



2023

Geological and Environmental Sciences Community 2023



Thomas R Howe

DEPARTMENT OF DEPARTMENT OF GEOLOGICAL
AND ENVIRONMENTAL SCIENCES

12/20/2023

GREETINGS FROM THE DEPARTMENT CHAIR

Dear faculty, staff, students, alumni, emeriti, and friends,

Another year of hellos and goodbyes, accolades, and achievements, and in true geological fashion, stability, and change. In May of 2023, we lost one of the “great ones” with the passing of Dr. Lloyd Schmaltz. I deeply appreciate hearing the stories of Lloyd’s kindness, generosity, and geological adventures. Many thanks to those of you who were able to join members of the department, his friends, and his family for the gathering. If you were unable to attend, a wonderful memorial put together by John Yellich is included in this newsletter. I am sure all the chairs, faculty, and staff of this department would agree that we owe much of our success to Lloyd’s foresight, generosity, and determination.

Another face we will dearly miss in the department is Dr. Michelle Kominz, who retired in August of 2023. During her career, Michelle was world renowned as an expert in global geophysics and basin dynamics. When I was early in my faculty career here, I bumped into an acquaintance from graduate school at a conference. When I shared that I was now at WMU, his eyes got huge, he looked thoroughly impressed, and he said (I quote): “Do you actually know Michelle Kominz? She is a superstar.” And that is how I found out that my office was two doors away from greatness! Stories aside, Michelle contributed more than highly cited papers and outstanding research to the department - she created and taught the wildly popular Ocean Systems course

and served for many years as the undergraduate advisor, tasked with helping students to navigate the many hurdles to graduation. I know that many of you are grateful to her for keeping you on track so that you can earn your degrees in a timely (or slightly less than timely) manner.

Perhaps the most critical new person in the department, certainly more important than the department chair, is our Program Manager and office coordinator. Cristine Thomas joined us last spring, after Lisah Crall accepted a promotion to join the College of Arts and Sciences Budget office. Cristine is already proving to be the go-to person for all issues large and small, a source of help and advice for students and faculty, and an endless supply of coffee.

I am particularly pleased to share that the Michigan Geological Survey not only received continuous state funding of \$3 million in the past year, but they also received an additional \$5 million over the next 5 years to support aggregate mapping. Thanks to the hard work of John Yellich and the WMU Legislative Affairs team, we were awarded just under \$6 million to support the purchase of a new facility to house both the Survey offices and the Michigan Geological Repository for Research and Education (MGRRE). Efforts are underway to purchase, build, or renovate a new home. This funding has also allowed us to hire new continuing staff, including MGS Assistant Director and Director of MGRRE Autumn Haagsma, Senior Research Associates Nathan Erber, John Esch, Amber Conner, and Ashley Quigley, Research Associates Evie Murgia, Greg Anderson, and Jennifer Trout, and staff Jessica Meskil, Marie Solom, Garrett Ringle, and Nolan

Gamet. Additional hires, including a search for a new Director, are underway.

Our staff and students continue to be recognized for their accomplishments. Faculty and staff published 19 peer-reviewed papers in 2022-23, 12 of which had a student as the first author. Faculty and staff also acquired over \$1.2 million in new external funding and gave 57 presentations (38 student presentations) at 10 different conferences. Dr. Mine Dogan was honored for her work with the Michigan State Police in the WMU Cold Case program, in which she uses geophysical techniques to locate buried evidence in unsolved murder cases. Based on her experiences with this program, Mine is creating a new course in forensic geosciences that I am sure will be a hit. We are also working with the WMU College of Aviation to highlight Dr. Mine Dogan's and Dr. Mohamed Sultan's courses in drone applications to environmental issues as part of launching a new undergraduate program in unoccupied aerial vehicles. Our students earned research grants, travel grants, fellowships, and awards from both outside and inside of WMU, including a clean sweep of the WMU Graduate College Research Poster Day awards. Read on to hear about their accomplishments! Finally, between Fall 2022 and Fall 2023, we welcome to the ranks of alumni 4 PhD recipients, 12 MS recipients, 5 hydrogeology certificate graduates, and 22 BS graduates.

My professional highlights of the past year include returning to my undergraduate institution, Smith College, to run a week-long NSF-funded Teaching Petrology workshop with colleagues John Brady, Sarah Mazza, and Clem Hamelin. We

brought together 30 instructors of earth materials, igneous petrology, and metamorphic petrology courses to develop innovative new teaching materials for connecting petrology to 21st century societal issues. I particularly enjoyed reconnecting with New England geology on our field trip to a gorgeous basalt quarry, complex igneous intrusion, and dinosaur footprints along the Connecticut River. I plan to incorporate some of these new activities into my Intro to Earth Materials course in the coming year. My research group had an excellent showing at the North-Central Geological Society of American meeting in Grand Rapids in May, and a few of us also attended the national GSA meeting in Pittsburgh in October, where I introduced Cristine to the fine art of using stickers to lure prospective graduate students into coming to WMU. My research group has now three students working on their dissertations - congrats to Chris Woodley, new mom Kristen Foley, and Timi Popoola for reaching this stage! Doctoral students Nina Morris, Chenyu Wang, and Lydia Yeboah are starting their early research requirement, and Rosa Carolina Ayala Calvo joined our group this fall. When not in the office, I enjoy my garden, reading science fiction, hiking, and birding, practicing driving with my younger daughter, and visiting colleges with my oldest.

Please continue to read the rest of our newsletter to hear updates from your professors, find out MGS and MGRRE news, learn about student clubs and field trips, and get news from the Hydrogeology Field Course. Please think of us as you plan your giving in the coming year. Thanks to your generous contributions, last spring we awarded 24 student scholarships totaling

just over \$29,000. Our scholarship funds are healthy, so donating to the unrestricted department fund allows us to support students and faculty where it is needed most. Your contributions help our students engage in classes and field experiences, and to prepare for careers as future geoscientists.

Stay warm, Geo-Broncos, and think of spring (and geological field trips).



Contemplating the Connecticut River Valley from the top of the Holyoke Range.



Timi, Heather, and Nina doing our impression of the Village People at GSA Pittsburgh.



2023 Intro to Earth Materials students learning to use their hand lenses correctly at MGRRE.

FACULTY UPDATES

DAN CASSIDY



Greetings to all of you!

I continue researching per- and polyfluoroalkyl substances (PFAS) with my Colleague Matt Reeves and our graduate and undergraduate students. In fact, we have co-authored 3 peer-reviewed articles on PFAS in Michigan in 2023 (including one that is out now in electronic form but has a publish date in 2024). We also have multiple conference presentations on PFAS, including at GSA and NGWA.

I am also lucky to be working on an applied project to research ways to remove chloride from surface water. As you well know, we use a lot of road salt in Michigan to de-ice roads for safety. The Chloride released has had very seriously negative impacts on the surface water in Michigan and elsewhere in the Midwest, as well as in Canada. Matt Reeves is also working on this project, as well as a MS student from Oman, Marwan Al Hinaai. Marwan is doing wonderful lab work on various critical issues and measurements associated with the impacts of road salts, as well as on samples from Asylum Lake and other surface water nearby bodies.

I continue to teach 6000 (Hydrogeochemistry), GEOS 5060 (Introduction to Soils), and GEOS 5450 (Hazardous Waste Remediation). I am also director of our graduate and undergraduate Hydrogeology Certificate Programs.

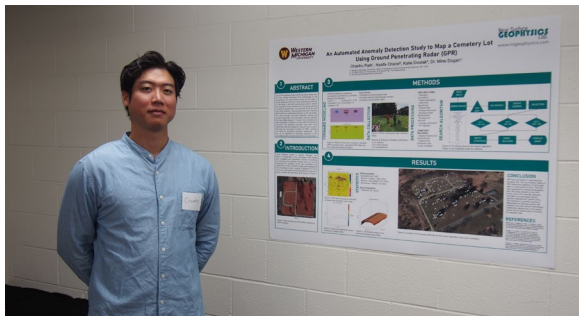
MINE DOGAN



Many things have happened in the Near Surface Geophysics Lab. (NSG Lab.) since last year including setting up a new lab space, creating a whole new website (www.nsgeophysics.com), getting the coolest field gears, and showing up in the news here and there. The Near Surface Geophysics Lab has been working in collaboration with WMU Cold Case Program and Michigan State Police using geophysical methods in assisting a criminal investigation. As the geoforensics consultant for the project, we have conducted several fieldworks utilizing airborne magnetic gradiometer, on-ground magnetometer, and Ground Penetrating Radar to locate evidence required to solve the case. We are very motivated and grateful for being offered this opportunity to help our community. While the events of

the crime occurred over 50 years ago, resolving the crime will hopefully offer the family members a form of closure in their lives. The investigation is still on going and it is exciting to see a different aspect of utilizing geophysical methods outside of the usual environmental work we do.

My doctoral student Chanho is getting closer to his own retirement (aka dissertation defense) from WMU and working hard by collecting, and processing drone-based data over several landfills (photo below is from one of his field trips). He will be presenting the initial findings of his research at the American Geophysical Union 2023 Fall Meeting in San Francisco. My other student Aylin has been working on her research interests of wetland contamination and saltwater intrusion. A study site is in discussion with local officials in Kalamazoo and NOAA (National Oceanic and Atmospheric).



