SOUTH DAKOTA SCHOOL OF MINES & TECHNOLOGY

Department of Geology and Geological Engineering

2014 Alumni Newsletter

Department of Geology and Geological Engineering – Fall 2014: Left to right: (back row) – Foster Sawyer, Kurt Katzenstein, Cleo Heenan (Department Secretary), Maribeth Price, Larry Stetler, Darrin Pagnac, Ed Duke, Tim Masterlark, (front row) - Zeynep Oner Baran, Christina Belanger, Laurie Anderson (Head), Nuri Uzunlar and Chris Pellowski. Absent: Arden Davis, Colin Paterson. Alvis Lisenbee, Perry Rahn, Sally Shelton, Clint Boyd, Bill Roggenthen, Jim Fox and Jack Redden.

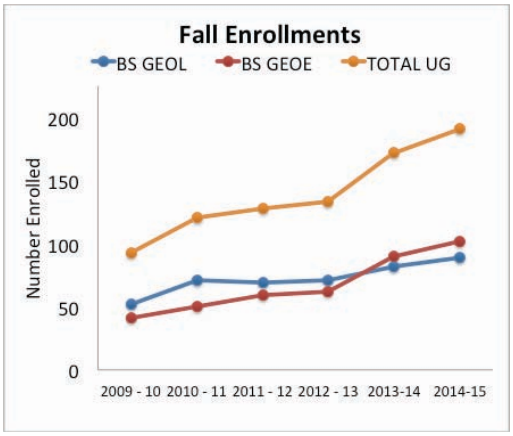
From the Editor – Nuri Uzunlar

Greetings Alumni and friends!
I wish each and every one of you good health and happiness in 2015. The 2014 newsletter is being produced as PDF and DOC and posted on the department's website http://geology.sdsmt.edu. Alumni with emails will be notified that it is on the web page. Please pass this newsletter to other alums you may know without emails. Have a blessed holiday season and a fantastic new year!

From the Head – Laurie Anderson

Status of the Department

Greetings from the wintery north! After the last year, I'm not sure that Rapid City can still claim to be the banana-belt of the upper Midwest.



The Department of Geology and Geological Engineering has had another banner year. **Undergraduate enrollments have increased dramatically in the last five years, and we currently have 191 GEOL and GEOE majors.** In our graduate programs, although enrollments have declined to 40 from a high of 56 in Fall 2011, we are seeing more students successfully finishing their degrees (in 2013-14: 8 MS and 4 PhD). For comparison, undergraduate enrollments decreased 3.4% and graduate enrollments remained steady nationwide in the geosciences from 2012 to 2013 (AGI, 2014).

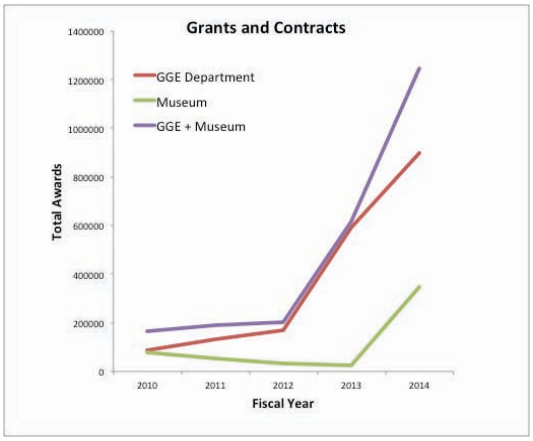
The GEOL BS program underwent a program review in 2013-14. The overall finding of the review is that the **department and Geology BS program are strong and moving forward to meet their goals**. As a result of the review process the department has identified areas for further improvement and growth, which include a renewed focus on retention and graduation rates for all our degree programs. Our graduate programs are being reviewed this year, and our next ABET review of the GEOE program is just around the corner.

Career placement of our undergraduates is remains positive. In 2012-13 graduation GEOEs had 100% and GEOLs had 57% placement. The average **starting salary for GEOE graduates was the highest on campus ($70,933)** (salary information not reported by GEOL graduates). This fall we had **30 companies and agencies** recruiting our students at the Fall Career Fair and a number of other companies on campus recruiting at other times during the semester. The department also participates in the Rocky Mountain Rendezvous, a regional student career expo for the energy sector (sponsored by AAPG and SEG). We still have much to do to increase the visibility of our excellent programs and students with industry at a national and international level. **We welcome any assistance that alumni and industry partners can provide in promoting SDSM&T, GGE, and our students!**

In addition to launching accelerated MS tracks for both the GGE and PALE degree programs, and a revised curriculum for the PALE MS in Fall 2014, we have started an interdisciplinary

minor in Petroleum Systems. This minor is an 18-credit program including 3 core courses (Drilling and Production Engineering, Fluid Mechanics, and a Petroleum Field Course) and 9 credits of approved electives in geology as well as in chemical, civil, geological, and mechanical engineering. The minor is available to any student on campus interested in expanding their portfolio of coursework to include additional content relevant to the energy sector.

The Petroleum Systems minor is part of the department's efforts to establish interdisciplinary research and teaching efforts in energy resources on campus through the ***Energy Research Initiative (ERI).*** *This initiative remains a top priority for fundraising for President Wilson and the SDSM&T Foundation, with alumnus Steve O'Rourke (GEOE 1983) serving as chair of a committee to coordinate these efforts. This year we have received support and pledges of support from a number of alumni and industry, whose generosity will help both the department and ERI. These gifts include a second year of support from Whiting Petroleum for student fellowships and student travel. In addition, Sherwin Artus (GEOE 1960) has pledged five years of support for scholarships for students enrolled in the Petroleum Systems Minor, for guest speakers, and for seed funds for new faculty. Joseph Kulik (GEOE 1961) and his wife Josephine have established two endowments to support graduate student field research in sedimentary geology, and Jeffrey (GEOE 1978) and Johanne Hohle are supporting Petroleum Systems Scholarships and salary support toward a new faculty hire in the area of petrophysics/geomechanics. In addition, the department received a donation of seismic and well-log data for the Gulf of Mexico from TGS, a gift-in-kind valued at ~$300,000. These data will be used in our undergraduate and graduate courses and for student projects.*



Our research efforts also have been met with much success. For the department as a whole, and the department and museum combined (museum grants can be administered through either unit), **awards increased by an order of magnitude** between fiscal years 2010 and 2014. These awards help support both undergraduate and graduate students and provide them opportunities for research experiences in the field and laboratory.

We currently have two faculty searches underway including a position in geophysics that Dr. Larry Stetler is chairing and in groundwater that Dr. Foster Sawyer is chairing. **We welcome nominations for these positions.**

I'd like to acknowledge some of the gifts we received for the Department or the Museum of Geology in 2014 (apologies for any omissions), in addition to those listed above. Barr Engineering has been a long-time supporter of our programs and again generously provided unrestricted funds in support of students. Long-time museum volunteer and alumnus William Schurmann (GEOE 1965) passed away in January 2014. A bequest from his estate and memorial gifts from Laurie Anderson, Samuel Begerman, Kenny Brown, John Hemmer, Steve Lenards, Foster Sawyer, James Schurmann, and James Vaughn are being used to build a visible prep area on the public floor of the museum (in O'Harra). Additional gifts from alumni, friends, faculty, and organizations include those from AAPG Foundation, Laurie Anderson, Leon Estes (GEOE 1953), Mark Fahrenbach (GEOL 1995), Becci Flanders-Paterson (GEOL 2010), Terese Hruska

(GEOE 1984), Colin Paterson, Maribeth Price, Bryan Ripp (GEOE 1982), Jared Scofield, SEG Foundation, Sally Shelton, and Mark Stafford (GEOE 1984).

Finally, I would like to list scholarship and other award recipients for 2013-14. Thank you to our alumni and corporate partners who are providing the funds to allow us to support and recognize our students.

