



Department of Geology and Geological Engineering

2022 Alumni Newsletter



2022 GGE Department fall field trip to NW Nebraska

Back row (l to r): Dr. Kurt Katzenstein, Carl Bachman, Joseph Moulton, Dr. Sarah Keenan, Dr. Darrin Pagnac, Riley Kortenbusch, Andrew Sansness, Rebecca Braun, Ben Dismang, Parker Nichols

Middle row (l to r): Colette McAndrew, Dr. Laurie Anderson, Breana Murray, Jared Blahovec, Gabie Olive, Caleb Hobbick, Dorothy Rodarte

Front row (l to r): Curtis Price and Logan McCutcheon

Tech Geological Association



Front row: Mehdi Paknahad, Jeff Glick, Trevor Davenport, Robyn Newell, Ted Heath, Norman Kamanga, Takeshi Okunishi.

Middle row: Vickie Clark, Mike Reed, Dr. Colin Paterson, Dr. Perry Rahn, Woo Young Kim.

Back row: Dale Nichols, Mellissa Boucher, Scott Cooper, Dr. Alvis Lisenbee, Gilbert Arnold, Brad Terhune, Mark Nelson.

Pictures and story courtesy of Scott Cooper

Taken from the 1996-1997 Engineer Yearbook as a substitute for the missing department photo.



Drs. Ustunisik, Ward, and Unzunlar working in the department booth at the fall AGU meeting in Chicago, IL.

From the newsletter coordinator – Christopher Pellowski

Greetings alumni and friends! Please enjoy reading the 2022 edition of the alumni newsletter.

This newsletter is also accessible on the department's alumni newsletter webpage:

<https://www.sdsmt.edu/Academics/Departments/Geology-and-Geological-Engineering/Activities-and-Organizations/Alumni-Newsletters/>

Status of the Department

Alumni and friends, I hope you all are healthy and safe, and have had a great year. For many of us in the department, 2022 was blessedly more back to normal than the last two years of challenges related to the COVID-19 pandemic. In this newsletter, you will see all the new faces and activities within the department.

We would like to acknowledge the gifts we received for the Department or the Museum of Geology. In Fiscal Year 2022, Geology and Geological Engineering (GGE) received \$75,043 in gifts for departmental support and a ~\$103M in-kind gift of software from Schlumberger. The Museum received \$159,220 in gifts, primarily to support the curation and conservation of National Park Service repository holdings (thank you Rachel Benton!). Friends, alumni, and corporate partners have also generously supported the efforts to fund the new Mineral Industries (MI) building (Nucor MI Building), and we thank you for your generous support of our students and programs. **I hope you will think of us as part of your charitable giving plan now and in future years.** I would be happy to chat with you about the department's needs and goals at any time.

Finally, all the best to you for the New Year.

GGE Update

We have broken ground on a new building! The Nucor Mineral Industries Building will be located on the south side of the quadrangle, between the Classroom Building and the Electrical Engineering/Physics Building. This placement means that we will need to relocate the sitting area on the quad dedicated to Paul Gries once the building is completed. I have been assured that Paul would understand!

GGE is also working with Mining Engineering and Management (MEM) to launch the Mining Hub, a center to foster innovations in mining education and research. The board of the Hub is meeting and has selected the focus for an initial project. If you would like to know more, here is a link to the Mining Hub site: <https://www.sdsmt.edu/Academics/Mining-Hub/>.

In addition, we are working to secure a gift of land adjacent to a quarry near Nemo, SD as a site to build a field station. Currently, the gift agreement is ready to be signed and we await an environmental assessment. The school has secured America Rescue Plan Act (ARPA) funding to install a septic system for the facility. Thanks to Jeanne Goodman for the tip about this funding source!

We have some changes to the faculty this year. One of our faculty members hired last year, Yi Fang, resigned his position for personal reasons. We are currently searching for a replacement in geological engineering (GEOE), and it has been exciting to sit in on the initial round of interviews. There are some very talented engineers/scientists in the applicant pool. In addition, Curtis Price, who has been anchoring the geospatial technology program for several years, left South Dakota for Washington this fall. We were able to hire an alumnae, Victoria Karnes, to fill that slot and Victoria joined us in August as a geospatial instructor. Victoria received her MS from the University of Arkansas this year.

Another major effort in 2022 was preparation for an ABET accreditation visits in Fall 2022. The GEOE BS program has been ABET accredited by the Engineering Accreditation Commission since 1950 and was reviewed for reaccreditation. The geology (GEOL) BS program is seeking initial accreditation through the Applied and Natural Sciences Accreditation Commission and will be the 2nd geology program in the country to gain ABET accreditation. The site visits for both programs went very well, with the program evaluators noting strengths in hands-on and field education for both programs.

The number of undergraduate majors has stabilized after declines for the last several years. In fall 2022, there 67 GEOL and 43 GEOE undergraduate majors. Graduate student enrollment is trending downward with 32 enrolled across the three graduate programs. This is particularly so in the GGE MS program, which had 7 graduates in the last year. Career placement of our undergraduates is strengthening. In 2020-21 (the latest numbers available), GEOE and GEOL BS programs both had 100% placement.

We are working in collaboration with MEM and Materials and Metallurgical Engineering (MET) to promote MI programs to prospective students. GGE also is back to recruiting graduate students at national meetings. In addition, our faculty led four high-school camps in 2022: two on geology (one overnight, one day camp), paleontology, and water. The fall all-department field trip to northeastern Nebraska was also fantastic.

We continue to strive to build our research programs in the department. Research awards help support both undergraduate and graduate students and provide them opportunities for research experiences in the field and laboratory. Please check out faculty entries to see the great things they and their students are up to.

Museum of Geology Update

The Museum welcomed 29,491 visitors in 2022. This is the highest annual attendance that I remember since arriving in 2011! GGE faculty and Museum staff helped lead activities for the National Speleological Society meeting held in the Black Hills over the summer and we also hosted an event with our regional repository partners for National Fossil Day in November that was very well received. We also had 17 external researchers visit collections in the last year, and 15 undergraduate and graduate students worked on research projects using PRL collections and/or lab facilities in the last year.

In September, Emily Berry, left the Museum for a position with the Sanford Underground Facility. But we have hired Kayleigh Johnson to replace Emily and, as expected, Kayleigh is jumping into her new responsibilities with gusto! This does mean, however, that we will be searching for a preparator to replace Kayleigh in the new year...

We also have been making progress on cataloging National Park collections and inventorying mineral collections with the support of Rachel Benton, Steve and Donna O'Rourke, and Dakota Gold Corp. We have used these gifts primarily to hire undergraduate and graduate students to gain experience in collections work, so it is a double win of providing professional experience to our students and advancing our effort to care for collections. In addition, Darrin Pagnac, Sarah Keenan, and Nate Fox were awarded an Institute of Museum and Library Services (IMLS) grant to support curation and research on White River age fossils from the Richmond Hill locality in the Black Hills. Further, Nate, Gokce Ustunisik, and I submitted a proposal to the IMLS this fall

to obtain funds to support rehousing, curation, and digitization of about one-third of the Mineralogy Collections, focusing on research collections and any un-curated material from the Black Hills region.

Laurie Anderson News

I was very honored this year to be named a Fellow of the Geological Society of America. The biggest honor, however, was that colleagues from different parts of my academic career thought to nominate me. So, thank you Sarah Keenan (SD Mines), Joseph Hartman (University of North Dakota), and Audrey Paterson (University of Tennessee Knoxville).

Much of my 2022 was consumed by preparing for and hosting the ABET site visit we had in September. That said, unlike Kurt Katzenstein and Larry Stetler, I didn't have to write a self-study at the same time I was teaching field camp! But seriously, I very much appreciate the collaboration that GEOL and GEOE have demonstrated through this review process.

As for teaching, I coordinated Senior Research I to a group of 13 geology students this fall. As usual, it was exciting to see the wide variety of projects students are developing, and how much their communication skills grow over the course of a semester. I also taught the interdisciplinary course Developing and Planning Research (GEOE/GEOL/MEM 700) in Fall 2022. I had a great group of 16 graduate students from geology, geological engineering, mining engineering, and paleontology, and I'm excited for the research they will pursue while here at SD Mines. I also taught Invertebrate Paleontology in Spring 2022, and really enjoy working with students and putting together labs and projects.

In research, Brooke Long-Fox completed her PhD on lucinid bivalves in Spring 2022. She currently is working with MorphoBank and on the SD Mines ADVANCE (ADVANCE= Organizational Change for Gender Equity in STEM Academic Professions) grant and she and Jared also just welcomed a new daughter to their family. Peter Daly is close to completing his MS work on foodweb modeling of Cretaceous methane seep faunas.

With collaborators and students, I published one paper in 2022 in *Frontiers of Ecology and Evolution* where we used geometric morphometrics of lucinid bivalves as a tool in conservation paleobiology to track changes in seagrass communities over time. Brooke and I are also working to complete and submit manuscripts from her PhD. I continue to work on the ADVANCE project

on campus, primarily focusing on demographic data collection and analysis. As mentioned above, I submitted an IMLS proposal to support the Mineralogy and Petrology Collections of the Museum.