I have started teaching Introduction to Geophysics course and having a lot of fun introducing my students to the fascinating world of physics and geophysics. We have been experimenting using basic tools such as springs, dynamos, and galvanometers to explore the fundamentals of geophysical methods and my students are sharing their experiences via creating colorful hand drawn/handwritten posters. They are up in the display case by the department office if you want to look. I am also excited to

offer Groundwater Modeling class (I took it over after Dr. Hampton retired) next semester for the first time. And finally, I am in the process of creating a new "Geoforensics" course to offer in fall 2024 as part of our collaboration with Criminal Justice/Cold Case Program.

JOHNSON HAAS

This last year has gone by quickly. Classes are coming along nicely, with enrollments strong. We're finally time enough past the 2020 pandemic that supply lines are (largely) working again, and I've been able to return to using a rock and mineral kit for GEOS 1000 that I far prefer, but which had disappeared for a couple of years, forcing me to switch to another kit that got the job done but didn't have as many samples. We are going back to using a 75-sample kit that covers a much greater variety of rock-forming minerals, ore minerals, and major rock types.

In January, I harvested some scion cuts from an old, heirloom variety pear tree on the farm in Alabama, and started them as grafts to some pear rootstocks in April. Only one took, but I plan to cut more scions in the coming winter, cut back the rootstocks where grafts did not take, and re-graft with new scions' next spring.

In addition to operating the WMU Community Garden during the summer months as usual, from New Year's to late May I kept busy doing landscaping work and moving rocks around to extend the gardens around my house, all in preparation for a backyard wedding. Mine, specifically. In June, Olivia and I got married. The rhododendrons were in full bloom and the

hydrangeas were starting to grow panicles, and the weather was genuinely nice except for it being 35° C outside in early June. Luckily, there was not any Canadian wildfire smoke, yet.

Olivia's attire included her grandmother's veil, and mine included my father's US Army Air Corps-issue 1942 Hamilton pocket watch that he carried as a B-17 navigator in WWII. The wedding was attended mostly by Olivia's family and a few of our longtime friends. I would have invited more of my family, but that would have required a séance.



The wedding was also attended by an unexpected screech owl that just basically sat on a tree and watched the whole thing, while everyone asked me if it was real. It was one of a pair nesting in a large white oak in the yard. A pair of mallard ducks flew down and landed in the koi pond just after the ceremony. They live there when they feel like it.



In late summer, Olivia and I adopted two kittens from the Kazoo Cat Cafe, which I highly recommend. Addy and Hawaiian Punch joined the household to become friends with already-living-here Heidi the black cat.



Late in summer we also adopted two new pullets to add to our backyard chicken flock; a heritage Rhode Island Red and an Ayam Cemani, which is totally black, even her eyes, but no, they do not lay black eggs.



On my most recent visit to the farm in Alabama the cotton on our acreage was just starting to be harvested. I managed to collect a few potential bonsai candidates from another section of the acreage that is a horse pasture, from small maple and pine trees that had been bush-hogged many times for many years and so are heavily stunted but with comparatively large trunks, which is a desirable bonsai trait.

STEVE KACZMAREK

As I settle comfortably into my ninth year at WMU, I am enjoying some perspective on my chosen profession. Mostly, I have been thinking on my morning walks to work how fortunate I am. Sure, work can be stressful sometimes, but to spend my days on a college campus is really a professional dream realized. The daily benefits from living in an academic environment are plentiful. The students do their best to keep me from thinking fresh thoughts, and my colleagues readily provide much appreciated wisdom. I very much appreciate that I get to pursue interesting questions, challenge myself to learn more every day, and to think about nature alongside really smart and interesting people. I take none of this for granted.

My lab team, the CPCL, continues to be exceptionally productive. We have published a number of papers in the past year, and made impressive showings at the northcentral GSA meeting in Grand Rapid in May, and the IAS meeting in Dubrovnik, Croatia in June.

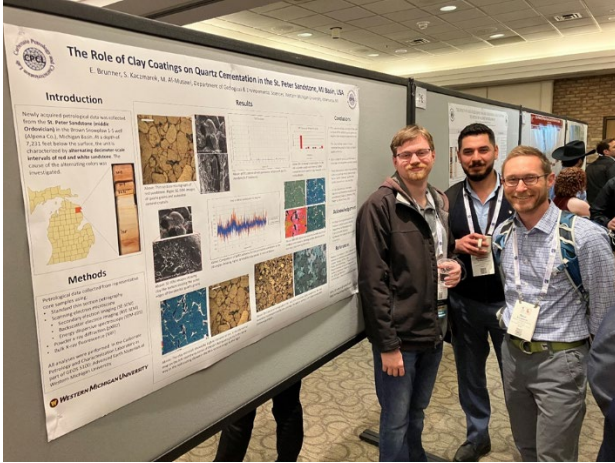


In between technical sessions at the IAS conference in June 2023, CPCL team members, Steve Kaczmarek, Ariel Martin, and Ashley Scott are all smiles as they enjoy the warm sunshine, and beautiful waters of the Adriatic Sea in Dubrovnik, Croatia.



The CPCL team in front of the new WMU Student Center (left to right: Saeed Norouzi, Ariel Martin, Steve Kaczmarek, Ashley Scott, Nathaniel Ledbetter Ferrill, and Mohammed Al-Musawi,). Photo credit: Tom Howe

Between these two conferences, CPCL researchers presented 13 papers. Nine of the presentations were authored by CPCL graduate students, who I highlight below. The remainder of the presentations were delivered by a subset of undergraduate students that had successfully completed the inaugural semester of my new Advanced Earth Materials course.



Undergraduate researcher, Eric Brunner, poses in front of his GSA poster with his research project advisors, Mohammed Al-Musawi and Steve Kaczmarek. Eric was one of four undergraduates from the new Advanced Earth Materials class that presented his research project at the conference.

Though challenging, this class continues to be an absolute pleasure to teach. I really enjoy watching the students, each of whom works on an independent research project, evolve technically and professionally during the semester. I am also still having a blast teaching Sed-Strat.

Of course, the highlight of the semester was the annual field trip to northern Kentucky, and a visit to Carter Caves State Park.



The Sedimentation and Stratigraphy class is all

smiles for our annual field trip photo at Carter Caves State Park in northeastern Kentucky.

In addition to running a research lab and teaching courses, I was elected as co-editor of the Journal of Sedimentary Research in January. First published in 1931, JSR is the oldest earth science journal dedicated to the field of sedimentology. It is the flagship publication of SEPM (Society of Sedimentary Geology), and I am honored to be at its helm. With the new position, comes a significant increase in my workload, but it has given me the opportunity to work outside my immediate discipline, and to interface with researchers through the world. The work is both challenging, but immensely gratifying.

Getting back to what I am most proud of: our amazing graduate researchers. We have so much to celebrate this year. We did a lot of geology, published some nice research papers, attended several scientific conferences, won some cool awards, and even found some time to have some fun. Here are a few updates on our fantastic graduate researchers and CPCL alumni collaborators.



CPCL team members, Ariel Martin, Ashley Scott, and Mohammed Al-Musawi, treated their advisor, Steve Kaczmarek, to a field trip to Silver Beach, St. Joe, Michigan, in May 2023. Their walk along the pier was followed by a pizza eating contest, an axe throwing session, and more delightful conversation around an evening bonfire.

Mohammed Al-Musawi (Ph.D.) is currently putting the finishing touches on his Ph.D. dissertation. Throughout his years at WMU, he has worked on a number of projects in Qatar and the Michigan Basin. His Ph.D. project, which is largely funded by ExxonMobil Research Qatar, has produced some very interesting results that the potential to upend our current thinking about dolomitization in shallow marine settings. This fascinating research is the subject of a handful of manuscripts that will be published in the coming year. Mohammed will soon defend his dissertation, and in February, he starts a post-doctoral research position at Yale University.

Ashley Scott (Ph.D.) continues unraveling the diagenetic history of the Saluda Fm. outcrops in southern Indiana. Despite being a common field trip stop, very little is known about the dolomites that comprise the majority of this section. Ashley's detailed petrological characterization has already led to a number of important insights about the timing and conditions of dolomitization in peri-tidal carbonates. Her scientific conference presentations have all been well received, and she is now working on writing her results in a series of manuscripts that will be submitted for publication in the coming months.

Ariel Martin (Ph.D.) is still neck deep in collecting data for her NSF-funded project,

which focuses on using high-temperature laboratory experiments to investigate oxygen isotope fractionation in dolomite. Her efforts and attention to detail have allowed us to answer some fundamental questions about the dolomitization reaction, particularly during the early stages. Her conference presentations this past year have gained the attention of key researchers in the field. Ariel is currently preparing a number of manuscripts based on her findings.

Nathaniel Ferrill (Ph.D.) joined the CPCL this fall after earning his B.S. with honors from Trinity University in San Antonio, TX. There, he worked on various carbonate-related research projects. One of Nathaniel's first tasks was to help me and Mohammed Al-Musawi teach the Advanced Earth Materials course. In terms of research, Nathaniel has started investigating the spatial variations in dolomite abundance and mineralogy in the Byron Fm., work that builds on a class-based research project in my Carbonate Petrology.

Saeed Norouzi (Ph.D.) joined the CPCL in August after a long and unanticipated delay. He comes to us after earning his M.S. from Shahid Beheshti University in Iran. Saeed's current research project builds on his M.S. thesis, which investigated the Khaneh Kat Fm., a series of Triassic age dolomites in the high Zagros of south-central Iran. Saeed is currently collecting new mineralogical and geochemical data by applying our detailed, integrative characterization approach to better constrain the timing and conditions of dolomitization.

