

Educational Resources and Outreach Services

Black Hills Natural Sciences Field Station (BHNSFS)

The Black Hills Natural Sciences Field Station functions in cooperation with universities from South Dakota, North Dakota, Mississippi, and Wisconsin with the purpose of providing summer field courses in the Black Hills and nearby areas, as well as overseas. Field courses in geology and geological engineering are offered. For descriptions of all courses offered, see the listings of the Department of Geology and Geological Engineering in this catalog.

The Field Station operates from three sites: School of Mines campus, field camp sites during the summer at Ranch A in the northern Black Hills, Wyoming, Taskesti in the country of Turkey, and Andaman Islands, India.

Geology and Geological Engineering Field Camps:

GEOL 410 Field Geology — five (5) weeks (six (6) semester hours) — Ranch A, Wyoming

GEOE 410 Engineering Field Geology five (5) weeks (six (6) semester hours) — Ranch A, WY

GEOE 410 Engineering Field Geology five (5) weeks (six (6) semester hours) – Taskesti, Turkey

GEOE 399 - Environmental Field Geology, a three weeks (3 semester hours), Andaman Islands, India

BHNSFS also offers youth geology field camps and field trips.

Further information may be obtained by calling (605) 394-2494, or go to the website: <<http://geologyfieldcamp.sdsmt.edu>> . Online registration or applications (available from the web page) should be received by March 1st. All deposit fees are non-refundable upon acceptance into the course.

Bookstore

The School of Mines Bookstore is located in the Surbeck Student Center and is owned and operated by School of Mines. All revenues generated by the Bookstore are reinvested into the School of Mines. The School of Mines Bookstore serves the students, staff, and faculty of School of Mines by providing course materials, office supplies, Hardrockers apparel, computer software, etc. In addition, the Bookstore cashes personal checks, sends and receives personal faxes, and special orders books and software. Please call (605) 394-2374 for assistance. For additional information, visit the School of Mines Bookstore's website at: <www.minesbookstore.com>.

Center of Excellence for Advanced Manufacturing and Production (CAMP)

The School of Mines formally initiated the Center of Excellence for Advanced Manufacturing and Production (CAMP) in October of 1997. After just three years in operation, CAMP won the prestigious Boeing Company Outstanding Educator Award for year 2000 and a year later the National Science Foundation (NSF) Corporate and Foundation Alliance Award.

As part of the educational experience, the South Dakota School of Mines and Technology offers students a unique opportunity to participate in this student-centered, hands-on, engineering program called CAMP. A key part of this experience involves designing, building, testing, and competing in a variety of engineering challenges.

What makes CAMP distinctive is an approach based on voluntary, individual contributions with students organizing themselves into teams that actively encourage participation, organization, and leadership starting in the freshman year. CAMP actively combines the classroom experience where students apply their developing technical skills in real world situations that involve fundraising, planning, deadlines, and international competitions where the teams test

their mettle against engineering universities from around the world.

The success of CAMP is based on combining both the contributions of each student with the demands of working with others. To accomplish this CAMP recognizes the importance of critical values such as trust, respect, well-being, and responsibility as essential in resolving conflicts, establishing goals, and completing a project. The unique element of CAMP is a focus on the process in that it is very clear that the means used to achieve a goal determines the outcome. Each team constructs a distinctive structure based on the dynamics of each member. By actively encouraging each student to fully contribute, CAMP teams have been able to develop a high level of intrinsic motivation where each student feels that he or she can make a constructive contribution while at the same time contribute to the success of others. The development of a winning engineering project could not be accomplished without developing the personal as well as the technical skills of each participating student.

Geographic Information Systems (GIS) and Remote Sensing Lab

The Geographic Information Systems (GIS) and Remote Sensing laboratory provides the campus and broader community with a facility for generating and analyzing spatially-referenced digital information, including maps and remotely-sensed data. The laboratory was developed by the Department of Geology and Geological Engineering in close cooperation with the South Dakota Space Grant Consortium and EROS Data Center in Sioux Falls, South Dakota. The lab became a NASA Center of Excellence in Remote Sensing in 1998. It served as an ESRI Authorized Learning Center from 2000-04, and continues to offer many GIS workshops every year.

Undergraduate and graduate courses in GIS are offered through the Department of Geology and Geological Engineering for the benefit of campus and off-campus users of GIS. Applications have been developed in a variety of areas, including abandoned mine inventory, archaeology, aquifer vulnerability, ecosystem

classification, geology, hydrology, land cover classification, land use planning, mineral deposit modeling, mineral exploration, paleontology, wildlife habitat modeling, carbon sequestration, and remote sensing.

Additive Manufacturing Laboratory (AML)

The Additive Manufacturing Laboratory (AML) provides manufacturing research and development in the form of material addition in size scales from microns to meters.

This laboratory houses the laser powder deposition (LPD) system that is comprised of a 3 kW Nd: YAG Laser, a Fanuc M16i Robot, a 2.5 - D gantry motion system with a CAD/CAM interface, and four metal powder-feed systems with integrated CID and CCD cameras. The LPD system facilitates laser cladding, solid free-form fabrication, and graded alloy development of both metallic and non-metallic materials. This lab also supports the development of laser ultrasonics for in-situ defect detect during the cladding operations. Projects include component repair, development of laser cladding wear resistance materials, material property response, thermal and stress modeling of the laser clad materials, and unique component direct laser fabrication.

