



**WHEATON
COLLEGE**

For Christ & His Kingdom

CONTACT

The Alumni Newsletter of Wheaton College's Department
of Geology and Environmental Science



Who knew PPE meant Perry Protection Equipment?
Thanks to Maureen Keil for keeping our mastodon COVID safe and Thunder Strong!

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From the Department Chair

STEPHEN MOSHIER

CONTACT is our annual report to alumni and friends of the department! Hopefully, some prospective Wheaton College students will also glean from these pages something of our activities, mission, and culture. COVID touches everything, even as we avoid touching anything! For the first time since 1935, there was no program in the Black Hills at the Wheaton College Science Station. There's a story that College trustees questioned the wisdom of running the program during World War II. The story continues that young trustee Carl Henry, a Science Station alumnus and ultimately renowned theologian, convinced "the deciders" that the show must go on! Not so with a pandemic. That didn't mean we sat on our hands. Activities included catching up on research projects, teaching online summer courses, creating lab activities for remote learning in the Fall, and creating a Wheaton vegetable garden.

Our team is now graced with the addition of Katy Foltz ('13) as our new Office and Lab Coordinator. We could not be happier to have her back for her famous enthusiasm, organization skills, and passion for all-things geoscience. I'll let her reintroduce herself (p. 7)

Each department was asked this Fall to look at our programs and come up with savings due to the economic impact of the pandemic. It was a robust process, very much like a program self-study. The result included some reorganization of faculty in the science division, but no permanent loss of faculty lines or programs. There will be no disruption for either of our majors. We were, however, urged to revitalize the number of geology majors and leverage GIS education as a means to create interest in the major. This has been our plan all along. The fine GIS courses that Jim Clark created nearly 20 years ago are still an important part of the geology and environmental science curriculum (more inside). The current population of Environmental Science majors is 30 and Geology majors is 16. We have a promising list of potential majors in the incoming class next year. Pray with us that they choose the educational experience that you enjoyed!

We know that you are all dealing with the pandemic in your own ways and situations. Thank you for your thoughts, prayers, and frequent communications of encouragement. So, on with the show...

Want to see the photos in this issue in color? Download pdf versions of CONTACT at wheaton.edu/geology



HELLO ALL!

We are creating a new Class Notes section in the CONTACT for alumni life updates. We want to celebrate all your important life milestones, awards, publications, and accomplishments. If you would like to submit an update, please contact the department anytime before the end of the year.

INTERNSHIP ARTICLES

Hasten Biddlecome Geology, Class of 2021

My name is Hasten Biddlecome, and I am a senior geology & Spanish double major here at Wheaton College. I have been working as an intern at Argonne National Laboratory for Joe Adduci. I met Joe at the college, where he is an instructor in the Geology Department. I met Joe in an intro Geographical Information Systems (GIS) class, where we learned spatial analytical methods using GIS software. Working with Joe and his team within the Nuclear/Radiological Proliferation Analysis Section, Strategic Security Sciences Division at Argonne continues to be a rewarding and enriching experience.

The primary focus of my work at Argonne involves situational awareness in the field of radiological and nuclear security. Our work collects, analyzes, and distributes a large array of complex and sometimes disconnected data that enhances the situational awareness of policy makers and security experts. The team at Argonne relies on GIS process and conveys complex datasets in order to enable decision makers to more easily analyze and comprehend these factors over space and time (spatially and temporally). Often, the datasets our team collects do not appear to relate to issues surrounding our work. Yet, I have found that GIS can often reveal relationships and relevancy not often apparent without a spatial component.

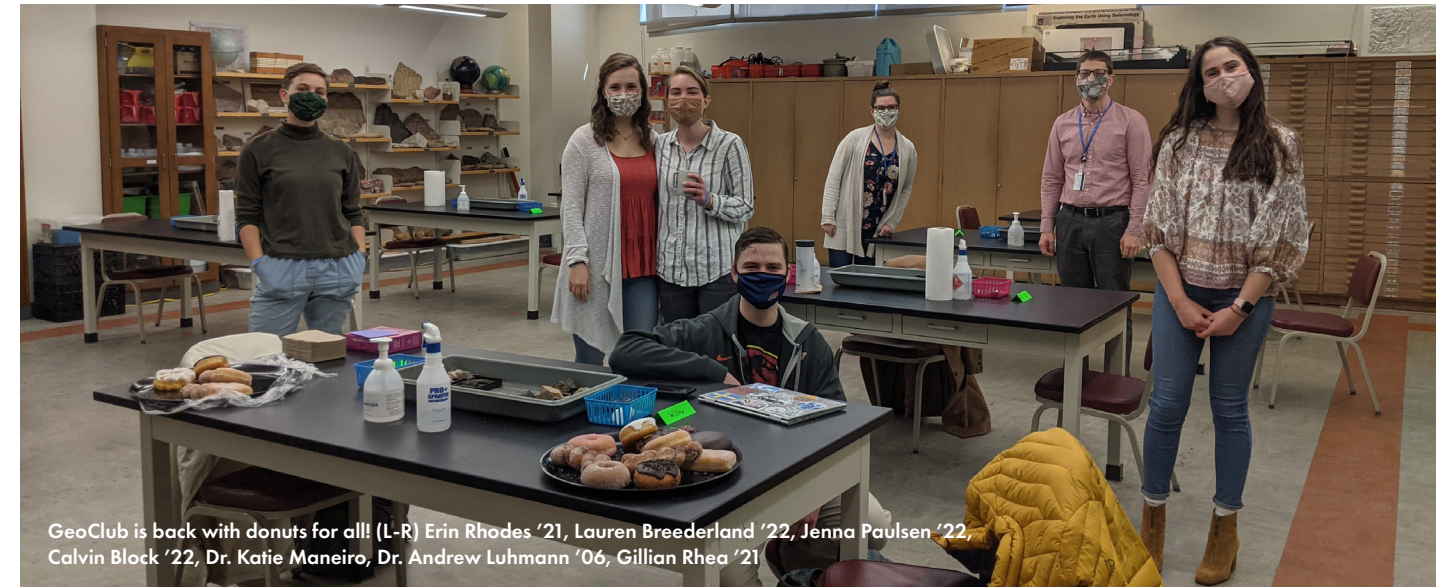
My primary duties at Argonne on a day-to-day basis involve data geolocation and analysis. I have been tasked with performing quality analysis and quality control (QA/QC) on various datasets that contribute to the mission within our section. My roles include data verification, geocoding (the process of assigning accurate coordinates to specific locations) and assigning specific data characterizations defined by subject matter experts (SMEs) in fields related to security, international relations, radiological health physics, and nuclear-related technology). Additionally, I have been tasked with assessing what is referred to as "Alternative Technology" - technology that may replace or reduce the global reliance on radiological materials in areas such as medicine, engineering, industrial processes, etc.

Overall, my job at Argonne in the Strategic Security Science division has been an awesome experience. The time I have spent working at the Laboratory makes me feel I am advancing peace and security in our country and the world. The utilization of geospatial technologies is an exceptional skill set that I plan to advance and pursue during my time at the Wheaton and Argonne.

Dianna Gagnon Environmental Science, Class of 2022

This past summer, I interned in the Office of Massachusetts State Representative Richard Haggerty. Though the pomp and circumstance of working in the actual State House was taken away due to the ongoing pandemic, I was at no loss of exposure to important work this summer. In truth, this summer, for obvious reasons, called upon legislators and their aides to make decisions with greater swiftness than is routine. This setting is fascinating to observe because there is so much change that is being called for in the government right now. Constituents have little patience with complacency in their politicians (nor should they!).

Decisions concerning COVID-19 responses were made regularly. Our team brainstormed best reopening strategies for the schools in our area; I had the opportunity to present my own insights. Other tasks within my job description included constituent correspondence, scheduling, legislative research, database management, communications, and social media assignments.



