IOWA

DEPARTMENT OF EARTH & ENVIRONMENTAL SCIENCES

SPRING 2024 NEWSLETTER

MESSAGE FROM DEO DAVID PEATE

"Generous financial support from alumni has been...critical...to enable student...field and research activities..."

Although many departments across the country are seeing a decline in the number of students taking a traditional Geology major, it is very satisfying to see that we are bucking this national trend, with a steady increase in Geoscience majors, now more than 65, coupled with over 180 Environmental Science majors. The College sees significant potential for continued growth in these areas, and will be making strategic investments through numerous faculty hires in the next few years. We are excited to be able to tell you that next year, we will be searching for a new tenure-track hire in Environmental Geophysics as well as a lecturer position to cover teaching of some introductory courses.

I firmly believe that the broad range of experiential learning opportunities (field trips, research, internships) that we offer students is critical to this success, and you can read about many of these activities in this newsletter. Students in environmental and hydrogeology classes have labs out in the instrumented prairie restoration site (Ashton Prairie Living Laboratory) on the cross-country course in west Iowa City. Ben Swanson has been mentoring an 'army' of undergraduate researchers working to characterize the geomorphology, soil and water quality, and ecology of this educational and research facility. The department provides numerous opportunities for field trips for Geoscience and Environmental Science students at all levels. The Mineral & Petroleum Exploration course had a very successful week-long trip to the Appalachians last spring, and the Tectonics & Basin Analysis class have just returned from a week-long trip to Big Bend National Park. There are also regular trips to the St Francois Mountains, MO, and the Badlands, SD, as well as the capstone Field Methods/Analysis course in Dillon, MT, that received the 2022 GSA / Exxon Mobil Field Camp Excellence Award. Many of our undergraduate students do research projects with faculty, and in this newsletter we have highlighted the group of students working with Valerie Payré on projects related to the geology of Mars. Many students also participate in internships with the Iowa Geological Survey and local companies, supported in part through an NSF education grant to Brad Cramer, Kate Tierney, Jessi Meyer, Ben Swanson, and Stephanie Tassier-Surine. Generous financial support from alumni has been a critical factor to enable student participation in these field and research activities, including student presentations at national conferences. Thank you.

I hope that many of you will visit Iowa City over Homecoming in the fall as we celebrate the 150th anniversary of the founding of the Geology Department at the University of Iowa. Details of this event are still being finalized, but will be announced soon on our webpage. I am grateful for your continued support for the Department of Earth & Environmental Sciences. Go Hawks!

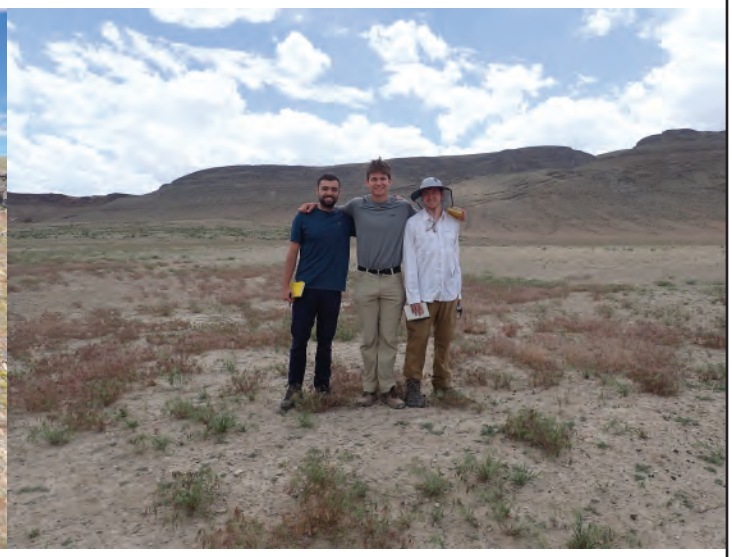
Trilobites provide clues to Early Paleozoic evolution and ecosystems

by Jonathan Adrain

My lab currently consists of Office of Undergraduate Research Fellow Ethan Bley, MS students Sebastien Mure-Ravaud, Nikka Hubert, and Drew Studzinski, PhD students Ryan Shanks and Josh Laird, and post-doc Fran Pérez-Peris. We study all aspects of Early Paleozoic evolution, ecosystems, and biotic events using fossil trilobites as a model system. Among current projects being presented at recent and forthcoming scientific conferences are: 1) that evolution in Early Paleozoic shallow oceans may have been governed by orbital forcings, particularly fourth order Milanković eccentricity cycles; 2) that the Early Ordovician Tremadocian Age in Laurentia featured two previously largely unstudied continent-wide mass extinctions spaced closely apart. The extinctions were obliterating, with the proportion of taxa extinguished comparable to the great end-Permian event; 3) investigating the macroecological pattern of trilobite within-habitat, between-habitat, and geographic diversity across major radiations and mass extinctions; 4) exploring the affinities of agnostoid arthropods, a group once considered trilobites but now of uncertain relationships; 5) many studies featuring discovering, collecting, and revising/describing trilobite faunas, with students doing projects in the midwest (Iowa, Missouri), Arctic Canada (Ellesmere Island), and the Great Basin (Utah, Nevada, Idaho).

(l-r) MS student Drew Studzinski, undergraduate OUR Fellow Ethan Bley, and post-doc Fran Pérez-Peris working on the early Silurian Sexton Creek Formation along the banks of Blue Shawnee Creek in southeastern Missouri, April, 2024. Drew is doing his MS on the taxonomy and paleoecology of the trilobites in the formation.

Fran at the level of the mass extinction which marked the end of the Laurentian Skullrockian Age, House Formation, Middle Mountain, western Utah, June 2023. Fran's Swiss National Science Foundation post-doc is based on study of Early Ordovician extinctions.



Fran, Ethan, and Ryan Shanks during fieldwork in the Ibex region, western Utah, in 2023.

