



**M** UNIVERSITY OF MICHIGAN

# EARTH NEWS

For Alumni and Friends of the Department of Earth & Environmental Sciences

**Fall 2022**

# Chair's Corner



## Hello friends!

Boy, it seems like a long time since we've been in touch and so much has happened! I hope this finds you managing, if not thriving again. As we emerge from the past few years of turmoil, we are really taking stock of what's changed all around us in Ann Arbor and beyond. Frankly, some days that seems like just about everything!

There is a lot to catch you up on in this newsletter. You'll notice some changes that reflect the expansion and evolution of our faculty and staff. New people and changing research directions bring fresh perspectives in Earth and Environmental Science to our department representing a broad swath of field, laboratory/experimental, and computational science. For the first time this year, we were ranked in all five sub-specialties by US News and World Report, one of only two departments to achieve this. These rankings emphasize that our breadth is truly one of our greatest strengths. You'll also notice a sharper focus on our commitment to advancing

diversity, equity and inclusion in all of our research and teaching spaces. From North University Building, to high schools in Detroit, to summer schools in Nigeria - we are shaping a new future for our discipline.

Our student enrollments continue to be strong and growing. While our PhD numbers have held steady at ~70 students, we see new growth in our master's program, some of whom will transition to our PhD program. Our undergraduate enrollments continue to climb as we reach an all-time high of 233 Earth and Environmental majors! This is in stark contrast to 71 majors just a decade ago and underscores the vitality of Earth and environmental study at Michigan.

Since our last newsletter, Dr. Rose Cory was promoted to full professor and Dr. Yihe Huang was promoted to Associate Professor with tenure. We also celebrate two successful lecturer reviews for Drs. Jeff Alt and Mark Robbins. -We've recently welcomed Assistant Professor Dr. Jenan Kharbush to the tenure track faculty after completing her prestigious Presidential Postdoctoral Fellowship. Jenan's expertise in microbial biogeochemical cycling of carbon and nutrients strengthens our growing footprint in the field of geomicrobiology. In January, we will welcome our most recent faculty hires: Dr. Mónica Carvalho (joint with the Museum of Paleontology) and Dr. Jessica Fayne. Monica's research on ancient tropical rainforests explores exciting directions in ecosystem function from the fossil record. Jessica will begin as a highly honored joint LSA Collegiate Fellow/Presidential Postdoctoral Fellow and transition to the faculty rank in 2024. Her work on hydrology and remote sensing will bring a new environmental dimension to our unit focused on improving resilience to ongoing climate change.

One of our biggest accomplishments of the past year is completion of our decadal strategic plan and successful external review, which was created with broad departmental input. In our 2021 plan, we defined future research directions based on common interests, exciting opportunities in sub-disciplines, and our ability to maximize departmental resources. Five themes emerged: (1) Water on a Changing Planet, (2) Climate, Ecosystems and Biogeochemistry, (3) Earth's Surface and its Hazards, (4) Evolution of Life and the Rock Record, and (5) Solid Earth Dynamics.

As you reflect on your own past experiences at Michigan, I would like to invite you to join us as we build back community. Or just plain build community for our newest members! Our EARTH seniors still haven't seen a "normal" campus year (they were freshman when COVID started) and are just now establishing their cohort. More than half of our graduate students have started since the pandemic began. We've welcomed a lot of new faces and said goodbye to longtime dear friends. Our vibrant Alumni Board has been connecting our alumni with the department at an ever-increasing rate and we deeply appreciate those ties.

Warmly,  
Marin

## Cover Photograph:

Michigan Earth students descend the path from Angel's Landing, Zion National Park, Utah, during a geologic field trip across the southwestern US in May 2022. See page 12 for more about this trip.

# New Course: Environmental Geophysics

**Assistant Professor Zack Spica** is bringing strong quantitative skills and robust interdisciplinary analysis to Earth 484, a new class that heavily integrates experiential learning. Asst. Prof. Spica's course aims to help students refine skills demanded of earth scientists in industry, students who increasingly need diverse field experiences prior to professional work.

The content of Earth 484: Environmental Geophysics promises to set up students for success in their post-graduate pursuits and professional ambitions. With specialized equipment like ground-penetrating radar and drones, students will take on the challenge of conducting unique, hands-on research right on campus.

Whether an advanced undergraduate interested in garnering expertise with industry tools or a new graduate student with minimal background in practical geophysics, this course is open to all U-M students. All that's required is an eagerness to learn more about geophysical mapping in an interdisciplinary fashion.

Students in 484 are expected to complete lab reports once every two weeks, and utilize their understanding of the coursework to submit a final industry report at the end of the term. Structured yet flexible, EARTH 484 is a smaller sized class that offers a one-on-one mentor environment while ensuring a broad approach to experiential learning in geophysical sciences.

Asst. Prof. Spica, who has conducted research at institutions such as the University of Tokyo and Stanford University, is passionate about preparing students for careers in industry. While some students less comfortable in quantitative methods may initially be daunted, Asst. Prof. Spica has designed the curriculum to demystify the field of geophysics through exposure to practical methods. No background knowledge of coding or informatics is necessary—only a willingness to learn.



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# ARE HIGHER WATER LEVELS CAUSING GREAT LAKES EARTHQUAKES?

There have been an increasing number of earthquakes around the Great Lakes in recent years, and **Associate Professor Yihe Huang** wants to know why.

One hypothesis is that the increased earthquake rate is due to higher water levels in the Great Lakes. Because of climate change, the lakes' water levels have been rising, with Lake Erie hitting a record high in June 2019 – the same month a magnitude 4.0 quake near Cleveland reverberated as far away as Michigan.

The higher water levels may be putting more stress on the faults in the region, which may cause the faults to become bigger or more active.

To investigate this question, Assoc. Prof. Huang and her former postdoctoral research fellow, Dongdong Yao, performed a systematic analysis of local seismicity around southern Lake Erie from 2013 to 2020.

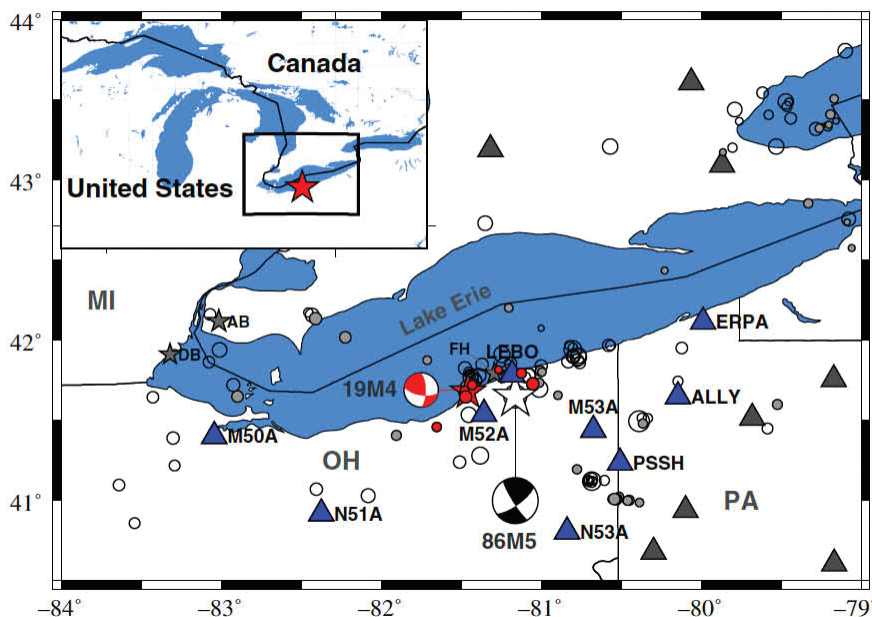


They dug into the seismometer recordings around Lake Erie to find as many earthquakes as possible. The region was noisier than they expected, with quarry blasts and noise from the lake itself appearing in the seismological readings.

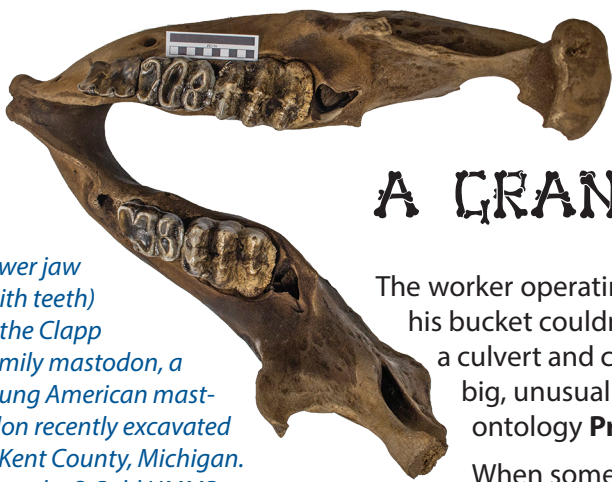
Their study, published in *Seismological Research Letters* on May 9, 2022, found no correlation between long-term seismicity and water level variations. But they can't rule it out, either. Unfortunately, the team wasn't able to detect enough earthquakes to reach a statistically significant correlation. To determine if changing water loading may reactivate shallow faults in the Great Lakes region, the researchers will need denser and closer seismicity monitoring.