Scholarship/Fellowship	Recipient(s)
Sherwin J. Artus	• Rachel Brunstad (BS GEOE), William Eldridge (BS GEOE), Young Jae Kim (BS GEOE), K Nishanthi Perea (BS GEOE)
Macy Baresch	• Jordan Richey (BS GEOE)
Barrick Gold	• Jared Fox (BS GEOL)
Jeff L. Bauer Memorial	• Michael Leopold (BS GEOE), Alyssa Biel (BS GEOL), Rachel Raysby (BS GEOE)
Bittner-Campbell Memorial	• Kayleigh Muilenburg (BS GEOL)
Surbeck-Connolly	• Darrah Jorgenson (BS GEOL)
Homer Davis Memorial	• Jordan Richey (BS GEOE)
Gregory French	• Paul Woods (MS GEOL)
Paul and Virginia Gries	• Daniel Lucas (BS GEOL), Benjamin Cathey (BS GEOL), Shelby Allen (GS GEOE), Jonathan Manning (BS GEOE), Hallie Bower (BS GEOL)
Ben Holmes Memorial	• Zachary Lampert (BS GEOE)
Joseph and Josephine Kulik Black Hills Field Station	• Alyssa Biel (BS GEOL), Zach Burgraff (BS GEOE), Steve Mezger (BS GEOE)
John C. Mickelson	• Joshua Laird (MS PALE)
Jack A. Redden (outstanding GEOL senior)	• Evan Doughty (BS GEOL)
Bill & Jean Roberts	• Zachary Gatton (BS GEOE)
Bill & Jean Roberts (Western Gem & Mineral)	• Darrah Jorgenson (BS GEOL)
Roy E. Roadifer	• Tia Burdick (BS GEOL), Thomas Punt (BS GEOE), Baylor Wagehoft (BS GEOE), Ethan Courter (BS GEOE), Jarek Haverluk (BS GEOE), Garson Bowers (BS GEOL), Taran Bradley (BS GEOL)
Seth Schaefer	• Fieford Redaloza (BS GEOE), Christopher Schiller (BS GEOL)
Shawn Stickler	• Jonathan Emmer (BS GEOE)
Edward L. Tullis	• Crystal Hocking (BS GEOE)

(outstanding GEOE senior) **Whiting Petroleum Corp. Travel Awards**	• Yodit Asmare (PhD GEOE): ARMA Symposium in Minneapolis, MN; Jen Bednar (PhD GEOE): RMS GSA in Bozeman, MT and MN Groundwater Association in Minneapolis, MN; Michael Baranowski (PhD GEOL): Hedberg Research Conference in Austin, TX; Laura Clarke (MS PALE): North American Paleontological Conference in Gainesville, FL; Bethany Costello (PhD GEOL): GSA in Vancouver, British Columbia; Anthony Gesualdo (MS GEOL) and Paul Woods (MS GEOL): SEG in Keystone, CO; Brooke Long (MS PALE): 4th International Paleontological Congress in Mendoza, Argentina; Ethan Melville (MS GEOL): AAPG Student Expo in Houston, TX and Petrel Training in Denver, CO; Ivana Stevanovic (PhD GEOL) AAPG in Houston, TX; Andrew Clift (PhD GEOL), Ethan Melville (MS GEOL), Harrison Costello (BS GEOE), Kasey Garrand (MS GEOL), Michael Baranowski (PhD GEOL), Ozlem Orhun (MS GEOL), Shawn Oberembt (BS GEOE), and Umit Yildiz (PhD GEOE): Rocky Mountain Rendezvous in Laramie, WY

Finally, all of the best to you for the New Year. **I hope you will think of us as part of your charitable giving plan now and in future years.** SDSM&T is experiencing some budget shortfalls and we could really use the support of alumni and friends, especially at this time. **I would be happy to chat with you about the department's needs and goals at any time.**

Laurie Anderson News

Research is keeping me hopping. Work on a project funded by the NSF Dimensions of Biodiversity program with Annette Engel from the University of Tennessee - Knoxville and Barbara Campbell from Clemson University has begun. This project is a field and lab investigation of the genetic, taxonomic, and functional diversity of modern lucinid bivalve chemosymbiosis from coastal marine biomes. At SDSM&T, we are investigating how the morphology of the living bivalve hosts might reveal the presence of endosymbionts, degree of symbiotic dependence, or the type of symbiotic dependence.

Brooke Long (BS Geology from Texas Christian University) joined the PALE MS program this summer and is working on this project. We conducted field research in Florida and spent time working in the collections of the Florida Museum of Natural History

in July. Brooke also presented some preliminary work at the 4th International Palaeontological Congress held in Mendoza, Argentina in October. I also had a paper published as a book chapter on the potential of morphometrics to detect aspects of chemosymbiosis in lucinids. Next year we extend our field work to the Bahamas!

My work still continues on freshwater ecosystems of the lower Amazon, with a book chapter on the possible adaptive advantages of ultraelongate morphologies in freshwater pearly mussels published in 2014. Also published was a paper with former LSU colleague Brian Fry on isotopic work that indicates minimal incorporation of hydrocarbon-derived carbon into coastal foodwebs affected by the 2010 BP oil spill.

Some of us in the museum (Christina Belanger, Jim Fox, Darrin Pagnac, Maribeth Price, Sally Shelton, Gene Hess and I) were again awarded funding for museum collections work. Last year we received funding from the Institute of Museum and Library Services for a project focusing on collections of the Cretaceous Western Interior Seaway (WIS). This year we received funding from the NSF Collections in Support of Biological Research program to curate and digitize three newly acquired collections of modern and Neogene-age (last 23 million years) invertebrates and protists. The targeted collections represent ancient and recent shallow-marine environments and are a foundation for conservation paleobiology and contemporary ecological research. Materials include collections I brought will me when coming to SDSM&T (representing 1989-2011 field seasons), the dissertation collections of Christina Belanger, and an orphaned collection from the former University of South Dakota-Springfield. Educational activities will include projects in our exhibits design class to build exhibits on conservation paleobiology for use in outreach to middle and high school students. Sally, Jim and I also have a small grant from the BLM to curate specimens in the SDSM collections from the decommissioned Fossil Cycad National Monument. The PRL is busy with many undergraduate and graduate students involved in these and other research and collections projects.

All the best,

Laurie C. Anderson
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Director, Museum of Geology
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605-394-1212 (museum office)

2014 GGE Department news:

January:
Davis to receive Ivan B. Rahn Award in Legacy News – January, page 4.
www.sdsmt.edu/Campus-Services/University-Relations-and-Media/Publications/Docs/Legacy-News-January-2014/
Sawyer charges course for National AIPG in the Hardrock – winter, page 7.
Sinking Sin City: Perils of fissures in land out west in the Hardrock – winter, page 10.
www.sdsmt.edu/Campus-Services/University-Relations-and-Media/Publications/Docs/Hardrock-Winter-2014/

April
New Horizons Oil & Gas Conference hosted by Mines
http://www.sdsmt.edu/News/New-Horizons-Oil---Gas-Conference-hosted-by-Mines/

May:
Paterson honored with J. P. Gries Geologist of the Year award in Legacy News – May, page 7.
http://www.sdsmt.edu/uploadedFiles/Content/Campus_Services/University_Relations_and_Media/Publications/LegacyNews-May14.pdf
Museum of Geology awarded nearly $500,000 grant
http://www.sdsmt.edu/News/Museum-of-Geology-awarded-nearly-$500,000-grant/

June:
Museum of Geology awarded nearly $500,000 grant in Legacy News – June, page 3.
Fossil conference draws 120 in Legacy News – June, page 6.
http://www.sdsmt.edu/uploadedFiles/Content/Campus_Services/University_Relations_and_Media/Publications/LegacyNews-June.pdf

South Dakota School of Mines & Technology to add Minor in Petroleum Systems
http://www.sdsmt.edu/News/South-Dakota-School-of-Mines---Technology-to-add--Minor-in-Petroleum-Systems/
New Civil & Environmental Engineering Ph.D. and Student Innovation Center Approved for Mines
http://www.sdsmt.edu/News/New-Civil---Environmental-Engineering-Ph-D--and-Student-Innovation-Center-Approved-for-Mines/
Shelton honored with American Alliance of Museums award
http://www.sdsmt.edu/News/Shelton-honored-with-American-Alliance-of-Museums-award/

July:
Shelton honored with American Alliance of Museums award in Legacy News – July, page 9.
www.sdsmt.edu/Campus-Services/University-Relations-and-Media/Publications/Docs/Legacy-News-July-2014/
First shale core samples drilled by School of Mines
http://www.sdsmt.edu/News/First-shale-core-samples-drilled-by-School-of-Mines/

August:
Mines receives gift of Gulf of Mexico seismic, geophysical data from TGS
http://www.sdsmt.edu/News/Mines-receives-gift-of-Gulf-of-Mexico-seismic,-geophysical-data-from-TGS/
First shale core samples drilled by School of Mines in Legacy News – August, page 2.
www.sdsmt.edu/Campus-Services/University-Relations-and-Media/Publications/Docs/Legacy-News-August-2014/
SD Mines students receive $50,000 geological modeling software donation
http://www.sdsmt.edu/News/SD-Mines-students-receive-$50,000-geological-modeling-software-donation/

September:
Students complete internships at 200 employers in 30 states with Ms. Audra Basal, a junior geology major from Marquette, MI who interned at the Eagle Mine in Michigan's Upper Peninsula in Legacy News – September, page 3.
Mines receives gift of Gulf of Mexico seismic, geophysical data to analyze in Legacy News – September, page 5.
www.sdsmt.edu/Campus-Services/University-Relations-and-Media/Publications/Docs/Legacy-News-September-2014/

