SOUTH DAKOTA SCHOOL OF MINES & TECHNOLOGY

Newsletter from the Dept of Geology and Geological Engineering

December 2005

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Faculty in Geology and Geological Engineering – November 2005:
Back row (l to r) – Maribeth Price, Colin Paterson, Bill Roggenthen, Jim Fox;
Front row (l to r) – Arden Davis (chair), Alvis Lisenbee, Larry Stetler, Ed Duke, Jack Redden (emeritus).
Absent: Jim Martin, Gale Bishop, Carrie Herbel

This Newsletter

We are mailing this newsletter to all alumni of this department. If you have an email address, please provide it to the Alumni Office (alumni@sdsmt.edu) if they don't already have it. Those alumni with emails will be notified that it is on the web page (http://geology.sdsmt.edu).

Message from the Department Chair – Dr Arden Davis

Those of you who were able to visit the campus recently have noticed that the School of Mines continues to change and improve. During the past year, the school was reorganized into two colleges: the College of Engineering, and the College of Science and Letters. The Department of Geology and Geological Engineering is within the College of Engineering. We're now conducting hiring searches for the deans of the two colleges.

The geological engineering program had a successful ABET visit last year and again received the maximum six-year accreditation. Since the late 1980s, we've now earned the maximum accreditation after successive visits in 1992, 1998, and 2004. Grateful thanks are extended to all those who helped prepare for the recent ABET visit, especially our graduates who responded to surveys and who shared information about their employment. We also thank our professional advisory board and the employers of our graduates.

During the past year or more, the job market for geological engineering graduates has been the strongest I've seen. Petroleum service companies have been offering starting salaries in the range of $75,000 to $80,000 for bachelor's graduates. December graduates are receiving three or more job offers each. We wish we had more graduates this year, as well as more undergraduate students, to meet the growing demand. We also hope to strengthen our faculty during the coming year, so that we can continue to prepare graduates for careers in petroleum, ground water, environmental, and geotechnical work. Some of our faculty members are nearing retirement, and we thank them for their service as we look forward to strengthening the department in the future. The SDSMT Foundation's new Capital Campaign will focus on scholarships and endowed chairs, and if you make a gift or donation, please remember that these can be directed specifically toward the Department of Geology and Geological Engineering for the needs that you feel are greatest.

Also in development are plans for a new Paleontology Building on the hillside south of O'Harra Stadium, above the athletic field. The planned building will depend on fund-raising from the Foundation's capital campaign. Within the paleontology program, Dr. James Martin retired last summer, although he continued to teach during the fall 2005 semester. A search also is underway for a Haslem post-doctoral researcher.

Before closing, I'd like to express special thanks to Dr. Gries's sons, John C. Gries and Donald Gries, and their families. The SDSMT Foundation recently announced that the Gries estate has made a substantial addition to the John Paul and Virginia Gries endowment, which will provide scholarships and fellowships for students in the department.

Best wishes to all of our graduates and friends. Please continue to stay in touch through personal visits, phone calls, letters, and e-mails. It's immensely gratifying to hear that so many of you are enjoying successful and productive careers in interesting fields.

Current Enrollments in the Department

BS Geology	56	MS Geol/GeoE	17
BS Geological Engineering	42	MS Paleontology	11
		PhD Geol/GeoE	10
BS Degree Total	**98 (+4 from 2004)**	**Graduate Degree Total**	**38 (-2)**

Visiting Lecturers

Duff Kruse (BS, ME 1966) of Pacer Minerals, Custer talked in January on "Technical Characteristics of Industrial Minerals that Every Customer Needs to Know."

Richard Zander, BLM, Buffalo (WY) spoke in January on "Coal Bed Natural Gas Development in the Powder River Basin of Montana and Wyoming"

William J. Siok (MS Geol 1973), Executive Director, AIPG, visited in April and talked on "Professional Credentials and the Workplace, Considerations After the University"

Dr Kevin Brown of Scripps Institution of Oceanography, San Diego, and 2004-5 Joint Oceanographic Institutions/U.S. Science Advisory Committee (JOI/USSAC) Distinguished Lecturer spoke in April on "What Causes Transience in Fluid Flow in Subduction Zones and in other Oceanic Margin Environments?"

Chris Schmitz (BS GeoE 1983), Chief Engineer, Phelps Dodge Mining Co., presented "Geology and History of Bagdad Porphyry Copper Deposit, Yavapai County, Arizona" in October.

Of the local talks, the one that generated the most interest was on **"**New Orleans, the Next Atlantis?" by Dr James Fox in October. The schedule of Friday Afternoon Seminars is maintained on the department web page – let Colin Paterson know if you are planning to visit and would like to present on your experiences.

News from Arden Davis

During the past year, I've taught graduate courses in ground-water modeling and environmental remediation, as well as undergraduate courses in ground water, engineering design, and mentoring of freshmen. I've also continued to collaborate with Dr. Cathleen Webb and Dr. David Dixon (chemical engineering) on a process for arsenic removal from drinking water. We've formed a team with a company in order to compete for the Grainger Challenge, which offers a $1,000,000 prize that is aimed at encouraging development of a low-cost method for reducing arsenic concentrations in drinking water in third-world countries. In other research, we plan to run a pumping test this spring at Jewel Cave National Monument, for evaluation of their water supply. We're also continuing with work to assess ground-water vulnerability in the Madison aquifer.

News from Jim Fox

Jim Fox is using subsurface geophysical well logs to construct the "stratigraphic framework" of South Dakota, illustrated with eight cross sections extending from the Powder River Basin, Wyoming to eastern South Dakota. Sets of structural contour and isopach maps will also be presented. Thanks to the efforts of Kelli McCormick and Tom Haggar they will be published electronically and in paper form by the South Dakota Geological Survey, Vermillion, South Dakota.