Assoc. Prof. Huang and her EARTH colleague, **Asst. Prof. Zack Spica**, are planning a new project to collect that data. They are investigating using Distributed Acoustic Sensing (DAS) to turn existing taticom fibers under the lakes into lines of sensors. If successful, the DAS sensors will give researchers much more information about seismic activity inside the lake, which would allow Assoc. Prof. Huang to identify correlations.

As climate change continues to increase water levels, understanding how water loading affects the Great Lakes faults will be essential. With more data, Assoc. Prof. Huang hopes to answer this question.



Red stars are 27 catalogued earthquakes close to Lake Erie and gray stars are nearby seismicity (2013-2020). The triangles are nearby seismic stations. Our template matching research leads to the detection of 15 times more earthquakes near Lake Erie in 2013-2020.



## A GRAND FIND IN GRAND RAPIDS

*Lower jaw  
(with teeth)  
of the Clapp  
Family mastodon, a  
young American masto-  
don recently excavated  
in Kent County, Michigan.  
Photo by S. Beld UMMP.*

The worker operating the hydraulic excavator knew the bone that tumbled off the edge of his bucket couldn't belong to a cow. It was too big. The team paused their work installing a culvert and called their office. The call eventually reached one of the go-to people for big, unusual bones in Michigan: EARTH and University of Michigan Museum of Paleontology **Professor Daniel Fisher**.

When someone finds a mastodon, Prof. Fisher usually drops everything to go to the site. But this time, Prof. Fisher couldn't get loose. Instead, he sent **Dr. Scott Beld**, a research lab specialist at the Museum of Paleontology.

Dr. Beld and Prof. Fisher have been working together for decades, so Dr. Beld had no trouble jumping in to handle the job. He was joined by Dr. Cory Redman, a curator at the Grand Rapids Public Museum and an experienced paleontologist.

Together, Drs. Beld and Redman worked several days to unearth the partial mastodon skeleton. The Grand Rapids Public Museum sent out staff and volunteers to help, and they in turn were joined by the landowners and personnel from the construction crew and county drain commission, all working together to recover many dozens of bones.

As the first day of work wound down, the team discussed the ultimate disposition of the mastodon specimen with the landowners, the Clapp family. In Michigan, like most US states, private landowners are the ones to make this decision. The Clapp family wanted it to go to a museum nearby and agreed to donate the specimen to the Grand Rapids Public Museum. Dr. Redman will manage the research, collaborating with Prof. Fisher.

This new mastodon appears to have died at a younger age than most mastodons recovered previously – its death was probably in its young teens rather than in its mid-thirties or older. This can be seen from the particular teeth present in its lower jaw, from the limited evidence of wear on those teeth, and from the fact that many of its bones still show separate centers of ossification that in an older animal would have fused together.

Much of Prof. Fisher's work with mastodons has dealt with their tusks, which are large, continuously growing teeth. As such, tusks compile a record of growth from near the start of life to the animal's last day. From microscopic studies of tusk structure, Prof. Fisher has shown that tusk growth can be quantified on daily, weekly, and annual timescales. Prof. Fisher and his students have then used stable isotope studies of tusk composition to assess diet, season of growth, climate, and health status. Unfortunately, no tusk was recovered from the Clapp Family mastodon, but well-preserved molars and premolars contain the same types of layers, preserving comparable isotopic profiles. The team now hopes to correlate annual layers from one tooth to another, much in the way a geologist traces distinctive sediment layers from one outcrop to another, yielding a longer record of time than is preserved in any one tooth.

In addition to the work with teeth, Dr. Redman and Prof. Fisher will use a radiocarbon assay on bone collagen to determine the geologic age of the specimen. They also hope to determine the mastodon's sex and, if possible, its condition at the time of its death. In especially interesting cases, they have found evidence of human predation or carcass processing on mastodon skeletons, but such judgments are still a long way off for a specimen with as many unknowns as this one.

For now, the team's main task is to complete the long process of cleaning and drying the bones. Only then will the bones be stable enough to advance safely into subsequent analyses. The most exciting revelations are still to be unearthed.

*Excavation leaders Redman (standing, lower left; Grand Rapids Public Museum) and Beld (sitting, middle foreground; U-M) record data, while volunteers expose bones at the Clapp Family mastodon site. Photo courtesy of GRPM.*



# Student Research Suggests Permafrost Thawing Will Warm the Earth More Than Expected

The Arctic is warming twice as fast as the rest of the Earth, and causing feedback loops that accelerate global warming elsewhere as well. One of those feedback loops is thawing permafrost. As the permafrost soil thaws, the carbon stored in these soils that has been frozen for thousands of years can be converted to carbon dioxide. Models suggest that the permafrost thawing alone could warm the earth an additional 0.3 to 1 degree Celsius, on top of warming from combustion of fossil fuels.

How much of the permafrost soil carbon will go into the atmosphere as carbon dioxide, and how fast?

That's the question that **Professor Rose Cory** is working to answer at Toolik Field Station, a United States Long Term Ecological Research Station (LTER) in the Alaskan Arctic.

Prof. Cory, who recently became one of the principal investigators on the Arctic LTER, brings her students to the Arctic every summer for field research. This summer, the group focused on one project: radiocarbon dating the carbon dioxide produced by thawing permafrost, as part of the PhD work of Prof. Cory's student, **Emma Rieb**.

The work took many hands. Dressed in Tyvek suits to protect the samples from contamination, the students carefully collected permafrost mud from Arctic sites. Then, at field labs, the students set up experiments to measure the decomposition of the soil into carbon dioxide under realistic Arctic conditions. Since the soil is highly heterogeneous, the experiments required many replications. And all of it required extreme care, as even a nanoparticle of radiocarbon from a researcher's clothes or tools could contaminate a sample.

Emma and Prof. Cory hoped that the project would put to rest a long-standing debate on Arctic permafrost thawing: whether the very old carbon in permafrost is so stable, it won't turn into carbon dioxide.

While some researchers argue that the ancient carbon in permafrost will not quickly decompose into carbon dioxide, Prof. Cory's previous research showed that even the oldest carbon decomposes. Emma and the other students'

work this summer was intended to quantify how much of that old carbon can decompose into greenhouse gases, and under what conditions. To answer these questions, the team used radiocarbon to date the soil carbon and the carbon dioxide produced as it decomposed.

Emma's results supported exactly what Prof. Cory expected. Even though the carbon in permafrost is ancient, it quickly and easily turns into carbon dioxide once exposed to sunlight and the relative warmth of earth's surface.

While the results weren't surprising, they have big implications. The models that suggest that permafrost thawing would warm the earth 0.3 to 1 degree celsius don't account for the processes that Emma and Prof. Cory showed convert ancient soil carbon into carbon dioxide. That means their predictions are too low. The permafrost thawing will warm the Earth even more than expected.

"Nations like ours that share Arctic territory, we have to do more to limit warming," says Prof. Cory.

Prof. Cory and her students will continue their research to predict what will happen as the permafrost thaws over the next few decades and centuries, and to determine how the process will unfold. As one of the new principal investigators, Prof. Cory will also take over the important work of monitoring at Toolik Field Station, which has been underway since 1975.

"Now it's my turn to take care of monitoring this environment that's precious and changing rapidly, with implications for the rest of us everywhere on Earth," says Prof. Cory.



# High School Students Dig in to Science at Earth Camp



This summer, Earth Camp was back in person for the first time since 2019, with several new learning opportunities for the students.

Twenty rising juniors spent a week on and around the University of Michigan campus digging into earth science. They spent time in **Assistant Professor Jena Johnson** and **Associate Professor Yihe Huang's** research labs on campus, then went to Sleeping Bear Dunes for two days of outdoor, experiential learning activities.

For the first time, the students were also able to go to the University of Michigan Biological Station. **Associate Professor Naomi Levin's** NSF grant funded three days of learning in the field for the students. They took core samples on a boat, learned how to run isotopes in the lab, and looked at water budgets for lakes and rivers.

For the second week of camp, **Dr. Jenna Munson**, EARTH's outreach coordinator, took a group of nine students to Camp Davis in Jackson, Wyoming, for a classic geological field trip around Yellowstone and Grand Teton National Parks. **Assistant Professor Robert Holder** came out to join the students for a learning activity along the Teton Fault Scarp. It was the first time a faculty member has led Earth Camp students in a learning activity in Wyoming.

While many were excited to be back in person, some students also requested a virtual camp. Dr. Munson and the Earth Camp team organized one week of virtual activities for forty high school students who did hands-on experiments using kits mailed to the students in advance.

This year's Earth Camp was particularly special for another reason: for the first time, former Earth Campers—now U-M students—came back to Earth Camp as instructors.

Next year, EARTH plans to increase capacity by including a third camp in the Upper Peninsula. Since Earth Camp's inception, Dr. Munson has organized these efforts and built relationships with students and their families, hosting an

annual barbeque in her backyard to help build community. She also liaises with various U-M programs that, together with generous donor support, allow students to attend.

