

QUARTERLY

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY

SPRING 1998



MUSEUM OF GEOLOGY
PALEONTOLOGIST TRAVELS TO
ANTARCTICA ON FOSSIL
EXPEDITION

- *Story on Page 10*

A PUBLICATION OF SDSM&T

Perspectives



Dear Friends,

The faculty, staff and students of the South Dakota School of Mines and Technology have established the traditions of excellence of which we are tremendously proud. Each year new students join the Tech family so that they too can experience our traditions and play a role in establishing new traditions.

These students have the highest average ACT scores in the state and have countless other options for continuing their education and numerous scholarship opportunities. These

excellent students choose to enroll in our programs for a variety of reasons.

- The university has a world-wide reputation for traditions of academic excellence. Our alumni are held in the highest regard by their fellow leaders in industry, consulting, government, health and education.
- Our exceptional faculty and staff are committed to providing personal attention to each student.
- New graduates experience outstanding job placement records with students 92 % (includes 15% pursuing graduate or professional programs) receiving offers within six months of graduation. Starting salaries average more than \$36,000 (engineering) and \$33,000 (science) for our students.
- Rapid City and the Black Hills offer students opportunities to balance their academic endeavors with a variety of outdoor recreational activities. The Black Hills and Badlands also serve as the perfect outdoor laboratory for students in our many earth science programs.
- A degree from SDSM&T is an excellent value for the investment. Tuition and housing costs are affordable. Financial aid, in the form of scholarships, grants, loans, and work study is available to those who qualify.

Our admissions staff and faculty stand ready to assist prospective students through the college search process. If you know of prospective students, whether they are high school students, potential graduate students, non-traditional students or students interested in continuing their education using distance learning technologies please contact my office at 605-394-2411 so that we may send them appropriate information. We ask your assistance in identifying students who will assist us in experiencing and continuing our traditions of excellence.

Sincerely,

Richard J. Gowen
President

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY QUARTERLY

Spring 1998

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Office of University & Public Relations.

Editor

Julie A. Smoragiewicz

Assistant Editor & Writer

Darrell R. Sawyer

Advertising & Design

Rachel A. Schofield

Administrative Support

Joyce Comfort

For additional information contact:
South Dakota School of Mines & Technology
Office of University & Public Relations
501 E. St. Joseph Street
Rapid City, SD 57701-3995
(605) 394-2554 • (800) 544-8162
e-mail: jsmoragi@silver.sdsmt.edu

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The South Dakota School of Mines and Technology, founded in 1885, has been a national leader in preparing world-class engineers and scientists. Our graduates design, construct, and operate modern technology to meet complex challenges such as global warming, health care delivery, energy resource development, mineral extraction and processing, environment quality, futuristic transportation, and national defense. Our alumni are held in the highest regard by their fellow leaders in industry, consulting, government, health and education.

Tech has diversified to meet the needs of engineering and science throughout the world. South Dakota Tech's intellectual environment was shaped a century ago by the ingenuity and rugged individualism of pioneers in science and technology. Tech's present day pioneers provide inspiration and remain on the cutting edge in the fields of engineering and the sciences.

ACADEMIC PROGRAM: SDSM&T is a state-assisted university providing graduate and undergraduate degrees in science, engineering, and interdisciplinary studies.

BACHELOR OF SCIENCE DEGREES

Chemical Engineering
Chemistry
Civil Engineering
Computer Engineering
Computer Science
Electrical Engineering
Geological Engineering
Geology

Industrial Engineering
Interdisciplinary Science
Mathematics
Mechanical Engineering
Metallurgical Engineering
Mining Engineering
Physics

MASTER OF SCIENCE DEGREES

Atmospheric Sciences
Chemical Engineering
Civil Engineering
Computer Science
Electrical Engineering
Geology and Geological Engineering

Materials Engineering and Sciences
Mechanical Engineering
Paleontology
Technology Management

DOCTORATE OF PHILOSOPHY DEGREES

Atmospheric, Environmental and Water Resources
Geology and Geological Engineering
Materials Engineering and Sciences

ENROLLMENT: The University has a diverse enrollment of approximately 2,200 students from nearly 30 states and 20 countries. Our 13 departments offer 30 degree programs in engineering and science disciplines at the baccalaureate, masters, and doctoral levels. Students enter the university with the highest ACT composite in the state and more than half graduated within the top 25 % of their high school.

COSTS AND FEES: Annual undergraduate costs for tuition, fees, room and board total less than \$8,000 per year for residents of South Dakota, Alaska, Colorado, Hawaii, Idaho, Minnesota, Montana, Nevada, New Mexico, North Dakota, Oregon, Utah, and Wyoming. Annual total costs for all other undergraduates is less than \$10,000 per year.

RESEARCH: High quality research is conducted in departments and in our research institutes.

FACULTY: There are approximately 100 faculty with degrees from more than 150 institutions, eighty five



Photo by Darrell Sawyer

Data collected assists in understanding the mysteries of nature

ARMORED PLANE THUNDERS INTO STORMY WEATHER

Atmospheric scientists at SDSM&T don't chase tornadoes as portrayed in the movie *Twister*—instead they fly a T-28 airplane directly into the middle of hailstorms! Frequent damaging hailstorms in the northern Great Plains, make hail suppression research very important.

SDSM&T's Institute of Atmospheric Sciences (IAS) maintains and operates the only armored T-28 meteorological research airplane in the entire United States. The T-28 plane is specially equipped and modified to fly directly into hailstorms and to withstand damage from hailstones and lightning strikes.

Operated as a national facility under a cooperative agreement between the National Science Foundation and SDSM&T, the T-28 program has been conducting weather research nationally and internationally for almost thirty years—from the Dakotas to Texas to Canada and even Switzerland. The T-28 aircraft has flown into more than 900 hailstorms and thunderstorms to collect data on how hail stones develop.

The concept of using a T-28 for weather research has its roots in the period of the Cold War between the United States and the Soviet Union. The idea of utilizing a specially modified aircraft to penetrate hailstorms evolved in response to research being conducted by the Soviet Union during the early 1960's. Hail researchers in the Soviet Union reportedly were developing the technology to treat clouds that would result in smaller hailstones, thereby reducing the amount of serious hail damage to Soviet crops.

Rather than flying research or cloud-seeding airplanes directly into storms, the Soviet scientists fired artillery shells and rockets with their seeding materials into the hailstorms. The conventional wisdom of American scientists at that time also believed that flying manned airplanes into hailstorms was too dangerous.

The T-28 program began to materialize when the National Science Foundation funded Project Hailswath in 1966 to study the feasibility of developing a storm penetration airplane. An analysis of the performance characteristics of all the Vietnam era military and civilian airplanes narrowed the field to the Douglas "Dauntless" dive bomber, a World War II combat plane, and the T-28, a military plane developed in the 1940's as a high performance, prop-driven trainer. Based on the cost and maintenance factors, the T-28 was determined to be the better choice for this type of research.

In 1967 the NSF provided funds to obtain a T-28 plane and outfit it with the

necessary armor to accommodate flying into hailstorms. After the modifications were completed, the T-28 was capable of flying into storms at altitudes up to 25,000 feet. The plane can withstand hailstones up to 3 inches in diameter at 100 meters per second (approximately 224 miles per hour!) with minimal damage. SDSM&T's Institute of Atmospheric Sciences acquired the specially fortified T-28 aircraft in 1969 and made some test flights at Rapid City and Flagstaff, Arizona.

The IAS's origins date to 1959 when South Dakota Senator Karl Mundt, an influential member of the U.S. Senate Appropriations Committee and a staunch supporter of weather modification research, secured funding to establish the Institute at SDSM&T. Senator Mundt arranged for \$1 million worth of surplus government electronic test equipment to be donated to SDSM&T.

One of the Institute's primary early objectives was to conduct meteorological research that might prove beneficial in developing weather modification techniques for the northern Great Plains. In 1961 IAS received its first research grant for \$30,000 from the Bureau of Reclamation. By 1963 IAS was studying summer clouds in the Black Hills and the effects of silver iodide seeding to promote rain.

Dr. Richard Schleusener, a leading figure in the U.S. hail research effort at that time, was hired as director of the Institute in 1965. He served in that capacity for ten years until being named SDSM&T President, a position he held until his retirement in 1987.

Over the years, the IAS scientists have conducted intensive studies of the

convective clouds that bring summer rainfall and often damaging hail to the region. Crop damage from hail is a serious and costly economic threat to farmers in the upper Midwest and Great Plains regions. Crop losses from hail in the U.S. average about \$1/2 billion per year, with property hail losses averaging about \$1.5 billion. (Source: Climatology of *Hail Risk* in the United States, Stanley A. Changnon, 1997)

Areas of scientific emphasis developed by IAS include cloud and precipitation physics, small-



Dr. Andrew Detweiler, Research Prof. of Meteorology and Dr. Paul Smithb, Research Prof. Emeritus of Meteorology analyze images of rain drops acquired from T-28 thunderstorm probe.

Above left picture: Charlie Summers, pilot of T-28.

scale atmospheric circulations, air quality, effects of pollution on cloud physics processes, atmospheric electricity, climate, radiative properties of clouds, satellite remote sensing and mesoscale processes. IAS scientists, who have been involved with cloud seeding experiments since the 1960's, also conducted an evaluation of North Dakota's state cloud modification project.

From 1972 through 1976, the T-28 made nearly 200 research flights as part of the National Hail Research Experiment (NHRE). The NHRE program was a concentrated effort to test the Soviet theory and techniques of reducing the size of hail stones by injecting ice pellets into the storm clouds. Through its capability of flying directly into hailstorms with meteorological equipment, the T-28 demonstrated that the Soviet theory of hail suppression was not applicable, at least to the clouds in the High Plains region of the United States.

"Our T-28 research has contributed to a different understanding of hail suppression," says Dr. Paul Smith, SDSM&T Research Professor Emeritus of Meteorology and former director of the Institute. "We eliminated the concept prevalent in the 1970's about how hail suppression works."

The T-28 has participated in summer

field programs almost every year from 1972 through 1995. Much of this research has been undertaken in joint collaboration by scientists from SDSM&T and the National Center for Atmospheric Research (NCAR), various universities, and federal and state agencies. Research involving T-28 flights has taken place in Alabama, Colorado, Florida, Illinois, Montana, New Mexico, North Dakota, Oklahoma, South Dakota and Texas.

In the early 1980's research using the T-28 was conducted in Switzerland to test the Soviet theories of hail suppression. The plane has also been used to make *in situ* observations in Alberta, Canada, to conduct hail research.

In addition, the T-28 has been flown in Alabama storms as part of a research program to study microbursts, which are weather situations in which the storm collapses producing high winds out of the bottom of the storm. Some airplane crashes have been caused by these sudden microbursts.

In the late 1980's and early 1990's the T-28 participated in Cloud Seeding Field Trials in Illinois and North Dakota. The plane has also been involved with research in Oklahoma and Florida to study how clouds electrify and produce lightning. By flying the T-28 through storm clouds and

taking snapshots, scientists can verify the radar data being collected by sophisticated equipment on the ground.

The hail suppression research conducted by SDSM&T in collaboration with colleagues in North Dakota has produced some tangible benefits. Former IAS Director Dr. Paul Smith indicated that hail insurance claims for crop damage decreased by almost 50% during the approximately fifteen years of hail research in North Dakota in which Smith and other SDSM&T scientists collaborated.

Flying the T-28 into hailstorms can be hazardous to say the least! Each summer the T-28 usually gets hit by lightning several times. To reduce the damage, lightning rods have been placed on the plane's extremities. Occasionally the propeller is also struck by lightning, but usually the only physical damages are some small burned spots on the propeller's trailing edges.

Because of the possibility of the entire electrical system being disabled by a lightning strike or electrical overload, precautions are taken to minimize the damage under such conditions. The T-28 has a generator that is used to power the sensing, recording and de-icing equipment. Double circuit breakers are placed on all the high-power equipment, and the pilot can easily turn off any or all

(continued on inside back cover)



Photo courtesy of Institute of Atmospheric Sciences

T-28 collects data even in the worst of lightening storms.



Dr. Leopold and recent Tech graduates, Chad (Comp Eng 97) and Kimberly (IE 97) Bishop discuss their future plans as new employees of Motorola.

