

Department of Earth and Environmental Sciences Newsletter

Message from DEO David Peate

The optimism of late Spring has been somewhat tempered by the appearance of the Covid Delta variant, which means that the effects of the pandemic continue to linger. Vaccination rates in Johnson County are high (~70%) compared to the rest of Iowa, although the University can not require vaccinations or mask wearing. Many activities in the department are now ‘almost’ back to ‘normal’, with just the largest classes online and department seminars in a hybrid format. We have managed to run successful field trips to the Badlands and Baraboo this semester.

In this newsletter, we highlight the development of the Ashton Prairie site as an on-campus living laboratory that is being incorporated into class activities of many of our environmental science and geoscience courses, as well as courses in geography, biology, and environmental engineering. Megan Lenss, a recent Geoscience B.S. graduate and currently on a Fulbright scholarship in Norway, was the main driving force behind the initial project to develop the site as a prairie restoration, and Brad Cramer led efforts to get college funding to instrument the site.



In faculty news, we are pleased to announce that Shamar Chin, who works on calcareous nannofossils and reconstructing past climates, has been hired into a tenure-track faculty position, and we are presently searching for a new faculty hire in Planetary Geoscience as part of a newly-funded initiative to expand space-based research on campus.

We did manage to hold the delayed inaugural Triennial Alumni Homecoming Event in October, and it was great to see so many alumni back in Iowa City for this event. We had a very productive meeting of the EESB – Earth & Environmental Sciences Department Alumni Advisory Board – plus a successful social event with alumni, faculty, and students, at a local restaurant on the Homecoming parade route. There was also an excellent Saturday morning field trip that looked at local Quaternary geology (thanks to Phil Kerr for leading the trip). I would like to take this opportunity to sincerely thank Amy Sullivan for the outstanding service she has provided to the department through her selfless and tireless leadership of the reestablished alumni board over the last six or so years. She has left the EESB in a very strong position, and I am looking forward to working with Lee Philips, the new EESB chair, moving forward. I am grateful to all alumni and friends for your continued support for the Department of Earth & Environmental Sciences.

Ashton Prairie Living Laboratory

By Brad Cramer

Nearly 25 years ago the University of Iowa created one of the first and most rigorous interdisciplinary Environmental Sciences (ENVS) undergraduate programs in the country. Today at Iowa, we continue our legacy as leaders in environmental science and engineering, leveraging our expertise in environmental research and education to address pressing societal issues such as access to clean air and water, soil health, preservation of biodiversity, and the impacts of global change. We train students in core competencies that seamlessly translate to the workforce and are critical for student success after graduation. To remain at the cutting edge of environmentally focused STEM disciplines we must increase our ability to provide innovative, immersive, and comprehensive opportunities for our students to develop skills outside of the classroom. Living laboratories – outdoor spaces where students and researchers can participate in focused, overlapping STEM investigations – provide an ideal opportunity to develop a place-based, real-world curriculum.

