



Down to Earth

Department of Geology and Geophysics
University of Utah



SAVE THE DATE

SUMMER 2022, Alps Field Trip

Ludwig Maximilian University (LMU) & University of Utah (UU) Exchange

WHO: Current undergraduate students in the Department of Geology and Geophysics who have completed GEO 1100, 2100, 2500, 3100, and graduate students. A few open slots for alumni who can sponsor their own trip are also available. Limit ~12-15 from the UU contingent.



Dr. Friedrich leading an Alps field course in Germany.

WHEN: Likely August 2022, following a virtual preparation class in Spring 2022, based out of Munich, Germany. Formal part of in-person trip will last approximately 10-12 days. ***Field Trip will be dependent on COVID restrictions.***

COST: Plan on ~\$500 per student with the rest hopefully subsidized (may be dependent on fundraising efforts). Program will be seeking internal and external funding support along with matching funds.



Dr. Friedrich diagrams and explains complex field relationships in the Alps.

WHAT: Experience a once-in-a-lifetime trip to see world-renowned Alpine geology (classic localities known from over 100 years ago) led by Dr. Anke Friedrich, LMU host, and UU's Dr. Pete Lippert and possibly Dr. Randall Irmis! Help build our academic exchange between the two geology departments. Be a Utah ambassador and meet European colleagues and counterparts as you learn together.

Dr. Anke Friedrich, Professor and Endowed Chair of Geology at LMU in Munich, was the 2019 recipient of the GG Distinguished Alumni Award (UU B.S. 1990, M.S. 1994). Dr. Friedrich had a short 2019 spring sabbatical in Salt Lake City, where she interacted with UU faculty and students. With over 15 years of exchanging students and staff to participate in teaching activities that are unique to their respective locations, the proposed collaboration will allow for new ideas to emerge and enhance the student/faculty interactions through research- and field-based learning environments. The goal is to revitalize and expand the partnership between Utah and LMU and develop options for a dual Master's degree program. This could be a win-win situation for all and best of all, seeing some of the best geology of the Alps!

Notes from the Chair:

Just starting out the new academic year and we are glad to be back in-person, at least “sort of” after the past year of almost 100% virtual teaching. We had expected COVID-19 to subside in the Fall 2020 semester, but it exploded in unexpected ways and the final result was that we did almost the entire year remotely. But Shakespeare had some of his most creative time during a pandemic and we, too, have used the experience in creative ways.

In July 2020 we began a project of 3-D photography of rocks, minerals, and fossils and it has continued to the present day. Sarah Lambart, Kathleen Ritterbush, Wil Mace, John Bowman, Erich Petersen, Nick Hebdon, Josh Marquart and others photographed dozens upon dozens of specimens from our collections so that we could do remote teaching of mineral and rock identification. Check out some of these on page 12. Quintin Sahratian and Paul Eubanks prepared rock and mineral kits, and lab kits, that were mailed to students so they had some of the actual specimens for handling and for small “kitchen” lab experiments. We had never done anything like this before, and now we have some new approaches towards learning that will make our teaching programs better when we finally return to normal.

Our Distinguished Lecture series was done completely virtually. This also allowed us to bring in speakers from abroad and also allowed many people to attend talks who could not have done so otherwise. I hope that some of you will also take advantage of this in the coming year. We expect that most lectures will be videotaped “live” so that people can attend even if not physically present at the University.

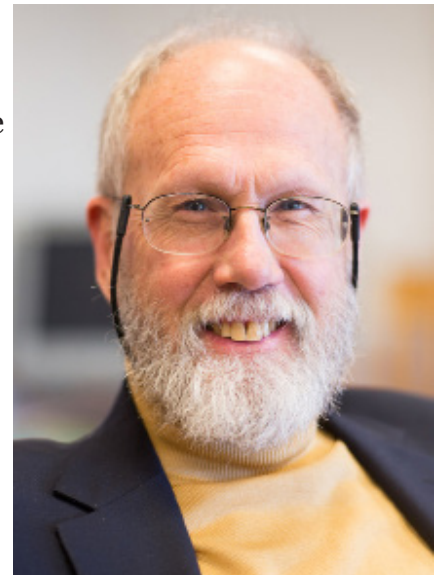
Field camp – once again – had to be done virtually. Professor Tonie van Dam, assisted by Professor Jamie Farrell, led the first half of the program, using her skills in geodesy and programming to show students how remote sensing and modeling could contribute to larger geological projects. Professors Randy Irmis and Pete Lippert led the second part of class using drill cores from Petrified Forest National Park to understand sedimentology/paleoenvironment and communicating science in National Parks.

Once again, we thank many of our alumni for supporting our program. Thanks to your generosity, we were able to award more than the \$100,000 in undergraduate scholarships for the 2021-2022 academic year.

In April, 2021 we hired Jamee Lefler who is handling our accounting. She joins our very competent staff of Shanna Futral, Michelle Tuitupou, Thea Hatfield, Wil Mace, Quintin Sahratian, Cindi Meyer, Alan Rigby, Kayleigh Kirkpatrick, and Paul Eubanks. In July 2022 we will also be joined by Sarah Crump as an Assistant Professor, coming from the University of Colorado. She works on ancient DNA and will bring a new dimension to our geobiology program.

We look forward to an exciting 2021-2022 academic year. Our beginning geology courses are full for fall term and we expect to be searching for several new faculty positions. I look forward to seeing you all – virtually – at our alumni reception on November 18, 2021.