Our CPCL Alumni Collaborators continue to represent WMU by accomplishing

amazing things in the world of geology. Here are a few highlights. **Dr. Mohammed Hashim (Ph.D., 2022)** is now in his second year of a post-doctoral research position at Woods Hole Oceanographic Institute in Massachusetts. **Katharine Rose (M.S., 2021)** recently started her new position as a research scientist at Los Alamos National Lab in New Mexico, and Ph.D. student at Arizona State University. **Dr. Cameron Manche (Ph.D., 2021)** continues his role as a post-doctoral researcher at Texas A&M, and adjunct professor at San Jacinto College in Texas. **Dr. Brooks Ryan (Ph.D. 2020)** remains a research geologist for Chevron in Texas.

As always, you can keep up with what we're doing by following us at:

<https://www.researchdolomite.com/>

Matt Reeves

Hello everyone! It's been another productive year with several highlights. First of all, Garrett Link and Dr. Xiang Fan successfully defended and graduated with their respective M.S. and Ph.D. degrees. I'd like to welcome two new members to the research group - **Kristen Hasbrouck** and **Rami Mansouri**. Both are pursuing a Ph.D. and have made exceptional progress during their first semester. Kristen is investigating PFAS movement and retention along the capillary fringe at Camp Grayling on a DoD funded project, and Rami is investigating the feasibility of artificial recharge in a fractured basalt aquifer in Saudi Arabia. Please welcome them to the Department if you haven't already.

During the last year, **Dr. Xiang Fan** published his dissertation work in

Hydrogeology Journal. It's a highly mathematical paper with some nice contributions to the theory of dispersivity tensors and their higher-order symmetry.

Ethan Coffin successfully published an invited paper on PFAS transformations in landfills in *Current Opinion in Environmental Health & Science*. He was also recently awarded the 2023 AJ Birkbeck Scholarship for PFAS Research and 2023 Michigan Water Environment Association Scholarship for his work on PFAS in foams. Speaking of foams, Ethan has developed a novel foam sampler and has been using this to study spatiotemporal distributions of PFAS in foams formed during wastewater treatment. Initial data show that PFAS in foams can be concentrated 100 to 10,000 times greater than in liquid effluent.

Donovan Vitale has rejoined our research group, this time as a Masters student. His undergraduate thesis involved performing a plant-scale mass balance associated with a PFOS-dominated AFFF spill at the Kalamazoo-Battle Creek Airport that reached the Kalamazoo wastewater treatment plant. It was the first study of its kind and was published in *Water Research*. Donovan is also interested in the presence of PFAS in foams formed in



Photo from GSA North-Central Section meeting in early May. Students from left-to-right - Donovan Vitale, Ethan Coffin, Kai Trobisch, Garrett Link, and Justin Honer.

natural surface waters, and has identified 25 sampling sites throughout the state using EGLE reported sightings and information collected from raft and kayak guide services.

Garrett Link recently published his research on PFAS in biosolids from 190 Michigan wastewater treatment plants in *Journal of Hazardous Materials*. His study was the largest biosolids dataset compiled for the U.S., and represents a geographically-diverse range of WWTPs serving communities of various sizes and industrial activity. The paper has generated substantial interest and I've

been invited to present our results at a PFAS-themed Air & Waste Management Association conference in January.

I'm pleased to announce that **Justin Honer** has decided to pursue a Ph.D. to further advance his research. He's investigating how volumetric contraction networks form in various media (rock, clay, and soil) and has been developing a novel code that simulates this process, beginning with the initial master joints and commencing with fully mature polygonal networks. Justin is also performing mud crack experiments in the laboratory to better understand the formation of volumetric contraction networks and to effectively link his code with experimental data. He's currently working on a manuscript to *Journal of Geophysical Research* detailing how

volumetric networks control fluid and contaminant movement in rock.

Katie Strohauer has changed her thesis to a very ambitious study to help EGLE with a new water quality program that investigates the spatial distribution of water chemistry in private wells across the state. The analysis suite includes many trace elements, some of which are emerging contaminants and others like arsenic are known contaminants.

Kai Trobisch has made some nice progress on identifying the number of wastewater treatment plants utilizing rapid infiltration basins, and modeling the migration of PFAS in the wastewater effluent to the water table. The code he is using takes air-water interface adsorption into account, although preliminary findings are showing this retention mechanism is likely not important for these systems due to relatively high moisture content.

I'm working with **Marwan Al Hinaai** and Dr. Cassidy on a new project in collaboration with Kieser & Associates to evaluate the potential for chloride removal from stormwater at Asylum Lake. Marwan has worked very diligently in the laboratory performing experiments as a proof-of-concept. His preliminary results have been very encouraging.

On a personal note, my older daughter is a senior in high school and we have been busy taking university tours and applying to various colleges/universities. Her younger sister is right behind her as a junior so it'll be a hectic two years, and then my wife and I will be empty nesters.

Mohamed Sultan

Greetings Alumni and Friends,

The Earth Sciences Remote Sensing (ESRS) facility continues to be a dynamic and productive unit in the GEOS Dept. Mohamed Elhebery earned his Ph.D., published his findings on the Late Ordovician ice sheet dynamics in EPSL, and is now a Visiting Assistant Professor at Hope College. Our distinguished ESRS Research Associate Karem Abdelmohsen secured a postdoctoral Research Scholar at Arizona State University School of Sustainability working with Dr. Jay Famiglietti. Our earlier graduates are making us proud: Richard Becker and Adam Milewski were recently promoted to Full Professor positions at the University of Toledo (Richard) and the University of Georgia (Adam), Mohamed Ahmed was tenured at Texas A&M Corpus Christi and Racha ElKadiri at Middle Tennessee State University.



Basilica of Saint Francis of Assisi in Italy where the joint (NASA-ESA) meeting was held on Nov 2-3, 2023

Our ESRS team has now seven Ph.D. students and a Senior Research Associate (Mustafa Emil) who are working on various projects in the UP and the Middle East in the general areas of economic geology, hydrology, land deformation, neotectonics, and geomorphology. This work is enabled

by multi-year, recently (2023) funded, awards to WMU, from the National Academy of Sciences, the USGS, King Saud University, and by ongoing funding from NASA and the Qatari government as well. Applying integrated approaches, Mary Elizabeth Shalifoe is assessing the distribution of critical minerals in the UP, and Ahmad Badawy and Hesham Sabry are looking into global warming and whether it will bring more floods to downstream countries of the Nile basin, and if it does how to make use of it. Along the same lines, Hassan Saleh and Hadi Karimi are assessing the frequency and intensity of extreme precipitation events and cyclones in Arabia and whether they are replenishing Arabia's fossil aquifers.

Abdullah Ibrahim is using field, structural, geochronologic, and radar interferometric data to examine whether the Gulf of Aqaba is correctly classified as a failed rift or is still extending. Mustafa is developing a fully automated radar interferometric system to monitor land deformation across the entire country of Qatar. To the best of my knowledge, we are the only university that developed such a system. I am appreciative of the efforts of the ESRS research team and fortunate to have them by my side. It is always fun for all of us to present our work on national and international platforms. I was asked to present our work on the contributions of GRACE to arid land hydrology in a joint NASA-European Space Agency (ESA) meeting in the charming city of Assisi in Italy three weeks ago and seven of us will be presenting at the AGU Annual Meeting in San Francisco (Dec 11-15). The ESRS team is looking forward to seeing as many of you there.

Peter Voice

Good day everyone!

As always, the department has kept me busy. Earlier this week, I submitted my tenure portfolio as I am going up for tenure and promotion this year. Writing and compiling the portfolio gave me a chance to summarize my career at WMU. I have taught 72 sections of 18 different courses since I started teaching at WMU in Fall 2012. I have expanded the reach and impact of the CoreKids program. I have put together a variety of papers, guidebooks, and maps for MGRRE and the Michigan Geological Survey. I even developed a taste for university service by spending three years on the College of Arts and Sciences Curriculum Committee - even chairing it for one year.

In terms of teaching, this summer, I had a lighter load than usual - just two weeks of field mapping. I took 5 students to Marquette for the annual field camp. This Fall I dusted off a course I had not taught in a long time - Ocean Systems. With Michelle's retirement, I am teaching the Ocean Systems course. She gave me a variety of resources for the course and I am better prepared to teach it now than when I first came to WMU. I am also teaching Dinosaurs! once again - 290 students signed up for the course, making it one of the highest enrolled courses in the College of Arts and Sciences again (the last couple of times it has been taught it has filled up to 300 students!). I am also teaching a graduate survey course on clastic petrography and provenance. In the spring, I am going to be busy with an honors section of Dinosaurs, Earth History, and Structural Geology.