Here's to a safe and happy 2022!

2022 GGE Department news:

February:

Dr. Gokce Ustunisik and Dr. Roger Nielsen – Mines wins NSF grant to study impact of ocean floor plate tectonics on climate change

<https://www.sdsmt.edu/Research/Research@Mines/Plate-Tectonics-Climate-Change-Study/>

March:

Mr. Rudolph Hummel (MS Paleo) (3rd place graduate posters) – Mines annual research symposium features work on space travel, water quality, supercells, DUNE, and more

<https://www.sdsmt.edu/News/2022-Research-Symposium/>

Ms. Colette Mc Andrew (BS Geol) – Museum of Geology “rocks” identification day

<https://www.newscenter1.tv/museum-of-geology-rocks-identification-day/>

Identifying fossils, rocks and more at Museum of Geology

<https://www.blackhillsfox.com/2022/03/06/identifying-fossils-rocks-more-museum-geology/>

April:

Ms. Colette McAndrew (BS Geol) – SD Mines host Dino Eggstravaganza event at school's geology museum

<https://www.newscenter1.tv/sd-mines-hosts-dino-eggstravaganza-event-at-schools-geology-museum/>

Dr. Larry Stetler – 1972 flood survivors bring sobering context to conference

https://rapidcityjournal.com/news/local/1972-flood-survivors-bring-sobering-context-to-conference/article_64cc880a-8154-546c-97c9-0743302aee25.html

May:

Ms. Elise Staat (BS Geol) and Dr. Kevin Ward – Mines student calculates depth of the Earth's crust with “Raspberry Shake” data at underground lab

<https://www.sdsmt.edu/News/Raspberry-Shake-Study-at-SURF/>

June:

Dr. Bill Roggenthen – Dive deep with Neutrino Day talks and livestreams from the underground
<https://sanfordlab.org/article/dive-deep-neutrino-day-talks-and-livestreams-underground>

July:

Dr. Laurie Anderson – Mines department head, professor, and paleontologist Dr. Laurie Anderson named GSA Fellow
<https://www.sdsmt.edu/News/Dr--Anderson-Named-GSA-Fellow/>

August:

Ms. Reghan DeBoer (BS Geol) – Interning a mile beneath the surface, 2022 summer interns share their experiences
<https://sanfordlab.org/article/interning-mile-beneath-surface-2022-summer-interns-share-their-experiences>

September:

GGE Department faculty, staff, and students – Mines breaks ground on Nucor Mineral Industries Building
<https://www.sdsmt.edu/News/Nucor-Building-Groundbreaking/>

Dr. Tim Masterlark – Mines faculty instills real-world field survival skills following State Department fellowship
<https://www.sdsmt.edu/News/Masterlark-Safety-Training/>

Dr. Tim Masterlark – SD Mines professor teaches field survival to geology students
<https://www.newscenter1.tv/sd-mines-professor-teaches-field-survival-to-geology-students/>

https://rapidcityjournal.com/news/local/mines-professor-teaches-real-world-field-survival-skills/article_bad28bb2-2534-59a2-b581-f9b2fe805a85.html

<https://www.blackhillsfox.com/2022/09/08/mines-students-learn-survival-skills-no-matter-their-major/>

<https://www.kotatv.com/2022/09/09/south-dakota-mines-students-get-hands-on-experience-emergency-situations/>

Dr. Brian Tucholke (BS Geol '68) and Mr. Everett Brill (BS Geol 12/MS EM '17) – Mines honors graduates at Homecoming Gala
<https://www.sdsmt.edu/News/Mines-Honors-Graduates-at-Homecoming-Gala/>

October:

Ms. Colleen Sullivan (MS Paleo '22) and Dr. Sarah Keenan – South Dakota Mines study shows fossil dissolution rates

<https://www.sdsmt.edu/News/Fossil-Dissolution-Rate-Study/>

Ms. Kayleigh Johnson – South Dakota Mines celebrates National Fossil Day with commemoration of the Fossil Cycad National Monument

<https://www.sdsmt.edu/News/National-Fossil-Day--2022/>

Dr. Darrin Pagnac – Special exhibit unveiled for National Fossil Day at the Museum of Geology

<https://www.blackhillsfox.com/2022/10/13/special-exhibit-unveiled-national-fossil-day-museum-geology/>

<https://www.blackhillsfox.com/video/2022/10/13/special-exhibit-unveiled-national-fossil-day-museum-geology/>

Ms. Kayleigh Johnson – Five things to know about the Night at the Museum at the Museum of Geology

<https://www.newscenter1.tv/five-things-to-know-about-night-at-the-museum-at-the-museum-of-geology/>

Ms. Kayleigh Johnson – SD Mines celebrates National Fossil Day with cautionary tale on over-collection

<https://www.newscenter1.tv/sd-mines-celebrates-national-fossil-day-with-cautionary-tale-on-over-collection/>

<https://www.keloland.com/news/local-news/the-south-dakota-school-of-mines-hosts-national-fossil-day-celebration/>

November:

Ms. Colleen Sullivan (MS Paleo '22) and Dr. Sarah Keenan – Fossil dissolution study propels student into Ph.D. program

<https://www.kotatv.com/2022/11/07/fossil-dissolution-study-propels-student-phd-program/>

Christopher Pellowski

We did our best, but our luck ran out and we had to contend with an outbreak of COVID-19 cases each session this past summer as we continue to operate from the SD Mines campus. During the two five-week sessions, we had 28 students (2 SD Mines) from 13 universities in session 1, and 23 students (1 SD Mines) from 16 universities in session 2. The weather this year was quite challenging, especially throughout session 1 and right up until the end when an outbreak of severe thunderstorms prevented us from our usual week 5 camping trip: [June 11-13, 2022 Severe Storm Reports \(weather.gov\)](#) . I continue to work on identifying/visiting additional field areas for future mapping projects to be incorporated when the new field station is constructed.

I was scheduled to teach Geol 451/L Economic Geology/Lab in the spring semester but with only two students enrolled, the course was unfortunately cancelled. I'm hopeful by spring 2024, there will be enough interested students and the course will be offered again. This year I am serving on six department committees and will be teaching Geol 351 Earth Resources and the Environment during the Spring 2023 semester with 24 students already signed up.



Session 1, 2022 group photo with Grubby.



Session 1 students at the Vore Buffalo Jump trying out the atlatl and throwing darts at the target to see who would have had enough skill to score us a buffalo dinner back in the day when the buffalo jump was active.



Backpack buddies were spotted in the field (Captain Aeolian) and on the outcrop (Riptide) during session 2.



Two different prickly pear cactus flowering on campus at the west end of the practice field.

Educational outreach events are slowly beginning to pick up again with several visits this spring to the Rapid City area middle school STEAM nights as well as the annual Rapid City Area Schools 8th Grade College and Career Fair held on Friday, November 4th at the Monument.



Dr. Pellowski represented the GGE Department at the RCAS 8th Grade College and Career Fair to get the students excited about rocks and minerals in their everyday lives.

Be sure to visit and like us on Facebook and follow our posts.



<https://www.facebook.com/SDSMTGeologyGeologicalEngineering>

From our Emeritus Professors:

Arden D. Davis, Professor Emeritus of Geological Engineering

Research – Missouri River Water Pipeline

A few years ago, several faculty members here started a research project that involves a proposed water pipeline from the Missouri River to the Black Hills area. Dr. Kurt Katzenstein was the principal investigator, and Dr. Scott Kenner and I assisted, with help from Mark Anderson of the U.S. Geological Survey, and the late Dr. Alvis Lisenbee. Later, a group of cities and towns in the Black Hills area formed the Western Dakota Regional Water System to find funding sources to pursue the project. In November, the organization held a meeting in New Underwood, with about 80 persons in attendance. The summit was organized by Cheryl Chapman, a civil engineering graduate and professional engineer who recently retired from Banner Associates but continues to be involved in water resources. Among those in attendance at this year's water summit were President Jim Rankin of the School of Mines, Bill Eldridge and Galen Hoogstraet of the U.S. Geological Survey, the Secretary of the South Dakota Department of Agriculture and Natural Resources, the Chairman of the Pennington County Commission, area mayors, and city water engineers.

The project has the potential to decrease our dependence on the Madison aquifer as a water source for Rapid City and other cities in the Black Hills. The City of Rapid City and the West Dakota Water Development District hold future-use permits for water from the Missouri River. It's possible that the project could take three decades or more until completion. The development costs currently are estimated at about \$1.9 billion dollars or more for construction, aside from operating costs, so it would require federal and state assistance. So far, the project has received a grant of \$8 million dollars for preliminary work from the South Dakota Department of Agriculture and Natural Resources, as well as local grants from communities.