Dr. Thure Cerling, Department Chair



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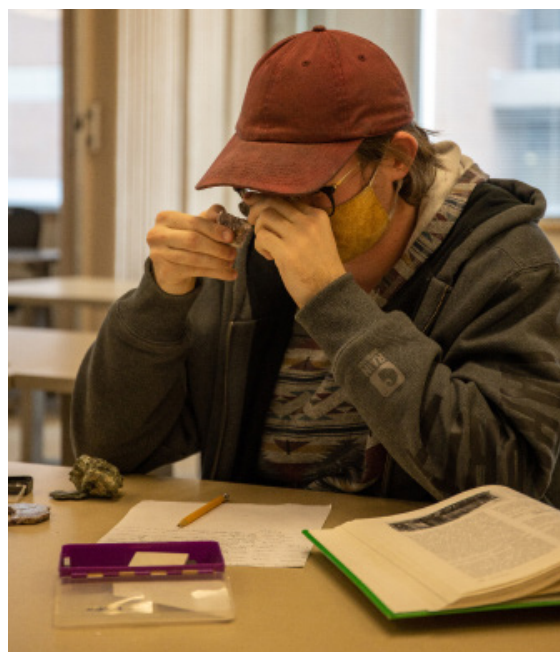
Front Cover:

*Stomp masks in the field

*Seismometer set up on Moab arch

Down to Earth contributors: Gabe Bowen, Marjorie Chan, Anke Friedrich, Shanna Futral, Paul Gabrielsen, Holly Godsey, Brendan Horton, Randall Irmis, Sarah Lambart, Fan-Chi Lin, Kevin Mendoza, Barbara Nash, Erich Petersen, Lisa Potter, Rebecca Sumison, Michelle Tuitupou

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From Undergraduate to Graduate: Discovering a Passion for Research

“I really enjoy writing code,” Armstrong shared. “I find it very rewarding to take these concepts and algorithms from computer science and apply them to our very specific seismology problems and get results.”

Alysha Armstrong fell in love with research while earning her undergraduate Geology and Geophysics degree from the University of Utah. Her research opportunities opened new doors and led Alysha to stay at the University for her MS in Geophysics by working with the University of Utah Seismograph Stations (UUSS).

Alysha initially started out as an environmental geoscience major. While taking a course taught by Research Assistant Professor Amir Allam, she received the opportunity to start research with Dr. Allam.

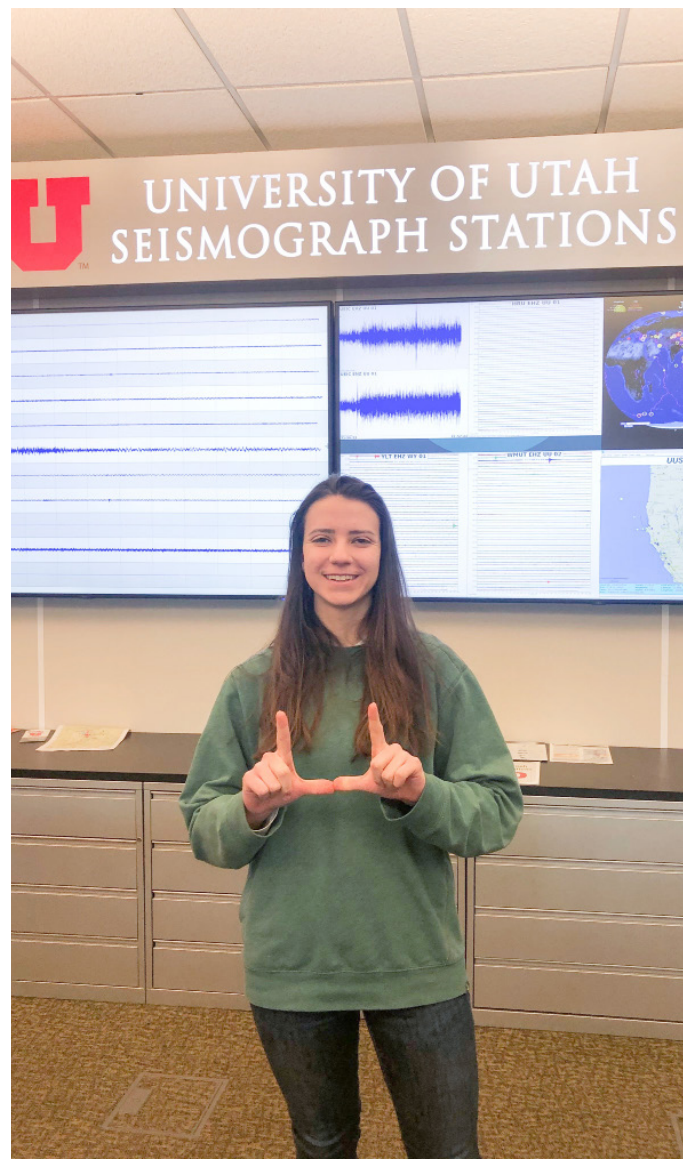
“In working with Dr. Allam, I figured out I was interested in geophysics – I’m really interested in math and physics so geophysics seemed to be a better fit for me,” Alysha said.

Dr. Allam also helped her connect with UUSS where she started as a student researcher. Not only did she further develop her passion for research, she also discovered her interest in seismology.

Alysha now finds herself thriving in her graduate program where research is the main focus. Her current research involves finding “hidden” earthquakes in Yellowstone. She writes machine learning code to identify earthquakes that aren’t big enough to trigger the automatic systems. This process can greatly increase earthquake catalog counts.

“I really enjoy writing code,” Alysha shared. “I find it very rewarding to take these concepts and algorithms from computer science and apply them to our very specific seismology problems and get results. It’s an exciting process.”

Alysha plans to earn a Ph.D. and would like to do research with a national lab or USGS.



Alysha Armstrong shows support for the U in the UUSS earthquake information center.

Project FIND-EM

Forensic Identification of our Nation's Deceased with Element Mapping

More than 80,000 American service members who lost their lives in 20th-century conflicts remain missing or unidentified. Obtaining, identifying, and repatriating the remains of those who perished overseas remains a focus for the families of missing service members, the US military and many non-governmental groups that have taken on this mission.

DNA techniques are now widely used for final identification of remains, but require matching DNA data from the deceased to that from a close relative. Other techniques that help investigators narrow the pool of potential identities, and reduce DNA sampling burden, can increase the efficiency and effectiveness of these programs. Stable isotope analysis, in particular, has been explored as a method that could provide information on the locations where a recovered individual lived and, consequently, guide the search for relatives.