October:
Western South Dakota is a Goldmine for Paleontologists with Dr. Pagnac from SDPB
http://listen.sdpb.org/post/western-south-dakota-goldmine-paleontologists
New Research Proves Underwater Landslide Quadrupled Size of Japan's 2011 Tsunami
http://www.sdsmt.edu/News/New-Research-Proves-Underwater-Landslide-Quadrupled-Size-of-Japan-s-2011-Tsunami/
Public Invited to Bring Rocks, Fossils to Museum for Identification
http://www.sdsmt.edu/News/Public-Invited-to-Bring-Rocks,-Fossils-to-Museum-for-Identification/
Night at the Museum Hosted at SD Mines Oct. 25
http://www.sdsmt.edu/News/Night-at-the-Museum-Hosted-at-SD-Mines-Oct--25/

November:
$1.25 Million Research Project to Improve Mine Ventilation with Dr. Katzenstein (co-PI) in Legacy News – November, page 2.
Museum Staff, Students ID Rocks, Fossils in Legacy News – November, page 3.
New Research Proves Underwater Landslide Quadrupled Size of Japan's 2011 Tsunami in Legacy News – November, page 8.
www.sdsmt.edu/Campus-Services/University-Relations-and-Media/Publications/Docs/Legacy-News-November-2014/
New Research Offers First Glimpse at 'Neglected' Dinosaur Skull
http://www.sdsmt.edu/News/New-Research-Offers-First-Glimpse-at--Neglected--Dinosaur-Skull/

Christopher Pellowski

It was a busy year at Ranch A with three five-week sessions being offered this past summer. During the three five-week sessions, we had 25 students from 16 universities in session one, 28 students from 17 universities in session two and 23 students from 14 universities in session three. The weather started out cool this year, but this year was the best that I have personally experienced in my time with the field station with only a couple of weather days during the entire summer.

Session 1 students shooting an azimuth to the flag pole on May 12th, a rather cool and cloudy day.

Session 3 group photo on the last day, August 22nd.

Recruitment efforts for our department include visits to local high schools. The counselors from Admissions have once again invited our department to join them for a visit to Central, Douglas and Stevens High Schools in early December to promote our programs. We will pack up some mineral and fossil specimens to display and hand out our undergraduate degree brochures to interested students.

This year I am serving on three department committees and assisting with data gathering and synthesis for the graduate program review that is currently being written as well as the upcoming ABET review in 2016.

Be sure to visit and like us on Facebook.

https://www.facebook.com/SDSMTGeologyGeologicalEngineering

From Our Emeritus Professors:

Perry Rahn

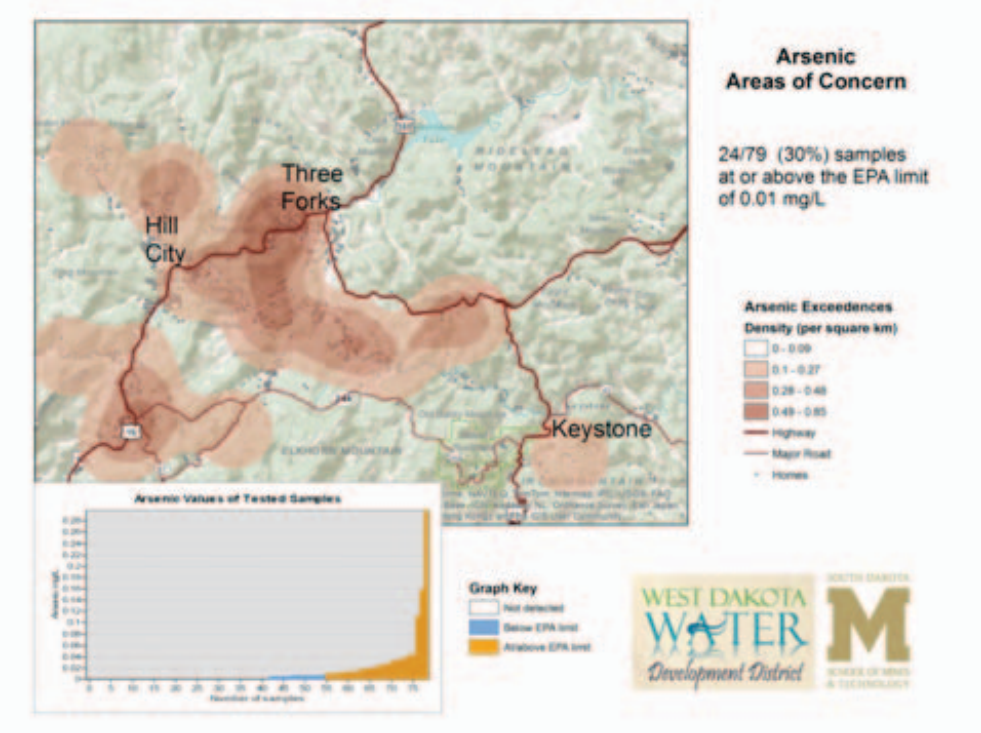
Perry Rahn sends his greeting to alums and friends:

"I still work in my office in the MI building and have coffee with my colleagues about one day per week. And I stop to see Jack Redden about every week. He is weathering out the winter at his house on West Boulevard. He has his dog Molly II and takes her for a walk every day. Up at Slate Creek I am burning hand-stacked brush piles, the result of cutting down all these darn "bug" trees."

Alvis Lisenbee

Yet another enjoyable year of travel and geology. Water quality studies with Dr. Davis, Dr. Price, as well as graduate and undergraduate students, are in the analytical stage. In home wells in the crystalline rocks of the central Black Hills, for example, an extensive area shows areas of concern for arsenic (as illustrated the map below prepared by Maribeth).

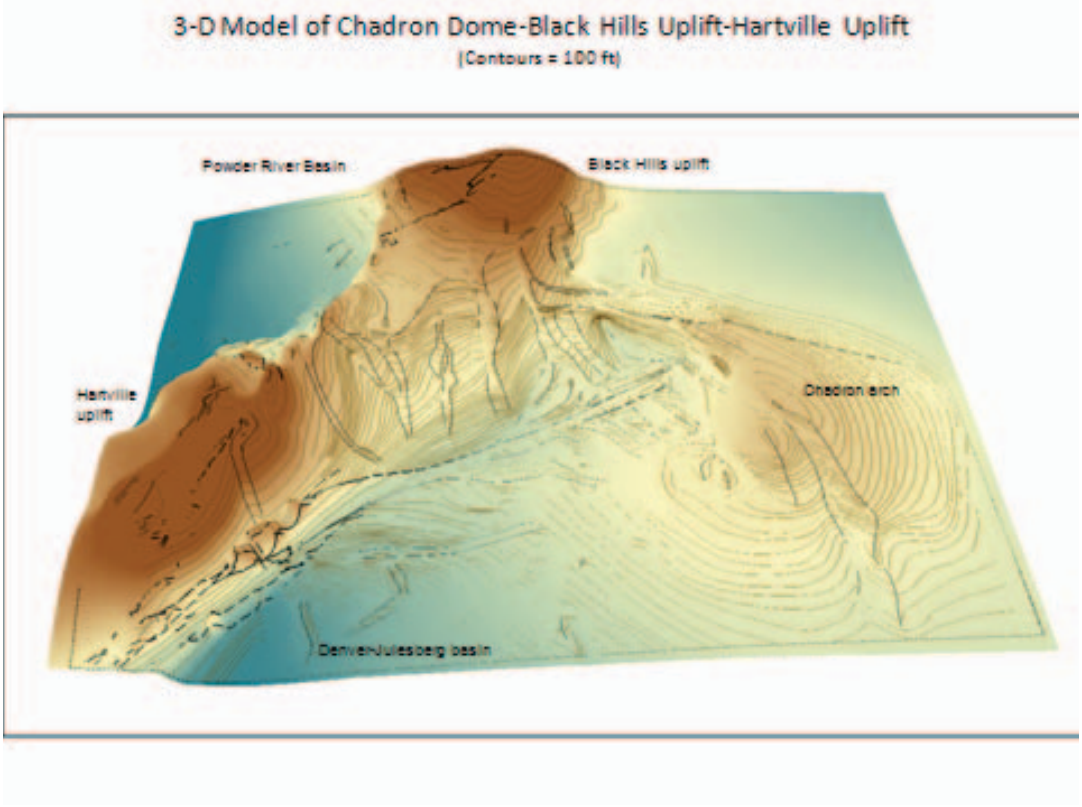
On the structural side, I have enjoyed working with the M.S. student, Kasey Garrand, who is utilizing the kinematics revealed on mesoscopic faults present in strata of the Black Hills and Fanny Peak monoclines to test for possible strike slip components in thei origin of these folds. Kasey's skill in presenting the findings by electronic analyses is quite a bit more advanced than my own.