News from Maribeth Price

Maribeth Price published the second edition of her introductory GIS textbook, Mastering ArcGIS in July 2005, and continues to teach workshops regularly. The GIS lab got a major renovation over the summer, with new furniture, computers, and a dedicated projection system. We're enjoying the new class space very much! GIS also played a major role in helping Professors Price and Paterson plan the spring field trip to Spain by overlaying geologic and road maps from a variety of sources.

Photo at right: Dr Price in the GIS lab

News from Larry Stetler

For the past 5 years, I have served as the program coordinator for GES 115, Professionalism in Engineering and Science, which is a required first-year course for all engineering students plus those in the Geology and Interdisciplinary Science degree programs. As part of that work, I have published 4 peer-reviewed papers in the last 2 years on various aspects of engineering education and assessment. However, due to the heavy time commitment required to run this program, my personal research has fallen off. Thus, I have made the decision to step down from this post effective Dec. 31, 2005. I have been approved for a sabbatical leave for the spring and fall 2006 terms and I will be working in the Great Plains Center for Native American Health, a new research center established from a Congressional earmark grant. I will be conducting research into soil erosion, dust emissions, and impacts to air quality effecting Native American health. I am also submitting 2 proposals to the US Army Corps of Engineers to conduct research on the Missouri River regarding habitat restoration for the Pallid Sturgeon. I am now teaching the engineering geology field camp at Ranch A and have submitted a proposal to establish a new educational facility as part of the DUSEL project at the old Homestake Mine in Lead. If this is built it would provide new facilities for the Black Hills Natural Sciences Field Station plus a fully equipped lab that would be used during the camps. As the next year progresses, I am intent on supporting additional graduate students to assist me in these various endeavors.

Homestake Deep Underground Science and Engineering Laboratory (HStake-DUSEL) – Bill Roggenthen

Efforts to designate the now-closed Homestake Mine as a national underground laboratory continued during the past year. The laboratory, whose depth can shield experiments from the effects of cosmic radiation, will provide a site to study fundamental particles, such as neutrinos, and will allow longer term geo-science and engineering investigations to progress in an underground environment. In July, 2005, Homestake, along with the Henderson molybdenum mine in Colorado, was chosen as one of the finalists in the competition to identify the site to be funded by the National Science Foundation (NSF). As a result of that decision, the Homestake Collaboration is preparing a conceptual design report for the facility, preparing management and safety plans, and identifying initial suites of experiments to be conducted. The project team includes the Homestake Collaboration of nearly 100 scientists and engineers along with Kevin Lesko of the Lawrence Berkeley National Laboratory (Principal Investigator) and Bill Roggenthen of the SDSMT Dept. of Geology and Geological Engineering (Co-PI). The report is due in June, 2006, and will form the basis for selection of the final candidate site in mid-2006.

South Dakota has been very aggressive and helpful in the competition for the site. On October 14, 2005, the South Dakota State Legislature met in special session to pass a funding bill that would direct an additional $19.9 million in support of the Homestake DUSEL. Including previous appropriations, this brings a total of $45.6 million available for operation and maintenance of the laboratory. These funds will provide for maintenance of the facility, holding of the water

in the mine to below the 4850' level, and establishment of an interim laboratory at the 4850'. This funding action will ensure preservation of the underground for the NSF DUSEL as well as providing much earlier access to the underground for experiments than previously anticipated.

News from Colin Paterson

I continued to be involved in the Black Hills Science for Teachers (BLAHST) NSF program with BHSU, offering workshops for teachers during the academic year and summer field workshops on "Geology of the Black Hills and Badlands". Crystal Hocking (BS Geol 2005) completed a senior research thesis, with advice from Dr Price and me. She produced a CD on the Geology of the Black Hills workshop – three days of the 4-day workshop are included on this CD. The 4th day (Badlands), along with other notable Black Hills geological features not included in the workshop, is being prepared by another senior student, Jeannie Steckman. Once completed, this CD will be available for sale.

I also directed the summer field camps; this year there were 21 students in the GeoE camp and 15 in the Geol camp, both at Ranch A. We offered the 2nd Annual geology camp in Taskesti in western Turkey, with 14 students (10 from other universities) participating *(see article below).* This doubled the enrollment of the previous year (fulfilling a stated goal), and for the coming year (2006) we may offer two sessions if numbers warrant it.

Together with Alvis Lisenbee, Ed Duke, and James Fox, I received funding from Barrick Gold Corporation for a research grant on Lithofacies Reinterpretation of Stratigraphy in the Homestake Mine, and Compilation of a Basement Tectonic Map of South Dakota. Three graduate students have been supported for research that is intended to assist Barrick with exploration for Homestake-type gold deposits worldwide – we hope this might be the beginning of a long-term research relationship. I have also been involved with the Homestake mine core storage and archive as part of the DUSEL project *(see other article).*

On a personal note, I am a founding member and first President of the Norbeck Society established in March. The Society encourages a diversity of outdoor activities and enjoyment of living, visiting, recreating, conserving and experiencing our public lands, with a goal of sustainable management. Initial focus is on travel management in the Black Hills National Forest, where the exponential increase in motorized travel (particularly ATVs) is causing resource damage especially in riparian areas with potential impacts on aquifer quality as well as aesthetics. The web page is http://speedy.sdsmt.edu/~cpaterso/norbeck_society.htm

I will be on sabbatical leave for the spring 2006 semester, and will be based mostly in Rapid City working on publications, research, and proposal generation for Geoscience Education for Teachers.