In a new project, the SPATIAL group, led by Dr. Gabe Bowen, has partnered with the Defense POW/MIA Accounting Agency (DPAA) to work towards developing the practice of forensic identification using isotopes. Project FIND-EM will focus on documenting and assessing oxygen isotope variations in tooth enamel across the contiguous USA, with the goal of developing maps of the expected enamel isotope values for individuals living in different locations. To achieve this goal, the team will be soliciting donations of 3rd molars (“wisdom teeth”), extracted during normal dental work, from individuals throughout the country. We will analyze the oxygen isotope composition ($\delta^{18}\text{O}$) of the teeth and use statistical methods to explore, understand, and model its geographic variation.

The resulting isotopic maps will provide a basis for evaluating data from unidentified remains to determine the geographic region in which the individual lived as a child, helping to establish their identity and offer closure to their families.



The Project FIND-EM team includes Postdoctoral Researchers Dr. Alejandro Serna and Dr. Kirsten Verostick, Master's student Francesca Spencer, Study Coordinator Stephannie Covarrubias, Research Faculty Dr. Rich Fiorella, and Lab Coordinator Sagarika Banerjee.

If you want to know more about FIND-EM or even become a part of the project as a donor, contact Gabe Bowen (gabe.bowen@utah.edu) and/or Stephannie Covarrubias (u0698556@utah.edu).

Utah FORGE Seismic Monitoring Leads to Unexpected Research Opportunities for Post Doc

Maria Mesimeri, Post Doctoral Research Associate in Seismology, joined University of Utah Seismograph Stations (UUSS) planning to help Associate Director Kris Pankow with the seismic monitoring for the Utah FORGE (Frontier Observatory for Research in Geothermal Energy) project. What Dr. Mesimeri didn't plan on was the many additional research opportunities she would lead and the subsequent popularity of her publications.

Dr. Mesimeri was only with UUSS for two short years, but was hard at work during her advantageous stay. Dr. Mesimeri's published research was the beneficial byproduct of the equipment and research occurring for Utah FORGE. Dr. Mesimeri researched the Roosevelt Hydrothermal System's role in earthquake swarms and developed a frequency-domain-based algorithm for detecting very small earthquakes.

Utah FORGE's mission is to enable cutting-edge research and drilling and technology testing, as well as to allow scientists to identify a replicable, commercial pathway to EGS. Find out more at utahforge.com.

Her work was published in the papers: "Episodic Earthquake Swarms in the Mineral Mountains, Utah Driven by the Roosevelt Hydrothermal System" and "A Frequency-Domain-Based Algorithm for Detecting Microseismicity Using Dense Surface Seismic Arrays."

In 2019, Dr. Mesimeri helped deploy seismic monitoring equipment near the Utah FORGE site in Milford, Utah. Soon after the deployment, the Black Rock, Utah earthquake sequence (unrelated to Utah FORGE) occurred and was well recorded on the new equipment. The sequence was studied alongside a September 2018 event and led to Dr. Mesimeri's paper "Unusual Seismic Signals in the Sevier Desert, Utah Possibly Related to the Black Rock Volcanic Field." This publication was particularly noteworthy. Her paper received a great deal of attention and was reprinted or covered by over thirty news outlets nationally and internationally.

"MariaMesimeri_UUSS": Daniel Wells, Santiago Rabade, Dr. Maria Mesimeri, and Hao Zhang deploy an array of 151 nodal seismometers at the Utah FORGE site.



IODP EXPEDITION 396: Causes of Excess Magmatism During the Northeast Atlantic Continental Breakup

The North Atlantic break-up event generated a volume of magma that is too high to be explained by the type of magmatism that occurs along the Mid-Atlantic ridge today, that is, passive decompression melting with a normal mantle temperature. Three different hypotheses exist to explain this excess magmatism: 1) elevated mantle potential temperatures associated with a plume, 2) small-scale convection at the base of the lithosphere (no plume, but enhanced mantle flux), and 3) the presence of mantle heterogeneity. While all three hypotheses could play a role in the break-up event, the relative importance of each mechanisms remains unresolved.

Dr. Sarah Lambart has been invited to sail as a petrologist on the next International Ocean Discovery Program (IODP) expedition. The JOIDES Resolution research vessel left the port of Reykjavik (Iceland) on August 6, 2021, and sail for two full months on the coast of Norway.

During the expedition, the team will drill cores from the continental margin. As part of the Core Description Lab, Dr. Lambart will be responsible for the petrological and petrographic descriptions of the collected igneous rocks.

Because of COVID restrictions, the ship will only sail with a partial science party. Dr. Lambart and the other member of the sailing team will communicate progress and observations with the onshore team on a daily basis.

After the expedition, Dr. Lambart and the members of the MagMaX lab will study the collected rocks, in particular the large mineral grains that can record information about the temperature and variability of the mantle source and will be used to discriminate between the different hypotheses.

The JOIDES (Joint Oceanographic Institutions for Deep Earth Sampling) Resolution is a research vessel used by scientists at hundreds of universities around the world to explore the geology beneath the ocean floor.



Hydrothermal Tremor Studies of Yellowstone Geysers

Yellowstone geysers are not only fascinating natural wonders but also the expression of a complicated interaction between deep mantle upwelling, crustal magma bodies, shallow geology, and the hydrosphere. Over the last several years, Professor Fan-Chi Lin and Professor Jamie Farrell in the University of Utah Seismograph Stations (UUSS) have been working closely with former student, Dr. Sin-Mei Wu, to study the hydrothermal tremor of two of the most iconic geysers in Yellowstone, Old Faithful and Steamboat. By deploying dense seismic arrays and developing novel seismic analysis methods, detailed geyser plumbing structures down to ~150-meters depth have now been imaged.