Me near the locality in the middle Cambrian Stephen Formation at Columbia Icefields, Jasper National Park, Alberta, Canada, where I discovered Burgess Shale-type soft part preservation. We will be conducting helicopter-supported fieldwork to explore it with colleagues from the Royal Ontario Museum and Pomona College in July, 2024.

Our acid dissolution lab in Trowbridge Hall. Bulk limestones with silicified fossils are dissolved and the fossils extracted from the residues using sieves.

Our work is extensively field-based and we carry out annual fieldwork in multiple localities. This spring and summer we'll do fieldwork on the Silurian of southeastern Missouri, a 16 day trip to Utah, a week-long helicopter supported trip to Columbia Icefields in the Canadian Rockies to explore a potential new Burgess Shale-type fauna, and a 16 day trip to Idaho. Five of us are presenting at the North American Paleontological Conference in Ann Arbor, Michigan, in June and we hope to have a presence at GSA Connects in Anaheim and at the Palaeontological Association Annual Meeting in Erlangen, Germany.

Our western trips are accomplished using Fleet Services Suburbans and driving two days each way. Last summer we carried out work in the upper Cambrian (Guzhangian) Lincoln Peak Formation in the Schell Creek Range and the upper Cambrian (Furongian) Windfall Formation in the Cherry Creek Range, both eastern Nevada, the Lower Ordovician Pogonip Group of the Ibex area, western Utah, and the upper Cambrian (Drumian) Marjum Formation of the northern House Range, western Utah. Most of the trilobites we work on are secondarily silicified, and they can be extracted from the rocks by dissolution in weak hydrochloric acid. This makes for exquisite preservation, but means that collection is essentially mining (and carrying) bulk limestone back to the lab in Iowa.

All students who have passed through the lab in the past 20 years are either employed in some capacity in the field or have continued graduate work. Recent MS students are currently in PhD programs at U of Wisconsin Milwaukee, the University of Chicago, and Harvard University.

Examples of silicified trilobite fossils, preserved in almost perfect three dimensions after being freed from the rock using acid dissolution. These are all from the Eary Ordovician of Utah and Idaho.

Flood records preserved in caves help to undertsand climate change

by Jeff Dorale

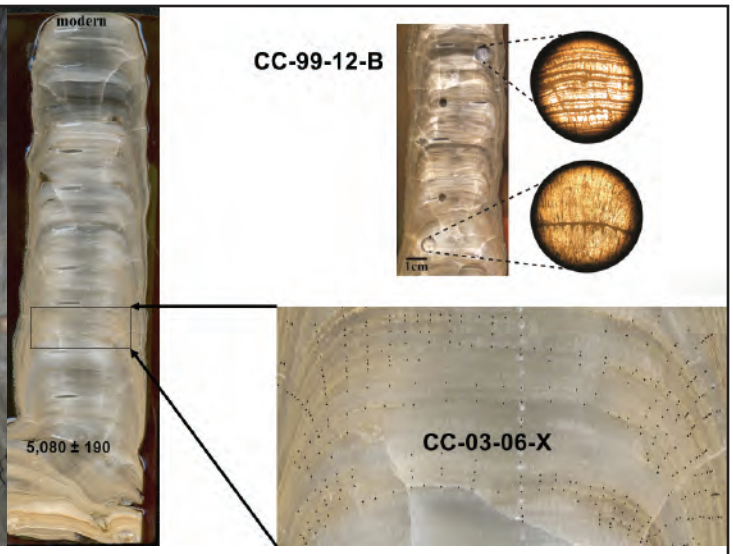
You have probably heard that one expectation of future warming is more extreme weather. More intense drought. Bigger floods. The year 1993 saw torrential rainfall throughout the Midwest, and then it happened again in 2008 in eastern Iowa. Were these years examples of more extreme weather, or were these events random, and normal? What we need to answer these types of questions is a long-term record of heavy rainfall and flooding that reaches beyond the short window of the instrumental period. Such records exist in caves.

We are working to extract flood records from Crevice Cave, Missouri, which is about 60 miles south of St. Louis. Crevice Cave is the longest known cave system in the state of Missouri, and when it rains hard, the cave floods. Mud in the cave gets stirred up when this happens, and things in the cave, such as stalagmites, get a film of mud deposited on them when inundated by the flood waters. Stalagmites can grow nearly continuously for thousands or even tens of thousands of years, and we can date them using the decay of uranium to thorium. By identifying these detrital layers in the stalagmites and establishing a timescale for frequency variations, we can see the longterm natural baseline of heavy rainfall events in this part of the Midwest. We are working to calibrate this record by instrumenting the cave with water level monitors and drip counters and comparing this data to rainfall all in real time. By choosing multiple stalagmites from different heights in the cave, we can tell not only the frequency of the flooding, but which events were the big ones. Eventually we will work with climate modelers to try to understand what drives this variability.

(Above) Local caver Josh Cooper, Jeff Dorale, and graduate student Dionysios Stamatis drop into the sinkhole entrance of Crevice Cave.

(Below) A stalagmite found naturally broken but whose growth position can be identified holds great potential for a long record.

The drip counter will monitor the drip rate in tandem with rainfall variations.



Polished stalagmite sections reveal the detrital layers that identify each flood event.

Blast from the past

Who can you recognize in this department photo from 2004?

Looking to other planets to understand early Earth processes

by Valerie Payré

The Planetary Exploration Group research aims to constrain geological processes that occurred on planetary bodies in the inner solar system, with an emphasis on Mars and Venus. With active plate tectonics, Earth's surface is fairly young, with scarce Archean terrains in < 5% of the Earth's surface. Debates are ongoing regarding how the Earth differentiated into a crust and mantle, how plate tectonics started, and how Earth evolved to what we know in the most recent years. On the contrary, Mars does not have plate tectonic, which enable half of its surface to be older than 3.8 billion years old. Exploring planetary bodies, especially ancient terrains of Mars, can thus provide insights into this erased window of Earth's early history > 3.5 billion years ago.

