

CONTACT

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



Earth History and Stratigraphy class in the Great Hall, Field Museum under Maximo dinosaur

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From the Department Chair

STEPHEN MOSHIER

Who knew the world was going to change during the late-winter and spring of AD 2020? You probably know, especially if you have children or grandchildren of college age, Wheaton College is among the majority of schools who are teaching all classes remotely. That means no personal interactions between students and faculty and sadly, no spring field trips! When did Wheaton geologists NOT make the April pilgrimage to Baraboo?!! When did Wheaton environmental scientists NOT visit a prairie stream and test its water quality once the snow melted?

Yet, even with the pause in activity on campus (starting on March 16 when students were supposed to return from Spring Break) there is much to report for this issue of CONTACT! Environmental Science and Geology at Wheaton College are thriving with motivated students and our new faculty. I love showing visitors

around the department because there is so much activity that they can see with their own eyes. Like the high school student who got to talk with senior April Phinney, as she worked on her maps in the GIS lab, about her summer internship studying stream equilibrium in Yellowstone National Park. Or, when alumnus Dick House '51 sat in on one of our "coffee and donut" seminars to hear senior Andrew Madsen share his recent experiences traveling to the Greenland ice sheet and being a USGS intern in California this summer coinciding with the Ridgecrest earthquakes.

One of the most significant development this year has been the inauguration of a new combination introductory Earth and Environmental Science course (ENVR GEOL 212 Dynamic Earth and Environment). Our proposal for the course was approved last year, and we worked during the spring and summer of 2019 to develop new or updated labs and lecture material. When I say we, I mean EVERYONE in the department. Special kudos go to

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STUDENT AWARDS

From the Chair Cont.

our lead Lab instructor Lisa Hiedlauf, who poured her mind, soul and lots of heart into the new labs. The combined course seems to be a success, with both Dr. Katie Maneiro and Dr. Andrew Luhmann helming the lecture sections. And those lecture sections are not about sitting still in a chair looking at slides of rocks and streams. Katie and Andrew have the students frequently engaged with in-class activities that involve hands on learning and even spirited competition between student teams.

But, with the highs come some lows. Last CONTACT you met our visiting professor Gilles Tagne, who filled the visiting position vacated by Sam Smidt. Gilles taught through the 2018-2019 year with contributions to introductory geology, Energy and Climate Change and our GIS courses. About one month into the Fall 2019 semester, we learned that a glitch in his immigration documents (through no fault of his own) required that he discontinue his employment with the college. Efforts over the next several months were unsuccessful in obtaining the correct documentation for him to return. We miss Gilles and wish him well, knowing that he has a bright future as a geoscientist and educator.

Finally, our community is grieving the passing of Diane Greenberg, wife of emeritus professor Jeff Greenberg and friend to every member of the Everlasting Family of the Wheaton College Science Station.

John Muir Award, 2019 and 2020

John Muir was a trailblazing naturalist and environmentalist. His advocacy helped establish Yosemite and Sequoia National Parks. He founded the Sierra Club which is one of the largest organizations in the world working for environmental protection and preservation. John Muir recognized the important role that the outdoors can play in a good life. "Everybody needs beauty as well as bread, places to play in and pray in, where nature may heal and give strength to body and soul alike."

The John Muir Award recognizes outstanding seniors in the Environmental Science Program at Wheaton College. Academic success and participation in the department community are considered in making the selection. It is always a challenging process to determine a recipient because we are blessed with many excellent students.

The 2019 John Muir Award winner was Yihong "Cindy" Hu. Cindy excelled in her coursework and was very active in the life of the department. She participated in Wheaton in the Black Hills and returned to be a cook in the kitchen. She was a teaching assistant in Introduction to Environmental Science and participated in data collection for research projects. During her semester participating in Wheaton in Chicago, Cindy worked with the Center for Neighborhood Technology tackling issues around aging water infrastructure in the Great Lakes region. Cindy was also a teaching assistant for Chinese classes and was active in international student groups.

The 2020 John Muir Award is shared by Aaron Lenhardt and Miriam Ritchie.

Aaron's interests truly embrace Geology as well as Environmental Science. Aaron has been a teaching assistant for a number of classes in the Department. Whenever something new is going on in the department, Aaron is usually there. If someone is using the XRF, Aaron wants to know "Can I learn too?" Are you looking for someone to go to Chicago with you to sample water in Bubbly Creek? Aaron is ready to go! Aaron also worked on research with Dr. Kristen Page and Dr. Chris Keil. Like Cindy, Aaron spent time both as a student and a cook in the Black Hills. While working there he went on extra field trips whenever he could find room in the vans. His internship at Packaging Corporation of America in the summer of 2019 produced excellent evaluations from his supervisor and practical regulatory experience that he has shared in his classes. During his senior year, Aaron also served as a policy researcher for Student Government's Sustainability Committee, helping advance sustainable policy for Wheaton's future.

Miriam jumped into advanced Environmental Science courses her freshman year which enabled her to be a teaching assistant in both Pollution and Toxicology as well as Quantitative Methods. Having an experienced student for these upper divisional courses strengthened the course delivery. Miriam also participated in data collection for a number of research projects some of which has been published. Her ability to connect principles from across many classes enhanced many discussions in senior Capstone. In the fall of 2019 Miriam participated in the Semester in Environmental Science at the Marine Biological Laboratory in Woods Hole, Massachusetts. There she did innovative research on microplastics in the environment.

The Gerald Haddock Outstanding Geology Senior Award, 2019 and 2020

Benjamin Hess is the Gerald Haddock Outstanding Geology Senior for 2019. Benjamin grew up in eastern Pennsylvania. After his freshman year he worked as an intern for an Environmental Firm in his hometown, impressing them with his subsurface mapping skills from taking Earth History and Stratigraphy. The next summer, Benjamin participated in a Research for Undergraduate Experience (REU) at the American Museum of Natural History, New York City, in a project with the Earth and Planetary Sciences group to study the evolution of S- and I-type granitic plutons through analysis of apatite. Benjamin was senior author of a presentation on their research at the American Geophysical Union Fall Meeting 2017. After taking an elective course in geochemical techniques with Dr. Greenberg, he began a multi-year project to study the Glen Ellyn fulgurite, including advanced analysis at the University of Chicago and University of Leeds, England, where he spent his senior fall semester. Benjamin was awarded the prestigious Goldwater Scholarship, a national recognition for distinguished university science students, during his junior year. Benjamin is currently completing a doctorate in geosciences at Yale University.

The 2020 Gerald Haddock Outstanding Geology Senior Award is shared by Lucy Dykhouse and Andrew Madsen.