With this success, the Utah team and collaborator, Prof. Michael Manga (UC Berkeley), just received a three-year award from the National Science Foundation (NSF) to continue their studies on Yellowstone geysers. The collaborative project entitled “Subsurface plumbing, tremor migration, and eruption cycle of Yellowstone Geysers” will collect interdisciplinary data to further understand the physical state of the geysers throughout the eruption cycle. Laboratory geyser models will be built to investigate the controlling factors on eruption characteristics (e.g. height, volume, and interval). With extensive and continuous seismic recording, questions on whether geyser eruptions can be accurately predicted will also be addressed. Through the research, the project will support undergraduate and graduate education in the department and the scientific findings will be disseminated through the education and outreach platforms of Yellowstone National Park and the USGS Yellowstone Volcano Observatory.

Wu, S. M., Lin, F. C., Farrell, J., Keller, W. E., White, E. B., & Hungerford, J. D. G. *Imaging the subsurface plumbing complex of Steamboat Geyser and Cistern Spring with hydrothermal tremor migration using seismic interferometry.* *Journal of Geophysical Research: Solid Earth*, 126, e2020JB021128. <https://doi.org/10.1029/2020JB021128>, 2021.

Wu, S.-M., F-C. Lin, J. Farrell, and A. Allam, *Imaging the Deep Subsurface Plumbing of Old Faithful-Geyser From Low-Frequency Hydrothermal Tremor Migration*, *Geophysical Research Letters*, 46. <https://doi.org/10.1029/2018GL081771>, 2019.

Wu, S.-M., Ward, K. M., Farrell, J., Lin, F.-C., Karplus, M., & Smith, R. B., *Anatomy of Old Faithful from subsurface seismic imaging of the Yellowstone Upper Geyser Basin*, *Geophysical Research Letters*, 44. [doi:10.1002/2017GL075255](https://doi.org/10.1002/2017GL075255), 2017.

Photo credit: Dr. Jamie Farrell, Steamboat eruption



UUSS Leadership Takes on Additional Responsibilities

As if dealing with the largest instrumentally recorded earthquake on the Wasatch Fault and the following attention in 2020 wasn't enough work, University of Utah Seismograph Stations (UUSS) Director Keith Koper and Associate Director Kris Pankow find themselves taking on even more responsibilities in 2021.

In 2019, UUSS joined the International Seismological Center (ISC). ISC is a non-governmental, non-profit international organization which maintains extensive information about earthquakes and other seismic events from around the world. This year, Dr. Koper became a formal representative to the ISC governing council, utilizing his expertise to make an international impact.

Dr. Koper and Dr. Pankow have also made significant contributions to the Seismological Society of America (SSA). Earlier this year, SSA announced their new journal "The Seismic Record," a rapid, short form open access journal. Dr. Koper is heading up the work for the new journal as the editor-in-chief.

SSA also announced newly elected leadership. Dr. Pankow was named the new secretary for the society. This is just one of many appointments she has received throughout her distinguished career, such as her service on the Utah Mine Safety Technical Advisory Council from 2011 to 2020 and her work as the Intermountain West regional coordinator for the Advanced National Seismic System (ANSS).

UUSS is proud to be led by such dedicated individuals who represent UUSS and their great work on a national and international scale.

To submit a story for The Seismic Record, please visit <https://www.seismosoc.org/publications/the-seismic-record/> for submission guidelines.

For up-to-date information regarding seismic monitoring in and around the state of Utah, please visit quake.utah.edu.



Publications

Jeremiah Bernau (PhD Candidate)
Co-author: Brenda Bowen

“Depositional and early diagenetic characteristics of modern saline pan deposits at the Bonneville Salt Flats, Utah, USA”

Sedimentology, The Journal of the
International Association of Sedimentologists
March 2021

<https://onlinelibrary.wiley.com/doi/full/10.1111/sed.12861>



Mark Radwin (MS student)
Co-author: Brenda Bowen

“Mapping mineralogy in evaporite basins through time using multispectral Landsat data: Examples from the Bonneville basin, Utah, USA”

Earth Surface Processes and Landforms
February 2021

<https://onlinelibrary.wiley.com/doi/10.1002/esp.5089>



Konstantinos Gkogkas (PhD candidate)
Co-authors: Fan-Chi Lin, Amir A. Allam,
Yadong Wang

“Shallow Damage Zone Structure of the Wasatch Fault in Salt Lake City from Ambient-Noise Double Beamforming with a Temporary Linear Array”

Seismological Research Letters
March 2021

<https://pubs.geoscienceworld.org/ssa/srl/article/92/4/2453/595243/Shallow-Damage-Zone-Structure-of-the-Wasatch-Fault?searchresult=1>



New Anthropocene Minerals Discovered

*Uroxite, San Juan County, Utah.
Field of view 0.68 mm across.
Photo credit: A. R. Kampf.*

The modification of Earth's landscape by human activity, often through construction and mining, has led to a punctuation event in the rate of production of new mineral species. Professor Emeritus Barbara Nash and her colleagues have reported in the last year the discovery of eight new Anthropocene minerals. The chemical compositions of the minerals were determined in the Department's electron microprobe laboratory. The majority of the minerals formed in the damp underground environment of abandoned mines in southern Utah, Colorado and Arizona.



Two organic species, uroxite, $[(\text{UO}_2)_2(\text{C}_2\text{O}_4)(\text{OH})_2(\text{H}_2\text{O})_2] \cdot \text{H}_2\text{O}$, and metauroxite $(\text{UO}_2)_2(\text{C}_2\text{O}_4)(\text{OH})_2(\text{H}_2\text{O})_2$, are the first known uranium minerals to contain the oxalate molecule, C_2O_4 . Two new ammonium-bearing uranyl sulfates, pseudomeisserite- (NH_4) , $(\text{NH}_4, \text{K})_2\text{Na}_4[(\text{UO}_2)_2(\text{SO}_4)_5] \cdot 4\text{H}_2\text{O}$, and nitscheite, $(\text{NH}_4)_2[(\text{UO}_2)_2(\text{SO}_4)_3(\text{H}_2\text{O})_2] \cdot 3\text{H}_2\text{O}$, were also found in southern Utah. The nitrogen is derived from organic material in the host sandstone. Also from the Uraivan District of southern Utah is uranoclite, $(\text{UO}_2)_2(\text{OH})_2\text{Cl}_2(\text{H}_2\text{O})_4$, the first uranyl chloride mineral that contains no other anions other than hydroxyl.