GeoClub is back with donuts for all! (L-R) Erin Rhodes '21, Lauren Breederland '22, Jenna Paulsen '22, Calvin Block '22, Dr. Katie Maneiro, Dr. Andrew Luhmann '06, Gillian Rhea '21

One of the greatest lessons I learned from this internship was on the importance of viewing the 'other' as one's own neighbor. In a conversation regarding political disagreements, Representative Haggerty noted how different politics have become since the normalization of commercial air travel. In previous decades, legislators not only worked alongside colleagues on the other side of the aisle, but also lived in the same neighborhoods - there was no traveling back-and-forth to D.C from one's home state. Children of legislators were on the same soccer teams and ate at the same lunch tables.

Around this time, I read an essay titled *It Takes Work* by Charles E. Moore (1956) who had this to say:

"If we are honest, we will recognize that we have been groomed to believe that our lives are ours to do with as we please and that our independence is more important than our involvement in whatever groups we happen to participate in, including the church. But forming community will never happen if we keep hanging onto our independence."

The Representative noted how difficult it is to blatantly disrespect another person who is known so personally, and from whose presence you cannot escape. Recognizing this not only corroborates with truths we find in scripture, but also moves us to engage in conversation, difficult as this can be. Often, we will find that while disagreements may stand, the 'other' has perfectly logical reasoning.

In a time when we are on Zoom calls and media, these disconnects occur all the more often. As Christ followers, we must ask ourselves: *how do we dignify those with whom we clash the most?* Jesus has a thing or two to say about this.

Jacob Sutton
Environmental Science, Class of 2021

Covid has shut down much of the country for the past year. Despite this shutdown, many environmental problems continue and need to be actively monitored. This past summer, I interned with Campton Township Open Spaces doing mainly water sampling, as well as some soil sampling and other small tasks. The goal of the internship was to evaluate the effectiveness of wetland and prairie restoration. With the growing pollution of our nation's waterways, it is important to look into remediation strategies. The data that I collected showed that the wetland restoration did improve several water quality indicators, such as suspended solids and coliforms. This data was then used as evidence for the restoration effectiveness. My findings were sent to the Open Spaces supervisor, where it was used to inform the township.

Despite finding promising results, there were still some challenges in completing my research. First of all, most of my previous lab experience was in a lab setting with premade samples. Therefore, it was difficult to adapt to sampling in the real-world environment where things were constantly changing. Consequently, it was more difficult to run my experiments in a controlled way. As a result, I had to account for these changes in my data analysis. Second, this was my first project in the field, and I had to start from scratch. The first few days were overwhelming, as I had to figure out exactly where to start. Eventually, I was able to break the project down into its key components, and it became much more manageable.

Through this internship, I was able to accomplish the following goals. First, I was able to design my own experiment and conduct research. Second, I was able to take my research and present it in a way that others could use to guide their decision-making. As I continue in the field as an environmental scientist, I hope to build on this experience and continue to conduct research as well as understand and interpret others' research findings that will be used to inform environmental public policy decisions.



Back row (L to R): Dave "Baldy" Baldwin '64, Craig "Hawk" Walker '62, Scott McCoy '61, Dr. Gerald Haddock '56. Middle row (L to R): John "Stetz" Stetzer '64, Jon Stoen '64, Ken Thomson '64, Dave "Bear" Kemna '63. Front: Dave Osborne '63

FIELD TRIP REFLECTIONS

Spring Geology Field Trip—1961

Contributed by David Osborne '63

It was cold, very cold, awfully cold. That is my ongoing, overriding memory.

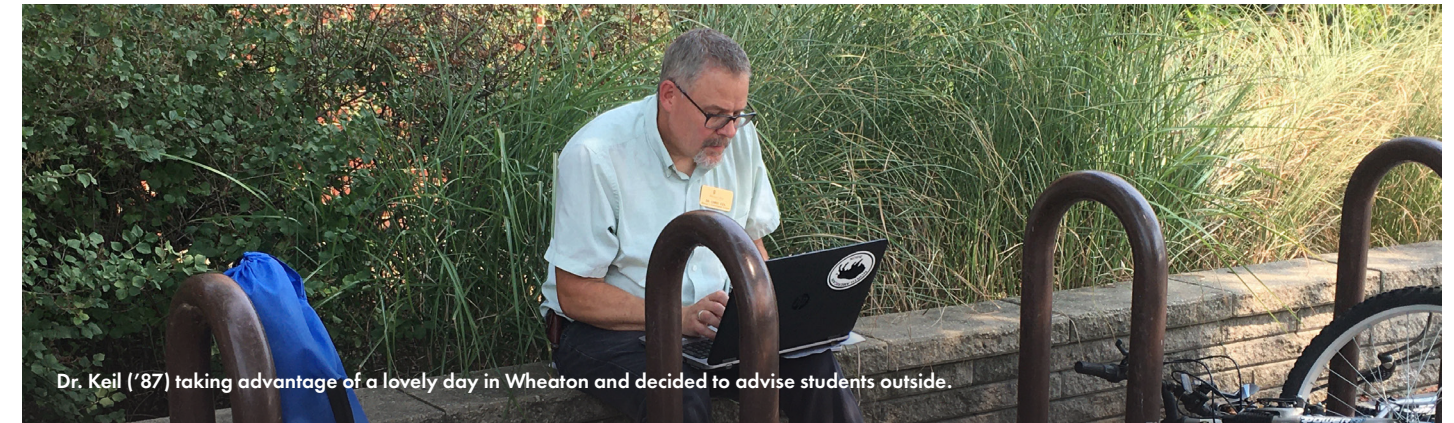
We were camped in the Cherokee National Forest in North Carolina; nobody else was dumb enough to be camping in that weather. There were some kids, presumably from the nearest town, racing their cars around the campground roads. I don't know if they were drunk or just trying to be obnoxious. We were camped right on the outside of a 90° bend in the road, and Jerry Haddock was concerned that an out-of-control car might come too fast and hit our cars or run into our campsite. So, he had us collect some decent sized rocks and we set them up in the roadway to protect the cars and us. As it turned out, the kids never came back.

One evening as we drove down the road in college station wagons from Mt. Mitchell, the driver of the car I was in (might have been Jon Stoen) suddenly declared, "I don't have any brakes!" Needless to say, everybody was now awake. He put it into low, and maybe had a little brake, but somehow was able to slow down as we coasted into a town and into a gas station. As we slowed we could smell smoke. When we stopped, all bailed out. There was smoke coming from the right rear wheel. Turned out that the wheel bearing had overheated, burned out, etc. It had gotten so hot that some of the ball bearings had seized and sheared in half. Normally steel ball bearing would bounce but these, because of the heat "treatment", seemed as if they were made of lead - no bounce. We believe that God was watching over us that night - the outcome could have been much different if the bearing had failed while we were still up on the mountain curves!

On the way home we stopped in the middle of nowhere to get gas, maybe someplace in Kentucky. A little store there had donuts, the best we had ever had. Guess we must have been really hungry! We also stopped some place in either southern Ohio (Cincinnati area?) or eastern Indiana to collect brachiopods as thick as gravel, horn coral, a few trilobites, etc.

KEIL'S CORNER

CHRIS KEIL, PROFESSOR OF ENVIRONMENTAL SCIENCE



Dr. Keil ('87) taking advantage of a lovely day in Wheaton and decided to advise students outside.

What a year it has been! Spring 2020 I was coming back after my sabbatical and getting into the groove: excited to be back with students, starting a research group, teaching some fun classes. Then WHAM! The pandemic hits. Like a freight train. And a bus. And a ton of bricks. All in a dumpster fire. I am so impressed with all the work my colleagues put in transitioning to an online learning environment in two weeks. I've taught various forms of online courses for over a decade and already made heavy use of online learning management systems. So while it was a hassle, I had many of the tools that were needed. Other faculty friends had never used any of those tools before and yet rolled up their sleeves and worked through the pain and did an incredible job continuing to provide a Wheaton education amidst the most difficult conditions in the College's history. Was it perfect? Absolutely not. Was it good? I think so. And the graciousness of our students was such a blessing. They were (and are) patient with our struggles and mistakes with the technologies we are using. I'm not sure they realize how powerful their end of class "Thanks Dr. Keil!" words are.