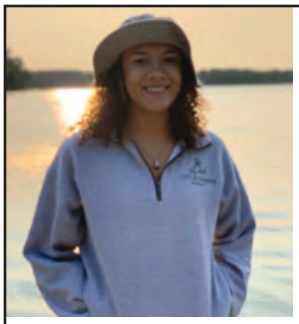
Mars' crust was long thought to be basaltic, but recent measurements evidenced intermediate and felsic igneous rocks (SiO_2 > 53 wt.%) scattered in the oldest regions of Mars excavated by impacts, faults, and erosion. Below the apparent basalt cover, there might be a crustal component of evolved compositions (SiO_2 > 53 wt.%) resembling in composition to that of Earth's continents. If that is true, the formation of early Mars' crust, and possibly early Earth's crust, would have to be revisited as being more complex than previously thought.

Orbital remote sensed observations enable to explore Mars at a global scale, but the spatial resolution of surface measurements is restricted to >100s of meters per pixel. The only felsic rocks and clasts that were observed at the surface of Mars with rovers are centimetric, and no outcrop in place has been found. Orbiters are therefore missing these felsic rocks although feldspar-rich terrains which could be related to evolved composition were spotted in >200 locations. Better understanding the constraints of orbital observations is crucial to back out the petrology of the martian crust and its formation mechanisms.

The Planetary Exploration Group work on these crust questions using various approaches: (1) producing Mars-like lavas with a gas mixing furnace using experimental petrology methods; (2) mineral and rock analyses of intermediate and felsic rocks with instruments analog to those onboard orbiters with lab measurements; (3) orbital and rover observations on regions of interest where possible evolved outcrops could occur.

The group involves undergraduate and graduate students. Some of them shared what they do as part of the group and what the most exciting part of their work is.

Part of the members of the Planetary Exploration Group. From left to right: Al Zukowski, Alexis Jansen, Sadie Richter, Valerie Payré, Kiersten Hottendorf, and Protiti Roy.



Jae Dancer, Undergraduate Student, '26

My research project involves looking at CRISM Stamps (Compact Reconnaissance Imaging Spectrometer for Mars) taken aboard the Mars Reconnaissance Orbiter and, furthermore, analyzing high-resolution mineral data through spectroscopy. This project hopes to identify non-random mineral distribution within the layered and domed structures in Mars's Eridania Basin region. The opportunity to learn about planetary exploration technologies like CRISM is particularly exciting to me in order to gain a deeper understanding of geological processes on Mars!

Landon Fuller, Undergraduate Student, '27

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Fiona Holmes, Undergraduate Student, '26

My research is on characterizing the effects on grain size of feldspar by using the FTIR microscope to analyze the NIR (Near InfraRed) signals and then comparing our results to the data from feldspar rich regions on mars.

Alexis Jansen, Undergraduate Student, '26

I have mapped lava flows of different ages of Syrtis Major using JMARS, and use CRISM data to analyze the mineralogy of these lava flows. I have really enjoyed doing planetary research and learning about Mars!

Sadie Richter, Undergraduate Student, '25

I am using an FTIR (Fourier Transform Infrared spectrometer) to map reflectance signals of feldspar and pyroxene at different grain sizes and in different proportions to analyze alterations in the spectral signatures of feldspar. I am enjoying studying the implications minerals have on each other and how that effects our interpretations of data from Mars!

Sadie's research was selected for the Independent Creative Research by Undergraduates Fellowship for Summer 2024 – Congratulations Sadie!

Carrie Fink, Undergraduate Student, '24

Currently, I am working on crystallization experiments using synthetic Martian melts to determine the limitations of remote sensing equipment for planetary body exploration. As part of this research, I have had the privilege of using the Electron Probe Microanalyzer to examine the chemical composition of these melts.

First International Conference

In March, two undergraduate students, Al Zukowski and Tommy Anderson, and two Ph.D students, Kiersten Hottendorf and Protiti Roy, of the Planetary Exploration Group, went to the well-known international conference Lunar and Planetary Science Conference (LPSC) in Houston, TX. For planetary geologists, LPSC is the most exciting conference to attend every year as it is the place where most collaboration, and even ideas of planetary missions were born. An intense week of fruitful science and up-to-date mission data are discussed and brainstormed by more than 2000 attendants. Below are the group's comments and excitements of such science-fertile and incredible experience.

Picture of the group in front of Valerie Payré's poster of a Helicopter mission concept to Mars at the LPSC conference. From the left to right: Al Zukowski, Protiti Roy, Valerie Payré, Tommy Anderson, and Kiersten Hottendorf.

Tommy Anderson, Undergraduate Student, ’25

This past month, March 11-15, I was honored to be selected to present a poster of my geology research at the 2024 Lunar and Planetary Science Conference in Houston, Texas. This gathering of the leading scientists in the field presented ample opportunity for learning of the latest research being conducted, meeting potential advisors for graduate studies, and connecting with other young researchers who I hope to continue to work with in the future. I was able to present my findings on the petrology and stratigraphy of the Séítah unit within Jezero Crater, Mars and receive feedback and support from industry professionals which I will use in strengthening future research projects. I was happy to be able to represent the University of Iowa at the event and I am hoping that I will be able to continue to do so in future years as I continue my studies!

Al Zukowski, Undergraduate Student, ’25

My presentation at LPSC 2024 was a culmination of over a year of research into a project I still felt like I was just scratching the surface of. While talking to students, professors, NASA post-docs, national laboratory researchers, and international faculty from top institutions, I found that, while I was just in the early stages of my academic journey, I was finally coming into my own as a researcher. Presenting built my confidence as a planetary scientist and allowed me to meet incredible, intelligent people; I got an opportunity to chat with one of the authors I’ve been citing, who gave me some novel ideas on where to move forward with my project. I also became close with the students and faculty from the University of Hawaii, who I’m looking forward to being colleagues with for my career, long into the future. Ultimately, LPSC was one of the most stimulating academic environments I’ve ever had the pleasure to be in, I learned so much from presenting and listening to presentations, and got an opportunity to network with some top voices in the field.