Three new organic minerals were discovered in association with bat guano deposits in a hot and humid area of the Rowley mine in Arizona. Allantoin, $\text{C}_4\text{H}_6\text{N}_4\text{O}_3$, also occurs as a major metabolic intermediate in most organisms including animals, plants and bacteria, and commercially is a common ingredient in skin care products. Natrosulfatourea, $\text{Na}_2(\text{SO}_4)[\text{CO}(\text{NH}_2)_2]$, derives its urea from bat urine. Also found in the Rowley mine is thebaite- NH_4 , a new ammonium-bearing, phosphate-oxalate mineral.

The newly-formed organic minerals further emphasize the intimate relationship between the biosphere and lithosphere, and uranyl sulfate minerals are important in understanding the mobility of uranium in post-mining environments.

Arnioceras ritterbushi named after GEO professor

Dating to around 190 to 199 million years ago during the early Jurassic Period, a newly described species of ammonoid was named after Assistant Professor Kathleen Ritterbush. The fossil was found in Nevada's Gabbs Valley mountain range in a rock layer known as the Sunrise Formation. Ammonoids lived in large spiral-shaped shells and were ocean-dwelling animals.

<https://attheu.utah.edu/announcements/fossil-species-named-for-u-professor-kathleen-ritterbush/>



Fossilized Tracks in Wyoming Dating Back to 58M Years



Adjunct Associate Professor Anton Wroblewski, first came across the 58-million-year-old tracks in 2019 at the Hanna Formation, about 75 miles northwest of Laramie, Wyoming. The tracks were left behind by two animals. The animal with the five toes appears to be a prehistoric mammal similar to a hippopotamus. The four-toed animal remains a mystery. Researchers, including Wroblewski, had walked by this outcrop for years, until the setting sun hit the tracks at just the right angle to make them noticeable.

<https://www.ksl.com/article/50165360/study-58m-year-old-tracks-found-by-u-geologist-earliest-documentation-of-seashore-mammals>

Monitoring Air Quality Using Evergreen Needles

Dr. Grant Rea-Downing, along with his mentor, Dr. Pete Lippert, have been studying evergreen needles and how they catch particle matter in the air. Those particles come from many sources including natural windblown dust, brake dust, and the byproduct of burning solid or fossil fuel. Some of the particles contain small traces of iron. Using a high-precision magnetometers, they are able to study these particles closer. “We’re not the first to explore the magnetism of pine needles to monitor air quality,” Lippert says, “but no one had tried this to study winter inversions in the basins of the American West.”

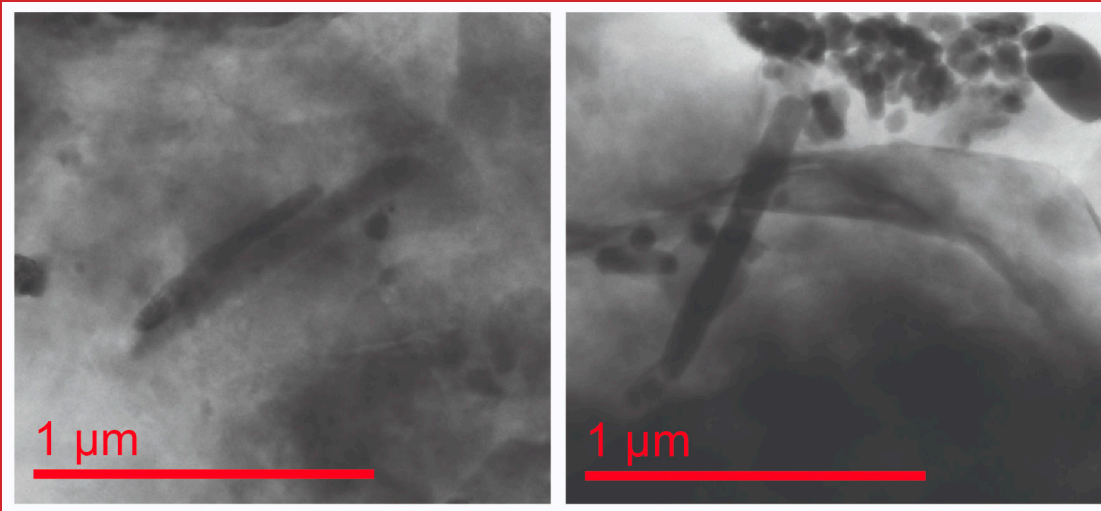
<https://attheu.utah.edu/facultystaff/evergreen-needles-air-quality/> (Photo credit: Paul Gabrielsen)



Clues to Past Climate in Magnetofossils

Dr. Courtney Wagner, Dr. Pete Lippert, and several colleagues have found that giant, needle-shaped magnetofossils have distinct magnetic signatures. Using a nondestructive method, they are now able to use information contained in magnetofossils to understand how oceans responded to past climate changes. This is also helping with current ocean and climate research.

<https://atheu.utah.edu/facultystaff/magnetofossils/>
<https://www.pnas.org/content/118/6/e2018169118>



Electron microscope images of giant needles. Needles have a cylindrical shape and some taper toward one end of the crystal.

Photo credit: Courtney Wagner, Kenneth Livi, and Ioan Lascu

Pterosaurs and the Reptile Family Tree

As part of a team of graduate students embarking on our first field season during the summer of 2006 excavating the Hayden Quarry at Ghost Ranch in northern New Mexico, they had no idea that this first discovery of a single bone would eventually play a crucial role in unraveling an enduring paleontological mystery: where pterosaurs – flying reptiles from the age of dinosaurs – fit on the reptile evolutionary family tree.