Lucy has been busy during her college experience. During her sophomore spring semester Lucy participated in the Wheaton in Mexico program where she immersed herself in Mexican culture and language by living with a host family for four months and participated in water development research at El Instituto Tecnológico de Querétaro and Agua Clara Internacional. Her projects included mapping water sources and underground piping infrastructure of the capital city and performing water quality analyses throughout the city using basic quality test kits to improve knowledge of the city's water contamination source. She spent her junior year summer in a Research Experience for Undergraduates (REU) at Biosphere 2 in Oracle, AZ where she calibrated a numerical model of subsurface water transport (using Python) for use in future experiments. She presented a poster on this work at the 2019 American Geophysical Union meeting. Lucy collaborated with Dr. Luhmann on research characterizing thermal retardation in karst aquifers using water temperature and electrical conductivity data. She has served as a Teaching Assistant in our introductory lab courses and as the Writing Fellow for the Water, the Essential Resource class.



DR. MOSHIER WITH 2019 OUTSTANDING SENIOR AND GOLDWATER SCHOLAR BENJAMIN HESS'19. HIS AWARD IS A SPECIMEN OF APATITE, HIS RESEARCH MINERAL DURING A SUMMER INTERNSHIP AT THE NEW YORK MUSEUM OF NATURAL HISTORY.

Andrew caught the geoscience bug in Dr. Greenberg's First Year Seminar and was drafted to assist him with a project to survey undergraduate attitudes about STEM careers and education. Andrew also contributed his own story to the project website CalledToScience.org. In a collaborative project with other students and visiting assistant professor Sam Smidt, Andrew analyzed dissolved oxygen and conductivity data from 23 shallow wells in a local forest preserve with the goal of finding a cost-effective method for quantifying surface water-groundwater interactions in a stream, resulting in a co-authored Geological Society of America poster in 2017. After completing our summer field mapping program in 2018, Wheaton faculty nominated Andrew for a USGS-NAGT summer field internship. He was selected to work as a Physical Science Technician at the USGS Earthquake Science Center, Menlo Park, CA, where he planned field trips for foreign researchers visiting the USGS and other guests, reviewed journal articles and grant proposals for his advisor, designed a comprehensive presentation on Indonesia's Geologic History and Natural Hazards, and deployed and retrieved seismometers following 2019 Ridgecrest earthquake sequence (yes, in one summer). Andrew completed courses in Ice Cores & Paleoclimatology and Arctic Glaciology in Copenhagen, Denmark through the Studies in Scandinavia (DIS) program, during his junior spring semester. The experience included a trip to the Greenland Ice Sheet. Finally, Andrew was involved in many extracurricular activities, including leading Bible studies and performance in the Wheaton College Men's Glee Club, Green Mill Jazz Combo, and Symphonic Band (vocalist, drummer and tubist, respectively).



DICK HOUSE'52 (CENTER), VISITED THE DEPARTMENT IN OCTOBER, HERE IN CONVERSATION WITH (L-R) TORY GUM (REGIONAL DIRECTOR FOR DEVELOPMENT), KATIE MANEIRO, AND ANDREW LUHMANN'06

\$1 Million Donation to Geology from Dick House '52

Richard D. House '52 has pledged to donate \$1 million to Wheaton College for an endowed fund to benefit field education for geology majors. Details remain to be finalized on exactly how the endowment income will be used, but Dick's dream is to enable future students to be better prepared for careers in the geosciences. Dick visited campus in October 2019 and took the opportunity to meet with our majors in a variety of settings, from the classroom to the dining hall. Students learned what it was like to be a geology major, before plate tectonics was widely accepted and when there was probably only one petrographic microscope in the department. One common experience for present students and Dick's 1952 cohort, which included Bruce Brown, Paul Gast and Lyman Taylor, is the summer field course at the Wheaton College Science Station.

Dick started his post high school education at a Bible college in New York City. Columbia University geochemist Laurence Kulp '42, who taught remedial science courses at the Bible college, convinced Dick to transfer to Wheaton and pursue a geology degree. Dick recounted that his job on campus was to shovel coal into the campus steam plant. He got behind in his textbook reading, so geology instructor Cordelia Erdman (Barber) '46 would come to the plant and read the textbooks to him as he worked.

After graduating from Wheaton College, Dick completed a Master's degree in geology at Northwestern University, writing a thesis on economic geology. During that time, he offered his services as an instructor at Trinity Christian College. Then it was off to the oil patch and a successful career in the Gulf Coast, first with Geophysical Services, Inc. and then many years with Texaco rising to the managerial level at the Lafayette Louisiana Office. In the early 80's Dick became an independent petroleum geologist with several lucrative discoveries in Louisiana.

[Personal story: Steve Moshier never forgot his first interview with an oil company recruiter when he was a first-year graduate student at SUNY Binghamton. It was a gentleman from Texaco, and no, he didn't get a job offer. When Steve met Dick last year, he asked him, "Did you ever recruit for Texaco at SUNY Binghamton back in the late 1970s?" Dick's response, "Only once."]

MANEIRO'S MUSINGS

KATHRYN MANEIRO, ASSISTANT PROFESSOR
OF GEOLOGY



DR MANEIRO
WITH STUDENTS
DURING SPRING
BREAK 2020
FIELD TRIP TO
THE SOUTHERN
APPALACHIANS.

It is hard to believe that I am now finishing my second year at Wheaton. This year has been challenging but rewarding, as days are filled to the brim with research, teaching, service, and other adventures.

I spent last summer in New York City with my husband while I wrapped up writing related to a project developing a new variation on the Sm-Nd garnet geochronology method that allows us to date detrital garnet (garnet that has been weathered and eroded and can now be found in sediments or sedimentary rocks) for the first time. I published a first-authored journal article in *Geology* in December 2019 on this work titled "Detrital garnet geochronology: Application in tributaries of the French Broad River, Southern Appalachian Mountains, USA." I have also submitted a first-authored companion book chapter providing the detailed methodology and case studies in support of detrital garnet geochronology to an upcoming special volume to be published by the American Geophysical Union. We are excited about how this new methodology advances small-sample size (< 100 picograms Nd!) garnet geochronology and specifically provides a new approach that can be used in sediments and sedimentary rocks.

Work continues to design and fund lab renovations at Wheaton to provide a clean lab space for my research, funding permitting. We are hoping for a small Class 1000 clean lab space that will allow me to do all of the bench chemistry required for garnet geochronology in-house and to provide Wheaton undergraduates with hands-on geochronology research experience. I will then work collaboratively with the Boston College Center for Isotope Geochemistry to utilize their mass spectrometer for final sample analysis. This is a large undertaking but would provide Wheaton students with access to facilities often limited to major research universities in a liberal arts context.

In Fall of 2019 I ended up teaching both inaugural sections of our new introductory course combining introductory environmental science and geology. I enjoy using my pedagogical training to design new classes that incorporate active learning strategies and seek to engage non-majors and future geology and environmental science majors in the exploration of our Earth, human survival needs, and the challenges inherent in Biblical creation care. Students are playing a semester-long version of a game based on the reality show *Survivor*, as they explore how geology and environmental science intersect with human needs for survival. They are also completing sustainability audits that help them explore their personal resource consumption before proposing and testing changes that could increase Wheaton's stewardship of resources. I also taught Mineralogy for the first time in Fall 2019, and I am teaching Structural Geology for the first time now in Spring 2020. We have twelve students taking Structure, who have had the added challenge of remote learning due to the Covid-19 pandemic. We had planned to have them in the Black Hills for field camp this summer but sadly those plans are on hold. We did get in a spring break trip to the Southern Appalachian Mountains during spring break before Wheaton went to remote learning, and we are thankful for that opportunity to be in field.