Photo by Darrell Sawyer

Campus Links State Leaders With Motorola Inc.'s IRIDIUM[®] Project: The Next Generation in Telecommunications Technology

SDSM&T recently linked community leaders with Motorola Inc.'s IRIDIUM[®] system that will revolutionize global communications. The co-designer of the new IRIDIUM[®] project recently visited the campus to provide a firsthand perspective on the exciting changes taking place in telecommunications technology.

Dr. Raymond Leopold, Vice President and Chief Technical Officer of the Motorola Satellite Communications Group, was the featured speaker at SDSM&T's Communications Technology Forum. He also delivered SDSM&T's 136th commencement address last December.

"Bringing such nationally known leaders to campus is one of the ways that the South Dakota School of Mines & Technology maintains its standards of excellence in science and engineering education," says Royal G. (Mac) McCracken, Director of Public Affairs for US WEST Communications, who attended SDSM&T's Communications Technology Forum in Rapid City.

With 66 interconnected satellites orbiting above the earth, the IRIDIUM[®] system will implement a satellite-based, wireless personal communications network that will provide voice, data, fax, and paging services worldwide. When operational, Motorola Inc.'s new system will bring telephone service to a new level around the world.

The \$3.5 billion constellation of satellites will simplify communications and will enable its users to call "anyone, anywhere, anytime." Using wireless handheld telephones, IRIDIUM[®] subscribers will be able to stay in touch with the rest of the world regardless of whether they are calling from the Bering Sea, the Sahara Desert, the Himalaya Mountains, or even Antarctica.

The IRIDIUM[®] project combines three sophisticated technologies—flying satellites, network management and telephone switching. Since its development approximately ten years ago, IRIDIUM[®] has become a well-known name in the telecommunications industry. Dr. Leopold described the IRIDIUM[®] system to SDSM&T's commencement audience as "the largest constellation ever built and ever operated in the shortest period of time since God created the universe."

Since receiving a license from the Federal Communications Commission (FCC) in 1995, Motorola officials have had the IRIDIUM[®] project on a fast-track schedule. The satellites are being constructed at a rate of one every 4.5 days and are being launched at an amazing speed. At 6:16am MST on the same morning Dr. Leopold was in Rapid City delivering SDSM&T's winter commencement address, five more IRIDIUM[®] satellites were successfully launched on a Delta

II rocket from Vandenberg Air Force Base in California. That launch was the system's ninth in eight months.

Motorola officials began 1998 with more than two-thirds of its IRIIDIUM® satellites launched and in orbit. Five more satellites were launched in mid-February, bringing the system's total number of functioning satellites in orbit to 49. Activation of the commercial wireless communications service is scheduled to begin this September.

Unlike geostationary communications satellites located 22,300 nautical miles above the earth, IRIIDIUM® satellites have low-earth orbits (420 nautical miles) and function somewhat like extremely tall cellular towers. Each satellite, weighing about 1,500 pounds, projects tightly focused beams over the ground. By being small and simply constructed, the satellites can be built, launched and replaced economically.

The intersatellite crosslinks will enable calls to be handed off between satellites. "Gateway" ground stations will connect the satellites to local phone networks around the world. The low-earth orbit of the satellites, in conjunction with new developments in microelectronics technology, will enable the satellites to communicate directly with handheld equipment of IRIIDIUM® subscribers.

Dr. Leopold visited SDSM&T because of his close ties and friendship with SDSM&T President Dr. Richard Gowen. They first met over thirty years ago when Dr. Gowen was teaching at the U.S. Air Force Academy (USAF) and spearheading the implementation of an electrical engineering major in the USAF's curriculum.

Recognizing the potential of a young cadet named Raymond Leopold who was one of his academic advisees, Dr. Gowen mentored his student's academic and professional growth in the electrical engineering profession. Upon leaving the Air Force Academy, Dr. Gowen turned over teaching of the capstone senior design course he had created to his former student, who by then had received his Ph.D. in electrical engineering. Over the years, the two have maintained both a personal friendship and a professional relationship.

"Ray Leopold is an engineering visionary who is recognized worldwide as a leader in advanced telecommunications technology," says Dr. Gowen.

In his commencement address, Dr. Leopold encouraged SDSM&T's graduates

to "think outside the box" and to develop the ability to discern truth. Drawing on his own career experiences and describing his insatiable appetite for reading novels, Dr. Leopold stated his own success as an engineer was closely tied to what he learned outside the engineering discipline itself. He stressed the importance of developing the abilities to communicate orally and in writing, to understand cultural differences, and to determine other people's motives.

While recognizing the importance of specializing in a particular field, Dr. Leopold called on engineers and scientists to also be generalists. "Continuously pursuing a self-directed, generalized education is a key to success," he advised. "Be interested in everything. Don't be afraid to work together and allow your ideas to play off one another."

The Motorola executive described successful persons as often those who can leverage their own knowledge and be positively synergistic in appreciating the knowledge of others. Openness and honesty in interacting with one's colleagues can produce a multiplier effect and result in building on each other's ideas.

To illustrate his point, Dr. Leopold described the genesis of the IRIIDIUM® concept. While vacationing on a Caribbean island, Karen Bertiger, wife of a Motorola executive, became frustrated by being unable to call the U.S. on her cellular phone. After returning to work, Bary Bertiger started brainstorming with Ray Leopold and Ken Peterson, another engineering colleague, about how to create a wireless communication system that would give people the freedom to communicate anytime, anywhere in the world. By building on each other's ideas and thinking "outside the box", the three Motorola Satellite Communications Group engineers developed the IRIIDIUM® system after testing several concepts.

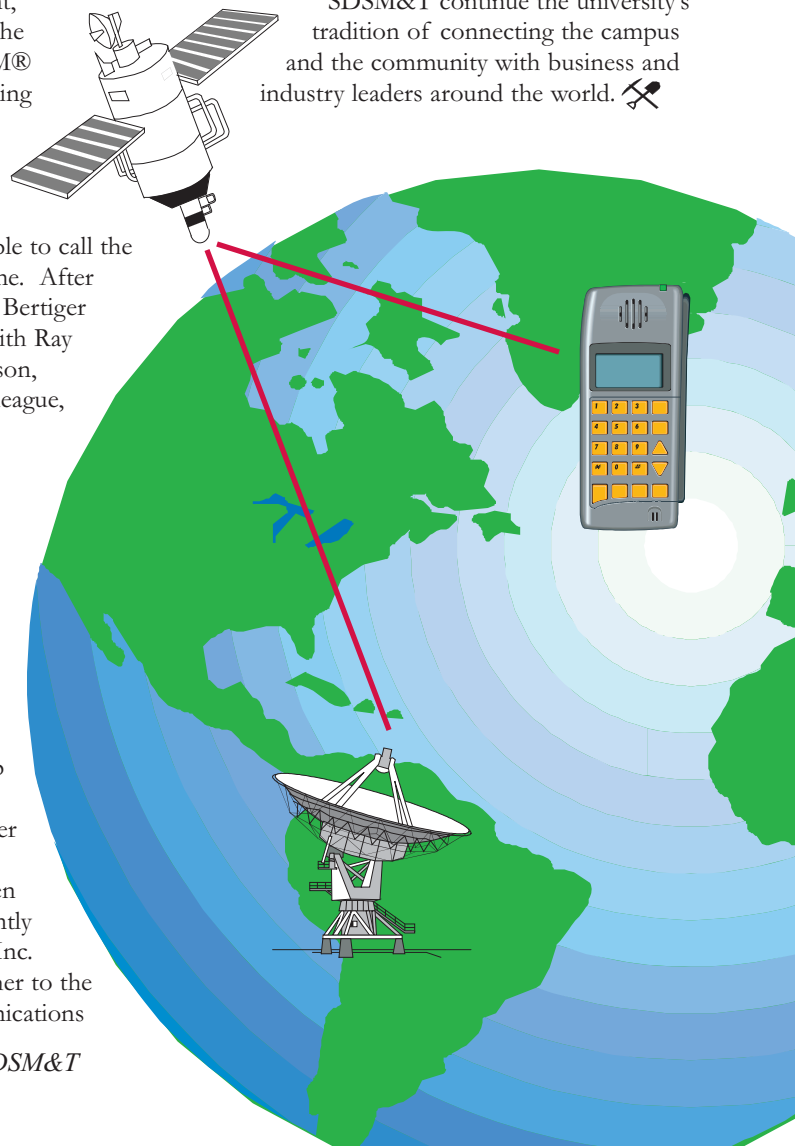
The nearly two dozen SDSM&T alumni currently employed by Motorola Inc. connect SDSM&T further to the advances in telecommunications

technology. Recent graduates Chad and Kimberly Bishop, both natives of Aberdeen, already had jobs lined up with Motorola by the time they graduated last December. The husband and wife received B.S. degrees respectively in Computer Engineering and Industrial Engineering.

The couple's interest in working for Motorola was stimulated in part by the company's involvement with the IRIIDIUM® system and its telecommunications leadership. During a reception for the winter commencement graduates, the Bishops had an opportunity to visit personally with Dr. Leopold about the IRIIDIUM® system and the future of communications technology.

As the new millennium dawns with revolutionary advances in global communications, Dr. Leopold's commencement advice applies to everyone: "Control your own lifelong development, both as a generalist and a specialist, both relating to people and to things. Develop your ability to discern, and be the creators of new visions, of new eras and of a better world."

Dr. Leopold's presentations at SDSM&T continue the university's tradition of connecting the campus and the community with business and industry leaders around the world. ✂



SDSM&T's Technical Assistance Program Launches Small Business to Success

Octa-Flex Environmental Systems captures national recognition

Octa-Flex Environmental Systems of Timber Lake, SD has come a long way since president Terry Gross contacted SDSM&T five years ago for technical assistance with a product he had invented. His start-up company has grown to twelve employees and now manufactures products that help protect ground water and the environment from contamination by pesticides, herbicides and other toxic chemicals.

After many years of owning and operating West River Aerial in Timber Lake, Terry Gross recognized in the early 1990's that growing demands for environmental safeguards would necessitate changes in his aerial spraying industry. He came up with the idea of a containment pad that would allow the toxic chemicals used in aerial spraying to be recovered in an environmentally prudent manner.

Gross received a patent for his design of an octagonal containment pad that allows aerial and ground sprayers the capability of parking on the platform while they change chemicals or rinse their equipment. The rinse water could be recovered and then reused or disposed of properly, thus preventing ground water or soil contamination. His first containment pad used a 50-foot diameter steel platform, which was susceptible to corrosion.

In 1993 Gross turned to SDSM&T to tap its technical assistance resources in developing a lighter, non-corrosive material for the pads and also in designing changes to make his invention more durable and environmentally safe. Gross teamed up with researchers through SDSM&T's Center for Innovative Technology and Enterprise (CITE), which was funded by the Governor's Office of Economic Development, for testing and development of his product.

Dr. Srinivasa Iyer, SDSM&T Professor of Civil and Environmental Engineering, supervised the research and testing to determine what type of composite materials should be used for the containment pad system. A strong supporter of furthering economic development in South Dakota, Dr. Iyer applied his extensive experience and expertise in advanced composite (fiberglass) materials.

A prototype of a fiberglass composite containment pad using marine plywood as the core material was developed in the Advanced Composites Laboratory on the South Dakota Tech campus. Load and leak tests were conducted on the prototype in both SDSM&T's lab and the field. The 22-foot diameter prototype built with composite materials was five times lighter than the original 50-foot steel pad and had nearly 95% fewer parts (reduced

from 638 to 35).

Based on the satisfactory test results and recommendations of SDSM&T's researchers, Gross decided to proceed with manufacturing the pads in Timber Lake. A \$20,000 loan from the Timber Lake and Area Development Corporation provided financial help with getting the manufacturing company started. "By selling their aerial application business, investing their life savings and borrowing additional money, Terry and his wife, Barb, have seen the project through." ("All Signs Are Go for Octa-Aqua-Flex," *Timber Lake Topic*, 6/27/96).

"This project could not have been possible without the help of your expertise in composites, SDSM&T and its facilities, and the Governor's Office of Economic Development..," stated Terry Gross in a September 14, 1994 letter to Dr. Iyer.

In 1995 Octa-Aqua-Flex Environmental Systems received a \$55,000 Small Business Innovation Research (SBIR) Phase I grant from the U.S. Department of Agriculture to develop smaller and more portable versions of the environmentally sound containment pad. Research from the SBIR award resulted in the design and testing of

three portable containment pad models that could be used by different types and sizes of spraying equipment: a semi-permanent system for golf courses and other places where the chemicals are handled at the same site; a large portable unit for larger commercial spraying equipment in the field; and a small portable unit for use with All-Terrain Vehicles for smaller spraying applications.

