



Newsletter from the
**Dept of Geology
and Geological
Engineering**
January 2009

Editor: Larry D. Stetler

larry.stetler@sdsmt.edu

501 E. St. Joseph Street, Rapid City, SD 57701
Web page: <http://geology.sdsmt.edu/>
(605)394-2461

Faculty in Geology and Geological Engineering – November 2008



Back row (l to r) – Bill Roggenthen, Maribeth Price (chair), Nuri Uzunlar, Jim Martin, Mike Terry, Kurt Katzenstein, Larry Stetler: Front row (l to r) –Jack Redden (emeritus), Alvis Lisenbee (emeritus), Colin Paterson, Foster Sawyer, Arden Davis: Absent: Gerald Grellet-Tinner, Ed Duke

From the Editor:

Happy 2009! The new year is here and we at the Department of Geology and Geological Engineering are already engaged in the Spring semester. This year's newsletter is being produced as an electronic version only in 2 formats: PDF or DOC. Those alumni with emails will be notified that it is on the web page (<http://geology.sdsmt.edu>). If you know an alum, please let them know that the newsletter is posted.

From the Chair - Dr Maribeth Price

Now that I'm well into my third year as chair, I've come to know some of the perks of the position, one of which is to share the department news with the alumni. This year seems pivotal to me for a variety of reasons. First, the Fall of 2008 started with two new faculty faces in the department. We welcome Assistant Professor of Geological Engineering **Dr. Foster Sawyer**, previously of the South Dakota Geological Survey, who accepted the tenure-track position vacated by **Dr. James Fox**. (Last spring we said thank you but fortunately not farewell to Jim, who has accepted Professor Emeritus status as well as the role of Curator of Invertebrate Paleontology at our Museum of Geology.) We also welcome Assistant Professor of Geological Engineering **Dr. Kurt Katzenstein**, who recently completed his PhD at the University of Nevada-Reno and will be helping cover courses while **Dr. William Roggenthen** is devoting his efforts to the Homestake Lab.

The Museum is taking on a new face as well--the new Paleontology Research Center is on its way. Museum staff, faculty, students, and volunteers are well into the arduous process of inventory and packing of specimens for the move to their new home. We expect to break ground in Spring 2009 and will hopefully complete the building by the Fall of 2010. The new building will house the collections as well as laboratories and research space for visiting scientists and students. Last spring we welcomed **Ms. Sally Shelton** from the Smithsonian Institution as the new Collections Manager. **Dr. James Martin** is working furiously to oversee the building process and the move, and Haslem Postdoc **Dr. Darrin Pagnac** has graciously agreed to cover Jim's teaching and service responsibilities. We are all very proud of **Dr. Martin** who was inducted into the South Dakota Hall of Fame in October. New initiatives between **Dr. Gerald Grellet-Tinner** and the Standing Rock Tribe are giving students and tribe members an opportunity to work together to preserve the tribe's outstanding fossil resources.

The Deep Underground Science and Engineering Laboratory (DUSEL) at Homestake was approved by NSF as the site for a physics laboratory with plenty of opportunity for engineering and geology research. As Co-PI of the project, **Dr. William Roggenthen** is providing a flash point of new research for students and faculty in the department. **Dr. Larry Stetler** is investigating the hydrologic regime during the mine dewatering, and **Drs. Colin Paterson** and **Mike Terry** are spearheading new research on the Homestake gold deposit. **Dr. Arden Davis** continues his work on arsenic in groundwater and as ABET coordinator, and **Dr. Edward Duke** continues to manage the EMES equipment that makes much of this activity possible.

We are very pleased to announce that **Halliburton** awarded the department a \$30,000 grant to foster training and recruiting of students into the petroleum industry. Alumnus **Dr. Abe Palaz** visited in September to award the check and discuss future collaborations. **Dr. Nuri Uzunlar** is preparing a new petroleum geology field course to be taught in the Powder River/Williston Basins and in Turkey. We will continue to strengthen research and instructional collaborations with Halliburton. This initiative comes at a perfect time when the department is working to reestablish strong links with the petroleum industry and revitalize our undergraduate petroleum offerings in order to help companies accommodate growing interest in energy reserves in our region. We have initiated a

search for a new petroleum faculty member for a research/teaching position focused on economic development supported in part by state research funding. We continue efforts to develop an endowed chair in the petroleum area to provide permanent support of energy issues in our department.

This letter is already too long and there are so many other things worth mentioning, such as the amazing growth of the Black Hills Natural Sciences Field Station under Director **Dr. Nuri Uzunlar**. Be sure to peruse the faculty notes to find out more about the field station, research and other initiatives. The department is vibrant and growing, and we appreciate the support of all of you alumni who have provided donations, internships, advice, and just an update on your careers and successes. I can only image what I'll have to talk about next year!

From Our Emeritus Professors:

Dr. Perry Rahn

Perry is professor emeritus of geological engineering and has been retired since 1997. He says he remains active by thinning trees! Perry regularly can be seen in the department where he is working on several areas of interest. He remains active in publishing papers and has the following for 2008.

2007, Fracture traces and the productivity of municipal wells in the Madison Limestone, Rapid City, South Dakota: (abstract): South Dakota Academy of Science annual meeting.

2008, Total dissolved solids in western South Dakota water (abstract): 20th annual meeting, Environment and Ground Water Quality conference, South Dakota Department of Environment and Natural Resources, Pierre, SD, p. 24.

2008, (with Arden D. Davis), South Dakota water rights do not protect head loss (abstract): Western South Dakota Water Hydrology Conference, Rapid City, South Dakota, p. 15.

2008, Historical perspective: uranium age dating at the Bob Ingersoll Mine, South Dakota: The Professional Geologist, v. 45, n. 5, p. 36-40.

Dr. Jim Fox

Dr. Fox retired after the spring 2008 semester. We see him periodically in the department.

Dr. Jack Redden

Dr. Redden is still active in research on various issues relating to Precambrian geology of the Black Hills, Jack is often found working in his office in the department.