I also serve as the faculty adviser for Wheaton College Student Government's Executive Vice President of Sustainability, a position in its second year of existence. We are pleased to announce that the Sustainability Committee won a grant to install a garden with raised beds next to Meyer Science Center that can be used in summer research and teaching efforts and will grow herbs for the dining hall. Wheaton also has infrastructure initiatives planned that are anticipated to reduce the school's carbon footprint by 20% or more in the next five years. We cheer these changes and work for more.

Mrs. Diane Greenberg (April 30, 1951-February 5, 2020)

A TRIBUTE FROM
DR. JEFF GREENBERG

The Greenbergs began a relationship with Wheaton College Geology and the Science Station, back in 1986. I am informed that my times teaching at the WCSS covered more weeks than anyone previously. More importantly, the weeks almost always included the company of my family, and always wife Diane. She was there to encourage and support me but also to contribute to the life of our family interaction with students, faculty, and staff. Like many of the faculty wives before and during our summer's duty, Diane served that community with nurturing love. I hope that for many of the WCSS "regulars", the place will never be the same again without her there. That is how I felt after we tragically lost Dr. Dave Bruce to disease many years ago. He was a cultural fixture. Diane was a cultural fixture with a different role.

She led women's prayer times and Bible studies. She shared her spiritual and parenting wisdom in formal and many more casual settings. Diane encouraged female students to seek her for more sensitive counseling concerns. She was always ready to listen and pray. Meanwhile, she tended to the lives of our (as many as five at a time) children. She also became a very entuned tourism guide for visitors and a close friend of other wives. During our earlier years in the Hills, Diane would help in the Kitchen, do laundry, and clean up cabins for new arriving occupants.

In addition to my sweet wife's campus life affections, she was a great student, lover of God's Creation out there. It would be difficult to pick her favorite place in the Hills. She loved the open spaces and animals of Custer State Park. She also felt free and joyful, even with the progression of her cancer, at Pactola Reservoir. The beautiful scenery (sunsets!) there and especially exploits out on the water in rafts, boats, and kayaks were her delight.



I am so very grateful that even last summer of '19, she experienced the gift of paddling a kayak on a warm, sunny day. The Reservoir is up there with strong competition from the Dalton Lake road site along Little Elk Creek. My wife would spend many more hours than we could afford, just sitting with her feet in the cool water and listening to the birds. Diane was an excellent nature photographer with remarkable patience (unlike her husband). She spent hours watching and snapping the activity of insects and spiders on wildflowers. She won two advanced-amateur awards for photos taken along the Creek. It was her pleasure to take others, including children along for the adventures.

Although Diane Slinn Greenberg was wed to the WCSS as well as to me, she spent the better part of three years helping the Geology and Environmental Department at Wheaton. When we could find no one to serve as Lab Instructor for some of our Intro Geology Course lab sections, she very reluctantly (with fear and trembling) volunteered to cover for us. Her academic and employment background were impressive, but in Medicine, not Geology. She had a BS degree in Bio-technology and a minor in Geoscience. However, after devoting many hours in preparation, she boldly stepped before those 25 gen ed students (plus some majors) in each section to inspire them about God's wonderful Creation. Her labs, as some of you might remember, always began with a personal devotion, often including a geology-related parable she crafted. She was a natural teacher.

It is hoped that just as we did for Dave Bruce and for our beloved caretaker, Bob Schryvers' wife Linda, that a fit memorial can be established for Diane at the WCSS. One suggestion was to have a plaque inscribed for her at the beginning of the Mt. Wheaton and Razorback Ridge hiking trails.

Please pray for our family, that we can be lifted by the memories of that great woman and endure life without our hero.

Fall 2019 in Thailand

EMMA RIDDLE '21 ES

Last semester I studied abroad in Thailand with the International Sustainable Development Studies Institute, and I had an incredible experience with so many wonders. My cohort consisted of 12 other undergraduates from various colleges and we started off the first month in host families in Chiang Mai while learning Thai in school. We then spent most of October in four different villages near Chiang Mai learning from the people about organic agricultural techniques in comparison to conventional agriculture. Most of November we spent backpacking in the northernmost province, Mae Hong Son— we stayed in six different hilltribes learning from the Karen people about their forests and the related political ecology. In December we flew to the Andaman Sea for one final host family stay in a Muslim village and sea kayaking between four different islands as we explored the variety of ocean ecosystems, learned about how they have changed, and sought to understand the local people's livelihoods.

I have learned so much from all of the villagers and Thai people that I was blessed to live among about tending for God's creation; it was amazing to see their thoughtful care intertwined into their lifestyles. There were many Mae's and Paw's, as we called our host parents, who so selflessly welcomed us into their homes as we learned from them, and I will never forget the beauty these people encompassed. The entire experience shaped my cohort of twelve students into a tight family unit as we learned to care for each other throughout the intensities.

Though the program was focused on sustainability, our cohort bonded in a way that made it possible for us four Christians in the program to share our faith in God to our nonbeliever peers and it was evident at the end of the program that God truly moved in some previously hardened hearts. It was amazing to witness God at work so evidently the entire semester.

I am so blessed for this experience ISDSI has provided me with and for God's nearness to me through all of the lows, highs, and in-betweens. Thailand is a place I will always cherish!

REU Experience

ERIN RHODES '21 ES

It was my privilege to be part of the University of Nebraska's Research Experience for Undergraduates (REU) program this past summer. While I was there and even now, I am grateful for the opportunity to experience something so different than Wheaton. It taught me both what is beyond Wheaton and why I love Wheaton.

I lived and worked within the University of Nebraska's campus in Lincoln (home to the second tallest State capital building of all the States) which alone serves 20,000 students during the school year and was one of the first universities west of the Mississippi River as part of the federal land grant program that established research institutions that disseminate research to the public through Extension programs. In particular, UNL is known for their Agronomy research which is immediately relevant to the fields upon fields of corn and soybeans that fill the state. It was an absolute privilege to work under my advisor, Sam, who has dedicated his career to improving specifically large-scale, bio-based farming methods with his team of graduate students who came to Lincoln from all over the world, and then to see how thoughtfully growers in the area took research into practice. While sitting in a classroom in Chicago suburbs, it's easy to talk about how humans should interact with the environment and how important sustainable agriculture is, but it was a totally different experience to bike to our experimental plots every day, work alongside students who would one day be growers themselves, get sweaty under the sun, and recognize growers at the weekend Downtown Farmer's Market who let us run experiments on their property. Though I realized that I don't intend to go into agriculture or research after this summer, I appreciated how researching agriculture in Nebraska got my hands dirty in the context of real environmental challenges.