2nd International Geology Field Camp: Turkey

In July and August of 2005 Dr. Nuri Uzunlar and Dr. Alvis Lisenbee led the second Black Hills Natural Sciences Field Camp, International Geology Field Course, from the base camp at Taskesti, Turkey. The camp is about 100 miles east of Istanbul in the Asiatic portion of Turkey known as Anatolia. Fourteen students from across the U.S. (SDSM&T, U. South Dakota, Appalachian State U., Harvard, U. Idaho, San Francisco State U., U. Tenn., U. South Carolina) participated. For five weeks we examined the remarkable exposures in the collisional belts of the Tethyan realm.

The course focused on two major themes. The first involved subduction-related features, e.g., volcaniclastic strata, fore-arc basin carbonates, and regional metamorphic and igneous rocks of passive continental margins, deformed during microcontinent collisions within the Tethys. The second examined post-Tethyan, Miocene lake deposits and wrench-tectonic deformation resulting from formation of the North Anatolian fault (equivalent to the San Andreas fault in scale and destructive capabilities) which separates the Anatolian and Eurasian plates. Three weeks were spent in the green mountainous belt surrounding Taskesti and two weeks in the drier, wheat-covered landscape of the high, central Anatolian plateau.

The Taskesti field station lies on a strand of the North Anatolian fault which last ruptured in 1964, causing extensive damage. This fact apparently escaped the notice of the German research team who built the station in the 1980s. No quakes occurred at the station during the 2005 field season, but one was felt during the mapping in central Anatolia. As ever, the food, the people, and cultural immersion into a small town (population ~ 3,000) were a major part of the experience.

Mongolian Trip – Alvis Lisenbee

Several faculty members and graduates of the Department traveled to Mongolia in June for a three week visit. The excursion was led by Dr. M.R. Hanson (CEE Department) and his wife Barbara and was a combination of geology and cultural interchange. The geology group included (soon to be Dr.) Foster Sawyer and Dr. Mark Fahrenbach (both with the SD Geological Survey), Dr. Rachel Benton of the Badlands National Park, and Drs Alvis Lisenbee, Gale Bishop, and Kata MacCarville of SDSMT. We visited Rapid City's sister city (Darhan, located about100 miles north of the capitol of Ulaan Baatar), our sister university (Mongolian University of Science and Technology) in Ulaan Baatar and a branch campus in Darhan, many museums, the state opera (incredible music), and the ger (Yurt) camp of the family of one of the Mongolian professors who accompanied us into the Gobi. A sheep was slaughtered and a ride made on the double-humped Bactrian camels which are present in abundance upon the rolling landscape of the Gobi. Along with generous amounts of boiled mutton, and even more generous toasts of vodka, we had real Mongolian barbeque which was delicious and unlike that of the same name found in the U.S.

The geological portion of the trip included visits to the large copper-molybdenum mine at Erdenet, a Carlin-type gold deposit in the central portion of the country, geological museums in the capitol, and an excursion extending from the Russian border (in land which looked much like the Black Hills and the northern Great Plains) to within 120 miles of the Chinese border in the south (which looked like the Navajo Indian reservation in northeast Arizona).

We traveled for over 1400 miles through the Gobi desert on “no dollar roads”, i.e., dirt tracks, and never crossed a fence. We did, however, visit many of the dinosaur localities originally made famous by Roy Chapman Andrews during excursions in the 1920’s. These included the “Flaming Cliffs” made of red-bed sandstone. We saw examples of fossils in place in the wind blown sands of the ancient Cretaceous dunes and excellently curated specimens in the National Museum in Ulaan Baatar.

Numerous contacts were made with the Mongolian academic community. SDSMT is currently exploring possible exchanges of faculty and/or students with the Mongolian University of Science and Technology. USAID and the Fulbright Commission are potential agencies for funding.

News from Jim Martin

Jim Martin has had another very busy year. January and February found him in Antarctica with Judd Case from California, Foster Sawyer, who will finish his Ph.D. at SDSM&T this semester, and Argentine colleagues. Our goal to collect four Cretaceous fossil marine reptile specimens was realized, but not without some sacrifice. First, Jim fell through a ceiling while retrieving a sled in Punta Arenas, Chile, while organizing equipment for the expedition. Other than a broken rib and a really nasty scar, he survived. While on the Antarctic Peninsula, we experience much snow, and one week we had winds that blew at least 70 mph without a break. The conditions made our work frustrating, and the curse of plesiosaurs did the rest. Every time we followed a skeleton up the neck, we found the skull was missing. We went 0 for 4 in heads, but Foster did find an excellent skeleton of a baby plesiosaur. This specimen may be one of the finest specimens to ever be collected from Antarctica, even if the skull was missing. In addition to the plesiosaurs, we found fragmentary dinosaur remains and a number of fine bird specimens. The birds are particularly important because they all represent fossils of modern bird types that were thought to diversify in the Cenozoic. We believe we had found the cradle of modern bird evolution in Antarctica.

Upon return, Jim taught short-course seminars and helped two students finish their Master's degrees. After the semester, he once again led Tech students on an expedition to Fossil Lake in Oregon. Another fantastic collection was made from the Pleistocene site, including mammoth, birds, camel and other unique specimens. From this site, he and Jen Roberts, who received her MS from Tech and is now pursuing a Ph.D. at University of Oklahoma, went north into central Oregon and collected jaws of a very large plesiosaur from the Cretaceous. This represents the first plesiosaur from the Pacific Northwest and is currently being prepared in the Museum of Geology laboratory.

During July, Martin in the company of Judd Case and four former Tech paleontology graduate students: Jen Roberts, Rob Meredith, and Jeff and Amanda Person, were part of an expedition onto the Outback of Australia. We collected in the mid Tertiary, attempting to understand the early evolution of the Australian marsupial fauna. Jeff Person found one ancestral form that will be the subject of a forthcoming paper. Martin was involved in collecting a site dubbed "Jim's Shell Hole." The site is producing much turtle and alligator material. From Australia, Martin went to New Zealand and visited many of the museums that house mosasaurs, marine lizards of the Late Cretaceous. As a result, he was able to synonymize a mosasaur named by the Argentines in 2002 with a taxon named in New Zealand in the 1870's. This paper was read before the Gondwana 12 International Conference in Mendoza, Argentina, in November.