To read more of Dr. Randall Irms' blog, visit <https://nhmu.utah.edu/blog/2020/pterosaurs-in-nature>



The wings of pterosaurs are made of of a membrane that stretches from their arm and elongate 4th (“ring”) finger to the base of their legs. Credit: Nobu Tamura (CC-A-SA 4.0)

Earth Science Education and System Complexity



Welcome sign in Kendall Square. Students walk by this at the intersection of the MIT campus and The Cambridge Innovation Center that hosts over 450 startups and established technology companies.

I graduated with a masters in geology in 2012 from the University of Utah and while it was one of the most enjoyable experiences of my life, I knew (with certainty) that I would never go back to school again. I was done with academia and ready to enter the capital “W” Workforce, working at Chevron in Houston. I worked for the research arm of the company, global exploration, appraisal, asset sale, and everything in between.

A new opportunity arose where I could join a group of employees as part of the inaugural digital scholar cohort. Our task was simple – complete the two-year master’s course with a thesis component in System Design and Management at MIT in one year. Despite my previous certainty that I was bound for industry work, here I was back in academia. I completed the program and can say again with certainty that I am done with school...

Being an Earth Scientist provided me with a huge advantage in attending an engineering school – earth scientists wrestle daily with concepts of uncertainty and complexity. In sedimentology, we collect thousands of paleoflow indicators not for fun, but to learn and confine our own limitations of systemic understanding. Earth science education drills into us how small changes in our own perceptions can have dramatic systemic impacts. These skills and their impact to our daily lives (personal and professional) can’t be overstated. The whole world is a complex system, and we are one irreplaceable component.

Brendan Horton (MS, 2012)

Innovative Teaching in the world of COVID-19

For the 2020-2021 academic year, courses in the Department of Geology and Geophysics were taught online due to the pandemic. Our faculty and staff were able to come up with creative ways to stay in touch with students as well as provide important teaching materials for successful learning. Below are just a few examples of our innovative teaching tools including 3-D models, course packets, and mineral sample kits. These were mailed to students or available for pick up to ensure quality teaching in a virtual setting.



Photo credit: Jeff Moore



Photo credit: Brenda Bowen



Photo credit: Sarah Lambert



Photo credit: Kathleen Ritterbush

Earth Science Teacher Training



The University of Utah’s Master’s of Science for Secondary School Teachers (MSSST) has been a stable program for the past several years. Current high school teachers can earn a Master’s degree while conducting research with university professors. This past cohort (2018-2020), three teachers worked under the guidance of Dr. Gabe Bowen.

“It’s a pretty unique opportunity for the teachers, but also for the faculty to have this structured program with highly motivated secondary school science teachers already at the U, engaged in science training,” Bowen said.

According to Jessica Cleeves, program director of MSSST, science teachers are in high demand. Sometimes they find themselves teaching in other science areas, for example, a biology teacher may be asked to teach physics. The MSSST program provides a program for teachers to learn about various science disciplines so they can take those skills into their classrooms.

The MSSST program, out of the Center for Science and Mathematics Education, had to show creativity as Cleeves and her amazing acrobatics made sure the teachers’ research experience was meaningful during the pandemic.

Read more about the MSSST program at <https://attheu.utah.edu/facultystaff/teachers-get-a-masters-to-revolutionize-science-classrooms/>

In more outreach news, Sarah Lambart was an invited speaker for the Geologists of Jackson Hole. The title of her presentation was, “Mondrian or Pollock, what is the true nature of the Earth mantle?”

<https://geologistsofjacksonhole.org/mondrian-or-pollock-what-is-the-true-nature-of-the-earth-mantle/>

2020-2021 Guy F. Atkinson Distinguished Lecture Series

Dr. Zachary Ross, Seismological Laboratory,
California Institute of Technology
3D fault architecture controls the dynamism of earthquake swarms

Dr. Mark A. Torres, Earth, Environmental and Planetary Sciences, Rice University
Rivers flow not past, but through: a fluvial perspective on Earth's carbon cycle

Dr. Shi (Joyce) Sim, Earth and Atmospheric Sciences, Georgia Tech
Melt transport at mid-ocean ridges

Dr. Ellen Thomas, The People of Earth & Planetary Sciences, Yale University
The Oceanic Carbon Cycle in a Greenhouse World: Oceanic Export and Primary Productivity

Dr. Enrique Merino, Department of Earth and Atmospheric Sciences, Indiana University
Replacement reveals metasomatism dynamics that is hidden from geochemists

Dr. Kate Freeman, Department of Geosciences, Penn State
Wildfires and Environmental Upheaval in the Cenozoic Era

Dr. Parvathy Prem, Applied Physics Laboratory, Johns Hopkins University
The Origins and Transport of Water on the Moon

Dr. Asmaa Boujibar, Earth & Planets Laboratory, Carnegie Science
The origin of Mercury's large core, volatile content and heat production: insights from high pressure experiments and spacecraft data

Dr. Jane Willenbring, Department of Geological Sciences, Stanford University
Forged Signatures: Tectonic versus climatic control on mountain heights and shape

Dr. Zack Spica, Earth and Environmental Sciences, University of Michigan
Distributed Acoustic Sensing: a new playground for seismology

Dr. Kayla Iacovino, NASA Johnson Space Center
What drives volcanic eruptions? Determining eruption triggers and magma sources with gas chemistry and thermodynamic modeling

Dr. Naomi Levin, Earth and Environmental Sciences, University of Michigan
Rare and Overlooked, But Mighty: Developing 17O for the Paleoclimate Toolkit

Dr. Asmeret Berhe, Earth Sciences, Life & Environmental Sciences, University of California, Merced
What's Soil Got to do with Climate Change: Let's Dig Deeper

Dr. Mark Panning, Jet Propulsion Laboratory, California Institute of Technology
Planetary Seismology: One Mars Year of InSight, and Prospects for Titan and Beyond

Dr. Estella Atekwana, Department of Earth Sciences, University of Delaware
Biogeophysics: Microbial-mediated changes in geophysical signatures