Kiersten Hottendorf, Ph.D Student, ’28

The Lunar and Planetary Science Conference (LPSC) is one of the premier gatherings of those who enjoy space science and is commonly attended by over 2,000 curious minds every year. To me this conference is a place where I get to talk to old friends and colleagues, while also getting to enrich my network with new experts in my field. As a planetary volcanologist, I have plenty to talk about with anyone whose research interests coincide with any of the rocky and/or icy bodies in our solar system. This leads to the most difficult part of the conference becoming which talks to attend. The diversity of topics and depth of quality research makes every talk a chance of finding a whole new subject to be passionate about. This year most of my time was taken up by surface processes that take place on Venus and Mars. My favorite talks this year focused on mantle flow and tectonism on Venus because of the conversations I was able to have with the presenters of these topics. This year was particularly special because I was able to introduce the Planetary Exploration Group from the University of Iowa to the Planetary Lab from the State University of New York at Buffalo where I received my Master of Science in Geology. I also love LPSC as a way to interact with the Organizers of Venus Early-career Networking (OVEN) and the Venus Exploration Analysis Group (VEXAG), which I am a part of on a yearly basis. LPSC is a great venue that brings planetary scientists from all over the world in contact with each other and NASA in a way that no other conference can quite replicate. I highly recommend those at all levels of experience who are interested in planetary science to attend, as there is not another conference like it!

Protiti Roy, Ph.D Student, ’28

As my first international conference, attending the Lunar and Planetary Science conference was an exhilarating journey into the forefront of space exploration and research. From the moment I entered the conference halls, I was surrounded by an atmosphere of intellectual curiosity and passion for discovery. Engaging presentations, insightful discussions, and cutting-edge research posters adorned the venue, offering a glimpse into the diverse array of ideas driving innovation in planetary science. From discussions on Lunar geology, Mars sample return, future Venus missions to debates about the potential for life beyond Earth, every session sparked new ideas and perspectives. Networking with fellow scientists, exchanging ideas, and forging connections within the community added another layer of richness to my experience. The conference left me inspired, with a deeper appreciation for the complexities of our solar system and a renewed enthusiasm for contributing to the exploration of worlds beyond our own.

Spring Break Field Trip

Hawaii

(top) Hallie Wirth, Claire Venard, and Brittany Stolfus Kiluea at Iki Lava Lake. (middle left) Bailey Mattioli, Jae Dancer, Hallie Wirth, Morgan Havens, and Liz Pumphrey. (bottom left) Top Row From Left to right: Dr. Kate Tierney, Fiona Holmes, Morgan Havens, Claire Venard, Hallie Wirth, Heibat Ahmed, Delilah Hale. Bottom Row from left to right: McKinnley Hoffman, Liz Pumphrey, Emma Walz, Jae Dancer, Brittany Stolfus, TA. Front: Bailey Mattioli. (above) Dr. Kate Tierney talking about Fissure 8, the 2018 flank eruption along the east rift zone that engulfed a neighborhood. Front row: Emma Walz, Morgan Havens, Hallie Wirth, Claire Venard, Fiona Holmes, Delilah Hale. Middle row: Liz Pumphrey, McKinnley Hoffman, Heibat Ahmed. Back row: Jae Dancer, Brittany Stolfus, TA.

EES:2001 Second Year Field Trip

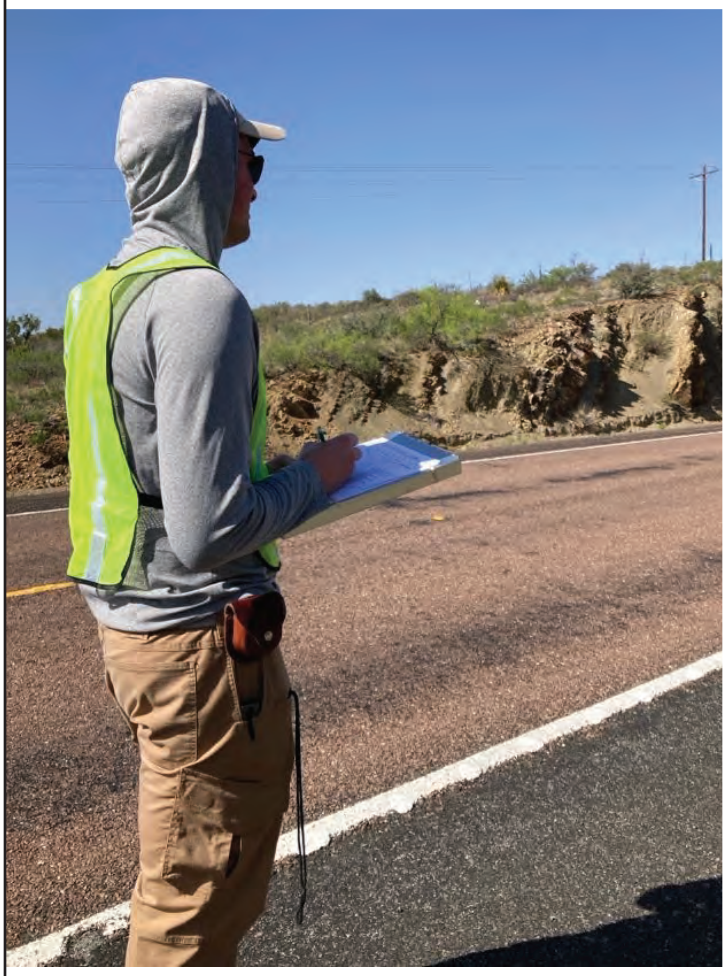
Missouri - Tiemann Shut-Ins, Knob Lick Tower, Elephant Rocks State Park, Silver Mines Recreation Area

(top left) left to right: Ezra Smith, Lucas Corrigan, Maddie Ripp, Ella Mastin, James Dickens, Nick Beaton, Kayden Heischman, Gabby Garcia, Emma Walz, Morgan Havens, Julia Pokorny, and Adi Craig at Knob Lick Tower. (top right) Dr. Kate Teirney lecturing to the group at Knob Lick Tower – Sam Hudziak, Kate Tierney, Emma Walz, Julia Pokorny, Maddie Ripp, Ezra Smith, Kayden Heischman, Adi Craig, Liz Pumphrey, Gabby Garcia, Ella Mastin,Owen Barstad, Carrie Fink, Nick Beaton, Morgan Havens (clockwise from tower) (bottom left) Kate Tierney and Emma Walz at Knob Lick Tower. (bottom right) Back from left – Lucas Corrigan, James Dickens, Grace Niemuth, Abbey Stoddard, Carrie Fink, Ethan Smyke, Adi Craig, Morgan Havens, Owen Barstad. Front from left – Kate Tierney, Kayden Heischman, Ezra Smith, Liz Pumphrey, Julia Pokorny, Emma Walz, Gabby Garcia, Ella Mastin, and Maddie Ripp at the Great Unconformity road cut.