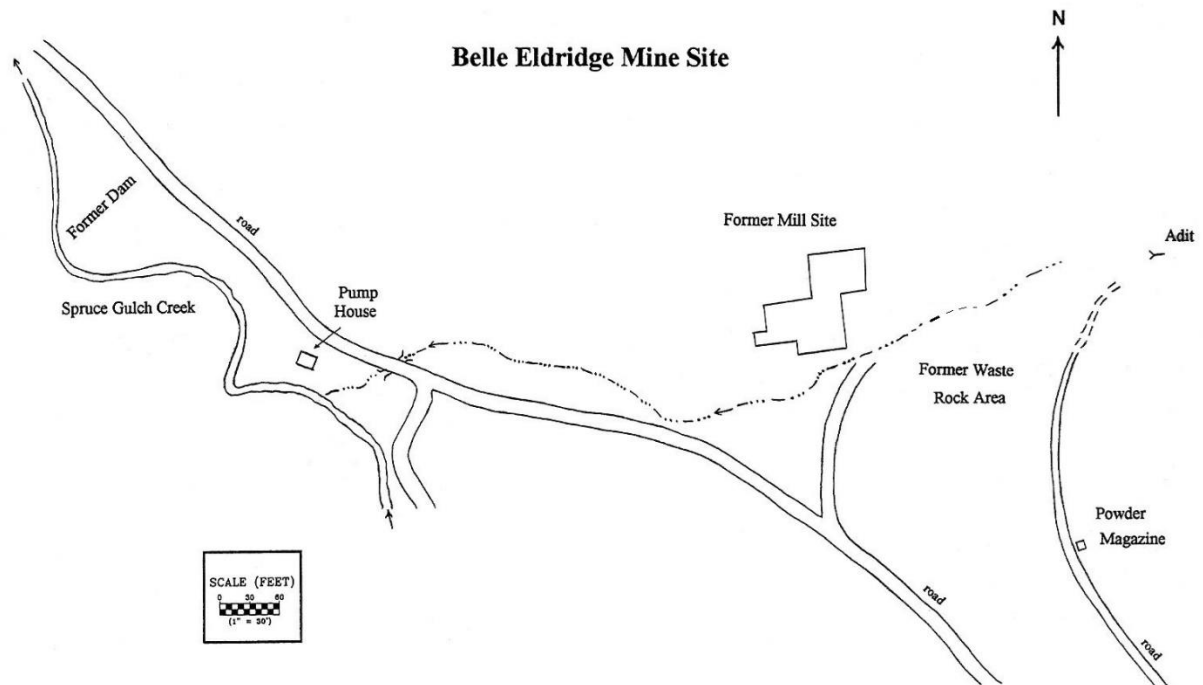
Research – Abandoned Mines

Recently Dan Seifert contacted me from the U.S. Bureau of Land Management's office in Billings, Montana. He and others are interested in continued monitoring of the abandoned Belle Eldridge mine site south of Deadwood. They also would like to remediate lands that were mined for bentonite northwest of Belle Fourche, South Dakota. The Google Earth image below shows the Belle Eldridge site. Before remediation during 1998 to 2000, the site had sulfide-rich waste rock and tailings. Drainage from an adit had a slightly acidic pH value, but the water picked up additional acidity and dissolved metals as it flowed through the waste rock and tailings.

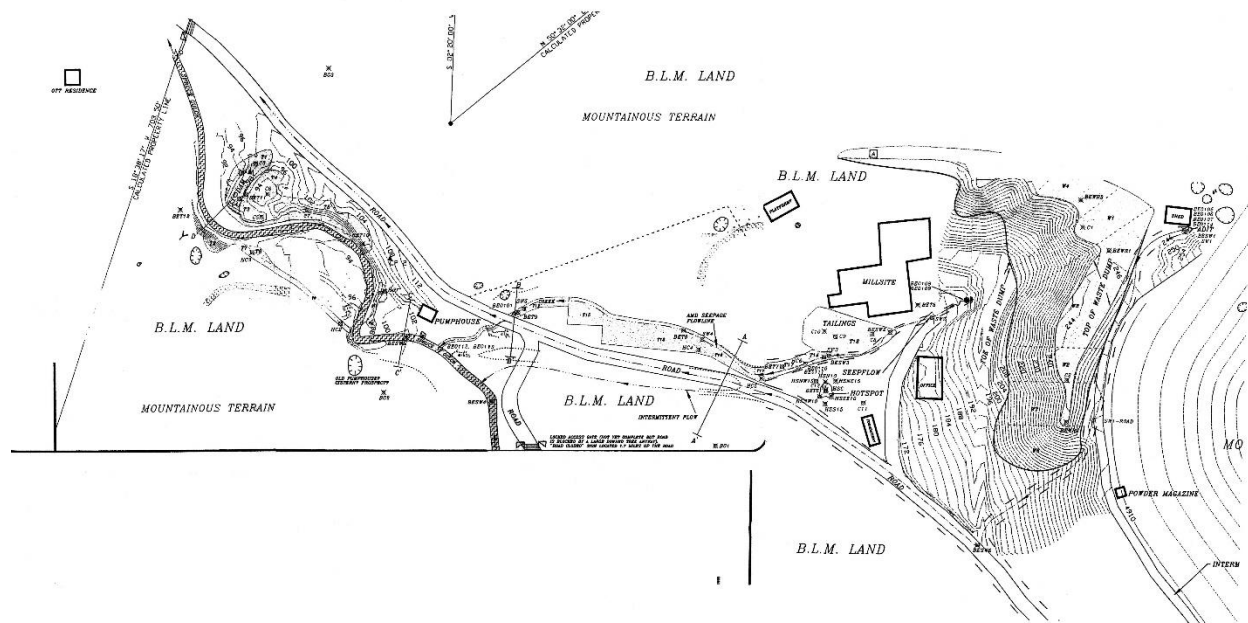
In October and late November, we held online discussions to plan the monitoring work with representatives of the U.S. Bureau of Land Management, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the South Dakota Department of Agriculture and Natural Resources, and others. Dr. Liangping Li and I also have met with Patrick Kozak, a department alumnus and current Ph.D. student in atmospheric and environmental sciences. Patrick works in Dr. Lisa Kunza's environmental laboratory, and his expertise should be especially helpful for the abandoned bentonite mines northwest of Belle Fourche.



This image shows the Belle Eldridge abandoned mine site south of Deadwood. The remains of the mill are in the center of the image. A draining adit is east of the mill, near the circular collapse features above old mine workings.



This figure shows a field map of the Belle Eldridge site.



This figure shows tailings and waste rock before removal when the Belle Eldridge mine was remediated during 1998 to 2000.

Research – Recent Landslides and Increased Precipitation in South Dakota.

In the past 20 years, while driving across South Dakota, I've noticed more recent landslides than in previous decades. Last fall I looked carefully at an area where the Pierre Shale is exposed on the western site of the Missouri River, in south-central South Dakota. Two of the landslides are shown in the images below.

From mapping with Google Earth images, I've identified almost 100 other landslides in that area, almost all of them apparently recent slope failures or reactivated landslides from older failures. Most haven't been revegetated completely. It's likely that older slope failures have been covered by vegetation and are more difficult to identify from aerial photos. I remember that Dr. Gries recalled his mapping work along the Missouri River in the 1930s, when he said that as he mapped and measured sections in the Pierre Shale, he was probably measuring every landslide that had occurred along there. He also said that he decided to walk to the top of Medicine Butte west of Chamberlain, joking that he thought he might be the first to set foot on the highest point, but when he reached the top, there was an old iron bed. (I hope I'm recalling these reminiscences accurately.)