I also enjoy working on another aspect of the Laramide tectonism of the region, specifically the area of join of the Black Hills uplift, the Chadron arch, and the Hartville uplift. As shown in the figure below, this "triple junction" join is present near the common boundaries of South Dakota, Wyoming and Nebraska. The Hartville uplift is unique within the Laramide framework of the Rocky Mountains in having an overall northeast strike. This may, in part, relate to the triple junction of Precambrian basement terranes which underlie this region. The diagram was created in GIS format by two graduate students from Ethiopia, Yodit Asmare and Micheal Tekle, both of whom have now graduated and taken their skills on into careers elsewhere.

In September, Kathleen and I visited Creties Jenkins, who has both B.S. and M.S. degrees from out department, and his wife Betty, in Santa Barbara. Creties set a lively pace of ocean kayaking, land hiking, viewing art on the beach and in the hinterland, walking the beach looking at oil seeps, and eating wonderful sea food. And as always, just listening to the world-expanding itinerary of his work schedule was amazing. Fortunately, there was time to get back to Rapid City and rest a bit before attending the GSA Conference in another Pacific coast city, Vancouver.

I am pleased to continue to participate in the Black Hills Natural Sciences Field Station expansion brought about by the guidance of Nuri Uzunlar. In March we visited Death Valley with John Caskey, who will conduct a three week field class there at the beginning of the 2014. John is a loquacious guy and the students will have quite an experience in the wonderful geology, and possibly in the winter weather, of this rather amazing place.



As ever, teaching in the Turkish field camp – the eleventh year – with Colin Paterson and Zeynep Oner, was a precious experience in the Tethyan world of Middle Eastern geology. The industrialization and growth of infra-structure of this nation, even within this 11 year period is amazing – and even more so across the span of 40 years in which I have visited this land. I returned in mid-summer from the delights of baklava and kebobs found there to a few weeks at the Ranch A camp on a more traditional American diet heavy on meat and potatoes – tasty meat and potatoes. Thank you, Nuri, for allowing both opportunities and I hope to see you in Turkey next summer.

Bill Roggenthen

This has certainly been a busy year in terms of projects that have involved a number of faculty and graduate students. Earlier in the year we were fortunate in acquiring funding to investigate the rock mechanics properties of shales, which launched us into an ambitious drilling program. As a result, we completed a 160 m continuously-cored hole northwest of Pierre, SD, starting in the middle of the Pierre Shale on the ranch where *Dances With Wolves* was filmed. We are now nearing the end of another hole that is being drilled in cooperation with the South Dakota Geological Survey. This one is planned to be 300 m deep and is slated to go through the lower Pierre Shale and the Niobrara south of Presho, SD. The creep properties of the shale are already being determined, which, as might be expected, are challenging due to the very low strength of the Pierre. Other studies on the cored materials are also underway, such as SEM work, micro-computer tomography, sedimentology, and stratigraphic correlations. We recently reached a milestone at the Presho locality with acquisition of acquired Core 100.

Bentonite in the Pierre Shale

Presho Core 100 !

Geologic work at the Sanford Laboratory at the site of the former Homestake Gold Mine continues as well. Funded studies include an investigation of the feasibility of conducting experiments to examine the use of in situ melting to plug boreholes are underway. The extensive workings at the Sanford Laboratory offer the possibility of drilling from one level to another, conducting melting experiments, and then doing a "mineback" to examine the results of the experiment. Other ongoing work at Sanford includes studies of the pillar stability through the characterization of seismic velocities and monitoring of seismic activity in the nearby underground using an accelerometer array installed on the 4100 ft level.

Colin Paterson

I retired in May 2014 after 32 years as a fulltime faculty member in the department, but in spite of that, I still seem to be busy. I spent 3 weeks teaching geology field camp with Alvis Lisenbee and Zeynep Baran in Turkey, and more than two weeks at Ranch A in the summer.

Two graduate students are completing their MS thesis research. Paul Woods is working on characterization of breccias at the Rare Element Resources project area in the Bear Lodge Mountains, Wyoming. One new MS student (Tony Gesualdo) in Economic Geology began in the fall 2014, and is developing a structural research project at the Marigold mine (NV) under the direction of Dr Zeynep Baran, and in collaboration with Andy Armstrong (MS Geol, 2013) with Silver Standard Co. An exchange student in economic geology from Freiberg, Germany (Alex Schwabe) arrived in August for a one year stay.

The Society of Economic Geologists student chapter (I am the faculty advisor) continues to be very active in the department with about 20 members involved in monthly meetings and field trips – thirteen students (freshmen to graduate) participated in the trip to the Stillwater PGE mine in southern Montana in October. Planning has begun, and funding solicited, for a northern Nevada trip in August 2015. I attended the annual SEG international conference in Keystone (CO) in September.

The search during the last year for my replacement in the area of petrology and mineral resources was a failure. Although the intent of the department was to continue the search this year, in addition to hiring a geophysicist (Bill Roggenthen replacement) and a hydrologist to replace Arden Davis, institutional budget constraints limited the department to two searches. Unfortunately, a specialist in petrology and mineral resources is not being sought at this time. Consequently, students will not have any exposure in courses to the geology of ore deposits as they relate to mining and exploration, thus limiting their opportunities for employment in that sector. Maybe it is time for mining companies to step up and provide endowments for a faculty position – any offers? For the sake of our students, I hope a remedy is found, and soon.


SEG group in front of "inch-scale" layering, and at the old Benbow chromite mine, Stillwater Complex, MT

From the Faculty:

Arden Davis

About a year ago, I completed my second three-year term on the ABET Board of Directors, so I've rotated off the board but I'm still involved with accreditation work as the past SME representative to ABET.

Over the past two years, Dr. Cathleen Webb (now at Western Kentucky University), Dr. David Dixon (Chemical and Biological Engineering), Jenifer Sorensen, and I helped form a company, CalxAqua, that plans to commercialize our method for removal of arsenic and heavy metals from water. We have received a U.S. patent for our limestone-based arsenic-removal process, and we've applied for a second patent involving removal of heavy metals. Currently, Dr. Dixon and I are collaborating on a proposal for a pilot plant to determine the total adsorptive capacity of our arsenic-removal material. Results from recent work with mine drainage water and metals removal from the Gilt Edge Superfund Site were published in the journal, "Environmental Geosciences."

Dr. Lisenbee, Dr. Price, and I are continuing our groundwater work that involves water quality in wells of the Precambrian aquifers of the central Black Hills. So far, we're finding that almost 30% of the water samples from the privately owned Precambrian wells have arsenic

concentrations above the maximum contaminant level of 0.010 mg/L. In addition, about half the samples have shown total coliform bacteria, and about 15% have fecal coliform bacteria. There appears to be a correlation between nitrate concentrations and bacterial detections in samples. We also recently received funding for sampling of water wells in the Custer area. In related work, we are continuing to compile an atlas of aquifer vulnerability for several quadrangles in the eastern Black Hills.

As in past years, during the summer my wife and I continued to take care of the farmstead in Minnesota where I grew up. The buildings, lawns, and orchard always need tending and upkeep, but the outdoor work and physical exercise are a pleasant change.

In June, 2015, I plan to retire after about 30 years of teaching at SDSMT. I hope to continue here as a professor emeritus, joining Perry Rahn and others in that status. My wife and I probably will live in Rapid City during most of the year, but I'll try to get back to the farmstead more often.

It was enjoyable to see many of the alumni who stopped by to visit during the past year. Please continue to visit us when you're in the area.

Larry Stetler

In 2014 I taught 4 courses in the spring term, 1 course in the summer, and was reduced to a single course in the fall semester (down from my usual 3). This has allowed time to prepare data and begin writing several journal papers. In addition, 2 of my MS GeoE students submitted their thesis and graduated and all 3 of my GeoE PhD students submitted their dissertation, successfully defended them, and graduated. This body of research is now being recast into manuscript form for journal publications to be submitted over the next ~6 months. Other campus activities included chairing 2 search committees in GeoE and serving as a committee member on 3 additional searches.

Research in 2014 has been primarily focused on the study of geomechanical and associated properties of shale. Two research cores were obtained from the Pierre shale in 2014. The initial core reached a depth of 512 feet and the 2nd hole is currently at ~550' and drilling is being suspended for the winter. I and a MS student are imaging the core using both CT scanning and SEM. Another PhD student is performing rock stress tests on the core to determine geomechanical properties and study long-term stress effects, or dilatency, of shale rock. One objective is to image changes in the orientation of the clay particles pre- and post-stress, which is requiring us to image with the CT at a 0.5 mm resolution. SEM analysis has revealed intricate clay particle orientations and the presence of large amounts of porosity. Inclusions include foraminifera, and crystals of barite and pyrite (Fig. 1). Several undergraduate and graduate students are working on various aspects of this core for projects.