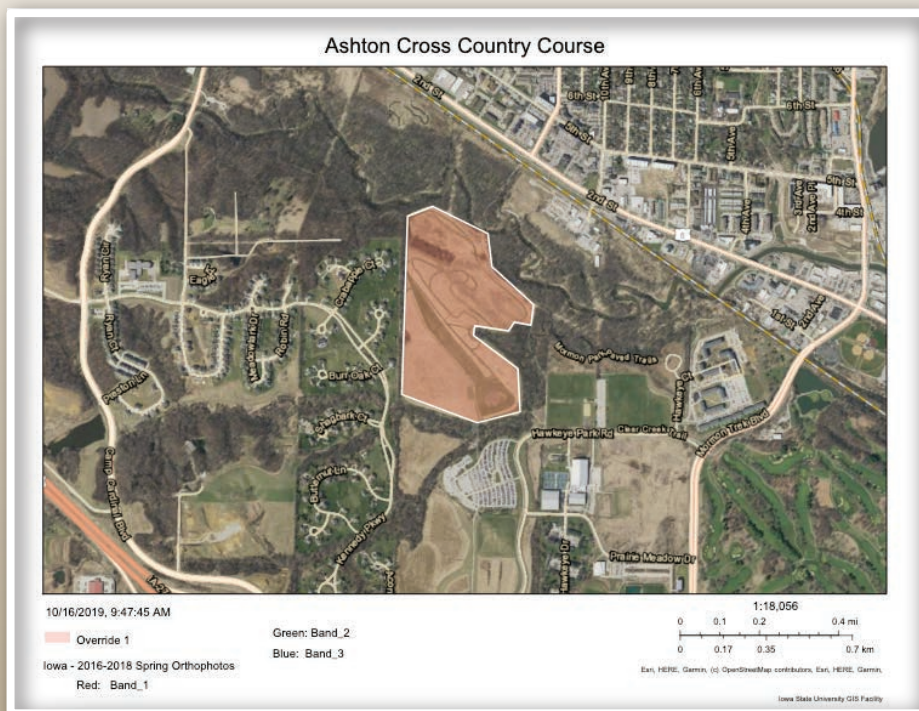
The complexity of environmental research and education revolves around the operation of the Earth and the environment as a system. Integrated Earth System Science (oceanatmosphere-biosphere-hydro-sphere-geosphere) has become the framework upon which our modern understanding of the environment is built and the myriad feedbacks and balances within this framework are critical to translate to students. Teaching how these systems work independently, and as a collective whole, is challenging when students are limited to textbooks, lectures, videos, and indoor laboratories. The most effective way to train environmental students is to provide experiences in the environment that demonstrate how each component operates within the larger system.

A collaboration between the Office of Sustainability and the Environment (OSE), the ENVS program, an EES undergraduate student, and the Athletics Program led to a one-acre Prairie Restoration Project on the grounds of the Ashton Cross-Country Course in 2019. In fall 2020, a four-acre expansion was approved to begin in 2021. This new expansion provides an ideal opportunity to deeply embed the site throughout a range of courses and research



across multiple units in multiple colleges. A coalition of 22 faculty, researchers, and staff members from ten units across campus in two colleges have united to turn this accessible and highly visible prairie site into a living laboratory for research and education with instrumentation that spans from the bedrock to the atmosphere. Here, we request support for infrastructure, supplies, and student support to further distinguish Iowa as a destination campus for environmental research and education.

More information about the prairie can be found at <https://prairierestoration.course.uiowa.edu/>.





Ashton Prairie Groundwater Monitoring Network

By Jessi Meyer

Jessica Meyer (Professor, EES), Matthew Streeter (Assistant Research Scientist, IGS), Stephanie Tassier-Surine (Research Specialist, IGS), Brennan Slater (Intern, IGS), Riley Kniptash (Grad Student, EES), Thomas Doyle (Grad Student, EES), and Phil Kerr (Research Associate, IGS) have been working hard this past summer and fall collecting sediment cores and installing 10 monitoring wells at the Ashton Prairie Living Laboratory (Ashton) to support teaching and undergraduate research (Fig. 1). Three CMT multilevel systems are also being installed as part of the groundwater instrumentation at Ashton. Multilevel systems are engineered devices that divide a single borehole into many depth-discrete monitoring intervals. Professor Meyer routinely utilizes MLSs in her research and is excited to introduce University of Iowa students to this state of the science technology used frequently in contaminated site investigations. The groundwater instrumentation at Ashton will be an exceptional resource for faculty and students across campus learning about and researching groundwater flow and contaminant transport problems. In addition, undergraduate and graduate students working with Dr. Meyer and collaborators will be conducting research at the site focused on the role of paleosols in water table flow systems and the evolution of groundwater quality underlying land converted to tall grass prairie. Many thanks to U Iowa Athletics for supporting the living laboratory activities, Solinst Canada which donated a CMT multilevel systems and a variety of other equipment to facilitate teaching groundwater science at the university of Iowa, and the Iowa Geological Survey for supporting the preliminary surface geophysical surveys, drilling, and well installations.