CoreKids is slowly waking up from the Covid doldrums. In the last year, we have done 23 events, reaching approximately 7000 people. Late October and November host a couple more scheduled events and we will likely interact with 5000 more students and teachers by the end of the year! This is a stunning turnaround from the near inactivity of 2020 and 2021 and light activity of 2022. I cannot claim much of the credit for this - instead I would like to thank our very engaged cohort of primarily undergraduate students in the WMU Geology Club who have been active participants in our outreach program, running events (and even in a few cases tracking down new events!). The other new development that has given the program new energy is the hiring of a new Outreach Coordinator at the Michigan Geological Survey, Marie Solum. Marie has experience as a K-12 teacher and a background in environmental consulting and a strong education in geology. She works with me closely and has been taking the lead on many of our outreach events, developing new displays and activities and working with the WMU Geology Club to find students able to help with our events. Marie, Heather, and I prepared a training course for our students who want to do outreach - making sure that they understand the gravity of working with minors. Marie and I went to the Michigan Alliance for Environmental and Outdoor Educators in September - where we worked with the Michigan Earth Science Teachers Association booth and rock shop. She also assisted me with a field trip that I ran to the Rockport State Recreation Area. During the field trip, the teachers collected fossils and learned from my co-leaders about bats in the park and student projects that had been done to improve the park.



Identifying fossils for teachers at Rockport State Recreation Area, Michigan Alliance for Environmental and Outdoor Educators Conference field trip 2023. Picture taken by Marie Solum.

My term as President of the Michigan Earth Science Teachers Association is winding down and by the time this newsletter reaches you, I will have transitioned to Past President (which is still an active board position!). I have also agreed to serve as their Field Trip Coordinator after my term ends. This was unanimously approved - as I co-led their field trip to Menominee in 2021 and led their field trip to Manistique in 2022.

Like much of the Department, I went to the 2023 North-Central GSA meeting in Grand Rapids - it was a hectic meeting for me. Prior to the Conference, I co-led a tour of the Core Repository. During the conference, I co-chaired with Steve Mattox (Grand Valley State University) a session on

K-12 Education and Outreach, where I also presented a talk on using our Dinosaur Park for student engagement and public outreach. After the conference, I had the exciting opportunity to co-lead a field trip to Grand Ledge. This post-conference trip's leaders came from Albion College, Calvin University, Grand Valley State University, Michigan State University, and Western Michigan University. Heather and I represented WMU. The trip was to highlight the use of Grand Ledge's geology and parks in college-level courses as a field experience for students.



A collage prepared by Linda Harrison showing some of the special cores we had on display for the field trip to MGRRE as well as Bill, Peter, and Robb leading the trip. North-Central Geological Society of America Pre-Field Trip. Pictures taken by Linda Harrison.

I had an exciting adventure this past summer - co-leading a Research Experience for Undergraduate Students project. My colleague, Jay Zambito and I kept a group of 9 undergraduate students from around the country busy. The project was designed to provide more information about the Middle Devonian units in the northern Michigan Basin. The project was funded by a Keck Foundation grant. The students came to Kalamazoo in early July to work at MGRRE for a week. We had a selection of cores laid out that covered the interval from the upper Traverse Group,

the "Squaw Bay Formation", the Antrim Shale, and Ellsworth Shale.



A first look at cores. The Keck Project Students are examining their first core. Picture courtesy of Linda Harrison.

The students described each core and worked with Jay and I to develop individual projects. Their projects included:

- 1) Redescription of the Traverse Group in core and attempting to correlate from the core to the outcrop belt
- 2) Redescription of the "Squaw Bay Formation" as part of a larger project to rename the unit
- 3) Description of the diagenesis of the Traverse Group and "Squaw Bay Formation" at the contact of the unit using optical and scanning electron microscopy.
- 4) A bedrock map of Alpena County
- 5) Three Students collected samples from multiple cores to run elemental analyses (x-ray fluorescence), organic carbon isotopes, and magnetic susceptibility. These projects looked primarily at the Antrim Shale.

- 6) A mineralogical characterization study of the Ellsworth Shale
- 7) A statistical analysis of laminations in the Ellsworth Shale



The Keck Project Students visiting the WMU Dinosaur Park. Picture courtesy of Jay Zambito.

They worked hard to collect the samples necessary for their projects during the rest of the week. They did get a brief break to visit the Schmaltz Geology Museum and Dinosaur Park. After finishing collecting samples, Jay and I took the students over to Beloit, Wisconsin so that the students could work on analyzing their samples in Jay's laboratory at Beloit College. We spent two weeks working on preparing samples for later analysis (x-ray diffraction samples, organic carbon isotopes) and analyzing other samples (x-ray fluorescence, optical microscopy). The student mapping Alpena County developed a database of formation tops from oil and gas wells in the county and worked on a preliminary geologic map. With some data in hand, the students worked on compiling a poster presenting their research projects and preliminary results in the last couple days at Beloit. Our next stop was in Cleveland, Ohio, where we met up with

the pre-conference field trip for the Devonian Stratigraphic Commission. This was an opportunity for the students to see rocks outcropping in the field that were similar to the rocks they looked at in the cores. The pre-conference field trip eventually took the students to Geneseo, New York, where SUNY-Geneseo was hosting the conference. Our students were approximately half of the students present at the conference - and they were active participants, presenting their poster, asking questions for the speakers, and socializing with other students and researchers from around the world interested in the Devonian rock record. At the end of the conference, Jay and I put the students on planes to go home - but their projects didn't stop there. Most of the students are using this project as part of their undergraduate thesis or capstone projects. We also plan on having the students present their work at the 2024 joint North-Central/South-Central Geological Society of America meeting.



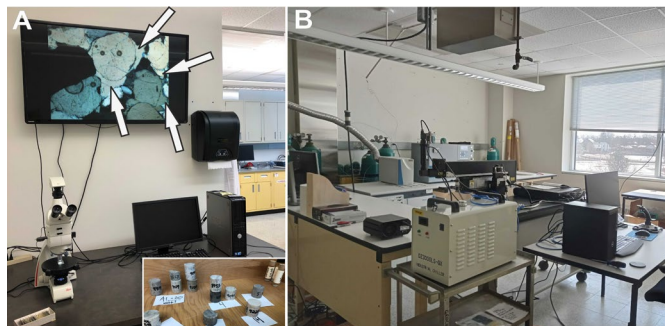
The Keck Project Students with Jay and I at an outcrop of the Panama Conglomerate in northwestern New York.

I wish everyone a good year!

David Zakharov

Wow, I cannot believe I have been here for almost a year now! This has been a very dynamic year for me and my lab. First, I welcome the 3 PhD students -- Afrid Sheik, Israr Hussain and Zack Stevens -- they joined my lab this Fall 2023. They put their trust in my newly formed lab and relocated across the country/globe to start their pursuits. For that I am grateful. Afrid is coming from West Bengal with a Master's degree from the Jadavpur University in Kolkata, India. Israr is coming from Karachi in Pakistan and previously earned a Master's degree from Voronezh State University in Voronezh, Russia. Zack is originally from Indiana and comes back to the Midwest after earning a Master's degree from Central Washington University (Ellensburg, WA). Our group is busy with multiple tasks ranging from building stainless-steel vacuum lines to locating rocks from old collections and plotting them on the map. My personal focus has been on resurrecting the existing mass spectrometer Delta V+ from a dormant state (3+ yrs). With ups and downs, the spectrometer is almost to a full speed and the vacuum apparatus is nearly ready to convert rocks (complex inorganic structures) to simple gases (H_2 , O_2 , CO_2) for isotope analyses. Over the summer 2023, our Earth Science major, Evan Angeski participated in a new project in my lab that was based on documenting beautiful quartz overgrowths from the St. Peters sandstone (see photo of the overgrowths in panel A). That current state of the lab is closely reflected in Panel B. Summer was also busy with travel to the NAGT Early Career faculty workshop and Goldschmidt geochemical conference in Lyon, France. I am now finishing the

second instance of teaching GEOS1300 and I am looking forward to doing it again next semester!



MICHIGAN GEOLOGICAL REPOSITORY FOR RESEARCH AND EDUCATION (MGRRE)



As we write this newsletter, we remember the many talented students and dedicated professionals that we have been privileged to work with since 1982, when Bill started the old Core Lab. We are excited to share this update about our activities. Many of you made this work possible.

Industry Outreach and Workshops



Workshop participants, October, 2022

We are finally back to the activity level we experienced before Covid. This year we welcomed industry and academic visitors who searched for geologic samples and data to support their mapping and research related to Basin geologic history, assessment of oil, gas, and mineral resources, carbon capture and storage, and infrastructure development. We presented a workshop in October, 2022, at the Grand Traverse Resort in Acme. Twelve speakers from industry, government, and academia discussed their research and field experiences with 157 participants.



Workshop Speakers, October, 2022

In May, as part of the annual North Central Section of the Geological Society of America (GSA), Peter Voice and Bill Harrison conducted a one-day core workshop at MGRRE. Examining cores from

18 wells, participants could lay hands on rocks from the Upper Precambrian through the entire Paleozoic, and from the Pleistocene. The oldest cores were 1.1 billion years old; the youngest were just 10,000 years old.



North Central GSA Core Workshop at MGRRE In April, 2023

Through a Keck Foundation grant, Dr. Jay Zambito, Professor of Geology, Beloit College and Dr. Peter Voice, Faculty Teaching Specialist, Western Michigan University, welcomed nine undergraduate students from across the United States to MGRRE in July. They examined and sampled cores from the Traverse-Ellsworth interval.



Peter Voice (4th from left) helps Keck students examine core at MGRRE

New MGRRE Director

We are very happy that Autumn Haagsma joined us in January, 2023, as our new MGRRE Director and Assistant Director of the Michigan Geological Survey. Formerly with Battelle Memorial Institute, Autumn is a nationally-recognized leader in Carbon Capture, Utilization and Storage (CCUS). In April, Autumn Co-Chaired the National CCUS Conference in Houston. More than 1400 participants met to share ideas about climate change and carbon storage.



