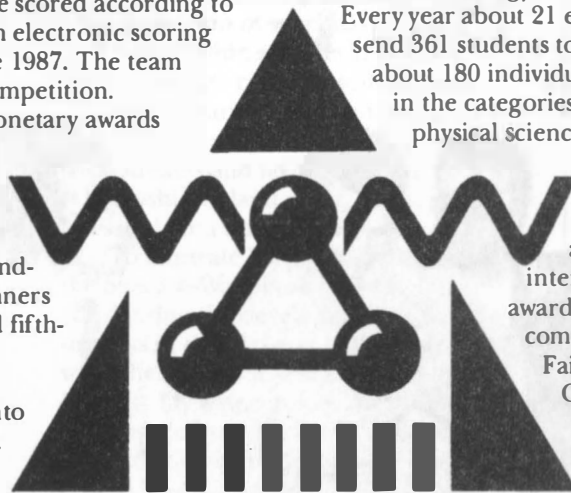
For the last 40 years South Dakota State University's annual Science Fair has brought together elementary and high school students from across the state to foster creativity in scientific endeavors and individual achievements in critical thinking.

"It is a good way for our faculty to mentor young budding scientists," said fair coordinator Gary Peterson, biology/microbiology professor. Every year about 21 eastern South Dakota Schools send 361 students to compete at the fair. Out of about 180 individual projects and 95 team projects in the categories of biological, chemical and physical sciences, two grand winners receive all-expense-paid trips to the international competition.

Although only two projects are selected to go to internationals, Peterson said, other awards are given. "When students come to participate in the Science Fair, they are all winners," he said. Other awards include some type of recognition, medallions, certificates, trophies, calculators, cash, cameras or film.

The Science Fair is designed to teach scientific methods, Peterson said, as well as a systematic means of problem solving. By giving students a means to solving problems, he said, they experience critical thinking and are rewarded with creativity — a valuable experience. Even students who don't go on to be scientists learn skills they can use in any area of life.

The event is made possible with support from by SDSU, SDSU President Robert Wagner, the SDSU Foundation and various businesses around the state.



Plans begin to form for Solberg Hall renovation

In 1901 the South Dakota Legislature appropriated \$40,000 for SDSU to construct a new engineering building. Little did SDSU professor Halvor Solberg know that when he constructed the building, he would be creating his own legacy.

Today the legacy still thrives, but not without problems. Solberg Hall's structure has deteriorated in recent years and needs reconstruction, said SDSU College of Engineering Dean Duane Sander. Although the top floor is not usable, he said, the rest of the building and the external brick structure are still intact. "We would like to preserve Solberg Hall," Sander said. "The architecture is unique and an attractive part of our campus." There are also a large number of alumni, including the

Sander has also considered using Solberg Hall as a resource center for K-12 teachers, a video library and a place high school students could tour when visiting SDSU. There has also been talk, he said, of remodeling the hall to provide facilities for special programs. Classrooms on the first floor could be remodeled or made into state-of-the-art dual purpose classrooms and conference rooms.

"I think renovating Solberg will help the College of Engineering in a number of ways," Sander said. It will provide meeting areas, he said, and a way for SDSU to gain the interest of K-12 students. Solberg would also help K-12 teachers and counselors learn more about engineering and science professions. Since it would be open to the general public, he said, it would help the people of South Dakota become more aware of science at SDSU and the profession of engineering.

Before any reconstruction or renovation can occur, Sander said, a cost analysis must be performed based on building use, safety and access. Once that is done, he said, the College of Engineering would have to decide whether keeping the building is economically feasible.

"If restoring Solberg Hall is economically efficient, we would rather do that than build a new one because it's a historical part of our campus," Sander said. If all goes well, he said, they would like to have the renovation completed in five to six years.

The Solberg project is one of several building projects the College of Engineering is exploring to provide future space. Sander said the College welcomes ideas from alumni on how to renovate and effectively utilize Solberg Hall.



... but Dean Duane Sander has more than restoration in mind. Although no definite plans have been made, he would like to renovate Solberg into a Discovery-type Center.

Solberg family, he said, who have close attachments to the building and would like to see it restored.

But Sander has more than restoration plans in mind for Solberg Hall. Although no definite plans have been made, he would like to renovate Solberg into a Discovery-type Center. This center would be used for a variety of purposes. Removing the third floor, Sander said, would create the structural space to display science and engineering projects, like the Wild Hare airplane designed by SDSU engineering students. There would even be the possibility of rotating displays with the Discovery Center in Pierre.

Teachers

create tipis, quilts to help students learn science

It may be hard to believe, but studying quilts and tipis can help students learn more about science. Some teachers in eastern South Dakota are creating kits about tipis, quilts and radon gas to be used by other teachers through the Resource Center for Systemic Enhancement of Science and Mathematics Education at SDSU.

The center, coordinated by SDSU associate professor of physics Larry Browning, is beginning its second year and is funded by the National Science Foundation Statewide Systemic Initiative.

"The purpose of the center is to support teachers in various ways, like technological innovation and new teaching methods," Browning said. "We provide background information and support so teachers can be in touch with what's happening at the national level."

The teachers and Browning communicate through the science teachers' computer network. (See related story on page 9.)

They also communicate during in-service training conducted by Browning or SDSU biology professors Gerald Myers and Gary Peterson.

To compile the student project kits, teams of teachers worked together. For example, the quilt kit includes information about the math and geometry of quilting, reasoning skills, models and pattern relationships. Ruth Anderson, a first grade teacher at Brookings Medary

Elementary, was involved in the quilt project.

"We wrote the units so the teachers can inject their interests and knowledge into it," Anderson said. "They can also tap into community resources and come up with new aspects we never even thought of."

Michelle VanderWal, Brookings High School physical science and algebra teacher, worked on the tipi kit, which includes a tipi large enough to hold an entire class.

"In order to understand the background of the tipi, students will have to do a research project," VanderWal said. "They'll learn about

"They'll learn about the outer cover, inner lining, insulation, what type of pole is best and other aspects. A video is being put together that explains how to set up the tipi, its history, how to furnish it and proper tipi protocol."

the outer cover, inner lining, insulation, what type of pole is best and other aspects. A video is being put together that explains how to set up the tipi, its history, how to furnish it and proper tipi protocol."

Mary Fredrick, Brookings High School chemistry teacher, is helping compile the radon kit. When radon alpha particles are detected, special pieces of plastic in the kit form tracks that can be seen under



Mary Fredrick, a Brookings High School chemistry teacher, looks for signs of radon during the Resource Center for Systemic Enhancement of Science and Mathematics at SDSU.

a microscope.

"Radon is something students have heard of, but they don't understand it," Fredrick said. "With the kits, kids can ask science questions and see how they apply in real life."

"It is important that the kit be easily accessible to teachers so they can use it and work with it," VanderWal said. "If you have everything you need to teach, more people will use it."

Ten schools are currently involved with the center. To reach more schools, additional funding sources need to be found.

Browning said SDSU will develop an agreement with the Southeast Minnesota Educational Cooperative Service Unit this summer to provide South Dakota teachers access to the hands-on materials and training the cooperative provides.

For more information about the center, contact Browning at the SDSU Physics Department, (605) 688-5428.

Bergum receives math honor

"I was shocked and really pleased to get the award," Bergum said. "It really shook me up. It was the first time in my life that I wasn't able to say much."

Gerald Bergum, professor and head of the Computer Science Department at SDSU, became the first winner of the Meritorious Service Award given by the North Central Section of the Mathematical Association of America (NCS/MAA).

The honor was a total surprise to Bergum. NCS members disguised the program so that not even Bergum's wife knew he would win the award at the annual spring meeting at Winona State University.

"I was shocked and really pleased to get the award," Bergum said. "It really shook me up. It was the first time in my life that I wasn't able to say much."

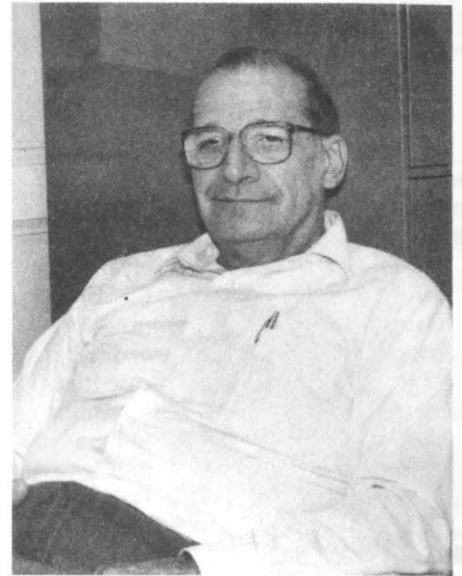
Bergum, who started his career teaching mathematics and later computer science, has been involved with the NCS/MAA since 1970. During that time he has played a prominent role in the section and in the wider mathematical community throughout his career. He has presented numerous talks at NCS meetings, authored two dozen papers on mathematics and held positions of chairman elect, president

and past president of the section.