The laboratory also houses state of the art Direct Write technology that includes aerosol and syringe deposition techniques. Similar to the LPD system above, Direct Write technologies also use CAD/CAM interface to add materials in a specific location. Main equipment in this facility includes, M3D (aerosol deposition), n-Script (slurry/paste syringe deposition), EFD (slurry/paste syringe deposition) and Photonic Curing (room temperature sintering system) along with associated support equipment. Projects include passive electronic device fabrication (resistors, inductors, capacitors and transformers), energetic devices, tissue engineering, optical devices and medical implant devices.

Advanced Materials Processing and Joining Lab (AMP)
NSF Center for Friction Stir Processing (CFSP)

The Advanced Materials Processing and Joining Center (AMP) was created in 2001 under a grant from the Army Research Laboratory. The latest in the state of the art Friction Stir Welding (FSW) and Processing (FSP) equipment was designed and installed at the School of Mines with our industrial partner, MTS Systems Corporation of Eden Prairie, Minnesota. This equipment provided AMP with the most versatile, fully instrumented FSW/FSP research and development tools found anywhere in the world. Since its inception, AMP has added state of the art ultrasonic spot welding, pulsed fusion, and virtual reality joining equipment. AMP is currently staffed by three full time employees (Director, Research Scientist, and an Administrative Assistant).

AMP has developed internal research programs with the academic departments at the School of Mines through funding support for graduate and undergraduate students and faculty members. Several graduating students have taken responsible positions in the field of FSW/FSP within industry. Currently, AMP projects involve students from the MES, CEE, EE, ChemE, and CSE graduate programs and sponsors several undergraduate senior design projects within the ME and MET departments. Sophomore, junior, and senior undergraduate students are employed to support research efforts. Collaborative outreach programs have been developed with the local Oglala Lakota College through the involvement of Native American summer student interns. The AMP Center is developing research programs with the Welding Group at the Western Dakota Technical Institute (WDTI) in the fusion welding of hard-to-join materials.

The School of Mines AMP Center is one of the world's leading focal points for research and development in the emerging Friction Stir Welding and Processing technologies. We are collaborating with major government laboratories, universities, and industrial companies and are training our students for positions of

responsibility within these organizations. AMP has an extensive government base of support for our R&D programs with current research collaborations with the Army Research Laboratory, Air Force Research Laboratory, NASA Langley Research Center, and DOE Pacific Northwest National Laboratory. Industrial partnerships exist with major aerospace and defense companies. These partnerships include direct funding, materials and equipment contributions, and engineering consultation and support.

AMP has developed collaborative research programs with Brigham Young University, University of South Carolina, University of Missouri-Rolla, Iowa State University, Ohio State University, Wichita State University, and the University of Colorado. A major achievement during these first three years has been the establishment of the region's first National Science Foundation (NSF) Research Center. This NSF Industry University Cooperative Research Center (IUCRC) for Friction Stir Processing (CFSP) brings together the School of Mines, BYU, USC, UMR, and WSU and 20 industrial sponsors from around the world to perform research and development programs to enhance the understanding of the science of FSP and accelerate its implementation into industrial environments. The School of Mines AMP Center has been designated as the Lead Institution for this NSF IUCRC Research Center.

The Center for Accelerated Applications at the Nanoscale (CAAN)

The Center for Accelerated Applications at the Nanoscale (CAAN) focuses on the increasingly important nanotechnology field. Nanotechnology covers many areas of research dealing with objects measured in nanometers. A nanometer is a billionth of a meter, or a millionth of a millimeter. A human hair's diameter measures about 200,000 nanometers. The ultimate value of nanotechnology is quality. By building products at the molecular level, they will last longer, work better, and push their potential to new levels. Some experts predict that nanotechnology will result in a new Industrial Revolution.

The industrial impact of nanotechnology is projected to be in excess of \$1 trillion annually within the next 10-15 years. Under Governor Mike Round's 2010 Initiative for Economic Development, a group of distinguished South Dakota researchers have joined together in a focused effort to conduct applied research and development relating to nano-science and engineering. The programs initiated by the center are chosen for their strong commercialization potential and mutual interest to industrial partners. The center is positioned to utilize student resources in these programs and is closely associated with the Ph.D. program in nano-science and engineering.

Direct write (DW) technologies support the direct printing of mesoscale materials, such as metals and ceramics for conductors, dielectrics, ferroelectrics, and ferromagnetics through use of several techniques. Available DW equipment includes: Maskless Mesoscale Materials Deposition (M3D), Ink Jet, n-Script, and micron scale laser sintering and ablation. With the materials handling capability and the precision of the DW technology, the School of Mines researchers are able to: manufacture conformal antennas; integrate circuitry with bio-materials; perform research involving tissue engineering, integrated lightweight electronics, and support development of products that are difficult and expensive to construct with conventional technologies."

Computational Mechanics Laboratory

Computational mechanics is concerned with the numerical simulation of advanced engineering problems. It brings together highly sophisticated methods of structural and applied mechanics, computer science and applied mathematics, and encompasses numerical methods for application to various mechanical engineering problems. It is now a well established and growing discipline which is increasingly exploited by engineers and scientists to optimize existing products and manufacturing processes and to promote the development of new technologies.