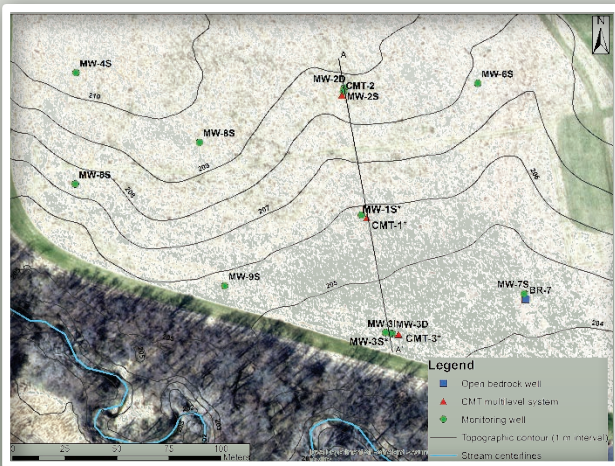


Fig. 1 – Map showing the locations of monitoring wells and MLS. * indicate wells that will be installed in December or spring 2022.

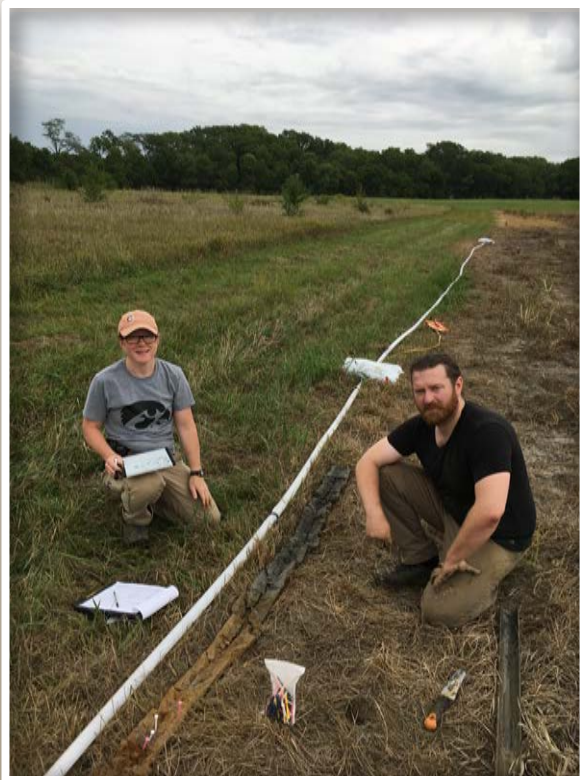




MS students Riley Kniptash and Thomas Doyle backfilling the CMT multilevel.



Top view of a CMT multilevel well. The multilevel has 7 depth discrete monitoring intervals.



Jessi Meyer and Phil Kerr (IGS) examining a sediment core in order to design the CMT multilevel (white tube).



Matthew Streeter (IGS) and MS student Thomas Doyle drilling a borehole using hollow stem augers and the IGS giddings drill rig.

Earth and Environmental Sciences Alumni Advisory Board Triennial meeting

By Kate Tierney

Members of the EESB joined us on campus during Homecoming week to have our triennial in-person gathering and meeting, though because of very reasonable COVID-19 precautions, some members chose to join remotely.

During our meeting Dr. David Peate, Department Chair, joined to update us on the happenings in the department. He focused on the initiation of the Ashton Prairie Living Laboratory, the innovative research being done by faculty, including their work to bring in funding to support that work, and the exciting news that we are making good progress to hire a new faculty member to start next year (<https://jobs.uiowa.edu/faculty/view/74285>).

Dr. Sara Sanders, Dean of CLAS, also joined us to acknowledge the good work of our department and to explain about the poor state of finances at the college level, she outlined a plan to rectify the poor state and some hurdles that we are facing to meet recovery goals. Her discussion was candid and realistic, but also tempered our expectations about college-level funding for the next few years.

This year the EES Alumni Board is seeing some personnel changes. Our fearless leader, Amy Sullivan (B.A. 78, B.S. 83, M.S. 86) finished her term as chair after gracefully and efficiently leading our group for the past 5 years. At the end of our meeting Lee Phillips took the lead as chair. Both the Board and the Department are grateful for our departing members service and energy to help us be our best. Leon Aden, Mike Burkart, Steve Shutter, Grant Smith, and Jennifer Wade are leaving the board as voting members. Aaron Suzuki (M.S.) and Jim Eagan (M.S.) joined the board. We are excited to have you work with us!