Dr. Chris Jackson, Department of Earth and Environmental Sciences, University of Manchester
Hot Rocks Beneath our Feet: 3D Seismic Reflection Imaging of the Processes and Products of Crustal Magmatism

Dr. Isabel Montanez, Earth and Planetary Sciences, University of California, Davis
Reconstruction a Deep-Time Earth System

Dr. Matt Jackson, Earth Science, University of California, Santa Barbara
Ancient Subducted Crust, Primordial Reservoirs, and Core-Influenced Mantle Domains: Clues From Volcanic Hotspots

Dr. Valier Galy, Marine Chemistry & Geochemistry, Woods Hole Oceanographic Institution
The Chilling Effect of Mountain Growth: Cenozoic Insights from the Bengal Fan

Dr. Jorge Velez-Juarbe, Natural History Museum of Los Angeles
Fossil Record and Evolutionary History of Walruses in the Eastern North Pacific

Dr. Roland Burgmann, Earth and Planetary Science, University of California, Berkeley
Earthquake Weather? Seasonal Water Storage, Deformation and Seismicity

Dr. Michael Kipp, Division of Geological and Planetary Sciences, Caltech
Earth history, as told by [your archive]: The importance of sample selection in paleo-environmental studies

Dr. Jamie McFarlin, Geological Sciences, University of Colorado, Boulder
Perspectives on a warming Arctic from Holocene biomarker hydrogen isotopes

Dr. Sarah Crump, Paleogenomics Lab, University of California, Santa Cruz
Lessons for a warming world: Late Quaternary insights from sedimentary ancient DNA and glacial history

Dr. Julia Kelson, Earth and Environmental Sciences, University of Michigan, Ann Arbor
Unlocking the paleoclimate archives of soil carbonates with clumped and triple oxygen isotopes

Watch recordings of DLS lectures on the department YouTube channel: https://www.youtube.com/channel/UCGOiAksXNNYnpYUSIGF2_iA

A New Twist on Wasatch in the Field

How do you hold a unique outdoor-experience, field-based course in a year with no field trips? For Fall 2020, associate professor Pete Lippert and his colleagues faced the challenge of offering the sophomore course Wasatch in the Field under COVID-19 precautions and without going into the field.

In typical years, Wasatch in the Field (listed as GEO 2500) offers sophomore geology students the opportunity to experience Wasatch Front fieldwork, with exposure to different subdisciplines within geoscience and an opportunity to build a cohort identity. The course does not require any previous geology experience and is open to all majors.

Wasatch in the Field introduces students to the natural outdoor laboratory via: geology, environmental geology, geological engineering and geophysics, which Lippert says are “the four main flavors of geoscience that we do in our department.”

First offered in 2018, the course made an abrupt pivot to remote learning in the 2020 school year due to COVID-19 precautions. Using digital versions of rock outcrops, geological datasets and water sampling bottles mailed to students’ homes, the instructors were able to not only increase the enrollment for the class (previously capped at around 30 students for practical reasons while working in the field) but also develop new accessible versions of assignments.

“This allowed us to create alternative exercises in case someone gets sick or injured or comes in with a challenge that prevents them from going out in the field physically,” Lippert says. “Now we have multiple ways to make this course accessible to more students.” Whether outdoor or indoors, students gain intimate knowledge of our local landscape and cover aspects of faults, earthquakes, water resources, landslides, environmental quality, and more!

A big achievement for PhD candidate, Casey Duncan, whose Mars mapping module for field camp was accepted into the SERC Exemplary Teaching Activity. Duncan taught the second half of field camp in Summer 2020 when the department had to make the quick decision to switch from in-person to virtual learning. His online field experience titled, *Mars Virtual Field Camp: Geologic Mapping of Jezero Crater*, is composed of six modules and four synchronous live online lectures. The skills and concepts students must be familiar with for the capstone course include geologic map attributes and interpretation, structural geology, sedimentology and stratigraphy, principles of geologic mapping, etc. You can read more about the course plan at https://serc.carleton.edu/NAGTWorkshops/online_field/activities/238366.html.



Sol 1785 VRR Outcrop Mosaic (corrected):
Sample slide from Casey Duncan’s Mars virtual
field module

Stomp Mask Challenge

The Department of Geology and Geophysics held a Stomp Mask Challenge utilizing the dinosaur image drawn by department friend and award-winning cartoonist, Pat Bagley. Those who sent in their photos were featured on social media and were given some coveted swag. Check out the submissions here and on the cover of this issue!



URGE Spring 2021

The Unlearning Racism in Geoscience (URGE) program, funded by the National Science Foundation, launched in January 2021. URGE was a scheduled, coordinated, virtual curriculum program, led by a team of geoscience PI's, with nearly 300 pods of participating geoscientists across the country. The College of Mines and Earth Sciences at University of Utah organized 3 pods, 12 members each, for a total of 36 faculty, students and staff, that participated in a 16 week modular curriculum program to raise awareness on the impacts of racism and develop anti-racist policies moving forward. More info on URGE can be found at <https://urgescience.org>.

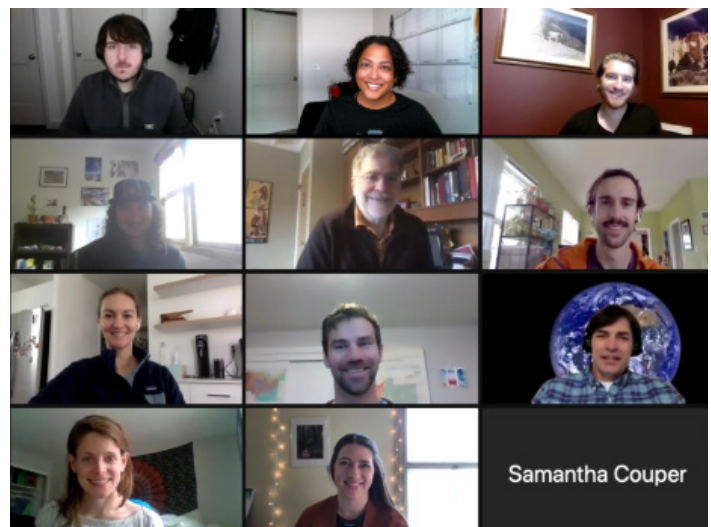
The URGE program's objectives are to: (1) deepen the community's knowledge of the effects of racism on the participation and retention of Black, Brown, and Indigenous people in Geoscience, (2) draw on existing literature, expert opinions, and personal experiences to develop anti-racist policies and strategies, and (3) share, discuss, and modify anti-racist policies and strategies within a dynamic community network and on a national stage.