The Computational Mechanics Laboratory (CML) was established to provide the basic

infrastructure required to promote, support, and perform, academic and research activities in the field of computational mechanics at the School of Mines. The CML (built as an addition to the Civil/Mechanical Engineering Building) started its operation in January 2006 and provides much needed space for a variety of high-end computing activities. The lab supports both state-of-the-art computer hardware and software, providing School of Mines students access to the modeling capability used in industry. The lab houses specialized computer laboratories, classrooms, office space, two visualization rooms, a small meeting room, and a computer server room. Drs. Karim Muci and Michael Langerman, both in the mechanical engineering department, are co-directors of the lab.

Center for Bioprocessing Research and Development (CBRD)

The Center for Bioprocessing Research and Development (CBRD) has been established through Governor's 2010 Initiative for Economic Development with the objective to conduct biomass research for lignocellulose bioprocessing to biofuels and biochemicals. The overall mission of the CBRD is to provide entrepreneurs and industry with expertise in cutting edge technologies, research facilities and equipment, technology transfer capabilities, outreach through education and training, and administrative and financial support. The Center is the leading institution in South Dakota in the development and technology transfer of new bioenergy technologies and aims to reduce the national dependence on imported fuels of environmental concern and stimulate economic growth in the region.

The CBRD, which is a collaborative effort between the School of Mines and the South Dakota State University, is headquartered on the School of Mines campus. It consists of a growing number of faculty members, researchers, graduate and undergraduate students, postdoctoral scientists, and technicians. The faculty members come from eight different departments of two universities in South Dakota. Principal areas of study in Bioprocessing include feedstock,

pretreatment of biomass, bioconversions, separations and isolation of extremophilic microorganisms capable of lignocellulose degradation and fermentation to biofuels and high value products. We are developing expertise in molecular biology to aid in breeding of feedstock such as native grasses for increased yields and chemical composition modifications; microbial mutagenesis and selection for improved production of bio-based chemicals and polymers; improved design of high solids bioreactors; mechanical, solvent-based and hydrothermal pretreatment using supercritical fluids; extraction of high-value and bioactive compounds from biomass; bioprocess design and optimization; metabolic engineering of strains for improved conversion of mixed sugars; anaerobic fermentation of biomass; utilization of hemicellulose and lignin to enhance the biomass value; nanofiber and adsorptive membranes for downstream processing; techno-economical evaluation and life-cycle analysis of bioprocesses. CBRD has identified three focus areas of research: 1) development of technologies for utilization of by-products from the chemical and biofuels industries; 2) production of biodegradable polymers and composites from biomass; and 3) microbial and enzymatic applications of extremophiles isolated from the NSF Deep Underground Science and Engineering Laboratory (DUSEL), the former Homestake Gold Mine in SD.

While the CBRD Director provides the overall leadership of the Center, the CBRD Executive Committee (EC) is the primary policy-making group of the CBRD and meets regularly to discuss and advise on budgets as well as research and educational programs. It consists of senior faculty from both SDSU and SDSM&T. The CBRD external Advisory Board (AB) consists of distinguished academic and industrial scientists representing industry, state government and federal laboratories. Board members attend the annual CBRD meetings to discuss the direction of the Center and its programs, and to offer insights into ways the Center can best interact with industries through technology transfer.

CBRD is a partner in the recently NSF-created Industry-University Cooperative Research Center

(I/UCRC) for Bioenergy Research and Development. The NSF CBRD I/UCRC will provide the foundation of a nation-wide cooperation between 6 universities and over 30 companies in the area of Bioprocessing. The newly formed CBRD I/UCRC is head-quartered in SDSM&T. Other founding member universities include SDSU, Kansas State University, the State University of New York at Stony Brook, North Carolina State University, and the University of Hawaii. Industry dues from the I/UCRC will fund over \$1 million of research activities each year. Of direct relevance to the CBRD's development and integration is the on-going formation of a new Northern Plains Bioprocessing Institute (NPBI). The NPBI is a non-profit research and development facility designed to optimize bench scale research and transition it through a flexible and readily reconfigurable pilot plant. The NPBI will be located in the Innovation Campus Research Park adjacent to SDSU and will be operated by a Board of Directors consisting of industry investors and SDSU. The process development and validation capabilities of the NPBI will also generate the mass balance, energy balance, and economic data needed by industry to transition technologies to commercial scale. Through the NPBI at SDSU, the CBRD will have the necessary infrastructure, facilities and flexibility to fill up the gap between lab research and industrial scale exploitation. This facility will scale-up and validate the performance of bioprocessing technologies to take advantage of current and future opportunities as we transition into the bio-based economy.

Composites and Polymer Engineering Laboratory (CAPE)

The Composites and Polymer Engineering Laboratory (CAPE) is a user facility that is open to all students and faculty. The 9,000 square foot facility houses state-of-the-art equipment to conduct novel and cutting-edge research and development in rapid tooling and polymer and composite processing and prototyping. The suite of rapid tooling equipment includes a CNC mill; a CNC lathe; and finishing tools, such as a drill press, saws and sanding facilities. The suite of

polymer and composite processing equipment includes an autoclave, two capillary rheometers, a composite fabric braider, a filament winder, a precision fabric cutting table, a materials testing instrument, two resin transfer molding systems, a single and a twin screw extruder, two vacuum bagging systems, and a walk-in oven. Combined, these capabilities provide students and faculty an extensive set of tools with which to create the prototypes for the next generation of advanced composite structures.