And while being in Lincoln was an immense privilege, it also showed me what I'm grateful for at Wheaton. Since I study science at a liberal arts institution, I often felt far behind in research experience and technical skills compared to my peer interns. However, once I learned the ropes for my particular lab, I began to realize that through other courses at Wheaton I had been primed to see connections and ask questions that others didn't, to read Nebraskan poetry and Native American history in the UNL library during my free time, and to communicate my research and manage communication with my mentors. I was grateful for Wheaton friends who had already lovingly taught me how to listen well and mediate conflict with my dorm suite mates. I owe Wheaton much for the skills I used to dig into this summer of learning and relationships that was so unlike what I experience during my school year and made it one I will never forget.

LUHMANN'S LETTERS

ANDREW LUHMANN, ASSISTANT PROFESSOR OF GEOLOGY

Wow, this year has been a whirlwind! I am really grateful for my colleagues and truly enjoying my interactions with our students. That said, our time with Gilles was unfortunately cut short, and I have missed seeing my students in person this last half of the semester due to COVID-19. We are also graduating a great group of seniors, and while I am confident that they will be salt and light as they enter a new chapter of life, they will be dearly missed. Some parts of this job are hard, but yet I would not choose to do anything else.

In my Hydrogeology class last spring, we joined Kyle Arney (Wheaton alumnus from 1993) in his field work at a site not far from campus, where we observed well drilling, completed surveying and water level measurements, and conducted a slug test. I also gave all of the students a karst monitoring dataset provided by colleagues elsewhere that they used to complete a class research project. We took field trips to the West Branch of the DuPage River and Illinois Beach State Park in my Process Geomorphology class this past semester to discuss fluvial, coastal, and aeolian processes and landforms. I also taught our Senior Capstone Seminar for our Geology majors this past semester, and Wheaton alumni Jeremy Vaughan (class of 1999), Frances Griswold (class of 2013), David Heidlauf (class of 1982), and Ana Meyer (class of 2004) as well as Richard Alley from Penn State and Joseph Kerski from Esri (thanks Dawn Wright (class of 1983) for putting me in contact with Joseph!) shared



ANDREW LUHMANN'06 WITH LUKE PENNY'20 HIKING IN NEW MEXICO

about a variety of geoscience careers and provided career and life advice and perspective to our seniors. This semester, I have enjoyed teaching Dynamic Earth and Environment and Water, the Essential Resource, opening students from across campus to the fields of geology and environmental science.

My karst hydrogeology and geophysics project in Florida has continued over the past year with colleagues from New Mexico Tech, the University of Florida, and the University of Alaska-Fairbanks. Luke Penney (senior with a double major in Geology and Computer Science) conducted research on the project this past summer with support from the Wheaton College Summer Research Program. Luke focused on characterizing environmental seismic noise (precipitation, wind, and traffic), which will help us to distinguish these signals from those that arise due to processes in the aquifer. Lauren Breederland (sophomore Geology major) joined me and the rest of the research team to deploy 150 nodal instruments in the week before the fall semester started. Analyses are ongoing, but one of the research highlights is that Jacob Gochenour (PhD student at New Mexico Tech) has found a discharge signal in our seismic records!

April Phinney (senior Geology major) participated in a Research Experience for Undergraduates program through the Keck Geology Consortium this past summer, working on a fluvial geomorphology project in Yellowstone with Lyman Persico from Whitman College and four students from Whitman College, Carleton College, and Washington and Lee University. I joined April and her team for a few days of field work, and we had a great time counting pebbles, surveying, and collecting samples by day and discussing research and playing Werewolf by night!

Some of the students (Claire Browning, Sophia Becker, Lucy Dykhouse, and April, all senior Geology majors) from my Hydrogeology class last spring have continued to work on the karst monitoring class research project, where we are characterizing the extent of thermal retardation at many karst monitoring sites to better understand the use of heat as a tracer in karst aquifers. Claire made a lot of progress while working on the project through the Wheaton Research Program this past summer, and Andrew Madsen (senior Geology major) decided to join our party this year!

My geologic carbon sequestration research with colleagues in New Mexico continues. Two of my Master's students published their theses recently about relative permeability and chemomechanical processes, and two other students are running additional lab tests on rock cores to assess creep and mechanical property changes that arise from interaction with CO₂-rich fluid.

SOPHOMORE DECLARATION BANQUET-
S. MOSHIER, DAVID HEIDLAUF'82, DAVID
SANDENO'22, LAUREN BREEDERLAND'22,
CALVIN BLOCK'22, SAMMY MALLOW'16



Papers

(Wheaton people in bold)

Rasmussen, L., T. Fan, A. Rinehart, **A. Luhmann**, W. Ampomah, T. Dewers, J. Heath, M. Cather, and R. Grigg. 2019. Carbon storage and enhanced oil recovery in Pennsylvanian Morrow Formation clastic reservoirs: Controls on oil/brine and oil/CO₂ relative permeability from diagenetic heterogeneity and evolving wettability. *Energies* 12 (19), 3663, doi:10.3390/en12193663.

Tutolo, B.M., T. Kiesel, **A.J. Luhmann**, P. Solheid, and W.E. Seyfried, Jr. 2020. Experimental evaluation of the role of redox during glauconite-CO₂-brine interactions. *Applied Geochemistry* 115, 104558, <https://doi.org/10.1016/j.apgeochem.2020.104558>.

Wu, Z., **A.J. Luhmann**, A.J. Rinehart, P.S. Mozley, T.A. Dewers, J.E. Heath, and B.S. Majumdar. 2020. Chemomechanical alterations induced from CO₂ injection in carbonate-cemented sandstone: An experimental study at 71°C and 290 MPa. *Journal of Geophysical Research-Solid Earth* 125, e2019JB019096, <https://doi.org/10.1029/2019JB019096>.

Abstracts

(Wheaton people in bold, see additional abstracts with the GSA list elsewhere in this issue)

Penney, L.J., S.L. Bilek, J.A. Gochenour, **A.J. Luhmann**, R. Grapenthin, and J.B. Martin. 2019. Characterization of environmental seismic noise near a karst aquifer in Florida. Abstract S23D-0661 presented at the 2019 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.

Browning, C.K., **A.J. Luhmann**, **S.M. Becker**, **L.J. Dykhouse**, **A.I. Phinney**, M.T. Childre, M.D. Covington, F. Gabrovšek, E.K. Herman, J.B. Martin, J.S. Polk, M.E. Schreiber, B.F. Schwartz, and L. Toran. 2019. Thermal retardation in karst aquifers: Field observations. Abstract H21H-1818 presented at the 2019 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.

Gochenour, J.A., S.L. Bilek, R. Grapenthin, **A.J. Luhmann**, **L.J. Penney**, and J.B. Martin. 2019. Expanding environmental seismology to karst aquifer systems: Correlating seismic power to discharge from a conduit network. Abstract S33B-04 presented at the 2019 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.

Simmons, J., A.J. Rinehart, **A.J. Luhmann**, P. Mozley, and J.E. Heath. 2019. Quantification of paragenetic controls on chemomechanical sensitivity of the Morrow B Sandstone during CO₂ injection, Farnsworth Unit, Texas. Abstract MR41C-0069 presented at the 2019 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.