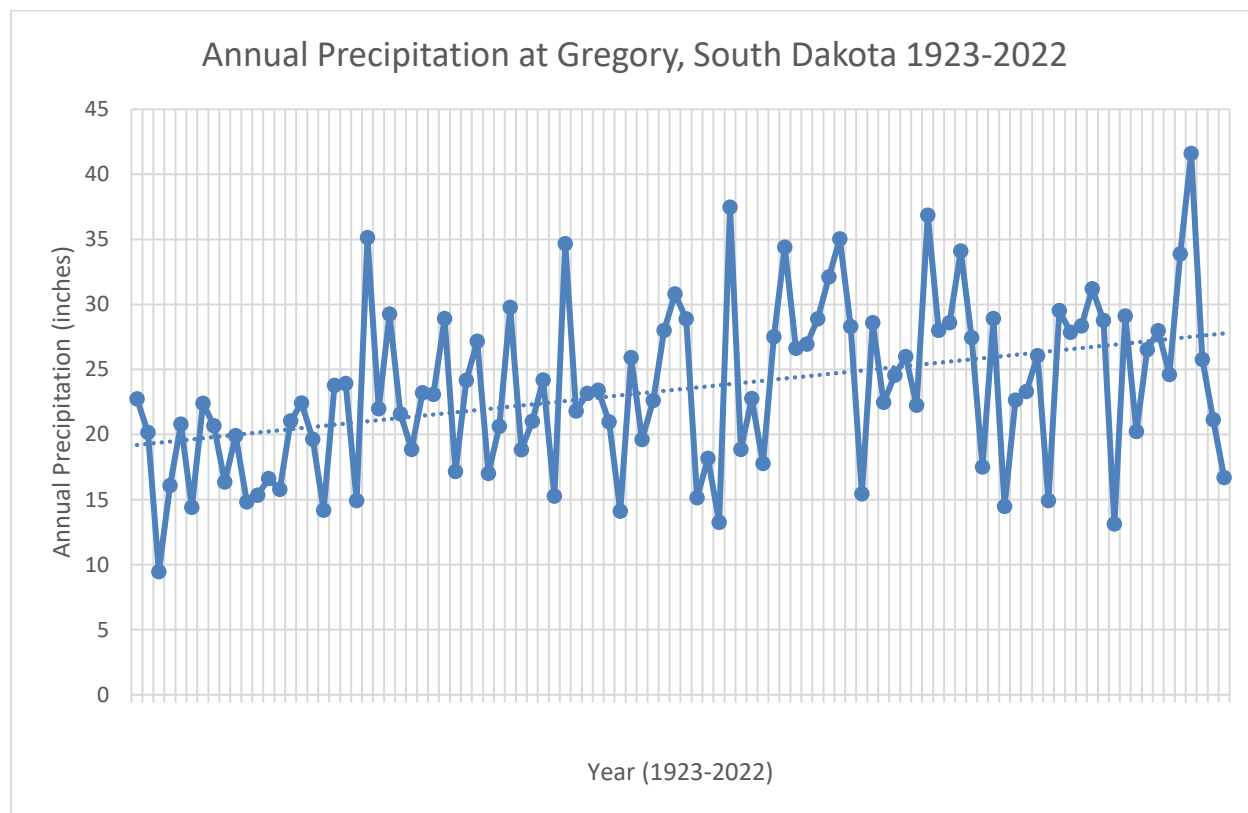


This landslide occurred between 2010 and 2013. The slope failure is about 1300 feet wide, from west to east, and about 1000 feet long, from south to north. The movement of the landslide material was generally from south to north.



This Google Earth image shows a landslide within a mile of the landslide in the previous figure. The slope failure is about 600 feet wide, from west to east, and about 800 feet long, from north to south. The movement of the landslide material was generally from north to south. The failure apparently started before 2010 but was greatly reactivated during the past three years.

Heavier precipitation and associated climate changes could be a factor in these slope failures. Average annual precipitation during the past one hundred years, as measured at a station at Gregory, South Dakota, increased from about 19 inches per year in 1923, to about 27.5 inches per year in 2022 (see the trend line on the graph below). The peak rainfall years also show a similarly increasing trend. It seems likely that landslides would be more common during the wettest periods when the bentonite in the Pierre Shale becomes saturated.



This figure shows a graph of annual precipitation at a station near Gregory, South Dakota. Adam French of the atmospheric sciences program helped find the data on a NOAA web site.

Research – Arsenic Removal and Water Quality

During the past year I've continued to be a part owner of CalxAqua, a company that several faculty members at the School of Mines formed as a commercial entity for removal of arsenic, heavy metals, and other contaminants from water. We've recently looked at a project that involved seepage from the Rapid City landfill, and we've continued our contacts with a gold mine. Some of the other owners of CalxAqua include Dr. David Dixon (Chemical Engineering), Dr. Cathleen Webb (formerly in the Chemistry Department, now Department Head and Associate Dean at Western Kentucky University), and Dr. Jenifer Sorensen (Minnesota Department of Natural Resources).

Teaching – Environmental and Groundwater Field Camp

From mid-May to early June, I taught an environmental and groundwater field camp course through the Black Hills Natural Sciences Field Station. Mark Anderson joined in teaching the class. Mark recently retired as director of the Rapid City office of the U.S. Geological Survey, which is now the Dakota Water Science Center. He also has served on the President's Science Advisory Council under President Clinton and President Bush, and the students appreciated his expertise in surface water and water policy. Unfortunately, the enrollment in the class wasn't large enough for Dr. Liangping Li to join us as an instructor, but we hope he can participate next spring. In previous years, Liangping, Mark, and I expanded the environmental / groundwater field camp to a variable three to four credit option, with additional emphasis on groundwater sustainability. Last spring, six students took the three-credit course, and eight took the four-credit course. The fourteen students came from schools that included the University of Wisconsin-Milwaukee, Grand Valley State University, Bowling Green State University, the University of Texas at Dallas, Rice University, the University of Montana, the State University of New York at Fredonia, Slippery Rock University, Earlham College, the University of Michigan, Bloomsburg University, Eastern Illinois University, and the University of California at Santa Cruz. Our projects included water sampling at an abandoned mine, spring flow, groundwater contamination, slope stability, safety of a small dam, and other topics.

Recent Publications

Li, L., and Davis, A.D., 2022, Teaching groundwater flow and contaminant transport modeling via a sand-tank model: *Mathematical Geosciences*, v. 54, no. 8, p. 1413-1428.
<https://doi.org/10.1007/s11004-022-10012-2>

Bao, J., Li, L., and Davis, A.D., 2022, Variational autoencoder or generative adversarial networks? A comparison of two deep learning methods for flow and transport data assimilation: *Mathematical Geosciences*, v. 54, p. 1017-1042.
<https://doi.org/10.1007/s11004-022-10003-3>
Full-text access: <https://rdcu.be/cNshF>

Other Activities

After retirement, I'm continuing to share an office with Dr. Perry Rahn in MI 327B. Perry stops in about once a week, and he also has coffee with others at the faculty lounge on campus. He looks healthy and hearty, so his outdoor work of cutting trees at his land seems to agree with him, and I think he's enjoying his time at his log house west of Hill City. Perry says he now has satellite internet service there.

My wife and I again spent about 2 ½ months in Minnesota during the summer. We enjoyed some late asparagus. It was unusually dry during June and July in Minnesota, but our garden yielded early and late sweet corn, green beans, zucchini, cucumbers, and a few other things. We also had summer apples.

During the past several years it has been enjoyable to visit with graduates and Professional Advisory Board members, including Ken Buhler, Joshua Valder, Bill Eldridge, Fleford Redoloza, Todd Anderson, Haile Betemariam, Nicole King, Patrick Kozak, Mike Ainsworth, Jeanne Goodman, Jim Goodman, Randy Taylor, Umit Yildiz, Scott Miller, Michael Fischer, Haley Noteboom, Jason Tinant, Alan Bakeberg, Al Paulson, Peter Larson, Ann (Barnum) Curnow, Janet Carter, Barb Nielsen, Tim Barker, Ray Wuolo, Joanne Noyes, Stuart Buchholz, Jennifer Bednar, Richard Arnold, David Hammond, Sherwin Artus, Steve O'Rourke, Scott Cooper, Andy Farke, Syed Huq, Syed Nayyer, Roberta (Fivecoate) Hudson, Joe Peterlin, Kathleen Grigg, Kyle Davis, Jenifer Sorensen, Dennis Riding, Tom Campbell, Katie Aurand, Jonathan Emmer, Nakaila Steen, James Sanovia, Lilly Jones Sanovia, Jonathon Odland, Cathy Hayes Daly, Mark Fahrenbach, Erik Walega, Erik Smith, Jonathan McKaskey, Karl Koth, Kathryn Johnson, Brad Stock, Matt Minnick, Morgan (Ekmark) Powell, Mike Wiles, Steve Mezger, Bruce Peterman, Heidi Sieverding, Greg Kipp, Mitch Kannenberg, Crystal Hocking, Kristin Pratscher, Bruce Woodhouse, Joyce Fry, Mike Buswell, Halim Mutlu, Zuhair Hafi, Dave Kyllonen, Jeff Sussman, Carson Reimers, Frank Torvik, Colton Medler, Greg Goeser, Abhishek Ray, and many others. Congratulations also to advisory board member and alumnus Jay Nopola, who recently was named a vice president at ReSpec. As always, please accept my apologies if I've accidentally left off anyone's name. I hope you can stop by and visit if you're in the area.



Rhoads Fork, near a stream-gaging site and a U.S. Geological Survey gaging station at the headwaters of Rapid Creek in the western Black Hills. The Madison Limestone is exposed in the distance. The springs flow from the Madison aquifer. Photo by Dr. Liangping Li.

Colin Paterson

Becci and I were able to win the “lottery” to snag a room in a quarantine hotel in New Zealand on January 6 – only NZ citizens and residents were eligible to enter NZ at that time, and the system was intended to prevent spread of Covid-19 in NZ, but within a month the quarantine system was scrapped. We spent 6 months in Te Anau backpacking (Kepler Track), cycling on trails in southern NZ, hiking, playing lawn bowls and tennis. We returned to Rapid City in July and spent more time in my office, working on a Homestake paper and clearing out excess rocks and documents.

Dr Kelli McCormick and I have continued to advise the Society of Economic Geologists student chapter, and a new slate of officers was elected in September. They continue to conduct monthly meetings, mostly presented by current students reporting on summer internships in the mining industry. We took a van load of students to the SME meeting in Lead to hear about the Dakota Gold exploration program involving alumni in the northern Black Hills. Kelli took 6 students on a field trip to visit the Dakota Gold drilling operation and core shed. SEG sponsored a visit by the Thayer Lindsley Visiting Lecturer, Dr Hartwig Frimmel, professor at the University of Wuerzburg, Germany. He presented at the Friday seminar on “The Global Gold Cycle: How did it start?”