By scaling down the size of the original system to a 22 foot-diameter pad, the production costs were lowered and the chances of rainwater build-up on the collection deck were drastically reduced. A Phase II SBIR award was used to develop a portable containment system for the sprayers, mowers and other grounds maintenance equipment used by golf courses.

In 1995 the South Dakota Department of Agriculture implemented a rule requiring the use of containment pads by aerial sprayers, ground applicators, landscaping companies, golf courses and others who handle large amounts of pesticides, fertilizers and other toxic substances. Demand increased for the Octa-Flex containment system that enabled recovery of any spilled toxic materials that could then be either recycled or properly disposed. Sites where Octa-Flex containment pads have been installed include Onida, Mitchell, Timber Lake, Pierre and Mobridge.

The company has also developed other products that are being well received by the marketplace: 1) Octa-Hut & Solar Flex - a

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The aerial spray applicator's model of the Octa-Flex Environmental Systems containment pad developed as part of a USDA SBIR Phase II project.

Photo Courtesy of Octa-Flex Environmental Systems

stock tank cover that is made from composite materials coated to collect solar heat, which helps to keep the water in the rubber tire cattle waterers from freezing; 2) GPS Antenna Mount - a mount that allows aircraft used for agricultural spraying to utilize the Global Positioning System for greater accuracy in spraying the crops; and 3) Thermo-Pad - a mounting base for electric watering units for livestock that are made from advanced composite materials that are solar-coated to reduce energy costs in keeping the livestock water from freezing.

Octa-Flex Environmental Systems also has received funding from the Department of Defense for developing a portable washdown and decontamination system for the U.S. Marine Corps to clean its equipment before bringing it back to the United States from abroad. A prototype with a filtration system allowing the rinse water to be recycled was built under a Phase I grant. Marine Corps officials are so impressed with Octa-Flex's prototype that they have proposed bypassing the usual Phase II stage and move directly toward a production contract in which an initial order of forty units is expected.

To manufacture the portable washdown systems for the Marine Corps, Octa-Flex is planning to expand again. The rapidly growing company already occupies three buildings in the small, western South Dakota town of Timber Lake, located on the Cheyenne River Indian Reservation, which has one of the highest unemployment rates in the nation. With a current payroll of twelve employees, Octa-Flex plans to hire more workers as the marketing and demand for its products increases.

The company's success is a big boost to the vitality of Timber Lake's Main Street businesses. The jobs created by Octa-Flex are providing opportunities for individuals who otherwise might have

had to move away from the Timber Lake area to secure employment.

"We have a very competent staff who all feel that the relationship we have with the South Dakota School of Mines & Technology is an important part of our team effort," says Roger Lawien, General Manager of Octa-Flex Environmental Systems.

With thousands of farmers, commercial pesticide applicators, golf courses and lawn care businesses in the U.S. economy, Octa-Flex's market potential is enormous. The company also has significant export market potential, with some of its products

already sold to Canada, Brazil, Argentina and South Africa.

Octa-Flex Environmental Systems has also received national attention. The company was selected as a winner of the Small Business Administration's SBIR Tibbetts Award, which recognizes small

businesses that exemplify the business, economic and technological achievements of the SBIR program.

Octa-Flex's collaboration with SDSM&T demonstrates the potential for productive partnerships between the private sector and research institutions like the South Dakota School of Mines & Technology. Information about the technical assistance SDSM&T can offer business and industry can be obtained by contacting Julie Smoragiewicz, SDSM&T Director of University & Public Relations, at (605) 394-2554 (toll-free 800-544-8162) or via email: jsmora@silver.sdsmt.edu.

The success of this small business proves that SDSM&T's technical assistance produces real-world economic development results. South Dakota Tech's value-added research helps entrepreneurs like Terry Gross turn good ideas into reality create jobs in South Dakota. ✂

"We have a very competent staff who all feel that the relationship we have with the South Dakota School of Mines & Technology is an important part of our team effort," says Roger Lawien, General Manager of Octa-Flex Environmental Systems.



AWARD WINNING PROFESSOR PATENTS

Any "doubting Thomas" who questions the value of spending funds on scientific research obviously hasn't heard about research results at SDSM&T showing that junk car parts can be recycled into platinum. Two SDSM&T researchers have developed a patented process that recovers platinum group metals from used automobile catalytic converters in an environmentally friendly and metallurgically efficient manner.

Dr. Ken Han, SDSM&T Dean of the College of Materials Science & Engineering and Distinguished Professor of Metallurgical Engineering, developed the new recovery process for platinum group metals in collaboration with Dr. Xinghui Meng, who received his Ph.D. from SDSM&T in Materials Engineering and Science in 1991. A grant from the South Dakota Governor's Office of Economic Development provided the initial funding for the research project. SDSM&T holds two patents on the new process that are based on two earlier patents for extracting gold from ore without using cyanide.

Platinum, iridium, osmium, palladium, rhodium and ruthenium are considered strategic metals. These metals are used in multiple ways by various industries including the automobile, electrical and electronic, dental and medical, petroleum refining, and numerous chemical industries.

The United States currently imports more than 50% of its platinum group metals (PGM) and rhenium supply. Reducing the U.S. dependency on these imported strategic metals is very important, especially in view of the political and economic instability of major foreign sources such as Russia and South Africa. No platinum ore is mined in the U.S. except at Stillwater, MT. Another source of platinum group metals that is becoming increasingly important, especially in the United States, is the secondary source-scrap of ceramics/glass, electrical components and auto-exhaust catalysts.

If all platinum-group metals were to be recovered and recycled from available scrap, such as automobile catalytic converters produced in the U.S., the U.S. would become the world's largest platinum-group metal producing country. Approximately 45 million automobiles are scrapped worldwide every year, more than 15

million of which are junked in the United States.

Over 70% of the catalytic converters generated from these junked automobiles are currently exported. They are exported primarily because no large scale, environmentally safe and economical process is available in this country. In general there are three types of automobile catalytic



converters in terms of the PGM content. Grade 1 consists of 2200 parts per million (ppm) of platinum (Pt), 200 ppm of palladium (Pd) and 300 ppm of rhodium (Rd). Grade 2 has 1000 ppm Pt, 200 ppm Pd, and 100 ppm Rd; while Grade 3 consists of 875 ppm Pt, 250 ppm Pd, and 30 ppm Rd.

On the average a metric ton of each catalytic converter grade contains the following PGM values: Grade 1 - \$34,588; Grade 2 - \$16,023; and Grade 3 - \$13,667. These values are based on March 13, 1998, metals market prices of platinum at \$392/oz., palladium at \$264/oz. and rhodium at \$535/oz.

With approximately 700 catalytic converters producing one metric ton of materials, over 21,400 metric tons could be obtained from the 15 million autos that are junked annually in the United States. With a current average value of \$21,426 per metric ton for the three grade types (based on March 13, 1998 prices), over \$450 million worth of platinum-grade metals could be recovered from these used catalytic converters.

Because the platinum group metals are very inert, their extraction using the conventional *aqua regia* technology is very expensive-approximately \$600 per ton of catalytic converters on chemical consumption alone. The process suffers from severe acid corrosion problems and also from using a high percentage of the

acidic reagent, the solution used in a chemical reaction.

Researchers at the U.S. Bureau of Mines recently developed a hydrometallurgical process where cyanide is used in an autoclave at high temperatures and pressures. Despite having a relatively good metallurgical efficiency, the process suffers from using toxic cyanide as the major reagent, has a low recovery of rhodium, and has high consumption rate of the reagent.

The new technology developed by SDSM&T researchers is based on halogen salts in a confined vessel in the presence of ammonium salts, ammonia and oxygen. The major

The process recycles used catalytic converters to platinum-group metals.

advantage of this new technology over existing technologies is that the halogen-salt process is very effective in recovering rhodium as well as the other platinum group metals.

The SDSM&T process produces very clean solid residue and continuously recycles the chemicals and liquid in the system, thus negating the need to dispose of any liquid or gas. In addition to being much more environmentally friendly, this new process has much lower operating costs - only 1/3 as much as the existing technologies.

The SDSM&T process works not only for extracting PGM from catalytic converters and petroleum refining catalysts, but also for extracting gold from refractory gold ores and PGM from platinum bearing ores. The process is an extension of another process developed by SDSM&T for extracting refractory gold ores using ammonia.

After SDSM&T researchers discovered the process, additional testing with a high-temperature reactor was needed for a feasibility study. Former SDSM&T Vice President Dr. Bill Hughes (EE 49), President of Dakota Alpha Inc., a Rapid City based engineering firm, and SDSM&T jointly built a titanium reactor that is capable of handling 25kg of catalysts per

Over \$450 million worth of platinum-grade metals could be recovered from these used catalytic converters.

batch. Test results to date show better than 95% recovery of PGM from automobile catalytic converters and 98% recovery from refinery spent catalysts.

Although the initial test results have been very promising, additional equipment and testing are needed to further fine-tune the process for use by the private sector. Companies or individuals interested in participating in further research and development of this process can contact Dr. Han at 394-2342 or Dr. Hughes, Dakota Alpha Inc., at 348-7665.

The patents issued to Drs. Han and Meng represent a few of many that SDSM&T researchers have obtained over the years. Since the early 1980's, an average of one patent per year has been issued to SDSM&T scientists based on research conducted at the university. Several other patent applications by SDSM&T researchers are currently pending approval.

After the remaining R&D resources are secured and testing is completed, junked car parts can be turned into platinum in an environmentally safe and cost-effective manner. This cutting-edge research on the SDSM&T campus is producing real-world applications with tremendous market value. ✂



Dr. Kenneth Han was recently awarded The Society of Mining, Metallurgy, and Exploration (SME) Distinguished Member Award.

Museum of Geology Paleontologist Journeys to Antarctica

Fossils yield evidence that dinosaurs migrated across land bridge

From South Dakota to the South Pole, SDSM&T's paleontologists are unearthing important scientific evidence. Dr. James E. Martin, SDSM&T Museum of Geology Curator of Vertebrate Paleontology and Professor of Geology, recently took part in an expedition to Antarctica that found fossil evidence supporting the theory of an ancient land bridge connecting Antarctica to the Americas.

The expedition produced a very significant find - the tooth of an ornithomimid dinosaur. This prehistoric dinosaur tooth is the first such fossil ever found on the continent of Antarctica!

Some scientists believe that Antarctica may have once been connected to the Americas. The hadrosauroid fossil found by the joint U.S.-Argentine expedition could help confirm the scientific theories that migrating species once used an ancient land bridge between Antarctica and the Americas. This land bridge may have been used not only by dinosaurs but also by marsupial mammals in their emigration from the Americas to Australia via

Antarctica when the continents were closer together.

The dinosaur tooth was located in Cretaceous period sands approximately 66-67 million years old, which is about 1-2 million years before dinosaurs became extinct. The sands are deposited in shallow marine waters east of what was then land.

"This find allows us to paint a much fuller picture of what life was like in Antarctica at the time," said Scott Borg, National Science Foundation program manager for Antarctic geology and geophysics. "The climate was obviously very different when these animals lived. There must have been a lot of vegetation to support these large plant-eaters. The find implies a complicated and robust ecosystem."

Dr. Martin was one of only three U.S. paleontologists selected for the prestigious U.S.-Argentine expedition. He was selected for the field team because of his "expertise in marine reptiles, dinosaurs and mammals," according to Dr. Judd Case of St. Mary's College, Moraga, CA, who served as U.S. Chief Scientist for the

expedition. The third U.S. member of the expedition was Dan Chaney of the Smithsonian/National Museum of Natural History, who found the dinosaur tooth.

"Understanding the life and distribution of past animals gives us a perspective for understanding that of present and future animals, as well as humans," said Dr. Martin.

The National Science Foundation funded the participation of Dr. Martin and his U.S. colleagues in this project to explore the animals which existed at the end of the age of dinosaurs. Scientists from Argentina participating in the expedition included representatives from the National Antarctic Institute and the La Plata Natural History Museum in Argentina.

"The discovery of this duck-billed dinosaur in Antarctica adds credence to the theory that a land bridge once connected the Americas to Antarctica," said Dr. Martin. "Finding fossils in Antarctica similar to those we have unearthed in South Dakota is not only exciting but also enlightening about the possible migration patterns of these animals."