Wu, Z., **A.J. Luhmann**, A.J. Rinehart, P.S. Mozley, T.A. Dewers, J.E. Heath, and B.S. Majumdar. 2019. Chemo-mechanical degradation in carbonate-cemented sandstone induced from carbon sequestration: An experimental study of CO₂-brine-rock interaction. Abstract presented at the Addressing the Nation's Energy Needs Through Technology Innovation – 2019 Carbon Capture, Utilization, Storage, and Oil and Gas Technologies Integrated Review Meeting in Pittsburgh, PA, 26-30 Aug.

Tutolo, B.M., **A.J. Luhmann**, X.-Z. Kong, B.C. Bagley, M.O. Saar, and W.E. Seyfried, Jr. 2019. The contribution of nanoscale pores to anomalous trace element release during dolomite dissolution. 2019 Goldschmidt Meeting, Barcelona, Spain, 18-23 Aug.

Gochenour, J.A., S.L. Bilek, R. Grapenthin, **A.J. Luhmann**, J.B. Martin, and S.A. Barbosa. 2019. Seismic observations of precipitation and recharge-related signals in the Floridan Aquifer at Santa Fe River Sink and Rise, Florida. Abstract presented at the 2019 Seismological Society of America Annual Meeting, Seattle, WA, 23-26 Apr.



Earthquakes and Ice Cubes

ANDREW MADSEN '20

On a sunny Sunday morning halfway through last summer, I wandered into Yosemite Chapel for the service. I had been off the grid for almost four days, having taken a long weekend off from my internship at the USGS Earthquake Science Center in Silicon Valley to go camping and explore the park. As the pastor offered up a prayer, he asked God to “be with the people in Ridgecrest who were affected by the earthquake.” “No!” I thought to myself. “I missed the Big One!” If the “Big One” had to hit the San Francisco Bay Area at some point, I wanted to be there!

After a little asking around, my ignorant Midwestern self was both relieved and disappointed to learn that Ridgecrest was actually hundreds of miles from the Bay Area, in the desert of southern California. But the M 7.1 earthquake with its M 6.4 foreshock was still the biggest to hit California in 20 years, and was understandably the hot topic during the rest of my USGS-NAGT Summer Field Internship at the Menlo Park Earthquake Science Center. Although I missed the caravan that headed straight down to Ridgecrest, I had the opportunity to head down five weeks later to swap out seismometer batteries at the China Lake Naval Air Weapons Station where the main shocks were centered, amid the bombed-out tanks and unexploded ordnance. This week of fieldwork was definitely the highlight of the summer, but I also enjoyed planning (geology) field trips through wine country, writing educational presentations about Indonesian and Californian geology, and reviewing publications during the rest of my time at the USGS.

My summer in California came just two weeks on the heels of a semester in Denmark. While studying at the Danish Institute for Study Abroad in Copenhagen, I had the opportunity to take classes in Ice Cores & Paleoclimatology and Arctic Glaciology from scientists who were involved in the deep ice core drilling in Greenland and Antarctica. The ice cores class, in particular, was one of my favorite courses I’ve taken; the class field trip to Greenland may have had something to do with it, what with hiking around the edge of the ice sheet, dogsledding on a frozen fjord, and catching spectacular views of the Northern Lights. But I also found the course material fascinating and, as I eye potential graduate studies down the road, ice coring is very much in my mind.

There are so many other highlights—geologic and otherwise—that I don’t have the space to write about, like seeing a world-class exposure of the K-T boundary in Denmark’s chalk cliffs, eating a 10,000-year-old ice cube, and finding the self-proclaimed “biggest rock in Norway.” But most importantly, my internship in California and especially my semester in Denmark stretched me in many ways; I learned greater and greater dependence on God, and I began to see how geology can serve as a door into places where people need to hear the gospel.

MORE THAN ROCKS FOR JOCKS

Lauren Breederland '22 shares what it's like to be a geology and environmental science major at Wheaton. (reprinted from MyWheaton blog <https://www.wheaton.edu/news/recent-news/2020/january/more-than-rocks-for-jocks/>)



LAUREN BREEDERLAND'22 IN FLORIDA SETTING UP SEISMIC EQUIPMENT AND (APPARENTLY) COLLECTING MOLTED SNAKE SKINS.

Before coming to Wheaton, I was pretty set on becoming a geology major, but I really didn't know the extent of the science of geology—or how meaningful the geology and environmental science department at Wheaton would become. Since the first day of my Exploring the Dynamic Earth class last fall, I have been learning more and more about the processes of the earth, and most of all, how God is the creator and sustainer of all creation. Colossians 1:17 says, "He is before all things, and in him all things hold together." I have been incredibly blessed to learn

more about how God sustains all things through the natural processes he has given us in order to study and steward His creation. Over the course of my time at Wheaton, I have realized how formative it has been to learn the science of geology from a Christian perspective. It has been a privilege to learn alongside other Christians here at Wheaton because in today's society, geology is commonly used as an argument to disprove the existence of God. I believe it is so important to learn geology from a Christian perspective, and that it is crucial for Christian colleges and universities to keep offering geology at their schools. For reference, Wheaton is one of only three CCCU schools with a geology major. A strong representation of Christians in the world of geology enables the testimony of the gospel to reach the scientific profession of geology.

At Wheaton, I'm pretty sure that the majority of students think the intro geology and environmental science class is the easiest lab science to get your Scientific Practice (SP) tag out of the way. While this may be true, I can personally verify that any course in geology beyond introductory geology is much more difficult and that rocks aren't necessarily for jocks. Something I would ask of a Wheaton student who may be trying to get their tag out of the way would be to go into the class with a posture that is open to learning more about the earth God has given us to steward.

During my three semesters here at Wheaton, I have had the opportunity to be a teaching assistant (T.A.) for two semesters so far in the Introductory Geology and Environmental Science Lab. Since Wheaton's geology and environmental science department is so small, I had the opportunity to T.A. the semester after I took the intro class. Doing this allowed me to solidify my knowledge and learn the course material better. I really enjoy being a T.A. for the department because not only do I learn the material better myself, but I am also able to help others learn. As a result of being a T.A., I have recently started considering a possible career path as a professor of geology. If I hadn't had the opportunity to be a T.A., I may not have started considering the possibility of becoming a professor.

I have found the geology and environmental science department to be a place of encouragement. From professors who graciously invite students into their homes for meals to awesome field trips with my classmates, the community that the department has created has been so important for me in my time at Wheaton. If you're ever in the basement of Meyer Science Center, feel free to stop by and say hi to anyone in the department! I'm sure they'd love to get to know you. And if you're potentially interested in geology or environmental science, we're always looking for new majors.