One of his biggest contributions to the NCS has been incorporating a highly successful summer seminar program. The five-day program looks at new topics in mathematics at a college level and new applications in mathematics. The seminars bring in prominent speakers on the areas of focus. One recent program tried to tackle the use of large primes, which are needed in code writing to prevent people from easily breaking into a system. The larger the prime, they've found, the harder it is to break the code.

Bergum began his math career after earning his bachelor's in math education at the University of Minnesota in 1958. He taught math at the high school level in Wisconsin for three years before earning his master's at Notre Dame in 1962. Then Bergum taught at Gonzaga University in Spokane, Wash., before earning his doctorate in mathematics at Washington State University in 1969.

Bergum joined the SDSU staff in 1970. He was a professor in the math



department until 1984. Wanting to pursue computer science to improve the program, he took a sabbatical and pursued a master's degree at the University of Minnesota. He has been in computer science ever since and thinks the move has really paid off.

"I think we have one of the strongest computer science departments in the area," Bergum said. "We have three faculty with Ph.D.s in computer science. That is uncommon for a school this size."

Bergum and his wife, Shirley, have lived in Brookings since 1970. They have 10 children.

Design Class ME 461 finds solutions to industrial problems

It's a class that requires time, understanding, patience, enthusiasm, leadership and knowledge.

Although most classes require some of these qualities, the Mechanical Engineering (ME) 461 Analysis and Design of Industrial Systems requires them all.

This class is a second-semester continuation of the ME 362 Industrial Engineering course. It provides students awareness on the engineering production/operation systems and management of industry, including recent trends concerning global competition, increasing emphasis on quality, integrating technology into production systems and decision making.

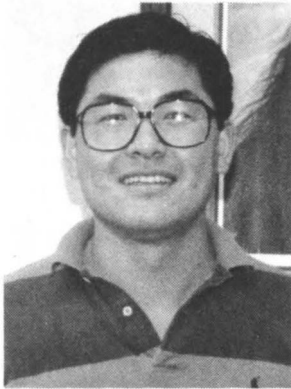
The focus of this class is to analyze problems that industries are faced with and design alternative solutions at an efficient cost, said Don Froehlich, professor and head of the Mechanical Engineering Department. Design decisions relate to capacity planning, product design, process design,

layout of facilities and selection of locations for facilities.

In order to give students hands-on engineering experience, the class divides into teams. Each team goes to a specific industrial site to analyze, plan and coordinate the use of an organization's resources, then makes operation and design decisions.

One of the design projects this spring was creating a layout area for the planned expansion in one of the Daktronics Inc. buildings. Another involved solving a problem the IAMS pet food company has with water remaining on the cans after they leave the retort ovens and before they enter the labeling machines. The lack of complete drying causes water spots, which the company feels adversely affect the image of their product.

Shin gets on the CASE



Sung Y. Shin is definitely on the CASE, and no ordinary case it is.

Dr. Shin, a South Dakota State University

computer science assistant professor, will be developing some Computer Aided Software Engineering (CASE) tools for the next three years in collaboration with D.R. Avresky at Texas A&M and Rex E. Gantenbein at the University of Wyoming.

The intent of the project, "Formal Testing of Fault Tolerance of Space Station Communication System," is to design a CASE tool that will automatically test a broad range of software, Dr. Shin said. Designing test scripts from data completed from Space Shuttle Flights, he said, will allow them to realistically simulate actual communications system failures. These test scripts, he said, will be used to inject faults into a specifically designed software test bed that will measure the response time and coverage of fault-tolerance algorithms.

Eventually, Dr. Shin said, they hope to receive some funding from NASA and extend the test bed for use with the actual software that will be installed on a space station.

Dr. Shin presented a paper at an IEEE conference last March on formal methods for testing software products, with special emphasis on space station communication systems.

Dr. Shin is also participating in an NSF-EPSCoR grant proposal for the College of Engineering.

Students to get first hand experience with special CASE tool

Computer science students will get first hand experience this fall with a \$4,000 Computer Aided Software Engineering (CASE) tool called an Info. Module.

Sung Y. Shin, assistant professor in computer science, said the Info. Module was funded through an academic grant and delivered by Asymetric, a company in Seattle, Wash.

"This CASE tool will provide students an opportunity to work with equipment used in the work force," he said.

Once students learn what a real CASE tool is, Dr. Shin said, they can develop marketable software and possibly resell their ideas back to Asymetric. Students working with this kind of specialized equipment, he said, will obtain experience they may need when looking for a job.

The Info. Module will be used in an undergraduate software engineering class and a graduate software engineering management course.

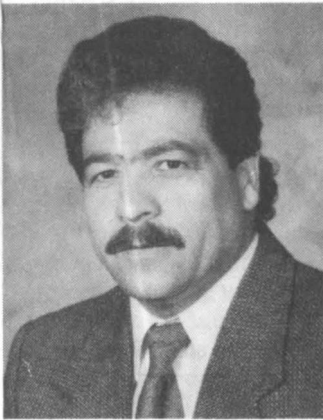


Faculty do more than teach

SDSU College of Engineering faculty members do much more than teach.

They are advisers, event coordinators and consultants for student organizations. They are also instrumental in bringing a variety of resources to the University. Here, Madeleine Andrawis, assistant professor of electrical engineering, is pictured with alumnus Byron Anderson, general manager of Hewlett-Packard's Communications Test Solutions Group, who spoke to SDSU engineering students during the College's second annual convocation. For the story on Anderson's talk, please turn to page 32.

Salehnia finds EROS challenging and rewarding



"It gives me the opportunity to work with other scientists and former students. The EROS Data Center is fantastic and overwhelming."

SDSU computer science associate professor Alireza Salehnia is getting spoiled this summer while working at the EROS Data Center. He's tackling the challenges he's always wanted and is not afraid to ask for more.

Salehnia won the Summer Faculty Fellowship, a NASA and state funded project with the South Dakota Space Grant Consortium and a joint program with SDSU and the South Dakota School of Mines and Technology. During his 10-week stay at EROS, he is mainly working on expert system prototypes, large data bases and image processing.

"It feels great to be chosen," Salehnia said. "It gives me the opportunity to work with other scientists and former students. The EROS Data Center is fantastic and overwhelming... there are a lot of things to learn."

Salehnia and another professor from the School of Mines were chosen for the program, now in its fourth year, after their applications and proposals were approved by an executive committee.

The goal of the program is to build the research infrastructure in space grant universities. What the program does for its members is make

them knowledgeable and give them background in other research areas.

University Affairs Coordinator and Principal Scientist at EROS Fred Waltz is pleased with the program and points out that other EROS programs, like student interns and visiting scientists, are strengthening their overall goal.

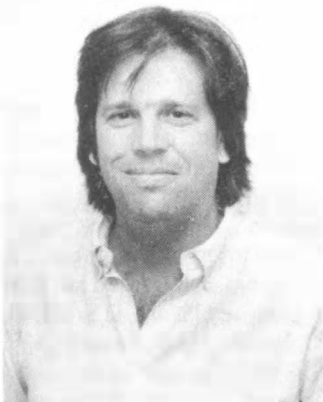
"We are building cells of expertise at the professor, graduate and undergraduate levels at the space grant universities," Waltz said.

Waltz is also happy with the work and experience that Salehnia has brought to EROS. "Because of his background," Waltz said, "he can work with the software and teach people how to run international accounting and use expert systems that have a knowledge base. This lets anyone off the street run a highly technical computer just by answering questions."

Salehnia came to the United States from Iran in 1976 after earning his bachelor's degree in cost accounting. He then earned his master's in business administration at Central State University in Oklahoma and his doctorate in computer science and technology at the University of Missouri.

Salehnia and his wife, Zari, have two daughters: Sonya, 9, and Shieva, 5.

Tracy honored with engineering award



Assistant professor of civil engineering John Tracy was named Outstanding Young Civil Engineer of 1993 by the American Society of Engineering East Branch South Dakota Section. He received the honor at a banquet in Sioux Falls.

"It's nice to get the award and even more special when my peer group is there to see it," Tracy said.

Tracy met the award criteria of age (35 years or less) and membership in the American Society of Civil Engineers, but he won due to his involvement in the civil engineering community. He has worked on many projects, published several papers and given numerous presentations and

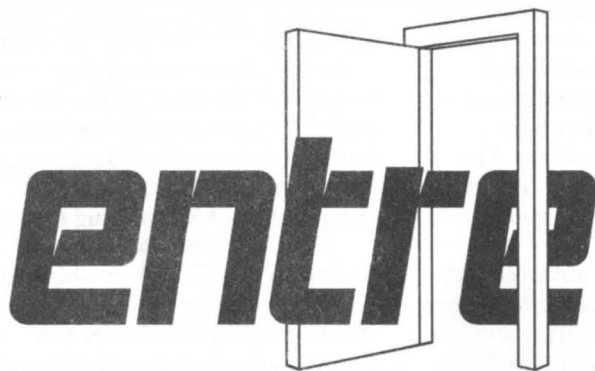
seminars at professional conferences.