In August, Martin, with former student David Parris (now director of science at the New Jersey State Museum) led a field paleontology course to the Missouri River area near Chamberlain. A number of good specimens were collected, and the first record of a particular marine turtle in South Dakota was found. With the help of James Lindley of the US Corps of Engineers and amateur collector, Paul Neumiller, another juvenile mosasaur was found, as well as the first occurrence of a large mosasaur known previously in the type Maastrichtian of The Netherlands. These specimens too are being prepared in the Museum Laboratory.

In the fall, Martin enjoyed teaching vertebrate paleontology to an enthusiastic group of paleontology graduate students, and saw a number of papers published. One in particular, has international consequences. We found a marsupial mammal in The Netherlands that resembles those in South Dakota. We believe that a land connection existed across the North Atlantic during the Late Cretaceous, and marsupials, boiid snakes, hadrosaur dinosaurs, and other vertebrates were able to make the crossing at least 10 million years before previously thought.

News from Ed Duke

Ed Duke is a co-investigator on a successful National Science Foundation proposal to purchase a new field-emission scanning electron microscope (FE-SEM). The lead investigator is Jon Kellar (Materials and Metallurgical Engineering) and other co-investigators are Jan Puszynski (Chemical Engineering), Bill Arbegast (Advanced Materials and Processing Center) and Sookie Bang (Biology). The grant in the amount of $554,867 will provide funds for a new FE-SEM in the Mineral Industries Building to replace the 16-year-old JEOL 840 SEM. The new instrument will feature resolution in the 1 nanometer range, a variable pressure column, heating and cooling stage operation, a complete energy-dispersive X-ray analysis system, and an electron backscattered diffraction (EBSD) system. The new instrument will support research in nanomaterials, composites, geology, concrete analysis, and many other fields. The new FE-SEM should be installed late in the spring semester of 2006.

South Dakota Space Grant Consortium

Ed Duke is Director and Tom Durkin (MS Geol '86) is Deputy Director of the NASA SD Space Grant Consortium (SDSGC) headquartered at SDSM&T. 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 math that are essential for the development of the nation's workforce. The Consortium consists of 26 educational, industry, and government members across the state. In the summer of 2005, SDSGC placed six students at NASA Centers and another six students at the USGS National Center for Earth Resources Observation and Science (EROS). Approximately $148,000 in NASA Space Grant fellowship/scholarship funding has been budgeted in 2005 to benefit students at Consortium colleges and universities in South Dakota.

In a special attempt to reach out to Native American students, the Consortium sponsored "South Dakota Space Day at the Pow Wow: Merging Technology and Tradition" at the Rushmore Plaza Civic Center and Journey Museum in Rapid City this past October. NASA Astrophysicist Dr. Ted Gull of Goddard Space Flight Center (native of Edgemont, SD) was a featured speaker. Dr. Gull, who has spent much of his career working with the Hubble Space Telescope and other NASA observatories, spoke to students about the amazing astronomical discoveries recently made by these powerful space-based telescopes.

Additional information about the Space Grant Consortium in South Dakota is available online at spacegrant.sdsmt.edu."

Photo: l to r: Ted Gull (NASA), Tom Durkin (SDSM&T), James Rattling Leaf (Sinte Gleska Univ.), Ed Duke (SDSM&T), Fritz Hasler (NASA, retired), Angelo Casaburri (NASA) at the SD Space Day at the Pow Wow – Oct. 7, 2005

News from Carrie L. Herbel

Carrie's position was reclassified this year and now includes managing the Museum of Geology's exhibits as well as the laboratory and collections. SDSM&T President Ruch wanted her to develop innovative and science-rich information for the specimens on display, particularly the vertebrate fossils which are extremely important as a degree program on campus and to the public. Since July 1, several new displays, some temporary, are up and enjoyed by many. Signage is being revised with updated information, since much of the labels were made in the 1950s. Students and volunteers are helping Carrie with the renovation and changes of displays, as well as the appearance of the Museum. If you have the time, please stop in at the Museum of Geology in the O'Harra Building and check out the changes - you will be pleasantly surprised!

This past year, Carrie completed the 3rd year of a three-year project relating to her dissertation. The hard data gathered over the past three summers is providing long needed information so as to revise the biostratigraphy within a portion of the White River Badlands. Carrie hopes to complete all portions of her Ph.D. program at SDSM&T by next May (cross your fingers!). During the fall of 2005, Carrie spent nearly two weeks at the American Museum of Natural History, studying their collections relating to her dissertation, as well as examining the spectacular exhibit halls and laboratories. New ideas have been developed for our little Museum of Geology stemming from this visit to one of the largest museums in the United States.

Carrie also manages several other projects for Badlands National Park, the Bureau of Reclamation, Bureau of Land Management, and tribal entities as well as working with local individuals on private land. These activities keep many of the paleontology undergraduate and graduate students busy with well-paying jobs year round. Carrie also worked with many visiting scientists from around the world this past year as they studied portions of the Museum of Geology's vertebrate fossil collections. Their wide-ranging research provided our paleontology students with new insights to various specimens, thus complementing their education from SDSM&T.