In collaboration with CAMP, CAPE has played a critical role in the successes of many of the student national competition projects. CAPE provides expertise and facilities that have created the first monocoque body for the Human Powered Vehicle, the unified inverted wing under-carriage for the Formula SAE vehicle, structures for several SAE Aero Design team planes, and the sub-vehicle for the Unmanned Aerial Vehicle, to name a few. The CAPE plays a critical role in supporting polymer and composite research and innovation. For example, faculty and students are investigating advanced nanocomposites, protective face gear for soldiers, low thermal coefficient of expansion composites, and new in-situ sensors for the health monitoring of composite structures. Funding for these projects come from the Department of Defense and the Department of Energy.

For additional information please visit our website: <<http://sdmines.sdsmt.edu/CAPE>>.

Engineering and Mining Experiment Station (EMES)

The Engineering and Mining Experiment Station (EMES) has provided analytical services to the public and private sectors since 1903. Analytical methods in use include a wide variety of classical and advanced instrumental techniques for the characterization and testing of minerals, ores, raw materials, and manufactured products.

EMES currently operates, maintains, and oversees training in electron microscopy (scanning and transmission electron microscopes), X-ray diffraction, atomic absorption spectroscopy, inductively-coupled plasma mass spectrometry, visible and near infrared spectroscopy, and

carbon/sulfur and hydrogen/nitrogen/oxygen analyses. EMES also works closely with other departments on campus, which house additional instruments, including a gas chromatograph-atomic emission detector, an atmospheric-pressure-ionization mass spectrometer, an X-ray fluorescence spectrometer, a laser particle size analyzer, Raman and FT-IR spectrometers, and scanning tunneling and atomic force microscopes.

Information Technology Services (ITS)

Information Technology Services (ITS) serves the academic technology needs of School of Mines by acquiring, supporting, and enhancing many of the technology resources available for students, faculty, and staff engaged in scholarly activity. The mission of ITS is to provide proactive, responsive, people-oriented technologies, training, and support in the areas of multimedia, computing, and networking. In partnership with faculty members, ITS pioneers new learning technologies to provide quality educational experiences outside the traditional classroom or to enhance traditional learning environments.

ITS supports the network and communications server infrastructure for the entire campus. ITS operates and maintains the campus Local Area Network (LAN) and all centralized computing resources, as well as gateways to external networks. Network connections for individuals in the residence halls are also managed through ITS. Please note, there is an additional charge for in-room connections to the Residence Hall Network. See the website at <its.sdsmt.edu/dormnet.htm>.

ITS supports academic computing, including computing labs, presentation classrooms, distance learning facilities, videoconferencing, the Governor's Electronic Classroom (GEC, CB110), the Digital Dakota Network studio (DDN, CB109), and traditional and cutting-edge audiovisual resources to support classroom instruction.

The ITS Software Development Team is responsible for maintaining and updating the School of Mines website while providing software development support to all departments on campus. They create specialized web software to

meet the needs of our campus customers, including the Student Association, residence halls, administration, special faculty projects, etc.

All ITS staff enjoy the challenge of assisting faculty in the transfer of cutting-edge instructional technology tools into the classroom, making the learning process more efficient, effective, and exciting. On request, ITS staff members are available for short class presentations on focused technology topics to complement curriculum. In 2000-01, Technology Fellows began working with faculty in this area. ITS is working closely with the Technology Fellows to ensure coordination among services.

ITS is involved in supporting technology to enhance many School of Mines outreach efforts, including the on-campus daycare center (Kids Kastle Little Miner's Clubhouse), the Higher Education Center-West River building, the Technology Development Center, the Black Hills Business Development Center, and local service organizations. On request, ITS will provide reasonable services to currently registered students from any South Dakota institution of higher education who may be located permanently or temporarily in the Rapid City area. In partnership with the State Bureau of Information and Telecommunications, ITS also provides services to local state agencies. For more details see: <its.sdsmt.edu>

ITS Help Desk

The ITS Help Desk assists students, faculty members, and staff with software and hardware questions and provides scheduling services for many shared resources. The Student Help Desk, (605) 394-1234, is located on the lower level of the Library — along with the Table Central Assistance Center. Contact the Help Desk at helpdesk@sdsmt.edu, drop by, or check the web pages: <its.sdsmt.edu>.

Tablet PC Program

The School of Mines began a tablet PC program in fall 2006. All incoming freshmen were issued convertible tablet PCs. These machines are laptops that are fully functional as a PC but also have a touch sensitive screen that allows students to write on the screen as if it were

a piece of paper. This technology allows students to take notes in class in their own handwriting, allows them to highlight lectures from their instructors and allows many other test-taking functions that would not be available with a basic laptop. The tablet PCs have built-in wireless capabilities so that any classroom on campus can be used as a computer lab and students can connect to the Internet and the campus' file servers from anywhere on campus. Tablet Central (the Help Desk for the tablet PCs) is located in the basement of Devereaux Library.

Find out more at: <its.sdsmt.edu/tablet>.