Currently working on the design of rain gauges, Tracy looks at which locations will net the best information on the amount of rainfall.

Tracy, a Kansas City, Mo., native, became an SDSU faculty member in 1992. He earned his bachelor's degree in civil engineering at Colorado State University in 1980, his master's in 1986 and his doctorate in civil engineering in 1989 at the University of California at Davis. He taught at Kansas State University for three years as an assistant professor.

Tracy's wife, Denise, is a dance major at Northern Illinois University.

Training program assists South Dakota entrepreneurs



With a \$145,000 grant from the US WEST Foundation, SDSU's Engineering and Environmental Research Center has brought a recognized entrepreneurship program to South Dakota.

The Essential Networking TRaining for Entrepreneurship (ENTRE) program uses the format and materials of the Premier Fast Trac program, a tested, comprehensive and educationally-based business development program for people interested in starting a business and small business owners or managers wanting to sharpen their skills.

Two training courses and follow-up networking with participants comprise South Dakota's ENTRE program. Fast Trac I is a 30-hour course aimed at helping potential entrepreneurs determine the feasibility of their business ventures. Fast Trac II is a 46-hour intensive training course designed to help entrepreneurs write a business plan and launch a successful enterprise.

A unique aspect of the program is the organization of state and local

coalitions to guide and promote it, to help recruit sponsors and to assist in marketing and fund raising activities.

"This program, the result of eight years of study and revision, is designed by entrepreneurs for entrepreneurs," said Kevin Dalsted, ENTRE director.

"The ENTRE program got off to a flying start with the first course we offered in May," Dalsted said. "We had 24 people take the business feasibility course (Fast Trac I) at five sites around the state on the Rural Development Telecommunications Network. A vast majority of the people taking the course gave it high marks on the content, instruction and materials. Our audience

was primarily interested in evaluating a business concept and the course really delivered. These people now know what it will take to get a sound business going."

Kalyn Brix-Davis of rural Brookings, took

the course in May to investigate starting a business to help farmers implement computer management. "I needed more guidance," Brix-Davis said, "and I needed to talk to other people who were thinking about or had started their own businesses."

Brix-Davis hopes to help farmers categorize their expenses and income to better see where they're making or losing money. "I have a background in computers and have done this for our own farm for the last three years," she said. "A lot of farmers wait until January to do their taxes. If I offer this service, I can help this go more smoothly."

The ENTRE course provided interaction with teachers who had been involved in entrepreneurial businesses themselves. "It was advantageous to talk to someone who had been through the process," Brix-Davis said. "The class gave me a lot more resources to use while starting a business. I had a resource book that had the same steps as in the class, but this went into more depth than I had before. If people are

serious about starting their own businesses, I would recommend the program."

Todd Bura of Sioux Falls and a friend, Mark Heiden, are starting High Performance Engineering, a business that will provide product development consulting, tool and die design and manufacturing, and engineering services for the plastics industry.

"About 90 days ago, the company I'm working for said it was shutting down in Sioux Falls and moving to Arkansas," Bura said. "I've been talking with Mark about starting a business for about three or four years, so I saw this as a good time to start. People at the Sioux Falls Development Foundation suggested I attend the ENTRE program."

Bura said he and his partner gained valuable reference names and addresses from the ENTRE course. "It had a very comprehensive financial planning and feasibility study," he said. "It gave us more networking in the state with other businesses and individuals. We made contacts for future business. We would definitely recommend this program for others."

Fast Trac II, which will begin in September, will give small business owners an intensive course on planning. "A business plan will be their project and the course will be organized around the basic elements of a good plan," Dalsted said. "A number of guest lecturers will round out this activity."

Two major sponsors of the ENTRE program are the South Dakota Micro-Business Marketing Alliance in Huron and Forward Sioux Falls. The Alliance helped coordinate the program and develop the statewide coalition. Forward Sioux Falls is leading the Sioux Falls coalition.

The US WEST Foundation grant is part of a \$1.8 million commitment from the Foundation to implement Premier Fast Trac programs throughout its 14-state region.

For more information on the ENTRE program, call Dalsted at (605) 688-4184 or write him at UITS/SDSU, Box 2220, Harding Hall, Brookings, SD 57007-0199.

Koepsell

receives engineering honor



SDSU civil engineering professor Paul Koepsell was recognized as SDES (South Dakota Engineering Society) State Engineer of the Year at the SDES Annual Conference.

Koepsell said he believes he was chosen because of his involvement in professional activities.

Having held nearly every position in the North Eastern Branch of SDES, Koepsell was also vice president of the National Society of Professional Engineers, one of the first South Dakotans to be elected at that level, where selection is conducted on a national basis. He has also been involved with the American Society of Civil Engineers.

A native of Canova, Koepsell graduated from SDSU with a bachelor's degree in civil engineering in 1952. He earned his master's degree from the University of Washington in 1954 and his doctorate from Oklahoma State University in 1965.

Koepsell has been a professor of civil engineering at SDSU since 1965. His duties include research and instruction, primarily in the areas of structural analysis and design, mechanical analysis and design and theoretical mechanics.

To return to South Dakota, Koepsell left a good job abounding in promotional possibilities at Boeing in

Seattle. But he has no regrets. "I just wanted to teach because I enjoy it," he said. "It's a challenging activity."

The state engineer of the year honor pleased Koepsell. "I felt pretty humble," he said. "It's quite an honor."

Koepsell has no immediate plans to retire, but knows that decision will have to be made sometime. "I like what I'm doing," he said, "and when you like what you're doing and your health is good, why quit?"

Koepsell also served as Brookings city commissioner for 13 years. He and his wife, Delores, an RN, have three children: Steven, 41, an SDSU civil engineering graduate, works for the Navy; Royal, 37, a West Point graduate, works for a private earth resources satellite data systems company; and Pamela, 34, an SDSU and Sioux Valley School of Nursing graduate, works in the Neo-Natal Intensive Care Unit at Sioux Valley Hospital.

Faculty notes

•Assistant professor Lewis Brown is guest editor for the North and South America Region for a special issue of the international journal "Ferroelectrics." Planned for late 1994, the issue will mark the 25th anniversary of Dr. H. Kawai's reporting of high remanent polarization in oriented films of polyvinylidene fluoride. The issue will contain both invited and contributed reviews and research papers covering the full scope of progress in piezo/pyro/ferroelectric polymers, including their piezoelectric, pyroelectric and ferroelectric material properties and applications.

•Douglas Miron, professor of electrical engineering, was elected a senior member of the Institute of Electrical and Electronics Engineers Inc. Only about 8 percent of the institute's 320,000 members have been elected to the grade of senior member, which is the highest professional grade for which application may be made and requires experience reflecting professional maturity.

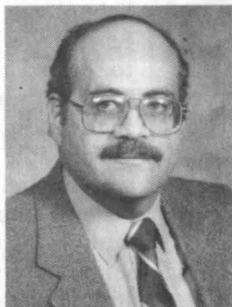
NASA work occupies engineering professors this summer



This summer electrical engineering assistant professors Madeleine and Alfred Andrawis are spending 10 weeks working with the National Aeronautics and Space Administration through the American Society of Engineering Education Summer Faculty Fellowship Program.

Alfred is at the Kennedy Space Center in Florida working with the multidegree-of-freedom serpentine robot manipulator to be installed in the cargo bay of the space shuttle. Madeleine is at NASA Langley Research Center in Virginia working on active and passive measurements of humidity in the upper atmosphere.

More than 300 faculty members from across the country apply for these positions; only 18 are chosen. Madeleine said she hopes the relationship with NASA continues in the future.



SDSU, School of Mines

launch hot air balloon experiment

Engineering students from South Dakota State University and the South Dakota School of Mines and Technology in Rapid City successfully launched a joint experiment using a hot air balloon. Two middle schools also took part.

The purpose of the project was to give students from SDSU and SDSM&T a practical experiment in engineering.

The project was started in spring 1993 with the goal of forming design teams, with each team taking over a part of the project and all teams working together in a project management mode.

Middle school students were involved in order to incorporate their minds into the world of science. Tom Mittan, graduate research assistant and project coordinator, was pleased with the results.

"A lot of excitement was brought into the middle schools," Mittan said. "The students got quite a bit out of it."

The project, designed to take temperature readings and video of land structures, was accompanied by a pair of 'hitchhike' experiments from Whittier Middle School in Sioux Falls and Rapid City Middle School.

Whittier Middle School sent up hardened wheat plants to see how they would react to radiation at higher altitudes. Rapid City Middle School, with the help of Los Alamos laboratories, launched a device

which would open up filters to collect air samples at altitudes greater than 20,000 feet.

The launch took place the morning of May 1 from the Strato-Bowl near Rapid City. The balloon and its contents were scheduled for a five-hour flight. The balloon measured 60,000 cubic feet and was to attain a height of 90,000 feet.