I am seriously looking forward to not having to work with all the public health precautions that are in place now. Nor will I miss having to use all technologies that are currently a constant part of our job. But there are many lessons and skills that will be valuable long after the pandemic has faded. I'll mention some of these.

Zoom. Yuck. I often say that if I need to attend one more Zoom meeting, I'll pull my hair out. Good thing I keep my hair short so I can't get a good grip on it. At the same time, becoming fairly fluent in Zoom allowed us to have a February Science Station faculty meeting with friends from six different institutions. The chance to connect early, see who we will be working with, and open up dialog about the summer will make getting started in the summer much easier and less stressful. Spring semester all-faculty meetings are something I'm sure we will continue in the future. Zoom, and other platforms, will be a great tool to use when needed.

Screen capture video and web cam recording. I've been able to develop some pre-lab video material for my pollution and toxicology class. Giving the students a chance to view an introduction to the instrument and the basic operation steps prior to coming to lab has improved the effectiveness of the exercises. Students still work through written instructions, which is a good

skill. But students have told me that having seen the pieces and parts and what buttons to push ahead of time is very helpful.

Perspective. For me and others I know it seems like Lent 2020 never ended. The practices of prayer, mortifying the flesh, simple living, and self-denial that started February 26th, 2020 seem to have continued to this day. Last Holy Week, I mourned that I couldn't experience Palm Sunday, Maundy Thursday, Good Friday, Holy Saturday, the Great Vigil, and Easter morning in the ways I've come to love. We were isolated, uncertain, a little fearful of going out and about. We had to try to embrace the season on our own in our house. Yet it occurred to me that there are millions of sisters and brothers around the globe for whom that experience is every day and every year. I hope my Easter 2020 experience and the entire pandemic experience has made me a little better at identifying with and empathizing with the world-wide Body of Christ.

My colleagues. Our team in the department is unmatched. The way we've shared ideas, approaches, solutions, failures, and joys this year makes me even more appreciative of them all. A special shout out to Lisa Heidlauf. In Spring 2020, she and I started working together on a full revision of the labs for our introductory course. You may know that we combined the intro courses from both majors into "Dynamic Earth and Environment." Lisa and I worked on not just selecting which labs to keep in the combined course, but on a rewrite of the instructions for each session. It was a lot of work but was fulfilling and went well. And then..... GO REMOTE B QUAD! Yikes! Talk about scrambling to make things work online. Fall semester 2020 saw room capacity limits so we only saw students in person every other week, with alternate weeks being a distance lab. Lisa was a phenomenal partner through all this with great ideas, constructive criticism, love for students, and prayer for the venture. There still are struggles this semester. But we have good opportunities in front of us. Paper and pencil / computer lab activities have been converted to good distance exercises. Now they can be used as lecture assignments. This will free up lab sessions for more handling rocks, playing with water, and measuring pollution. Yay!

I hope all of you have been able to struggle through the pandemic with minimal scarring. We'd love to hear from you! Shalom!

IN MEMORIAM

David A. DeVries

Wheaton College Geology Professor (1967-1985)

Compiled from reflections contributed by Carol DeVries, Rich Aram, and Gerry Haddock

David A. DeVries passed away December 2020 at the age of 95. Dave, the son of Baptist missionaries, was born and raised in the Philippines on the island of Luzon. He was an active boy scout and expected to be awarded his Eagle Scout on December 8, 1941 in Manila. However, that day the island was invaded by Japan at the beginning of the Pacific theater of World War II. His scout leader died that day. Local officials commandeered him in his boy scout uniform to drive an ambulance at Clark Air Base, though he had never driven before. As the invasion progressed, Dave was forced into hiding. Eight days later, he was found hiding under a bridge by a Japanese soldier who recognized the boy scout uniform. Fortunately, the soldier told him to discard the uniform so he could be taken into the civilian prison. Dave spent four years in the Los Baños concentration camp, formerly the campus of an agricultural school. Adult prisoners organized a camp school for the children. One of the prisoners was a petroleum geologist, and his teaching hooked Dave on geology. In one of the most daring and successful rescue operations in modern military history, a combined U.S. Army Airborne and Filipino guerrilla task force liberated the camp and its 2,147 prisoners on February 23, 1945, minutes before their captors planned to execute all of them.

After his release, Dave returned to the states and was immediately in trouble again. When this 20-year-old showed up to register with selective service he was immediately charged with draft evasion!

Dave was a Geology major in the Wheaton College class of 1949. He completed doctoral studies in Geology at the University of Wisconsin-Madison in 1955. After working in the minerals and petroleum industry, he assumed a teaching position at Mississippi Southern College (now University of Southern Mississippi) in 1957. In 1967, Dave

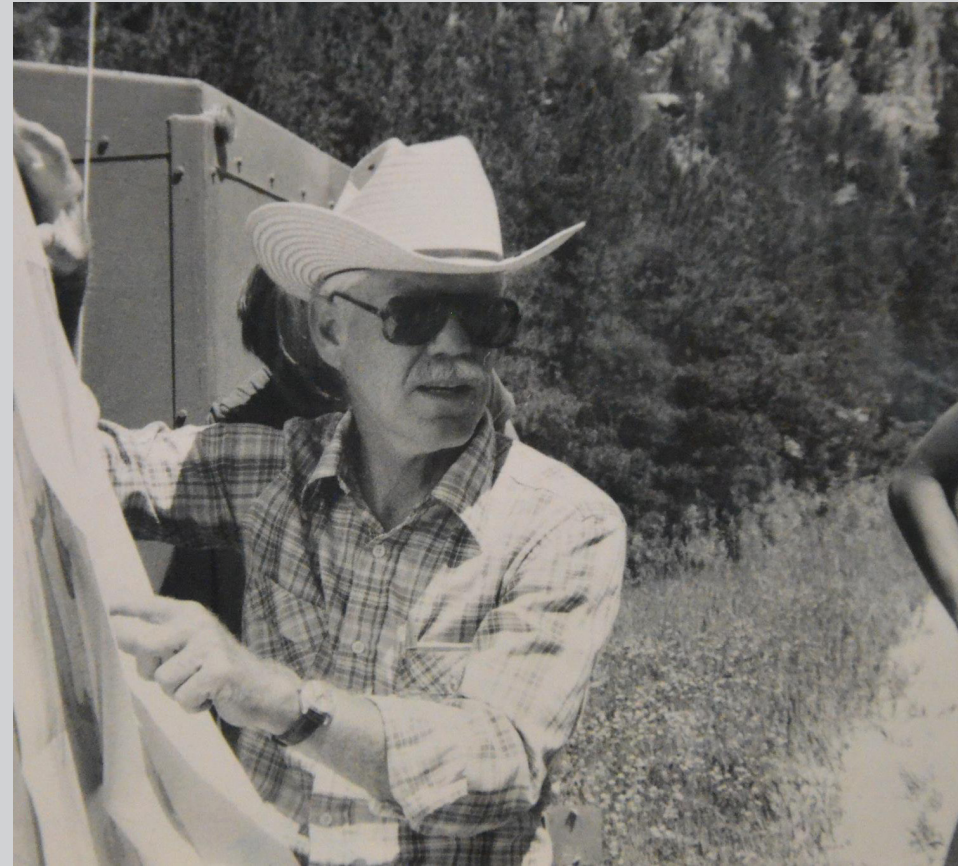


Photo credit: Bruce Sidebotham

joined the geology faculty at Wheaton College with colleagues Don Boardman and Gerry Haddock. He became department chair when Don Boardman retired in 1979. Dave's area of teaching was sedimentology and paleontology, as well as field studies in the Black Hills. He retired from Wheaton College in 1985 and moved to California, most recently living in Hemet. Dave's family included three daughters, three grandsons, and two great-granddaughters.

Rich Aram '76 remembers "Doc" as very soft-spoken and calm. He loved to share geology through 35mm slide shows and field trips. He drove his sedimentology class to Dauphin Bay, Mississippi. Rich shared, "That was helpful to me, because until then, I still visualized a lagoon as the little pond on Gilligan's Island. We also drove to the Grand Canyon and back for a spring break field trip, twenty-nine people in two vans, camping in the snow." Dave had a fun sense of humor. When driving and approaching a turn to the right, he would say, "and we are approaching a barium sulfate turn" (barite, think about it). Once he stopped for a photo of a snake sunning itself on a windshield and called it a "windshield viper."