All of this year's students were recruited through the Wolverine Pathways program, a University of Michigan provost program that enables students from Detroit, Southfield, and Ypsilanti to participate in educational enrichment. Together with generous donor support, the introduction of this program has allowed Earth Camp to increase its impact, eliminating the barrier of program fees that may otherwise be prohibitive. Many students lack experiential science education in their own high schools, and Earth Camp provides important exposure to earth science that they otherwise may not have had. As observed with returning Earth Campers, it helps set the course for their educational careers.

EARTH thanks our generous donors, whose support allows us to offer Earth Camp at no cost to students who otherwise may not afford these educational experiences.



*Asst. Prof. Robert Holder teaching Earth Camp students how to measure the height of the Teton Fault scarp.*

# NEW INTERNSHIP PROGRAM PLANTS THE SEEDS OF A SCIENCE CAREER FOR UNDERSERVED HIGH SCHOOLERS

Researching in a university lab can be a formative experience for high school students. It can help them decide on a path for their university education, and prepare them for success. It can also provide a relatively low-stakes environment to explore, learn, and become acquainted with some of the most unfamiliar aspects of natural science research alongside peers.

That's why the Department of Earth and Environmental Sciences kicked off a new project this summer that brings high school students from underserved schools and/or underrepresented groups to the university to do a research project. EARTH took its inspiration from the Department of Chemistry's D-RISE program, which connects students from Cass Tech High School in Detroit with internships in chemistry.

**Associate Professor Selena Smith** welcomed three rising high school seniors into her lab for six weeks this summer. Each student was paired with a graduate or undergraduate mentor and given a small research project within their mentor's thesis project. The high schoolers worked on collecting data, analyzing data, and drawing conclusions, and were encouraged to think about the big picture behind



their work.

Aubrin Deyarmond worked with a PhD student, Jeronimo Morales Toledo, on the structure of fruits in the Alismatales family. Aubrin helped to process anatomical and morphological data, built 3D models, and compared traits, with the goal of identifying where within the group certain fossil samples belong.

Sofia Martinez Lozoya worked with Mike Machesky, a master's student, on variations in palm leaf traits collected along a climate gradient. Sofia helped to identify how the leaves change with climate.

Eselohirere (Ese) Izirein, the final high schooler, helped Malinda Barberio with her undergraduate honors thesis on Araceae leaf traits. Ese collected data on the leaves to see how the leaf traits reflect ecology and the relationship of the plants to each other.

In addition to their research projects, the students did informal seminars and lunches with faculty to learn about other earth science careers, like attending a skills seminar to prepare for college. Together with students from D-RISE, the high schoolers learned about science communication that culminated in presenting their work and an activity at a Scientist Spotlight event in the U-M Museum of Natural History.



Further amplifying outreach efforts, all three students selected for the internship program had participated in Earth Camp and were recommended because they expressed an interest in plants. It's our hope that continued connection and engagement with the department across a number of programs will help launch these students into successful academic careers in STEM.

"It was just a joy," says Assoc. Prof. Smith. "Everyone in the lab enjoyed having the students, and the students enjoyed being there and made the most of it. I'm looking forward to doing it again next year."



# WAVES OF CHANGE OCEAN SCIENCE SUMMER SCHOOL IN AFRICA

For the first time since 2019, the Coastal Ocean Environment Summer School In Nigeria and Ghana (COESSING) was back in person this year.

Led by EARTH **Professor Brian Arbic** and many others in the US, Nigeria, and Ghana, the school has been running since 2015. For five years, it was held in person in Ghana, after which it became virtual due to the pandemic. This summer, COESSING was held in Nigeria for the first time, and used a new hybrid format.

The purpose of the school is to increase ocean science capacity in Africa and to connect African scientists to others around the world. Because of a lack of resources and connections, scholars and students from many African countries are significantly underrepresented in the ocean sciences community. COESSING's organizers hope to help change that.

This summer's school was at the University of Lagos, co-hosted by the Nigerian Institute for Oceanography and Marine Research (NIOMR). Undergraduates, graduate students, postdocs, faculty, and some private sector, government, and NGO workers attended. People attended the virtual portion of this year's hybrid programming from East Africa, India, and Malaysia. The instructors came from across the United States, Ghana, and Nigeria, and taught a broad range of ocean and environmental science topics. Attendees participated in lectures and labs as well as field and boat trips.

The lessons from COESSING can have a big impact on attendees' research. For example, in a previous year, an attendee took a popular computer programming workshop at COESSING and created a new technique for using the instruments that wouldn't require as much power – a big deal in regions where power is unstable and resources are limited. This year, that former student came back as an instructor to share his method.

In 2021, COESSING became an endorsed project of the United Nations Decade for Ocean Science for Sustainable Development, part of UNESCO. While COESSING currently has funding for two more years of in-person schools in Africa, the organizers hope to expand the school into a UN programme, called Global Ocean Corps and Conveyor (<https://globalocean corps.org>), which would allow them to run multiple summer schools around the world.



There are testimonials on the COESSING website: Coastal Ocean Environment Summer School In Nigeria and Ghana ([coessing.org](https://coessing.org))

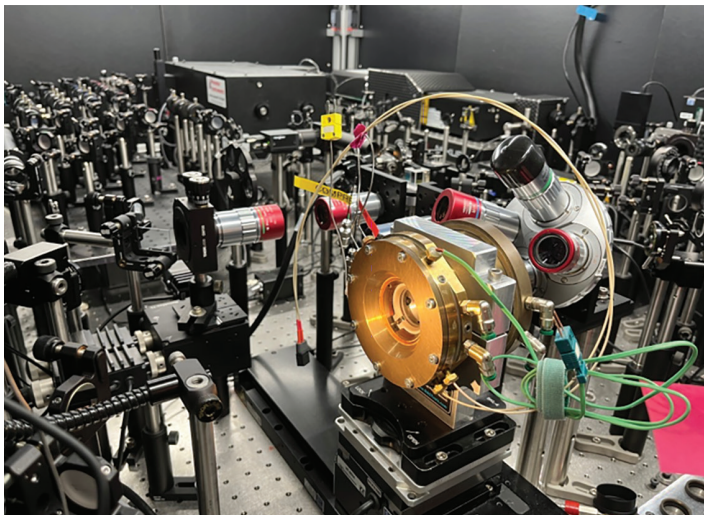
# Using Diamond Anvils to Simulate Earth's Mantle and Core Conditions



Despite our knowledge that volcanic eruptions, earthquakes, and mountains result from dynamic processes in the Earth's interior, the mantle and core remain largely inaccessible. **Professor Jackie Li's** group is utilizing several instruments to reveal more about these processes, helping to expand our understanding of the Earth's interior.

In Prof. Jackie Li's lab, researchers are using specialized equipment to study the interior of the Earth. By replicating the extremely high pressures and temperatures of the mantle and/or core, they can see how materials behave at great depths inside the Earth.

One piece of equipment is the Multi Anvil Apparatus, in which researchers use a 1000-ton hydraulic press to generate pressures above a quarter million bars on a tiny sample inside an octahedron. The sample is placed inside a metallic furnace and can be heated to more than 2300 °K (more than 4000 °F).



Another piece of equipment is the Diamond Anvil Cell (DAC). In this device, a sample is pressed between two diamonds. Using diamonds with different culet sizes, researchers can replicate pressure conditions ranging from the crust to the core. Since the diamonds are transparent, lasers can pass through and heat the sample. Recently the group managed to heat a sample to 6000 °K, which is hotter than the surface of the Sun.

The transparency of the diamond anvils has another important advantage: researchers can see what's happening as the sample is compressed. Using x-rays and lasers, researchers can study the sample while it is under conditions mimicking the Earth's interior.

**Dongyuan Zhou**, a second year PhD student in Prof. Li's lab, is using this equipment to study forsterite. Forsterite

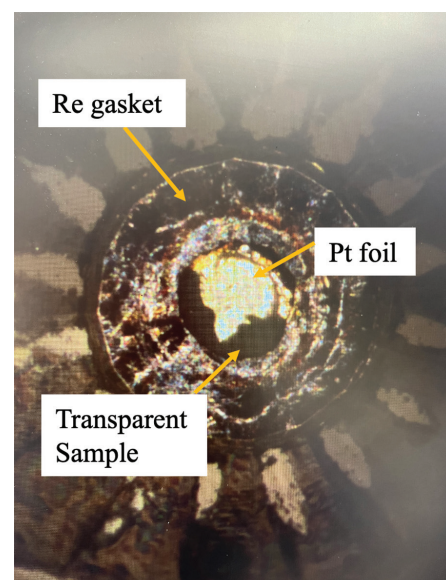
is a mineral found in the Earth's mantle and occasionally transported out via volcanic eruptions. While in the mantle, forsterite goes through phase transitions to become wadsleyite, ringwoodite, or bridgmanite. Those phase transitions are related to seismological discontinuities at 410 km and 660 km, which mark the upper and lower boundaries of the mantle transition zone. In subducted slabs, deviatoric stress may shift these phase boundaries and possibly cause deep earthquakes.