Both SDSU and SDSM&T played integral parts in the experiments. SDSU was responsible for flight structure, thermal analysis, command/control and telemetry systems, video transmitter/receiver and ballast systems.

SDSM&T took care of the video camera, software design, destruct systems, parachute/recovery systems and weather forecasting.

SDSU and SDSM&T stayed in constant touch to relay progress reports through the Rural Telecommunication Development Network. Mittan was responsible for the telecommunications portion of the project.

The balloon itself was attached to a parachute through a chain link-type device with an explosive mechanism that would go off after five hours. Attached to the parachute were the coordinated experiments that would safely return to ground to collect data.

Tracking of the balloon was coordinated by a Global Positioning Satellite, which sends information to the ground on latitudinal and longitudinal positioning as well as altitude. An FAA transponder was also used. There was a problem, though. About a half hour after launching, a power failure on the system made tracking impossible. The balloon and experiment were lost. Mittan said he thinks the project is somewhere in the Badlands and that he hopes fall hunters will find and return it.

Despite the power failure, Mittan considers the project a success.

"We fulfilled the goals that we wanted to," he said. "Overall, the project gave the students a chance to integrate with others, like in the real world."

The experiment could not have been launched without the help of the South Dakota Space Grant Consortium, Horizon Inc., Hughes STX and Raven, which supplied the balloon and provided launch consultations.



In a joint experiment, SDSU and SDSM&T engineering students launched a hot air balloon this spring from the Strato-Bowl.

Energy audits available to area manufacturers

SDSU engineering students have been busy conducting energy assessments, but they still have time to help South Dakota manufacturers or those in Minnesota and Iowa within a 150-mile radius of Brookings.

As explained in the last issue of the *Impulse*, SDSU has become one of the 30 schools selected by the U.S. Department of Energy to participate in its Energy Analysis and Diagnostic Center program. Through this program students conduct energy assessments and give energy and money saving suggestions to industrial clients. Last semester students audited five businesses in South Dakota, three in Minnesota and have heard from several in Iowa.

Students range from freshmen to graduate students and are either electrical engineering or mechanical engineering majors.

"I can't think of any other federal program for an engineering school that provides more opportunities for students to apply their knowledge and learn more than the standard classroom experience," said Kurt

Bassett, assistant professor of mechanical engineering and director of the energy program.

"They learn from the manufacturers about their products and the production aspects of their businesses," he said. "At the same time, they teach the manufacturers about energy conservation and the importance, in terms of dollars, of the energy they use."

"It's given me a lot of practical experience," graduate student Colin Gaalswyk said. "I have a good idea about the kind of work I'd like to get into."

Another student, Quentin Flippin, said he has also learned much. "It gives us a chance to apply what we've learned," he said. "Another important aspect is learning to work with everyone else and communicating to get your point across."

Bassett said that if the contract is renewed, the students will be



Working on an energy audit are engineering students Jason Devine, Colin Gaalswyk and Dale Henning.

conducting twice as many assessments next year.

Audits are free for qualified companies. All information the company supplies and any data SDSU collects is kept confidential. The information is added to a national data base to find common energy conservation opportunities.

Interested company representatives can contact Bassett or Mike Twedt in the SDSU Mechanical Engineering Department at (605) 688-4817.

New Ph.D. program to start this fall

"It will provide training to produce technical people who will be equipped to assist and manage the environmental and water resources of our region."

The importance of water and the environment is stressed in the new Ph.D. program at SDSU and the South Dakota School of Mines and Technology.

Starting this fall, students can take classes for a doctorate in atmospheric, environmental and water resources.

"We feel this program will be a great asset to the Northern Great Plains Water Resource Research Center," said Duane Sander, dean of the SDSU College of Engineering. "It will provide training to produce technical people who will be equipped to assist and manage the environmental and water resources of our region."

Vernon Schaefer, director of the research center and coordinator of the Ph.D. program, said the program is an academic counterpart of the center.

"Together they will provide

increased research in water-related areas," Schaefer said. "The program helps us attract faculty and graduate students and helps sell the research program better to granting agencies."

Sander said initially five to 10 students will begin the program this fall. An additional faculty member will be hired in the Civil and Environmental Engineering Department to work with the program.

Besides the College of Engineering, the colleges of Arts and Science and Agriculture and Biological Sciences at SDSU and the South Dakota School of Mines and Technology will have faculty involved in the program.

Doors of Opportunity

Youth experience wonders of science at conference

More than 200 students from the area travelled to space, at least in their minds, when they attended the Opening Doors of Opportunity Conference at South Dakota State University April 7.

The event featured a National Aeronautics and Space Administration engineer and 10 scientific breakout sessions.

Tandi Bagian, an engineer at NASA for 17 years at the Johnson Space Center in Houston, was keynote speaker.

"Many types of engineering are used in space," Bagian said. "Engineers make checklists and other decisions on the ground that make shuttle launches possible. They help design experiments that can be answered in the zero-gravity of space."

Bagian said she always liked math and science, but didn't know much about engineering until she entered the field.

"I think it's important for engineers to come back and tell students about what they do," she said. "It's such a diverse field. The more you can get kids exposed to more engineers, the more they can understand about the variety."

Madeleine Andrawis, assistant professor of electrical engineering, coordinated the conference.

"I feel it was a really good program for the students," she said. "It's important for girls to know the field is open to them. It's also good for boys to know women can be in the field."

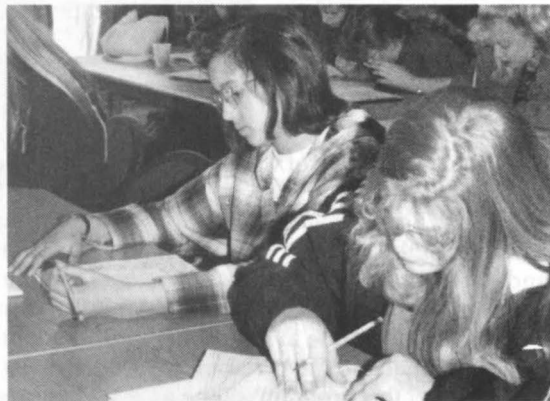
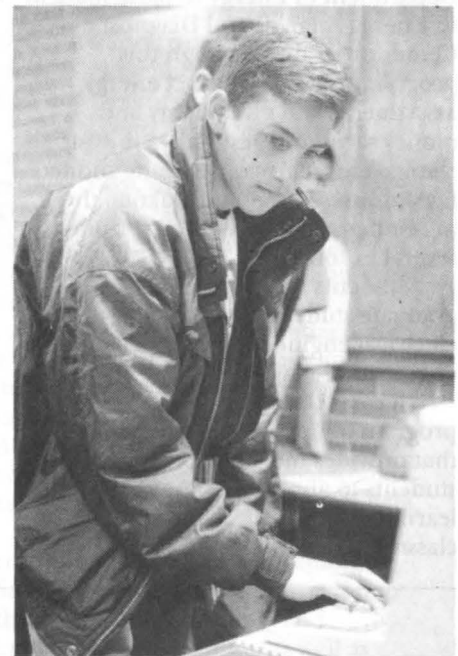
Andrawis said although the conference was geared toward showing girls about engineering, about 30 percent of those attending were boys.

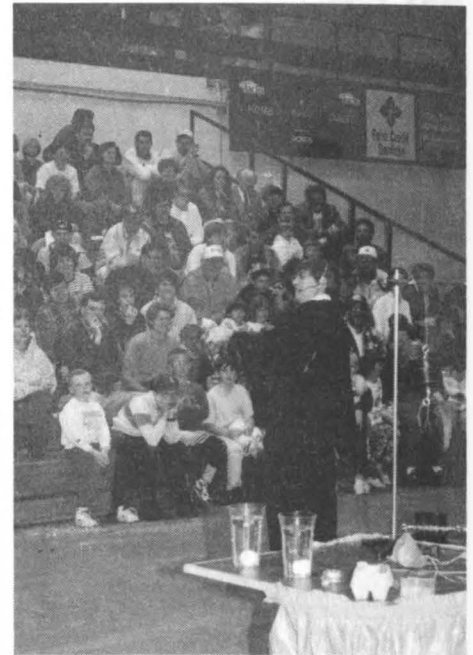
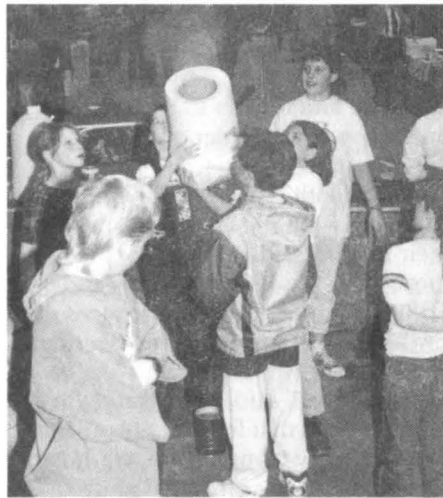
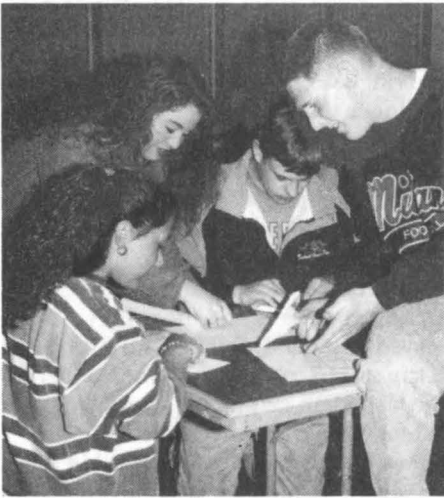
"The whole idea was to teach about engineering in general," she said. "With the continued support of

faculty, staff and students, we hope to continue the program next year."