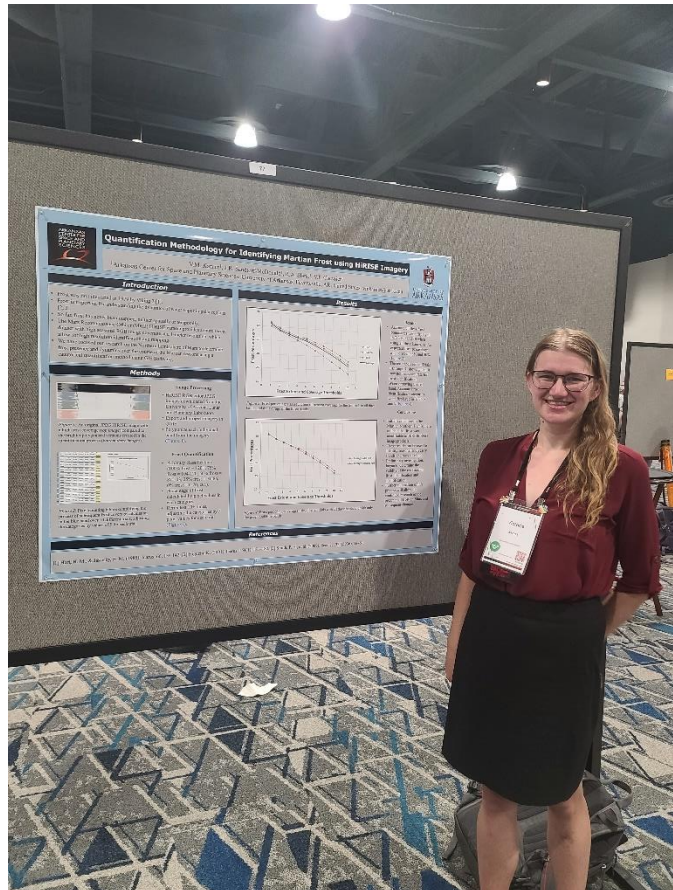
From the Faculty:

Victoria Karnes

Hello all, and Happy Holidays!

I am so excited to be back at Mines as a fellow alumnus, this time joining the GGE Department as an Instructor in Geology specializing in GIS and Remote Sensing! It is an honor to take over such a well loved and respected position from my predecessors, Mr. Curtis Price (soon to be Dr. Price!) and Dr. Maribeth Price, and I have enjoyed every second working here!

This year has been quite the whirlwind. I attended and presented my research on HiRISE ice detection at my first international convention (the Lunar and Planetary Science Convention), graduated from the University of Arkansas, Fayetteville with my Masters in Space and Planetary Sciences studying the detection and quantification of CO₂ ice and water ice on Mars, moved fourteen hours up to Rapid City with my partner, and started my first semester as an Instructor at Mines teaching Introduction to GIS and Advanced Geospatial Technologies! I have also joined multiple committees on campus and in the GGE department, most notably Team Tantalum, a university-led group working on critical mineral detection in central Africa. I have also started assisting multiple students and student groups on campus with their GIS endeavors, as well as several wonderful professors in GGE in need of spatial data deliverables for their research. I will also be teaching my first set of GIS Workshops the upcoming January, which I am beyond excited about!



Outside of Mines, I have started re-exploring the Black Hills and Rapid City with my partner, Zach! We have loved every minute, and plan to spend many more days out and about this coming summer!

Wishing you all the most wonderful and fun-filled holiday season!

Kurt Katzenstein

Greetings! Here's hoping your 2022 was fruitful and enjoyable. As usual, the Katzenstein family's schedule was filled with weekend trips to soccer and basketball tournaments including multiple trips to Denver, Casper, Billings, Gillette, Sioux Falls, and other Northern Plains/Rocky Mountain metropolises. Brianne (12) even earned her varsity letter in soccer as a 7th grader! Brianne and I also went on another tri-generations backpacking trip in the Sierra Nevada with my dad and we enjoyed beautiful weather and minimal mosquitoes (thank you La Niña!) and it looks like I have convinced Hannah (11) and Leslie (8) to join us next year. Our family also took a trip to Monterey in April to celebrate my parents' 50th wedding anniversary. We rented a house on the beach and had a very relaxing time. As we flew into San Francisco, Bri and I (who are big SF Giants fans) caught a game at Oracle Park. During a trip to LA later in the year, we also caught a Dodgers/Giants game at Dodger stadium.

We also got to enjoy a trifecta of injuries in our family this year. In October, I lost a fight with a front-loading washing machine and tore my bicep which required surgery to repair, Hannah is currently sporting a boot for a stress fracture in her big toe (soccer), and Leslie has a cast on her right forearm resulting from a lost battle with a bouncy house. Family deductible...met!



Over the summer, I was excited to host the Geology Rocks Youth Camp once again. We had 20 eager young geologists and we spent four days exploring all the great things the Black Hills have to offer. In addition to offering the day camp that I oversaw, Drs. Ward and Waldien rejuvenated the overnight version of the camp which is fantastic!



With Covid impacts diminishing, I represented GGE in multiple outreach events in an effort to provide exposure for our majors. These typically involved either the mobile sediment flume or the augmented reality sandbox which are both always big hits. GGE is actively recruiting undergraduate students so if you know anybody with an affinity for how the world works that is looking for a major, please have them contact me!

The Spring and early Summer were spent collaboratively generating and editing our ~200 page ABET self-study (thanks for the help, Laurie and Larry!). Our visit went very well with only a minor concern being identified for our GEOE program and a clean accreditation for the GEOL program (way to go GEOL!). In July, I began my term as an ABET Commissioner representing all GEOE programs globally. In addition to participating in ABET policy and criteria development every summer at the annual meeting in Baltimore, I also got promoted from a Program Evaluator to a Team Chair on accreditation visits. As such, I completed my first visit as a Team Chair in October which was an interesting experience. In the Spring I was elected to serve as the SD Mines Faculty Senate Chair for the next two years which has monopolized a lot of my time as well. These major service roles, coupled with an extra course to teach in the Fall led to a very busy work life.

When I have had time to conduct research over the past year it has focused on securing funding for a few incoming graduate students that are starting in the Spring of 2023. Currently I am finalizing an agreement to conduct InSAR quantification of subsidence at a major mine in Nevada as well as a project to extend subsidence quantification from a previous study of mine at

a municipality near Salt Lake City that has seen numerous foundation failures due to rapid subsidence rates in the area. I am also part of a growing group that is working to make the Missouri River pipeline project that was evaluated in our funded project a few years ago a reality. I believe that there is no more important project on the horizon in western South Dakota. Keep watching for opportunities to learn more about this project ([here](#) is a good place to start).

I hope that you and your family are well and that you have a very enjoyable 2023. Best wishes!

Sarah W. Keenan

How is it already December? 2022 has been an exciting year. Our curling team, the Frost Heaves, was mostly victorious this season. Win or lose, it was fun to curl with Kurt, Scott, and Foster. We hope to improve in 2023, with Kevin stepping in for Foster due to his hip surgery. Scott and I have been busy around the house painting, installing trim, and recently, ripping up an old deck. Next year, we're going to learn how to build a patio. I entered my knitting in the Central States Fair this fall, and got best in class for a pair of mittens, three first place ribbons, two second place ribbons, and a third-place ribbon—not too bad for my first competition!

Scott, Stella, and I have been busy hiking around the Black Hills and in Wyoming and Colorado. Stella is now 2 years old and loves the snow, hiking, and digging holes in our yard. We took her on her first road trip to visit the legendary stromatolites of the Medicine Bows, WY (A), where we encountered other geologists also checking out the stromatolites. We also explored Steamboat Springs, CO, and even took Stella to her first brewery.

Our annual departmental field trip to western Nebraska was a huge success, despite the extreme heat. Highlights included seeing *Daemonelix* (fossil beaver burrows), learning about White River Group stratigraphy, visiting Toadstool (B) and Agate, “carhenge”, and finally seeing the sand hills of Nebraska. The students all had a great time, particularly the freshmen that joined us on the trip.

Research has been moving along, and a highlight this year was conducting research on decomposing horses in Hermosa, SD at the Ken Brown Ranch. An undergraduate student, Colette McAndrew (C), is helping me collect soils and analyzing the biogeochemistry for her senior research project. I had an NSF grant funded that allowed us to purchase a new, top of the line ion chromatography system for the university (D). The instrument will allow my research group and others on campus to analyze water geochemistry in the region. I am particularly excited to use it this spring/summer to collect samples from SURF and from caves in the Black Hills. I've also been busy studying a beaver grave originally started 20 years ago—a remarkable opportunity to explore animal decomposition impacts to ecosystems. We're integrating novel and exciting techniques in our research into the process of fossilization, and I gave an invited talk at GSA on some of the results of this work.

My lab group has been incredibly busy conducting research, collecting data, setting up experiments, and presenting research at conferences. Michael and Colleen (M.S. Paleontology 2022) both successfully defended their thesis research in May. Current students, Will and Andy, presented their research at GSA in Denver. Will and I are collaborating with Dakota Radiology (part of Monument Health) to CT scan ammonite fossils from the Museum of Geology collections to explore trends in shell thickness through time. Colleen published her thesis research in *PLOS ONE*, right in time for her to start a PhD program at the University of Kansas! Darrin and I also had a grant funded to curate specimens from a Pliocene fissure-fill deposit in the Black Hills, the only deposit of this age from the entire region. The work will support two Master's students for the next year and a half, and will provide much needed work on an important collection in our Museum of Geology.