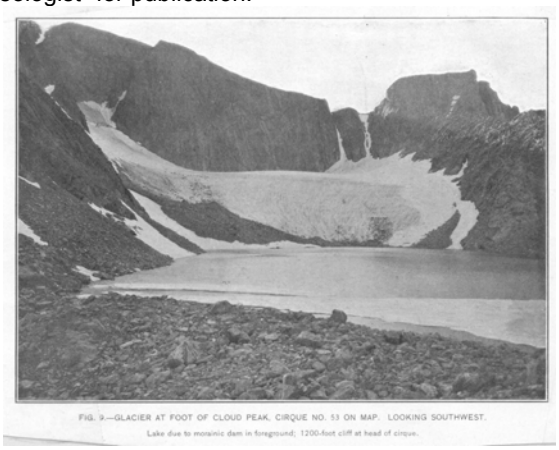
News from Jack Redden

I'm still alive and pursuing the Precambrian fossils although it's extremely frustrating inasmuch as the Precambrian paleontologists won't believe me. Their standard judgment is that there's nothing like these structures so they must be something else. I think the thing that bugs them is that many of the critters grew through one another in the original shallow sand environment. I call them incestuous. Ho Hum. Another problem is that there are likely several different critters. Also it is said that they are too large to have existed then (~2 Ga).

I still haven't heard anything about the publishing of the 1:100,000 maps in the Black Hills. Ed DeWitt says Homeland Security has taken over printing of the USGS maps, so it may not be published in my lifetime.

News from Perry Rahn

In August, Perry Rahn, his son Mike, and Charles Michael Ray (BS Geol 1997) hiked to the base of Cloud Peak in the Bighorn Mountains, Wyoming. On the northeastern side of Cloud Peak is the last glacier in the Bighorns. “We photographed the Cloud Peak glacier from the exact spot that Nathaniel Darton used in the year 1905. After 100 years the glacier has been reduced to about 20% of its original volume. The results of this study have been sent to "The Professional Geologist" for publication.”



Cloud Peak glacier, Darton, 1905

Cloud Peak glacier, Rahn, 2005

News from Karel Bielstein (BHNSFS)

Dr. Nuri Uzunlar and I taught Geology Field Camp again in 2005. We had fifteen students, eight from SDSM&T, three from UND, three from the University of Wisconsin, Milwaukee, and one from Northwest Missouri State. Nuri had to leave after the third week to head overseas to teach the Turkey session so David Nonnast, a SDSM&T graduate student, helped me the last two weeks. Since we alternate sessions with GeoE 410, the geology session was conducted from June 20 through July 23. It was hottest session that I can remember with the temperature pushing past 100º at least once each week that we were in the field. The stress of that heat can make it hard to maintain morale but the students, for the most part, worked hard and kept a positive attitude through sweat and sunburn.

Field camp students mapping at Reva Gap

In our field camp curriculum, we are trying to incorporate more technology into our field work. A pair of laser binoculars that was purchased by BHNSFS and the Geol/GeoE Department two years ago has been put to good use by our students in creating some very good geologic maps. We used it the third week instead of the plane tables and alidades that have basically been retired.

This fall, I am an adjunct instructor teaching GEOE 466/566 – Engineering and Environmental Geology at SDSM&T, and also beginning geology classes for Black Hills State University – Ellsworth.

Career Fair, September 27, 2005

It was encouraging to see the number of employers at the Career Fair in the packed Ballroom and foyer area of Surbeck Center, and especially those seeking interns and permanent employees in Geology and Geological Engineering. In visiting with many company representatives (many of whom are Geol and GeoE alumni), it was clear that there is now a very strong demand for our graduates. At least one company was offering a signing bonus for summer interns, together with a bonus for completion of the summer job, an indication of the competition for our students and graduates. The companies interested in hiring our students included:

Full Time- GEOE

Barrick Goldstrike Mines (Intern/Summ)
Burns & McDonnell(Intern/Summ)
EnCana Oil & Gas (USA) Inc. (Intern/Summ)
Foundation Coal Corp.
Geomatrix Consultants, Inc.
Granite Construction Company
Halliburton
Navy Officer Programs
Newmont Mining Corporation(Intern/Summ)
Phelps Dodge(Intern/Summ)

Placer Dome(Intern/Summ)
Rio Tinto (US Borax & Kennecott)

SAIC / EROS Data Center(Intern/Summ)
Sanjel (USA) Inc.
Schlumberger
SD Department of Environment & Natural Resources(Intern/Summ)
U.S. Marines Corps, Officer Selection(Intern/Summ)
URS Corporation(Intern/Summ)
USDA Forest Service, Black Hills Nat. Forest(Intern/Summ)
Washington State Department of Transportation(Intern/Summ)

Full Time-GEOL
Barrick Goldstrike Mines(Intern/Summ)
Burns & McDonnell(Intern/Summ)
EnCana Oil & Gas (USA) Inc. (Intern/Summ)
Foundation Coal Corp.
Geomatrix Consultants, Inc.
Halliburton
Kansas Department of Transportation(Intern/Summ)
MDU Resources Group, Inc.
Navy Officer Programs(Intern/Summ)
Newmont Mining Corporation(Intern/Summ)
Phelps Dodge Corp. (Intern/Summ)
Placer Dome(Intern/Summ)
Rio Tinto (US Borax & Kennecott)
SAIC / EROS Data Center(Intern/Summ)
SD Department of Environment & Natural Resources(Intern/Summ)
Schlumberger
U.S. Marines Corps, Officer Selection(Intern/Summ)
URS Corporation(Intern/Summ)