The Opening Doors of Opportunity Conference was sponsored by the South Dakota Department of Education and Cultural Affairs; the South Dakota Space Grant Consortium; the SDSU Student Section of the Society of Women Engineers; the SDSU College of Engineering; and the U.S. Department of Labor, Women's Bureau, Region 8.

More than 200 area students participated in a variety of scientific breakout sessions and heard NASA engineer Tandi Bagian speak (top right photo) during the Opening Doors of Opportunity Conference at SDSU this spring.





Snowstorm doesn't hamper EED and Inventors Congress

An April 28 snowstorm didn't keep students or inventors from coming to SDSU for Engineering Exploration Days and the South Dakota Inventors Congress.

"We were pleased with the way the event went this year," said Dan Humburg, Inventors Congress adviser. "It grew from last year and, even with the snowstorm, we had a good turnout for the Congress and the information sessions. I look forward to another great event next year."

About 100 high school students participated in the calculator, bridge building, spontaneous question and pentathlon contests. SDSU college students participated in design, demonstration, movers, vehicle without wheels and stair climber contests.

All events for Engineering Exploration Days and most of the events for the Inventors Congress were coordinated by SDSU students.

"We had great student involvement from freshmen through graduate students," Humburg said. "Three of them were even out in the snow helping me put up signs to direct people to the event."

Saturday's Inventors Congress featured a magic show by Larry Browning, associate professor of physics.

Roger Hauk of Mitchell won the

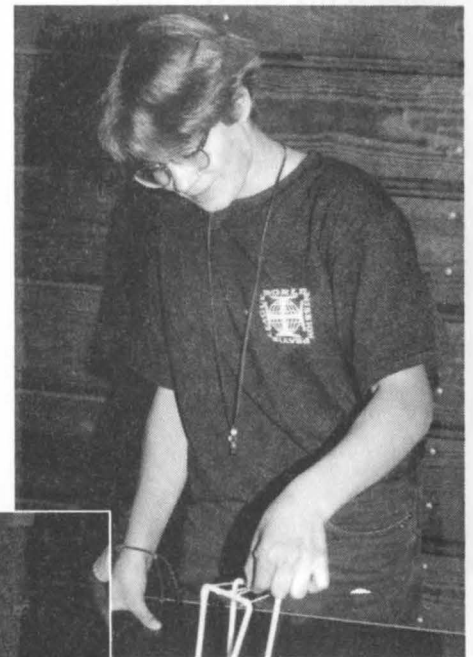
\$500 Ron Reed Economic Development Award for the most marketable invention at the Congress. Hauk created the Kord Kaddy, a plastic holder for extension cords.

Eighth grader Molly De Gezelle of Mankato, Minn., won the \$200 People's Choice Award for Mollyboard, an environmentally-sound particle board made from recycled newspapers.

The \$100 Outstanding Display Award went to Wayne Tjeerdsma of SLECTRO Co. in Avon for the Selective Row Shut-Off for planting equipment.

Next year the Inventors Congress will be held April 20 through 22 while EED will be April 21.

For more information call the SDSU College of Engineering at (605) 688-4161.



Clockwise from top left: Students have certain designs on the paper airplane contest.

Creating smoke rings sends a special message all its own.

Professor Larry Browning casts a spell with his magic show.

An engineer-to-be tries her hand in the high school pentathlon contest.

Professor Don Froelich takes a spin on one of the vehicles without wheels.

SDSU engineers pledge oaths at Order of Engineer Ceremony

The Order of the Engineer Ceremony originated from the Canadian concept "Ritual of the Calling of an Engineer." The Canadians believed there was a need to introduce a spirit of community and cohesiveness among engineers and those they served.

Every year since the mid-70s, South Dakota State University Engineering students have come together to pledge oaths of integrity, honesty, fair dealing, devotion, tolerance and respect to their profession at the Order of the Engineer Ceremony.

"The oath is important because engineers hold the lives of people in their hands," said Dr. Paul Koepsell, speaker for the 1994 ceremony and SDSU professor in the Department of Civil and Environmental Engineering.

An engineer has to know his/her limits, Koepsell said. To illustrate his point, he said that for every plane that flies, there are many engineers who are responsible. "No person has any business in misleading someone who is relying on them."

Koepsell, who was honored as the South Dakota Engineering Society Outstanding Engineer of 1994, said the ceremony is sort of a secular Trinity embodied in a single word: obligation. And that obligation, he said, is to preserve one's integrity.

Students who take the oath receive an iron ring, which symbolizes their publicly avowed dedication to their

profession. The engineer ring is worn on the small finger of the engineer's working hand so people will remember the principles they serve. Koepsell said the ring also serves as a reminder to an engineer that he/she is a professional.

The Order of the Engineer Ceremony originated from the Canadian concept "Ritual of the Calling of an Engineer." The Canadians believed there was a need to introduce a spirit of community and cohesiveness among engineers and those they served. Homer T. Borton and Brooks Earnest, U.S. citizens who took oaths in the Canadian ceremony, wanted to extend the ceremony to the United States, but copyright laws prohibited it.

In 1966, however, a group of U.S. engineers began pursuing the establishment of a ceremony like the Canadian one. Since then, the Order of the Engineer has grown to include tens of thousands of engineers who have received a degree in engineering from programs accredited by the Accreditation Board for Engineering and Technology Inc.

The Oath:

I am an Engineer. In my profession I take deep pride. To it I owe solemn obligation. Since the stone age, human progress has been spurred by the engineering genius. Engineers have made usable Nature's vast resources of material and energy for Mankind's benefit. Engineers have vitalized and turned to practical use the principles of science and the means of technology. Were it not for this heritage of accumulated experience, my efforts would be feeble.

As an Engineer, I pledge to practice integrity and fair dealing, tolerance and respect and to uphold devotion to the standards and the dignity of my profession, conscious always that my skill carries with the obligation to serve humanity by making the best use of the Earth's precious wealth.

As an Engineer, in humility and with the need for divine guidance, I shall participate in none but honest enterprises. When needed, my skill and knowledge shall be given without reservation for the public good. In my performance of duty and in fidelity to my performance, I shall give the utmost.

Electrical engineering students take 1,720-mile tour

"It was very beneficial because I learned many things about electrical generation plants that I never knew."

Engineering students and faculty took a five-day, 1,720-mile tour to observe energy-related sites in the four-state area of South Dakota, North Dakota, Minnesota and Wisconsin.

Among the 12 sites visited, students received a unique opportunity to tour hydro, steam, garbage and coal generation plants, including energy control centers.

Except for two years, students and faculty have made the annual spring field trip since 1983 to look at different ways energy is utilized, said Wayne Knabach, SDSU electrical engineering professor.

Unfortunately, the trip was canceled last year due to lack of interest. But that's unusual. Knabach said there is generally great interest, sometimes with more than 20 students participating.

This year seven students attended. One of the students, Pat Smith, said the trip allowed him to make connections with professional

engineers, as well as learn the latest technology industries are using. "It was very beneficial because I learned many things about electrical generation plants that I never knew," Smith said.

Another student, Quentin Flippin, said it let him see what he did and didn't want to do after he graduated.

The field trip is important for electrical engineering students, Knabach said, because there is no way they can experience this from a class or textbook. "Due to complexity and intensity of this field, students need to get out there and see the advancement of technology, as well as the efficiency of power," he said.

Students not only gain a valuable experience on the trip, but one technical elective credit toward their major.

The Center for Power System Studies supported all transportation costs.

SDSU mini-baja team finishes 22nd in competition

Building your own vehicle is satisfying by itself, but it's even more fun to see how yours compares to others in competition.

South Dakota State University senior mechanical engineering students took their car design project to the 1994 Society of Automotive Engineers Mini-Baja competition in Waukesha, Wis. in June.

Of the 68 vehicles from all over the United States, Canada and Mexico, the SDSU vehicle placed 22nd overall. SDSU placed seventh with its design and cost report, ninth in braking, ninth in skid pull, 20th in serviceability, style and safety, 22nd in maneuverability, 27th in endurance, 29th in acceleration and 34th in hill climb.