I completed my final research report to Badlands National Park detailing the results of ~4 years of research into slope erosion and determining a model to predict visitation schedules for fossil resource preservation. Six sites were monitored and slope erosion documented with a

resolution of 0.5 mm. 3D photogrammetry was also used to determine slope movement. Figure 2 is an example of a slope model derived from field measurements. The red line is the final slope position and the average slope retreat rate was 1.22 cm/yr. Based on physical measurement, Badlands slope had an average retreat rate of ~1.0 cm/yr. Sites near the Park Headquarters building were ~1/3 more erosive than sites further to the west near Scenic. Figure 3 is a slope profile generated using photogrammetry. The red line is the ending position. These 3D slope profiles are more representative of actual field conditions as they were generated from point data having a resolution of ~1/2 cm spatially whereas the profiles of figure 2 were based on physical measurements from 3 engineering scales positioned along the slope. In figure 3 it is clear the material eroded from the upper slope was deposited minimally on the middle slope with a significant amount of deposition below the slope break at height ~ -0.4 m. The majority of this material came from the middle slope at height ~ 0.2 m where a high spot (on black curve) eroded and slipped as a mass down the slope.

Two papers were published in 2012 in addition to the Final Research report for Badlands National Park. There were:

Asmare, Y.A., L.D. Stetler, and Z.J. Hladysz. 2014. A new method for estimating 3D rock discontinuity roughness from a terrestrial LiDAR data using slope angles of triangular facets. 48th American Rock Mechanics Association Geomechanics Symposium, Minneapolis, MN. Paper No. ARMA 14-7104, 5 pg.

Stetler, L.D. 2014. Geomorphology. Reference Module in Earth Systems and Environmental Sciences, Elsevier. 05-Feb-14 doi: 10.1016/B978-0-12-409548-9.09078-3.

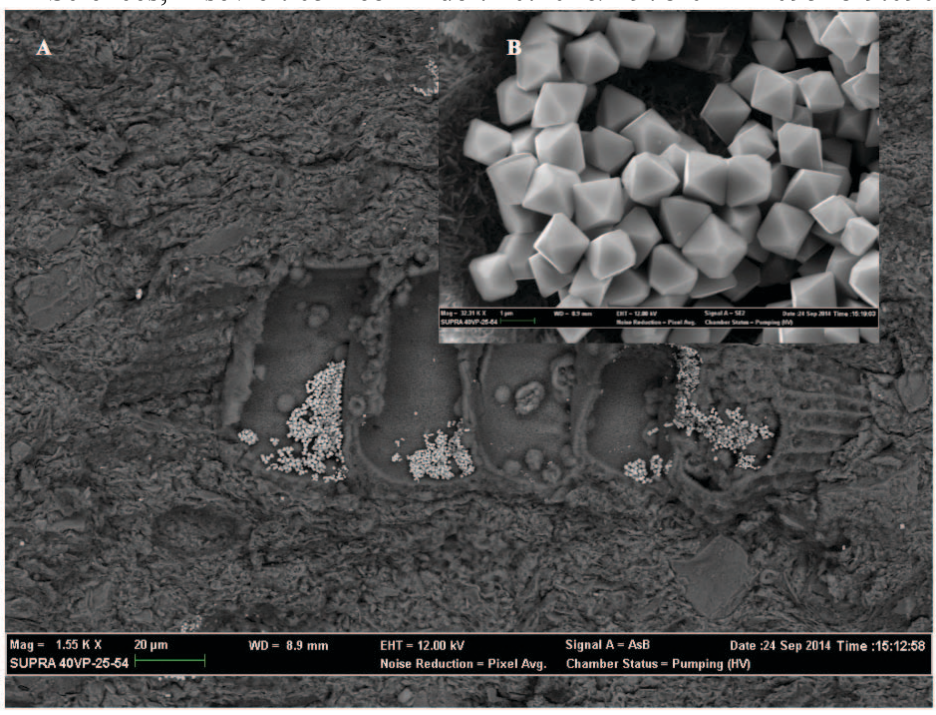


Figure 1. SEM scan of the Pierre shale (A) from western South Dakota revealing oriented clay structure (bedding?) and a microfossil partially filled with authogenic octahedral pyrite crystals that are 1 mm across (inset B). Scan by MS student Ethan Melville.

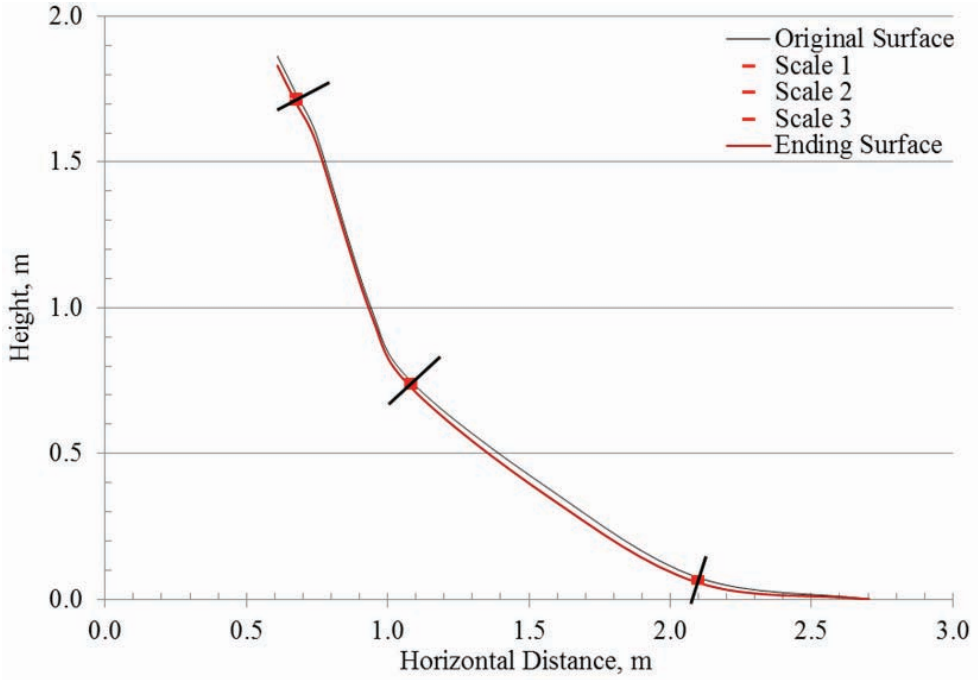


Figure 2. Slope profiles from an erosion site at Badlands that indicated net slope retreat throughout the study period. Measurements were obtained from 3 engineering scales located along the slope.

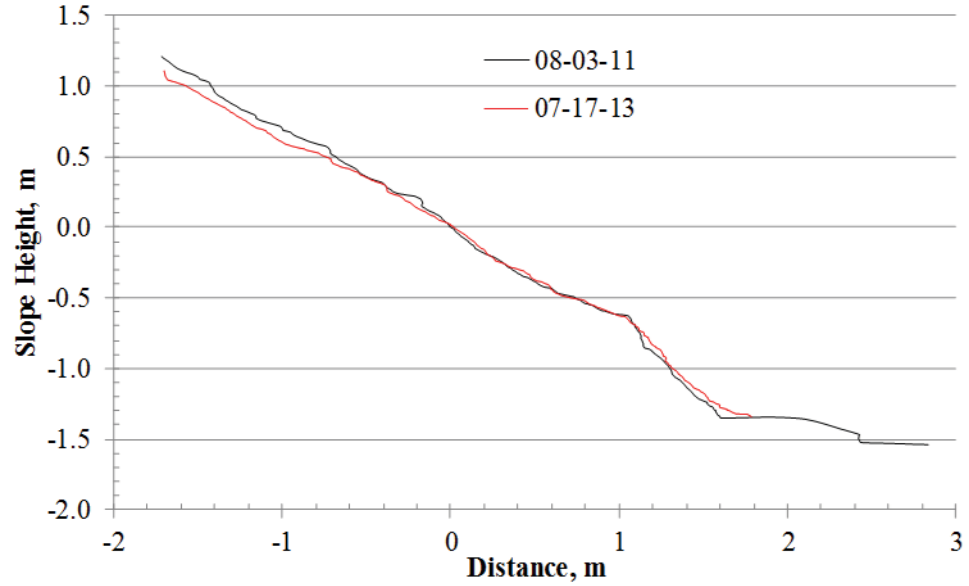


Figure 3. Slope profile from an erosional slope at Badlands obtained by 3D photogrammetry that indicated erosion and depositional variations along the slope length.