Dr. Alvis Lisenbee

Retirement from teaching has resulted in an interesting and busy time! I have been fortunate during the past year to continue involvement with the Department in several ways and to have also done other things, mostly in geology, unrelated directly to school.

I am pleased that teaching has not completely ended yet for I greatly miss the students. And so last spring I presented a one credit course on the Laramide of the Northern Rockies to graduate and undergraduate students. Our weekend field trip to the Buffalo, Wyoming area reminded me of earlier trips to the thesis areas of Creties Jenkins, Murat Marcarci, Ty Naus, Darren King, and Guonong Hu in which we explored the margins of the Powder River Basin.

In the summer I had the good fortune to work once again with Nuri Uzunlar and Colin Paterson in the international geology field course in northwestern Turkey. This is perhaps the finest learning experience in which I have participated. The geology of the Tethys realm or the North Anatolian fault, which we study in every project, is just marvelous and well exposed. The total involvement of the students and staff with the food, culture, people, beauty, and history of this ancient land adds a wonderful dimension not found in the U.S. field camp experience.

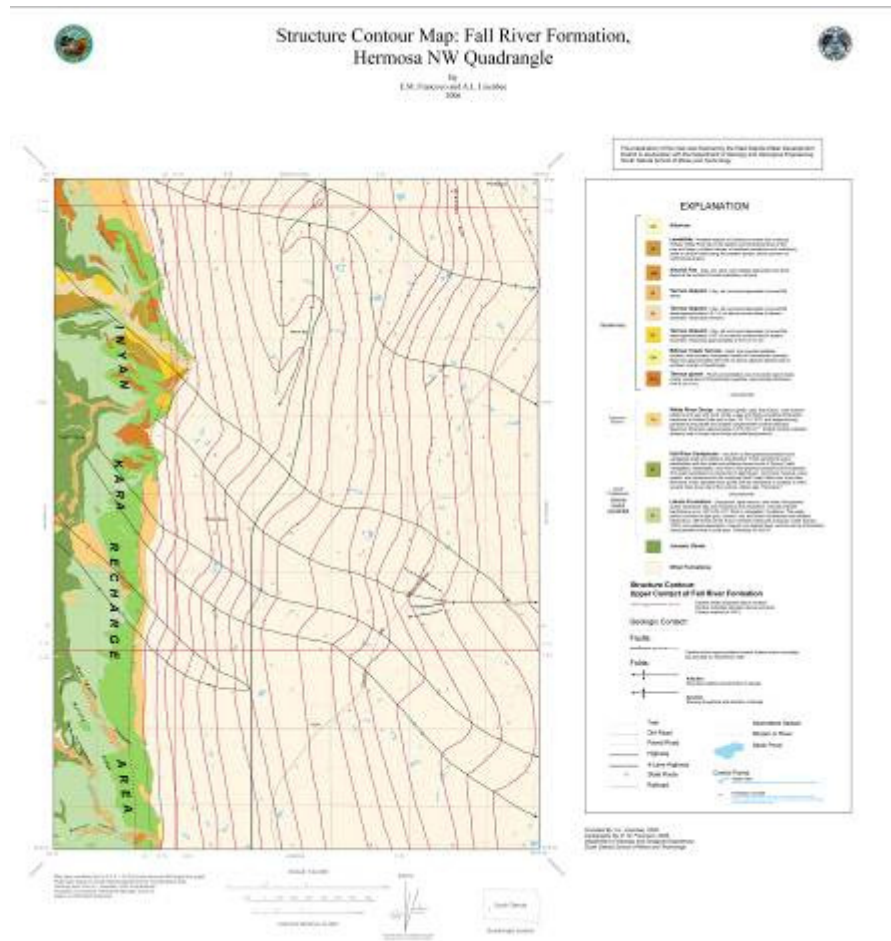


Standing on the Davutoglan fault near Cayirhan, Turkey. It's really easier to see at a distance – and definitely safer!

Some of my efforts have gone toward consulting, for a uranium project in Wyoming and ground water for Santa Fe County, New Mexico. My connection with the Santa Fe County planners is based on experience starting with my master's thesis (through the University of New Mexico) there. Later I was fortunate to have a contract with the New Mexico Bureau of Geology to map four quadrangles in the same area (I got paid to redo my M.S. study). This preparation led to the contract with the county. I can now say unabashedly that the free spirited study of rocks is much more rewarding than working with agenda-driven lawyers and planners. In addition to getting me back to the great vistas of New Mexico and green chili enchiladas, however, this did allow me to increase the number of visits to my 91 year old mother who remains in her home in Artesia.

Arden Davis and I continue our studies of geology and ground water of the Rapid City area (sponsored by the West Dakota Water Development District) where urbanization is advancing rapidly. Working with a group of excellent students over the past several years we have prepared 1:24,000 scale maps of geology, structure contours, drill depths to aquifers, and aquifer vulnerability and susceptibility. Nine of the ten quadrangles in this study are nearing completion and preparation of an atlas of the results of these studies is underway. We hope to have a web site displaying the results of the various products soon.

Structure Contour Map (top of the Fall River Sandstone), Hermosa NW Quadrangle based upon new geologic mapping and water well logs. Laramide folding was previously unrecognized east of the Inyan Kara recharge area.



In August of 2007 a flood swept past the village of Hermosa along Battle Creek south of Rapid City. Chris Pellowski and I mapped the flood plain noting the maximum extent of the flooding and the direction of flow, as indicated by bent grass and trees, piles of debris, scour marks, the final resting locations of houses, stock trailers, pickups, horses, etc. We then compared the flood limits to the geologic flood plain, as defined by the Qal and Qt deposits, and to the FEMA 100 and 100-500 year flood plains. Interestingly, the flood debris matched the location of the geologic flood plain quite well and the FEMA 100-yr flood plain rather well also. We have presented our findings at seven talks in the area. People really like a flood – after it’s over.



The pickup began its floating journey behind the trees in the distance. The tree trunk was added along the way.