SDSM&T has a hadrosauroid dinosaur displayed on campus in the Museum of Geology that was found in Harding County in northwestern South Dakota. The ornithomimid tooth found in Antarctica is similar to the ones that Dr. Martin and other SDSM&T paleontologists have found in eastern Wyoming and northwestern South Dakota.

Advanced ornithomimids such as hadrosaurs are commonly found throughout the world, mostly in North America. Two hadrosaurs found in

*American and Argentinean scientists at plesiosaur site.
Pictured l to r: Dr. James E. Martin, Dr. Flavia Salani, Dr. Andrea Concheyro, Gaston Cornachione, and Hugo DeVido*



South America are from the very end of the age of dinosaurs, which further supports the theory that Antarctica was connected to South America at that time.

Members of the expedition also made other important paleontological finds in Antarctica. The three-inch bone of a bird, which was also found by Dan Chaney, is believed to be the oldest remnant of a bird ever found in Antarctica. Partial skeletons of giant marine reptiles called plesiosaurs and mosasaurs also were recovered. Some of these specimens include fossils of young plesiosaurs and mosasaurs, which are very rare in the fossil record, according to Dr. Martin.

Dr. Martin describes the collection of young plesiosaur and mosasaur fossils found by the expedition as rivaled only by the similar body of fossils collected by SDSM&T paleontologists along the Missouri River near Chamberlain. Sea life at the end of the dinosaur age was dominated by plesiosaurs and mosasaurs, which were giant, large-toothed marine reptiles. "These ferocious mosasaurs were top dog in the water," says Dr. Martin. "A T-Rex wouldn't stand a chance in the water against a mosasaur."

The shallow-water environment in both South Dakota and Antarctic regions suggests that these reptiles came into shallow water possibly to breed. The young probably stayed in the shallows until they were large enough to face the dangers of the open ocean.

How does searching for fossils in Antarctica differ from fossil expeditions in the Great Plains? A 3½ hour flight on a

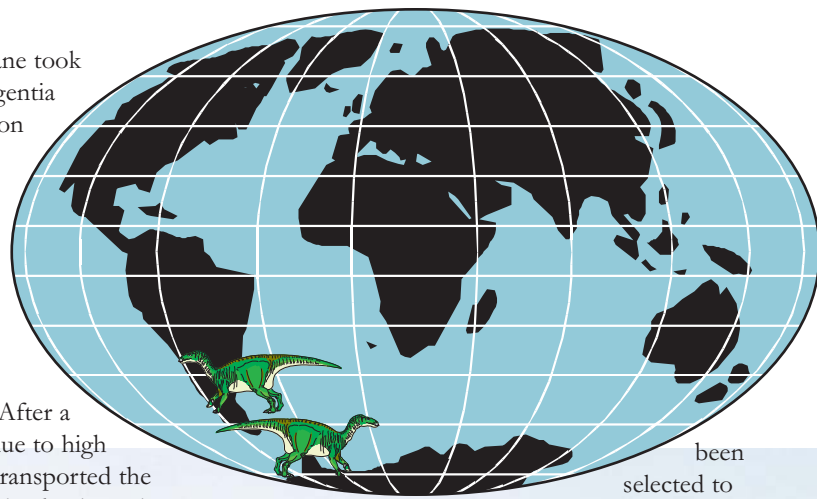
C-130 transport plane took the group from Argentina to Base Marambio on Seymour Island, where they were hosted by the La Plata Natural History Museum, Argentina's National Antarctic Institute, and the Argentine military. After a few days of delay due to high winds, helicopters transported the scientists to Vega Island, where they were dropped off with their expeditionary supplies and a two-way radio as their only means of communications with the rest of the world.

Dr. Martin visited Antarctica in January and early February, summer months with 22-23 hours of sunlight every day. Unlike South Dakota, the sun is always in the north in Antarctica. Some days the temperature did rise above freezing and on windy days, the wind sometimes blew so hard that icicles froze horizontally. Every day, Dr. Martin and his colleagues hiked over four miles round trip with a 2000-foot climb in elevation to reach the Sandwich Bluff area where they conducted their fossil search.

Icebergs provided their source of fresh water supply for cooking, drinking and cleaning. They used Mother Nature for their refrigerator, digging down to permafrost to bury their meat to prevent skua birds from getting at their food.

"Everything is bigger than life. Because there are no trees, it is very difficult to get a sense of scale," says Dr. Martin. "The scenery is nothing short of spectacular."

Dr. Martin returned to SDSM&T from Antarctica in mid-February and brought back several smaller fossils that Argentine officials agreed to place on loan with the Museum of Geology. Some of these will form the basis for an upcoming display at the Museum of Geology on the South Dakota Tech campus. He also has




been selected to participate in a second field session in Antarctica for this project in January and February of 1999.

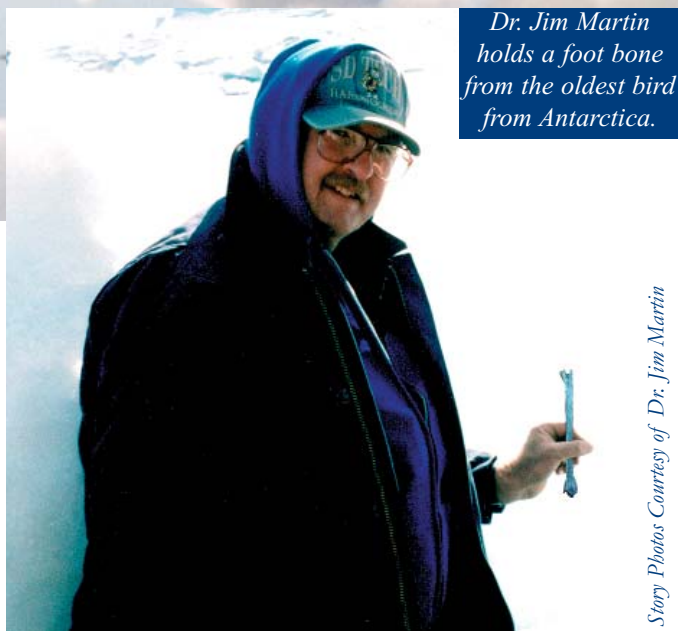
Individuals looking for an opportunity to participate in a fossil expedition need not travel to Antarctica. Drawing on their

"Finding fossils in Antarctica similar to those we have unearthed in South Dakota is not only exciting but also enlightening about the possible migration patterns of these animals."

- Dr. Jim Martin, SDSM&T Museum of Geology Curator of Vertebrate Paleontology and Professor of Geology

wealth of experience in field paleontology, Dr. Martin and his colleagues at the SDSM&T Museum of Geology lead field expeditions each summer that draw participants from around the country. (See page 23 for a listing of the field digs being offered this summer.)

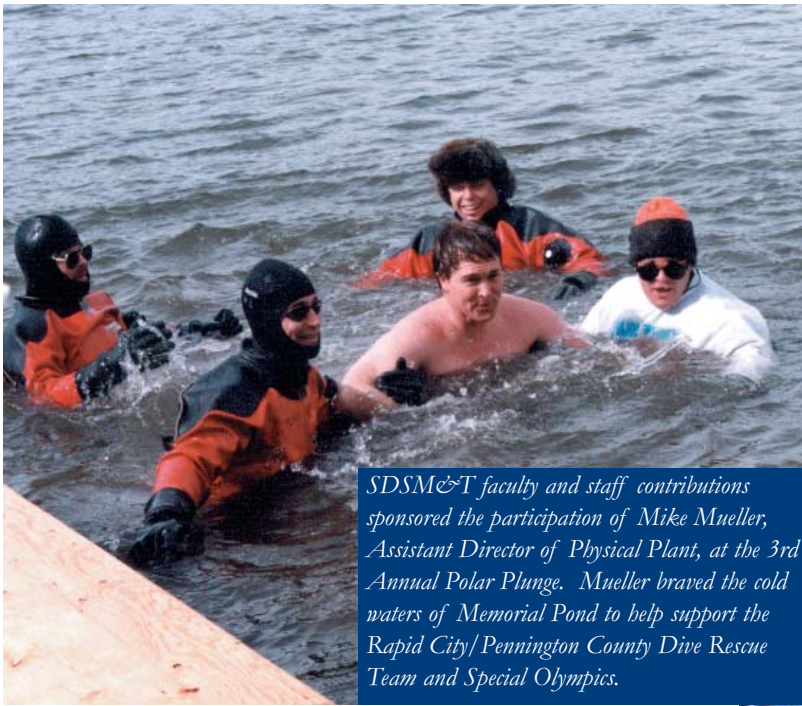
SDSM&T paleontologists are known nationally and internationally for their expertise. Dr. Jim Martin and his colleagues are making important paleontological connections between the far away continent of Antarctica and the lands of western South Dakota. 



Dr. Jim Martin holds a foot bone from the oldest bird from Antarctica.

Story Photos Courtesy of Dr. Jim Martin

Photo by Joyce Comfort



SDSM&T faculty and staff contributions sponsored the participation of Mike Mueller, Assistant Director of Physical Plant, at the 3rd Annual Polar Plunge. Mueller braved the cold waters of Memorial Pond to help support the Rapid City/Pennington County Dive Rescue Team and Special Olympics.

Photo by Darrell Sawyer



SDSM&T REACHING OUT

The active participation of the South Dakota Tech family - students, faculty, staff and friends of the university - connect the campus to the community through a wide range of programs and activities.



Photo by Darrell Sawyer



Josiah and Andrew LaFrance intensely look on as Paul Oien (Mechanical/Civil Engineering double major senior) tests a bridge built by area junior and senior high school students during SDSM&T Engineers Week.



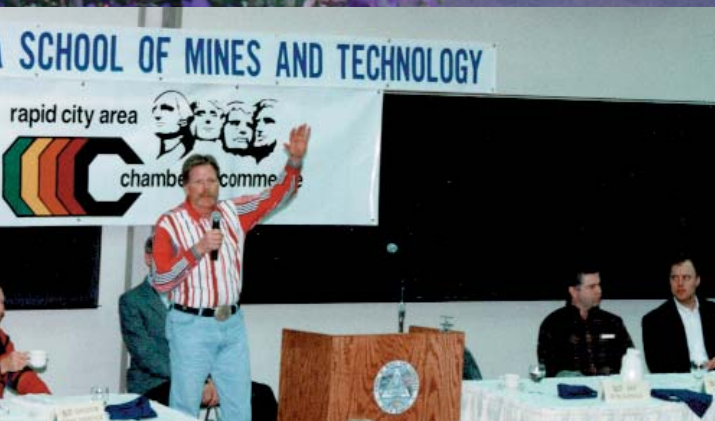
Dan Warren, Chairman of the Board, Rapid City Chamber Legislative Crack



Phil Huebner, Director of Scientific Knowledge for Indian Learning and Leadership (SKILL), dazzles curious students with the wonders of technology at the South Dakota Future Fair Education Day. SKILL also co-hosted the NASA displays exhibited at Future Fair.



Photo by Laurel Fouist



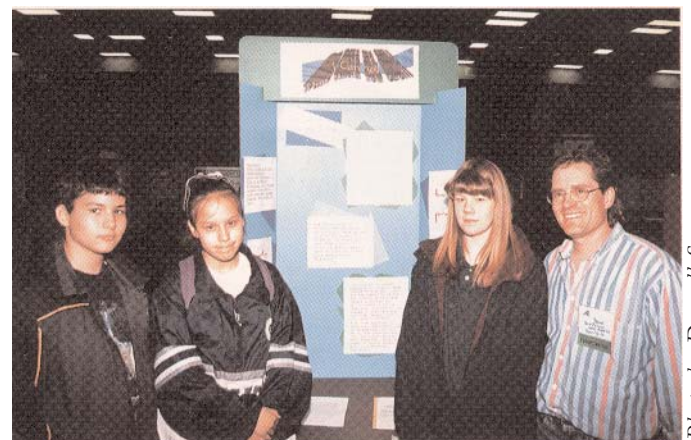
Rapid City Area Chamber of Commerce, addresses attendees at one of the 1998 cyberbarrel sessions held on campus.

Photo by Darrell Sawyer



SDSM&T international students introduce area students to the cultural diversity of the world through displays and food.

Photo by Darrell Sawyer



SDSM&T hosted the 1998 American Indian Science and Engineering Society (AISES) National Science Fair.