Team leader Andy Muser of De Smet said the team learned much from the example set by last year's team, the first SDSU team to compete

in the Mini-Baja event.

Muser and four other students travelled to the competition: Casey Berg of Fairmont, Minn., Carmon Dunn of Hartford, Curt Fryman of Blue Earth, Minn., and Joe Gruman of Aberdeen. Mechanical engineering research associate Jim Lund of Selby was the advisor during the trip.

"It was a blast! Everyone should be in one or two of these kinds of events in their lives," Muser said. "After working on it for so long, I never thought it would come together, so it was really fun when we got to play with it."

Other students involved in the project were Collin Breyfogle of Holstein, Iowa, Mark Browning of



Shown with their vehicle at the 1994 Society of Automotive Engineers Mini-Baja competition in Waukesha, Wis., are SDSU senior mechanical engineering students Carmon Dunn, Andy Muser, Joe Gruman, Casey Berg and Curt Fryman.

Aberdeen, Jamie Devine, Keith Enevoldsen and Amy Scriver of Brookings and Dave Weber of Montrose. Kurt Bassett, assistant professor of mechanical engineering, was the group's advisor.

SDSU holds ASME regional conference

South Dakota State University mechanical engineering students hosted this year's Northern Tier Annual Regional Conference for the American Society of Mechanical Engineers (ASME) April 28 to 30.

Every year undergraduate and graduate students from South Dakota, North Dakota, Minnesota, Nebraska and Iowa come together to exchange ideas, discuss student activities, learn the latest trends within the profession and participate in oral and other technical competitions.

There are four contests: the National Design competition, Old Guard Oral Presentation, Graduate Student Technical Presentation and the Old Guard Technical Poster

Display. Of the four contests, only first-place winners from the National Design competition and the Old Guard Oral Presentation go to nationals.

One of the more difficult competitions is the National Design competition. Each year ASME picks one specific project that all mechanical engineer students, in teams of three, must design for competition. This year students designed a stair climber. SDSU students Chris Lemair and Dane Steffen placed first in the event.

"The opportunity to exchange information like this conference is certainly an important initial step in the educational process of the graduate students," said Hamid Hamidzadeh, chairman of the

conference and professor in mechanical engineering department at SDSU.

Students need to be aware of what's happening in their profession, Hamidzadeh said, and the contests help them to prepare for what they'll be doing every day.

The conference was organized by the Department of Mechanical Engineering with the support of SDSU and Region VII of ASME. Hamidzadeh said the organizing committee acknowledges the valuable efforts of the ASME Student Section at SDSU, as well as the financial contribution of ASME Region VII.

Held wins prestigious national scholarship

SDSU engineering student Eric Held of Huron was awarded the Barry M. Goldwater Scholarship, which provides the cost of tuition, fees, books and room and board for the next school year.

The Goldwater Scholarship is given to only 250 students out of the 1,400 mathematics, science and engineering students nominated by faculties of colleges and universities nationwide. The program is designed to encourage outstanding students to pursue careers in the fields of math, natural science and engineering.

Held, an engineering physics, mathematics and German major, plans to obtain his doctorate in nuclear engineering and work in the field of medical physics.

"Eric is one of those special students that we, as faculty members, have a chance to work with only occasionally during our careers," said Warren Hein, head of the SDSU Physics Department. "He is extremely well-motivated and is not content with just getting the correct answer, but wants to have a thorough understanding of every problem he works."

When Held becomes a full-time scientist, he wants to dedicate himself to being a communicator.

"It's important to have the ability to express the implications of scientific facts in a simplified manner so people can understand them," Held said. "It takes a conscious effort on the part of scientists to do that for the public."

Too many times, Held said, public opinion is based on fear and confusion because of incorrect or incomplete information.

"I consider myself an environmentalist, but in a different fashion than groups like Greenpeace, in that I choose to believe in scientific facts instead of scare tactics as a means of protecting the environment," he said. "There are people out there who are trying to counteract this hysteria, but it really has to be a counter-movement, not just a few people."

Held is also involved in the SDSU Hockey Club, math club, the Society of Physics Students, German Club and is a volunteer math tutor. His wife, Nicole, is a math education major at SDSU.

East River Electric Power Cooperative scholarship winners

Two SDSU engineering students were among the 10 scholarship winners from four universities and four technical schools honored by East River Electric Power Cooperative at its annual scholarship meeting.

Andrew Bommersbach, who received his electrical engineering degree in May, and Brian Enga, who will be a senior in electrical engineering this fall, received scholarships from the V.T. Hanlon Memorial Scholarship fund, established by East River in 1969 in memory of Virgil T. Hanlon, the first general manager.

Bommersbach is the son of Roger and Marilyn Bommersbach of Bruce. Enga is the son of Wallace and Dianna Enga of Valley Springs.

Buckley named Distinguished Engineering Alumnus

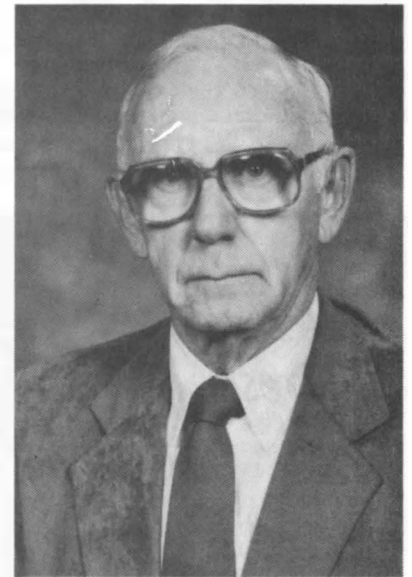
Dr. Ernest Buckley, BSEE '47 and dean of the SDSU College of Engineering from 1983 to 1989, was named a Distinguished Alumnus of SDSU during homecoming activities 1993.

Buckley, who died of cancer in August 1989 at the age of 65, is remembered as a man who spent his lifetime saying "yes, we can" when others said "we can't." He spent his life serving others in a search for excellence and progress.

He earned his master's degree in 1949 from Kansas State University, where he served as a civil engineering professor. Prior to earning his doctorate in 1972 from Texas-Arlington, Buckley was an administrative technical supervisor for General Dynamics Corporation in Fort Worth, Texas. He also served as vice president of construction for E.E. Cloer Company in Fort Worth and spent seven years in the Air Force as a civil engineer stationed in Texas, Maine and Morocco.

A native of Lemmon, S.D., Buckley took a great interest in his home state. He was special adviser to Gov. George Mickelson on science, technology and economic development and in 1988 spearheaded a successful educational funding campaign as acting director of the South Dakota Board of Regents. In 1980 he was named a Distinguished Engineer by his alma mater and in 1986 earned the South Dakota Engineering Society's Outstanding Engineer Award. He served as a consultant for 16 cities and corporations and was widely published.

Buckley was also a poet, cartoonist and illustrator. In 1991 a collection of his poems and drawings was published as a hardcover book. The verses in "Write me a poem, Ernie!" chronicle the ups and downs of family life and marriage, giving form to issues that were personal to the Buckley family, yet typical of American families.



At right, Michael and Betty Bob Buckley accept the SDSU 1993 Alumni Association's Distinguished Alumnus Award for their father and husband, the late Dr. Ernest Buckley, top right.

Distinguished engineers honored at banquet

"There is a lot of challenging research to be done by engineers, if they're willing to do it."

Don Ufford

The SDSU College of Engineering honored four alumni as 1994 Distinguished Engineers during a banquet April 29.

Featured banquet speaker was Don Ufford, a 1987 ag engineering graduate originally from Vermillion. Ufford spoke about how engineers will play an important part in the change the world is making toward a global marketplace. He works at Ford Motor Company in Detroit, Mich., where he is responsible for developing worldwide technical strategy for noise and vibration research.

Distinguished engineer Donald Kukuk attended high school in Huron and graduated from SDSU with a bachelor's degree in civil engineering in 1951. Since 1952 Kukuk has worked for Boyle Engineering Corp. of San Diego, Calif. He started as a design engineer, then moved to project engineer, senior engineer, principal engineer and vice president/managing engineer in the San Diego office. He also served five years as vice president of the Amman, Jordan office. He is currently vice president of the San Diego office.

Kukuk has managed several complex civil engineering design and construction projects, including the City of San Diego Miramar Filtration Plant Expansion and the Jordan Valley Authority Water Treatment Plant. He was responsible for all engineering offices where specialized water systems were required. In Jordan he was director of water resource projects and master planning of water systems in Germany for the Europe Division of the Corps of Engineers. Now he manages two projects for the Sweetwater Reservoir urban runoff diversion system in San Diego County.

Fred Rittershaus was raised in Freeman and graduated from high school and junior college there. He completed his bachelor's degree at SDSU in 1958 and his master's in 1962. He spent 36 years as a noncommissioned officer and commissioned officer in the Air Force and retired as Brigadier General in the Air National Guard.