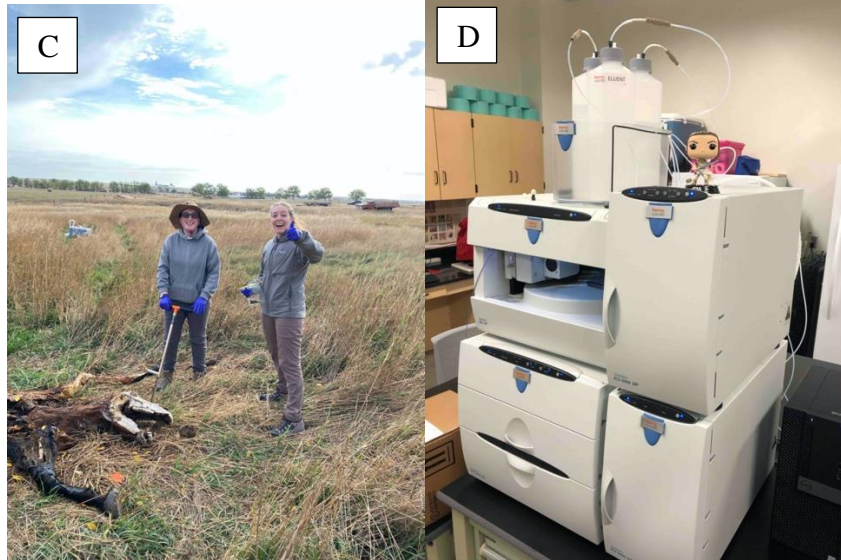
In addition to the long list of abstracts from this year (check out my website for more info—I had 8 abstracts submitted this year), I published two papers:

Sullivan, C.A.^{GS} and **Keenan, S.W.** (2022). Experimental dissolution of fossil bone under variable pH conditions. *PLOS ONE*, 17:e0274084, doi.org/10.1371/journal.pone.0274084. (GS = graduate student)

Emmons, A.L., Mundorff, A.Z., Hoeland, K.M., Davoren, J., **Keenan, S.W.**, Carter, D.O., Campagna, S.R., and DeBruyn, J.M. (2022). Postmortem skeletal microbial community composition and function in buried human remains. *mSystems*, e00041-11. doi.org/10.1128/mSystems.00041-22.

Wishing you all a happy and healthy 2023!





Liangping Li

Alumni and friends, Happy New Year and Merry Christmas! In 2022, I continued teaching Groundwater course (GEOE/CEE 475/575L) for undergraduate and graduate students in fall and spring semesters. I published a pedological paper about how to use sand tanks for teaching groundwater flow and contaminant transport modeling in the journal of Mathematical Geosciences. I also taught a new required course for geological engineering major in fall: GEOE 456/556/L: Statistical Methods for Geology and Geological Engineering. In this course, data analytics were emphasized for application in the earth sciences. Also, programming skills such as using Python were included in the lab exercises.

I continued conducting research for projects funded from NSF and USGS 104b. For the enhanced geothermal recovery project funded by the NSF, we developed a novel hydraulic fracture data assimilation method based on genetic algorithms and discrete fracture networks. We plan to conduct a more comprehensive sensitivity analysis and apply the method into the enhanced geothermal recovery site at the Sanford Underground Research Facility. For the USGS 104b grant, we modeled groundwater flow for the Split Rock Creek Aquifer. The goal of the project is to design pumping wells for water resource management of the aquifer for the City of Sioux Falls.

I published five papers in 2022:

1. **Li, L.** and Davis, A.D., 2022. Teaching Groundwater Flow and Contaminant Transport Modeling via a Sand-Tank Model. *Mathematical Geosciences*, pp.1-16. (impact factor: 2.6) [SpringerLink](#)
2. Bao, J. *, **Li, L.** and Davis, A., 2022. Variational Autoencoder or Generative Adversarial Networks? A Comparison of Two Deep Learning Methods for Flow and Transport Data Assimilation. *Mathematical Geosciences*, pp.1-26. (impact factor: 2.6)
3. Huang, G., Han, D., Song, J., **Li, L.** and Pei, L., 2022. A sharp contrasting occurrence of iron-rich groundwater in the Pearl River Delta during the past dozen years (2006–2018): The genesis and mitigation effect. *Science of The Total Environment*, 829, p.154676. (impact factor: 5.7)
4. Bi, P., Huang, G., Liu, C. and **Li, L.**, 2022. Geochemical factors controlling natural background levels of phosphate in various groundwater units in a large-scale urbanized area. *Journal of Hydrology*, 608, p.127594.
5. Huang, G., Pei, L., **Li, L.** and Liu, C., 2022. Natural background levels in groundwater in the Pearl River Delta after the rapid expansion of urbanization: A new pre-selection method. *Science of the Total Environment*, 813, p.151890. (impact factor: 7.9)



Students from Groundwater class visited Gravel Spring



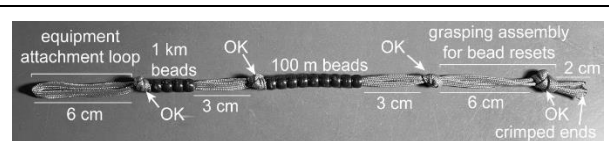
Ran my 1st marathon from Cement Ridge to Spearfish, and my time was 3:39.

Tim Masterlark

Teaching: Primal Skills.

I began teaching Primal Skills (personal responsibility, mental toughness, and situational awareness) to fill a significant gap in Geoscience education. I address these Primal Skills head-on with a sequence of fieldcraft training for the Physical Geology Laboratory that culminates with a Field Training Exercise in the South Dakota Badlands (Figure: Badlands FTX). Students practice walking head up and scanning for potential threats. Crawling through a mud obstacle, they dismantle the comfort mindset and embrace the discomfort of wet and dirty conditions. They are then confronted with a simulated medical situation and evaluated on their ability to mitigate the threat with a tourniquet. All the while, students must maintain a Mission First perspective to complete a pace count exercise and estimate distance in the field using Ranger Beads. No other Geology program in the world provides this kind of training. If you want a piece of the action, I will present Primal Skills at the upcoming South Dakota STEM Education Conference (04 February 2023), GGE Seminar (10 February 2023), and the STEAM Café (21 March 2023). Click this link for a sample of GGE students getting comfortable being uncomfortable in the South Dakota Badlands:

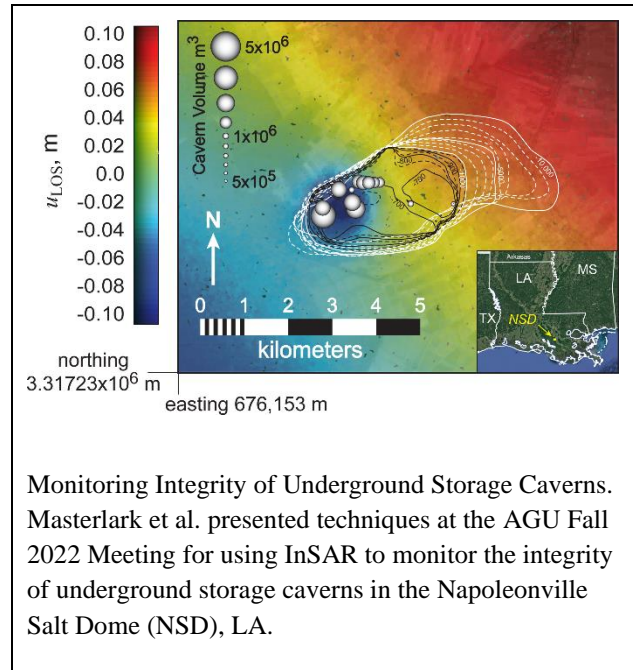
https://drive.google.com/file/d/1J486JEJxV3wgTPn3WAt4-vadtPaxx_vF/view



Badlands FTX. (top) Ranger Beads. Students construct Ranger Beads to track pace counting and measure distance in the field. (bottom) Situational Awareness. Masterlark debriefs students and assesses their observations for potential threat scenarios at the conclusion of the Badlands FTX.

Research: New Landscapes and Partnerships.

Dr. Jay Tung and I have a newly awarded NSF grant to develop probabilistic methods for estimating tsunami hazards for high-threat coastal areas. I am very pleased to report that Dr. Tung (a former post-doc on my SD Mines research team) accepted an appointment to Assistant Professor at Texas Tech University. I began a new line of research with new industry partners to investigate deformation of caverns in salt domes. The caverns are formed by solution mining and designed to serve as underground storage reservoirs for critical hydrocarbon and H_2 energy resources. I bring expertise in combining satellite radar (InSAR) data, finite element modeling, and machine learning to bear on monitoring the integrity of these caverns, which are subject to pressurization cycles of the cavern fluids and creep of the salt that hosts the caverns.



Service: Giving Back with Global Perspectives.