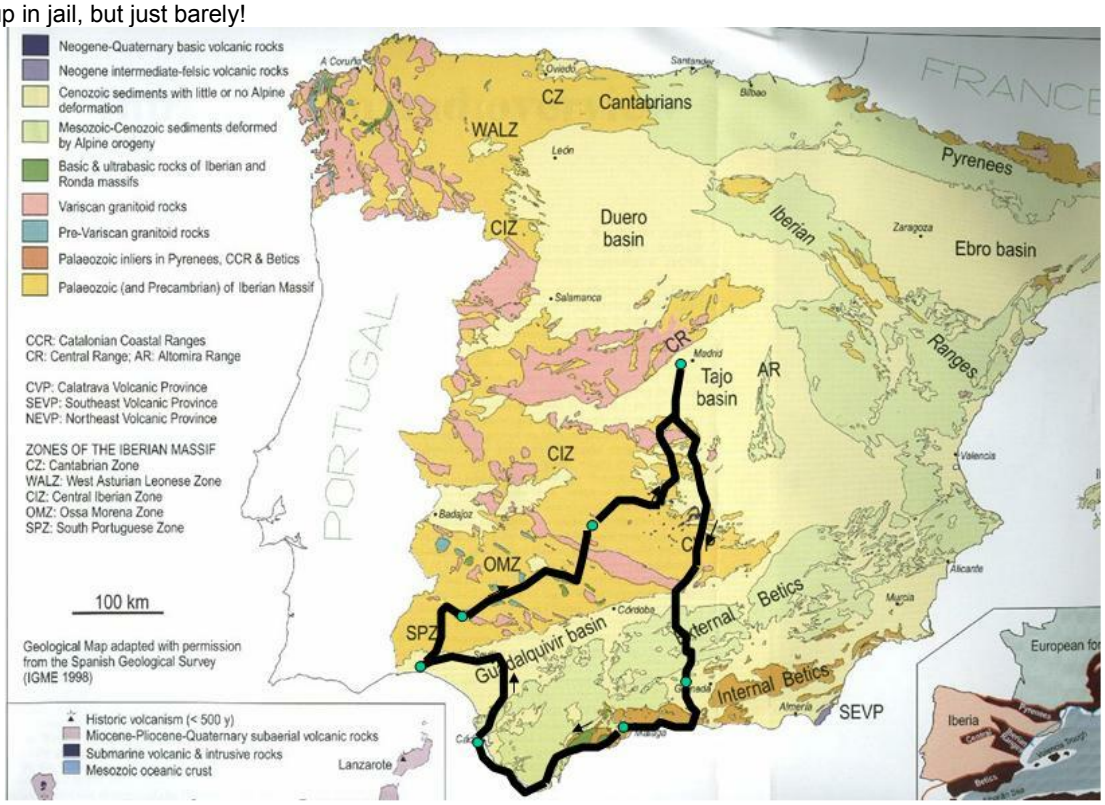
Wedding of Reko Hargrave and Jennifer Roberts

Over the Thanksgiving weekend (2005), Mr Reko Hargrave (MS GeoE, 2005) and Ms Jennifer Roberts (M.S. Paleo, 2005) returned to the Black Hills to be married in Spearfish Canyon Lodge. Attendees included family and friends from Louisiana (now widely spread across the U.S) and South Dakota. The bride was lovely in an elegant white gown designed and sewn by her mother. Following the wedding ceremony, held before the large fireplace in the lobby of the Lodge, a reception was held in the nearby Latchstring Inn. For the walk across the icy parking lot, the bride picked up her train and put on her snow boots! The Reverend Dr. Prof. James Martin officiated at the service.

Spring Break Geology Trip to Southern Spain – Colin Paterson

(or "why one should not transport mercury ore on a plane", or "the great baggage pursuit")

Dr Price, Dr Lisenbee, and I were really busy since September 2004 organizing a geology trip to Spain over spring break in early March. None of us had been to Spain, so we had to learn language, culture, and the geology. Dr Lisenbee had to withdraw the night before we left leaving two of us to lead the group of 19 for 12 days. Anyway - we survived it without ending up in jail, but just barely!



Route of 2005 spring break trip to southern Spain

Seventeen travelers departed Thursday March 3 on Northwest Airlines from Rapid City for Minneapolis, Amsterdam, and Madrid. Ed Friend (BS GeoE 2000) met us in Minneapolis, and Al Schwalm (PhD Geol 1996) was planning to meet us in Madrid. The party consisted of 2 faculty, 10 students and 7 alumni. As we approached Amsterdam, the pilot said we were diverting to Frankfurt because of fog – not uncommon for that time of day and year! We were parked on the taxiway for paperwork and refueling, and then we returned to Amsterdam – the fog had lifted. Our connecting flight on Lufthansa to Madrid was about to leave – they closed the doors just as we arrived at the gate! We all managed to get on the next flight about 2 hours later, and arrived in Madrid five hours later than planned. Al Schwalm was to meet us at Madrid at the rental van counter. No Al. He flew in from Frankfurt earlier – turns out he was leaving Frankfurt for Madrid as we were parked waiting to return to Amsterdam – we could have waved to him on the tarmac. The carousel kept spitting out baggage at Madrid, but none of ours was there. Joy Lester (Geol BS 1996; MS 2004), our Spanish speaker, helped with the baggage claim paperwork, and then we were ready to do the rental van paperwork. Already it was 8 pm, and too late to drive 5 hours south to a reservation in a hotel in Granada. But three rental Mercedes vans were waiting for us at the airport, as was Al. A frantic search for a hotel for 19 near the airport in Madrid ensued. For 30 euros each, we snagged the Aparthotel Convencion Barajas. The hotel limo guided us there, thankfully. What narrow streets and tight parking!! What a relief to have a bed for the night and no need to drive through the night to Granada.

Saturday morning was clear and cool – we just missed the snow in Madrid by a few days – an unusual event. After calling the airport to see if our baggage had arrived (it hadn't), the convoy of 3 vans (quite spacious now) headed south, through rolling countryside, past large statuesque bulls and white windmills, vineyards and olive groves (millions of them), through a gorgeous canyon, and eventually over a snowy pass (brief snow fight ensued) past the Sierra Nevada (13,000 ft) to Granada. Finding Los Jeronimos Hotel downtown was a challenge, made more so by one-way streets, narrow alleys, and hidden signs. Sure enough, our baggage had not arrived. We were ready for cruising the town for the tapas bars, where a small appetizer comes with the drink order. By visiting several bars, one can get one's fill of food and drink – some of us did quite well!