The phase boundaries of forsterite have already been determined at the high pressures and temperatures in the Earth's mantle. However, at subduction zones where plates subduct into the Earth, minerals can be reduced to tens to hundreds of nanometers in size, smaller than usually found in the mantle. It's possible that the phase transitions of forsterite may be different when its grain size is very small.

Dongyuan is studying nanocrystals of forsterite to determine their phase boundaries and determine if those boundaries are different from existing studies. She uses a diamond anvil scale to simulate mantle conditions. With x-rays, Dongyuan can measure the phase.

The project is a challenge because the nanocrystal is so small that signals from the substrate and diamond can overwhelm the sample's signal.

While Dongyuan perfects her methods to measure olivine phase transitions, other projects continue in Prof. Li's lab. By studying different materials related to different geological problems, Prof. Li and her students hope to reveal more about how the Earth's interior works.





# New Tools for Complex Problems: Machine Learning in Earth Science

In **Associate Professor Eric Hetland's** lab, he and his students are using data science to solve geophysical problems that can't be solved with other existing tools.

One student, **Olivia Walbert**, is developing sophisticated machine learning algorithms to estimate the direction and magnitude of the stresses responsible for earthquakes.

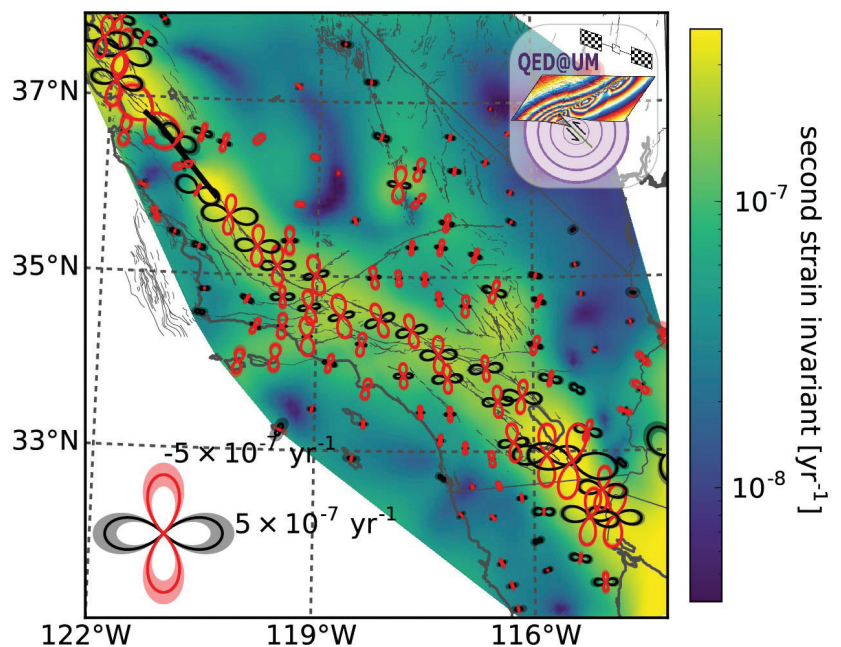
Earthquakes occur when stress overwhelms the ability of a crack in the earth to withstand slip. While scientists can estimate stress during earthquakes and make inferences of how stresses have changed as a result of an earthquake, measuring the stress that leads to an earthquake has been impossible up to this point. That's because of the difficulty in measuring stress in the Earth.

This new method looks at data from New Zealand and eastern central China. The algorithm has succeeded in determining the direction of stresses leading to earthquakes. Measuring relative magnitude has been a challenge, and absolute magnitude is more difficult still, since it requires consideration of topography, sedimentary deposits at the surface, and other aspects that load the crust. Assoc. Prof. Hetland and his students will continue to explore machine learning techniques to answer these questions.

Another active project in Assoc. Prof. Hetland's lab also uses machine learning, this time to measure earth deformation. There are currently two primary methods to measure earth deformation: GPS and InSAR. GPS provides useful information but at most sites, GPS sensors are several kilometers apart. That doesn't provide enough data to determine what is going on under the surface.

InSAR, on the other hand, provides much denser data. InSAR compares satellite pictures taken weeks or months apart, and determines which areas have moved closer or further from the satellite in that time. While the data covers the entire area, it doesn't give detailed directional information. It tells researchers that an area has moved closer to a satellite, but not if it has moved vertically or horizontally to achieve that.

Another of Assoc. Prof. Hetland's students, **Eric Szymanski**, is using Gaussian Process Regression, a type of machine learning, to in essence blur GPS data and unfold InSAR data to complement each other. While researchers have tried to combine GPS and InSAR data before, they don't blend well together using simple techniques. With these advanced machine learning systems, Assoc. Prof. Hetland and Eric hope to create something that combines the strengths of GPS and InSAR into something even more useful.



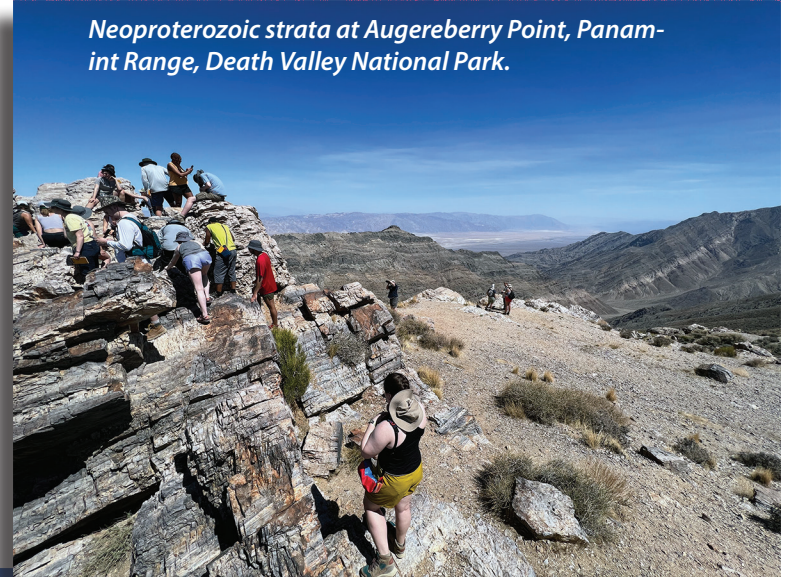
*Continuous strain rate field in southern California estimated from GPS velocities using a Gaussian process regression; glyphs indicate principal strain rates, with black extension and red contraction, with shading denoting 95% confidence of estimates. Figure by Trevor Hines (PhD 2017).*

# Basins and Ranges, Canyons and Mountains

This May, EARTH got students back out to the field for the first major field excursion since March 2020. Led by **Professors Kacey Lohmann** and **Nathan Niemi**, 24 students spent two weeks exploring from the Sierra Nevada, California, to the Grand Canyon, Arizona, with stops at Death Valley and Zion National Parks. Thanks to generous subsidies from our alumni-supported endowment and field trip fund, the trip filled to capacity quickly, with multiple students experiencing their first trip to the southwestern US, some traveling west of Chicago for the first time, and a couple taking their first plane flight. We were thrilled to have a diverse group of incredible students participate on this trip.



Visiting one of **Prof. Catherine Badgely's** Miocene fossil localities near Red Rock Canyon State Park, CA.



*Neoproterozoic strata at Augereberry Point, Panamint Range, Death Valley National Park.*



*Taking in the view at Plateau Point, Grand Canyon National Park, before the 7 mile hike back out.*



*Cambrian ripple marks in the Carrara Formation, Titus Canyon, Death Valley National Park.*



Discussing airborne dust pollution at Owens Lake, Owens Valley, CA.



*Studying a low-angle normal fault in Natural Bridge Canyon, Black Mountains, Death Valley National Park.*

# Supporting Experiential Learning in Earth

EARTH provides a multitude of experiential learning opportunities for students. These include classes at Camp Davis, weekend course-related field trips during the semester, GeoClub led excursions, and domestic and international field trips to places of geologic interest during mid-semester and summer breaks.

In response to the dearth of field opportunities over the last few years due to COVID, EARTH is thrilled to have several field trips planned over the 2022-2023 academic year. Destinations for these upcoming trips include **Brazil, South Africa, and Texas/New Mexico**. Each trip will be led by an Earth faculty member and will accommodate one to two dozen undergraduate and graduate students.

EARTH typically runs one domestic trip each year, and an international trip every two to three years, so hosting three trips in a single year is record-breaking. It is clear that there is significant student demand and EARTH believes strongly in the value of field-based, experiential learning, especially when combined with exposing students to new cultures and new countries. This year's trips will deplete our field excursion funds significantly, and EARTH has always prioritized a high level of department subsidy toward student costs. This subsidy enables students from all economic backgrounds to participate. We welcome contributions from generous donors and alumni to enable EARTH to continue with this practice, ensuring that no student misses out on these important educational opportunities for lack of financial means. A prospectus of an example forthcoming trip is below.