Photo by Darrell Sawyer

O'Harra Stadium Celebrates 60 Years of Athletic Competition

Thanks to the vision and perseverance of former president Dr. Cleophas O'Harra, the stadium and field named in his honor has been serving the university and area schools for sixty years.

Even before O'Harra Stadium was built, the South Dakota School of Mines was actively involved with hosting track meets for area high schools. In 1920 the school sponsored the first of 13 annual field and track meets for west river high

(November 1967 *Hardrock*), "the field...was the location of "Hop" Roberts' pig feeding area-their feed being garbage from Rapid City-with the tin cans building up year after year. One afternoon Gail and I looked the area over. I stepped off in Boy Scout fashion what I thought would make a football field. Among the four-foot weeds, we stuck in laths with a white cloth tied to the end of each. Then we climbed Smelter Hill and from this spot we thought we saw this football field with a track...We

suggested to Dr. O'Harra that we hold a field day for both faculty and students, and this we organized. That day they moved a mountain of cans, slag, brush...and filled the ponds." (*SDSM&T Centennial: An Illustrated History, 1885-1985*, pp. 54-55)

With the help of Works Project Administration (WPA) laborers and a \$50,000 WPA grant, development continued from 1932 through 1936. The Alumni Association raised the remaining funds to finish the field by contacting the school's 750 alumni through meetings held in 26 alumni regions around the country. With the successful fundraising drive, the \$132,000 O'Harra Memorial Stadium was dedicated on September 16, 1938.

Black Hills businesses and government agencies also provided valuable help in completing the stadium field. Northwestern Railway Company donated cinders for the track and Homestake Mining Corporation gave 4,000 feet of cable for a running track fence. The Forest Service allowed timber to be harvested from the Black Hills National Forest for guard railings and posts. Government officials authorized limestone to be quarried from federal land for "rip-rapping the upper tier" of the stadium field.

Surrounded on three sides by a natural

From 1931...

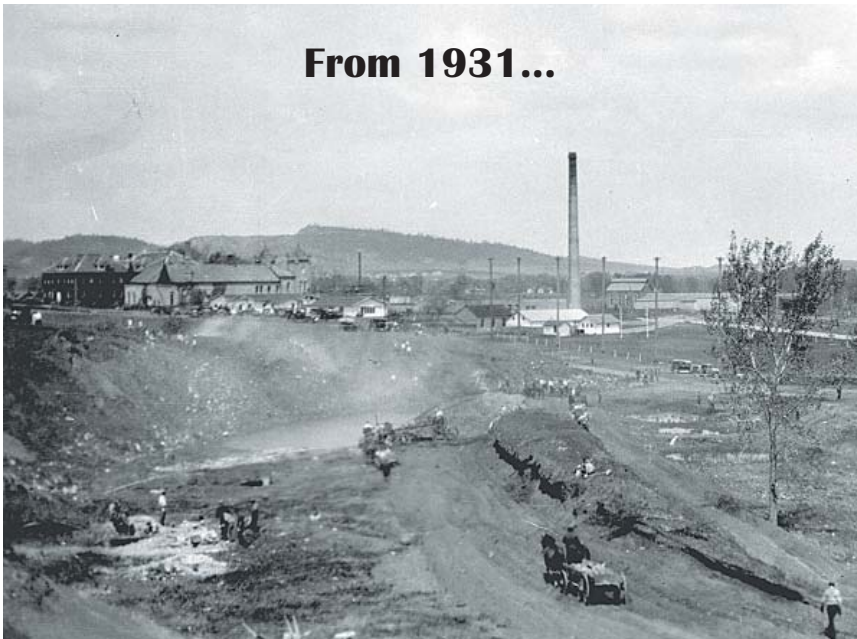


Photo Courtesy of SDSM&T Alumni Services

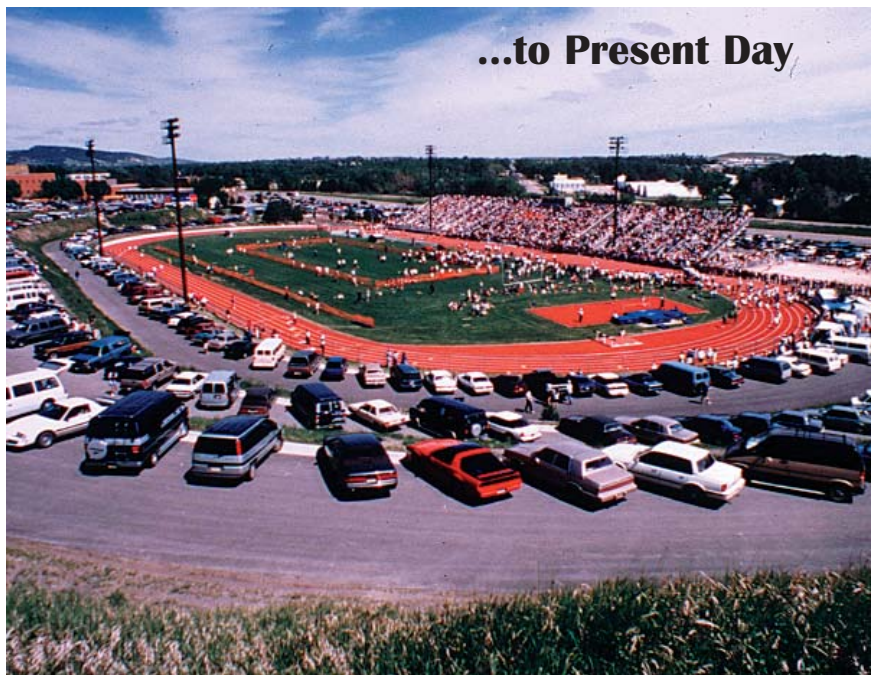
schools with a quarter-mile cinder track and a 120-yard straight-away.

Although the building of a gymnasium in 1928 fulfilled part of President O'Harra's plans for the school's athletic development, he also envisioned an athletic field and a stadium. The School of Mines obtained an open area southeast of the campus in 1930 and began work on clearing the land.

Sigma Tau fraternity pledges mapped the land and designed improvements for developing the field. President O'Harra declared a campus holiday on May 18, 1931, for students to bring their tools and work on leveling the land. By the end of the day, the students had leveled the land enough so that work could begin on building the stadium. Good soil was hauled to the campus and slag (residue from smelting mineral ores) was used to fill the excavation site.

According to Guy March's recollection

...to Present Day



File Photo

(continued on page 17)

John Vucurevich Generosity Benefits SDSM&T Students

Few persons exemplify the spirit of philanthropy better than John T. Vucurevich. SDSM&T and its students have benefited greatly from this man's generosity - from both his personal gifts and a challenge grant from the John T. Vucurevich Foundation.

Photo Courtesy of John Vucurevich



Engineering senior, Rapid City) and Allen Wilaby (Computer Engineering junior, Rapid City) - receive John T. Vucurevich Scholarships. His latest gift will substantially increase the number of awards available to local students.

"This scholarship has been a real blessing to me and has helped a tremendous

amount," said current recipient Kelli Hoback. "It is tough to be a full-time student, married and the father of three children. This scholarship has relieved a lot of the financial pressure."

John's support of scholarships and the Vucurevich Foundation Challenge Grant personify his basic moral and ethical standard--to help others help themselves," said Rod

"This scholarship has been a real blessing to me and has helped a tremendous amount," said current recipient Kelli Hoback. "It is tough to be a full-time student, married and the father of three children. This scholarship has relieved a lot of the financial pressure."

Pappel, SDSM&T Foundation President. "His scholarship program is already benefiting local students in continuing their education. The Foundation's challenge grant helped enlist new contributors that will greatly help achieve our institutional goals."

In his address to the graduates at SDSM&T's 1992 winter commencement, John Vucurevich advised the students to set their values wisely and then have the courage to act on those values when making decisions in their spiritual, professional and personal adventures through life. "Remember truth, hard work, a kind heart, and sound spiritual values will carry you through the ups and downs that we are all subject to as we walk through our lives," said Vucurevich.

To obtain information about applying for one of the John Vucurevich Scholarships at SDSM&T, students are encouraged to contact the SDSM&T Enrollment Management Services Office at (605) 394-2400 or toll-free, 1-800-544-8162.

Quarterly 15 SDSM&T



Did you know.....

- The first licensed radio station in South Dakota-WCAT- was established on the South Dakota School of Mines campus in 1911 under the direction of the Physics Department.
- Astronaut Frank Borman, who spoke at the 1970 dedication of the Devereaux Library, was offered an honorary doctorate of engineering degree by twenty other institutions but chose to receive his first such degree from SDSM&T.
- The first School of Mines football team had no uniforms or helmets and let their hair grow long for protection in their first game against Black Hills College at Hot Springs in November, 1895. The Black Hills Weekly Journal called them "the long-locks."
- Governor M.Q. Sharpe signed a bill in 1943 changing the institution's name from the South Dakota School of Mines to the South Dakota School of Mines and Technology.
- The School of Mines mascot in 1912 was Mucker the cat.

Photo Courtesy of SDSM&T Archives



Mucker the cat

GOVERNOR'S ECONOMIC CLASSROOM FOSTERS COLLABORATIVE TEACHING AND LEARNING

When the Governor's Electronic Classroom was established on campus earlier this year, SDSM&T hit the ground running and immediately started putting the new facility to good use. The state-of-the-art classroom with its interactive instructional technology links SDSM&T students and faculty to networked off-campus resources.

The Governor's Electronic Classrooms (GEC) were established at each of the six public universities in South Dakota's higher education system this year. In a dedication ceremony last January that electronically linked the six university campuses, Governor William J. Janklow spoke from the Capitol in Pierre and participated in the electronic ribbon cutting of the new system.

After envisioning the idea of high-tech classrooms in the state's public university system, Governor Janklow worked with Dr. Robert "Tad" Perry, Executive Director of the South Dakota Board of Regents, to make the cutting-edge classrooms a reality. The GECs are the beginning of a new era in public higher education in South Dakota.

"These are innovative steps that allow us to do more with less," said Regent Pat Lebrun of Rapid City during the ribbon-cutting ceremony of SDSM&T's classroom. "We are ready to move into the next century."

The classrooms are designed to foster innovative teaching methods utilizing collaborative, inquiry-based learning. The GECs were not designed to be large lecture halls or traditional computer labs where students work independently. Instead, the GECs facilitate group-based, cooperative learning by students working together in teams on assigned projects.

The Governor's Electronic Classrooms feature PictureTel, interactive two-way audio and video. All of the workstations in each GEC are wired to allow simultaneous access to the Internet with a high-speed connection. Access to resources and guest speakers not available on campus is only one of the benefits that the electronic or "smart" classrooms offer students. In addition to hands-on use of new technology, students gain valuable experience with group-based collaborative learning.

The GECs enable South Dakota's six public universities to share instruction and faculty expertise. This inter-institutional collaboration provides students with access to low demand courses that otherwise might not be offered on their campus during a particular semester. For example, a physics class that does not meet the minimum enrollment

standards to be offered every semester is still be available to an institution's students through electronic access to the course being taught at another public university in the South Dakota. The GEC's technology enables students at SDSM&T taking the physics course to interact via PictureTel and computer workstations with the professor located at SDSU and with other students at USD or another institution.

This is a win-win situation for students, faculty, universities and South Dakota taxpayers. Access to low demand courses through GEC can prevent unnecessary delays in a student's graduation time frame. Faculty

"These are innovative steps that allow us to do more with less," said Regent Pat Lebrun of Rapid City during the ribbon-cutting ceremony of SDSM&T's classroom. "We are ready to move into the next century."

members receive opportunities to teach some courses they otherwise might not have had because of the minimum enrollment thresholds for undergraduate and graduate courses. By collaborating to share resources, South Dakota's six public universities can make their budgetary dollars stretch even farther and also enhance the level of instructional offerings at the same time.

South Dakota high school students and K-12 teachers also can take courses via the GEC for dual credit and continuing education. Thus, the GECs offer increased distance education opportunities for rural South Dakota. Earlier this year Creative Writing students from Britton High School interviewed author Virginia Driving Hawk Sneve of Rapid City by being linked electronically to SDSM&T's PictureTel technology.