Rich remembers the day that he became a geology major. "Doc passed around a rock sample, a silicified *Lithostrotionella* (a colonial rugose coral) that he had cut into bookends. I asked him after class how in the world he sawed through a rock, so he gave me a personal tour of the lapidary. Even at Wheaton College, I was impressed with his personal interest in me. I was already weakening towards geology after he took a leisurely stop on the LaSalle-Ottawa field trip for some bird-watching. I had a great 35-year career in geology and never regretted it. Thank you, Doc!"

KATY'S KOMMENTARY

KATY FOLTZ, LAB AND OFFICE COORDINATOR

Hello to my fellow alumni, and thank you, Dr. Moshier, for your gracious re-introduction! For those of you whom I have not had the opportunity to meet, my name is Katy Foltz, and I am a 2013 Geology (and History) alum. Originally from North Carolina, I was one of Dr. Greenberg's many freshmen 'converts,' although I truly fell in love with geology in Dr. Clark's Soil Science and Dr. Moshier's Earth History classes. Post-Wheaton, I went on to complete my Master's in Geology from Oklahoma State University and then worked in the oil patch for 5 years. I am so grateful and delighted to return to Wheaton and be part of this amazing group of faculty and students!



A silver lining of Covid teaching is the opportunity to teach Geology to students from around the country. Here is Katy Foltz ('13) teaching middle school students from Fayetteville, NC about the Rock Cycle!

Returning to campus after time away has been an interesting transition for me. I was part of the first group of students to study in the "new" Science Building and was practically living in the department by my senior year. I even helped put together the original Frog Display for the Museum. When I graduated, I knew this department backwards and forwards, so upon my return, things were mostly familiar to me. However, not everything has remained the same. For one, I sit behind the desk in the office instead of in front of it. Another adjustment for me has been the transition of faculty. The additions of Dr. Katie Maneiro and Dr. Andrew Luhmann, as well as the integration with Dr. Chris Keil and Environmental Science, have provided amazing opportunities and diversity to the department, and getting to know everyone better has been a joy. However, the most important thing that hasn't changed is the community. Our students are engaged, enthusiastic, and always entertaining. Our faculty are passionate, welcoming, and fun. We may be a small department, but we are united in our desire to educate and learn and be the best possible stewards of God's Creation. There is an energy and a positivity coming out of this department, and I am so blessed to be a part of this team. I can't wait to see how the Lord uses me in this position and what we will accomplish in the years to come.

If you, our dear alumni, have anything you would like to see come from this department, I would love to talk with you about it. We have several social media accounts that I highly recommend you follow. Please feel free to reach out at any time to question, comment, or just chat! Blessings and peace to you all!

1996 Texas Spring Break Fieldtrip

In the Spring of 1996, Doc Mo took a van full of students and headed south to Texas. The first two days were warm and sunny. Our first stop in Texas was Dinosaur Valley State Park in Glen Rose. Students camped comfortably in another park south of Ft. Worth. Doc Mo stayed with his sister who lived there at the time (Doc Mo has a custom of leaving the students to camp whilst he seeks shelter with friends or family). At the campground students got to watch the filming of an action scene for *Walker: Texas Ranger!* Next morning, we stopped in Austin and met UT professor Leon Long '54 who led us on a 19-stop excursion in the Hill Country. Yes, 19 stops; Precambrian to Quaternary, finishing by van headlamps. It was wonderful and the students had never experienced anything like it. There are two trays of hand specimens and thin sections in our department collection from that day alone. Next, we camped (Doc Mo included) at a State Park near Llano when it turned cold overnight, turning our left-over dishwater into ice. For lunch, we visited *Doc Mo's* mother and father-in-law south of Fredericksburg, where the crew collected Cretaceous oysters in Left Bear Creek running through their property. And we had hot soup! "I found this photo in a photo album here at the property this spring, where Carol and I are staying for my sabbatical. Chad Smith joined us as an alumni, as he was in grad school at Rice U. Ben Sheesley and Jamie Fulton both now live in Waco. Jamie told me it was his first trip to Texas."



Ben Sheesley, Steve Moss, Stephen Moshier (kneeling in goofy cowboy hat), Chad Smith, Robert Francis (kneeling, looking back), Miriam (Gage) Wall, Craig Renz, Jamie Fulton, Nate Burkhart, and Seth Holzwarth.

LUHMANN'S LETTER

ANDREW LUHMANN, ASSISTANT PROFESSOR OF GEOLOGY

This has been a difficult year with COVID, and I am certainly looking forward to life without COVID-related restrictions in the future. Field trips have been limited to nearby locations. In Hydrogeology last fall, this involved measuring stream discharge with the salt tracer dilution discharge method at Winfield Creek just west of campus. In addition, Kyle Arney (Wheaton alumnus from 1993) alerted me to several monitoring wells just behind the Chase Service Center on campus that we used to create a water table map and conduct slug tests.

One of the advantages of this season was being able to participate in more research conferences than I would have if they were not virtual. I presented on thermal retardation from karst aquifers at the Geological Society of America (GSA) Annual Meeting, a project which involved extensive work by Sophia Becker, Claire Browning, Lucy Dykhouse, and Andrew Madsen (all geology majors who graduated last year). At the American Geophysical Union (AGU) Meeting, I presented on geophysical responses during recharge events in karst aquifers that I have been researching with colleagues at other institutions. April Phinney (geology grad from last year and now a graduate student at Utah State) presented on her fluvial geomorphology research from Yellowstone National Park that she completed while at Wheaton. One disadvantage of the virtual meetings was that there were not the same opportunities to connect with friends and colleagues, and since I was still on campus and teaching, I was not able to attend as many talks and posters as I would have with an in-person meeting.



Andrew Luhmann '06 LEAPING, September 2020

One highlight for me this year is that I now have a lab that will be used for hydrogeology and geochemistry research right across from my office! Renovations were recently completed on what those of you familiar with the Meyer Science Center knew as the room with our department's poster printer, which has now been moved into our computer lab. The first use of the lab involves building an aquifer model for an interactive museum display (one of the broader impacts for my NSF-funded project). I am working on this with Julia Baer (Philosophy integrated with French major), Ethan Emerson (Environmental Science major), Ethan Paul (Geology major), and Isaac Struebing (Engineering major). Users will be able to flip switches to move water through caves/conduits within the model, and seismic responses from the water flow will be monitored with a small Raspberry Shake seismometer that is mounted to the top and then projected onto a large monitor. The plan is to send this and two educational panels around to six museums and state park visitor centers for a few months each. If you have connections to a prospective hosting site and live near karst, I would be happy to try to get our exhibit there.

COVID has also postponed the completion of data collection and uninstallment of the equipment for my karst aquifer project down in Florida. I will hopefully be heading down with a couple of our students to meet up with colleagues from a few other institutions to remove everything from O'Leno and River Rise Preserve State Parks in May. We will have three years of data collection by the time everything is removed, and there should be many papers that result in the next couple of years. You can read more about the project at the following website: <https://sites.google.com/site/andrewluhmann/florida-karst-project>. My research with colleagues at New Mexico Tech has continued exploring chemomechanical processes during geologic carbon sequestration, and we were also funded this past year for another study to conduct fluid-rock interaction experimental research relevant to the San Juan Basin in the Southwest.

I am teaching Environmental Geochemistry for the first time this semester. The department has been wanting to teach more geochemistry for some time, and it is now happening! I am having a lot of fun teaching this class and am looking forward to having this be one of my regular offerings moving forward. Everyone in the department has been cleaning and organizing. Meyer 049 has been converted into more of a lab room, as the shelves, cupboards, and drawers are filled with lab and field instruments and supplies. This has been really beneficial for teaching the lab component of Environmental Geochemistry.