Autumn Haagsma, MGRRE Director, delivered opening remarks at CCUS conference in Houston

Autumn has already secured a grant from the DOE for approximately \$1M, titled “Advancing CCUS in Michigan,” which is focused on detailed characterization of confining systems, leakage risks, and societal considerations. Our team is working on developing additional proposals for grants which align with our research interests in carbon sequestration, hydrogen storage, data preservation, and data accessibility.

In addition, Autumn and the MGRRE/MGS team have developed a quarterly newsletter to share all the work and updates with anyone interested. We also include a core highlight, to share our knowledge of Michigan geology. To read the newsletters, follow the link below!

https://issuu.com/michigan_geological_survey

Our research and student activities—a Year in Summary

- Our students did the heavy lifting, literally, continuing our core photography project to photograph 9000 boxes of core in the next 3 years, funded by the USGS National Geological and Geophysical Data Preservation Program (NGGDPP). The photographs, as well as other electronically available data, are freely available for viewing and downloading <https://scholarworks.wmich.edu/mgrre/>



Luke Martin and Chris Redlon organizing cores for photography



Christian Fuentes photographing cores

We just started to tackle another three-year project to rebox and reinventory our cuttings collections. All these resources will then be more accessible for student education and use by industry and government. The photographs, as well as other electronically available data, are freely available for viewing and downloading at <https://scholarworks.wmich.edu/mgrre/>



12,512 boxes of cuttings in manila envelopes with Jen Trout in green at the left

CCUS Research continues

Bill Harrison, Jennifer Trout and Autumn Haagsma continue to work on a DOE grant through Battelle Memorial Institute to research Trenton/Black River reservoirs for potential Carbon Capture, Utilization and Storage. They are compiling data about reservoir quality, stratigraphic and geographic distribution of potential reservoir zones. We are also working with Battelle as part of a 20-state consortium called the Midwest Regional Carbon Initiative (MRCI, www.midwestccus.org). These resources will allow stakeholders to more effectively assess specific areas for carbon storage potential.

USGS Cooperative Agreement

Finishing a one-year cooperative agreement with the USGS in September, Bill Harrison, Linda Harrison and Jen Trout compiled formation data and reservoir

characteristics for all Lower Michigan sedimentary formations. That data will be used further in several other research projects and for industry outreach.

Fueling student education

Several WMU Department of Geological and Environment Sciences classes visited MGRRE throughout the year to examine cores and use them in their laboratory assignments.



Dr. Kaczmarek teaching his carbonate sedimentology class



Dr. Voice discusses cores with his students



Dr. Petcovic shows students how to describe cores

Students from many of Michigan's universities and colleges visited MGRRE to examine and work with cores. No other Michigan institutions of higher learning have a core archive.



Bill Harrison discusses samples with Rachel Agardy and her CMU students



Susan Breightol and her MSU sedimentology class spent a Saturday here examining cores

It has been an incredibly busy year, and we are grateful for that.

We always look forward to hearing from you and hope you will visit us whenever you are in Kalamazoo. Until we see you again, we wish you peace, joy, and good health.

MICHIGAN GEOLOGICAL SURVEY

Greetings fellow alumni and friends,

For the last 10 years, I have summarized Michigan Geological Survey (MGS) successes and challenges as they have occurred as the Director of the MGS. Now, after thirty years of scientific dormancy, Michigan has turned the corner with \$3.0 M annual State funding and MGS has begun to function as a scientific geologic resource for the State at Western Michigan University, Geological and Environmental Sciences Department (GES). MGS has hired a team of professionals and incorporated the existing significant geologic staff of the MGS/Michigan Geological Repository for Research and Education (MGRRE) into the foundation of the Michigan Geological Survey. The mapping and geological programs of the one-person survey were initiated in 2013 and continued in priority areas and has been acknowledged by the Michigan Departments and citizens. We have placed the names and pictures of the current MGS staff in this Newsletter summary and encourage all who know them to reach out and send them congratulations and success. Since 2013, the last ten years, with limited financial support and awarded grants, MGS has served as the one-person Survey. MGS crafted and developed that practical geological research with support from MGRRE and faculty staff, that has been

recognized by the citizens, Departments within Michigan and the Michigan Legislature much of this for the health and welfare of the State. MGS has continued to support a number of MS and PhD students. Currently MGS is training a number of them in field and data management, WMU students, graduates and other geoscientists to support the State of Michigan through our mapping, drilling and data compilation, presentation and publications. The current MGS professionals are proceeding to expand the support of the scientific needs of Michigan. MGS is also acknowledging that MGS wants to selectively offer part time geological employment/training to qualified Michigan and local university students, as needed. MGS is positioned to provide field and technical training for the future geoscientists on a limited basis. MGS has published three quarterly newsletters, "Core Quarterly" and these can be accessed on the MGS QR code below:



MGS has been invited to and had over 150 informal and structured meetings, formally presented PPT presentations, including testifying to House Aggregate mapping session and both a House and Senate budget hearings in 2022 and 2023. MGS has been interviewed on matters related to water, Precambrian minerals and bluff issues. The questions are still being asked about why do the aggregates have to be mined in my backyard? Part of that answer

is, Michigan does not know where the water resources nor do we know where are the potential aggregate resources located and they be only located in your backyard, where you live, because Michigan had not done sufficient mapping. That is changing and MGS is the recipient of a second new Legislative grant of \$5.0 M over five years to identify, map and present the location of aggregates throughout the State for all the county and local government staff and citizens to have access to the data and MGS has a \$4.0M combined annual budget for the next year or more.

MGS continues to apply for an receive grants from the USGS, the State and currently, we have been averaging over \$300,000 per year. We now have the staff to conduct the work and apply for additional Federal matching mapping funds, 1:1 dollar for dollar. MGS received a special grant in 2019 through the EGLE water division (WRD) and EGLE -MPART to support the water resources and to provide data to support the tracking of PFAS transport in the Michigan subsurface geologic formations, the Triage Project. The Triage grant has escalated to \$2.9M over 3+ years and is providing immediate data support to the Health and Welfare of the Michigan water resources, the Wellogic water well data program, correcting existing locations (560,000 wells) and digital input of ~700,000 historic well records (1950's to 2003) into the only Michigan database. MGS has completed ~70% of the ~1.2+ M wells in the database having the only subsurface data in Michigan that was NEVER validated for location, with an average of 35% of those wells not located on the correct property. Triage is now a virtual program which has allowed MGS to increase staff by advertising to all

the Michigan Universities. This along with networking for candidates/students to be employed by MGS to increase the staff to achieve greater production and to work at any time. This search resulted in a favorable statewide response from Lake Superior State, Central Michigan, Eastern Michigan, Grand Valley State, Michigan State and also out of state, i.e., Georgetown, Colorado School of Mines, Univ of Colorado, Univ of Texas and Illinois, to name a few. MGS this year has had on average 28 staff working on this project, which includes Grad and Undergrad students, recent graduates who are entering Graduate School or are working until they find employment. The MGS Triage project has a formal hiring and training program to achieve the highest quality data entry staff. The Triage team has been expanded, refined and successfully managed by two highly qualified staff, Project Manager, Sophia White, a WMU BS Alumni, promoted to Project Manager, when Evangelia Murgia was hired as the MGS Hydrogeologist. The Digital Input Coordinator is now Eylse Gagne, Central Michigan BS, who replaced Garrett Ringle, (CMU) just hired as an MGS Geologist. The Triage team has produced training programs and converted them to YouTube training videos, to make training and re-training more consistent, which has increased the quality of the work done by all the Triage staff. MGS also continues to provide, at the request of EGLE-MPART, detailed geologic and hydrologic data summary reports for specific locations having PFAS. Detailed documentation to better understand the groundwater and surface water flow, geology and bedrock within a 2-5-mile radius of the contaminated area, not provided in many existing consultants reports. A total of 68

data locations have been provided to date.

The new Federal budget bills will provide more opportunities for MGS and MGRRE to apply for funds to map and collaborate with industry on working towards a better understanding of Climate Change and our contributions to meet our national goals of Carbon, Hydrogen and utilizing the Michigan geology.

MGRRE has generated their project and funding summary in this newsletter.

MGS has been supported by Geological and Environmental Sciences faculty, staff and students, plus consultants to conduct and maintain much of this research and produce the MGS professional publications and products for the State of Michigan during these ten plus years. MGS continues to receive letters of support from the Michigan Departments of Environment, Great Lakes and Energy (EGLE), EGLE-Water Resource Division (WRD), Department of Natural Resources (DNR), Department of Agriculture and Rural Development (MDARD), United Tribes of Michigan, Michigan Farm Bureau, Michigan Groundwater Association, and Michigan Aggregates Association, all who support the MGS programs and existing projects.

MGS continues to support collaborative research on bluff stability and changes dating back to the 1990's with Drs. Ronald Chases and Alan Kehew's research, now using UAV Remote Sensing technologies to monitor the changes and potentially project where future failures can occur, at low and high lake levels. This research has funded a PhD and professional publications and will hopefully fund other students to work with direct and indirect remote sensing methods to understand physical

changes in the surficial geology in many changing areas, not just near the bluffs.