I continue to advise my Diplomatic Security colleagues at the US Department of State on a variety of topics. In the wake of my service as a Jefferson Science Fellow, I received the Meritorious Honor Award from the Bureau of Diplomatic Security and a Letter of Appreciation from the Commanding General, Training and Education Command, US Marine Corps. The Primal Skills described above represent my effort to bring the excellent training and experiences I received as a Jefferson Science Fellow back to the students at SD Mines. Finally, I am pleased to report that I was elected to serve as the Chair of the SD BOR Natural Sciences Discipline Council. I see this as an excellent opportunity to provide big-picture guidance for the future of STEM education across the SD university system.

Roger Nielsen

This has been another rewarding year, with two of the group's students defending their thesis and recruitment of two new students. My research, most of which is in collaboration with Dr. Ustunisik, has been very productive – including the submission and publication of new papers and a 5-year renewal of our National Science Foundation (NSF) funded project focused on using Big Data approaches to building models of igneous systems. Both of the new students are working on the project that continues our work on understanding how the oceanic crust forms.

In my other role, as a policy coordinator in Academic Affairs, I worked on several new initiatives that are designed to help us in faculty development and evaluation. This includes both benchmarks for mid-term review for tenure track faculty, and draft guidelines for two new faculty tracks, the Professor of Practice (faculty with expertise in more applied fields) and Research Professors (faculty who focus on research and are supported with external grants). Much of this work is part of the Advance initiative, funded by a grant from NSF.

On a personal note, Dr. Ustunisik and I were finally able to hold the ceremony that Covid delayed for over two years. We want to thank all of your good wishes and look forward to all the adventures in the new year.



Darrin Pagnac

Happy Holidays, alumni!

2022 was a fantastic year on all fronts! We've finally mostly come out of COVID quarantine protocols and were able to commence "normal" activities, whatever that means these days.

Field work during the summer of 2022 was basically back to normal. In June, I started a new series of survey efforts with the Bureau of Reclamation. We conducted a survey at Keyhole Reservoir, which was AMAZING! Keyhole contains formations from the Jurassic Sundance to the Cretaceous Fox Hills. The students and I saw so much fantastic geology and paleontology, from belemnites, to Morrison dinosaurs, to early Cretaceous crocodiles, to mosasaurs. This survey was one of the highlights of my career, despite the bears (don't ask).



Keyhole reservoir was gorgeous!

We spent late July and early August out of Chamberlain, SD in the upper Cretaceous Pierre and Niobrara Formations. We were pretty much unrestricted in our efforts this year and had a spectacular season. Although we spent three weeks in the vicinity of Chamberlain, we pushed south a bit this year and worked out of Platte for a week. The new scenery and fossils were very refreshing. We worked with a local naturalist who showed us several of the "hot spots" we'd been getting reports on.

Our "bundle of joy" I reported on last year is now a full-grown Australian cattle dog, Siberian husky mix. We're also pretty certain there's a dash of coyote in there based on some of her behavior and vocalizations. We've named her Iyeska, which is Lakota for "mutt". She is a total sweetheart and give me actual hugs in the morning and when I get home from work.



Left: Iyeska from last December. Right: Iyeska this year.

Best wishes to you all for the holiday season and a successful 2023!

Gokce Ustunisik

Alumni and friends,

Season's warmest greetings! Another year has flown by and 2022 was a great one. I am happy to share the exciting news that I am granted tenure and promoted Associate Professor in Spring 2022. Our lives are back to mostly normal with the help of vaccination and regular boosters.

Currently my research program is supported by 5 NSF grants which provided funding for 3 MS (*Erica Cung, John Hewitt, Madison Betts*), 1 PhD (*Olivia Daynes*), and 1 undergraduate student (*Amelia VanWinkle*). My 2 new awards, NSF Ocean Sciences/Marine Geology & Geophysics (405K) and NSF-EAR/Geoinformatics (466K) are supporting 2 new graduate students joined in Fall 2022 (*Madison Betts- UNLV and Olivia Daynes- UNC, Wilmington*). I also submitted 4 new proposals to federal agencies (3 NSF, 1 NASA) 1 as a PI, 2 as a co-PI, and 1 as a senior personal. Among these, 3 of them are major research grants submitted to NASA-SSW, NSF OIA - EPSCoR RII Track-2 FEC, NSF EPSCoR Track 1 programs; and 1 of them is an instrumentation grant submitted to NSF-MRI.

On the teaching side, I continued teaching department 2 required Earth Material courses "Mineralogy and Crystallography" in the Fall and "Igneous and Metamorphic Petrology" in the Spring in addition to my 2 graduate courses "Volcanology" and "Planetary Geology". These graduate courses are designed to attract a broader range of graduate students, including those especially in Solid Earth research areas and even ones with research interests in paleontology. With its quantitative approach and experiential learning laboratory activities Igneous and Metamorphic Petrology served a critical component of both Geology and Geological Engineering ABET self-study reports. In preparation for ABET certification, we collected data on the student assessments for addressing 3 Geology Performance Indicators (PIs) that are used to evaluate 3 out of 6 GEOL Student Outcomes (SO) as well as 2 Geological Engineering PIs that are used to evaluate 2 out of 6 GEOE SOs.

I am very proud of the effort and progress put forward by my graduate students. Erica Cung (University of California - Santa Barbara) and John Hewitt (SD Mines) successfully defended their thesis, graduated in Spring 2022, and received Outstanding MS Student award by the Geology and Geological Engineering Department. Erica completed her MS research in 2 years. She presented her research with 3 abstracts (2 first author, 1 co-author) at Annual GSA Fall Meeting, AGU Fall Conference, and Goldschmidt meeting. Erica's thesis manuscript "Quantitative Analysis of Trace Element Partitioning Data for Clinopyroxene, Garnet, and Amphibole Using Statistical Methods" was submitted to Geochemistry, Geophysics, Geosystems. Currently, Erica is working as an instructor at Oglala Lakota College. John Hewitt completed his Accelerated MS degree in 1 year. He presented the findings of his research with 2 first author abstracts at Annual GSA Fall Meeting and AGU Fall Conference. During Summer 2022, John's thesis manuscript, "Petrogenesis of Plagioclase Ultraphyric Basalts (PUB) from the Northeastern (NE) Pacific Ridge System: Evidence From Mineral Textures and Geochemical Characteristics", has been revised by the coauthors and the submission to Geochemistry, Geophysics, Geosystems will happen in early

2023. John is currently working as a staff geologist at Seafloor Investigations LLC (SFI), based in Seattle WA.

Thanks to my research group and collaborators in various projects, 2022 was a very productive year for publications and presenting at a wide range of conferences. We submitted 4 journal articles, 2 published, 1 in-press, and 1 in-review:

- Dygert, N., **Ustunisik, G.**, and Nielsen, R. L. (*in-review Nature Communications, 2022*). Europium in Plagioclase Reveals Mantle Melting Modulates Oxygen Fugacity.
- Rogaski, A.*, **Ustunisik, G.**, Yang, S., Humayun, M., Righter, K., Berger, J.A., and DiFrancesco, N.J. (*in-press, Meteoritics and Planetary Science, 2022*). Experimental Constraints on the Volatility of Germanium, Zinc, and Lithium in Martian Basalts and the Role of Degassing in Alteration of Surface Minerals.
- Bradley, T.*, **Ustunisik, G.**, Duke, E. F., Unluer, A.T.*, Yildirim, D.K., and Flores, K. F. (2022) Qualitative Barometry of High P/T Rocks with Field Based NIR Spectroscopy of White Mica. *Lithos*, V. 408-409, <https://doi.org/10.1016/j.lithos.2021.106533>. [Impact factor 3.93]
- **Ustunisik, G.**, Nielsen, R. L., and Walker, D. (2021) The Missing Magmas of MOR: Insights From Phase Equilibrium Experiments on Plagioclase Ultraphyric Basalts. *Geochemistry Geophysics Geosystems*, V.23, <https://doi.org/10.1029/2021GC009943>. [Impact factor 3.447]

With the back to in-person conferences, my students and I presented our ongoing research in 9 conferences with 9 proceedings - one was presented at 53rd Lunar Planetary Science Conference (LPSC) and one was presented at American Association of Petroleum Geologists (AAPG) Annual Convention in March 2022; 3 were presented at Goldschmidt in July 2022; one was presented at EarthCube annual meeting in June 2022; one was presented at GeoMinKöln in September 2022; 2 were presented at AGU Fall Meeting in December 2022; and 1 will be presented International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) in February 2023.