At last I feel that I have the time to do some professional writing about a few things which still may be relevant. A paper on aspects of Laramide deformation in New Mexico is scheduled to appear this year in a multi-paper GSA Memoir on the Rio Grande rift. Here at home Jack Redden, John Lufkas, Tom Loomis and I have a Guidebook to the Geology of the Black Hills nearly ready for the printer. Jack Redden tells of the Precambrian, Tom Loomis has excellent pictures of minerals, and John and I covered aspects of stratigraphy and structure. Jack really upheld the concept of careful editing and revision and we will have something worthwhile as a result. The four geologic quadrangles in the Galisteo area of New Mexico should be released soon, and three others on which I have participated in the Black Hills are nearing the finish line.

Just as the economic downturn began, and minerals and petroleum prices dropped, I started working with Brad Johnson of the SDSMT Foundation to see if we could find alumni able and willing to help us (directly or through their companies) gain enough money to endow a chair in the Department. So far this has included trips to Houston and Casper. Obviously the timing for this effort isn't quite what it needs be. But, if you know of a way to encourage your company to participate in such an undertaking, please contact me. If not a chair, a scholarship would be nice. I suppose begging is what comes to most old professors eventually.

From the Faculty:

Dr. Arden Davis

In late 2007 I was appointed to the ABET Board of Directors. It's an interesting change after five years of duty as a team chair for accreditation visits, as a member of the Engineering Accreditation Commission. The ABET board met recently at the annual meeting in Louisville, Kentucky.

During the past year I've continued with interdisciplinary research on removal of arsenic from drinking water by limestone-based material. Pradeep Chintalapati finished his M.S. thesis on a project that showed the limestone waste, after arsenic removal, could be recycled in concrete. Leaching of arsenic from the concrete was less than the detection limit and it met the criteria for the U.S. EPA's Toxicity Characteristic Leaching Procedure. We've submitted the results in a paper that has been accepted for publication in the journal, "Environmental Geology." Dr. Lisenbee and I also are continuing our aquifer vulnerability work in the Rapid City area.

In the summer, my wife and I continue to take care of the farmstead in Minnesota where I grew up. The Black Hills area enjoyed a cooler and wetter summer than normal, and while we were in Minnesota I was glad to see that the summer weather was cooler and drier than normal.

Davis, A.D., Roggenthen, W.M., Stetler, L.D., Hladysz, Z.J., and Johnson, C.S., 2009, Post-closure flooding of the Homestake Mine at Lead, South Dakota: in-press, Mining Engineering.

Davis, A.D., Stetler, L.D., Roggenthen, W.M., Hladysz, Z.J., and Salve, R., 2009, Instrumentation of the Homestake underground laboratory for drawdown measurements during dewatering: Preprint 08-051, SME Annual Meeting, Denver, Colorado. In-review

Dr. Larry Stetler

I am working on several research projects which at times seems like too many, but it is fun and rewarding. I have been conducting various research experiments in the Harding County area of northwestern SD on offsite impacts from abandoned uranium mines. I am working with Dr. Jim Stone in Environmental Engineering on this project. This work has been ongoing since January 2006



and looks to be extended for many years into the future. Phase 1 of the project was conducted in the North Cave Hills and was completed in March 2007. The final assessment report is online at <http://uranium.sdsmt.edu>. Preliminary reports on groundwater transport and air transport of radionuclides are also available at this site. Phase II of the project was focused on the South Cave Hills and Slim Buttes areas of Harding County which received the majority of work this past year. I collected soil and water samples from around these areas in spring 2008 with my GeoE 465 Geological Engineering Design II class. Over the summer, my

data came from collected surface dust, atmospheric dust fallout, and high volume PM₁₀ monitors (the last 2 methods are shown in the photo). This is an EPA-funded, US Forest Service-directed project funded through CERCLA, or Superfund.

Last spring funding was granted from the SD DENR to initiate work to identify mercury contamination in South Dakota and conduct the necessary studies to write a TMDL for the state. I am working with Dr. Jim Stone in Environmental Engineering on the project. We have built and deployed 8 Hg samplers across the state where data are collected and analyzed monthly. The US National Park Service contributed more money to this project to built additional samplers and deploy them at Badlands and Wind Cave. Currently, 7 lakes in South Dakota are impacted by mercury. To develop a model of mercury transport and impact, we are measuring atmospheric mercury transport, soil, water and fish. Soil cores are being planned from the impacted lakes as well. Data are collected weekly from the sites. Analysis will be performed as data accumulates.

My aerosol dust monitoring sites on the Cheyenne River (shown in the photo) and Pine Ridge Indian Reservations are still running and collecting data. The long-term aspects of continued monitoring at these locations is unknown as preliminary data analysis suggest that there are weak statistical relations between aerosol dust and human health in western SD. We live in a naturally dry and dusty environment and apparently, our systems are not negatively impacted by increased dust in the air, at least not during the time of this study or the time period data were analyzed for (since 2000). Dust were also analyzed in terms of bacteriological content but this did not result in a statistical correlation to increased presentations. Two masters thesis were completed from this project and were focused on atmospheric dust transport mechanisms and modeling. Modeling data were derived from Black Hills National Forest fire events and correlated to various air quality monitors around the region. The aim of these studies was to determine a method for developing a rapid early air quality warning system.



The National Science Foundation funded my proposal titled: Characterization of the Precambrian Aquifer at the Homestake DUSEL. This is a 2 year project that has 2 specific tasks, 1) instrument the shafts and measure the reduction in the water level, and 2) install 10 climate stations in the mine to establish a climatological baseline for the mine. Arden Davis (SDSMT) and Rohit Salve (LBNL) are working with me on this project. Currently I have a pressure transducer, conductivity meter and

3 temperature sensors suspended in the #6 winze at the 4550-ft level. The photo on the left shows the #6 winze collar with data cable, on right, dropping into the shaft. The water surface can be seen in the center of the photo as the blue-grey color. The water table is about at the 4630-ft level now (at this writing) and the transducer is set at 4890 feet below the surface. As the water level is reduced, I



will lower the instrument package again, thus, keeping the transducer below the water table at all times. Data are being collected on a datalogger but will be web accessible as soon as the Sanford Lab runs fiber optic cable into the mine. On Friday, Nov 21, I deployed the first 4 microclimate stations throughout the mine, shown on the right. These stations are recording temperature, relative humidity, and barometric pressure. The intent is to be able to document and monitor the changes to the atmosphere as areas are opened or closed, the mine is dewatered, ventilation is

established, and as humans begin to occupy the spaces again. Additional systems will be placed in the mine in the near future and the project is being referred to as the Homestake Microclimate System.