The return on investment in the new classroom at SDSM&T is already quite evident. The GEC classroom is available for use at SDSM&T from 8:00 a.m. until 9:00 p.m. Monday through Friday. SDSM&T's "smart" classroom is averaging 42 hours of use each week, which means the GEC is already booked 65% of the available time. This is an impressive figure considering the new classroom has only been fully operational for three months!

"We expect that figure

to be even higher next year," says James R. Hartman, SDSM&T Systems Programmer. "By the fall semester, the classroom could be booked over 50 hours per week."

SDSM&T faculty and students are utilizing the GEC technology and equipment for a variety of teaching strategies, including large screen presentations of program modeling and videotaping of presentations by both students and instructors. The interaction between faculty and student via the Link System allows the instructor to review the student's activities on the PC, modify the content, and then display the changes to other students in class.

The private sector is also recognizing the cost-effectiveness of using the GEC to recruit SDSM&T students and conduct interviews via PictureTel. For example, Howmet, a Wichita Falls, TX company, recently leased the GEC for three one-hour sessions to interview SDSM&T metallurgical engineering students. Renting the PictureTel equipment for \$100/hour is considerably less expensive than sending recruiters to SDSM&T for on-campus interviews or paying the travel expenses for students to make on-site visits to the company.

The electronic classroom is being used by a wide variety of classes and also is fostering partnerships with other institutions. For example, South Dakota State University (SDSU) uses the "smart" classroom at SDSM&T to teach nursing classes to students on the Pine Ridge Indian Reservation.

As use of the interactive instructional technology continues to increase, so does SDSM&T's collaboration with its sister institutions in South Dakota. Thanks to the Governor's Electronic Classroom, the SDSM&T campus and South Dakota's university students are connected electronically to one another and also to the outside world. ✂



Ribbon cutting ceremony introducing Tech's electronic classroom.



Meet Our Alumni

1998 Outstanding Recent Graduates

Five SDSM&T alumni were honored as Outstanding Recent Graduates during a recent Engineers Week luncheon on the SDSM&T campus. The Outstanding Recent Graduate Program was established to honor SDSM&T graduates who, within 10 years of graduation, have achieved exemplary career progress. The recipients are considered excellent role models for current students. The 1998 honorees are:

Susan K. Burnet - Electrical and Computer Engineering: After graduating from SDSM&T in 1987, Susan (Janovy) Burnet (EE) worked for Alcoa as a Project Engineer in Davenport, IA. She and her husband then started their own company, IMS, which is the leading supplier of equipment for measuring on-line, real-time, profile, thickness, flatness, width, contour, and shape of flat and tubular products for the steel and aluminum industry.

Timothy R. Harter - Mining Engineering: During the past ten years, Tim Harter (MINE '87) has held many positions in engineering and management. He has been directly involved in start-up operations at four underground mines and one mill, which resulted in his becoming the youngest manager in Nevada. The backfill techniques he pioneered are currently in use at the major underground mines in Nevada.

Andrzej (Andrew) Kaczmarek - Geological Engineering and Mechanical Engineering: An engineer with Shell Oil

Company in New Orleans, Andrew, a native of Poland, has made significant advancements to Shell Oil Company's technology of developing oil and gas fields. Responsible for the design and construction of drilling and production systems totaling \$50 million, he also has helped contribute to the success of four \$1 billion Tension Leg Platforms.

Byron E. Wolf - Chemical Engineering: Byron E. Wolf (Chem E '87) has spent his entire career with Dow Corning in Midland, MI. His positions have included engineer, development engineer, design engineer, senior chemical engineer and development specialist. Currently designated as Product Steward, he has become the "voice of the customer" within Dow Corning for the silicone elastomer medical materials product line.

Jeffrey E. Shield - Metallurgical Engineering: Jeffrey Shield (Met '87) has been very successful in teaching, research and outreach at the University of Utah. His research specialties include the microstructural development of materials during processing, with a teaching emphasis in the characterization of materials. He has developed a course to introduce engineering to freshman students to increase retention rates and also has been a leader in outreach efforts to area high schools. (Jeffrey was unable to attend due to a winter storm.)



Pictured l to r: Dr. Richard J. Gowen, SDSM&T President, Andrew Kaczmarek, Susan K. Burnet, Byron E. Wolf, and Timothy R. Harter, not pictured, Jeffrey E. Shield

O'Harra Stadium

(continued from page 14)

horseshoe bowl, the stadium field was based on a unique concept. Three terraces that were graded into the hill created parking spaces for 250 cars from which fans could watch the games. This increased the bleacher seating capacity for spectators.

"The natural bowl had been used for smelter slag, had served as a home for frogs and pigs, and it was a city refuse area for many years. The football field not only was a needed addition for the school, it also enhanced the aesthetic value of the landscape." (*SDSM&T Centennial: An Illustrated History, 1885-1985, p. 74*)

The Hardrockers won their first football game on O'Harra Field, played on the night the stadium was dedicated, by beating the South Dakota State Jackrabbits 18-7. The Hardrockers were one of only five teams in the nation that year with six straight victories.

Over the years O'Harra Field has hosted many football games and track meets for area high schools. That tradition continues today. Rapid City Central and Stevens High Schools both play their football games at SDSM&T. In addition, track meets for area junior high and high school teams are held each spring.

When the need arose for expanded seating and enhanced facilities to accommodate the crowds attending O'Harra events, the spirit of campus-community collaboration was vividly demonstrated. The \$1.8 million project modernized the O'Harra facilities and expanded the bleacher capacity to nearly 3,500 seats. This was accomplished through the participation of the Rapid City School District; State of South Dakota/SDSM&T; the City of Rapid City; SDSM&T Alumni; Rapid City Area Chamber of Commerce; Pennington County and the SDSM&T Foundation.

As a result of this joint campus-community endeavor, O'Harra Field will continue to host athletic events for area schools and SDSM&T for many years. As O'Harra Stadium marks its 60th anniversary of service, the support of students, alumni and community members in building and renovating this important facility serves as an inspiration for further collaboration between SDSM&T and the community to benefit future generations. ✂

Kennecott Contributions

Provide Internships, Scholarships, and Lab Improvements

A successful partnership with Kennecott Corporation is providing SDSM&T students with major scholarships and valuable internship experiences. Supporting scholarships for SDSM&T students since the early 1950's, Kennecott companies have donated recent gifts exceeding \$100,000 to Tech students and departments.

Two years ago Kennecott officials selected SDSM&T as one of seven key universities for scholarship and development support as part of the company's comprehensive recruitment program. The Kennecott Scholarship program's goal is to help provide a good pool of talented, well-educated students that are essential to the mining company's future.

In 1996 Kennecott Corporation awarded SDSM&T a \$14,000 scholarship package to fund four students - one each from the Mining, Metallurgical, Geology/Geological and Mechanical Engineering Departments - with a \$3,500 scholarship for their junior year. The first Kennecott Scholars selected were Nathan Chupka (metallurgical engineering), Ryan Hoel (mining engineering), Bruce Larsen (geology), and Justin Vig, (mechanical engineering).

Last year Kennecott Corporation provided SDSM&T an additional \$28,000 to fund four new Kennecott Scholars in their junior year and also renew the four scholarships awarded the previous year. The newly designated scholars were Angel Emerson, (geology), Andrea Gross (mining engineering), Terree Short (metallurgical engineering), and James Tremel (mechanical engineering).

In addition to \$7,000 in total scholarships over two years, Kennecott Scholars were each offered paid internships with one of Kennecott's mining company subsidiaries during the summers before both their junior and senior years. These internships provide SDSM&T students with hands-on, real-world work experiences that make them well-prepared for private sector employment when they graduate.

Last summer Ryan Hoel worked as a paid intern at Kennecott's Spring Creek Coal operation in Decker, Montana. Ryan, a senior majoring in mining engineering, already has a job offer from Spring Creek when he graduates from SDSM&T this spring. "The scholarships help students financially get through school and the internships give us a head start in developing the work skills to succeed in our chosen field of work," says Ryan Hoel. "It is a win-win situation for both the students and the companies." Other Kennecott Scholars had internships at Cordero Coal, Gillette, WY; Rawhide Mine, Fallon, NV; and Barneys Canyon Mine, Utah Copper Mine, Utah Copper Concentrator, and Utah Copper Power Plant, Salt Lake City, UT.

"Kennecott provided these gifts to help ensure that SDSM&T continues its tradition of excellence in education. Our partnership with SDSM&T is helping to foster talented students with the skills and knowledge necessary to meet the mining industry challenges of the 21st century," said Steve Carlisle, Human Resources Manager, Kennecott's Spring Creek Coal Company.

In addition to the scholarship support, Kennecott awarded SDSM&T a \$50,000 Program Development Grant, one of only two in the nation. This grant recognized SDSM&T's importance to Kennecott's university relations and recruiting strategy. SDSM&T departments are using the Kennecott grant to leverage an additional \$150,000 in funds for laboratory improvements and outreach programs. This represents a combined total of \$200,000 in program development support for SDSM&T.

The funds leveraged with the Kennecott grant are providing opportunities for SDSM&T's Mining, Metallurgical, Mechanical and Geology/Geological Engineering Departments to acquire state-of-the-art laboratory equipment for undergraduate education and research. The grant also will enhance SDSM&T's educational outreach programs to area high schools.

"Kennecott's generous support reflects our national reputation

"The scholarships help students financially get through school and the internships give us a head start in developing the work skills to succeed in our chosen field of work," says Ryan Hoel. "It is a win-win situation for both the students and the companies."

as a top-notch science and engineering university. SDSM&T offers the disciplines and the type of quality graduates that Kennecott is seeking," said Dr. Richard Gowen,

SDSM&T President. "Our productive partnership with Kennecott is marking a new level of educational excellence."

Many SDSM&T graduates are employed by Kennecott companies, including Pierre native Lyle Randen (ChemE 71), general manager of Kennecott's Spring Creek Coal Company. Duff Erickson (MinE 55), SDSM&T Alumni Director, is a Kennecott retiree who came back to SDSM&T while working for Kennecott to recruit students for mining careers.

Many other ties exist between Kennecott and SDSM&T. For example, the Dale & Diede Scholarship at SDSM&T was established by former Kennecott employee Marshall Dale (MinE 43) and his sister, Norma Diede, in memory of their brother, Norton Dale (MinE 41) who was killed during World War II. Dave Ridinger (MinE 51), a native of Onida, SD and a past Guy March Silver Medal recipient from SDSM&T, worked for a Kennecott subsidiary, Braden Copper Company in Chile, after graduating from SDSM&T.

A recent corporate restructuring dissolved the parent corporation that sponsored the SDSM&T scholarships. Kennecott Energy, Kennecott Minerals and Utah Copper are now separate entities. Kennecott Energy has generously agreed to fulfill the 1998-99 academic year scholarship commitments previously made by its parent corporation.

With the support of corporate partners like Kennecott, SDSM&T continues to build on its traditions of excellence by offering students a cutting-edge curriculum with modern laboratory equipment. By partnering with corporations like Kennecott, SDSM&T is producing graduates with the skills and training to meet the industry's needs in the 21st century. 



Ryan Hoel at the Spring Creek Mine during his summer internship.

Photo Courtesy of SDSM&T Foundation

PERSONNEL *Changes*

WELCOME:

Casey Allen, Integrated Mfg Specialist,
Mechanical Engineering

Terry L. Horton, custodial worker, Physical
Plant

Michael A. Johnson, custodial worker,
Surbeck Center

James Miller, Associate Professor, IAS,
non-unit faculty

Qixu Mo, IAS, Research Scientist I

Ronald Richards, Athletics, Assistant
Professor/Head Football Coach

Sherrill A. Selwyn, custodial worker,
Physical Plant

Mary Shields, Financial Aid Assistant,
Enrollment Management Services

Norma J. Stead, Custodial Worker,
Residence Life

DEPARTMENT/CLASSIFICATION CHANGES:

Vickie Bender, Software Development
Manager, from CSA to Exempt

Rita Sabe, Secretary, transferred from Math
to CAMP (1/2 time Industrial Engr. & 1/2
time CAMP)

Bryan Schumacher, Asst. Director,
Computer Networking Services, from CSA
to Exempt

Gary Swanson, Physical Plant, from
custodial worker to custodial crew leader

David Turner, High Plains Center,
Programmer Analyst to Sr. Programmer
Analyst

RETIREMENT:

Robert (Bob) Cecil, CSA, Physical Plant
(21 yrs of service)

Patricia Mason, CSA, Instructional
Technology Services (11 yrs of service)

CAREER SERVICE AWARDS:

(Years of service to SDSM&T)

Helen Birkholz, Grad. Ed & Spon.