(top left) Ben Swanson lecturing on dam failure and geomorphic processes, Johnsons Shut-Ins State Park. From left – Owen Barstad's feet, Carrie Fink, Kayden Heischman, Abbey Stoddard, Gabby Garcia, Julia Pokorny, Emma Walz, Maddie Ripp, Ben Swanson, and Ella Mastin. (middle left) Abbey Stoddard and Grace Niemuth at Elephant Rocks State Park. (bottom left) Liz Pumphrey (center), Emma Walz, Grace Niemuth, Morgan Havens, Adi Craig, and Abbey Stoddard (clockwise from bottom) at Silver Mines Recreation Area. (top right) Liz Pumphrey, Adi Craig, and Owen Barstad at abandoned quarry, Elephant Rocks State Park. (Bottom right) Ethan Smyke getting a close look at the rocks at Elephant Rocks State Park.

EES:4820 Tectonics Field Trip

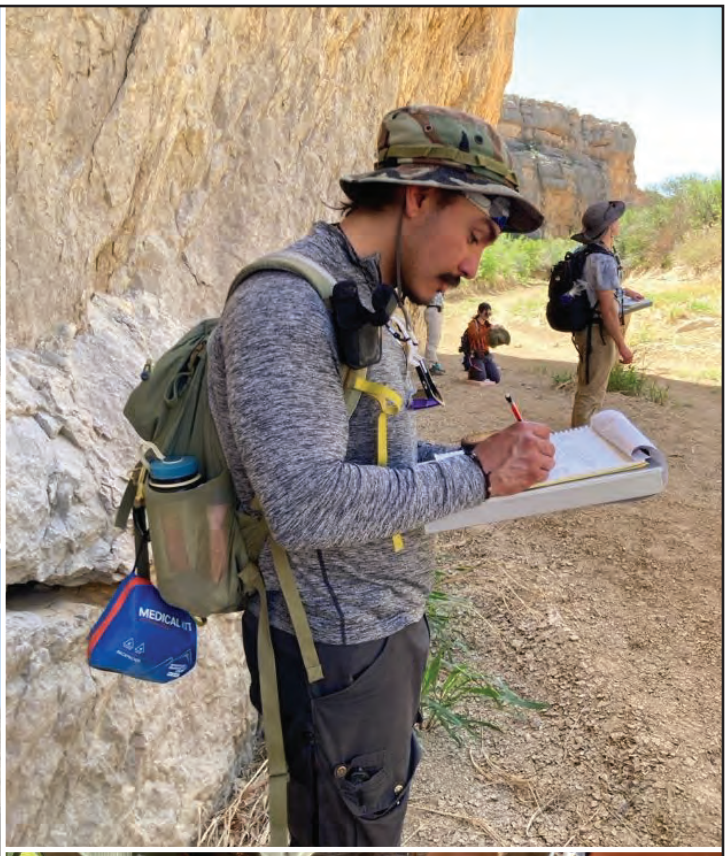
Marathon Fold-Thrust Belt, Big Bend National Park, Guadalupe Mountains National Park



THIS PAGE: (above left) Samson Bruxvoort taking notes along the Marathon fold-thrust belt transect. (above right) Class photo during th peak of the solar eclipse at the Tesnus Fm. syncline. (right) Tosh Klever, Matt Brodale, Manny Murillo, Samson Bruxvoort, Brandon Botha, and Jack Doyle working on their geologic maps and cross-sections back at camp.

NEXT PAGE: (top left) Class photo at the entrance to Big Bend National Park. (middle left) Tosh Klever pointing out Eocene igneous intrusions at the Burro Mesa Fault map area. (bottom left) Al Zukowksi "blown away" by igniimbrite deposits in Tuff Canyon. (top right) Manny Murillo contemplating Laramide basement structures along the Dog Canyon hike. (bottom right) Class photo at the Burro Mesa Pouroff.


BIG BEND
NATIONAL PARK


MEDICAL KIT

(top) Matt Brodale pointing out gas escape structures at Tuff Canyon. (left) Lily Cripe and Sadie Richter found a fault in Tuff Canyon. (above) Dr. Emily Finzel, Megan Kroeger, Samson Bruxvoort, Sadie Richter, Matt Brodale, Manny Murillo, Sydney Rayburn, and Astrea Munyan on the Permian Reef Trail at Guadalupe Mountains National Park.

Earth Day 2024

The Earth Day event on April 22nd was a success! Around 200 people came to discover what the Department of Earth and Environmental Sciences and the Department of Geographical and Sustainability Sciences do for research. Inside and outside demos and exhibitions attracted families, teenagers, kids, and UI students. The public was thrilled to participate into fossil hunt, observe microfossils, learn about minerals of various shapes and colors, build a volcano, hold >3 billion years old pieces of America, build a dam, have a planetary core in their hand, understand water, observe how plants breathe, hang out on Mars, discover how impact craters can tell us about sub-surface geology, and what Lidar can observe. Kids left with goodies and of course, some pieces of petrified wood to be reminded of this celebration day!

The Outreach Committee wants to thank all the volunteers for this special day – hope you liked the pizzas! –, we could not have done it without you! We are hoping to see you all next year for another amazing experience!