- Lewis, K.*#, **Ustunisik, G.**, and Nielsen, R.L., “Experimental Constraints on Homogenization of Plagioclase-Hosted Melt Inclusions from Plagioclase Ultraphyric Basalts” IAVCEI Meeting, Rotorua, New Zealand (January 30 - February 3, 2023).
- **Ustunisik, G.**#, Vaughn, M.*, Govil, T.*, Soeder, D.J., Lingwall, B., Sani, R.K., Betts, M. X.*, Van Winkle, A.*, and Kaur, J.*, “Biogeochemical Controls on Carbon Mineralization in Basalts: Insights from Dissolution Experiments” AGU Fall Meeting, Chicago, IL (December 12-16, 2022)
- Profeta, L.#, Lehnert, K.A. , Ramdeen, S., Peng, J., Nielsen, R.L., **Ustunisik, G.**, Walker, J.D., Block, K., and Grossberg, M., “The IEDA2 Facility - Harmonizing FAIR Sample (Meta)Data for VGP Research” AGU Fall Meeting, Chicago, IL (December 12-16, 2022).
- Lehnert, K.A.#, Profeta, L., Ramdeen, S., Peng, J., **Ustunisik, G.**, Nielsen, R.L., Walker, J.D., Block, K., and Grossberg, M., “IEDA2: Next Generation Data Infrastructure For Fair Geoscience Sample Data” GeoMinKöln, Cologne, Germany (September 11-15, 2022).

- Wolf, A. S.#, Cung, E.*, **Ustunisik, G.**, and Nielsen, R. L., “Causal Predictive Modeling for Trace Element Partitioning” Goldschmidt Conference, Honolulu, HI (July 10-15, 2022).
- Lehnert, K.A.#, Profeta, L., Ramdeen, S., Peng, J., Figueroa, J.D., Cao, S., Shane, N., Sweets, H.A., **Ustunisik, G.**, Nielsen, R.L., Block, K., Grossberg, M., and Walker, J.D., “IEDA2: Evolving EarthChem, LEPR/traceDs, and SESAR into a Next Generation Data Infrastructure for Data-Driven Research Paradigms in Geochemistry, Petrology, and Volcanology” Goldschmidt Conference, Honolulu, HI (July 10-15, 2022).
- Govil, T.*#, Vaughn, M.*, Kaur, J.*, Soeder, D.J., **Ustunisik, G.**, Lingwall, B., and Sani, R.K., “CO₂ Solutions - Driven by Enzyme-Enabled Carbon Capture” Goldschmidt Conference, Honolulu, HI (July 10-15, 2022).
- Wolf, A.S.#, Cung, E.*, **Ustunisik, G.**, Nielsen, R. L., Antoshechkina, P., Lehnert, K.A., Peng, J., Cao, S., and Profeta, L. R., “Toward Causal Predictive Models of Trace Element Partitioning” EarthCube Annual Meeting, San Diego, CA (June 14-16, 2022).
- Soeder, J. D.#, **Ustunisik, G.**, Lingwall, B.N., Roberts, D. L., and Nulwala, H., “An Approach for Sealing Depleted Oil and Gas Reservoirs while Sequestering Carbon Dioxide” AAPG Carbon, Capture, Utilization, and Storage (CCUS) Conference, Houston, TX (March 29-31, 2022).



John Hewitt (MS, Geology) and Erica Cung (MS, Geology) at 2022 Spring Commencement.



Left to right: Erica Cung, Gokce Ustunisik, John Hewitt at 2022 Graduate Student Award Ceremony, Spring 2022.



John Hewitt (MS, Geology) and Gokce Ustunisik at 2022 Spring Commencement.



Madison Betts (MS started in Fall 2022), is preparing an experiment to be loaded in cold-seal pressure vessel. Experiments are testing the role of thermophilic bacteria on carbonate mineralization in basalt (NSF CBET Funding).



Olivia (PhD started in Fall 2022), is picking plagioclase megacrysts from Plagioclase Ultraphyric Basalts of Endeavor segment of Juan de Fuca Zone. Olivia is preparing plagioclase megacrysts for melt inclusion rehomogenization experiments at 1 atmosphere quench furnace (NSF OCE/MG&G Funding).

Besides, research and teaching, I continued being involved in several department, university, and professional committees. Of those, I believe that I had the highest impact as part of the Peer-Review of Teaching committee; University Research committee; leading the IEDA traceDs and Library of Experimental Relationships (LEPR) ([EarthChem- Experimental Petrology](#)); and getting involved in the Tiospaye Organization and STEM Tribal College Committee.

On a personal note, after a long wait due to Covid, Dr. Roger Nielsen and I had our wedding ceremony on May 19, 2022, at Skylands Manor, Ringwood, New Jersey. We were so happy for our families, graduate students, colleagues and friends from all over the places – American Museum of Natural History, Lamont Doherty Earth Observatory of Columbia University, Oregon State, Stony Brook, South Dakota Mines, to share our special day with us. It turned out to be a beautiful Spring Day – the rain stopped, and the sun came out just before the ceremony. All we felt was the outpouring love by these wonderful people whom we feel fortunate to call our “extended family”....



May 19, 2022, The Castle at the Skylands Manor, Ringwood, NJ.

Best wishes to you and yours for a happy and healthy holiday season and lots of hopes for 2023!

From Black Hills Natural Sciences Field Station (BHNSFS) and Nuri Uzunlar

The BHNSFS is the world's largest field school offering summer and winter camps in earth science and related engineering fields including geology, geological engineering, environmental geology, volcanology, petroleum, and geomorphology on six continents. In 2022, 252 students from 81 institutions across the USA mapped geological environments ranging from volcanoes to fault zones in Hawaii, Turkey, France, Spain, Morocco, Iceland, and the Black Hills of South Dakota. We are getting ready for the winter camps in Hawaii, New Zealand, Arizona, and Death Valley. All four camps will start after Christmas.



In addition to traveling from camp to camp I attended GSA in Denver and AGU in Chicago, where the field station and the department had an exhibit.

For additional information about upcoming field station activities please visit:

<http://geologyfieldcamp.sdsmt.edu>, call me at (605) 394-2494 or write to nuri.uzunlar@sdsmt.edu

Trevor Waldien

Hi Everyone,

Since starting at SDSMT in fall 2021, I've spent the last year trying to find my rhythm in the department. I'm happy to report that I think I'm getting there, bit by bit. Aside from developing my undergraduate structural geology course, I've developed a graduate course in geologic mapping that I taught for the first time in fall 2022, and I will be teaching a combined undergraduate/graduate class in geochronology in the spring of 2023. I'm hoping that these courses, and others that I am planning for the future, will help students gain essential skills related to map generation/interpretation, understanding the geologic timescale, and proposal writing that they will take with them into their future careers.

Although my 2021 field season was short (only two weeks), I had a fun time with colleagues at the Valdez Creek Mine (Alaska) where we were working to pinpoint the bedrock source(s) for placer gold deposits that have been historically mined in the area. The mine was very accommodating: they showed us hundreds of meters of core, lent us their ATVs, and let us eat their food! Never before have I had fresh salmon fillets while in the field, enjoy the photos!

I had a relatively productive year in research: I published two papers, submitted a few more, but the most fun part is that I got grant funded from the NSF Tectonics program to work out some persistent issues related to strike-slip faulting in the North American Cordillera and the Alaska orocline. As you may know, the Alaska orocline is a textbook example of oroclinal bending (literally, it is in textbooks). However, it is not well understood when the orocline formed and therefore, it is not clear what tectonic process(es) influenced its formation. To address these problems, my graduate students and I will work on a series of projects in/around the Ahklun Mountains in western Alaska to better bracket the timing of oroclinal bending, uplift of the Ahklun Mountains, and the tectonic history of the region. Few geologists have ever set foot in this area, and most of them did so prior to 1985, so I am really excited to get out to the field this June and get the ball rolling! Stay tuned!

As if that wasn't enough to keep me busy, I also received funding from the Keck Geology Consortium to better characterize deformation in the Archean rocks of the Black Hills. The Keck Geology Consortium is a program that provides funded research experiences to undergraduate students in the form of sponsored research projects. Since I am still learning the geology of the Black Hills, I thought that the Keck program would be a good opportunity to get in the field and look at some neat old rocks with some students! After documenting the geometry and kinematics of the shear zones in the field, we will use oriented thin sections to perform some quantitative strain analyses. Some students will work on crushing rocks and separating zircons to obtain a more precise age for the rocks using modern analytical techniques. Should be fun!

Take care, Trevor



Kevin Ward

Hello everyone. A lot has been going in and we are all keeping busy, but I thought I would focus on one thing that might be of interest to those reading this newsletter. There currently is a big push to engage in groundbreaking high-profile research but sometimes interesting and worthwhile things can get lost in that endeavor. I have been working on a local project to make sure I that doesn't happen. Currently, we have deployed about seven Raspberry Shakes in the Black Hills, and more are planned as soon as chip shortages are ameliorated, and more instruments can be added. Raspberry Shakes are small inexpensive seismic instruments that can measure earthquakes from around the world but also detect events originating in the Black Hills that are too small for our national networks to detect. Although the area is not historically a high earthquake hazard risk, there are many small earthquakes that might yield interesting results about the local geology and ongoing processes in the Hills. I would like to thank my students who have helped with the deployment and maintenance of the Shakes and those who have hosted a seismometer in their home or workplace. Many of these instruments are in places you have visited including some of our faculty homes but also at the 4100' level in the SURF and at the Mammoth Site. I will conclude by noting all of this data is streamed in real time and available to anyone who wants it at the following link: <https://stationview.raspberrylshake.org/#/?lat=43.90833&lon=-103.65894&zoom=9.000&net=AM&sta=R6C38>

I wish you and your family a healthy and happy year.