Our time together was capped by a great field trip to see quaternary sections around the Amana Colonies, led by Phil Kerr. About 15 people, including faculty, survey workers, students and alumni of varied generations joined for a beautiful morning seeing tills and soils, and even a few dunes! Thanks so much Phil!





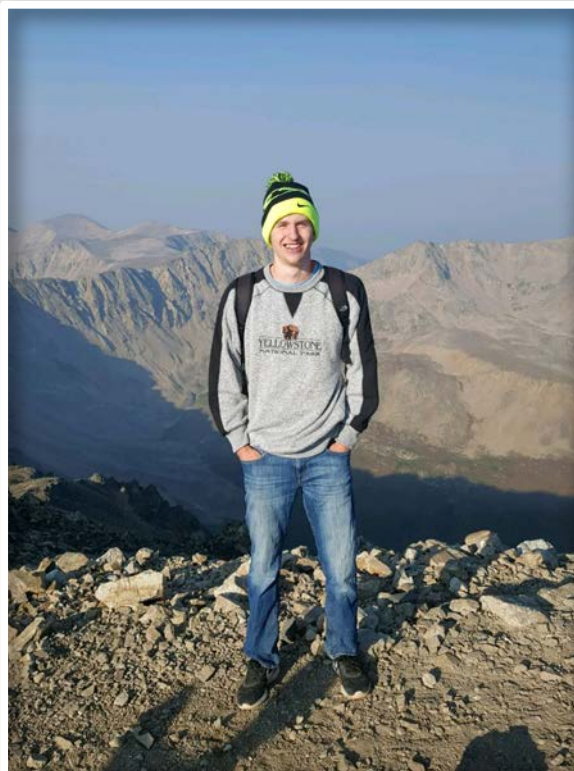
Faculty Profile

Dr. Shamar Chin

My research entails analyzing the evolution of paleoclimate, paleoceanography, and paleoecology during the late Campanian – Maastrichtian (~72–66 Ma) using calcareous nannofossils. This time interval is of interest because there were global perturbations in the carbon cycle, global cooling, and the reorganization of water masses; however, the triggering mechanisms are a point of contention. Calcareous nannoplankton dwell in the upper photic zone and are sensitive to changes in surface waters; therefore, variations in the assemblages, such as morphometrics, abundances, bloom events, and fertility indicators, are purported to reflect different triggering mechanisms. I am also collaborating with Dr. Bradley Cramer on the Cenomanian –

Turonian anoxic event (OAE2) using the Hawarden Core, NW Iowa. We hypothesize that the OAE2 biogeochemical events' triggering mechanism is the same as three major Paleozoic events. Significant changes in the calcareous nannofossil assemblages coincide with OAE2, and these variations allow for age constraint and the reconstruction of paleoenvironmental conditions.

I will be teaching Marine Ecosystems and Conservation in Spring 2022. This course aims for students to understand how our oceans and ecosystems have evolved through time, how anthropomorphism has disrupted these habitats, and how to modify our behaviors to mitigate our oceans' crises. Ultimately, students will be able to deduce that these changes contribute to climate change and ocean acidification. As a postdoctoral fellow, I co-lectured Introduction to Earth Science with Dr. Benjamin Swanson, and will continue teaching it in the fall semesters.



Graduate Student Profile

Thomas Doyle - MS student

Research: High resolution monitoring of vertical hydraulic head profiles to identify hydrogeologic units in the eastern Iowa Silurian-Devonian Aquifer

Experience I value at UI: I've been able to do a lot of field work for my research and the Ashton Prairie Living Laboratory. This has helped me learn more about groundwater monitoring and improved my field troubleshooting skills. Over the last semester, the sense of community among students in the department has really grown, and I've made a lot of friends. I know that whenever I have a question there will be someone who can help out.

Future Plans: I am planning on staying in the Midwest and working in the environmental sector, either for a consulting firm or state agency. I hope to specialize in groundwater and be able to work on solving groundwater problems here in Iowa.