In summer of 2008 I received a Nelson Research grant from SDSMT. These funds are being used to develop and install the Homestake Hydrostatic Water Level System (Homestake HLS) which is a tiltmeter array to measure ground response

(rock stress release) from dewatering and renewed excavation activities. I am using tiltmeters that are made at the Fermilab National Acceleration Laboratory, a DOE high-energy physics lab, in Batavia, IL. I visited the site in October 08 to see how the systems are used at that site. Currently, I have identified 4 locations in the mine that will receive a network of 6 tiltmeters. Each network will consist of 6 tiltmeters deployed over a 1000' length and around a corner. This will allow 3-D analysis of tilt and direction. The instruments have a 5 μm resolution. Dr. Jin Volk, Applications Physicist II at Fermilab, was here during the week of January 5, 2009, when we installed the first 2 HLS arrays on the 2000-ft level. The Sanford Lab installed a new fiber optic backbone that will allow the data to stream real-time to any PC in the world within the next few weeks. The photo shows Jim Volk and myself on the 2000-ft level at the termination of the 2000L A array.



I was asked by the South Dakota Science and Technology Authority (the Homestake property and laboratory managers) in early May to write a sampling protocol for collecting water samples from the Ross Shaft and the #6 winze for water quality analysis. We conducted the sampling in May on 2 separate trips and the results were used to design the surface water treatment facility for the discharged water. We sampled about 300 feet into the water in the Ross and about 750 feet in the #6 winze. The photo is of me at the edge of the Ross Shaft clearing the sampling hose prior to collecting a sample. Several additional water samples were collected at each depth for biological analysis. These samples were sent to researchers at SDSMT, BHSU and Lawrence Berkeley National Laboratory in California. Currently, we are planning for additional sampling in early Dec 08 in the #6 winze using a deep-sea sampler. The instrument will be run on wire rope into the water and pressure sensitive triggers will close the sample vessels at pre-selected depths. Our hope is to sample to 2500 feet into the water column, or down to the 7350-ft level.



My teaching load remains heavy with 2-3 courses per semester. Last summer, I taught the engineering geology field camp in the Black Hills and I taught the 1st engineering geology field camp in Turkey. With course prep that amounted to 11.5 weeks of field camps!

Dr. William Roggenthen

Dr. Roggenthen is in year 2 of a 3 year absence from the department working as the Co-PI for the NSF DUSEL proposal. He is either in his office here, at Homestake or traveling to Berkeley for various



meetings. He also has a funded research project in the mine looking at micro seismic events and ground motion. 3-axis accelerometers were cemented in sand holes on the 2000-ft level and are used for seismic monitoring.

Dr. Kurt Katzenstein

I was recently hired as a two-year term Assistant Professor of Geological Engineering to help fill in while Dr. Bill Roggenthen is busy with duties pertaining to the proposed Homestake DUSEL site.

I recently earned my Ph. D. in Geo-Engineering from the University of Nevada, Reno and am thrilled to have the opportunity to be a part of the Department of Geology and Geological Engineering here at SDSMT. My interests include the study of landslides and surface deformation related to

groundwater withdrawal, earthquakes, and regional tectonism. Recently, I have utilized spaceborne synthetic aperture radar interferometry (InSAR) to quantify such surface changes with sub-centimeter scale accuracy. I will be presenting results from this work at the American Geophysical Union annual meeting in San Francisco this December (see abstracts below).

I look forward to studying landslides here in the Black Hills as well as applying the InSAR method to geotechnical topics in the area such as dewatering-induced subsidence at Homestake DUSEL, and subsidence resulting from both groundwater withdrawal and petroleum production. I am also excited to participate in field instruction at the Geological Engineering Field Camps both at Ranch A as well as in Turkey.

To be presented at AGU in December:

Katzenstein, K. W., Bell, J. W., and Watters, R. J., (2008) One Dimensional Bedrock-Aquifer Subsidence Model Based on InSAR-Observed Mine Subsidence in North-Central Nevada, *Eos Trans. AGU*, 89(52), Fall Meet. Suppl., Abstract G31B-0654 (presenter)

Hammond, W. C., Bell, J. W., **Katzenstein, K. W.**, and Oppliger G. L., (2008) InSAR Search for Earthquakes Across the Sierra Nevada-Basin and Range Transition Zone, *Eos Trans. AGU*, 89(52), Fall Meet. Suppl., Abstract S23B-1892 (co-author)

Dr. J. Foster Sawyer

This fall is my first semester on the faculty of the Geology and Geological Engineering Department, and what an exciting, challenging, and rewarding experience it has been! Some of my activities have included teaching new courses, advising students, participating in conferences, coordinating the Friday seminar series, serving on various committees, and generally learning how the Department functions. The weather was beautiful in September and October, and several excellent field trips were highlights of the semester for me. We also had a strong turnout for the fondue party that was held for the student body, and I am hopeful that a vibrant geological student organization will emerge from everyone's efforts.

I also am involved in efforts to strengthen the oil and gas program here at SDSM&T. To that end, we are developing a new petroleum-related summer field course, and we have recently interacted with Halliburton Co. regarding additional steps that can be taken to enhance our oil and gas program. I also was involved in the Society of Petroleum Engineers (SPE) student paper contest that was held in conjunction with the 2008 Rocky Mountain Unconventional Gas Conference, both of which were great successes.