Kurt Katzenstein

Season's greetings to you! I hope you and your family had a wonderful year. Things have been busy for me this year both personally and professionally. At home, my wife Lisa and I welcomed our third daughter, Leslie Renae Katzenstein, on January 3rd. Our two older daughters, Brianne (4 ½) and Hannah (3) are growing up fast and are a few standard deviations towards the energetic side of the curve which keeps us extremely busy at home.

The Tech Geological Association had another successful year. This year we held our annual camping trip at Badlands National Park, attended the Geo-Influence conference on Geologic Hazards in Lakewood, CO, hosted the annual fall department kickoff party, hosted the annual ice fishing pot-luck, enjoyed great tours of RESPEC and the Cleghorn Springs Water Treatment Facility, had a great agate hunting trip near Farmingdale, climbed Harney peak, took our first TGA-sponsored overnight backpacking trip, attended recruiting events at Douglass and Sturgis High Schools, and hosted four bowling nights.

I currently have funded research investigating land subsidence in an arid alluvial valley in California (sorry, I can't provide more information until the study is complete!). Al am also a co-investigator on funded research investigating complex mine ventilation in block-caving operations, volcanic deformation resulting from magma injection. I am also involved in the partially externally-funded acquisition of a new triaxial load frame to be utilized by both GGE and MEM. I and colleagues in MEM and RESPEC are also finishing up the development of a new direct-shear testing apparatus for rock.

Needless to say, I have had a very busy year and hope to continue the trend in the future. Happy Holidays!

Foster Sawyer

Greetings to all of our alumni, students, and friends! I hope this message finds you and your families doing well. Another year has flown by, and it's time once again to share some highlights from an exciting year around the Department. Our Department continues to grow and flourish in many ways, and it is truly an exciting time to work in the Department of Geology & Geological Engineering.

We're continuing to develop our energy-related course offerings in response to vigorous industrial activity, increased job opportunities, and student interest. This year we increased the enrollment capacity and the frequency with which the course is offered for our Petroleum Geology course (which I teach), we now offer a minor in Petroleum Systems, and we currently are designing a graduate certificate program in Petroleum Systems as well. We received a generous donation of digital 3-D and 2-D seismic data and geophysical well logs for a geologically interesting area in the Gulf of Mexico from TGS-NOPEC Geophysical Company, and I would like to sincerely thank Mr. Steve O'Rourke for his critical assistance in acquiring this data and Mr. John Adamski for his generosity and expertise in providing it. The dataset is being used to develop teaching exercises for use in our petroleum-related courses. I am also working with Dr. Nuri Uzunlar to develop a three week Petroleum Field Camp that will be offered for the first time in the summer of 2015. We also hosted another highly successful New Horizons Oil & Gas Conference in April, and we are planning the next conference which will occur in October, 2015.

An exciting development occurred in my cooperative grant program with Sinte Gleska University when progress surged forward through coring activities in cooperation with shale research underway by Drs. Lance Roberts and Bill Roggenthen. Together with major contributions by the South Dakota Geological Survey and the U.S. Department of Energy, two continuous cores from the Pierre Shale (Figure 1) and Niobrara Formation are being acquired this fall and next spring. Core from these formations in South Dakota is rare, and these samples will provide a treasure-trove of data for shale and chalk lithologic and mechanical characteristics, reservoir properties, paleontologic information, stratigraphic correlation, isotopic data, and many other purposes.

The Pre-Engineering Educational Cooperative (PEEC) program in cooperation with Oglala Lakota College and South Dakota State University was another highlight this year with eight SDSM&T students and three faculty members from SDSM&T participating in the summer program. PEEC students presented about ten science and engineering posters at the EPSCoR South Dakota Undergraduate Research Symposium in Pierre, SD, last summer (Figure 2), and

Tyler Rust, a student in our Department, went on to present his poster at the national conference of the American Indian Science and Engineering Society in Orlando, FL, in November. Student organizations have been very active this year with great field trips, meetings, and social events. The Tech Geological Society sponsored an agate hunt, a hike on Harney Peak, visits to professional offices in the area, an overnight Badlands field trip, and many other activities throughout the year. The Society of Petroleum Engineers (SPE) Student Chapter also organized a field trip to a Baker-Hughes oilfield service facility in Casper, WY, and several students attended SPE Powder River Basin Section meetings in Gillette, WY.

Another highly interesting activity this year has been serving as the national President-Elect of the American Institute of Professional Geologists (AIPG) and preparing to serve as the national President of AIPG in 2015. It is an honor to serve in this position and I am excited by the opportunity to make a positive impact on the profession of geology at a national and international level. I also was honored and humbled this past year by receiving tenure and promotion to Associate Professor at SDSM&T, and I want to thank all of my friends, colleagues, and students for their support and encouragement.

I wish each of you Happy Holidays and a successful, healthy year in 2015, and I hope you will stay in touch.

Sincerely,

Foster Sawyer

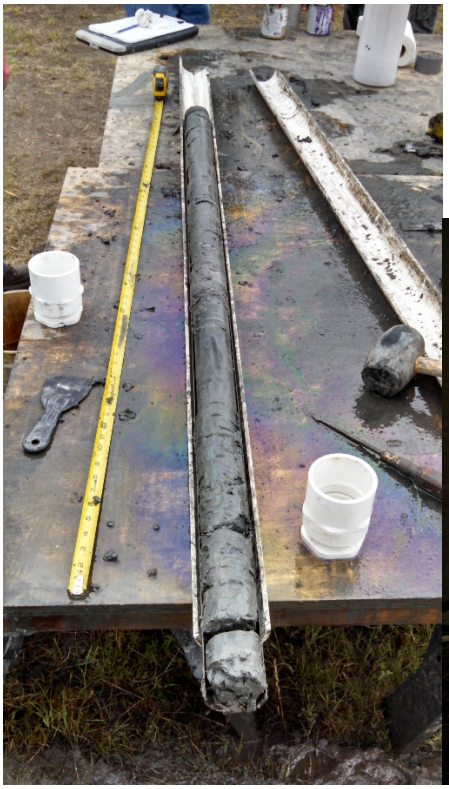


Figure 1.

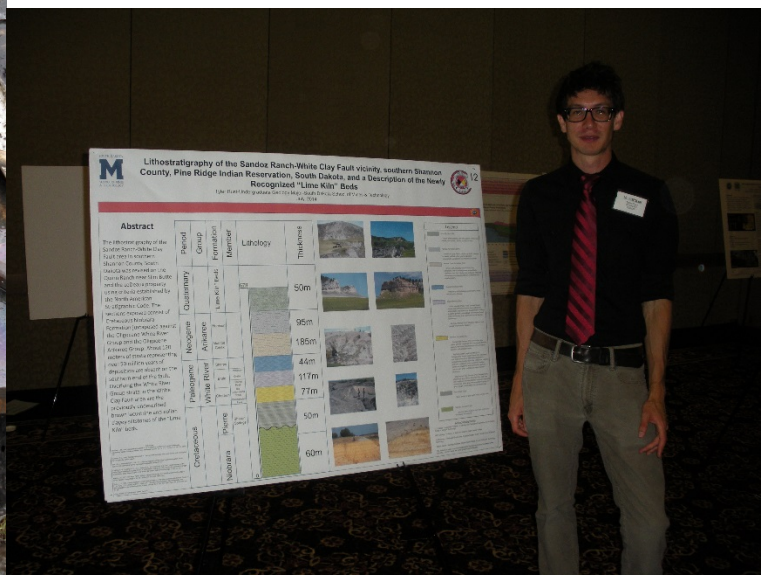


Figure 2.

Figure 1. Rainbow sheen from hydrocarbons in the Pierre Shale from core acquired west of Ft. Pierre, SD. **Figure 2.** Tyler Rust presenting his poster presentation at the EPSCoR South Dakota Undergraduate Research Symposium in Pierre, SD, in July 2014.

Tim Masterlark

This past year was a whirlwind of new ideas, discoveries, and opportunities. I took responsibility for teaching Introduction to Geology, a course that confronts students from the entire campus with the dynamic processes of the world beneath their feet. My other two courses, Geodynamics and Linear Inverse Methods, provide graduate students with the theory and numerical tools to quantify the physical processes that underpin a variety of Earth's systems. Dr. Tung, Dr. Uzunlar, and I taught the Hawaii Field Camp last summer. We were disappointed that the southeast-flowing lava supply from Pu'u 'Ō'ō (pronounced "Poo oo oh oh") diminished and eliminated the spectacular lava ocean entry. However, the recent lava breakouts that are currently threatening villages northeast of Pu'u 'Ō'ō may provide opportunities for next summer's students to sample the lava and examine rocks with an age of zero. Dr. Tung kindly agreed to teach Geophysics I during Spring 2015 and our students will benefit greatly from his experience as an instructor for the Hawaii Field Camp, as well as his research in the field of geophysics.