I just completed a 4-year term as Associate Editor of Hydrogeology Journal and a 3-year term as the Primary Representative of the GSA Karst Division Joint Technical Program Committee. These were both great opportunities to interact with many others, but I am looking forward to a couple less service commitments in the next year to hopefully complete a few writing projects. Please keep in touch and please send prospective students our way whom you know have interests in geology and environmental science!



Early stages of the aquifer flow model, which is part of an interactive museum exhibit on Dr. Luhmann's NSF grant. (L-R) Ethan Emerson '23, Ethan Paul '24, Isaac Struebing '23, Julia Baer '23, Dr. Luhmann '06

Abstracts

Wheaton people in bold

Gochenour, J.A., S.L. Bilek, H.B. Woo, **A.J. Luhmann**, R. Grapenthin, and J.B. Martin. 2020. Seismic responses to the rate-of-change of surface- and groundwater level within a karst aquifer system, Santa Fe River Sink-Rise, north-central Florida. Abstract S025-07 presented at the 2020 Fall Meeting, AGU, San Francisco, Calif., 7-11 Dec.

Luhmann, A.J., S.L. Bilek, R. Grapenthin, M.D. Covington, J.A. Gochenour, and H.B. Woo. 2020. Seismic observations of possible overpressurized air pocket release in a karst aquifer. Abstract H054-03 presented at the 2020 Fall Meeting, AGU, San Francisco, Calif., 7-11 Dec.

Simmons, J., A.J. Rinehart, **A.J. Luhmann**, J.E. Heath, and P. Mozley. 2020. Quantifying chemomechanical reservoir sensitivity to CO₂ injection using paragenesis, flow-through experiments and strength testing at in situ conditions, Farnsworth Unit, Texas. Abstract GC111-08 presented at the 2020 Fall Meeting, AGU, San Francisco, Calif., 7-11 Dec.

Woo, H.B., S.L. Bilek, J.A. Gochenour, P.N. Adams, **A.J. Luhmann**, R. Grapenthin, and J.B. Martin. 2020. Monitoring spatial and temporal changes in seismic velocity of the Florida karst aquifer system with phase cross-

correlation and wavelet cross-spectral analysis. Abstract S021-0003 presented at the 2020 Fall Meeting, AGU, San Francisco, Calif., 7-11 Dec.

Phinney, A.I., L.P. Persico, **A.J. Luhmann**, C. Iosso, A. Hinzmann, T. Foky, and E. Van Wetter. 2020. Geomorphic controls on hydraulic processes of Blacktail Deer Creek, Yellowstone National Park. Geological Society of America Annual Meeting Abstracts with Programs, Vol. 52, No. 6, Paper No. 27-11, doi: 10.1130/abs/2020AM-360039.

Kavousi, A., T. Reimann, R. Liedl, T. Wöhling, **A. Luhmann**, M. Sauter, J. Kordilla, and T. Noffz. 2020. Characterization of karst systems by joint inversion of spring flow and transport signatures from a spatiotemporally small-scale controlled test. Geological Society of America Annual Meeting Abstracts with Programs, Vol. 52, No. 6, Paper No. 213-5, doi: 10.1130/abs/2020AM-357452.

Luhmann, A.J., S.M. Becker, C.K. Browning, L.J. Dykhouse, A.C. Madsen, M.D. Covington, M.T. Childre, F. Gabrovšek, E.K. Herman, J.S. Polk, M.E. Schreiber, B.F. Schwartz, G. Tagne, and L. Toran. 2020. Evaluation of thermal retardation in karst aquifers. Geological Society of America Annual Meeting Abstracts with Programs, Vol. 52, No. 6, Paper No. 213-3, doi: 10.1130/abs/2020AM-359721.

Peer-Reviewed Publications

Cutts, K.A., **Maneiro, K.A.**, Stevens, G., and Baxter, E.F. 2021, Metamorphic evolution for the Inyoni shear zone: Investigating the geodynamic evolution of a 3.20 Ga terrane boundary in the Barberton granitoid greenstone terrane, South Africa, *South African Journal of Geology*, 124, 1 [Publication March 2021, Currently In Press]

Maneiro, K.A., Baxter, E.F., Samson, S.D., Marschall, H., and Hietpas, J. 2019, Detrital garnet geochronology: An example from the French Broad River, Southern Appalachian Mountains, USA, *Geology*, 47, 12, 1189-1192.

Maneiro, K.A., Jordan, M.K., and Baxter, E.F., 2021, Detrital Garnet Geochronology: A New Window into Ancient Tectonics and Sedimentary Provenance, *Isotopic Constraints on Earth Systems Science*. AGU Monograph Series. [Publication Expected 2021, Currently In Press; Invited chapter for an AGU Monograph in honor of Don DePaolo]

Tutolo, B.M., **A.J. Luhmann**, X.-Z. Kong, B.C. Bagley, D. Alba-Venero, N. Mitchell, M.O. Saar, and W.E. Seyfried, Jr. 2020. Contributions of visible and invisible pores to reactive transport in dolomite. *Geochemical Perspectives Letters*, 14, 42-46, <https://doi.org/10.7185/geochemlet.2022>.

Research Grants:

- G.W. Aldeen Faculty Development Grant Recipient 2020-2021 (**Maneiro, K.A.**)
- Wheaton College Summer Research Fellow for Summer 2021 (**Maneiro, K.A.**)
- Department of Energy—National Energy Technology Laboratory. San Juan Basin CarbonSAFE Phase III: Ensuring Safe Subsurface Storage of CO₂ in Saline Reservoirs. Subaward to **A.J. Luhmann**, 10/1/2020-9/30/2023, \$46,170.

STUDENT ARTICLES

Emma Riddle

Environmental Science, Class of 2021

I never expected to spend my senior year serving on Student Government as the Executive Vice President of Campus Sustainability, but I find myself in this role nonetheless. It has always been a passion of mine to encourage environmental stewardship among friends and family, but through this experience I have learned that institutional sustainability is an entirely different ballpark. Though not all of my goals as EVP of Campus Sustainability were met, I have learned so much through the processes involved in building a foundation for the campus garden and prairie areas, which I believe are important additions to campus for the ways in which they engage students in hands-on stewardship activities.

After being awarded a \$1000 grant last spring, the Campus Sustainability Committee made plans for the campus garden to break ground on the south side of Meyer Science Center. The summer of 2020 was prosperous for the garden thanks to Dr. Rorem, Dr. Maneiro, many other faculty and staff, and a student researcher, Luke Gentry; but going into the academic year, the garden had no structure of volunteers necessary to sustain it.

Needless to say, the campus garden was a project I had always intended to prioritize during my role, so much so that I appointed a small group of people to a sub-committee of the Campus Sustainability Committee referred to as the “Garden and Prairie Project” (GPP), which is led in conjunction with my peer, Lauren Jenkins. The prairie refers to the native prairie area neighboring the campus garden that we seek to conserve, largely because it is home to vital pollinators.

During early fall semester, the GPP committee appointed a network of student volunteers to care for the campus garden and prairie areas. In total, there were more than 45 students actively involved in this project last semester which enabled the garden and prairie areas to not only survive, but to flourish. Thanks to the daily care from students, the campus garden produced an abundant amount of produce that was donated to our local food shelf, the People’s Resource Center. We have grown varieties of tomatoes, zucchini, pumpkins, carrots, basil, butternut squash, beans, and various other crops. We are now in the process of growing the GPP as a ministry through chartering it in the Christian Service Council of the Office of Christian Outreach. Our future hopes for the GPP involve growing our relationship with local food shelves and partnering with local schools to provide a space for education on gardening practices, environmental sustainability, and local food insecurity.

Thus far, my time spent as the EVP of Campus Sustainability has taught me the ways in which the pursuit of institutional sustainability is complicated by competing interests, deep-rooted systems, and slow-going procedures; but I have also been grateful to witness the fruits of the labors of my committees and our predecessors through the prosperity of our campus garden and native prairie.