For 30 years Rittershaus has

served as a design engineer, project engineer, project manager, senior project manager and principal in the architectural/engineering firm of Banner Associates Inc. in Brookings. He is currently senior vice president, corporate director, corporate treasurer and assistant corporate secretary at Banner. He also spent seven years as instructor and assistant professor of civil engineering at SDSU.

Rittershaus has had broad experience in all elements of project management involving transportation, structures, municipal civil works, water resources and wastewater disposal. He has worked on more than 100 bridge designs and 2,000 bridge inspections. He also managed multiple highway and urban street projects and airport improvement projects.

Jerald Tunheim attended high school in Langford. After receiving his bachelor's and master's degrees in physics from SDSU in 1962 and 1964, he earned his doctorate from Oklahoma State University.

Tunheim began his career at SDSU as an assistant professor of physics, moving up the ladder to become an associate professor, full professor and serving as head of the Physics Department for five years. For two years he was dean of the School of Mathematical Sciences and Technology at Eastern Washington



Jerald Tunheim, who earned his bachelor's and master's degrees in physics at SDSU, was one of four honored as 1994 Distinguished Engineer.

University. Since 1987 he has been president of Dakota State University in Madison.

Tunheim was twice named Teacher of the Year at the SDSU College of Engineering, was given the Friend of Education award by the Madison Education Association and has been listed in "Who's Who in America," "Who's Who in American Education," "American Men and Women of Science" and "Oxford's Who's Who." He has several publications and presentations to his credit and has been involved with grants worth hundreds of thousands of dollars.

John Wiersma was born in Brookings and attended high school in Volga. He received his bachelor's degree in agricultural engineering from SDSU in 1943. He was a math instructor at SDSU, then an engineer with the Soil Conservation Service in South Dakota.

After joining the faculty of the SDSU Agricultural Engineering Department in 1946, Wiersma received his master's degree from SDSU and became a full professor in 1958. From 1965 until his retirement in 1983, he was both the director of the Water Resources Institute at SDSU and a professor. He received his doctorate from the University of California at Davis in 1970.

Wiersma guided and cultivated a



Featured speaker Don Ufford addresses the role engineers will play in the change toward a global marketplace.

program of education and research that produced more than 300 reports addressing water quality problems in South Dakota and the Missouri River Basin. His leadership stimulated the development of a program to address non-point pollution of water quality in the 1970s that is the basis for programs of water quality improvement being conducted today. He also developed the technical information and design criteria for the development of an extensive network of rural water systems in the state. Wiersma now lives in Mesa, Ariz.



SDSU College of Engineering Dean Duane Sander, right, congratulates Distinguished Engineer Donald Kutruk.



Freeman native Fred Rittershaus earned his bachelor's and master's degrees from SDSU in 1958 and 1962.



John Wiersma, SDSU alumnus and former faculty member, was born in Brookings and now lives in Mesa, Ariz.

Al Yocom has his day



Al Yocom, at left, visits with a colleague during his retirement roast, when he received Gov. Walter D. Miller's executive proclamation naming May 20, 1994 Al Yocom Day.

One way to get a day named in your honor is posthumously. The other is to work hard and show integrity and leadership. Al Yocom prefers the latter.

At his retirement supper roast, Yocom, a Pierre native, was handed an executive proclamation by South Dakota Gov. Walter D. Miller naming May 20, 1994 Al Yocom Day. The document's many laudable achievements were interspersed with humorous anecdotes showing the more personal side of the SDSU alumnus.

The proclamation read, in part, that Al Yocom:

- Has worked and given 34 years of dedicated service to the Department of Transportation, with over 20 years as the manager of the department's

computer services;

- Served in the U.S. Army from 1950 to 1952 and then began his career with the South Dakota Department of Highways in 1955, first as a checker and later as an engineering aid;

- Graduated from South Dakota State University in 1959 as a civil engineer. He went on to work for Boeing Aircraft in Wichita, Kan., from 1959 to 1961 before he returned to Pierre to become a full-time employee in the Plans Department (now called Roadway Design) of the Department of Highways;

- Helped install South Dakota state government's first computer, an IBM 1620. The desk-size computer, with a whopping 20K memory, was so heavy it broke a fellow worker's car jack, which Al had suggested would work "just fine"

for removing the computer's shipping castors;

- Wrote the first roadway design system which became one of the first cooperative, multi-state engineering computer software projects;

- Helped develop the PreConstruction Engineering Management System in cooperation with the Federal Highway Administration in 1980. He also worked on joint American Association of Highway and Transportation Officials' (AASHTO) development of the Roadway Design System and the Bridge Analysis and Rating System;

- Participated in, supported and guided the development of professional associations like AASHTO and received the AASHTO President's Special Award of Merit in 1986 and the Alfred E. Johnson Achievement Award in 1993;

- Was appointed chairman of the AASHTO Joint Development Task Force in 1987. As a charter member in that group he promoted and successfully secured significant software purchase price concession for AASHTO's smaller states;

- Actively contributed to the Highway Engineer Exchange Program (HEEP), served as its national president in 1990 and delivered a major program about computers and transportation at the International HEEP meeting held in Prague, Czechoslovakia, in 1993;

- Participated in the Western Association of State Highway and Transportation Officials (WASHTO). He received the Dr. L.I. Hewes Award—WASHTO's highest award for outstanding achievement in the field of engineering;

- Received South Dakota state government's "Governor's Award for Employee Excellence in Management" in 1990.

Yocom's accomplishments in the office are no greater in weight or significance than some of his outdoor experiences. His family can vouch for that.

Yocom's love for fishing is shown by the careful preparations he makes before every trip. One unforgettable event some years past took place after he had carefully backed his boat into the garage to protect it from forecasted

the trailer tongue because he didn't want to rehook the trailer the next morning. It is not known whether he had overslept or was just excited about getting his line in the water, but the next morning, no doubt with fish jumping in his mind's eye, he just pulled out—garage door and all.

Yocom and his wife of 38 years, Loralee, spent many years camping, boating and water skiing with their children: Shari, Scott, Lisa and Lynn. One eventful trip took them to the Black Hills with sleeping bags, but no tent. It wasn't a problem the first night, as the weather was kind. But the second night featured rain, rain and more rain. The camping gear and three kids had to be loaded into the station wagon, leaving Al, Loralee and Lynn to seek shelter under the car. After that, it was agreed they would forego camping until they got a tent.

Yocom thinks his SDSU education complimented the direction he wanted to take. "SDSU did an excellent job in my training," he said. "They didn't have computers then, but they gave me the educational background that you need to get the job."

Yocom has not only been an exceptionally productive employee and served as a leader in his profession, but he has always found the time to be a great family man and leader in his community and church.

His wife will retire in January and they plan to get away from South Dakota for awhile. "We're going on a southern trip," Yocom said. "We're going to visit Texas, Louisiana, Florida and all the rest of the south because my wife has always wanted to."

For now, Yocom is still fishing and camping and has catered to a newfound challenge—training his new

hunting dog, an Irish Setter. "I'm trying to teach him how to point," he said. "I haven't even begun to teach him to retrieve, but I'm a little lazier these days."

And why not? For Yocom, now is the time to live it up a little.

Jensens provide scholarships in parents' honor

A farm in Hamlin County has provided Roland and Deloris Mangels Jensen with a unique way to honor their parents, Chris and Cicely Jensen and George and Alvera Mangels.

The Jensens sold the 288-acre farm so the money could be used to establish two scholarships at SDSU, one in home economics and one in engineering.

The scholarships will reward academic achievement and extracurricular activities, with first preference given to students from Deuel and Hamlin Counties.

"We wanted to honor our parents because without their support and encouragement we couldn't have started or finished college," Deloris said. "We also wanted to return something to the communities from where they came."

Deloris received her bachelor's and master's degrees from SDSU in home economics education in 1954 and 1958, respectively. She was raised in Clear Lake, where her parents were hardware and implement dealers for nearly 50 years.

She taught home economics and

related subjects at adult, college and high school levels in South Dakota and Minnesota and is a member of the American Home Economics Association and Phi Upsilon Omicron, an honorary home economics association.

Roland obtained his bachelor's degree from SDSU in mechanical engineering in 1959. He received his master's degree in business administration from the University of Minnesota in 1963.

A Lake Norden native, he worked for Northern States Power for more than 30 years after leaving SDSU. In 1990 he became chairman and CEO of NRG Energy, a non-regulated subsidiary of NSP. He received the James N. Landis Medal from the American Society of Mechanical Engineers in 1993.

The Jensens live in Golden Valley, Minn.

Anderson advises SDSU engineering students:

'make the most of college, carry a can-do attitude'

To be successful, make the most of college and carry a can-do attitude into the work force, Byron Anderson, BSEE '68, told SDSU engineering students during the second annual College of Engineering convocation April 22 at SDSU.

"Do well in your studies," Anderson said. "That's why you're here. It's something employers look for. It's a prerequisite."