MGS began supporting data acquisition in the Upper Peninsula (UP) in 2015 and in subsequent years, MGS has endorsed USGS Aeromagnetic data acquisition and received a USGS Earth MRI grant to map and better understand the geology in this Dickinson County area to determine if we have any geologic potential for Critical Minerals through an MOU with Michigan Tech. The MGS 2023 annual funding has allowed the hiring of a three person UP Precambrian geologic team, led by Ashley Quigley who is now collaborating with all the UP-State Departments (EGLE), MTU, other Universities and industry with the other MGS geologists. MGS was recently informed that USGS is in receipt of additional airborne geophysical data through a data swap they arranged with industry, a collaboration, which will allow MGS to expand our UP mapping to include the majority of the Western UP with a partnership with USGS and MTU. Mapping and correlating the geophysics with ground truthing the geology, a combined team. This will result in continued support to map in areas having potential geology favorable for US Critical Minerals in Michigan with the USGS Earth MRI funded mapping project utilizing MGS and Michigan Tech geologists, scientists and students.

MGS has continued with other Michigan mapping and geological projects throughout the State. The Ottawa County water issues are being geologically supported with drilling, installing monitor wells and mapping and now expanded into Allegan County to map and assess groundwater with groundwater monitoring, and publishing these two county maps and

technical report, an example of MGS collaboration with any County providing detailed geologic support, in priority areas.

Lastly, MGS is most appreciative of the strong Legislative (Senate and House) support, funding bills, for annual funding of the Geological Survey and the MGRRE facility to sustain the data collection for the water, infrastructure, critical minerals and climate change issues facing Michigan and the US. Annual funding, has allowed MGS to hire staff to expand the current water, infrastructure and natural resource support and to seek additional Federal Funding, not seen since the 1980's. We all hope that this will be successful so that MGS can continue as a functioning State Department at Western Michigan University in the Geological and Environmental Sciences Department and to train the next generation of geoscientists.

MGS is also in need of additional funding to support the expansion of the MGRRE repository, now filled. We hope that all alumni and friends will support this funding request, so not just WMU but all Michigan and regional universities can continue to come to MGRRE to train the next generation of environmental, mining, energy supported geologists utilizing the rock and data records stored at the MGRRE facility.

This 2023 GES Newsletter highlights are some of our current successes, short, to the point and presents some of the current MGS facts. You may see more details of the MGS products in the MGS Quarterly Newsletters, as found on our website. <https://wmich.edu/geologysurvey>

Lastly, I would like to personally provide a memorial summary for Dr. Lloyd J.

Schmaltz, the Geological and Environmental Sciences Department Chair, 1958 to 1987. I sent out over 600 emails to Alumni and friends to invite all to attend a Lloyd Schmaltz memorial event sponsored by the Schmaltz family. I received comments from many of you, some with regrets but also some who came and many of you specifically noting the impact Dr. Schmaltz had on your career. Dr. Schmaltz was the mentor and guiding strength of not just my geologic career, that began in 1962, but to so many other successful geologists, faculty and community members during his term as Chair and in subsequent years when he and Marilyn Schmaltz continued to support WMU and established their scholarship program. One of the many significant achievements was when Dr. Schmaltz established the first Advisory Council at WMU in the Geology Department in 1983 and now, an Advisory Council has become a template for many WMU departments to evolve and grow. I have attached the memorial retirement plaque presented to Dr. Schmaltz in 1987 by that GES Advisory Council. I know I share much gratitude for all the WMU alumni, faculty and friends who were influenced by Lloyd J. Schmaltz.

Thank you, Lloyd!

-John



John Yellich, Director and Alumni



Schmaltz memorial attendees at Lawton Ridge Winery.



Lloyd J. Schmaltz 1987 Retirement Plaque
Rock hammer, leather removed, filed smooth and plated with 24K gold, by John Yellich, in 1987. The Schmaltz family wishes this to be placed in the Schmaltz Museum.





Butch (Lloyd) and Jane Schmaltz, Brian and Lynne Walters, David Schmaltz.



To Lloyd and Marilyn Schmaltz...Thank you!

GEOSCIENCES ADVISORY COUNCIL

Fellow Alumni,

As current chair of the WMU Geology Advisory Board, let me thank you for reading this and considering my call to action. I'm pleased that we've now been able to convene twice in person after a few years of zooming. It's beginning to feel back to normal again. In October, the annual WMU Geology Department Alumni Gathering was very much a success. We

had a blast seeing old friends and frenemies and remembering our glory days while doing some professional networking. For me, it's a highlight.

I'm excited to let everyone know that the department and advisory board have now developed two separate events (Spring and Autumn). The Spring meeting will allow us to head back to Rood Hall to see what the research is at WMU and to mingle with the current crop of aspiring geologists. The Geoboree in 2024 will be on Friday, April 12. If your company is looking for entry level employees, this is a great place for you to be. If you want to help the students with guidance and mentoring as they begin their professional careers, I fervently request your attendance at this event. Check out their Posters and Talks, Get Involve! Be the alumni you wish had been in your life...



Revel and Roll alumni homecoming get together 2023 was so fun!

As always, the autumnal meeting will continue to focus on our wonderful alumni. We are currently looking for some new people to join the planning committee so please reach out if you're interested in any amount of volunteerism.

(wlaton@fullerton.edu or 714.296.4055)

It's a great time and we'd love to get you

involved in the planning and most importantly, your attendance. Look for announcements on social media and through the regular alumni channels about the 2024 get together.

Finally, as we near the end of the year, please think about donating to the department [giving page](#). Every dollar truly helps a student.

Finally, please keep in touch and make sure the department has your current [contact information](#).

Richard Laton

2023 Department of Geological and Environmental Sciences DISTINGUISHED ALUMNI

Franklyn Legall - MS '98, Ph.D. '02 - Director, Global Environmental Remediation and Due Diligence, Procter & Gamble



The Department of Geological and Environmental Sciences at WMU is extremely pleased to offer its distinguished alumni award for 2023 to Dr. Franklyn Legall, Dr. Franklyn Legall, who graduated with both a Master of Science and Ph.D. from Western Michigan University in hydrogeology, has over 25 years of experience in Health Safety and Environment (HS&E). Legall is the Director, Global Environmental Remediation and Due Diligence at Procter & Gamble (P&G) located in Cincinnati, Ohio. Legall joined The Gillette Company (Gillette) as an Environmental Remediation Manager at its Boston corporate headquarters in 2003, and then Procter & Gamble via its 2005 acquisition of Gillette. He currently oversees the cleanup of a portfolio of legacy and active contaminated sites worldwide, in various geologic settings and regulatory jurisdictions, with complex technical and regulatory issues and legal challenges, including third-party claims, litigation and insurance recovery.

Legall began his career as a geologist in oil and gas exploration at Petro Canada, Inc., a Canadian multinational, located in Calgary, Alberta. Legall then launched a successful small business in Calgary, which he owned and managed prior to moving to the U.S. Before joining Gillette, Legall spent eight years in environmental consulting in Michigan where he managed environmental projects at the federal, state and local levels. Prior to his current role, Legall was a technical leader within the Global Innovation HS&E Group (GI HS&E) at P&G.

Legall holds a Bachelor of Science and Master of Science in Earth Sciences from the University of Waterloo, in Ontario, Canada. He obtained his Juris Doctor (JD)

from the Massachusetts School of Law and is a licensed attorney in Massachusetts and a member of the Massachusetts Bar, and the American Bar Association. He is also a member of the Association of Professional Geoscientists of Alberta (APEGA); the National Groundwater Association (NGWA); and is a Certified Hazardous Materials Manager (CHMM).



Dr. Legall receiving his award from WMU College of Arts and Sciences Dean Carla Koretsky, in October 2023.

GEOLOGY CLUB AND AIPG STUDENT CHAPTER

The AIPG (American Institute of Professional Geologists) Student Chapter at Western Michigan University (dba Geology Club at WMU) has been thrilled to be back fully in person after a few difficult years of remote learning and not being able to meet in person often enough and were very honored and humbled to have been selected as the AIPG National Student Chapter of year in 2023! Our very first meeting back in September was full of a diverse and excited group of new members and familiar faces, eager to be a part of a

great organization, learn more about the big world of geosciences and how to make new, in-real-life friends with common shared interests and the common goal of raising awareness and fostering unique experiences related to geology and the geosciences.

In September, I went to the AIPG National Conference as the student chapter representative. Being able to go was an amazing experience, and I was able to talk to older members about the profession after college. I was also able to go on two field trips where I learned about Karst geology of Indiana and fossils, which we can find in Ohio. This was an honor to be at the conference and to be chosen as the chapter's representative.