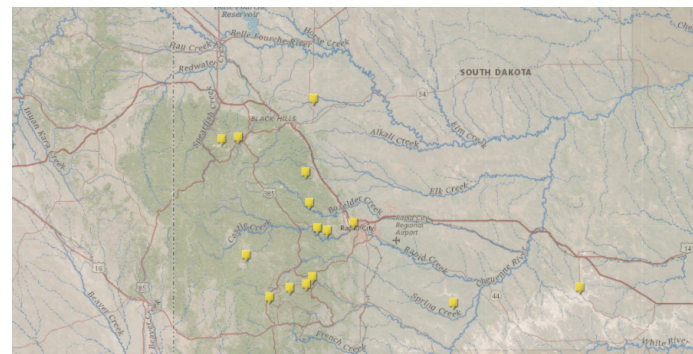
Gillian Rhea Geology, Class of 2021

This past fall semester in Senior Seminar, fellow senior Benjamin Robbins and I were asked to create a virtual field trip for the Dynamic Earth and Environment introductory class. This virtual field trip was to replace the normal field trip that intro students would take to local sites here in Illinois. Due to COVID-19 regulations, we had to devise a new creative solution to still give the students a field trip experience without physically going anywhere. And what better place to send our students to than the beloved Black Hills! With the help and guidance of Dr. Moshier and Professor Heidlauf, Ben and I developed a Black Hills Virtual Field Trip.

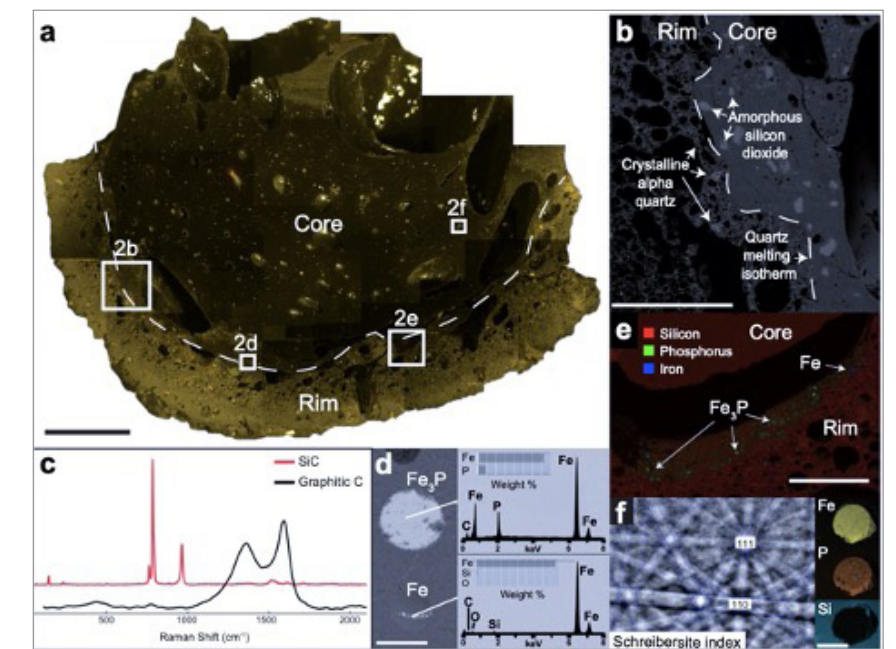
Choosing our format for the trip was a big part of the project, as we wanted something user-friendly, accessible, and informative. We ultimately decided upon using the ArcGIS online story map program. It has many spectacular features that suited our needs well: a main screen that can change from an interactive map of the area to a picture, a column for text and information about the area, photo link capabilities within the text, tabs for every stop on our trip, and more! Neither Ben nor I had used this program before, but thankfully we had the privilege of being assisted in our ArcGIS endeavors by Juliana McMillan-Wilhoit ('11, IDS). Her assistance and advice were critical in the planning and development of this trip. We are so very thankful for all of her help and couldn’t have done it without her!

Once we solidified our program and learned how to effectively use it, we began to develop the field trip itself! Dr. Moshier and Professor Heidlauf provided us with the main body of information, pictures of the area, pertinent geologic maps, and assessment questions for students at the end of each stop. Ben also took high resolution photos of all the hand samples, and even took some great close-ups that showcased important features of texture, grain size, and metamorphic grade. Having all the resources we needed, Ben and I began working on organizing the field trip in a way that was clear and engaging. We organized the trip by geologic time, starting with the oldest rock and proceeding through the field trip stops to the youngest. Finally, we finished our work and now it had to be put to the real test in intro lab. Students seemed to really enjoy it, as it accomplished its goal of being both informative and user-friendly for our students. We were happy to be able to give them a small taste of what a geology field trip looks like, especially in the context of a place that is so special to our department, professors, and alumni!

<https://wheaton-college.maps.arcgis.com/apps/MapSeries/index.html?appid=c661bf3cd566459aa95cc9a7dd7a931b>



Main section of clay fulgurite created by lightning striking soil. Area of analysis indicated by box. Scale bar =10 cm



Sample structure and chemistry with SEM imagery mapping elemental distributions described in the article.

BENJAMIN HESS '19 RESEARCH ON GLEN ELLYN FULGURITE PUBLISHED IN NATURE COMMUNICATIONS

We reported in a previous CONTACT about the Glen Ellyn fulgurite that Dr. Moshier excavated in May 2016. In the fall of 2017, students in Dr. Greenberg’s geochemistry seminar began to analyze the specimen with our XRF. Benjamin Hess continued to study the material using microprobes at the University of Chicago and University of Leeds, UK during a semester off campus. Two professors at Leeds were impressed by the results and saw the implications for origin of life studies. Their paper in Nature Communications was published on March 16, 2021. Benjamin was awarded a Goldwater Fellowship when he was a senior at Wheaton College and is now pursuing his geoscience PhD at Yale University.

Lightning strikes as a major facilitator of prebiotic phosphorus reduction on early Earth
Nature Communications
<https://doi.org/10.1038/s41467-021-21849-2>

Benjamin L. Hess^{1,2,3}, Sandra Piazzolo² & Jason Harvey²

When hydrated, phosphides such as the mineral schreibersite, (Fe,Ni)₃P, allow for the synthesis of important phosphorus-bearing organic compounds. Such phosphides are common accessory minerals in meteorites; consequently, meteorites are proposed to be a main source of prebiotic reactive phosphorus on early Earth. Here, we propose an alternative source for widespread phosphorus reduction, arguing that lightning strikes on early Earth potentially formed 10-1,000 kg of phosphide and 100-10,000 kg of phosphite and hypophosphite annually. Therefore, lightning could have been a significant source of prebiotic, reactive phosphorus which would have been concentrated on landmasses in tropical regions. Lightning strikes could likewise provide a continual source of prebiotic reactive phosphorus independent of meteorite flux on other Earth-like planets, potentially facilitating the emergence of terrestrial life indefinitely.

¹Department of Earth and Planetary Sciences, Yale University, New Haven, CT, USA.

²School of Earth and Environment, Institute of Geophysics and Tectonics, The University of Leeds, Leeds, UK.

³Department of Geology and Environmental Science, Wheaton College, Wheaton, IL, USA.

IN MEMORIAM

David James Keating

David James Keating passed away on October 10, 2020, at the age of 91. He attended Wheaton College and graduated in 1951 with a bachelor's degree in Geology, while playing football and lettering in soccer. After graduation, David attended Officer Candidate School in San Antonio, Texas, and proudly served in the United States Air Force during the Korean War. David worked for 30 years with the oil and gas division of Dow Chemical (Dowell), working in eight different states before his retirement in 1984 as a Regional Sales Manager. After retirement, he taught First Aid and CPR for the American Red Cross for 10 years. David is survived by his wife of 69 years, Ellyn (VanVlaanderen) Keating, children, and grandchildren. Ellyn notified the department adding, "A more wonderful husband there never was."