The next day (Sunday) required a morning visit to Alhambra high on the hill overlooking Granada. Built in the 13th and 14th century by the Moors, and captured by the Spanish in 1492, the Alhambra is considered a prime example of Moorish architecture. Amazing architecture and ornamentation and gardens were reminiscent of what some of us saw in Istanbul 4 years earlier. No time to tarry – we have a hotel reserved in Benalmadena, near Malaga on the Mediterranean coast, but we were able to take a scenic mountain route through melting snow, past Spaniard families delighting in snow fights and building snowmen, even in the back of pickups. The hotel was again elusive, but eventually, we cornered it. We were welcomed with the famous words –"your bags are here" – our joy was short-lived – five of the 19 bags had turned up!! It turned out that the baggage tag numbers for the 5 bags were on the front page of the baggage claim document, and the rest were on the backside, where one never looks!!

Monday morning, we awoke to the arrival of all but two of the bags. Some success at last. The Ronda Massif northwest of Benalmadena was the target for today – it is considered a piece of obducted upper mantle peridotite, exhibiting a variety of lithologies including lherzolite and serpentinite with contained asbestos. The next day saw us touring the Rock of Gibraltar, a block of Jurassic limestone caught between the colliding African and European plates. Its strategic position at the mouth of the Mediterranean Sea has led to a series of conflicts beginning with capture by the Moorish leader Tarik in 711 (Gibraltar derived from Jabal-al-Tarik – mount of Tarik), the Spanish in 1462, and ultimately the British in 1704. It is still a British dependency, and a wonderful opportunity for a subject of the Queen to catch up on traditional British fare such as fish and chips, ale in a pub, and British candy.

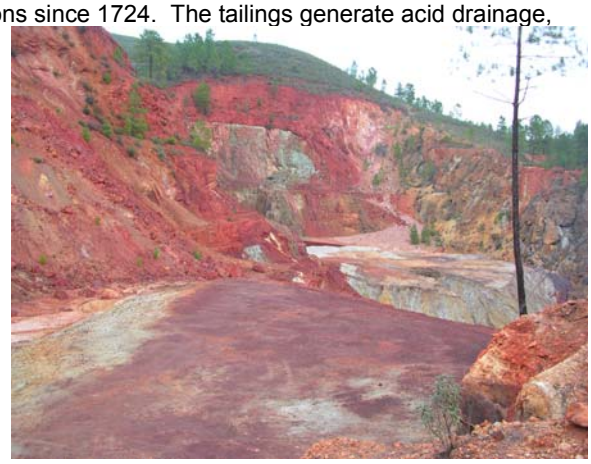
Group with Sierra Nevada in back

Rock of Gibraltar

We continued west past wind farm after wind farm to Cadiz, from where Christopher Columbus set sail for the "ocean blue" and America, and our destination of Santa Maria, an opportunity for Midwesterners to enjoy the beach. Sevilla was our next destination, and everyone had half a day and evening to see such sights as the 3rd largest cathedral in the world and the 9th century Muslim fort of Alcazar.

Dr Jose Miguel Nieto (Univ. of Huelva) met us at Zalamea, for a tour of the Rio Tinto ('river red") base and precious metal mining district in the Iberian Pyrite Belt, focusing on environmental problems related to Dev.-Carb. volcanogenic massive sulfide deposits. Low pH of 2.5 – 3.0 in local rivers resulted from natural weathering, and may have existed for at least the last 5000 years, but maybe back to 6 Ma BP. Research is in progress on how species survive and adapt in such extreme conditions, and this has implications for existence of life on other planets, such as Mars. Archeologists have established early mining dating back about 5000 years, several centuries of activity during the Roman Empire (3^{rd}-1^{st} century BC), and modern mining operations since 1724. The tailings generate acid drainage, in which algal mounds and bacteria thrive. We left our guide, and drove off the main highway in search of the abandoned San Miguel mine to see an old mining village and fossick through a large open pit with spectacular thick red gossans from weathering of the massive sulfide deposit. Oranges nicely ripened on the trees were impossible to resist.

After staying in Aracena, we toured through the town of Rio Tinto, past very large mine pits of Corta Atalaya and Cerro Colorado to the mining museum. From Rio Tinto, our journey took us north and east to the town of Almaden, the site of the largest mercury mining operation in the world – about 1/3 of the world's mercury has been produced from mining here since at least before 490 BC. The Almaden School of Mines, the 4^{th} in the world, was established here in 1777. Most of the production of mercury followed its application in the 16^{th} century to amalgamation of gold in gold mines, especially in Mexico in the 18^{th} century. Angel Hernandez of the Fundacion Almaden guided us to the El Entredicho open pit which closed in 1997. The ore is in veins of cinnabar (grades up to 25% Hg) cutting Silurian Criadero Quartzite in close proximity to alkalic pyroclastics – the source and cause of deposition of the mercury in this unique deposit is still uncertain. Not only is there cinnabar in the ore, but globules of liquid mercury occupy fractures in the rock. Recognizing the health effects of mercury, we handled the ore carefully. A stockpile of ore at the Almaden mine was available for sampling – we took advantage of this opportunity to collect unique specimens. Infrastructure of the mercury mining is being preserved as an in situ mining museum. The old shaft of the Almaden Mine dating back to the early 19^{th} century will be accessible to tourists in 2006. The furnace for mercury recovery dating back to 1720 is preserved next to the modern processing plant involving the same basic process of cooking the crushed ore to 720°F, generating Hg vapor that is condensed in water, and as liquid mercury sinks to the bottom. Stockpiles of ore continue to be processed even though mining has ceased in the Almaden district. Our last stop was in the Mining Museum, occupying the company



Gossans in the San Miguel pit, Rio Tinto district

Cerro Colorado pit, Rio Tinto

Acidic waters of the O'Diel River, Rio Tinto district

Group at Almaden mercury mine

Silver droplets of liquid mercury in cinnabar ore

hospital that was built in 1752 to treat miners for mercury poisoning. The history, mining artifacts, and the health effects on the workers are well documented in the museum. Some bought small bottles of Almaden mercury as a souvenir.