Dr. Kate Tierney named Collegiate Teaching Award winner

Reproduced from <https://clas.uiowa.edu/news>



Kate Tierney, lecturer in the University of Iowa Department of Earth and Environmental Sciences, has earned the Collegiate Teaching Award from the College of Liberal Arts and Sciences.

Tierney teaches courses in environmental science, the study of energy and the environment, and sedimentary geology, and—when travel is not barred due to a pandemic—regularly leads field trips to locations around the United States and internationally.

Her students respond not only to her excellent teaching both in the classroom and in the field, but also to her caring mentorship. One student who worked with Tierney said that she inspired a major academic and career decision in the student's life.

"My first interaction with Dr. Tierney occurred after a friend convinced me to sign up for the fall semester geology field trip offered by the Earth and Environmental Sciences Department," the student said. "At the time, I was somewhat unsure of my future path as a student and had changed my major multiple times. I was tentatively thinking about changing it yet again, perhaps to geology, but was not convinced. Dr. Tierney was the instructor for the field trip, and I briefly visited her office to get some details about the logistics prior to our departure. This was a routine affair, but I realized very quickly in

her office that day that Dr. Tierney was extremely generous with her time and knowledge, both with students she had known for many years and with a student like me, whom she had first met just a few minutes prior."

The field trip changed the student's life.

"It was that field trip to southeast Missouri that convinced me to change my major to geology for good," they said. "More accurately, it was Dr. Tierney's enthusiasm and excitement about Earth history that convinced me to study geology as a career pursuit. At each outcrop, she encouraged us to hone in on the smallest of details, and then to zoom out to try and catch a glimpse of the bigger picture. Every stop was a lesson in both what we could learn about the Earth from the rocks right in front of us and what questions we might answer with further study. Every student inquiry was met with absolute respect and graciousness, and I know that even students who did not end up pursuing a career in geology benefited from Dr. Tierney's literally down-to-Earth approach."

Another student related a similar story about Tierney's infectious love for her discipline.

"Not only is she an outstanding educator, an incredibly knowledgeable scientist, and an advocate for all her students," the student said, "but it is because of Professor Tierney's guidance that I am where I am today—a graduate student at an institution renowned for its geosciences program, happily conducting research and learning from top-tier researchers. And I owe it all to Kate Tierney."

A third student hailed Tierney's skills in front of a classroom.

"Kate can hold the attention of an entire lecture hall simply with her charisma and relatable storytelling. This attention to detail, both in class and at an individual level with students, even earned her a standing ovation at the end of the semester," they said.

Tierney spearheaded the development of, and serves as faculty advisor for, the Environmental Sciences Student Club, which connects students in diverse majors who are interested in environmental sciences. She also is a member of the advisory board for the interdisciplinary Environmental Sciences Program, which offers BS and BA degrees. *(continued on next page)*

David Peate, professor and chair of the Department of Earth and Environmental Sciences, said Tierney is dedicated to student success and academic development, as well as to her students' well being. He emphasized her success in leading field trips, noting that she ensures the journeys are operated in an equitable and inclusive manner.

"It is really the 'field-based' courses where Kate's passion and instructional skills really stand out," Peate said. "It takes a certain mindset and dedication to willingly travel with a group of college students to different parts of the country and even abroad for a week or two. Kate plays a key role in department instruction by teaching most of our non-capstone field courses. She has established herself as an excellent teacher, dedicated to undergraduate student success and academic development, and an incredible mentor to all students."

Tierney earned her PhD from Ohio State University and joined the UI faculty in 2015.

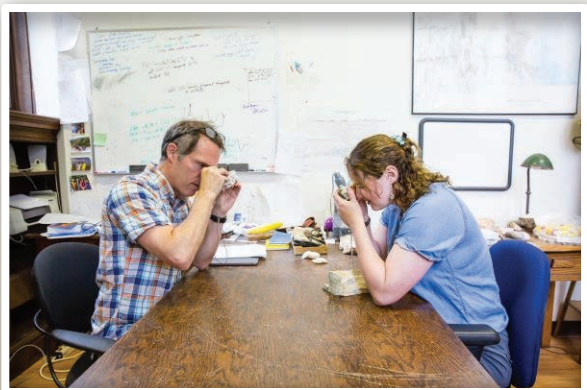
Dr. Rhawn Denniston receives national Undergraduate Research Mentor Award

Reproduced from <https://news.cornellcollege.edu/>

Rhawn received his Ph.D. in Geosciences from the University of Iowa in 2000 and is currently serving as the secretary for the Earth and Environmental Sciences Department Alumni Advisory Board.