## The Karoo, Kimberlites, and Kudu

This coming spring, students will have the opportunity to join a two-week field trip to South Africa with **Professors Nathan Niemi and John Geissman (BS'73, MS'76, PhD'80)**. This journey will enrich students' knowledge of the geological formations and events that took place in one of the most resource-rich continents on Earth, as well as deepen their cross-cultural understanding and grow their perspectives on the intersections among geology, environment, and human evolution.

The trip will begin in Kimberley, South Africa, famous for its diamond mines, which stretch so deep into the ground that workers are required to don special temperature-absorbing suits, and where students will learn about the economy of gem resources and examine genuine Kimberlites. The next stop will be in Johannesburg, where students will get to uncover the history of our hominid ancestors and the evolution of humankind by examining ancient remains held in the Hominid Vault at the University of the Witwatersrand.

In the Karoo Basin, students will develop a keen ability for investigation, as they attempt to resolve mysteries like examine the continental record of Earth's greatest mass extinction event and explore whether life on land or life in the ocean was first to perish during such major extinction events, which punctuate much of the broader geological time scale.

Geology is a critical aspect to understanding the history behind our planet, but it can also shape how people and animals interact with their environment. Students will gain a hands-on understanding of how local land-

scapes can affect the livelihoods of nearby communities, as students travel in vans across South Africa and spend the nights in remote spots and farmstays, and become acquainted with this remarkably unique and stunning environment. Local faculty and researchers will join the U-M group on their journey, where students will get to interact with indigenous groups along the way and see parts of the country that many tourists don't frequent.

The value of international field experiences cannot be underestimated. South Africa is a nation packed with millions of years of unique geologic history that does not exist anywhere else on the planet, and as our society becomes more and more global, the understanding that arises from seeing other parts of the world is vital to becoming a thoughtful and well-rounded lifelong learner.



*Sani Pass in the Natal Province, South Africa*

# Camp Davis Gazette

The summer of 2019 seems that it was both yesterday and a lifetime ago. We were excited to have EARTH students inaugurate the new Camp Davis student cabins, and to host a celebratory christening with alumni old and new. The impromptu “demonstration” of the student cabin fire alarm system at 6 am on a Sunday is particularly fresh in our memories...

Since then, COVID has prescribed both a summer of “virtual field camp” (2020) and of “distanced” field camp (2021), when we reduced our offerings to only those courses required for EARTH majors and had only a single class in residence at a time. It was refreshing and invigorating to return to a full slate of courses this summer, with introductory, non-major, and upper-level field courses in residence.

We would be remiss, however, to let the frustrations of the last two summers eclipse the bright spots those experiences provided.

In 2020, Camp Davis faculty joined with faculty across the country in a crash-course on “virtual field geology.” Best practices were exchanged, digital exercises were shared, and, perhaps most importantly, the circumstances forced us to assess, and to articulate, what the essential learning outcomes are from field-based experiential learning.

We reduced our “Camp Davis” offerings (one introductory, one non-major, one upper-level), and pitched in to team-teach “virtual” field geology under the theme of “Earth Science where you are.” Field kits with soil sampling tubes, mineral ID cards, and myriad other supplies were shipped around the globe to students who enrolled. The novel and impactful experience provided to our students is a reflection of the engaged and committed faculty and lecturers who teach Camp Davis courses.

In summer 2021, Camp Davis (along with the BioStation

and the New England Literature Program) were the first full-time in-person course offerings at U-M in over a year. Re-launching summer experiential learning courses in the midst of a pandemic took months of planning, without the knowledge that a vaccine would be readily and widely available. We rose to the challenge of planning courses under these circumstances, and the required classes for EARTH majors were run without a single COVID issue. We were able to offer our students a world-class field experience because the necessary resources (from our alumni, faculty, Department, and College) were focused to make a Michigan Difference.

Camp Davis will resonate with the effects of COVID well in to the future. We will continue to plan for outbreaks at Camp, and to modify our plans accordingly. Most critically felt, however, will be the myriad ways that this pandemic has impacted our faculty. We are especially grateful to the post-docs, alumni, friends, collaborators, and colleagues who pitched in to teach in summer 2022.

We are planning to be in session throughout the summer of 2023, so please stop by if you are in the Jackson area. Our gate is always open (it’s just past the “Goat Yoga” signs - things really have changed...), so please drop-in and see us if you are in the area.



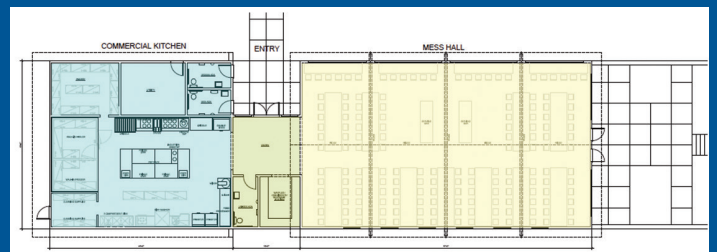
*Rich Briggs, US Geological Survey, opening a soil pit on a strand of the Star Valley fault near Alpine, with Earth 440 students, summer 2022.*

## A Camp Davis for the Next 100 Years

Camp Davis was established in 1929, and, at the turn of the last century, the majority of buildings and infrastructure at Camp dated to that time. Over roughly the last decade, we have constructed new faculty and student cabins, replaced the Rec Hall, and rejuvenated our basic infrastructure, thanks to the support of our alumni, department, and college.

Three generous gifts from alumni have provided the impetus to launch the final, and most ambitious, phase of Camp Davis revitalization - replacing the Dining Hall. A feasibility study has been approved and is ongoing to develop a vision for a new dining that will meet the needs of our students, the kitchen staff, and the program for another 100 years of field education in Wyoming. The scope

of this project is larger than any previously attempted, and we hope to be able to break ground in 2024. An AAB task force, co-chaired by Steve Henry and Larry Davis, is spearheading the fundraising effort to turn this vision into a reality at Camp Davis.



*Conceptual diagram of a new Camp Dining Hall and outdoor learning space.*

# Teaching in the Round: Dynamic Pedagogical Spaces on Campus

This September, a new classroom opened in the Central Campus Classroom Building (CCCB). The room is unlike any other classroom in Michigan and was designed to immerse students in the course material.

**Dr. Michela Arnaboldi** taught Earth 100: Coral Reefs, in the new “classroom in the round” this fall. For each lecture, she stood in the center of the class with students in concentric rings around her. There were 190 seats, but no student was more than five rows away from her.

“It makes a large class feel very intimate,” says Dr. Arnaboldi. “I can see everyone’s face, which isn’t possible in a classic lecture hall. It creates a totally different atmosphere that’s much more dynamic.”

Above the students were four curved screens, each showing the same images so every student could easily see. The screens could be split to show up to three images, which allowed Dr. Arnaboldi to show a text and image slide simultaneously.

“Coral reefs are a very visual topic,” says Dr. Arnaboldi. “The classroom in the round let me enhance the exposure of the students to visuals.”

Including more pictures, videos, diagrams, graphs, and other visual media can be beneficial for many science classes, Dr. Arnaboldi pointed out, and creates a more immersive experience for students. It also creates a more inclusive learning environment for a diversity of students whose learning styles vary.

Beyond supporting individual learning, the classroom in the round facilitates group work as well. Instructors can easily move between tables to interact while students

work, and the new technology in the classroom allows students to connect to the projectors from their device to share their work, their phone’s camera, or other visuals with the class. It’s a flexible space that encourages students’ active participation.

Dr. Arnaboldi saw many positive effects, among them higher attendance than previous years and students demonstrating more engagement with the class material.

“Last semester, I taught this class in a gigantic lecture hall and had low attendance even though the class was in the middle of the day,” says Dr. Arnaboldi. “This semester, more students came to class, even though it was at 9 AM.”

The classroom in the round is one of many new types of classrooms in CCCB, which opened in January 2022. The new building is full of alternative classrooms that encourage team-based and immersive learning. Dr. Arnaboldi has been among the first instructors to experiment with the new classroom styles and while she has experienced some challenges adjusting her slides and teaching style, she finds it to be an overall positive experience. She’s requested to teach more oceanography classes in the classroom in the round soon.

“I’m excited by this new space,” says Dr. Arnaboldi. “I think it has a lot of potential. I want to encourage other instructors to think about moving classes into one of these new alternative teaching spaces, because they can really change the dynamic of your class and the student experience.”

*Classroom photo courtesy of Frances Mueller*



EARTH faculty continue to use be certain to bring the real world into their classroom and vice versa. As in the past, **Professor Jackie Li** took 20 students from her Earth 315 Mineralogy class to the 77th Annual Detroit Mineral Show. Students received admission and a take-out lunch, and spent a Saturday engaging with a wide diversity of minerals they had studied in class.

# Farewell, Chris!

It's bittersweet to share the news that **Professor Chris Poulsen** has recently stepped into a new role as the dean of the University of Oregon's College of Arts and Sciences. It, of course, comes as no surprise to us in EARTH that Chris was sought out for further advancement within higher education administration. We have watched Chris serve as associate dean with equanimity, thoughtfulness, and clear vision since he assumed the role in 2018. We are delighted to see him take on this new opportunity.