ODE TO A FRAGMENT OF FULGURITE

by **Karen An-hwei Lee**
Wheaton College Provost

It is more fuliginous than a fragile rod of glass—
rather, a sintering metaphor of holiness—
footprint of God as forked lightning in a mineral form from
the Latin *fulgur* or *fulgor*, same root as *fulgeo*, to flash, lighten—

God's divine design, the electricity flows in patterns of ferns and
fractals, and a differential in charge fuses the sand,
changing to fugues of glass vitrification—
flashes or darts like prayer and the word of God
as pure voltage, *sharper than any double-edged sword*
life-breathed
living and active—
our flesh reduced to ash
or mineraloid lechatelierite in a crater—
lightning is at least forty times hotter than the sun—
for as lightning that comes from the east
is visible even in the west,
so will be the coming of Christ—

ALUMNI ARTICLE

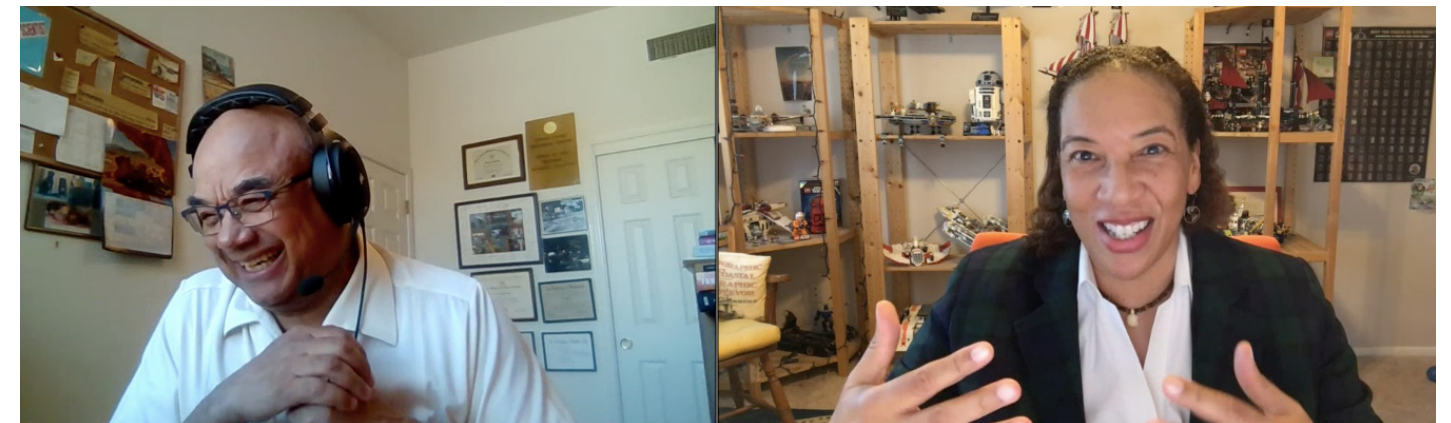
Miriam Ritchie
Environmental Science, Class of 2020

I began my four years at Wheaton College similarly to most freshmen by declaring a major I thought was interesting and began taking introductory courses. Unlike most students, that was the same major I graduated with four years later. Choosing Environmental Science and sticking with it was a key part of my Wheaton College experience. Though there is nothing wrong with changing majors multiple times and double or even triple majoring, I found that for me, having a single focus throughout my four years was not only beneficial but allowed me to pursue opportunities and experiences I would not have had otherwise. It allowed me to work as a teaching assistant for several courses, which allowed me not only to gain significant experience in those areas but helped me to hone my time management skills and ability to work independently. I was also able to work on independent study projects, along with other students, that I found to be valuable research experience for me moving forward.

My major has been invaluable through the technical skills I've gained. Having graduated into a tough job market, I experienced rejection from several jobs as well as having been offered a job only to have it canceled due to the pandemic. Eventually, I was hired as a GIS consultant, and from there became a full-time GIS Analyst with the same company. Though I would rather be working more specifically in my field of environmental science, Wheaton has equipped me with the technical skills to work in a job outside of my field, and as I continue to look forward to opportunities within my field, the skills I developed at Wheaton are a valuable asset.

In addition to the technical skills I gained, I valued my education at Wheaton because it was defined by excellent professors who encouraged me to think critically about issues and ask questions when necessary. This, I believe, has allowed me to become very teachable, and has equipped me to become a lifelong learner. Through courses including Poverty, Justice, and Transformation; Race and Justice; the Holocaust; and the Environmental Politics, I have been confronted with many difficult and at times disturbing realities. I was led through discussions about these topics by excellent professors who not only taught me the importance of confronting these realities, but also my own role in systematic systems of oppression, and recognizing the need not only to think and discuss but to actively work against injustice. I believe that my ability to be a lifelong learner, think critically about difficult issues, and confront atrocities, have been vital parts of what I have taken away from Wheaton.

I value my Wheaton education because of all of the aforementioned reasons, but it would not have become my home in the four years I attended but for the community and relationships I was able to develop along the way. In particular, spending a summer in the Black Hills at the Wheaton College Science Station, where I was able to live and work with professors, surrounded by creation every day, and in weekly Sunday-night dinners at Dr. Keil and Mrs. Keil's home. Through these experiences, I came to value Wheaton for more than just the education I received but for the community I developed along the way.



Wes Ward and Dawn Wright in conversation for a special GSA web event

DAWN WRIGHT FEATURED IN SPECIAL GSA WEB EVENT

Dawn Wright '83, Chief Scientist, Environmental Systems Research Institute, was the featured guest on a special, "Conversations with GSA's Bromery Awardees" web event on February 26, 2021. The Randolph W. "Bill" and Cecile T. Bromery Award was established in 1999 to recognize geoscientists of color who have made significant contributions to the sciences or who have been instrumental in opening the geoscience field to

other geoscientists of color. The event, the first in the series, was a lively Q&A between Dawn and moderator Wesley Ward in which she talked about her education; past and current research; and issues of inclusion, equality, and diversity in the geosciences. Dawn gave a generous shout-out to Wheaton geology and current students.



Right as the world went wonky, Dr. Maneiro was co-leading a group of students from Wheaton and Olivet Nazarene University on a field trip through the Southern Appalachians. (L-R) Back Row: Dr. Maneiro, Lauren Breederland '22, Gillian Rhea '21, Jenna Paulsen '22, Aaron Lenhart '20, Andy Margason '20, Grant Miller '20. Front Row: Benjamin Robbins '21, Michaela Sandeno '20.

DOC MO'S MEMOIRS

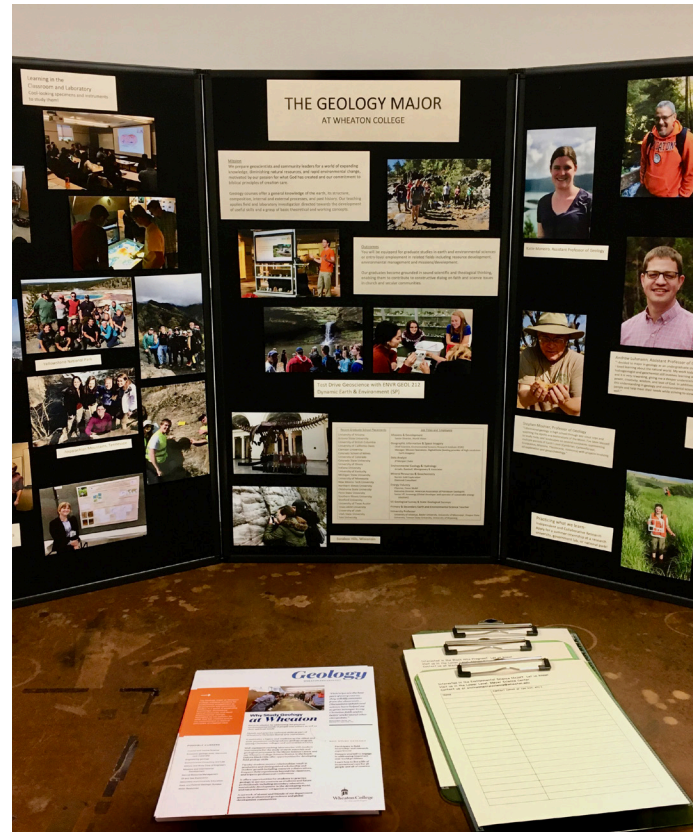
STEPHEN O. MOSHIER, PROFESSOR OF GEOLOGY

Sabbaticals are one of those perks of the academic life. Given the seven-year recurrence interval, this should be my #5. However, due to life choices and who-knows-why-now, it's only #3 and it will be my last. Carol and I are taking the opportunity to spend spring 2021 living with Carol's mother on her property in the Texas Hill Country, near Fredericksburg. The creek that runs through the property is most of the time as dry as the scattered bones in the surrounding live oak dotted fields. The local bedrock is Cretaceous Glen Rose Limestone, so the creek's gravel bars are full of wonderfully shaped chert nodules and loose fossil oysters, *Exogyra*, *Ostrea*, and *Gryphea*. There are dino prints in the Glen Rose elsewhere, but the local strata appears to be strictly marine. Along with the fossil treats there are, for a mid-westerner, the exotic flora of wild cactus (blue bonnets in the spring) and fauna of armadillo, white tail deer, goat, cattle and alpaca. We see all of these every day on our walks- and yes, the last three are not wild.