PC Labs

All of the PCs on campus are linked to the campus network, providing access to file servers, applications software, electronic mail, and the Internet. Approximately 90 PCs are located in campus labs, accessible to all students. An additional 62 PCs and Unix workstations are located in department labs, and these are also accessible to all students upon request. Many of the campus labs are reserved for class use much of the day but can be used as open labs otherwise. PC labs are located in

Civil/Mechanical Building: Room 310

Devereaux Library: East lower floor

EE/Physics Building: Room 307

Surbeck Center

In these labs students have access to standard office productivity software, as well as electronic mail and World Wide Web/Internet. Many of the labs are also equipped with discipline-specific software packages. For current lab descriptions, software listings, and locations see: <its.sdsmt.edu/labs>.

ITS Software Development Team

The ITS information services team assists faculty members, staff and students by creating software solutions for unique campus needs. These services include database-driven Internet applications, online surveys, MS Word, MS Excel, and MS Access programming solutions.

The information services team can be contacted via the Technology Help Desk at (605) 394-1234, Vickie Bender at (605) 394-1299, or by e-mail to Vickie.Bender@sdsmt.edu.

Interactive Supplemental Materials

All faculty members at School of Mines have access to Internet and electronic mail facilities. Faculty members have the capability to use interactive videoconferencing technologies to meet with students, including Elluminate which requires no software installation on the users' computers. Some classes use listserves or chat groups to distribute additional material and for communication and discussion among students. Some course use the course management system called Desire2Learn. Students have the option of corresponding through mail, telephone, fax, and electronic mail with faculty and instructors. The course syllabus will list options for course material delivery. Distance instructors will provide contact information (e-mail address and telephone number) along with their course materials. If students have privacy concerns regarding using Internet-based communications, please contact the Help Desk at: helpdesk@sdsmt.edu or (605) 394-1234 for assistance.

Distance Education Course Delivery Systems

Distance education courses are available via Internet and various interactive media. The technology of distance education is changing as fast as technology itself, and School of Mines strives to benefit students by taking advantage of cutting-edge technologies for course delivery. As technologies become available, they will be incorporated into the offerings.

Video-based courses at School of Mines usually include segments filmed in the classroom as the lecture is being presented to the on campus students during the current semester. This is especially important in the science and engineering classes because of today's rapid advances in knowledge and technology. Most distance learning classes are "semester based." This gives distance students the opportunity to meet and work with other students who are taking the class at the same time.

Information Technology Services makes distance courses available via video streaming. To inquire about distance offerings, check the Schedule of Classes or contact Academic and Enrollment Services (605) 394-2400.

Distance Education Using Videoconferencing

The Digital Dakota Network (DDN; located in CB109, CB110, and CB106 videoconferencing facilities link all six South Dakota universities, as well as all South Dakota K-12 school districts, and many state agencies with interactive videoconferencing capabilities.

All videoconferencing sites are fully interactive, so students at every site receiving the class can see and hear the faculty member at the originating site. Students at any participating site can ask questions of the faculty member and students at the other sites, and participate in class discussion.

Other videoconferencing applications are also supported via DDN, and Internet2, such as student job interviews with potential employers or meetings with research sponsors. For more information see: its.sdsmt.edu/videoconferencing.

Institute of Atmospheric Sciences (IAS)

The Institute of Atmospheric Science (IAS) at the School of Mines has a rich history of research going back to 1959, when the emphasis was on weather modification and hail damage research. Areas of scientific emphasis have broadened today to include aspects of atmospheric studies varying from air quality to convection in the atmosphere to ecosystem structure and the effects of climate on our earth's ecosystems.

The expanded mission of the Institute of Atmospheric Sciences is to study the physical, chemical, and biological processes that affect the composition and dynamics of the earth's atmosphere. Our research and educational programs focus on issues of regional, national, and global importance. Research conducted at the IAS is linked to undergraduate, master of science (M.S.) and doctoral (Ph.D.) degree curricula that provide a fundamental understanding of the atmosphere, biosphere, and hydrosphere. Together our research and educational programs provide opportunities for students to conduct theoretical and applied research related to earth-atmosphere systems and their interactions.

The vision of IAS is to provide opportunities for students to become colleagues with IAS

faculty in the conduct of cutting edge research to determine how the earth-atmosphere system functions. As an example, information gained through linked observations and models in the Black Hills is being used to predict when and where lightning-caused fires are likely to occur. In addition, IAS scientists and students make field measurements during active fires using portable, solar-powered mesonet stations specifically deployed in the area of the fire, which are integrated with larger-scale observations and models generated and maintained by the National Weather Service in order to help deploy fire-fighting resources for maximum safety and effectiveness.

The IAS strives to improve our understanding of the earth's natural systems through observations made using instruments mounted on a variety of platforms, such as towers and aircraft. Such observations may focus on specific phenomena such as lightning and severe storms. Observations are compared to output from complex numerical models used to diagnose the underlying physical processes. These models may be used to predict short- and long-term system behavior. Current modeling studies focus on hailstorms, thunderstorm electrification (including lightning), lightning produced nitrogen oxides, precipitation processes, and transport of smoke and dust by atmospheric circulations.

Mesoscale research has focused on the study of factors governing the initiation and organization of convective storms, mesoscale cloud systems, and topographic effects on airflow and precipitation. This research has included analysis of severe wind-producing convective storms and observational studies of bow echoes and supercell storms carried out jointly with the National Weather Service, Rapid City, to increase the understanding of these storms and to improve forecasting.