Chris is a climate scientist and professor of earth science at the University of Oregon. His research seeks to understand the causes of past climate change on Earth and what lessons they hold for predicting our future climate. Much of his work uses advanced theoretical climate models as tools for exploring climate processes and dynamics. To do his work, he collaborates closely with geologists, environmental scientists, and ecologists. He has co-authored over 130 articles on topics such as past cold and warm climates, climate-mountain interactions, and earth system modeling. Chris is an associate editor at the *American Journal of Science*, and a former associate editor for *Paleoceanography and Paleoclimatology*. He is also a fellow of the Geological Society of America and the American Association for the Advancement of Science.

As the Tykeson Dean of the College of Arts and Sciences at UO, Chris is committed to advancing the liberal arts mission and scholarly excellence of the college, and to creating a diverse community where all are welcome and can thrive. He believes that the teaching, learning, research, creation, and service that happens in the college contributes to making a more just, equitable, and sustainable world. His aim is to foster an inclusive climate that supports and celebrates this work. Chris oversees the operations of the College of Arts and Sciences and sits on the Academic Leadership Team and the Dean's Council.

His colleagues in EARTH—and across both LSA and UM—are grateful for his years of contribution, his dedication to teaching and research, and his commendable service. Please join us in wishing Chris the best of luck at the University of Oregon.

## Turner Award Highlight

**Kaitlin Koshurba** is a master's student in EARTH, and is one of the recipients of the Turner award, a departmental grant that provides students with financial support for travel, fieldwork, or research projects. Kaitlin, originally from Macomb, MI, started in EARTH as an undergraduate, where she worked in a lab that focused on rare mineral synthesis, transforming manganese silicate into braunite. After taking a gap year post-graduation, Kaitlin pursued a master's in Earth and Environmental Sciences with a focus on geomicrobiology, and is currently working on clay synthesis to compare early Earth and Martian clays. Her first-year proposal received the department's Golden Nebula Award.

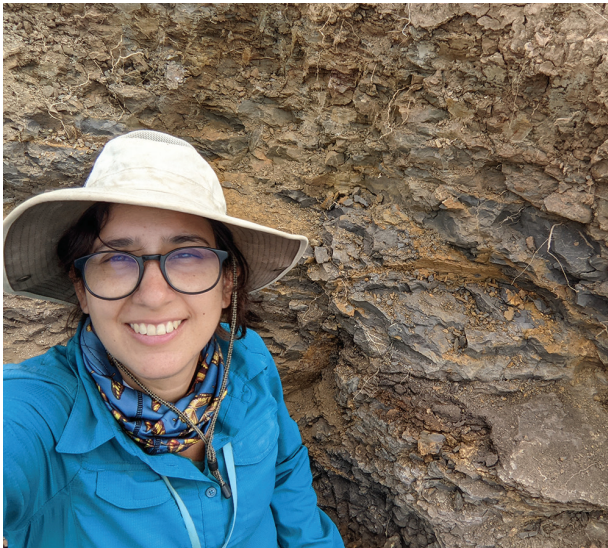
"There's always a question that needs to be answered," Kaitlin explains when asked about her favorite and most challenging parts of lab work. "There's always something new to do and figure out — it's never the same thing everyday." Whether she's dealing with contamination issues in the lab or mentoring her undergraduate peers, Kaitlin continues to find inspiration and passion in her studies. Originally a student at Oakland University, Kaitlin was motivated to transfer by the caliber of department resources and caring faculty, as well as the one-of-kind Rocky Mountain Field Station at Camp Davis. She cites her advisor, Jena Johnson, and senior lab assistant, Alice Zhou, as sources of inspiration, admiring them for their intellect and willingness to listen when "[I come with questions] to pick their brain."

Kaitlin utilized her grant to participate in a 2-day seminar on Raman spectroscopy, where she got to practice on real instruments and sharpen her mineral identification skills. Raman spectroscopy is frequently used in chemical labs to provide a blueprint of a molecule, which is essential for confirming its identification. Kaitlin is excited to continue her work in the research lab and "see it all come together," and hopes to pursue a Ph.D. or industry work in the future.



# Faculty Hires

After weathering the hiring freezes of the early COVID period, EARTH and U-M Museum of Paleontology (UMMP) were delighted to have our request for a new faculty hire in Paleontology approved. We recruited Dr. Mónica Carvalho as an Assistant Professor in EARTH and Assistant Curator in UMMP. Dr. Carvalho will begin her appointment as an Assistant Professor on January 1, 2023. We also successfully recruited Dr. Jessica Fayne through the LSA Collegiate Fellowship/Presidential Postdoctoral Fellowship. Dr. Fayne will begin her postdoc in January 2023 and Assistant Professorship in September 2024. Dr. Fayne's postdoc is the first time the university has made a combined collegiate fellowship-presidential postdoc offer. EARTH also hired Jefferson Yarce, the department's first Lecturer III. Jefferson will teach undergraduate and graduate courses as well as commit time to undergraduate advising.



**Dr. Mónica Carvalho, Assistant Professor and Assistant Curator** - Mónica received her BS in Biology from Universidad de Antioquia (2009), a MS in Geosciences from The Pennsylvania State University (2011) and PhD in Plant Biology from Cornell University (2017). Her research aims to understand how plants and tropical ecosystems have changed through geologic time. Mónica collects and studies plant fossils in tropical South America, and uses observational and experimental approaches to better understand the paleobiology and evolution of tropical rainforests. Her work documents how interactions between plants and insect herbivores are recorded in leaf damage, form-function relations of leaves, and how acclimation responses of tropical plants to climate change can inform ecosystem function in deep time.



**Dr. Jessica Fayne, LSA Collegiate Fellow/Presidential Postdoctoral Fellow/Assistant Professor (2024)** - Jessica received her BA in Political Science from Hampton University (2010), a graduate certificate in Cross Cultural Communications from American University (2011), an MS degree in cartographic sciences from George Mason University (2015) and a PhD in Geography from UCLA (2022). Jessica's research focuses on remote sensing datasets to study water quantity and state. By understanding the dynamics of water quantity and state, her work aims to better understand current and historical hydrologic trends and improve resilience to ongoing climatic changes. Her research is interdisciplinary, crossing fields of electrical engineering, Earth Science and Civil Engineering, urban planning, and geography.



**Jefferson Yarce, Lecturer III** - Jefferson began his PhD in January 2015 at the University of Colorado, Boulder, studying microearthquake seismicity in the North Island of New Zealand and the potential relationship of seismicity with Slow Slip Events. During his graduate studies, Jefferson realized that his true passion in the Earth sciences was in education. He also realized that inclusive education and diverse representation is fundamental for achieving equity and diversity in the Earth sciences. After completing his PhD in May 2020, he joined the department as a Lecturer I in fall 2020 and as a Lecturer III in winter 2021. Jefferson is giving all his passion for equitable and inclusive teaching of Earth sciences to his classrooms here at the University of Michigan. Jefferson is currently teaching the Comprehensive Studies Program (CSP) section of Introduction to Earth Science and the natural hazards class, When Earth Attacks! Jefferson also taught Introduction to Earth and Environmental Sciences at Camp Davis this past summer.

# Earth Staff Spotlight

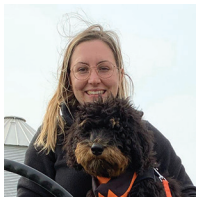
We've been busy hiring since we last sent out a newsletter. Please join us in welcoming our new administrative and technical staff members! Some have been with us for quite some time but never been introduced in a newsletter, so we're taking the opportunity now.



**Karly Clippinger, Research Lab Technician Lead** - Karly Clippinger joined EARTH in June of 2022 as a lab technician for the Cory Lab. Karly is originally from Wisconsin and graduated with a BS in Environmental Geology from Beloit College. Since graduating, Karly has worked as an environmental consultant in Chicago as well as a lab technician in Denver. When not in the lab, Karly spends her time traveling and hiking with her husband and two husky mixes.



**Kelsey Dyez, Research Lab Specialist Senior** - Kelsey Dyez is a Lab Manager working in the Stable Isotope Facility with Julie Cole's group. He is finalizing a project that reconstructs annual rainfall over the Great Barrier Reef using geochemical proxies from coral skeletons. He works alongside the rest of the team which includes four amazing undergrad research assistants, one outstanding grad student, and two work-horse spectrometers. He earned a PhD at UC Santa Cruz and taught courses at San Francisco State University and then studied abroad and at Columbia's Lamont-Doherty Earth Observatory. Kelsey is actively committed to establishing anti-racism policies more broadly in the geosciences.



**Amie Frank** is EARTH's Facility and Safety Coordinator, overseeing daily operations within our building infrastructure and maintaining high safety standards for our research labs and class labs. This includes working with custodial, maintenance, Architecture, Engineering and Construction (AEC) and Environment, Health and Safety (EHS) to have the North University Building (NUB) running as smoothly as possible. She is always more than happy to assist anyone in the building with any wayfinding, building or safety related needs.