William Harmon Norton Professor of Geology Rhawn Denniston has been named the recipient of the 2021 Undergraduate Research Mentor Award by the Geosciences Division of the Council on Undergraduate Research (CUR).

The CUR established this award to recognize the importance of undergraduate research and celebrate those who support and mentor students. Denniston started his teaching career at Cornell College in 2000 and has since mentored more than 50 undergraduate students across the majors of geology, environmental studies, and archaeology. Many of his students have worked with Denniston on several projects.



In his acceptance speech for the award, which was presented at October's annual meeting of the Geological Society of America, Denniston thanked those who guided him as an undergraduate researcher and said mentoring students is the most important part of working at Cornell.

"I love teaching in the classroom but spending time in the lab and in the field with my students is the best part of my job," Denniston said. "My students regularly impress me. I've seen them reach way outside of their comfort zones on countless occasions—rapelling into one cave or crawling past snakes in another, grinding through mountains of data and reading paper after paper to make sense of it all."

Cornell College Professor of Geology Emily Walsh wrote one of many letters nominating Denniston for the award. In that letter, she says Denniston understands the transformative power of research.

"Rather than merely mentoring students in research, Rhawn provides the tools and framework for the students, and then hands over the reins," Walsh writes. "Each student is unfailingly treated the same way—with trust and with the belief that the student can and will succeed."

Walsh says Denniston juggles his intensive block classes and often several student research projects at the same time. That means he's meeting with students first thing in the morning, over the lunch hour, and right after class.

Professor Rhawn Denniston and Huong Quynh Anh Nguyen '19 discussing a stalagmite
Denniston and Huong Quynh Anh Nguyen '19

"The results of Rhawn's faculty-student research collaborations can be breath-taking," Walsh wrote in her nomina-

tion letter. “Students from every background have worked with Rhawn and have succeeded. Students who may have struggled in classes realize they are good at research and apply to graduate school with a new sense of achievement and purpose. Even those students who do not pursue major research with Rhawn come away with a valuable experience—the experience of having a professor believe wholeheartedly that they can succeed at something challenging and new. And THIS is where the magic happens.”

Not only have Denniston’s students presented their findings at the Cornell College Student Symposium, but many also present their research at national meetings, such as at the Geological Society of America or the American Geophysical Union annual meetings. In addition, 18 undergraduate students have been published with Denniston in 13 peer-reviewed journal articles over the past 14 years.



Denniston has a Ph.D. in Geosciences from the University of Iowa. His research with students involves the use of stalagmites and corals as paleoenvironmental records to investigate the history of tropical Australian rainfall associated with the Australian monsoon and tropical cyclones in recent millennia, climate variability in Portugal associated with Atlantic Ocean temperatures and the North Atlantic Oscillation, shifts in precipitation in the Western United States across ice ages, climate and vegetation change in the Midwest, El Niño-Southern Oscillation activity in ancient “greenhouse worlds”, wet and dry periods in the Indian Summer Monsoon region of Nepal over the last 4000 years, and forest fire activity in the Australian tropics since AD 1000.

Teaching Lab Classroom Renovation



Many of you will remember the teaching lab in room 135 of Trowbridge Hall, with the 45-year-old large lab tables and pre-World War 2 rock storage cabinets. Thanks to new funds acquired through an internal proposal led by Drs. Finzel, Foster, Peate, and Reagan, that space has been completely renovated to allow for more flexibility and to foster group learning.

The old large lab tables were replaced with shorter, rectangular tables that allow four students

to face each other, encouraging group work and arranged in a more efficient manner to facilitate instructor/student interaction. These tables also allow for crucial microscope storage, permits students to move around the room more freely, and increases the current seating capacity from 18 to 24.