PREVIOUS PAGE: *(top left) JP Nemec (Undergraduate Student) talking about volcanoes. (top right) Protiti Roy (Graduate Student) helping kids make impact craters.. (bottom left) Alice Hinzmann (Graduate Student) demonstrating with the stream table. (bottom middle) Valerie Payré (EES Assistant Professor) and Kiersten Hottendorf (Graduate Student) running the Explore Mars exhibit. (bottom right) Matt Dannenberg (GSS Assistant Professor) talking about tree rings.*

THIS PAGE: *(top left) Matt Wortel (Staff) and Brynn Hogue (Volunteer) running the minerals exhibit. (top right) Jessica Meyer (EES Assistant Professor), Sophie Pierce (Graduate Student), Henry Frederick (Undergraduate Student), and Megan Kroeger (Undergraduate Student) demonstraing groundwater principles. (middle left) Paige Liebrecht (Undergraduate Student) helping out at the fossils exhibit. (middle right) Alyssa Bancroft staffing the Iowa Geological Survey table. (bottom left) Sophie Pierce (Graduate Student) and Henry Frederick (Undergraduate Student) conducting groundwater experiments.*

Recent Alumni Spotlight: Dustin Northrup, PhD 2024

As I reflect on my journey to where I am today, one word comes to mind, persistence. It took me nearly sixteen years from when I graduated high school, including thirteen years of college, to finally land in my professional career. I have seen ups and downs, and my life has certainly zig zagged quite a bit, but through it all I have seen that not giving up makes all the difference.

Like most people, I didn't start off my college education in geology. Once I discovered that I could spend my time working outside and taking field trips to the mountains I was hooked and quickly switched my major to geology. In my undergraduate degree I had a sedimentology professor who introduced me to the science of oil and gas which led to me developing a love for petroleum geology. After completing my bachelor's degree at BYU in 2015, I immediately started my master's degree focusing on planetary geomorphology with the intention of transitioning into a career in oil and gas. Little did I know, that in late 2014 and early 2015 oil prices would tank, and the industry would dramatically reduce recruiting and hiring. This lasted throughout my master's degree. To gain experience, I took a part-time unpaid internship with a small oil company. I also did free work for a small geophysical company that provides services to the petroleum industry all while I was working on my degree. This experience helped me land a paid summer internship in Houston, TX with a larger oil company. This, however, unfortunately did not end in a full-time position. So, I pivoted, deciding to apply to PhD programs hoping to shift from planetary geomorphology to sedimentology and stratigraphy.

After working for a year making thin sections, I moved my family to Iowa City to start my PhD working with Dr. Finzel. While at Iowa I had the opportunity to do fieldwork in New Brunswick Canada and near Savannah Georgia looking at sediments in the Petitcodiac River (Canada) and Ogeechee River (USA) as well as describe core from the Lower Pennsylvanian Cherokee Formation in Iowa. Towards the end of my PhD, I had the opportunity to intern at ConocoPhillips in Midland, TX for a summer as a geologist where I worked on a project centered around the Woflcamp D formation in the Permian Basin. This ultimately led me to landing a job as a petroleum geologist at ConocoPhillips.

My family and I moved to Midland TX in May of last year (2023) when I started full-time at ConocoPhillips. As a petroleum geologist I work as a project lead planning and executing multiple drilling projects in the Permian Basin with a diverse interdisciplinary team. I work closely with petroleum and civil engineers, landman who work on the business/contract side of the oil and gas industry, regulatory/legal professionals, and other geologists (geochemists, petrophysicists, geophysicists, geologists, geomechanicists, sedimentologists, and others). I also interface with drilling engineers and directional drillers who work on actively drilling drill rigs as I help them navigate the subsurface geology. ConocoPhillips also presents potential future opportunities to live in places like Alaska, Canada, Norway, and Australia based on my career interests.

While there have certainly been a lot of ups and downs, as my wife and kids can attest to, I have found the journey to not only be challenging but also rewarding. It has afforded me opportunities that I otherwise would have never come across and allowed me to rub shoulders with amazing people that have greatly enriched my life at BYU, the University of Iowa, and now ConocoPhillips.

Ashton Prairie Living Laboratory Undergraduate Army

Directed by Ben Swanson

Situated on the University of Iowa's Ashton Cross Country Course, the Ashton Prairie Living Laboratory (APLL) is an educational and research facility for UI students and researchers and the local community.

Abbey Stoddard, Junior - Environmental Science
Heibat Ahmed, Sophomore - Environmental Science

This year, I have been conducting a tree inventory of the Camp Cardinal Creek floodplain along the south end of the Ashton Prairie Living Laboratory site. With the help of Heibat Ahmed and Professor Jeffrey Dorale, I have identified over 100 of the trees bordering the prairie. For each tree with a circumference greater than 0.3 m, I identify the species (mainly by the bark), measure the circumference at breast height, and mark its location and elevation with a Trimble R12 GPS. The goal of this study is to investigate the biodiversity of this forest/-floodplain. Another aim is to analyze differences in species distribution based on their distance from Camp Cardinal Creek and their elevation. As the first researchers in this group to start a study on trees, I hope that the data can be used as a starting point for future research on these trees and the floodplain area.

Noah Beam, Junior - Environmental Science

Birds are fascinating and integral components of prairie ecosystems. Their increased body temperature, rapid metabolism, and elevated ecological position in most food webs make them trustworthy indicators of how regional and local changes are impacting habitats. I am conducting a bird count survey at the Ashton Prairie Living Laboratory in efforts to begin monitoring temporal changes in bird community composition and abundance. We hope to improve our understanding of how habitat management at the prairie has influenced bird populations. This analysis provides current local trends for breeding birds and allows for future comparisons with bird data collected as a part of the long-term monitoring goals at the site. This information will aid in planning conservancy objectives and assess the overall effectiveness of past land treatments. To perform this point count, I monitor bird activity for 20-30 minutes at each of the six designated points that surround the prairie footprint a couple times a week. At each point, when a bird was observed, I recorded the approximate distance they were from the point, their species, behavior, and number of birds there were. I have also installed audio-recorders to record bird calls to supplement what I miss at that site.