Programs (30); **Renae Bringolf**, Physical
Plant (5); **Gerald Chaney**, Physical Plant

(10); **Kathy Crawford**, Enrollment Mgt

Services (15); **G. Jean Eatherton**, Office of
the President (10); **Mark Erbe**, Physical

Plant (5); **Joyce Godfrey**, College of

Interdisciplinary Studies (20); **Kathy**

Herting, Residence Halls (10); **Neal**

Hodges, Instructional Technology Services

(20); **Lori Hodgin**, Athletic Department

(10); **John Lofberg**, Office of Vice President

(5); **Donald Myhre**, Physical Plant (5);

Steven Phelps, Physical Plant (5); **Deb**

Rowse, Business Office (15); **Gayla Schlei**,

Residence Halls (10); **Vi Stoltz**, Office of

Vice President (10); **Carol Stork**, Business

Office (10); **Deb Tompkins**, Mechanical

Engineering Dept. (10); **Arlene Wilkerson**,

Residence Hall (10); and **Deb Zeidler**,

College of Interdisciplinary Studies (5).

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Scholarships Encourage South Dakota's Best and Brightest to Stay in State

The Joseph F. Nelson Endowment Fund at SDSM&T provides very important institutional scholarships that help to recruit and retain some of SDSM&T's best and brightest students. Each year a SDSM&T student is selected as a Nelson Outstanding Scholar with the recipient alternating between a graduate and an undergraduate student. This honor includes a \$5,000 scholarship award plus tuition and fees.

Established in 1995 through an estate bequest, the Joseph F. Nelson Endowment Fund was SDSM&T's first million dollar gift. In addition to the Nelson Outstanding Scholar, twelve \$2,000 scholarships also are awarded every year. The balance of the endowment's annual earnings funds research projects at SDSM&T.

Born in the Custer area, Nelson graduated from Black Hills Teachers College (now Black Hills State University) in 1927. After teaching high school and serving as school superintendent at Faith, SD, Nelson earned a M.S. in Chemistry from the University of South Dakota and a Ph.D. in Organic Chemistry from Iowa State University. He then went to work for Esso Research & Engineering Company

"Definitely visit the campus," says Borge. "I was only half considering coming to Tech until I visited the campus, but a single afternoon here changed my whole outlook on the school. Since then, I have never regretted coming to Tech."

(EXXON) in New Jersey, where he conducted research on making synthetic rubber by drying oils, resins, chemicals and other petroleum products.

During World War II, Dr. Nelson was chairperson of the Rubber Reserve Committee on Specification for the Raw Materials and Analytical



Nelson Outstanding Scholar, Brandon Borge, a ChemE junior from Aberdeen, adjusts the values on equipment in the Chemical Engineering lab.

Photo by Darrell Sawyer

Procedure for making butyl rubber. He also was the inventor and co-inventor of 81 U.S. patents on chemicals, rubber and detergents made from petroleum.

"Dr. Nelson's wonderful generosity is providing much-needed support for both student scholarships and research," says Rod Pappel, SDSM&T Foundation President.

The first Nelson Outstanding Scholar at SDSM&T was named for the 1996-97 academic year. Travis Christopherson, a graduate student in Chemistry from Rapid City, received this prestigious designation that included a total scholarship package representing an approximate \$10,000 value.

Brandon Borge, a junior Chemical Engineering major from Aberdeen, is the 1997-98 Nelson Outstanding Scholar. His

student projects to date include designing a heat exchanger and a triple-effect evaporator to determine certain effects based on given design parameters.

Brandon also is one of several Mickelson Scholars at SDSM&T. This scholarship was awarded to South Dakota high school seniors whose ACT test scores were in the top 1% of the state. Upon graduating from Aberdeen Central High School, he was considering attending the University of Minnesota or Iowa State University.

What prompted Brandon to decide to attend SDSM&T instead of an out-of-state institution? The Mickelson Scholarship was a major factor in his decision to attend a university in South Dakota because he realized he could obtain the same high quality of education at SDSM&T as an out-of-state institution and also

graduate debt-free.

A campus visit was the other deciding factor in Brandon's decision to attend SDSM&T. He liked the open, peaceful atmosphere of the South Dakota Tech campus, especially compared to the urbanized setting of the University of Minnesota.

The Admission Office staff at Tech also impressed him. "They called me several times and treated me like an individual person," said Borge. "At the other larger institutions, nobody knew who I was. I was just a number to them." He also heard positive comments about SDSM&T from his father, who is principal at Warner High School, about Aberdeen area students who were glad they had gone to South Dakota Tech.

What advice does Brandon offer high school students who are trying to decide where to go to college?

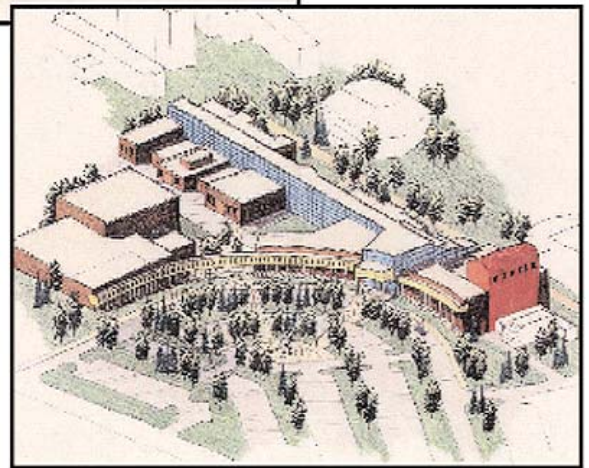
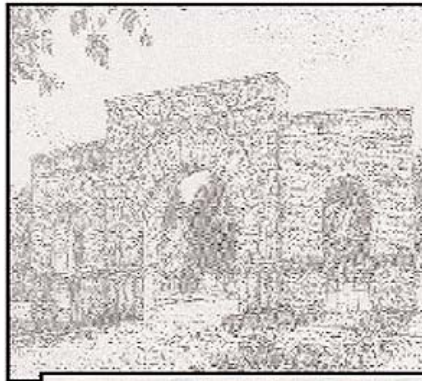
"Definitely visit the campus," says Borge. "I was only half considering coming to Tech until I visited the campus, but a single afternoon here changed my whole outlook on the school. Since then, I have never regretted coming to Tech."

SDSM&T students have received numerous other prestigious national scholarships. For example, last year Michael Connell, a metallurgical engineering major from Rapid City, and Christin Sjomeling, a chemistry major from Rapid City, were named Barry M. Goldwater Scholars.

SDSM&T offers many other scholarship opportunities for incoming and currently enrolled students. SDSM&T offers a scholarship package that totals more than \$332,000 in scholarships, federal and state grants.

The institution offers numerous scholarships to incoming freshmen with guaranteed renewable support for four years provided the recipient maintains a minimum 3.0 grade point average. In addition to four-year renewable scholarships, over 230 other scholarships-some with certain eligibility criteria and others that are unrestricted-are also available to incoming and returning South Dakota Tech students.

With gifts such as Dr. Nelson's generous estate bequest, the scholarship opportunities for undergraduate and graduate students at SDSM&T will continue to grow in the future. ✂



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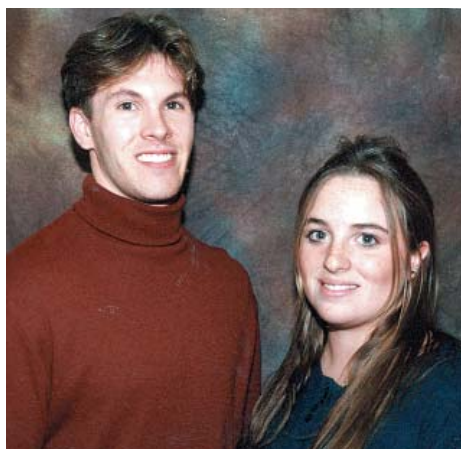
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CAMPUS BRIEFINGS AND RESEARCH

Dr. Sue Shirley, Assoc. Professor of English & History, and Barbara Dolan, Coordinator of Academic Support Development, recently made a presentation entitled "A Model for First-Year Mentoring: Changing the Culture of Advising" at the 17th Annual Conference on The Freshmen Year Experience in Columbia, SC.

Charlie Baker (Civil Engineering senior, Sturgis) won the annual photography contest sponsored by the ASCE Water Resources Planning & Management Division. His photo of the Oahe Dam last spring showing the emergency spillway releasing water will appear on the cover of the WRP&MD 25th Annual Conference Booklet.



Charles Cox (Mechanical Engineering junior, Yankton) and **Jennifer Trenary** (Civil Engineering junior, Rock Springs WY) were recently elected president and vice president of SDSM&T's Student Association. Their fathers are both SDSM&T alumni.

The Society of Mining, Metallurgy, and Exploration (SME) recently awarded **Dr. Kenneth Han**, Dean of SDSM&T College of Materials Science & Engineering and Distinguished Professor of Metallurgical Engineering, with its Distinguished Member Award. Only two other individuals in the nation were selected to receive this award, which recognizes SME members for their outstanding contributions to the technology or professional activities encompassed by SME.

Traditions of Excellence Awards: Joyce Comfort, University & Public Relations; Gayla Schei, Residence Life; and Marilyn Denison, Physical Plant; were named recipients of the Traditions of Excellence Award respectively for January, February and March. TEA recognizes career service employees for their outstanding service to SDSM&T.

South Dakota Space Grant Consortium Scholar **Trevor Davenport**, (M.S. Geology graduate student, Rapid City) co-authored a paper, "Geology and topography of Ra Patera, Io, in the Voyager era: Prelude to eruption" for the Geophysical Research Letters published in October by the American Geophysical Union. Principal author Paul Schenk was Trevor's advisor during a summer 1995 internship at the Lunar & Planetary Institute (LPI) and Johnson Space Center.

Dr. Robb Winter, R.L. Sandvig Professor of Chemical Engineering, is assembling an Interfacial Force Microscope on the SDSM&T campus, which will be the fifth such system in the world. Capable of probing the nanomechanical and chemical properties of materials with nanometer resolution, this special microscope is funded through the NSF Major Research Initiative on which Drs. Jon Kellar, Robert Corey, David Dixon, Edward Duke, Kenneth Han, Christopher Jenkins, Lidvin Kjerengtroen, Andrew Rogerson, and Robb Winter were Co-PI's.

Dr. Roger Opp, Professor of Mathematics, Computer Science and Computer Engineering, was recently inducted into the SDIC Hall of Fame. He served for many years as SDIC secretary-treasurer and as Tech's faculty representative at SDIC meetings. Dr. Opp has served at approximately 700 total consecutive games with either scoreboard or scorebook duties.

The American Society of Civil Engineers (ASCE) and Master Builders, Inc. have selected **SDSM&T to host the 11th Annual ASCE/MBT National Concrete Canoe Competition** June 18-20, 1998. The event is expected to draw 650 people from across the nation to the Black Hills.

Dr. Jon Kellar, Associate Professor of Metallurgical Engineering, was organizing co-chairman for the Engineering Foundation Conference "Surface Characterization of Adsorption and Interfacial Reactions II" held January 11-16 in Kona, Hawaii. The 1998 conference drew participants from 15 different countries and was supported by industry, the National Science Foundation and the International Association of Colloid and Interface Scientists.

Three members of the South Dakota Tech football team have been selected as **NAIA Football All-American Scholar Athletes**. Chosen to the team from SDSM&T were **Jim Lang** (Chemical Engineering junior, Omaha), **Mike Podraza** (Chemistry junior, Hitchcock), and **Jason Alcorn**

(Metallurgical Engineering senior, Hay Springs NE).

Dr. Michael Day, Associate Professor of English, presented a paper on preparing English classes for work on the Internet during the 87th Annual Convention of the National Council of Teachers of English (NCTE) held recently in Detroit. As chair of the NCTE Assembly on Computers in English (ACE), Day also ran the ACE Software Center, led the ACE Roundtable meeting, and chaired the ACE workshop for 40 K-college English teachers at Univ. of Michigan/Dearborn.