Amie received her BS (2015) in Chemistry at Ball State University followed by her MS (2017) and PhD (2020) in Chemistry at the University of Michigan prior to joining the EARTH team. Outside of work, Amie enjoys spending time with her family and helping on the family-owned farm. Always with her is her trusty sidekick, Whistler, a bernedoodle who loves taking the spotlight whenever he can.



**Carla Huhn, Executive Coordinator** - Carla Huhn is EARTH's Executive Coordinator. She works closely with the Chair and CA, and manages their calendars and correspondence along with providing other support. She coordinates and supports meetings with the faculty, executive committee, and alumni advisory board and handles faculty affairs processes like promotions, recruitment, and reviews. Carla received her BA in Psychology from U-M Dearborn. Before coming to EARTH in March 2021, she worked in the LSA Dean's office and the Opportunity Hub. Outside of work, Carla loves spending time with her family. She and her husband, Nate, have a total of five kids between the ages of 14 and 21.



**Courtney Hooper, Chief Administrator** - Courtney oversees the administrative operations of the department, specifically the faculty affairs, human resources, student services, financial affairs, and facilities domains. Each area is directly managed by a member of EARTH's staff, but Courtney works closely with each of them and the associate chairs to oversee operations. She's like an air traffic controller, making sure every piece is coordinating with the others.

Courtney received her BA in Cultural Studies from Columbia College Chicago and her MSW from New York University. She worked in academic program management at three different schools within Columbia University for more than a decade before joining EARTH in September 2020.



**Jenna Munson** is EARTH's Outreach Specialist and a Lecturer for EARTH classes. Jenna coordinates outreach activities with high-school students in the greater-Detroit area, and continues to support students who have participated in our pre-college programming when they matriculate to UM. Jenna is often looking for staff for summer field-trip programming to places like northern Michigan, the UP, and Wyoming. She also pairs undergraduates from her outreach programming with mentors and in EARTH laboratories. If you are interested in being involved with outreach to high-school students from backgrounds traditionally underrepresented in the earth sciences, please contact her.

Jenna received a BS in geology from the University of Minnesota and her PhD from Scripps Institution of Oceanography. When she's not in the office, she spends time with her family outdoors, on the river, or backpacking/camping, driving her kids to/cheering them on in activities, or playing with her dog.



**Zhongrui (Jerry) Li, Associate Research Scientist/Lab Specialist Senior** - Jerry works in the Electron Microbeam Analysis Laboratory (EMAL). His research interest is in using advanced spectroscopies to investigate the structure-property relationship of functional materials. Currently, he is studying the electronic structure and correlation of quantum materials using Auger electron spectroscopy.



**Nico Spraggins, Senior Student and Administrative Services Assistant** -While working the front desk, Nico coordinates the department's Smith Lectures, manages the mailroom and supplies, and assists the Academic Program Manager with graduate student recruitment, major/minor expo declarations, fall preview, commencement, among many other things. Nico received his Bachelors in Business Administration from Cleary University. Prior to joining Earth in October 2021, he worked in the emergency room as a registration team lead at Michigan Medicine.



**Chrissy Zigulis, Academic Program Manager** - Chrissy works with the associate chairs for undergraduate and graduate studies. She handles graduate student support and works with undergraduate advisors, plans class scheduling and curriculum along with class registration. Chrissy received her BA in Communications and Sociology from Michigan State University and her Master's of Management in Human Resources from University of Phoenix. She has worked in various student-facing roles for the past 14 years at the university in Physics, Rackham Graduate School, and the School of Education.

## Alumni Achievements



### **Anjali Goswami - President-Elect of the Linnean Society**

EARTH alum Dr. Anjali Goswami, dean of Postgraduate Education and research leader in Life Sciences at The Natural History Museum in London and an honorary professor of paleobiology at University College London, was recently elected president of the Linnean Society of London. Founded in 1788, the Linnean Society of London is the world's oldest society dedicated to the field of natural history. Goswami completed her BS in EARTH and is now leading a project to better understand the transition of biodiversity that resulted from the Cretaceous/Paleogene mass extinction that occurred 66 million years ago.



### **David Krause - Romer-Simpson Medal**

Dr. David Krause, who received his PhD in Geology from the University of Michigan in 1982, is this year's recipient of the Romer-Simpson Medal from the Society of Vertebrate Paleontology. This award is the Society's highest honor, presented only to individuals who have displayed sustained and outstanding scholarly excellence in the discipline of Vertebrate Paleontology. Now at the Denver Museum of Nature and Science, Dr. Krause is focusing on researching the evolutionary and biogeographic history of vertebrate fauna from the Neoproterozoic supercontinent Gondwana.



### **Peng Ni - UCLA Tenure Track Position**

EARTH alum Dr. Peng Ni has accepted a tenure track position at UCLA as Assistant Professor of Earth, Planetary, and Space Sciences. Beginning in January of 2023, Dr. Ni will be conducting research in the experimental planetary sciences, and examining how using isotopes as tracers of physicochemical processes can elucidate the mystery behind the physical bodies in our Solar System. His projects will integrate a variety of methods, from cosmochemistry to experimental petrology to isotope geochemistry, in order to better understand the formation, differentiation, and evolution of Earth and planets like it.

# In Memoriam

**Teal Furnholm (1982-2022).** Teal died surrounded by friends on June 27, 2022, of cancer. Teal was a unique and gifted human being. She joined Greg Dick's research group in fall 2018, following a postdoc on the microbiome of human skin and a PhD and BS in Microbiology. Teal also founded and led an educational software company during her eclectic life. As a member of the Geomicrobiology Lab, she completed an impressive project with Procter & Gamble, supported collaborative research with colleagues in the med school, and laid foundations for a database and data portal that will make genomics data from the Great Lakes more broadly accessible and valuable.

Teal's kindness, passion for science/bioinformatics, and interest in training students and helping others were obvious. Her attention to detail, deep thinking about complex databases and algorithms, and dedication to "getting it right" were all exceptional. Her insistence on continuing to make professional contributions through the difficult health challenges she faced, especially in service of others, were remarkable. Her caring and generous spirit were also apparent through her sharing of wellness and mindfulness resources with the lab group during the most difficult moments of the pandemic.

**Julie Haggerty (1955-2021).** Julie passed away peacefully at home on September 21, 2021, after a long battle with cancer. She served as the department's chief administrator from 2010 through her retirement in 2020, continuing on beyond her original planned retirement date to help see Earth through the earliest, chaotic days of the pandemic. For the three department chairs who worked closely with Julie, she was a wise, resourceful, and treasured colleague. Julie was known to all in the department for her keen intellect, her unflagging support of the Earth community, and her loving spirit. Donations in Julie's memory can be made to Gilda's Club of Grand Rapids.

**Roberto Molina Garza (1960-2021).** Roberto was killed December 29, 2021, in an attempted carjacking near Villagran, Guanajuato, Mexico. He was a professor at the Centre for Geosciences, Universidad Nacional Autonoma de Mexico (UNAM), in Juriquilla, Queretero, having received his PhD from Earth in 1989. Roberto studied geophysical engineering and received an BSc degree from UNAM prior to coming to Ann Arbor and working with Rob Van der Voo. His dissertation included paleomagnetic studies of the tectonic rotation of the Yucatan Block and the opening of the Gulf of Mexico, as well as the magnetostratigraphy of red beds of west Texas, demonstrating the age of the termination of the late Paleozoic Kiaman superchron. He carried out postdoctoral research at the University of Utrecht and then at the University of New Mexico and became a Research Scientist in the Department of Earth and Planetary Sciences there, continuing research with John Geissman and several other colleagues for almost a decade. He returned to Mexico, to the UNAM Centre of Geosciences where he was a member of the faculty and broadened his research efforts to a number of geologic and tectonic problems in Mexico and adjacent regions. He was the mentor to numerous students, both from Mexico and several other countries, promoting an array of international collaborations. He was deeply interested in earth science education, as indicated by his textbook on earth science and the geology of Mexico. Roberto loved life, family, and work, and will be greatly missed by many.



**Jerry Smith (1935-2022).** Jerry passed away peacefully at his home on Sandhill Farm on September 20, 2022, in the company of his wife, Catherine Badgley, his son, Keith Smith, and his sister-in-law, Barbara Badgley. Jerry leaves behind a major legacy in paleontology and in the U-M Museum of Paleontology. He began as a curator in 1969 and served as director from 1975-1981. He also held a curatorial appointment in the Museum of Zoology, where he served as director from 1998-2002.

Jerry's work focused on fossil and living freshwater fishes, with an emphasis on the Cenozoic of North America. Jerry used fossils in innovative ways to examine changes in drainage systems, the response of morphology to shifting environmental conditions, and the impact of hybridization on evolution. His years of effort in the field contributed to one of the principal



strengths in the vertebrate collection, with thousands of fossil fish specimens--including many types--arising from his work.

In addition to being an outstanding scientist, Jerry was a positive force in the paleontological community at Michigan and beyond. Jerry provided mentorship to generations of researchers and students. He was a wise, kind, and generous colleague who will be dearly missed. In lieu of flowers, donations in Jerry's memory can be made to the George Junne Internship Fieldwork Award Fund of the University of Michigan (account 337670). This fund was started by Jerry and Catherine Badgley to support Black and Indigenous paleontology students in conducting their field work.