Jae Dancer, Freshman - Environmental Science

My project at Aston Prairie Living Laboratory focuses on locating areas with strong groundwater input in correlation with fish and aquatic insect's distribution along Camp Cardinal Creek. We will measure stream temperatures every five meters along the creek using a digital thermometer and utilize a tripod-based thermal camera to identify areas with temperature differences, indicating groundwater seepage. Additionally, we will collect aquatic insect samples along the stream for analysis of the correlation between groundwaters and habitats for aquatic invertebrate populations. I am eager to see what this project reveals about the relationship between aquatic life and groundwater at Camp Cardinal Creek!

Kobie Long, Senior -Environmental Science

I conducted a temperature survey of the stream to attempt to locate groundwater-surface water interactions. By taking GPS points along with temperature points, I was able to locate specific spots in the stream where the water temperature changed dramatically. I did this survey both in the summer and winter. We identified one reach of stream that is strongly influenced by incoming groundwater, and another that has produced variable results due to the unusually dry year and requires further study. Sampling indicates these areas harbor aquatic macroinvertebrates indicative of colder streams with higher water quality. The second part of my project was to conduct aquatic macroinvertebrate (insect) surveys. Todd Hubbard with the State Hygienic lab taught me how to conduct these surveys. I conducted these surveys at six points along the stream. Three of these survey points were areas which I had identified as having groundwater-surface water interactions. At all six survey sites, we found many pollution-tolerant species like aquatic worms, left spiral snails, and crane fly larvae. However, at the groundwater-surface water interactions sites only, we found some pollution intolerant species like caddisfly larvae and right spiral snails.

Eric Thomas, Senior - Environmental Science

Eric has been a major facilitator for all the projects at Ashton Prairie over the past two years, including project and data management. His main project focuses on measuring infiltration and runoff rates between prairieland and turf grass. With heavy rain events happening more frequently due to climate change, more infrastructure for flash flood mitigation is needed. Other studies have found that prairies are a great way to absorb water and slow runoff before it gets into our streams. He has been attempting to corroborate these findings by using infiltrometers and small flumes at the Prairie and its surrounding cross-country course. Unfortunately, the results have been somewhat limited due to the drought conditions over the past two summers. Eric has also been involved in almost all the onsite projects at Ashton and instrumental in mentoring students and managing data.

Lucien Sturdevant, Freshman - Environmental Science

Water quality is an issue of paramount importance in Iowa. Only 15 waterways measured by the Iowa DNR meet water quality standards for all uses, and although agricultural nutrient and sediment pollution rightfully gets the attention, we need to be better educated about a variety of water quality issues. Camp Cardinal Creek flows through a suburban neighborhood and university athletics complex, as well as along an ongoing prairie restoration site. For the past 2.5 years, water quality data have been collected once every 1.5 weeks at four sites along the creek, located upstream and downstream of the restored prairie, parking, and athletic fields at the site; and above and below an incoming tributary draining a miscanthus grass field. We have been monitoring these locations for 2.5 years using A YSI ProDIGITAL Handheld Meter with probes and a YSI 9500 Photometer to measure pH, dissolved oxygen, dissolved solids, select metals, phosphorus, and nitrates and other parameters at the site. Although the data has been variable, the water meets most water quality standards for the state (it is not "impaired" for most uses). We will continue to collect data at the site to 1) show the relative health of the creek, and 2) provide a baseline dataset for future undergraduate students learning how to conduct water quality testing and research.

Sydney Benton, Senior - Environmental Science

The Iowa landscape, once dominated by prairie, now comprises less than a percent of the state's land cover. In recent years, prairie cultivation has become an essential tool to help reintroduce nutrients and enhance soil stability. My research, with Rachel Walenceus, at Ashton Prairie is centered on measuring soil health, with a primary goal of observing the interplay between soil health and slope dynamics. To achieve this, we conducted sporadic soil sampling across the prairie, mapping each sample using GPS coordinates. These samples were sent for laboratory analysis to find the Haney method, which provides insights into nutrient levels and microbial ecology necessary for optimal plant growth. Leveraging ArcGIS Pro, the resulting data will be overlaid onto LiDAR and soil type data obtained from USGS and NRCS databases. This analysis will enable us to compare the relative changes in slope, soil type, and soil health at each sample location. The second part of our research will include sampling multiple prairies within Iowa to compare Haney scores. Mapping changes in slope with soil health measurements aids our ability to visualize slope dynamics and the potential impact on nutrient distribution. We are eager to analyze the results of this research and apply what we learn toward better management practices and increase prairie resilience.

Owen Barstad, Junior - Environmental Science
Brady Bird, Sophomore - Environmental Science

We are new to Ashton Prairie Living laboratory, so we have primarily been helping with various projects and learning how to use the technology we have access to such as infiltrometers, water quality probes, photometers, GPS, and stream velocity meters. We are also helping to install soil moisture probes and tensiometers to monitor vadose zone water. In the fall, we plan to help with plant identification and soil characterization as part of a comparison of soil health data, topsoil thickness, and plant species, and continue our stream measurements.

Jack Olson, Senior - Environmental Science

Camp Cardinal Creek flows adjacent to the constructed prairie at Ashton Prairie. The creek is incised into its floodplain and features numerous reaches with degraded channel banks. Some of these failing banks appear to be a result of groundwater seepage rather than shear stress along the banks caused by the stream. Groundwater seepage can occur one of two ways: 1) through filling pores due to general water table fluctuations or 2) through high stream flow filling pores along the banks, followed by draining as the stream levels decrease. It is unclear what roles these processes play in bank failure along Camp Cardinal Creek, so we intend to instrument a section of channel bank and monitor erosion, water table elevations, stream flow and stress, and the unsaturated zone hydrology to determine the primary erosion mechanism in the reach and similar reaches of the creek. These data will provide a benchmark of understanding for me and other students to better understand hydrogeological and stream dynamics.