An ongoing project involves studies of lake-effect snow storms and interactions of the wintertime Great Lakes with larger-scale weather systems. Another area of continuing research is the study of the influences of surface conditions, especially moisture availability, on mesoscale weather and climate. Related numerical modeling studies include the coupling of atmospheric,

surface, and subsurface hydrologic processes in mesoscale models. Work is underway on remote sensing of land surface properties and processes and the use of remotely sensed data to initialize mesoscale models. New areas of work include the application of high-resolution mesoscale models to incident meteorology (as in wildfires) and local-scale ensemble forecasting. Global cloud and aerosol properties are being retrieved from satellite data, and their influence upon the earth's radiation budget and climate change is under study. Access to the supercomputer facilities of the National Center for Atmospheric Research at Boulder, Colorado, has been of great value in running the larger cloud models. Recently, a cluster computer has been acquired, so most models can now be run in-house as well as on remote computers.

In order to leverage scientific and intellectual resources in the region, IAS scientists collaborate with partners at other institutions, including other colleges and universities in the state and region, the National Center for Atmospheric Research, and the EROS Data Center. Unique local facilities associated with these collaborations include flux towers for monitoring of heat, moisture, and carbon dioxide transport through the surface layer. Often IAS research also involves community facilities, such as radars and aircraft in the National Science Foundation Atmospheric Sciences Division facilities pool, or research satellites launched by NASA. In addition, IAS students often serve as interns at the local National Weather Service Office, located adjacent to campus and have been employed as "weekend" weather forecasters at local TV stations.

The IAS has state of the art laboratory facilities to analyze key constituents of the atmosphere, and terrestrial and aquatic ecosystems. For example, the Biogeochemistry Core Facility is an analytical and research laboratory facility shared by IAS and the Civil and Environmental Engineering department. Additional laboratory facilities in IAS focus on measurements of atmospheric constituents that have the potential to affect the radiation and the oxidant balance of the earth system.

As IAS looks to the future we are working to develop additional unique opportunities

associated with our region that leverage our historical strengths and developing expertise. For example, the T-28, a specialized aircraft designed to penetrate and investigate severe storms, operated for more than 30 years by IAS scientists, was recently retired. Plans are underway to develop a successor research aircraft, a modified A-10 “Warthog,” which will have enhanced capabilities. The IAS is linked to the establishment of a Deep Underground Science Laboratory located at the former Homestake mine in Lead, South Dakota. Finally, IAS is participating in development of an Advanced Visualization Center in collaboration with the Computational Mechanics Lab established in the Mechanical Engineering Department.

Most of the Institute’s scientists teach in the university’s Department of Atmospheric Sciences. The Department supports a B.S. with a focus in atmospheric sciences through the Bachelor of Science in Interdisciplinary Sciences (B.S.I.S.) program, an M.S. degree in Atmospheric Sciences, and a Ph.D. degree in Atmospheric and Environmental Science. The Institute employs both undergraduate and graduate students from atmospheric sciences as research assistants.

Current IAS projects that illustrate the varied opportunities for students interested in interdisciplinary atmospheric research include the following:

- NSF and NASA projects to link models of the fundamental physics of lightning to the resultant impacts on local and regional atmospheric chemistry.
- An NSF project to study the interactions of the Great Lakes with winter storms.
- A NASA project to assess the impact of land use change on regional climate.
- An NSF project to develop a digital on-line archive of airborne in situ observations obtained during 15 years of summer thunderstorm field projects.
- An Army project to assess the role of assimilating abridged atmospheric data into incident meteorology scenarios.
- An NSF project to link science and Native American culture through the exploration of special places in the Black Hills.

- A NOAA-funded project involving collaborations with Black Hills State University, the Black Hills Center for American Indian Health, and the Western Research Alliance to establish the Great Plains Center for Atmosphere and Human Health.

Library

The Devereaux Library, located in a four-story building on the north side of the campus along Saint Joseph St., provides a wide variety of resources and services for students, faculty, staff, and the community. During the academic year, the library is open ninety-five (95) hours each week.

The library’s main level is the location of the South Dakota Reading Room, reference collection, electronic resources, reference desk, downtime (the popular reading area), circulation desk, interlibrary loan, technical services, and administrative offices.

The lower level of the library contains the literature collection, Government Documents Collection, movies (VHS and DVD), audiobook collection, an audiovisual listening and viewing room, study areas, and a PC laboratory. The Tech Learning Center, Tablet Central and the ITS Help Desk are also located on the lower level.

The second level of the library houses an extensive journal collection, the print versions of Abstracts and Indexes and study areas.

The library’s top level houses the majority of the Main Book Collection, the Special Collections vault and study areas.

The library’s collection supports the entire range of academic disciplines, with a primary focus on science and engineering; it contains approximately 180,000 volumes. Special collections include the South Dakota Collection, audiovisual materials, extensive documents from every branch of the federal government, and patents and trademarks. Devereaux Library is an official Patent and Trademark Depository Library, the only such designation in South Dakota, as well as a participant in the Federal Depository Library Program. The library’s collection includes hundreds of CD-ROMs and a growing collection of videos, DVDs, and audiobooks.

Devereaux Library is a “library without walls,” providing electronic access to many of its resources. The Library has developed its own web home page, providing access to other library catalogs, electronic databases, and all other resources on the Internet. Patrons may use the web page to ask reference questions, order interlibrary loans, make suggestions about the library’s resources and services, search the online catalog, and renew books.