Majors honored in the 1st Research Poster Session Contest during Homecoming Week, October 2019

SECOND PLACE: Sophia Becker (GEOL), "Long-term Crop Rotation and Nitrogen Rate Effects on Soil Organic Carbon"

HONORABLE MENTIONS: Lucy Dykhouse (GEOL), "Modifying a Catchment-Scale Model for Structural Soundness: A Monte-Carlo Calibration of a Leaking Landscape" **Luke Penney** (GEOL), "Characterization of Environmental Seismic Noise near a Karst Aquifer in Florida" **Erin Rhodes** (ENVR), "Interactive Effects of Tarping and Bioamendments for Nutrient and Weed Management"



LUKE PENNY'20 WITH HIS SUMMER RESEARCH COLLABORATOR AT NEW MEXICO TECH LOOKING AT RECORDED SEISMIC SIGNALS FROM FLORIDA WITH THE HOPE OF DETECTING AQUIFER CHARACTERISTICS.



ALUMNI GATHERING AT 2019 GSA (L-R AROUND TABLE): GREGG DAVIDSON'85, ANDREW LUHMANN'06, VALERIE TEWELL'18, SOPHIA BECKER'20, BRADLEY DOWELL'19, HAYLEY ANDERSON'20 ES, SUSAN LEIB (WCSS'10), CHUCK CARRIGAN (ONU PROFESSOR AND WCSS FIELD CAMP INSTRUCTOR)



MEETING AT GSA 2019 (L-R) VALERIE TEWELL'18, SOPHIA BECKER'20 (HER POSTER) AND KEVIN BEFUS'08. SOPHIA CONDUCTED AGRICULTURAL RESEARCH AT THE UNIVERSITY OF NEBRASKA DURING THE SUMMER AND WILL START AN MS IN NATURAL RESOURCE MANAGEMENT THERE AFTER GRADUATION.

GSA 2019 MEETING ABSTRACTS BY FACULTY AND STUDENTS

Field Analysis Of Thermal Retardation In Karst Aquifers

BECKER, SOPHIA M., LUHMANN, ANDREW J., BROWNING, CLAIRE K., PHINNEY, APRIL I., CHILDRE, MARK T., COVINGTON, MATTHEW D., GABROVŠEK, FRANCI, HERMAN, ELLEN K., POLK, JASON S., SCHREIBER, MADELINE E., SCHWARTZ, BENJAMIN F. AND TORAN, LAURA,

Geoscience And Sustainability At The Grassroots: Preliminary Results From The Geoscience And Society Summit

WESSEL, GREGORY R., WHITE, KASEY S., GREENBERG, JEFFREY K., SHIMAMOTO, MARK AND UDU-GAMA, NATASHA

Regional And Local Controls On Groundwater Quality In Sierra Leone, West Africa

TAGNE, GILLES V., MARGASON, ANDY, GLAVNIK, ALEKSANDR, BROWNING, CLAIRE, NORRIS, RYLEE, MESA, KATIE AND ROBBINS, BENJAMIN

Estimating Conduit Diameter In An Eogenetic Karst Aquifer From Modified Water Temperature Signals

LUHMANN, ANDREW J., BROWNING, CLAIRE K., DYKHOUSE, LUCY J.,

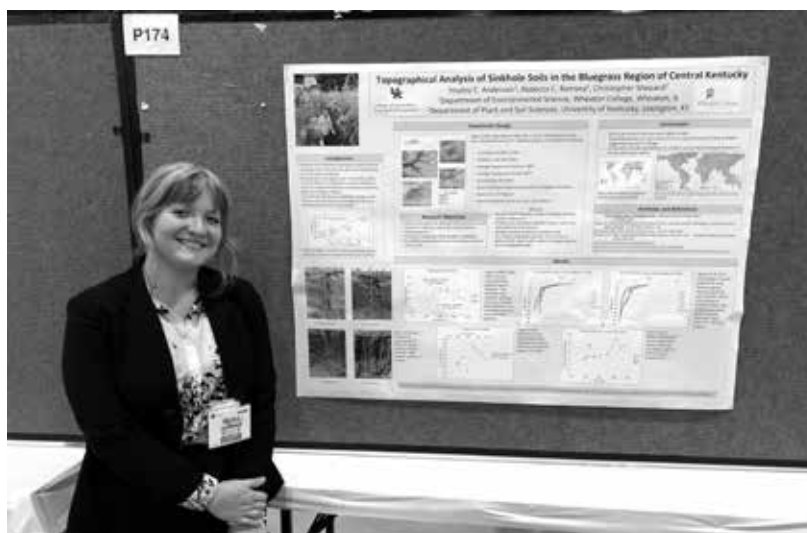
GOCHENOUR, JACOB A., BARBOSA, SERGIO A., BILEK, SUSAN L., GRAPENTHIN, RONNI, SUMMERALL, TATIANA, VAN DER VELDE, KRISTA, MARTIN, JONATHAN B. AND PENNEY, LUKE J.

Topographical Analysis Of Sinkhole Soils In Central Kentucky

ANDERSON, HAYLEY C., RAMSEY, REBECCA C. AND SHEPARD, CHRISTOPHER

Little is known about the interaction of soil forming processes in sinkholes, an abundant geologic feature of karst landscapes. We examined soils forming at varying topographic positions to better understand soil formation and biogeochemical cycling processes in sinkhole features. Soils were described and sampled by genetic horizons along a catena within two sinkholes.

The sinkholes were located outside Versailles, KY, Woodford County in the Bluegrass Region of Central Kentucky on the University of Kentucky C. Oran Little Research Center Farm. Initially, we will quantify bulk density, coarse fragment content, Munsell soil color, soil texture, pH, cation exchange capacity, and percent organic material (via loss on ignition) within the samples. Initial data suggested increased erosion from the summit to the toe slope positions in the sinkholes, which resulted in an accumulation of organic material at the base of the sinkhole. Additionally, we expect to observe greater acidity and greater presence of cations in the toeslope soils, compared to the summit and shoulder positions. These observations suggest that sinkholes may act as a carbon sink instead of a source, which influences landscape management considerations.



HAYLEY ANDERSON'21 ES CONDUCTED SUMMER RESEARCH ON SINKHOLE SOILS AT THE UNIVERSITY OF KENTUCKY AND PRESENTED THIS POSTER AT GSA 2019.

Jim Clark Recognized for Humanitarian Service Through Geophysical Innovations.

Emeritus Professor of Geology James A. Clark has been selected to receive the Society for Exploration Geophysics *Craig J. Beasley Award for Social Contribution*. This honor is in recognition of sustained humanitarian geophysics work over more than 10 years. Dr. Clark, with associates and students, developed and deployed inexpensive geophysical tools for water resource prospecting in developing countries around the world. His DIY (do-it-yourself) approach to building the instruments, published mostly in open-access scientific journals, has been adopted by missionary and development efforts. He was nominated by Colorado School of Mines Geophysics Professor Andrei Swidinsky, who discovered Dr. Clark's work and promotes it in his teaching and applied research.

Craig J. Beasley was the driving force behind the founding of *Geoscientists Without Borders*. In recognition of this contribution, the Craig J. Beasley Award for Social Contribution is given from time to time to a person or organization that, in the unanimous opinion of the Honors and Awards Committee and the Board of Directors, has made a meritorious achievement that supports the application of geophysics to a humanitarian, public service, or other socially significant cause.