Geology Club/AIPG Student Chapter Vice President Gabe Fox, accepting our award at the AIPG National Conference in Kentucky

One of the first orders of business for the WMU AIPG Student Chapter was the election of the executive board members for the year 2023-24. After the dust settled and each of the prospective board

members had a fair chance to campaign, the following members were elected to the Executive Board for this year:

President - Donovan Vitale: 1st year, MS Geosciences major
(Donovan.s.vitale@wmich.edu)

Vice President - Gabe Fox: 2nd year; Hydrogeology major
(ava.g.fox@wmich.edu)

Secretary - Mina Bohl: 4th year; Elementary Education major
(maximina.r.bohl@wmich.edu)

Treasurer - Jordyn Gibbs: 4th year; Biology major and earth science minor
(jordyn.l.gibbs@wmich.edu)

WSA Representative - Mary Howe; 4th year Public and non-profit leadership major
(mary.e.howe@wmich.edu)

Thanks to generous support from the Department, alumni, friends, and families, we were able to go on a once-in-a-lifetime opportunity trip to Ireland! Thirteen students in total attended the trip. Six students had strong geologic backgrounds while the other seven had diverse backgrounds including teaching, fine arts, biology, civil engineering, nonprofit administration, and environmental studies. During our trip to Ireland, we visited various breathtaking geologic locations including The Cliffs of Moher, Doolin Cave, Giant's Causeway, and Malin Head. For each day of the trip, a pair of students oversaw researching the events and geologic locations of the day to instruct the other students. We also got learn more about Irish culture and history by interacting with locals, touring Irish Castles, and visiting some classic Irish Pubs



WMU Geology Club in Ireland 2023

Since September, our Chapter has been having our regular weekly meetings, Mondays at 3pm, that have been very well attended. We have established several standing committees: Fundraising, Education and Outreach, Marketing and Communications, Field Trip, Museum and Program committees. Each of these committees has worked extremely hard and logged countless volunteer hours so far! The club has been hosting and participating in A LOT of events. One of our first and biggest events of the year was the WMU Bronco Bash. The Student Chapter met with hundreds of WMU students and talked to them about AIPG and what it is that geologists do. We gave away rock candy, quartz crystals, fossils, broke open geodes and challenged them to a game of Whack-a-Dino! It was a TREMENDOUS success, and we had a line of people that wrapped around the block waiting for spin to win and talk with us!



Bronco Bash 2023 was such a tremendous success! We could not believe how many people would wait in line for a free rock!

A week later we helped host the WMU Geological and Environmental Science Alumni, Friends, and Family “Tools of the Trade” Homecoming gathering at Revel and Roll in Kalamazoo where we honored our amazing 2x alumni and rockstar, Dr. Franklyn Legall, PhD, with a very well-deserved achievement award! Our volunteer student members got the chance to network with alumni and ask questions about careers and advice about the world of geosciences. Students helped with the event activities and got the chance to raise funds by selling rock and mineral samples and merchandise.

To help identify where we will be going for our annual spring geology field trip, we did a “Donate to Decide” fundraiser at the event, giving those who attended the option to help pick the location of the AIPG

student chapter annual spring trip. The friends and alumni voted and this spring the Chapter will be going to Chile to visit the Atacama Desert among other excellent field stops and excursion sites planned along the way. We are very excited to make this once in a lifetime journey and create some unforgettable memories! To this end, we have been busy fundraising and planning the trip.

Throughout the semester, the Geology Club at WMU has been exceptionally active in organizing a diverse range of events and activities. We embarked on an adventurous road trip to Bear Cave with a group of 10 people, providing members with hands-on geological experience. We also displayed our creative side by orchestrating a punk rock concert in the Student Center, featuring three live bands, and drawing in a substantial crowd of over 150 attendees. Adding a spooky twist to our repertoire, we successfully executed a haunted house in the Rood Hall basement. Demonstrating a commitment to community engagement, we hosted the “Chili for Chile” cook-off competition, not only fostering a sense of camaraderie but also raising funds for the spring trip. Moreover, we participated in various educational outreach events with the Children’s Playscape, Portage Northern Middle School, and the Boy Scouts of America to introduce young students to geology and get them excited. Securing \$8,000 in lapidary equipment through a well-crafted proposal, the club is poised to host rock-polishing events throughout the year. Fundraising for the spring trip, we have hosted over 10 rock and mineral sales around campus and participated in a two-day Holiday craft show.



Student Chapter teaching some of the general student body how to use our newly acquired lapidary equipment.



Our first rock sales of 2023 have been a tremendous success for our Student Chapter and made some great new connections with students!

Earlier this semester, the Program committee welcomed a guest speaker, Sienna Meekhof, from SME. Sienna talked to our student members about careers, opportunities, and ways to connect with

other professional organizations. Would you be interested in talking with our student chapter? Please let us know! The WMU AIPG student chapter formal meeting is held every week and to engage members to get to know others in the club, but there are also lots of other formal and informal events scheduled.

The Chapter has been super busy and super involved this year! We are looking forward to connecting soon with the members of AIPG-Michigan Section and the other AIPG Michigan student chapters. To reach even more people about the amazing aspects of geology and AIPG, the members have taken to social media via Facebook and Instagram. Look out for regular postings about geology, and unique geological locations. Please like and follow us on social media on Instagram:

@wmugeologyclub or on Facebook
@Geology Club at WMU, or you can reach out to us directly at
wmugeologyclub@gmail.com

Would you also be willing to help support us by donating to our Ireland geology trip?

We are more than halfway to our goal of \$15,000!! Let us know if you would be willing to assist us!

Donations to the WMU AIPG Student Chapter can be sent directly (without fees) to our Treasurer, Jordyn Gibbs on Venmo @Jordyn-Gibbs-1 (security code is 7141)

We would be so grateful if you wanted to! As the fall semester starts to wind down, we are excited to continue in full force in planning the spring trip, fundraising, and make memories and lasting connections!

Spring Awards and Honors 2023

Faculty, Staff, and Student External Awards

Ranked on Research.com as one of the top 5,000 Best Earth Scientists in the world:
Dr. Mohamed Sultan

2022 El-Baz Student Research Award for Desert Research, Quaternary Geology and Geomorphology Division of the Geological Society of America: **Mohamed Elhebery** (PhD Geosciences)

Awards for Geochronology Student Research (AGeS2), National Science Foundation: **Abdullah Ibrahim** (PhD Geosciences)

2022 SEPM Society for Sedimentary Geology Student Research Grant: **Mohammed Al-Musawi** (PhD Geosciences)

Environmental Research and Education Foundation (EREF) Research Scholar: **Chanho Park** (PhD Geosciences)

Geological Society of America Travel Grant: **Ariel Martin** (PhD Geosciences)

North-Central Geological Society of America Travel Grant: **Ashley Scott** (PhD Geosciences)

National Association of Geoscience Teachers (NAGT) Outstanding Teaching Assistant Award: **Kristen Foley** (MS Geosciences)

2023 American Institute of Professional Geologists (AIPG) National Student Chapter of the Year: **WMU Geology Club / AIPG Student Chapter** (Avianna Jackson - President; Moira Burns - Vice President; Mary Howe - Secretary; Garrett Link -

Treasurer; Will Roosien - WSA Representative)

American Institute of Professional Geologists (AIPG) National Undergraduate Student Scholarship: **Donovan Vitale** (Geophysics)

American Institute of Professional Geologists (AIPG) - Michigan Chapter Student Research Poster Awards: **Donovan Vitale** (Geophysics) - 1st place, undergraduate; **Ariel Martin** (PhD Geosciences) - 1st place, graduate; **Ashley Scott** (PhD Geosciences) - 2nd place, graduate

WMU Staff Awards

2023 Semi-Annual Make a Difference Award: **Lisah Crall**

WMU Graduate Student Awards

Gwen Frostic Doctoral Fellowship: **Ahmed Badawy** (PhD Geosciences)

Graduate College 3M Thesis Competition, People's Choice Award: **Hassan Saleh** (PhD Geosciences)

Graduate Research and Creative Activities (Department-Level) *Doctoral* - **Mohamed Elhebery**; *Masters* - **Garrett Link**

Graduate Teaching Effectiveness (Department Level) *Doctoral* - **Mohammed Al-Musawi**; *Masters* - **Justin Honor**

Graduate College Research Grants: **Mohamed Elhebery** (PhD Geosciences), **Hesham Elhaddad** (PhD Geosciences), **Abdullah Ibrahim** (PhD Geosciences), and **Hassan Saleh** (PhD Geosciences)

Graduate College Travel Grants: **Ashley Scott**, PhD Geosciences

Graduate College Research and Creative Activities Poster and Performance Day Awards: **Ariel Martin** (PhD, Geosciences), **Abdullah Ibrahim** (PhD, Geosciences), and **Chanho Park** (PhD, Geosciences)

College of Arts and Sciences Climate Change Research Scholarship: **Ahmed Badawy** (PhD Geosciences) and **Hassan Saleh** (PhD Geosciences)

WMU Undergraduate Student Awards

Presidential Scholar: **Donovan Vitale** (Geophysics)

Phi Beta Kappa: **Brianna Salome** (Hydrogeology); **Sami Hamed Sulaiman Al Mahrizi** (Geochemistry)

Department Senior Honor Awards

Earth Science - **Hamed Salim Al Azzani**

Environmental Geology - **Avianna Jackson**

Hydrogeology - **Will Silvey**

Geochemistry - **Marwan Al Hinaai**

Geology - **Eric Brunner**

Geophysics - **Donovan Vitale**

Department Scholarships

Alan E. Kehew Scholarship: **Mohamed Elhebery** (PhD, Geosciences)

Geosciences Graduate Student Scholarship: **Ashley Scott** (PhD, Geosciences)

William and Linda Harrison Scholarship: **Ariel Martin** (PhD, Geosciences)

Envirologic Technologies Scholarship: **Ethan Coffin** (PhD, Geosciences)