Another of my new activities is working with Dr. Mike Terry on the 2010 Geological Society of America Rocky Mountain Section meeting which will be held in Rapid City in April, 2010. What a great opportunity to host this high caliber meeting here in the Black Hills!

My recent research activities have included completing several water-quality investigations that were begun at my previous employment, and initiating involvement in cooperative research efforts with faculty and students at academic institutions in Mongolia. Efforts with respect to Mongolia will lead to an exploratory journey to Mongolia and the Gobi Desert in the summer of 2009 with a number of representatives from SDSM&T and Oglala Lakota College.

Overall, it has been a great pleasure to meet many of the students in the Department and to become better acquainted with the faculty and staff here at SDSM&T. I am delighted and honored to be working here with so many talented and interesting people, and I truly look forward to working with all of you in the future!

A few of my additional activities and recent publications are listed below.

- President, South Dakota Chapter of the American Institute of Professional Geologists
- Board of Directors, West Dakota Water Development District
- Vice-President, Black Hills Digital Mapping Association
- Vice-President, Inyan Kara Group, LLC
- President, Rapid City Morning Optimists
- New publications:

Putnam, L.D., Hoogestraat, G.K., and Sawyer, J.F., in press, Characterization of water-quality effects and indicators of onsite wastewater disposal systems in the east-central Black Hills area, South Dakota, 2006-08: U.S. Geological Survey, Scientific Investigations Report.

Sawyer, J.F., 2008, Water quality near wastewater treatment systems in alluvial and karst hydrogeologic settings, Black Hills, South Dakota: South Dakota Geological Survey, Report of Investigations 117, 135 p.

Long, A.J., Sawyer, J.F., and Putnam, L.D., 2008, Environmental tracers as indicators of karst conduits in groundwater in South Dakota, USA: Hydrogeology Journal, vol. 16, no. 2, p. 263-280.

Dr. Ed Duke

Ed continued his remote sensing research in western Death Valley National Park this year. Ed and graduate student Patrick Kozak are using hyperspectral imagery from NASA's AVIRIS instrument and from the commercial HyMap system to map the distribution of metamorphic minerals in the area



surrounding Racetrack Playa (photo). So far they have been successful in mapping the distribution of calcite and dolomite in the Ordovician through Devonian carbonate rocks and the distribution of contact metamorphic minerals and hydrothermal alteration adjacent to Jurassic-Cretaceous plutons. The latter include tremolite, serpentine, brucite, grossular, and epidote, each of which records unique metamorphic conditions in the contact aureoles.

Dr. Mike Terry

This past year my time was spent teaching structural geology, petrology, optical petrology, advanced field geology and field courses at Ranch A in Wyoming and in Taskesti Turkey. I supported five undergraduate students to do siting of seismometers for Earthscope program which is designed to image and understand the evolution of the North American lithosphere (earth's crust and uppermost mantle). I am currently advising five graduate students on projects in the Black Hills area including the deep underground science and engineering lab.

In the spring, Ed Duke and I hosted Florian Heidelberg from Bayerisches Geoinstitut in Bayreuth Germany for a workshop on SEM-EBSD (Scanning Electron Microscope-Electron Backscatter Diffraction). The technique allows rapid determination of the crystallographic orientation of minerals in a thin section which assists determining deformation mechanisms in minerals and the study of rock fabrics.

Work with national and international collaborators result in the following publications:

Heidelberg, F., **Terry, M.P.**, Bystricky, M., Holzapfel A. and McCammon, C. (in press), A simultaneous deformation-diffusion experiment: Quantifying the role of deformation in enhancing metamorphic reactions, *Earth and Planetary Science Letters*.

Frei, R., Dahl, P.S., Frandsson, M. M., Jensen A.L. , Hansen, T.R., **Terry, M.P.** and Frei, K.M (accepted pending revision). Lead-isotope and trace-element characterization of Paleoproterozoic metasediments in the Lead and Rochford basins (Black Hills, South Dakota, USA): Implications for genetic models, mineralization ages, and sources of ore leads for the Homestake gold deposit, *Precambrian Research*.

Terry, M. P., Robinson, Peter, Krogh, Tom, and Hollocher, Kurt, 2008, Day 9: Geology of Haramsøy, Flemsøy and Lepsøy. In Robinson, Peter, Roberts, David, Gee, D. G. and P. G. Andréasson, Editors. *Guidebook: A tectonostratigraphic transect across the central Scandinavian Caledonides*, 33rd International Geological Congress, Oslo, Norway, Day 9, p.1-24.

Dr. Colin Paterson

I continued to coordinate the new course IS 110 Explorations for all entering students majoring in science at SDSM&T. The theme for Fall 2008 was "climate change". Eleven students came on the optional field trip to Glacier National Park in August to examine ecosystems and their response to fire and climate change. The Grinnell Glacier has been steadily receding for more than 80 years, but ironically, the very heavy snowfalls of last winter appeared to have at least resulted in a minor reversal on the trend. I spent a total of 5 weeks teaching field camp at Ranch A and in Turkey in the summer. I am involved with the Homestake underground lab, and am coordinating the PODS geoscience working group (Petrology, Ore Deposits, Structure) endeavoring to get research underway on a variety of aspects of the Homestake iron-formation gold deposit and its geological setting. Two graduate students completed ore deposit theses, and there is one dissertation on Namibia in progress. Two or three new students are considering ore deposit research, maybe on Homestake or on gabbros intersected in drill holes in SE South Dakota.