Official recognition of the award will take place in October during the SEG's 2020 Annual Meeting in Houston, TX.



TOP & BOTTOM LEFT: DYNAMIC EARTH AND ENVIRONMENT FIELD TRIP AT MATHIESSEN STATE PARK. **MIDDLE RIGHT:** DYNAMIC EARTH AND ENVIRONMENT FIELD TRIP ALONG THE FOX RIVER IN BATAVIA, IL **BOTTOM RIGHT:** GILLIAN RHEA'21 DISCOVERS ANCIENT RIPPLES IN THE BARABOO QUARTZITE (APRIL 2019).



LEFT: LISA HEIDLAUF (LAB COAT) DEMONSTRATES OUR EMRIVER STREAM TABLE TO STUDENTS IN DYNAMIC EARTH AND ENVIRONMENT LAB. **ABOVE:** TWO WHEATIES MEET ON A FIELD TRIP (IT'S NOT THE OPENING LINE TO A JOKE) (L-R) KATIE FOLTZ'13 AND LINDSEY CHRISTIANSEN HENRY'05

BELOW: WHO GOT THE RIGHT STUFF? DOC MO AND PHYSICS ASSISTANT PROFESSOR JIM SCHROEDER DISCOVERED THEY BOTH LIKE TO DRESS UP LIKE ASTRONAUTS FOR HALLOWEEN.



ABOVE: EARTH HISTORY AND STRATIGRAPHY PICNIC IN BAXTER HOLLOW, BARABOO, WI (APRIL 2019). **LEFT:** DAVID'82 AND LISA HEIDLAUF, OUR LEAD LAB INSTRUCTOR, ENJOYING GOOD CHEER AT THE ANNUAL CHRISTMAS DINNER.

KEIL'S CORNER

CHRIS KEIL, PROFESSOR OF ENVIRONMENTAL SCIENCE

The biggest news for me this past year is that I spent fall semester on sabbatical. After the end of classes at the Science Station, Maureen and I stayed on in the Black Hills for a couple months. It was a great chance to explore the Hills without having the responsibilities of working at the station occupying our minds as well. I realized that though we are out in the Black Hills for months every summer, the places I go and things I do are often the same from year to year since I'm teaching the same classes from year to year. This August and September was an opportunity to explore new places and see new things. My love for the Black Hills was really enhanced and expanded. After over twenty years of going to the Hills, there are still lots of new things to see, do, and explore.

It was fun being in the Black Hills during the Sturgis rally. Being at the station with the Black Sheep Motorcycle Club was a good time of getting to know those Christian bikers and the ministry they do during Sturgis. We also got a chance to travel to Yellowstone, which Maureen had never visited before. And we were able to host guests at the station cabins and apartments through August and the beginning of September since Maureen and I were there to take care of the basics of running the place.

As you may know the water system at the station is at ground level. Pipes run above the ground and maybe a little bit below in places. That is the limitation to cold weather operation at the station. Pipes will freeze. We were hoping to stay as late as possible in the Black Hills, so we always kept an eye on the long term weather forecast. Ultimately we were able to stay until the last day of September. That allowed us to do something we always wanted to do, go to the bison round up in Custer State Park. There were thousands and thousands of people there and it was pretty neat. As I looked on the hillsides covered with people in binoculars and blankets I thought it looked like a Woodstock for bison fans.

The last day of September we finished up draining the water system and locking up the buildings. We then started a drive west. The day after we departed it snowed in the Hills, so the timing was great. On our way to the Olympia, Washington area we visited the Tetons, Craters of the Moon National Monument, John Day Fossil beds, and the Newberry National Volcanic Monument.

We spent a couple weeks in Lacy, WA with our son Ian and his wife Ally. I worked on my sabbatical projects for at least part of most days at the Saint Martin's University library, just a mile or so away from the house. We got to visit Maureen's sister and do some day trips as well. One of the highlights of our sabbatical was the day we spent hiking around and on (but not all the way up) Mount Rainier.

We then went down to California to spend some time with Maureen's family. Following that we took a long roundabout route back to Wheaton via Yosemite, Joshua Tree, Grand Canyon, Zion, and Monument Valley. There were a couple more stops on our list, but we got to a point where we had seen enough red rock and hauled it back to Wheaton in time for me to do academic advising early in November.

We then went east and spent much of November in Pennsylvania with my family. Got some good time on trails in the Appalachians. After Thanksgiving we were back in Wheaton for Advent.

Sabbatical wasn't all travel and hiking ☺. I worked on a number of projects throughout the time. The main scholarly project I was working on was (and is) a book of case studies doing applications of the sort of chemical exposure modeling that I research. The previous books and articles I've written put the theory and mathematics up front, then put example applications at the end. I realized over the past couple years through teaching professional development courses, seminars, and in discussions that a different approach to teaching modeling would be good for much of my target audience. The case study book starts each section with a story of an accident, a spill, a sickness, a compliance problem, or something similar. The "why" is developed first, then the mathematics. The general approach has gotten a good reception. The project is about 70% done which was where it was in December. It's been an interesting semester to say the least. I hope to get a chance to work on wrapping it up in the next couple months.

Another project I worked on during sabbatical was a proposal for a certificate program in Environmental Sustainability. The proposal has the program rooted in an eight week "Sustainability Summer" in the Black Hills, which will alternate with Geology Field camp. During sabbatical I also wrote up some work that a student, Grant Miller '20 ES, and I did last June. That paper just got accepted for publication! I also did some analysis and heavy thinking about some other data that I have from previous projects.

So sabbatical was a big piece of my last year. It was a great time. But I was ready to get back to teaching and working with my colleagues. ☺

Keil, C.; Miller, G. Modeling the Size of Small Spills of Pure Volatile Liquids for Use in Evaporation Rate and Air Concentration Modeling. *Journal of Occupational and Environmental Hygiene* 2020, 1–9. <https://doi.org/10.1080/15459624.2020.1751177>.



OUR ES AND GEOL MAJORS AS INDISPENSABLE TEACHING ASSISTANTS

Many alumni can undoubtedly recall their experience as Teaching Assistants for faculty and instructors in the department. Some discovered their calling to teach helping students learn how to distinguish granite from gabbro or how to interpret geologic structures from maps. We asked senior Michaela Sandeno to reflect on her experience as a geology T.A.. Michaela was also on the swim team and earned the Female Most Outstanding Participant at the conclusion of the 2020 CCIW Swimming Championship this year!

DYNAMIC EARTH AND ENVIRONMENT TEACHING
ASSISTANT MICHAELA SANDENO'20.

This spring was my third semester as a geology T.A. for the new Dynamic Earth and Environment course (combining the traditional introductory geology and environmental lab courses). I was a T.A. for two semesters with Dr. Maneiro and one semester with Dr. Luhmann, assisting with in-class activities, answering student questions during lab, and grading outside of class. Much of the outside grading had to do with the new class theme that Dr. Maneiro enacted fall 2019.