SDSM&T's student team won **Honorable Mention** in the **Association for Computing Machinery (ACM) International Collegiate Programming Championship** held recently in Atlanta, GA. Only the top 162 students qualified for the ACM World Finals out of 3,750 students from 700 universities around the world who competed in regional contests. SDSM&T team members were **Ed Mandy** (Comp.Sci. senior), **Ben Sutter** (Comp.Sci. M.S. graduate student) and **Rune Torgersen** (Comp.Eng. senior). Team coaches were **Drs. Edwin Corwin** and **Antonette Logar**, Professors of Mathematics, Computer Science and Computer Engineering.

Dr. Venkataswamy Ramakrishnan, Distinguished Prof. of Civil & Environmental Eng., was awarded \$70,888 from the SD Dept. of Transportation for "Evaluation of High Performance Concrete in Four Bridge Decks as well as Prestressed Girders for Two Bridges." He also received \$15,000 from Research & Technology Corporation (prime sponsor: National Academy of Sciences, Dept. of Transportation) for "Evaluation of Basalt Fibers and Rods Used in Concrete."

Dr. Jan Puszynski, Prof. of Chemical Eng., and Co-PIs **Dr. Larry Bauer**, Prof. of Chemical Eng., and **Dr. David Dixon**, Asst. Prof. of Chemical Eng., have been awarded a \$150,000 grant from the National Science Foundation (NSF) for "Integration of Design Project and AspenPlus Process Simulator through 4-Year Undergraduate Chemical Engineering Curriculum."

Dr. Francine Campone, Assoc. Dean of Students, has been awarded a \$69,454 grant from Salish Kootenai College (prime sponsor: NSF) for "All Nations Alliance for Minority Participation - Bridge Program." Dr. Campone also was awarded \$79,995 by NM Highlands University (prime-NASA) for "AISTER - Year 4 Continuation Grant" and \$41,160 in

Museum of Geology Sponsoring Summer Field Digs

additional funds by NM Highlands University (prime-NASA) for the AISTEC Consortium.

Dr. Maribeth Price, Asst. Prof. of Geology, received \$82,300 from NASA for "Center for Excellence in Remote Sensing at SDSM&T."

Dr. Christopher H.M. Jenkins, Assoc. Prof. of Mechanical Eng., received \$30,000 in additional funds from the Jet Propulsion Laboratory (prime-NASA) for his project entitled, "Shape Control of an Inflated Circular Disk: Mechanics of Surface Precision."

Dr. Jon Kellar, Assoc. Prof. of Metallurgical Eng., received \$9,996 in additional funds from the NSF for "Research Experience for Undergraduates."

Dr. Mark Hjelmfelt, Chair and Prof. of Atmospheric Sciences, and **Dr. L. Ron Johnson**, Research Assoc. Prof. of Meteorology, were awarded \$24,600 in additional funds from the Univ. Corp. for Atmospheric Research for "A Proposal for the Investigation of Mesoscale Convective Systems over the Northern Great Plains and Mid-Mississippi Valley."

Dr. Robb Winter, Sandvig Prof. of Chemical Eng., received \$66,282 from the NSF for "REU Site: Molecular Level Modification of Surfaces."

NASA has awarded **Dr. Sherry Farwell**, Dean of Grad. Ed. and Research, and Co-PI **Dr. Paul Smith**, Research Prof. Emeritus of Meteorology, \$800,000 for the Upper Missouri River Basin Project.

Dr. Srinivasa Iyer, Prof. of Civil & Environmental Eng., has been awarded a \$43,922 grant from the SD Dept. of Transportation for his SD Local Transportation Assistance Program project.

Dr. Tom Propson, Prof. Emeritus of Civil Eng., has been awarded \$78,723 in additional funds from the U.S. Geological Survey for his project entitled "Water Resource Investigations and Research."

The SDSM&T Museum of Geology is sponsoring several field digs of important paleontological sites in the Black Hills region, along the Missouri River, and in the Pacific Northwest. The public can participate in these field digs on a limited, space-available basis. Participants will be in small groups working closely with the involved scientists. The field digs may also be taken for academic credit.

Officials from the SDSM&T Museum of Geology will be conducting scientific excavations for Jurassic Dinosaurs and Mammals; Late Cretaceous Dinosaurs; Miocene Vertebrate Mammals; Late Cretaceous Marine Turtles, Mosasaurs, and Plesiosaurs; Giant Pigs and Rhinos in Badlands National Park; Pleistocene Mammals, Fish and Birds; and many other fossils.

Following is a description of the various field paleontology sessions being offered this summer by Tech's Museum of Geology:

MAY 11 - 22 Fossil Lake, Oregon Fossil mammals, fish and birds from the late Pleistocene on the historic trail of Professors Condon and Cope (Dr. James Martin)

JUNE 15 - 26 Late Cretaceous Dinosaurs and other vertebrates from Northwestern South Dakota (Bruce Schumacher and Dr. James Martin)

June 15 -26 Giant Pigs and Rhinos in Badlands National Park - excavate a tangle of Archaeotherium and Subhyracodon in the classic White River Badlands (Carrie L. Herbel)

July 6 - 17 Miocene Vertebrates of Flint Hill, a generous mixture of large and small mammals in Bennett County, South Dakota (Carrie L. Herbel)

July 6 - 17 Jurassic Dinosaurs and Mammals I near Sundance, Wyoming. The "found" world of Camarasaurus and Allosaurus and tiny primitive mammals are present at this exciting locality (Dr. James Martin)

JULY 20 - 31 Jurassic Dinosaurs and Mammals II, the second excavation session at this important paleontological site described above (Dr. James Martin)

AUGUST 3 -14 Marine Turtles, Mosasaurs, and Plesiosaurs from the Late Cretaceous Excavations along the Missouri River near Chamberlain, South Dakota (Dr. James Martin, David Parris and Dr. Gordon Bell) A follow up session August 17 - 28 is also available

AUGUST 17 - 28 The Unwily Coyote Site, a series of fissure and cave deposits in the northern Black Hills that is producing camels, coyotes and a diverse assemblage of tiny vertebrates. The setting is especially conducive for field work (Dr. Philip Bjork)

For information on participating in the field digs, call 1-800-544-8162/ext. 2467; email pjbjork@msmail.gw.mail.sdsmt.edu; or write: Dr. Philip Bjork, Director, SDSM&T Museum of Geology, 501 E. St. Joseph Street, Rapid City, SD 57701. ✍



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Honors Convocation



Pictured l to r: Dr. Richard J. Gowen, Jadwiga, Ruth, Ann and Monique Ziolkowski.

SDSM&T's 1998 Outstanding Public Service Award was presented to **Ruth Ziolkowski and her family** in recognition of their tremendous work in keeping Korczak's dream alive at the Crazy Horse Memorial. Ruth Ziolkowski serves as Chairman of the Board and CEO of the nonprofit Crazy Horse Memorial Foundation. Seven of the ten Ziolkowski sons and daughters remain actively involved in the Crazy Horse project. Crazy Horse Memorial will celebrate its 50th anniversary with the dedication of the completed face of Crazy Horse on June 3, 1998.



Dr. Al Boysen, Professor of English, received the 1998 Presidential Award for Outstanding Professor in recognition of the positive impact he has had on

teaching students over the past three decades.

The 1998 AISES Outstanding Teacher Award was presented to **Dixie Serr**, a teacher at Rapid City School District's 9th Grade Academy, an alternative program that focuses on at-risk youth.



SDSM&T's 1998 Benard Ennenga Award was presented to **Dr. David Dixon**, Assistant Professor of Chemical Engineering, for his accomplishments in

teaching and motivating students, as well as his work in developing new courses and lab experiments for his classes.

Dr. Arden Davis, Professional of Geological Engineering, received the 1998 Virginia Simpson Award for his work with the Rapid City community, as well as South Dakota and Wyoming, on ground water.



The 1998 Award for Outstanding Teacher was presented to **Gary Kocmick** of Renner, a science teacher at Tri-Valley School for the past 33 years.



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T-28

(continued from page 3)

of the scientific equipment if an electrical problem should occur.

The plane carries a Global Position System (GPS) that helps pinpoint the plane's exact location in the storm clouds. Each year IAS scientists, in cooperation with NCAR engineers, work to improve the data acquisition equipment and instrumentation on the plane. A laser-based hail spectrometer developed at IAS counts and measures hailstones passing underneath the wing of the airplane. An on-board computer records a wide range of meteorological data from a variety of instruments.

Several IAS scientists also are faculty members in SDSM&T's Department of Atmospheric Sciences, which offers a B.S. degree through the Interdisciplinary Sciences program and a M.S. degree. The Master's program in Meteorology established in 1965 was the first of its kind in South Dakota. In addition, a Ph.D. program in Atmospheric, Environmental and Water Resources (AEWR), a joint doctoral program between SDSM&T and South Dakota State University, was initiated a few years ago.

SDSM&T's partnership with the National Science Foundation in maintaining the T-28 facility and its collaborative research relationships with various agencies over the years have been very productive. SDSM&T's research into the real world of hailstorms has the potential to someday discover ways to sharply reduce hail damage to crops and property, which would have important ramifications to the economy and to the world's food supply.

The T-28 flights not only provide SDSM&T scientists with an up close and personal look at stormy weather, but also important meteorological data to better understand the mysterious forces of Mother Nature. ✂

You Are Invited . . . Calendar of Events

For information on these events contact University and Public Relations at (605) 394-2554.

APRIL

SATURDAY-SUNDAY, APRIL 18-19
2nd Annual Great Plains Alliance for Computers and Writing

TUESDAY, APRIL 21
Noon United Campus Ministry FORUM
"Is Freud Passe?"

WEDNESDAY, APRIL 22
Secretaries Day
Water Resources Forum

FRIDAY, APRIL 24
SD Space Day

SATURDAY, APRIL 25
CSU Invitational At Ft. Collins, CO
(Limited entries)
West River Math Contest

SATURDAY-SUNDAY, APRIL 25-26
SDSM&T at Rushmore Mall

TUESDAY, APRIL 28
Noon United Campus Ministry FORUM
"A Party With Barb and Her Favorite Hymns"
Senior Design Fair

THURSDAY, APRIL 30
SDSM&T Foundation Campaign Kick-Off Event

MAY

FRIDAY, MAY 1
7:30pm Symphonic Band and Jazz Band Spring Concert

SATURDAY, MAY 2
8:00pm Concert Choir, Master Chorale, Alumni Choir Spring Concert

MONDAY-FRIDAY, MAY 4-8
Finals Week

FRIDAY, MAY 8

7:30pm "Visions of Venice," Dakota Choral Union, Master Chorale, Alumni Choir Concert

SATURDAY, MAY 9
10am Graduation

SUNDAY, MAY 10
Mother's Day

TUESDAY, MAY 12
Water Festival

FRIDAY, MAY 15
Museum in Motion opens for summer

MONDAY, MAY 25
Memorial Day

JUNE

SATURDAY, JUNE 13
ACT Exam

THURSDAY-SATURDAY, JUNE 18-20
National Concrete Canoe Competition

MONDAY-FRIDAY, JUNE 22-26
Summer Teacher Workshop: Aerospace in the Curriculum

MONDAY-FRIDAY, JUNE 22-JULY 3
MIE/NSF Summer Water Resources Institutes (also held July 9-22)

Special thanks to:

Black Hills Power and Light, Dakota Telecommunications Group, Elks Country Estates, Emerald Pines Refuge Bed and Breakfast, Latte'da, Norwest Bank, Margaret Puszyński - Raben Real Estate, TSP Three, Inc.

For more information on providing financial support for future issues of SDSM&T Quarterly, please call (605) 394-2554.

2,500 copies of this publication were printed @ a cost of \$1.89 each.



Front Row (l to r): Manager Brenda Andreassen, Elaine Foy, Ann Konechne, Randee Harmdierks, Jami Barraclough, Erin Caikowski

Back Row (l to r): Assistant Coach Lori Coble, Kelli McCabe, Amy Wilson, Kori Hoff, Michelle Lammers, Marissa Richards, Head Coach Barb Felderman.

Congratulations Lady Hardrockers on reaching the NAIA Final Four!

- Kori Hoff was named SDIC Most Valuable Player and also was selected to NAIA All-American First Team.
- Jami Barraclough was selected to the SDIC First Team and led the Lady Hardrockers in scoring. She also set the record for points in a season with 589.
- Tech's fourth trip to NAIA National Tournament in five years and the most successful Lady Hardrocker season in school history.
- Records set during the season include most wins and fewest losses (28-4), most points in a game (104), and highest season scoring average (81.0 points per game).



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