The Society of Economic Geologists student chapter has been very active in the department with about 45 members involved in monthly meetings and field trips. The chapter sponsored the fall department picnic, and provides sodas and cookies for the department Friday seminars. Fifteen students visited the Henderson molybdenum mine (CO) and the Denver Museum of Natural History in April – our

visit coincided with the spectacular Newmont Gold exhibit at the museum. Ten students toured the Wharf gold mine in the northern Black Hills in October, led and facilitated by Keenan Sarratt and Ken Nelson. As one of our fundraisers, the chapter has Homestake gold mine rock suites for sale, in beautifully crafted wooden display boxes, for \$165 – check out the details and order form at <http://seg.sdsmt.edu> or email colin.paterson@sdsmt.edu

Dr. James Martin

The year 2008 has been very busy for the paleontology department and Jim Martin. As reported last year, the paleontology building has received funding from the State of South Dakota. As a result, much of Jim's time has been expended in directing the effort to move the building ahead with interface with architects, state engineers, and preparing for the move of approximately 300,000 specimens. Currently, the architectural plans are completed, and bids for construction should be let in December and close in January, 2009. If all goes well, ground-breaking for the new facility will occur in March. Obviously, we are very excited and hope that the project will be completed by August, 2010, in spite of economic concerns. We will need to raise additional funds for outfitting laboratories, and particularly for storage carriages and drawers (\$500,000). Overall, we hope to raise an additional \$3 million to outfit the building and for specimen and archival storage. We could certainly use your help in any amount you are willing to give. Please contact James.Martin@sdsmt.edu if you are willing to contribute or have ideas for fund-raising.



Rendering of proposed Paleontology building, viewed looking south

Even though much time has been expended with duties concerning the new building, other undertakings continued. Two television documentaries were filmed at the Museum of Geology with Jim as a major contributor. Both documentaries will soon air on the National Geographic channel. One concerns the giant pig-like entelodonts and the other concerns the largest carnivores, the hyaenodonts, from the Badlands of South Dakota. Our large collections contain very important specimens of both these very bizarre terrestrial mammals. Jim was also a principal on a documentary on the White River Badlands that was shot by South Dakota Public Television. Finally, Jim was offered a “starring” role in a Discovery special on mosasaurs, one of Jim's loves. However, upon reading the script, he turned down the offer as the special seemed less scientific; a mosasaur swimming under the Golden Gate bridge or swimming with whales? Jim also undertook many interviews with Public Radio, television, and numerous newspapers. Most of these interviews concerned a short-necked plesiosaur that was found along the Missouri River near Pickstown. The specimen was found by a 10-year old boy from Sioux City, who reported the find to the US Corps of

Engineers, who manages that portion of the Missouri River. About 60% of the skeleton was recovered, including the skull. Associated with the stomach area were the last supper of the plesiosaur that may have been killed by a tsunami generated by a meteorite impact in Iowa.

Jim continued publishing, and completed a large paper on the biostratigraphy of small mammals from the Pacific Northwest. Jim named two new species in honor of long-time friends and colleagues, Ben and Bev Witte of Seattle, WA, and Dr. Michael Woodburne, Flagstaff, AZ. Other papers include mosasaurs from Antarctica and from Argentina. The latter publication represents is the first time mosasaurs have been described from Patagonia. Jim was invited to presented a talk at the Antarctic Symposium at the national Geological Society of America meeting in Houston. He spoke on plesiosaurs from Antarctica and was a coauthor with a former student, Jennifer Hargrave, on a contribution concerning sedimentology of lake beds in Oregon and Australia.

Finally, Jim was honored in September when he was inducted into the South Dakota Hall of Fame for his educational and research accomplishments. I guess he is officially old!

Dr. Grellet-Tinner

Highlights from 2008 include the following:

- Develop a new cooperation between SDSMT graduate students and 3 Universities/research centers in Europe the in the field of paleontology
- Develop a new cooperation between SDSMT and 1) the University of Lyon (France), the Center of National research (France), the university of Sao Paulo (Brazil), and the University of Dublin (Ireland)
- Taught and organized for the first time on Tribal land 2 -12 days-field paleontology lectures in the Hell Creek Formation in Standing Rock Sioux Tribe. Although only 2 students out of the 2 entire groups registered through SDSMT, these lectures resulted in over 120 contact hours per student during each session. Participation of PhD student Joe Monks (SDSMT and now ex-SDSMT student) was helpful in the realization of these field lectures. Both lectures are cited on line and in the international Nature peer-reviewed Journal, as well as recognized by our President Dr. Wharton
- Taught 2 lectures at the University Claude Bernard for Graduate Students and faculty development. Both are cited on line.
- One NSF in systematic biology, which received good reviews but needs to be resubmitted
- One tribal grant for 2 year-field work, which was funded for \$100,000
- One European and internationally open solicitation for excellent research, which was awarded for 1-month research at the Center of national Research for \$ 7000
- One grant in co-authorship with Dr. Alley and Terry to establish future and stable academic and research goals between SDSMT and MUST/MOU in Mongolia
- Received international recognition in Nature working in the terminal phase of the Cretaceous in



the Standing Rock Sioux Reservation



- Contributed to leadership of teams in development of new technologies in multidisciplinary approach by using SEM, TLM, CL, and synchrotron in micro and micro fossil examinations.
- Reviewer for 10 national and international professional journals

- Contribution at a federal level of disseminating expertise related to paleontological resources, their origin and detection for the Home Land Security Office. This also contribution received national and international recognition in the press and Radio broadcast.

Publications that were submitted and accepted in peer-reviewed journals

- Balanoff, A., Norell, M., **Grellet-Tinner, G.**, and Levin, M. 2008. The First Embryo of a Ceratopsian Dinosaur with Comments on the Microstructural Anatomy of Dinosaur Eggs. **Naturwissenschaften**. This publication received local, national, and international recognition in the press and Television
- F. de A. Machado, E. Hingst-Zaher 1, L. F. Silveira1 e **G. Grellet-Tinner**. 2008. Utilizando la matriz de variancia-covariancia para corregir las deformaciones diagenéticas: un ensayo utilizando huevos fósiles. In Neuquén and the name is III Congreso Latino-Americano de Paleontología de Vertebrados (<http://www.proyectodino.com.ar/3clpv.html>).
- **G. Grellet-Tinner**, Mazin, J.M, and Pouech J. 2008. New micro fossils from the Jurassic and Cretaceous boundary from Cherves de Cognac. Paleobiological implications. Geobios-in press.