Dr. Maneiro's idea was to divide the class into teams for a semester-long game of SURVIVOR. A section of 70 students is divided into teams of 3-4 students for the SURVIVOR competition. The teams have daily rewards and immunity challenges (just like the TV show). About once a week the whole class votes a team "off of the island" (although they are still able to be in the running for the most rewards points at the end of the semester or regain status as an active team). The students receive participation points every class period for the day's challenge. Sometimes the challenges are as simple as a notes check. Sometimes the challenges are more difficult and involve calculations. The hydraulic conductivity and earthquake triangulation chapters often challenge many of the students and involve a steep learning curve.

Throughout the semester, the SURVIVOR teams also compete by conducting sustainability audits. Each team designates a specialist to compile the team's data for the week to analyze their environmental impact on Wheaton's campus. Students have timed how long they take showers, observed how much and what kind of trash and/or recycling they accumulate, recorded how much food they intake, and measured the electricity usage of their dorm rooms. After completing all the audits, the students plan and conduct an experiment that could help with developing sustainability practices on Wheaton's campus. Finally, their data and findings are presented to the class at the end of the semester.

Being an in-class T.A. for geology has been such a blast. I have loved getting to know the students as well as learning more while helping teach students. I will be attending Wheaton's Grad school in the fall for a Master's in Teaching, with a focus on secondary education, with the intent of teaching geology. I have made some amazing friends through being a T.A. and it has helped prepare me for a future of teaching. One thing I know for sure: the professors and students have definitely left a positive impact on my life.

Doc Mo's Memoir

STEPHEN O. MOSHIER,
PROFESSOR OF GEOLOGY

This year has been full of surprises. In early May, I was surely surprised to receive two more coronary stents, but recovered and was ready to join faculty at the Wheaton College Science Station only a few weeks later in June. I have been much more intentional about physical fitness and mindfulness ever since, including Yoga for old people twice weekly (doctor's orders).

My son Zachary drove from Seattle to Rapid City to spend the last of my three weeks at WCSS with me in July. He brought along Lucy, his young, frisky Australian shepherd. The Black Hills were a second boyhood home to him and his brother. We toured around old haunts while I collected specimens for a new Sedimentary Geology course that will become part of our summer field camp program. I joined Zachary on the drive back to Seattle and we took our time crossing Wyoming, Montana, Idaho, and Washington. Along the way we stopped at the Indiana University Geology Field Station in Cardwell, Montana where I attended field camp during the nation's bicentennial summer (43 years ago)! I had called ahead, so it was wonderful to be greeted by the Station Director and be given a tour by one of the young faculty. Except for some new buildings, it really had not changed (much like our beloved WCSS). We also stopped to visit Farragut State Park in Idaho, not far from Spokane. I attended the Boy Scouts National Jamboree there in 1969, which coincided with the week of the Apollo 11 lunar landing. This was a meaningful way to celebrate the 50th anniversary of that momentous event. The park is located where the waters of glacial lake Missoula broke out across the Columbia River Plateau, carving a wondrous landscape of scablands, coulees, and instant river valleys. We were sure to visit some of the best of those landforms before we crossed the Cascade Range and descended to Seattle.

Another highlight of the summer was being part of the host team for the 2019 American Scientific Affiliation meeting at Wheaton College in late July. The meeting was held during the actual anniversary week for Apollo 11, so one of my contributions was to make sure that no one at the meeting forgot about it. With all the technical sessions for the meeting held in Meyer Science Center, I turned the Geology and Environmental Science seminar room into Mission Control, displaying items from my collection of books and memorabilia from the Apollo era. The room's TV



NEW DISPLAY OF SEDIMENTARY STRUCTURES IN OUR DYNAMIC EARTH AND ENVIRONMENT LAB.

monitor displayed a website devoted to replaying mission audio, video, and photos in "real time" 50 years removed. ASA members at the meeting included the senior project scientist for the Hubble Space Telescope, Jennifer Wiseman, and a former "corporate astronaut" (for training and life support systems development), ASA Executive Director Leslie Wickman.

In mid-August, Ethan Knoll, a local high school student who is interested in Earth science, volunteered some three weeks of his time to help me with "chores" around the department. We met at our Rock Sale in April. Ethan asked if he could help me with anything, so I put him to work. Remember those rocks I

collected in the Black Hills? Ethan cut the stubs for thin sections. Both of us created a display of sedimentary structures for our intro lab (stuff that's been "in the closet" for decades). It's a seriously good exhibit featuring ripple marks, graded bedding, an impact crater shatter cone, mud cracks, and raindrop impressions (see photo)!

Other activity this year was mainly devoted to course development; two reasons for that. First is that the whole department collaborated on the new combined introductory Earth and Environmental Science course. For me, that involved rewriting the sedimentary rock and rock cycle/Black Hills labs. With the untimely departure of Dr. Tagne, I picked up two sections of the new introductory lab mid-Fall semester and the Energy and Climate Change course during spring semester. I have invited some guest lecturers, via skype, to the latter course, including Joel Moore '00 to share with students how they have dedicated their professional work to climate research and entrepreneurial green-energy development, respectively.

Finally, in November my son Joshua and his wife Carrie elevated Carol and me to grandparent status.

As for teaching remotely during the viral pandemic? That's a whole 'nuther story!

Recent Publications

Moshier, Stephen O., and Bahaa Gayed. "Geological Investigation of the Ballah Depression, Northern Suez Canal Zone, Egypt." In *Excavations in North Sinai: Tell el-Borg II*, edited by James K. Hoffmeier, 5-20. University Park: Pennsylvania State University Press, 2019.

Moshier, Stephen O. "Identification and Provenance of Elite Stones found at Tell el-Borg." In *Excavations in North Sinai: Tell el-Borg II*, edited by James K. Hoffmeier, 355-364. University Park: Pennsylvania State University Press, 2019.

Media Appearances

Appearance in Theatrical Movie Documentary *Patterns of Evidence, The Red Sea Miracle* (2020)

Appearance in Nat Geo TV Documentary *Buried Secrets of the Bible with Albert Lin, Parting of the Red Sea*, S1E1 (2019)

Do you have a Perry Mastodon Story?

The Perry Mastodon was discovered in 1963 and excavated by Wheaton College geology faculty and students. But you all know that! Stephen Moshier is planning to write a book about the beast during his Spring 2021 sabbatical. If you have a Perry story, such as participation in excavation, restoration, pranks...any special memories... please share them. Contact stephen.moshier@wheaton.edu.



**Department of Geology
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STUDENTS IN THE FIELD



LEFT:STUDENTS (ABOUT TO GET WET?) ALONG LAKE MICHIGAN DURING A PROCESS GEOMORPHOLOGY FIELD TRIP (FALL 2019) **TOP RIGHT:** JIYOUNG PARK'23 ES LOOKS A BIT CONCERNED LOOKING AT SOLIDS RECOVERED FROM THE WHEATON WASTE WATER TREATMENT PLANT. #STUFFWEFLUSH. **BOTTOM RIGHT:** DOC MO WITH STUDENTS ON A FIELD TRIP.