Devereaux is a teaching library, offering classes that introduce patrons to the state’s on-line catalog (SDLN) and to the Internet. Individual instruction in the use of electronic resources is available weekdays at the Reference Desk. To facilitate teaching an electronic classroom was added last year. Nicknamed I-Hub it has a 50 inch plasma screen, access to the Internet, and a DVD player. I-Hub is located near the Reference Desk.

Devereaux Library’s primary mission is to support the university, but the public is also welcome to use its resources and services.

Museum of Geology

The Museum of Geology is an outstanding part of the School of Mines, especially since the surrounding region is rich in fossils, rocks and minerals. Many of these are represented in the Museum’s collections and exhibits.

Approximately 350,000 specimens, representing the fields of vertebrate paleontology, invertebrate paleontology, paleobotany and mineralogy, are either on public display or in the research collections. Museum collections form the basis for staff and student research. The Museum also provides an active educational outreach program to area schools and organizations.

Undergraduate paleontology education is an option within the geology curriculum, whereas graduate education opportunities can lead to the Master of Science degree in paleontology or Ph.D. in the Geology and Geological Engineering Department. Museum staff assist the Department by teaching several museum and paleontology courses, providing exhibits of fossils and minerals for teaching use, and offering practical experience

through summer field expeditions, laboratory preparation work, and collections management experience. These activities support the Department’s undergraduate and graduate programs. Inquiries from the public about specimens and discoveries are welcome, and often lead to partnerships with local ranchers and fossil enthusiasts. Many volunteer opportunities are available. Through partnerships with Federal and State agencies, the Museum collects, conserves, and houses these rare, often unique, resources.

The public exhibits feature fossils from as early as the Late Cretaceous marine and non-marine rocks to as late as the Mid-Tertiary Big Badlands of western South Dakota, providing a vivid record of Dakota life in ancient times. Spectacular minerals from throughout the world are also on exhibit. The South Dakota Hall of Minerals focuses on the tremendous diversity of Black Hills minerals. Also included are special exhibits featuring fluorescent minerals, lapidary specimens of local agates, meteorites, and native gold.

The Museum is open to the public throughout the year. A gift shop is available. Tours for groups may be scheduled with the Museum, which is located on the top floor of the O’Harra Building. The Museum can be reached at (605) 394-2467 or (800) 544-8162, ext. 2467.

South Dakota Space Grant Consortium

The South Dakota Space Grant Consortium (SDSGC) was established March 1, 1991, under a grant from the National Aeronautics and Space Administration (NASA). Consortium members in addition to South Dakota School of Mines and Technology include Augustana College, South Dakota State University, the South Dakota Discovery Center and Aquarium, and the USGS Center for Earth Resources Observation and Science (EROS). SAIC, Raven Industries, and RESPEC are industrial affiliates. Educational affiliates include Black Hills State University, University of South Dakota, Dakota State University, Lake Area Technical Institute, Oglala Lakota College, Sinte Gleska University, Lower Brule Community College, Kirby Science Discovery Center, The Journey Museum, Black

Hills Astronomical Society, and Badlands Observatory.

The vision of the SDSGC is to expand opportunities for all South Dakotans through education, research, and public service in the fields of aerospace, earth, and space science. As the link between NASA and the citizens of South Dakota, SDSGC's mission is to instill the spirit of exploration and discovery in students and educators and in the general public, with a special focus on the fields of science, technology, engineering, and mathematics (STEM) that are essential for the development of the nation's workforce.

The Consortium administers a fellowship and scholarship stipend program (approx. \$150,000 in student awards per year) with the goal of offering educational and research opportunities to students from diverse backgrounds who are pursuing degrees in STEM-related fields that align with NASA's mission and those of the Consortium's membership. It also provides summer fellowships tenable at NASA Centers, industry, and EROS to help enhance interactions among member institutions and strengthen research capabilities related to aerospace, earth science, and remote sensing. The Consortium has assisted in the development of a Geographic Information Systems laboratory on campus. Other Consortium programs include support for undergraduate and graduate research projects and faculty travel to NASA Centers or elsewhere that can aid in developing enhanced research capabilities. The Consortium office on the campus is located in MI 228. The Consortium Office also maintains a K-12 informal education function to help foster wider use of earth science and aerospace-related materials in precollege educational programs throughout the state, and to improve education in the areas of STEM. Outreach activities include sponsorship of South Dakota Space Days, teacher workshops, Visiting Scientist programs in schools, and Aviation Careers Exploration Academy.

For more information, see the South Dakota Space Grant Consortium website located at: <http://sdspacegrant.sdsmt.edu/>.

University and Public Relations

The Office of University and Public Relations provides a variety of services to the campus community including public relations, media relations, government relations, photography, graphic design, and educational outreach. Efforts and activities are designed to assist in the recruitment of students, faculty, and staff; support fundraising activities; provide recognition for the faculty, staff, and students for their many achievements; and identify opportunities for the university to work more closely with the community and state.