Rachel Wenceleus, Senior - Geoscience

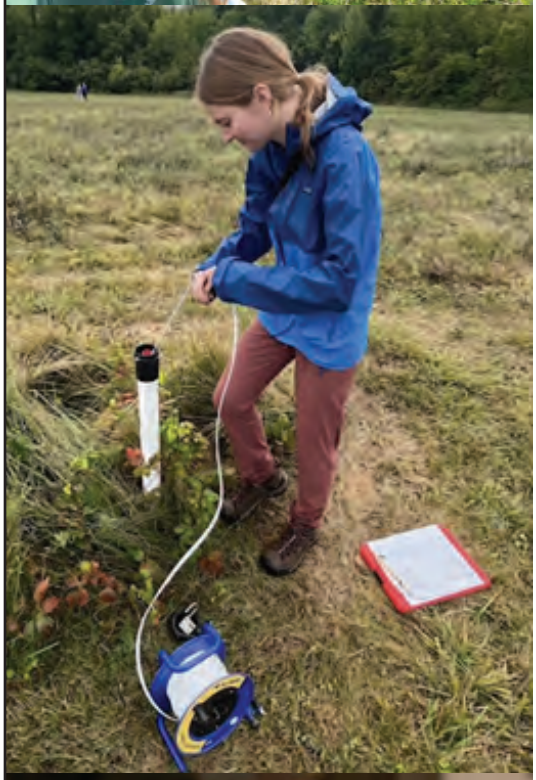
Prairie soils are the foundation for the overall success of the flora and fauna that thrive there. Therefore, in a restoration project such as Ashton Prairie, understanding soil health and chemistry is a key factor to understand. Sydney Benton have been collecting soil samples to be analyzed for metals and the Haney number, a measure of soil health. These data will be compared to past (2021, 2022) and future samples to analyze for seasonal differences and annual trends in soil health as Ashton Prairie develops and matures. We are also interested in other prairies' soil health and chemistry. The soil health indicators, and the interpretations offered by the laboratory regarding these values, are catered towards the agricultural industry. This decreases our confidence in any conclusions regarding Ashton's overall soil health. Therefore, we are planning to expand our data collection to at least three other prairies. Criteria for the prairie sample selection are (i) that they be well established or have little to no influence from anthropogenic processes, (ii) have relatively the same texture as the soil at Ashton, and (iii) the samples must be taken from similar slope and aspect as those taken at Ashton. Investigating patterns in other prairies will provide us with insight into the potential trajectory of Ashton's soil health and may establish how useful the Haney number is for non-agricultural sites.

Ed Marion, Senior - Environmental Science

This semester I was introduced to the modified Phillip-Dunne soil infiltrometer! The infiltrometer is used to measure saturated hydraulic conductivity, or water infiltration rates, in soil. Infiltration allows soil to store water for use by plants and other organisms, and eventually percolate to the groundwater, and soils with high rates of infiltration tend to result in lower surface runoff volumes. Factors that affect soil infiltration are composition/porosity, slope of the landscape, differences in micro elevation, and vegetation. I have performed a few tests in Ashton Prairie and will commence collecting data this summer to compare the original 1-acre prairie, the new prairie area, and the cross-country course area. The goal is to identify how the prairie impacts hydrologic processes during storm events and over time as the prairie develops.

Liz Gaar, Senior - Environmental Science

The study of a gully advancing onto The University of Iowa Ashton Cross Country Course is being conducted to track patterns of soil erosion and gully formation processes, as well as to better understand the impact of precipitation and seasonal variations on the speed of erosion. Data collection has been done in the form of remote sensing with the use of a Leica LiDAR scanner with help from Adam Skibbe and Ben Swanson. The study began with the first set of scans collected in October of 2023, and the second set of scans collected April 21st of 2024. These two sets of scans will be used to compare the growth of the gully over the winter months caused by the dramatic temperature variation that led to cycles of freezing, thawing, and refreeze for the precipitation that collected in the gully formation. Leica Cyclone Processing Software is being used to analyze and compare the remote sensing data that has been collected.



Ciara Gallen, Senior - Geoscience

Willow Creek, located in Willow Creek Park, Iowa City, was migrating up against infrastructure along Benton Dr. To mitigate this issue, the City regraded channel slopes and placed large riprap along the channel to prevent the erosion. The riprap abruptly stops at the downstream end and empties the narrower original channel. The concentration of my project is to monitor the affects the riprap and regrading have had on erosion both in the immediate reach and downstream. I have measured cross-sections at 14 locations along the study reach at multiple times over the past two years using a survey-grade, Trimble R12i GPS. Subsequent cross-sections and long profiles have been compared to monitor erosion and will be used to construct a hydraulic model in HEC-RAS. Twelve erosion pins have also been installed downstream of the riprap in areas of identified bank failure to measure the rate at which the stream banks are eroding. Additionally, I have been leading collection of stream flow data at Ashton Prairie Living Laboratory to create stage-discharge curves for our monitoring locations, and I have been involved in plant identification for past distribution studies.

Makenna Schinstock, Senior - Environmental Science

The pilot acre of Ashton Prairie was seeded with a variety of native species in the spring of 2020, and biodiversity monitoring began in the Spring of 2021. In the fall of 2022, a controlled burn was conducted at the prairie in attempts to manage invasive and volunteer plant species at the site. In the past, native prairies regularly experienced disturbances such as fire, and adapted to these conditions. Therefore, plants native to this area are more likely to be fire-tolerant, whereas invasive species are often not. Over the summer of 2023, my colleague, Sydney Benton, and I returned to previously surveyed sites to identify plant species presently growing in the original Ashton Prairie. We compared these two sets of data to determine how the controlled burn performed at controlling invasive species. Our data showed that the controlled burn increased the number of native, seeded species at the site, but that biodiversity compared to other prairies and to the seed list, remains low. This experience has been foundational in my career path and allowed me to gain practical field skills that helped me secure an internship working on prairie restoration and provided a path to meet new people and have fun!

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