**G.D. Sharma (1931-2020).** The namesake and founding donor of Earth's G.D. Sharma Fellowship, Dr. Ghanshyam Sharma received his PhD in 1962 from the erstwhile Department of Geology. Dr. Sharma had originally planned to pursue his studies elsewhere in the United States when a friend told him he should really go to the University of Michigan. With less than \$500 in his pocket, Dr. Sharma arrived in Ann Arbor but soon found he had underestimated tuition and other expenses. Having spent his meager funds within a year or so after his arrival in Ann Arbor, Dr. Sharma's financial situation forced him to contemplate leaving academia for industry. He had been accepted to a lucrative, eighteen-month expedition to the South Pole, intending to take a hiatus from his studies to earn money as a field assistant, when Prof. James T. Wilson, chair of the department, learned of his plans. Citing the university's mission to provide an "uncommon education to the common man," Prof. Wilson objected to Dr. Sharma being denied an education for lack of financial means and located support for Dr. Sharma. It was in memory of this kindness that Dr. Sharma gave a \$1M gift in 2017 to establish a fund for need-based financial support to graduate students.

Dr. Sharma led a successful career in petroleum geology, founding the Petroleum Development Laboratory at the University of Alaska, Fairbanks. He pursued his work in Alaska for nearly thirty years before relocating to Europe where he eventually retired. Dr. Sharma's acumen, pragmatism, and generosity marked him as a leader in both his field and the department. His vision and willingness to recognize and encourage talented scholars created a lasting legacy of innovation and success. He is survived by his son, Dr. Arun Sharma, and nephew, Dr. Trilok Sharma. Contributions in Dr. Sharma's memory may be made to the Sharma Family Endowed Fellowship Fund, account G020652.

**Jillian Wiener (2000-2022).** Jillian and her sister Lindsay were killed on August 3, 2022, while vacationing with their parents and brother. Jillian's friends, family, and classmates remember her as a playful, vibrant young woman who loved the outdoors, yoga, and ice hockey. Jillian planned to begin a career in environmental activism, having spent a semester abroad in the Turks and Caicos studying coral reefs. Jillian, who was expected to graduate in 2022, received a posthumous Bachelor of Science degree from the University of Michigan. Jillian spent part of this past summer at Camp Davis, and several native trees were planted there in her memory. Jillian's family has asked that in lieu of flowers, donations be made to Coral Gardeners.



# Thanks to Our Generous Donors!

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# Goings-On

While the pandemic has presented some unique challenges, our faculty, students, and alums have continued to shine. Here are just a few exciting developments since EARTH's last newsletter.

**Professor Joel Blum** was elected to the National Academy of Sciences (NAS) in 2020. Members are elected in recognition of their distinguished and continuing achievements in original research. Membership is a widely accepted mark of excellence in science and is considered one of the highest honors that a scientist can receive. Current NAS membership totals approximately 2,400 members and 500 international members, including approximately 190 Nobel laureates.

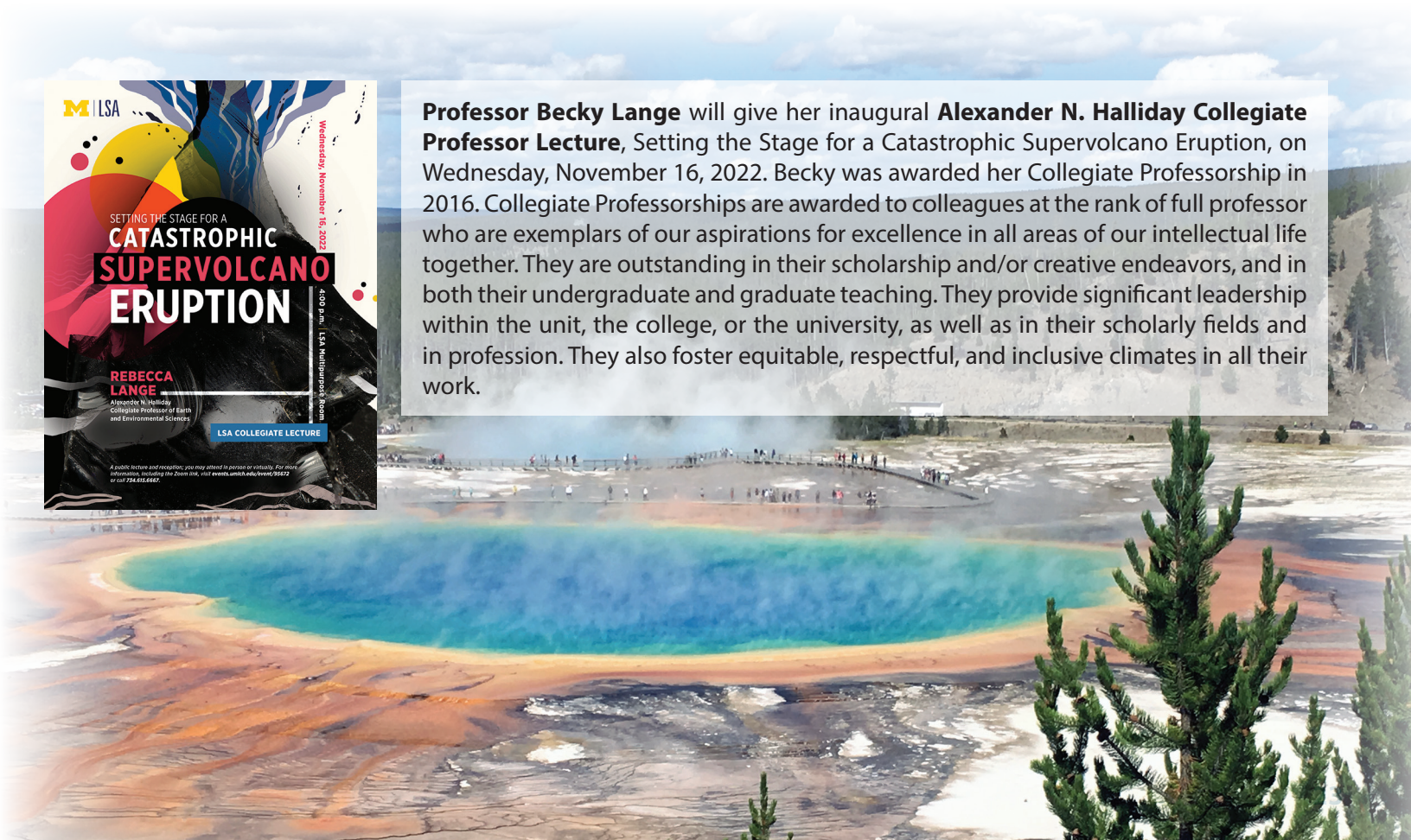
**Professors Marin Clark** and **Becky Lange** were elected to the 2022 class of AGU Fellows. This year's AGU Fellows earned the honor because of remarkable innovation and/or sustained scientific impact. In addition, each fellow embodies AGU's values by fostering equity, integrity, diversity, and open science; by mentoring; through public engagement; and in their communications.

A paper published this fall in AGU Advances by MS student **Molly Range**, and **Professors Brian Arbic** and **Ted Moore**, and colleagues which summarizes the sediment disturbance and tsunami modeling evidence for the size and dispersion of the tsunami produced by the Chicxulub asteroid impact 66 Mybp has been picked up by the Washington Post, CNN Space Science, and many others. Molly began the project as an undergraduate in our department, and it then became her fifth year MS project. She presented it at the 2018 Fall AGU meeting, and it stirred much interest there as well as an EOS article. It was merged with an article by Ted Moore before being published. As of this writing, the paper has been out for 3 weeks and has been discussed in 176 news stories from 149 outlets (as recorded by Altmetric).

**Professor Becky Lange** was elected a GSA Fellow for her contributions to our understanding of the thermodynamic properties of magmas and her leadership in Earth science programs and organizations (2021).

**Professors Nathan Niemi** and **Nathan Sheldon** were elected to the 2019 and 2020 classes (respectively) of the American Association for the Advancement of Science (AAAS). Fellows are a distinguished cadre of scientists, engineers, and innovators who have been recognized for their achievements across disciplines, from research, teaching, and technology, to administration in academia, industry and government, to excellence in communicating and interpreting science to the public.

**Professor Becky Lange** will give her inaugural **Alexander N. Halliday Collegiate Professor Lecture**, *Setting the Stage for a Catastrophic Supervolcano Eruption*, on Wednesday, November 16, 2022. Becky was awarded her Collegiate Professorship in 2016. Collegiate Professorships are awarded to colleagues at the rank of full professor who are exemplars of our aspirations for excellence in all areas of our intellectual life together. They are outstanding in their scholarship and/or creative endeavors, and in both their undergraduate and graduate teaching. They provide significant leadership within the unit, the college, or the university, as well as in their scholarly fields and in profession. They also foster equitable, respectful, and inclusive climates in all their work.



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