Publications that are submitted and in review

- Higa, A., **Grellet-Tinner, G.** and Secchi, E.R. Re-submitted. *Pontoporia blainvillei*. Mammalian Species Special Account.
- **Grellet-Tinner, G.**, Buscalioni, A., and Corsetti, F. Submitted. Discrimination of biomineralization and diagenetic overprints from biological features in dinosaur eggs. Geobios
- **Grellet-Tinner, G.** and Norell M. An egg clutch of the troodontid *Byronosaurus jaffei* from the Gobi Desert: Comparison with the North American troodontid, *Troodon formosus*. American Museum of Natural History, *Novitates*.

- G. Dyke and Grellet-Tinner, G. Submitted. A new Hesperornithiformes from New Zealand. Palaeobological and geographical implications.

Six more papers are in preparation, namely one for Nature, as I have been invited to 6 international cooperative investigations. Their topics relate to:



1. Assessment of the late Cretaceous Fauna in South France in association with the CNRS (Paris)
2. Assessment of the late Jurassic Fauna in South France in association with the CNRS (Lyon)
3. Assessment of the Jurassic Fauna in North Spain in association with the University of Madrid
4. Assessment of the late Cretaceous Fauna in Roumania in association with the Royal Museum of Belgium

5. Assessment of the Cenozoic reptile Fauna in Pine Ridge Reservation in association with the USP (University of Sao Paulo, Brazil)
6. Investigation of the global distribution of the Mesozoic toothed bird (hesperornis), its ecomorphology, and paleoecology in association with the UCD (University of Dublin, Ireland)
7. Assessment of the Cretaceous Fauna in Standing Rock Sioux Reservation in association with the Tribal Council of Standing Rock

In addition, I was able to include SDSMT on the official List of Universities of the French Universities and the Center of National Research. This opens the door to allow a free exchange between faculty, students, and academic-related topics.

I have continued my efforts to have SDSMT and SRST work together and as such I was able to lobby the Tribal Paleontological Committee to open a permanent position for a ex-SDSMT doctoral student, Joe Monks, to work as a paleontologist for the tribe and its tribal college.

I have served as chairman at the first international Symposium on the Jurassic Paeloenvironment

I am invited as a special lecturer in “ the evolution of birds in the Mesozoic: a symposium in honor of Cyril A. Walker” at the international meeting of Vertebrate Paleontology in England.

All the above-mentioned service, scholarship, and teaching activities resulted in several local, national, and international media dissemination, including but not limited to radio, TV, news papers, and on line dissemination (over 120 coverage).



Future

- Pursue the investigation in the transition from non-avian to avian theropod dinosaur.
- Pursue inter collegial seminars that include SDSMT faculty and students
- Pursue and maintain international and national cooperative research.

Dr. Darrin Pagnac (Haslem Postdoctoral Fellow)

2008 was an extremely busy year for me. I was primarily occupied with teaching duties. In the spring I taught graduate Vertebrate Biostratigraphy for the second time, and in the fall I successfully developed my own curriculum for Comparative Osteology. The latter course was quite extensive in anatomical instruction and it challenged my ability as a stratigrapher, but it was well worth it as both the students and I found the course very rewarding.

Research took the back burner this year as my teaching duties kept me quite busy, but I did manage to get some work done. I successfully compiled and wrote up part of my dissertation research on the mammalian biostratigraphy of the Miocene Barstow Formation of California, a paper submitted to the journal *PaleoBios*. I also await publication of a paper in press with Jim Martin on the



mammalian fauna of the late Miocene Ellensburg Formation of central Washington. I am pursuing some new research avenues as well. I will be writing up a description of a unique specimen of *Archaeohippus*, a dwarf Miocene horse, from the Punchbowl Formation of southern California. This specimen is unique in that it

is the first specimen of the genus with deciduous (milk) teeth. Additionally, I will be investigating stable isotope signatures of large mammals from the Barstow Formation with colleagues from New York. We will be the first to combine stable isotope data for interpreting diet and climate with detailed stratigraphy, thus allowing for precise placement of isotopic values to fossils from discrete stratigraphic levels. This will reveal unique isotopic signatures from specific points in time, rather than broad sweeping trends over long temporal intervals.

I have also played a prominent role in new collaborations between the Museum of Geology and regional paleontology interests. The Museum of Geology is now a primary repository for fossil material derived from Agate Fossil Beds National Monument and Scottsbluff National Monument, both in western Nebraska. This recent collaboration will provide numerous opportunities for research into late Oligocene and early Miocene paleontology, both for me and future graduate students. Even more exciting are the education and outreach opportunities these collaborations provide. Agate Fossil Beds needs expert input on their displays and interpretation, which will provide opportunities for my input and may provide projects for students in the “Museum Methods” courses in the paleontology undergraduate track. Scottsbluff National Monument is primarily a historical site, as a major landmark on the Oregon Trail. As such, they have no mandate for natural history and paleontology resource management, so this collaboration provides an excellent opportunity for us at the museum to directly affect the policy of management of fossil resources in the national park service.

My future plans involve continuing research into biostratigraphy and evolution of early to medial Miocene mammals. Additionally, I will be making the leap to public education and outreach. I will be developing some outreach programs for middle and high school teachers on the use of paleontology for teaching evolution. Additionally, in the summer of 2009 I will be reopening the Little Houston Quarry near Sundance, WY. This quarry is an extremely prolific site in the Jurassic Morrison Formation which has yielded fossil material from fish to theropod dinosaurs, from the largest sauropod dinosaurs to the smallest Jurassic mammals. I am extremely excited to be educating and interacting with the public at this fascinating site. For information on participating in the activities at this site, please contact the Museum of Geology.



From Museum Staff:

Ms. Sally Shelton

Sally Shelton was hired in early 2008 as Collections Manager at the Museum of Geology and Instructor in the Department. Sally came to SDSMT to oversee the management of the Museum's 300,000+ specimens, records, archives and associated data. This is particularly important now because the Museum will be moving to new quarters within the next three years. All the collections will be inventoried, assessed, databased, packed and logged for inventory tracking over the next two years. It is a huge undertaking, but, thanks to SDSMT and the South Dakota State Legislature, this collection will finally be housed under one roof and fully accessible for research, teaching and interpretation. This will not affect the current Museum gallery and store, which will not be moved from the O'Harra Building. Since February, Sally has rewritten the museum's collections management policy and initiated discussions for several new Federal agreements for the management of paleontological resources in the region.