Ted Donovan (GGE Ph.D. student) and the Geodynamics Laboratory's newest acquisition (code name: Hephaestus). Hephaestus comprises two CPUs with 48 effective compute cores, GPU acceleration with Teraflop performance, 196 GB RAM, and 1TB solid-state storage. Hephaestus is housed in a hermetically sealed unit with internal cooling in the Geodynamics Laboratory.

My Geodynamics Research Team made great progress on all fronts. Dr. Jay Tung (Post-doc, funded by NASA JPL) developed parametric methods for constructing Finite Element Models (FEMs) of earthquake deformation. 'Parametric' means that with the specification of a few strategic controlling parameters, his methods will automatically generate and execute suites of FEMs at the push of a button. This is a major breakthrough for predicting earthquake and tsunami scenarios that are important for hazards assessments. Mike Baranowski (Ph.D. student, funded by NSF) presented some of his research at the Fall AGU Meeting 2013 and, more recently, began studying numerical models for the problem of simulating the propagation of fluid-filled cracks and induced seismicity due to fluid injection in poroelastic systems. Ted Donovan (Ph.D. student, funded by NSF) developed parametric methods for constructing FEMs of volcano deformation. He presented preliminary results at the Wegener 2014 Conference in Leeds, UK. Much of Ted's work is conducted on a high performance computing system, acquired with support from NSF. Jay, Ted, and I are finalizing a manuscript that describes how we solved a particular challenging problem of embedding FEMs in nonlinear inverse analyses of InSAR data and seismic tomography to quantify the characteristics of magma migration and

storage within Okmok, an active volcano in the Aleutian Islands. The analysis includes an elegant and unprecedented automaton of sophisticated FEM-based optimization and posteriori Bayesian techniques.

My colleagues from the University of Rhode Island, the British Geological Survey, and I published an article in the journal *Marine Geology*. This paper describes how the unusually large tsunami run-ups (wave heights of 40 meters) observed along the coast of northern Japan following the 2011 M9 Tohoku earthquake were caused by the regional coseismic seafloor deformation, as well as a massive submarine landslide that was triggered by the earthquake. These results are important, because they indicate that tsunami hazards assessments should explore possible contributions of triggered undersea landslides in addition to coseismic seafloor deformation scenarios. The *Marine Geology* article was highlighted by the journal *Science* and NBC News. I published other articles in *Geophysical Journal International* and the *Chinese Journal of Geophysics*.

Finally, I was invited to join the science team for the Krafla Magma Drilling Project (KMDP) and attended the workshop in Krafla, Iceland, sponsored by the International Continental Drilling Program (ICDP) and Landsvirkjun (the Icelandic geothermal power company). The project plans to drill and directly sample rhyolite magma that was erroneously discovered at a depth of 2 kilometers beneath the Krafla volcanic center when Landsvirkjun was prospecting for supercritical steam.

Christina Belanger

I am in my third year as an Assistant Professor with GGE and now have a fully functioning lab for paleontological and geochemical analysis necessary for work on paleoecology and paleoclimatology. Two of my graduate students, Rebecka Hastings and Ozlem Orhun, and I have been working on marine sediment samples from the Integrated Ocean Drilling Program Expedition 341 I that participated in during summer 2013. Our goal is to use the microfossils, specifically foraminifera, to reconstruct productivity and bottom water oxygenation in the Gulf of Alaska over the past glacial-interglacial cycle. This work will allow us to understand how the Gulf of Alaska responded to past climate changes and, thus, forecast the effects of future climate change. Preliminary data from modern sediments collected by a Senior Research student, Eric Beebe, helped us justify a grant submission this Fall. We have also had an undergraduate research assistant, Christopher Schiller, working with us all year – without his help we wouldn't be near as far with our work. He is applying to graduate programs in paleoclimate this year and will graduate in the Spring. The group is currently working on a collaborative paper comparing modern and fossil foraminifera in the region that will support all of our various project goals.

A student I worked with as senior last year, Joshua Laird, has started in our M.S. Paleontology program this year and will be investigating the ecology of fossil hydrocarbon seeps preserved in the Cretaceous Pierre Shale. He was able to start collecting data for this thesis this Fall and got enough done to support his thesis proposal before the snow came.

The Paleontology M.S. program also underwent revisions in the courses we offer. A new course that I prepared for this Fall semester is on quantitative analysis of paleontological data to help our graduate students leave the skills necessary for properly collecting and analyzing their data. Next semester, I will offer a new course on paleoenvironmental reconstruction that help our students provide an environmental context for the fossils they collect.

This past May, my husband and I welcomed our daughter Robin Isabell. She is now 6 months old and already expressing interests in engineering and music, despite both her parents being paleontologists. We are all doing well, albeit with much less sleep. Robin will attend her first geology conference this December when we travel to San Francisco for the American Geophysical Union Annual Meeting before spending the holiday season with family in California.
I hope the holidays find you all well.

Robin playing with her piano while mom grades midterms.

Ed Duke

This year Ed Duke has taught three courses in the Department: Mineralogy and Crystallography, Scanning Electron Microscopy, and Igneous and Metamorphic Petrology. In July he traveled to Newcastle, New South Wales, to present an invited keynote lecture on "Applications of Visible and Near Infrared Spectroscopy in Studies of Metamorphic and Hydrothermal Systems" at the Australian Earth Sciences Convention. In connection with the Engineering and Mining Experiment Station (EMES), and with support from the South Dakota Board of Regents, he helped to acquire a new portable visible and near infrared spectrometer ($65,000) and a new inductively coupled plasma mass spectrometer ($175,000). In connection with the South Dakota NASA EPSCoR Program, he serves as the Project Director on new research on "High Performance and Durable Lithium-ion Battery for NASA Space Applications" ($750,000).

Zeynep Oner Baran

Dear Alumni, Students and Faculty, it is unbelievable how fast time is flying especially when we get a busy and productive. It has been already one year that I joined the department of Geology & Geological Engineering here in SDSM&T. As a new structural geology & tectonics instructor and researcher started in Fall 2013, it is been an enjoyable experience for me to meet our undergraduate and graduate students. I have been an instructor in our Turkey Field camp in summer 2013 and summer 2014. Meeting the field camp students from different schools and cities and helping them getting through an intensive learning and practicing stage was priceless and unforgettable experience.

I have taught a graduate-level seminar course, "Tectonics and Basin Analysis" in my first semester and we read many different published papers about different basin types evolving in

specific tectonic settings. Teaching a big class of Structural Geology in the Spring 2014 was a little bit challenging due to the size and mixture of different disciplines but at the same time it was great to see how much our students were willing to learn more throughout the semester. I am recently teaching Advanced Structural Geology and I will be teaching undergraduate-level Structural Geology in Spring 2015. I have three graduate students whose research projects involve in detailed structural analysis and modeling in different regions.

Ethan Melville, MS student is recently conducting his research about pore space characterization of a potential unconventional hydrocarbon reservoir. He will utilize Computed Tomography (CT) and Scanning Electron Microscope (SEM) in his research to characterize fracture patterns and its effects on pore space reduction with depth. He collected outcrop samples and he will use core samples to combine his results from surface and subsurface samples. It recently became more important to better understand internal structure and deformation mechanisms acting on shale units because of changing exploration and production trends in Petroleum industry. We believe his results will make a good contribution to our understanding of rheological features of shale and its response to the deformation. Ethan had an internship with Yates Petroleum in summer 2013 and he will have another internship with Hess Corporation in summer 2014.

Anthony (Tony) Gesualdo, MS student, joined us this year and he has a strong background in economic geology and structural geology. Therefore, his research project is designed as it will be more beneficial for his future career. Tony will be involved in a detailed structural analysis project in Marigold mining district. With great contribution of Dr. Kelly McCormick, Dr. Alvis Lisenbee, Dr. Colin Paterson, we had research meetings with Andrew Armstrong, our alumni and exploration geologist and Jim Carver, the Chief Geologist at Silver Standard Resources Inc. In November, we visited the company and made a tour at their open pits and core repository to get information about geology in the mining site. Anthony Gesualdo will conduct his Master's thesis study in Marigold mining area to provide the company with a detailed geologic model including open pit mapping and structural analysis. Our research will attempt to explain main structural and tectonic features controlling gold mineralization in the mining district.