W. David Kuenzi Memorial Scholarship: **Marwan Al Hinaai** (MS, Geosciences), **Mohammed Al-Musawi** (PhD, Geosciences), **Hadi Karimi** (PhD, Geosciences), **Molly Shalifoe** (PhD, Geosciences), and **Aylin Yildirim** (PhD, Geosciences)

Randall Kerhin Graduate Scholarship: **Mohammed Al-Musawi** (PhD, Geosciences)

Douglas Daniels Scholarship: **Ethan Coffin** (PhD, Geosciences)

Lauren D. Hughes Environmental Scholarship: **Marwan Al Hinaai** (MS, Geosciences), and **Molly Shalifoe** (PhD, Geosciences)

Kalamazoo Geological and Mineral Society Scholarship: **Ahmed Badawy** (PhD, Geosciences), **Hesham Elhaddad** (PhD, Geosciences), **Abdullah Ibrahim** (PhD, Geosciences), **Chanho Park** (PhD, Geosciences), **Hassan Saleh** (PhD, Geosciences), and **Ashley Scott** (PhD, Geosciences)

Laton-Lambright Field Camp Scholarship: **Aylin Yildirim** (PhD, Geosciences) and **Andrew Muldur** (Calvin College)

Lloyd Schmaltz Scholarship: **Elric Rinehart** (Geology)

Roger and LuAnne Steininger Geology Scholarship in honor of Dr. Lloyd Schmaltz: **Eric Brunner** (Geology), **Moir Burns** (Geology), and **Brandon Tulban** (Geology)

Tom Straw Scholarship: **Avianna Jackson** (Environmental Geology), **Diamond Norlien** (Science Education)

John and Kelly Grace Scholarship: **Diamond Norlien** (Science Education)

Core of Four Scholarship: **Ashley Patti**
(Geology)

Shirley J. Aiken Geosciences Scholarship:
Matt Runk (Hydrogeology)

Christopher J. Schmidt Scholarship:
Avianna Jackson (Environmental Geology)
and **Luke Singer** (Geology)

Department Graduates Fall 2022 through Fall 2023

Doctoral

Mohammed Al-Musawi, Mohamed Elhebery,
Xiang Fan, and Guzhalaiyi Sataer

Masters Geoscience

Garrett Link, Nina Morris, Nicole Sanabria,
and Kai Trobisch

Masters Earth Science

AJ Barrette, Adam Canute, Trenton Cerny,
Lauren Jaskot, Jean Maurisset, Justin
Macks, Evangelia Murgia, and Sauradeep
Purkayastha

Hydrogeology Graduate Certificate

Ron Dioso, Sue Konkol, Garrett Link, Shea
McQuinn, and Scott Williams

Earth Science

Hamed Al Azzani, Hunter Braginton, and
Connor Tinsley

Environmental Geology

Avianna Jackson

Geochemistry

Marwan Al Hinaai, Sami Al Mahrizi, Azzan
Al Sheidi, and Alaina Pitera

Geology

Abdallah Al Housni, Eric Brunner, Ashley
Patti, Chris Redlon, and Elric Rinehart

Geophysics

Nasiyba Al Maskari, Abdallah Al Hosni, and
Donovan Vitale

Hydrogeology

Jack Misner, Matt Runk, Will Silvey,
Brianna Salome, Madison Schrader, and
Jtannar Wiens

Publications 2022-23

**Abdelmohsen, K., Sultan, M., Yan, E.,
Abotalib, A.Z., Save, H., Emil, M.,
Elhaddad, H., and Abdelmalik, K. (2023)**
Watching the Grand Ethiopian Renaissance
Dam from a distance: Implications for
sustainable water management of the Nile
water. *Nature Sustainability* (in review).

**Abdelaal, A., Sultan, M., Abotalib, A.Z.,
Krishnamurthy, R.V., Bedair, M.M, and
Elhebery, M. (2023)** Emerging mercury and
methylmercury contamination from new
artisanal and small-scale gold mining along
the Nile Valley, Egypt. *Environmental
Science and Pollution Research* 30, 1-21.
10.1007/s11356-023-25895-9.

**Al-Musawi, M., Kuglitsch, J., Harrison W.,
Voice, P., Griffith, E., Saltzman, M., and
Kaczmarek, S.E. (in press)** Cross basin
chronostratigraphic correlation of
carbonate succession (Llandovery, Michigan
Basin) using global carbon $\delta^{13}\text{C}_{\text{carb}}$ isotope
excursions. *GSA Bulletin*.

**Akara, M.E.M., Reeves, D.M., Gnazou,
M.D.T., and Boguido G. (2022)** Assessing
future climate trends and their impact on
different fractured rock aquifers in

Northern Togo. *Journal of Water and Climate Change*, 13(11).

<https://doi.org/10.2166/wcc.2022.264>

Brandt, D., Higley, M., Marshall, M., **Petcovic, H.L.**, Velbel, M., **Voice, P.J.**, and Winkelstern, I. (2023) *Mid-Michigan's Outdoor Classroom: Pennsylvanian Marginal-Marine Strata at Grand Ledge Michigan. Field Trip Guidebook* for field trip FT7 Mid-Michigan's Outdoor Classroom: Pennsylvanian Marginal-Marine Strata at Grand Ledge Michigan, North Central Section, Geological Society of America, 105 p.

Coffin, E.S., **Reeves, D.M.**, and **Cassidy, D.P.** (2023) Per- and polyfluorinated substances (PFAS) in municipal solid waste landfills: Sources, transformations, leachate trends, and challenges. *Current Opinion in Environmental Science and Health*, 31, 100418.

<https://doi.org/10.1016/j.coesh.2022.100418>

Erber, N.R., **Kehew, A.E.**, **Schaetz, R.j.**, **Gillespie, R.**, **Sultan, M.**, **Esch, J.**, **Yellich, J.**, **Curry, B.B.**, **Sebastien H.**, and **Abotalib, A.Z.** (2023) Evidence for an early Saginaw lobe retreat and drainage adjustments across southern Michigan, USA. *Catena* 233, 107510.

<https://doi.org/10.1016/j.catena.2023.107510>

Fan, X., and **Reeves, D.M.** (2023) A framework for assessing the 4th rank dispersivity tensor under anisotropic axial symmetries. *Hydrogeology Journal*, 31, 465-484. <https://doi.org/10.1007/s10040-022-02584-4>

Hashim, M.S., **Rose, K.**, **Cohen, H.**, and **Kaczmarek, S.E.** (2023) Effects of sodium and potassium concentrations on dolomite

formation rate, stoichiometry, and crystallographic characteristics.

Sedimentology, 16 p.

<https://doi.org/10.1111/sed.13124>

Hashim, M.S., **Burke, J.E.**, **Hardesty, D.S.**, and **Kaczmarek, S.E.** (2022) Iodine incorporation into dolomite: Experimental constraints and implications for the iodine redox proxy and Proterozoic Ocean. *Geochimica et Cosmochimica Acta*, 338, 365-381.

<https://doi.org/10.1016/j.gca.2022.10.027>

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<https://doi.org/10.1016/j.jhazmat.2023.132734>

Manche, C.J. and **Kaczmarek, S.E.** (2023) Dolomite mineralogy as a proxy record for lake level fluctuations: A case study from the Eocene Uteland Butte Member of the Green River Formation, Uinta Basin, Utah, USA. *Journal of Sedimentary Research*, 93, 431-452.

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Nyarko, S.C., and **Petcovic, H.L.** (2023) Do students develop teamwork skills during geoscience fieldwork? A case study of a hydrogeology field course. *Journal of Geoscience Education* 71(2), 145-157. DOI: 10.1080/10899995.2022.2107368

Nyarko, S.C., and **Petcovic, H.L.** (2023) Essential teamwork skills: Perspectives of environmental geoscience employers. *Journal of Geoscience Education* 71(1), 20-32. DOI: 10.1080/10899995.2022.2044665

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Ryan, B., Rivers, J., Petersen, S., and Kaczmarek, S.E. (2023) Evidence of nonplanar dolomite textures formed at near-surface temperatures. *Journal of Sedimentary Research*, 93, 729-740, <https://doi.org/10.2110/jsr.2022.117>

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Vitale, D.S., Reeves, D.M., Coffin, E.S., Link, G.W., Cassidy, D.P., and Rochow, S.M. (2023) Long-duration monitoring and mass balance of PFAS at a wastewater treatment plant following the release of aqueous-film forming foam. *Water Research*, 242, 1202868. <https://doi.org/10.1016/j.watres.2023.120268>

Voice, P.J. (2023), *Geology and Paleontology of Rockport State Recreation Area*, Guidebook for the geology of the Rockport State Recreation Area 2023 field trip for the Michigan Alliance for Environmental and Outdoor Educators Annual Meeting, 11 p.

Voice, P.J., Harrison, W.B. III, Harrison, L., Gillespie, R., and Trout, J. (2023) *Adventures with Cores: A Tour of the Michigan Geological Repository for Research and Education*. Field Trip Guidebook for field trip FT1 Michigan Repository for Research and Education (MGRRE) Tour. North Central Section, Geological Society of America, 36 p.

Zakharov D.O., Marin-Carbonne J., Pack A., Di Rocco T., Robyr M. and Vennemann T. (2023) In-situ and triple oxygen isotope characterization of seafloor drilled cherts: Marine diagenesis and its bearing on seawater reconstructions. *Geochemistry, Geophysics, Geosystems*. <https://doi.org/10.1029/2022GC010741>

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