Anderson is general manager of Hewlett-Packard's Communications Test Solutions Group at Santa Clara, Calif. The company has facilities in Europe, the U.S., Canada and the Far East. Anderson stopped in Brookings on his way from Europe to China, continuing a pace set years ago.

"I graduated from SDSU on a Saturday, got married that Sunday and left for California that Monday," he said. "And my career has followed that pace ever since."

"I've had many different jobs with Hewlett Packard. You'll have many different jobs in your career. Your first job is only a start. Don't worry about the next job. Take the job you have today, treat it as the best job in the world and give it 150 percent. That will get you ahead. In this high-tech world, you never know what's around the corner."

Take care to choose the right

company, Anderson said. "Don't job hop. Getting engaged in a company is important. Try to find a good personal match. Look at how people are rewarded in the company."

Anderson told the students they'll soon go from being a pauper to making pretty good money. "I wouldn't spend it all right away," he said. "Make that nest egg so you can sleep well. If you do want to go on to something

else, you'll be able to afford to branch into something else that's right for you."

Other qualities key to a successful engineering career, Anderson said, are:

- Industry knowledge and awareness. It's important to understand the industry you're focusing on, Anderson said. This knowledge can be gained through trade magazines, trade shows and company

visits. "Summer work and internships are good," he said, "because it makes you a temporary insider. It's a critical way to be recognized."

Hewlett Packard, a \$20 billion company in 19th position with Fortune 500, is an extremely global company, Anderson said. The No. 10 exporter and the No. 3 traveller on United Airlines, Hewlett Packard employs

95,000 people and produces 22,000 products. Fifty percent of what they sell is less than three years old, Anderson said, because the company considers research vital. Hewlett Packard puts a dime of every customer dollar back into research.

- Have a demonstrated ability to work with new things. Having the most up-to-date computer skills is a must, Anderson said. "Be a risk taker, adaptable to change. Be a forward looking person, not always looking back." His student government involvement at SDSU, Anderson said, "stretched my engineering experience."

- Team work and team management skills. "There are very few solo assignments in high tech industry anymore," Anderson said. "It's all team worked. You need to realize that not everyone is an engineer, so they don't think like an engineer. You have to learn to put up with that. Hewlett Packard believes in teamwork. They have lots of respect, trust and integrity for people. It shares its success with its employees."

- Communications, presentations and organizational skills. Verbal and written skills are vital, Anderson said. "You have to be able to sell your idea to your teammates, to break up projects in ways that make sense." It's important to combine technical skills with managerial skills and people skills. "You need a rich set of skills beyond engineering skills. You need to be a team player, a team builder. Help others grow in their professions. Be a teacher and a do-er."

"I encourage international assignments early in your career if you have that chance. Foreign language is a plus. Knowledge about other cultures is also valuable."



Alumnus Byron Anderson talks to Alfred Andrawis, assistant professor of electrical engineering, after his lecture for the second annual College of Engineering convocation.



Alumni notes

J. Rich Profazaier, P.E., BSCE '87, of Wayzata, Minn., has been working as a construction engineer/project manager with the City of Minneapolis Public Works the past few years.

His duties have included design/engineering and management of a number of multi-million dollar flood control projects. His latest venture is a large diameter underground tunnel near the University of Minnesota.

Albert J. Heber, BSAE '78, is an extension agricultural engineer and associate professor in the Agricultural Engineering Department at Purdue University after nine years at Kansas State University. He specializes in air quality research and conducts extension programs in livestock buildings design, layout and environmental control. He and his wife, Gloria, have six children and live in Delphi, Ind.

James Arthur Ramsey, BSEE '66, died Sept. 5, 1993 in Santa Barbara, Calif., of a brain aneurysm. He is survived by his wife, Louise Andiae-Ramsey, his mother, Mrs. Arthur Ramsey, a brother, Elling, and a sister, Mrs. William Zimmerman.

Andre J. Fiscbach, CE '84, was promoted in 1993 to Maintenance Department manager at Menasha's Paperboard Division in Otsego, Mich. He and his wife, Mary Ann (Erk), HE '84, and their two children, Amanda, 6, and A.J., 4, live in Otsego.

Darrell Bren, EE '89, of Sioux Falls, and his wife, Dawn, '92, had their first child, Kiely Morgan, Dec. 23, 1993. Darrell is a design engineer at West Plains Engineering in Sioux Falls.

Roger R. Hall, BSEE '64, was recently promoted to security testing and quality assurance manager for the Minnesota State Lottery. Prior duties included on-line games manager from the Lottery's start-up in June 1990. Roger and his wife, Aggie, live in Fridley, Minn., with their two children: Britta, 18, and Ryan, 15.

Gerry Schmidt, BSEE '68, is midwest region sales manager for the Installation and Service Engineering Department of the General Electric Company in Evansville, Ind.

Matthew DeWitte, ME '92, married Yvonne Riswold of Baltic July 24, 1993 at East Side Lutheran in Sioux Falls. Matthew is employed at Nebraska Boiler Company. They live in Lincoln, Neb., where Yvonne attends the UNMC College of Dentistry.

F. Robert Nuckols, ME '35, died Feb. 10, 1994 in Marietta, Ga., at the age of 80.

Andrew J. Barnett, BSME '85, of Dearborn Heights, Mich., earned Ford Motor Company's highest honor, the Henry Ford Technology Award, for break-through innovation and technological achievement. Barnett was part of a two-person team honored for concept, design and development of an improved residual torque-measurement evaluation methodology. The innovation improves the way torque readings

are taken for the more than eight million fasteners secured to Ford vehicles each day. It also helps eliminate squeaks, rattles and fluid leaks.

Joseph M. Abernathy of Madison, Wisc., BSCE '40, is retired LCDR USN Civil Engineer Corps (SeaBee's WWII SW Pacific), Officer and Director of Genisot Engineering (15 years) Rhinelander, Wisc., retired director of Airport Development/Chief Engineer with the Division/Bureau of Aeronautics, Wisconsin Department of Transportation. He is a Registered Professional Engineer (Wisconsin), a Registered Land Surveyor (Wisconsin) and a private pilot (instrument rated). His wife, Jean (Ramsay) passed away in 1981. He has since married Carol (Leemkuil) (UW BS bacteriology). They have eight grown children, 10 grandchildren and seven great grandchildren. They have been traveling to Australia, New Zealand, Scotland, England, Jamaica, Mexico and Canada. They also travel full time in a motor home and have toured

each of the 50 states at least once.

Charles O. Danielson, AE '58, of Rye, N.H., writes that though his agricultural engineering degree does not apply to his work as a captain flying B767s on international and domestic flights for American Airlines, "the degree has done wonders for me."

Rollie Miller, BSEE '88, of Madison, Wisc., and his wife, Gina, announce the birth of their first child, Cody Ray, born Feb. 13, 1994. Rollie is a business development manager/project manager for the newly opened Wisconsin office for Stanley Consultants Inc.

We want to hear from you!

We want to hear from you! Have you moved, accepted a new position, gotten married, given talks in your community, received an advanced degree or had an addition to your family? Everyone at the College of Engineering and your classmates want to know what has been happening with you.

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CASE award recognizes SDSU for outstanding achievement

Thanks to alumni from across the University, including many key volunteers and donors from the College of Engineering, as well as friends, faculty and staff, South Dakota State University has been recognized as one of the outstanding universities in the nation for fund raising accomplishment.

Using the last three years as a base of comparison, the Council for the Advancement and Support of Education compared and analyzed results of 1990-93 fund raising to pick those universities whose accomplishments were truly noteworthy. SDSU came out on top! The University was given the Circle of Excellence in Educational Fund Raising Award at the 20th annual CASE assembly in Chicago in July.

Nearly 350 research/doctoral and comprehensive public universities were considered. SDSU was one of six universities in its classification to receive the award. Only 16 public universities were recognized nationally.

Since 1990 the SDSU Foundation has increased support of the University from \$3.4 million from 9,375 contributors to \$8.3 million from 13,526 contributors.

Foundation president Don Holliday of Rapid City said he's very proud of the award.

"It recognizes the generous support of alumni and friends, as well as the hard work of board members, staff and volunteers," Holliday said.

In selecting award winners, judges looked at the pattern of growth in total support, overall breadth in program areas, the pattern of growth among alumni donors and other individual donors and total support in relation to the alumni base.

With the start of "Visions for the Future: \$50 million for South Dakota State University," the impact of fund raising growth at SDSU should be even more significant, according to Orin Dahl, executive director of the SDSU Foundation. "We are developing a fund raising program on behalf of a great university. South Dakota's largest university is now taking its place as one of America's outstanding fund raising programs."

The effort needed to generate \$50 million in contributions over the next five years will be met by a cadre of alumni and friends who are committed to the quality of their university. "The College of Engineering will play a vital role in producing the resources necessary to meet our potential. SDSU has a future even brighter than its present."



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