Stephanie Loose, MS student has also joined us in Fall 2013 and she is also interested in structural geology research with economic geology component. Her research project will focus on main factors controlling the Tertiary magmatism in the Northern Black Hills and Wyoming areas. She will collect fault and fracture measurements for a detailed fracture and Paleostress analysis to document any important Paleostress distribution changes between 60-40 Ma. Her research results are expected to provide a better idea about the overall distribution of lineaments and intrusions in the region. Since geothermal resources and gold mineralization is also significant in the Black Hills region, her results can provide us critical information about occurrence of these resources in specific locations and may have importance to regional mining companies.

I attended in Rocky Mountains Rendezvous (Laramide, WY) together with Chris Pellowski and 15 students this year. Our students had a great opportunity to meet with petroleum company recruitment teams and academic professions. Some students presented their research projects and represented our school very well. I had industry connections for future research opportunities and met other researchers from different schools in the region. I have invited Exxon Mobil recruitment supervisor for a campus visit and they have generously and kindly accepted our invitation so we will host them in our campus in the Spring 2015.

I encouraged our students to initiate our AAPG (American Association of Petroleum Geologists) Student Chapter and they successfully managed to establish our new student organization. Mr. Brian Stambaugh, NMR Petrophysics generously gave an NMR logging short course to our student chapter. We also offered a "Resume Workshop" for our students to help them with improving their resumes before any job application. Darrel Sawyer, assistant vice president for student development at our career center joined us and provided students with important tips about resume writing.

Finally, time passed so fast with teaching, advising and assisting our students. We are now getting close to the end of 2014 and getting ready for another semester. I wish you all a great Thanksgiving and I hope 2015 will be more productive and enjoyable for all of us.

Darrin Pagnac

Greetings and happy holidays. 2014 was an exceedingly productive year for me. I developed some new course material, conducted some new research, and got some work-related travel in as well.

Spring was quite busy with grant proposals and preparing for the summer field season. In 2014 I instructed a few long-standing courses for the last time. Spring was devoted to finalizing and implementing the new curriculum for the MS in Paleontology program. As such, I taught both Vertebrate Paleontology and Vertebrate Biostratigraphy for the last time. Although these courses have been replaced by new ones, such as Paleobiology and Phylogenetic Systematics, much of the content of these older and important courses will be transferred over to our new courses, particularly in the laboratory sections. The new MS in Paleontology curriculum was finalized this spring and was implemented this fall (more on this below).

I spend a considerable amount of time in the field this summer, which was, of course, fantastic. In May I spent two weeks with a fantastic group, Native Explorers, out of the University of Oklahoma. Native Explorers, led by Dr. Kent Smith, is a program designed to get Native American students out in field paleontology settings. Students need not be paleontologists or geologists, but must have a desire to learn about natural history in the field. We spent a wonderful few days in the Espaniola Basin of north-central New Mexico taking in the sights and looking at the wonderful exposures of the middle Miocene Tesuque Formation. We also spent a few days in Middlegate, Nevada, prospecting for Miocene mammals there as well. However, the highlight of the trip was a traditional meal served by residents of the Taos Pueblo. We were treated to a VIP meal in a traditional pueblo home that was utterly amazing. The flavor of the clay-oven baked plum pies is still with me months later!

Summer finished with our typical survey along the Missouri River with the Army Corps of Engineers. We were there for an entire month, and the weather was quite cooperative this year. Clint Boyd and I took nearly a dozen students on the Missouri River surveying for fossils in the upper Cretaceous Niobrara and Pierre formations. Our students had a wonderful time, learned about fossil prospecting, documentation, and recovery, and even got buzzed by four, very low flying F15s in the last week. Very nice of those pilots to give us a friendly wave.

Typical scenery along the Missouri River in August

Fall has been busy finishing up some final projects. I completed a paper on a STEM ed project I began in 2011 involving development of teaching kits for middle school students, which will be published in the Proceedings of the South Dakota Academy of Science in December. I've also prepared and taught a new class this fall, Paleobiology. This course has been a bit different than those I've previously taught as the focus is not limited to vertebrates. I've enjoyed teaching it immensely. The course is a survey of several important topics in modern paleontology aimed at graduate students. The students responded very well to the content and appear pleased with the course overall.
In closing, I wish you all the best for the upcoming year. Mine will be quite busy as I come up for tenure next fall and have many projects to finish up between now and then.

From Black Hill Natural Sciences Field Station and Nuri Uzunlar:

In summer of 2014, 34 instructors and 204 students from 87 institutions across the USA mapped geological environments ranging from volcanoes to fault zones in Hawaii, Turkey, Iceland, Nepal, India, Ecuador, the Galapagos Islands, and the Black Hills of South Dakota. We are adding two new camps, **Geology Field Camp in Death Valley** and **Petroleum Field Camp**. Today, the BHNSFS is the world's largest field school offering summer camps in earth science and related engineering fields including geology, geological engineering, environmental geology and engineering, volcanology, geomorphology and geo-hazards on four continents.

During spring break Alvis and I traveled to Death Valley to scout projects for the Death Valley winter field camp. Dr. John Caskey, associate professor at San Francisco State University and an expert on the local geology, who led the expedition, will be running the camp. In June, I joined the Turkey field camp and spent part of the summer in Turkey with Alvis and Colin and Zeynep. Late July, I joined the Hawaii camp lead by Tim Masterlark. We spent three weeks on the big island studying lavas in Kilauea National Park, Mauna Loa and Mauna Kea with 13 students.

Courses offered in the summer of 2015 are listed in the table and locations are shown on the map.

Field Camps 2015			
USA			
Session Name	Credit	Course Number and Name	Date
Geology Field Camp, Session One -Ranch A	6	GEOL 410 Field Geology	May 11 - June 12
Geology Field Camp, Session Two - Ranch A	6	GEOL 410 Field Geology	June 15 - July 17
Geology Field Camp, Session Three - Ranch A	6	GEOL 410 Field Geology	July 20- August 21
Engineering Field Camp, Campus	6	GEOE 410 Engineering Field Geology	May 18 – June 19
Environmental Eng. Field Camp, Campus	3	GEOE 412/512 Science and Engineering Field Applications	May 18 – June 4
Death Valley Field Camp, Shoshone, CA	3	GEOL 412/512 Science and Engineering Field Applications	Dec. 28, 2014 – Jan. 14, 2015
Petroleum Field Camp, SD, ND and WY	3	GEOL 412/512 Science and Engineering Field Applications	July 13 - 28
Pegmatites Field Camp, Campus	1	GEOL 412/512 Science and Engineering Field Applications	May 30 - June 5
Paleontology Field camp, SD and NE	2	GEOL 471 Undergraduate Field Paleo.	Multiple dates -
Paleontology Field camp SD and NE	2	PALE 571 Graduate Field Paleo.	Multiple dates -
Hawaii			
Volcanology Field Camp, Hawaii	3	GEOL 412/512 Science and Engineering Field Applications	July 22- August 7
Turkey			
Geology Field Camp, Turkey	6	GEOL 410 Field Geology	May 31– July 5
Nepal			
Geomorphology Field Camp, Himalayas -Nepal	3	GEOL 412/512 Science and Engineering Field Applications	Not offered in 2015
India			
Environmental Field Camp, India	3	GEOL 412/512 Science and Engineering Field Applications	No offered in 2015
Iceland			
Volcanology Field Camp, Iceland	3	GEOL 412/512 Science and Engineering Field Applications	July 26 – August 14
Galapagos Islands			
Volcanology Field Camp, Ecuador/Galapagos	3	GEOL 412/512 Science and Engineering Field Applications	May 17 – June 3

In addition to traveling from camp to camp I have been very active in departmental committees and the department's graduate recruiting efforts. I attended GSA in Vancouver and going to AGU in San Francisco on behalf of the BHNSFS and the department.

I am also leading the efforts on campus to establish interdisciplinary research and teaching efforts in energy resources through the **Energy Research Initiative (ERI)**. The newly established Minor in Petroleum Systems, an 18-credit program including three core courses and 9 credits of approved electives in geology as well as in chemical, civil, electrical, geological, mechanical, and metallurgical engineering is getting great deal attention from students and industry. Electives allow students to focus either on upstream exploration and production or on downstream refining. To support this educational effort, the Black Hills Natural Science Field Station will be offering petroleum field camp in the summer of 2015.

The BHNSFS is growing every year and lodging is becoming a serious issue. I am looking for a suitable land somewhere close to Nemo or Spearfish to build a field station. Please contact me if you can help or you know someone who can.

For additional information about upcoming field station activities please visit: http://geologyfieldca mp.sdsmt.edu, call me at (605) 394–2494 or write to nuri.uzunlar@sdsmt.edu