Educational/Summer Programs and Professional Conferences

The office of Educational Programs and Professional Conferences (EPPC) coordinates and organizes continuing education opportunities, workshops and conferences at School of Mines that focus on science and technology. These workshops and conferences combine the expertise of faculty with the cultural and natural resources available in the beautiful Black Hills. Classes are designed for youth, adults, K-12 math and science teachers, and for alumni and other technical professionals. Conferences serve both regional and national audiences. Youth programs focus on building an interest in science, technology, engineering and math in students. Both on-campus residential and non-residential programs are offered.

Communications and Marketing

University and Public Relations acts as the hub for the School of Mines overall marketing and communications efforts through the Office of Communications and Marketing.

The Office of Communications and Marketing assists academic departments and campus organizations involved in outreach to elementary and secondary students throughout the region, assists in organizing and publicizing events, and in recruiting participants through a variety of ways.

Through traditional avenues such as media relations and advertising, and through campus

events and other opportunities, the Office of Communications and Marketing spreads the positive message about how School of Mines can help students reach their goals and achieve their dreams.

Services provided by the Office of Communications and Marketing include publications, graphic design and layout, media relations, and photography.

Publications

The publications manager coordinates the production of all major campus publications including, but not limited to, the catalog, recruitment publications, and the South Dakota School of Mines and Technology Hardrock magazine. Staff members of the Office of Communications and marketing staff are available to edit and proof publications produced by campus departments and offices. Staff can also assist with the coordination of printing bids.

Graphic Design and Layout

Communications and marketing staff members are experienced in creating advertisements, newsletters, brochures, fliers, and other marketing materials using industry-standard software. Image scanning and limited color printing services are also available.

Public Information and Media Relations

The public information coordinator organizes all media activities for the campus, including press releases, weekly tip sheets, and hometown releases. It is a goal of the university to provide faculty, students, and staff with recognition for their achievements. Hometown releases are sent for student achievements including Dean's List, Honors Convocation Awards, and Commencement. Students, faculty, and staff are encouraged to notify the public information coordinator regarding newsworthy achievements and events.

Photography

Photography services are provided to document campus events. Reprints of photos are available through the public information

coordinator. Photos can be made available electronically for publications or the web.

Surbeck Center Scheduling Services

As the student union for School of Mines, Surbeck Center provides more than just 71,000 square feet of space devoted to campus and community activities; it also provides information services, equipment check-out for students and scheduling services for all of campus. Surbeck Center's main office serves as a one-stop scheduling center assisting with the reservation and coordination of University resources for the various activities of the University — academic, student, departmental, community and professional. Additionally, Surbeck Center staff provide assistance for all on campus activities, events, academic and summer conference scheduling as listed below.

Surbeck Center's main floor houses a large student lounge, the alumni office, the bookstore, banquet-ballroom, career planning office, conference rooms, counseling services, the dean of students office, health service facilities, mail boxes for all students living on campus, student accounts and cashiering services office, the main office for residence life, and the Surbeck Center offices. The dining hall, snack bar, recreation area, student activities and leadership center, Ivanhoe International Center, the multi-cultural activities office, campus ministries, and display areas can be found in the lower level in addition to more meeting rooms and "hang-out" space for students. Surbeck Center includes an addition completed in December of 1971 and newly renovated spaces completed in 2004.

Summer Conference Services

From mid-May through mid-August, the campus of School of Mines provides conferencing services to a variety of guests. Surbeck Center staff is available to confirm and coordinate reservation information and to assist with special event planning and logistical needs to ensure a successful experience for summer guests.

Academic Scheduling

The office of Academic and Enrollment

Services determines the initial classroom assignments and provides this information to Surbeck Scheduling. Typically, fall and spring semesters are downloaded to the scheduling system managed by Surbeck staff before March 15 of the preceding academic year. Summer class schedules are downloaded by March 15 of the same year.

Reserving Facilities

All scheduling of campus resources begins with Surbeck Center. Scheduling and event staff for Surbeck Center process and coordinate all requests for use of University facilities, services, and equipment. Once a request is received, documentation requirements are determined; Surbeck Scheduling staff then coordinate with the appropriate authorizing and resource providing departments. Campus resources are reserved by contacting Surbeck Center's scheduling and event staff. Telephone Number: 605.394.6774, Fax Number: 605.394.6998, and e-mail address: usc@sdsmt.edu.

Women in Science and Engineering (WISE) program

Women in Science and Engineering (WISE) is a multifaceted program that is dedicated to addressing the university's continuing concern about the under-representation of women in the Science, Technology, Engineering, and Math (STEM) disciplines nationwide. The program is based on the belief that maintaining American global preeminence in the STEM fields can only be achieved by fully developing the intellectual capital women have to offer. The Women in Science and Engineering staff work with students, faculty, and staff to provide an inviting and supportive environment at the School of Mines for women at all levels of study.

Programs and opportunities under the WISE umbrella include the following:

- Mentor and Mentees (M&M) program at the School of Mines pairs upper-level students with underclass women to give the younger women the support they need to succeed. The mentors serve as role models, tutors, and

friends who can help the mentees experience smooth transitions and college success. Students are paired by major, interests, and hobbies and participants in the program meet monthly.

- Professional mentoring and shadowing is available within the community.
- Students can choose from a variety of volunteer and community services.
- Students will have opportunities to impact future generations of women in the STEM fields through outreach programs such as Girls' Day and Shadowing Minds at Mines.

For more information on the WISE program at the School of Mines, please refer to: [<http://wise.sdsmt.edu>](http://wise.sdsmt.edu).