Sally came to SDSMT from the National Museum of Natural History, Smithsonian Institution, where she spent over 9 years as Collections Officer for the NMNH in the Directorate of Research and Collections. She holds a B.S. in vertebrate biology with an option in museum science from Texas A&M University, an M.A. in museum science with work in vertebrate paleontology from Texas Tech University, and a post-graduate diploma in geological conservation from the Geological Conservation Unit, Sedgwick Museum, University of Cambridge (UK). Sally is a past president of the Society for the Preservation of Natural History Collections, served as chair of the Museum Assessment Program Advisory Board, American Association of Museums, and is a peer reviewer for the AAM Museum Accreditation Program and the Museum Assessment Program. She was selected for the first Collections Care Pilot Training Program at the Natural History Museum of Los Angeles County.

Sally's expertise includes the care and conservation of geological collections, extensive work with Federal and international scientific collecting permits, collections stewardship and repository issues, and museum legal issues. She has taught professional museum courses for International Academic Projects of London, ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property, Rome), the American Association of Museums, the National Park Service, Department of the Interior, the Smithsonian Center for Education and Museum Studies, and a variety of state and regional museum associations. Since 2002, she has been a lead instructor in DOI's annual training course on the curation of natural history collections. At SDSMT, she is teaching the museum exhibit and museum curation courses, and will be offering a new course in paleontological resource management in Spring 2009. Sally is working with the coordination of the Museum's ongoing and new repository and cooperative agreements with Federal and state agencies, including the National Park Service, the Bureau of Land Management, the Bureau of Reclamation, the U.S. Forest Service and the U. S Corps of Engineers, which will benefit students as well as the Museum collections and programs.

From the Field Station:

Dr. Nuri Uzunlar

The BHNSFS has been growing since Alvis and Nuri introduced the International Geology Field Camp on North Anatolian Fault in Turkey, with seven students in summer of 2004. As the Director, Nuri established an Advisory Board to oversee the activities of the Field Station. Last summer 93 students from 34 colleges attended our six different camps. The BHNSFS now offers camps in three locations in the **USA, Turkey and India**. In 2008, the BHNSFS presented 17 scholarships (total \$14000) to field camp students.

New ventures in 2008 were **Environmental Geology Field Camp in India** for engineers and scientists and **Geological Engineering Field Camp in Turkey**. As the Director of BHNSFS, with help and guidance from Dr. Alvis Lisenbee and the Advisory Board, we plan to build a field station in the Black Hills.



Geological Engineering Field Camp, led by Larry Stetler and assisted by Arden Davis, Zbigniew Hladysz from SDSM&T and Joel Kuzsmal from University of Mississippi and had 19 students. TA for the engineering camp was Jason Van Beek a graduate student at SDSM&T.

Geology Field Camp at Ranch A had 27 students from nine different universities. The camp was taught by, Colin Paterson and Michael Terry from SDSM&T

and Jordan Brennan from USD. Randy Moses, Chris Nichols and Chris Pellowski, all graduate students at SDSM&T were the TAs.

Environmental Field Camp in India led by P.V. Sundareshwar and taught by number of faculty member from Anna University in Chennai, India.

In addition to teaching a week at Ranch A, Nuri left for Turkey in early June to teach two five-week



camps from our Taskesti base camp. The field station lies on a strand of the North Anatolian fault and Taskesti was destroyed by an earthquake in 1964.

In mid-June, Alvis arrived in Taskesti to teach the **Fifth International Geology Field Camp** in Turkey. Alvis Lisenbee, Colin Paterson, Mike Terry, Maribeth Price and Larry Stetler (not all were present for the entire camp period) and Nuri Uzunlar taught all three camps which were attended by total of 40 students from 17 different universities.



In addition to summer camps, Nuri has been active in departmental committees and the department's graduate and undergraduate recruiting efforts. Nuri attended GSA in Houston, to host a booth on behalf of the BHNSFS and the department.

For additional information about upcoming field station activities visit <http://geologyfieldcamp.sdsmt.edu> , call (605) 394-2494 or write to the director, nuri.uzunlar@sdsmt.edu

Research News:

Homestake Deep Underground Science and Engineering Laboratory (DUSEL)– Continuing Progress

In April 2008, a DUSEL workshop was held in Lead, SD. Dr. Terry led a field trip on Sunday prior to the meeting which received great interest and attendance. Many of the faculty from the department attended and participated in the numerous sessions and breakout planning meetings including Dr's Terry, Paterson, Duke, Uzunlar, Price, Davis, Roggenthen and Stetler. Workshop attendee's were shuttled from the Rapid City airport to Lead by a never-ending stream of our students acting as chauffeurs. The workshop was structured such that Monday-Wednesday was primarily focused on earth sciences included engineering, geology, biology, education, and all non-physics research and outreach. Thursday and Friday were dedicated to the physicists. Over 390 people enrolled for the workshop. The mid-week banquet on Wednesday night was held at the Deadwood Convention Center and standing room was hard to find. In fact, it was just plain hard to walk around.

The SDSTA also conducted underground tours to the 300 foot level of the mine. People were given a safety talk and then went into the mine using the Ross cage. After a walk around on the 300 level, we walked out the Kirk adit and were bused back to the top.

Many new collaborations were established in the week and several proposals have been submitted to NSF as a direct result. Interest remains high and very upbeat about the new lab possibility and its potential for science and engineering. Our department is uniquely positioned to benefit from this lab by having so many of our faculty directly involved and by the potential for future student involvement.

Progress at the Lab can be followed by viewing the SDSTA and Lawrence Berkeley websites:

<http://www.sanfordlaboratoryathomestake.org/sdsta.html>

<http://www.lbl.gov/nsd/homestake/>