Carol, my mother-in-law, and I spent nine nights in a local hotel in mid-February as storm refugees, waiting for our power to be restored. Ah, Texas. They called it the storm of the decade. In Chicago they would call it a typical Wednesday in February.

Our experiment of combined intro geology and environmental science in one "Dynamic Earth and Environment" course continued for a second year. During the fall semester, Chris Keil and I split lecture duties for one of the three sections on the schedule. Happily, students wrote in course evaluations that the duo-approach worked, despite obvious or inevitable differences in content and delivery from the two of us. What really worked was our commitment for each of us to be at every class. That way, each could add a few words from our disciplines and experiences, as well as have one proflogged on with the remote learners while the other lectured in front of the in-person class. Most of my comments to Chris' lectures involved obscure pop culture references and occasionally some serious geology. Labs were more challenging, but I'll leave that for others to describe.

So, what you ask, am I doing in the Republic of Texas? My primary project is a book on the Perry Mastodon. I'd like to write an accessible book that is both natural and human history. There are stories to tell about the life and death of the beast, as well as the story of its discovery, excavation, restoration, and significance in Wheaton culture. I spent four days in the Wheaton College archives before departing Illinois, scanning and photographing thousands of memos, photographs, and news clippings. Some of the alumni who were involved in the excavation and restoration have already provided memories. If you have a significant memory and I neglected to contact you, please don't hesitate to reach me ASAP. Other projects include finishing up a paper for peer review on our Tel Ashkelon geoaerchaeology project and contributing blogs representing the geosciences at Christian Scholars Review (<https://christianscholars.com/blog/>). I also hope to examine a diary of Professor George Fredrick Barker from 1861, stored at the Briscoe Center for American History at the University of Texas, Austin. Barker was the professor Jonathan Blanchard hired to teach science and natural history at Wheaton College in 1862. He



Top: With everything else digital, we are still old school with our freshman Orientation week promotional displays! Bottom: Covid-safe Department meetings have their advantages. Do you remember asking your professors, "Can we have class outside today?"

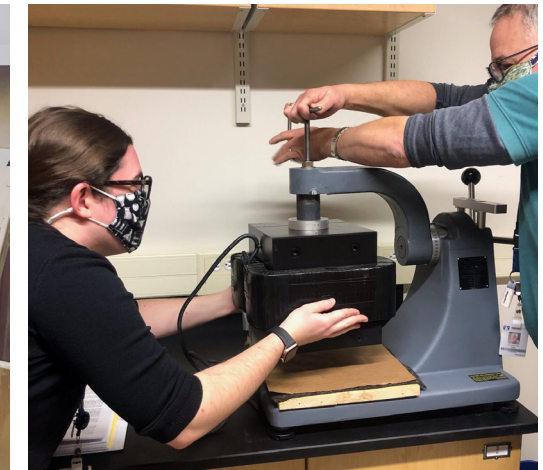
was a student of Harvard's Louis Agassiz. Barker left Wheaton after one year (due to lack of full payment of salary) and went on to be a prominent scientist of the early 20th century. I would like to write more about Barker or re-imagine a lecture he might have given as a Wheaton professor.

MANEIRO'S MUSINGS

KATHRYN MANEIRO, ASSISTANT PROFESSOR OF GEOLOGY



Gillian Rhea ('21) helping Dr. Maneiro set up her Mineral Separation Lab. First time these boxes have been opened in 3 years!!



Drs. Maneiro and Keil hoisting a 300 lb Franz electromagnet.



Girl power in the Southern Appalachians (PCE - Pre-Covid Era).

In so many ways it has been a long and challenging year, although there have been joys and blessings along the way. A year ago in March 2020 I was leading a field trip in the Southern Appalachians over spring break with eight Wheaton students as well as a faculty member and eight additional students from Olivet Nazarene University. While we were in the field, we received the news that we would pivot to remote learning for the remainder of the spring semester - setting in motion what we now know is more than a year of modified teaching. Meanwhile, at the same time I was on the field trip last March my husband (Anthony), who typically works in New York City during the week, fell sick with COVID in that first terrible wave that hit the city. We are thankful for God's protection over his parents, whom we nearly lost to COVID in that same wave, and for Anthony's recovery as well. Anthony's office in New York remains closed so he has been working remote from Wheaton since last April. This provided an unexpected silver lining for us, since we have now been in the same city for the longest span of our entire marriage!

Before I came to Wheaton, I taught several fully remote lab courses. Little did I know that I would need to rely on those remote teaching skills at Wheaton! Over the summer, I served on a subcommittee under Dean Eggmann to help the Natural Science Division enhance remote teaching skills and prepare to teach physically distanced in-person courses in Fall 2020. Teaching modifications abound! For example, one of my current introductory classes with 47 students barely fits in Barrows Auditorium with physical distancing - a space which would normally seat hundreds. Of those 47 students, several are fully remote and join class from their living rooms or bedrooms in the United States or as far away as South Korea and Thailand. In the fall, I also taught course sections with split attendance (where students rotate between in-person and online attendance) as well as teaching fully remote for a number of weeks at the beginning and ends of semesters over Zoom. We are eagerly looking forward to a return to fully in-person learning!

This year, I also worked on gaining approval for departmental honors as an option for our students. Wheaton students can now undertake independent research alongside our faculty members in Geology and

Environmental Science, write and defend a senior thesis, and receive recognition at graduation with departmental honors. We already have a student, Lauren Breederland ('22), ready to pursue an honors senior thesis in Geology next year.

Research continues even in the midst of teaching upheaval. Over the past year, my second paper (which was submitted in early 2020) was accepted for publication and is now in press as a chapter in an AGU Monograph with expected publication later in 2021 due to pandemic delays. Additionally, I have a second-author paper in a March 2021 special issue of the *South African Journal of Geology* devoted to the Barberton Granite-Greenstone Belt. This paper presents the oldest robust garnet age in the world free of analytical issues; they are 3.2 billion year old garnets! New projects are also underway with Wheaton student researchers. Gillian Rhea ('21) is working on garnet from the Acasta Gneiss Complex as a part of an internal Aldeen Faculty Development Grant I was awarded this year. Lauren Breederland ('22) is preparing for her honors senior thesis, which will provide a bulk garnet age on rocks from the Limpopo Belt in South Africa to help resolve tectonic timing in a critical Archean craton. I am also participating in submission of a grant application for funding to support a pilot research project focused on garnet from Greenland, which could be even older than the 3.2 Ga garnets from South Africa.

Finally, I continue to work on my "side hustle" of sustainability initiatives at Wheaton. I remain the faculty adviser to the Student Government Executive Vice President of Sustainability and am now co-advising a new student club called the Garden and Prairie Project ("GPP"). The GPP was created to coordinate and supervise the Wheaton College Garden, which was installed in May 2020 and has now completed its first harvest season and is starting planting for year two. We currently have sixteen raised beds that are in food production and donate the harvest to People's Resource Center in Wheaton to fight local food insecurity. This semester I am also co-chairing a faculty committee looking at the expansion of the Aequitas program, which would bring high caliber students to Wheaton to participate in four-year thematic and interdisciplinary cohorts, including a track focused on sustainability.



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STUDENTS IN THE FIELD