An additional 20 feet of whiteboard space along the west wall of the room provides creative space for small group projects. The old rock storage cabinets were replaced with sleeker, more efficient storage options that allow us to make use of space beneath the windows on the north side of the room. In the future, we plan to equip this room with 12 laptop computers stored in a charging cabinet that will allow small group computer exercises as needed.

Laboratory classes give students first-hand experience with concepts covered in lecture sessions and provide an opportunity to explore and apply methods used by scientists in their field. These classes require resources that differ from those found in a standard classroom environment.

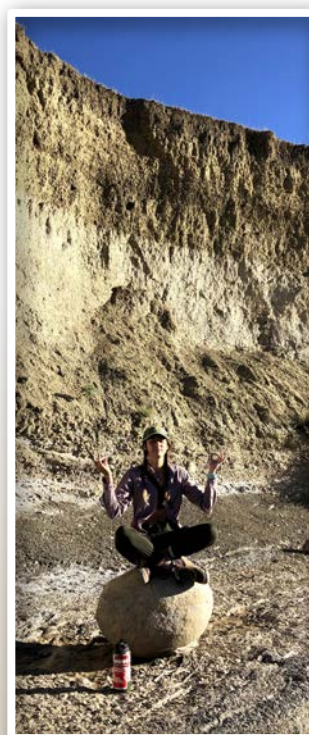
EES:3001 Junior Field Trip to Badlands National Park

By Kate Tierney

In early fall, Drs. Ben Swanson and Kate Tierney took a group of students to Badlands National Park for a hands-on opportunity to look at the natural world through a scientific lens. We camped at Sage Creek Campground and spent our days investigating the North Unit of the Park.

We investigated Sage Creek thinking about downcutting rates and fluvial process, hunted for marine and terrestrial fossils in the gravel bars (making sure to return all our finds) and thought about environmental change that could account for the faunal replacement. We hiked the famous trails of Badlands, including Window, Doors and the Notch.

To our great delight we saw many animals including Bison, Pronghorn Antelope, Bighorn Sheep, Prairie Dogs, and Coyotes. The skies were clear and temperatures were mild. We had a very dark night with a new moon. The stars were breathtaking!





Undergraduate Student Profile

Talia Hill - Geoscience BS student

Research: Analyzing the rare earth composition of apatites from bentonite layers

Experience I value at UI: I have been most grateful for the professors and staff in the department for the consistent welcoming and supportive environment created both in the classroom and field. The encouragement for students to pursue their interests and actively engage with course material both in and out of the classroom has helped me grow as both a student and a person. Not only am I more comfortable diving into subjects I might not know anything about, I also have grown to be more trusting with myself as a student capable of handling these subjects. Through my time here, I have grown to see myself with the ability to have a successful career in the future, and I thank my professors and department staff for helping me reach this point.

Future Plans: I plan to attend graduate school in Fall 2023 to continue my studies in geology, and I hope to eventually pursue a career in academia focused on environmental justice, and the intersection of geology, the environment, and inequality in the U.S.



Undergraduate Student Profile

Hanna Konavaluk - Geoscience BS student

Research: Comparison between geochronologic and geochemical provenance models for Cretaceous sedimentary rocks in Southwestern Montana

Experience I value at UI: As an undergraduate student studying Geoscience, I am always astounded at all of the opportunities this department has to offer. From field courses to research projects, there are always opportunities to dive into topics that interest you. I was able to jump right into a really hands-on research project in my junior year and have since then have been able to learn so much. I feel very lucky to have the opportunity to be trained on equipment and machines we learn about in class, such as the XRF or the LA-ICP-MS. Outside of the lab, I have been able to gain some experience working in the field and apply everything I have learned in the classroom.

Future Plans: I plan to attend graduate school in the fall and continue my research in sedimentology and basin analysis.



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EARTH & ENVIRONMENTAL SCIENCES

FALL 2021

Share your perspective

Please share the wisdom you've accrued throughout your career with our students by answering one or more of the questions below, or dispensing any other advice you may have. Your responses will be included in the Alumni Perspectives in the next newsletter. Send them to geology@uiowa.edu and indicate whether you would like it to be anonymous or attributed to you. Thanks for sharing!

What made you competitive in your field?

What were your lucky breaks?

What type of preparation would have made your career path easier?