Now, we head for our last stop in Madrid, arriving downtown at about 6.30 pm on a Saturday night. Our navigators were successful in directing us within 1 block of the hotel, where we were diverted by a demonstration in Puerto de Sol. What ensued was an hour and a half of following one way streets and alleys in downtown Madrid in a search for our hotel, trying to beat the 8 pm deadline of the rental van return. We entertained police and bystanders as a convoy of 3 white Mercedes vans circled and retraced routes in vain, until we decided to look for the rental car terminal, reaching it with minutes to spare. A nervous wait followed while we watched the vans being inspected for new scrapes (the alleys were very narrow) – we passed the test. Now, we could relax in taxis as they took us by the normal route to the hotel, now made easy by the fact that the demonstration in Puerto de Sol had ended!! Our emergency contact in Madrid, Keith Martin who is a geologist with the national oil company, brought us good news in the form of the last two pieces of baggage (you had forgotten about them, right?) – at last we were whole.

We all needed a free day (Sunday) to relax in Madrid after the hectic pace of the previous 10 days – most shops were closed, but the Prado Art Museum, the Palacio Real, Mineralogy Museum, cafes, and other sights were popular diversions for everyone to enjoy. Early Monday (3 am wakeup) we piled in to taxis (at last, with all our baggage) for the airport, looking forward to an uneventful journey home.

Minneapolis was a welcome sight, and we all made our way to the departure gate for Rapid City. It won't be long now. Slight delay, as Tom Loomis (BS GeoE 82) was paged to the departure counter. And several more times. "What is in your baggage, Mr Loomis?" "Nothing". "Mr Loomis, we have detected mercury in your bag" "So? Just some samples of cinnabar, a mercury mineral – we visited a mercury mine in Spain. We are geologists" "Did you know mercury is prohibited from being transported in planes?" "No" I was thinking it would be good to get on the plane and head for Rapid City – hurry, hurry!! I don't know why, but they decided to reassign Tom to a first-class seat – maybe they were feeling sorry that he was being harassed. At last we got to board the plane, all filing past Tom as he smiled from his first class seat – we knew how to get on first class in the future. I wished they would close the door, and begin taxiing. Slight delay – some official-looking persons came on board and asked Tom to accompany them off the plane. Hmmmmmm- what now? Hurry – close the door! Ahhh - the door closed and we began our departure for Rapid City. It was a smooth uneventful flight, complete with baggage, with great views of South Dakota.

We pulled up to the gate at Rapid City, and the pilot said "Would all those archeologists (sic) with the State School of Mines please stay on board while everyone else disembarks?" No doubt there was a special welcoming ceremony for our return from overseas. Well, the welcoming committee consisted of Homeland Security in long black coats, Hazmat team, and Northwest Airlines personnel, and the Fire Department. Come to think of it, there was a Hazmat vehicle on the tarmac as we approached the gate. Endless questioning about what was in our baggage, where had we been, and why. The students were then allowed to leave the plane but stay in the departure area, while the "responsible" persons (Dr Price and I) were interviewed further. Dr Price and I were then led off the plane, walking behind the officials, and attracting stares from the passengers assembled to board the plane for the return flight to Minneapolis. "Who are these criminals?" they must have been thinking.

Captive passengers on the plane at Rapid City

I prepared a written statement of my assessment of the potential danger (if any) of the mercury-bearing materials, while the officials continued to consult Homeland Security Headquarters and the FAA to find out what to do with us and our baggage. After two hours, the FAA decided not to release our bags, but we were free to go. Those d… bags!!!

Eventually, the next afternoon, after several phone calls to Homeland Security in Rapid City, we were informed that we could come to the airport and collect our bags. It was interesting that, at least in my case, the bag was open, and the Ziploc bags containing the mercury ore, and that I had sealed, were open!

This would be the end of the story, but one of our party had been detained in Minneapolis for several hours of questioning. He did arrive in Rapid City on the next flight from Minneapolis, but without his baggage. He spent a month trying to get his bag released, with no success, until he asked our local senator to intervene – John Thune's office was able to have his bag released within hours. However, Northwest Airlines were not going to put it on a plane for him -he had to drive to Minneapolis to collect it. When he got there, he was escorted to a location where a sealed drum containing his bag was stored. He was also told that no less than 14 agencies were involved with his baggage ordeal, and the SD Department of Transportation has been informed that he will be transporting mercury on our highways!!

Mercury is a banned substance for air travel (mercury fulmonate is a compound used in switches for explosives, and liquid mercury alloys with and dissolves aluminum), and it is routinely sniffed at international airports in the US. Subsequently, I and several others received a letter from the FAA containing an official warning about transporting hazardous substances via airlines, even though we passed the detection system. I will probably have my bags searched everywhere I go now. Aaagghhh!! – baggage – who needs it?

GEOLOGY AND GEOLOGICAL ENGINEERING DEPARTMENT—front row—Dr. J. Paul Gries, Dr. Andrew Button, Dr. James E. Fox, Dr. John C. Mickelson, Prof. Willard L. Roberts; back row—Dr. James E. Martin, Dr. Fredrick J. Rich, Dr. Alvis L. Lisenbee, Dept. Head, Dr. Perry H. Rahn, Dr. Philip R. Bjork. Not pictured—Dr. Kenneth E. Kolm, Dr. Gergely Markos, Dr. Jack A. Redden, Prof. William M. Roggenthen.

From the Archive – the faculty in 1980, 25 years ago

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