Beyond raising awareness about the impact of racism in geoscience, University of Utah pod members came together to develop a set of deliverables that outline our current policies and provide recommendations for change. These deliverables stand as an important written check-point, holding us accountable for a future plan and progress toward institutional change.

Pod 1: Cari Johnson (Pod leader), Emily Cunningham, Mary Anne Berzins, Sarah Lambart, Alysha Armstrong, William Johnson, Riley Finnegan, Michelle Tuitupou, Kitzia Casasola, Rich Fiorella

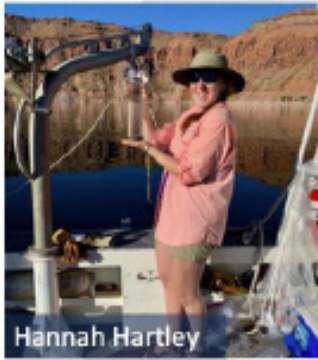
Pod 2: Lauren Birgenheier (Pod leader), Ellen Reat Wersan, Brenda Bowen, Marjorie Chan, Holly Godsey, Abby Condon, Gannet Hallar, Emma Morris, Jim Steenburgh, Jenny Hambleton, Peter Lippert

Pod 3: Mo Holt (Pod leader), Becca Sumison, Jeremiah Bernau, Otto Lang, Desmond Moser, Eric Humphrey, Evan Kipnis, James Holt, Diego Fernandez, Katherine Whidden, Erin Bessette-Kirton, Samantha Couper

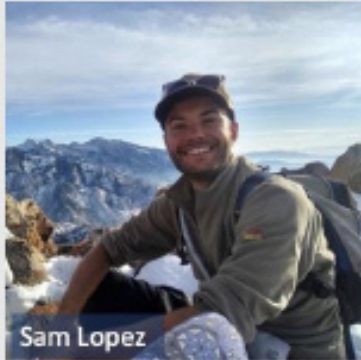


Deliverables from the 2021 CMES URGE Pod workshops can be found at https://earth.utah.edu/equity_diversity_inclusion/uo-fugg_urge/index.php.

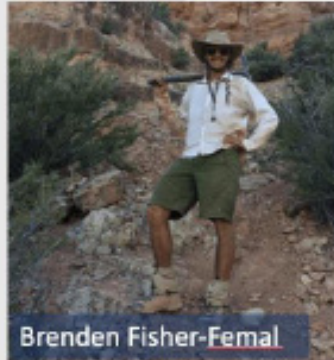
Williamson Fellows



Hannah Hartley



Sam Lopez



Brenden Fisher-Femal

In a continuing effort to connect with K-12 students, this year's Williamson Fellows took a new approach to outreach. Each Fellow made a 3-minute video of themselves talking about their research and how it can be applied to solving global problems. Under their mentor, Dr. Holly Godsey, they also developed topical online teaching modules that address several state-required science standards for use in grades 6-12. Modules address the overarching concepts of the rock cycle, water cycle, and carbon cycle, and the role these cycles play in environmental change. Each module contains three lesson plans that can be taught independently or as part of the whole module. The Fellows were able to test out all three modules both online and in-person. They made modifications based on the feedback they received from the teachers and students.

A fascinating outcome has been the types of thoughtful questions the young students have posed to the Fellows. It shows that their interactions piqued their interest, and the scientific thought-process will help sharpen their analytical thinking.

Feedback from the teachers was overwhelmingly positive in a very difficult and stressful year. All of the teachers welcomed the opportunity to expose their students to actual scientists and their research, and were impressed with the quality of lessons and communication skills of the Fellows. Teachers were able to help fine-tune teaching skills and a few are even trying to recruit the Fellows to become future middle school teachers.

Two Title I schools participated in this year's program covering grades 8-12: SLCSE (Salt Lake Center for Science Education) and SLCSE-Bryant Middle School. SLCSE-Bryant's enrollment for 2019-20 was 80.7% minority (under-represented groups) and 83.5% low income (defined by those who qualify for free or reduced lunch). SLCSE's enrollment was 52.8% minority and 48.9% low income. The Fellows worked with six teachers who each teach about six classes of ~25-40 students. Collectively, the Fellows interacted with over 1,000 students throughout the course of the year, both online and in-person.



More about the 2020-2021 Williamson Fellows and their lesson modules can be found [HERE](#). Dr. Godsey moved into a new role within the College of Education so Dr. Brenda Bowen and SLCSE-Bryant teacher Tommy Good (MS, 2013), have taken over as mentors. This year's fellows are Sam Lopez and Jeremiah Bernau.

Department Scholarships

We thank the College, the Department, and our many friends who made substantial and important support possible for the following students:

Kenneth & Nedra Bullock Keller Scholarship

Daniel Ovard, Emily Larson, Isabel Duke, Jonah Miller, Josh Heaps

David & Hanne Duke Scholarship

Jessica Kent, Kali Braning

Dorothy Goode Endowed Scholarship

Karrah Spendlove

Dr. Ricardo Presnell Memorial Scholarship

Aiden Beukema, Amin Hamidat, Brooke Garza, Edward Tang, Megan Denney, Rachel Jorgensen

Frischknecht Scholarship

Madeleine Festin

G. Frank & Pamela Joklik Scholarship

Benjamin Rivera

GG Scholarship

Erin Lofgran, Neo Hill, Sarah Smart, Eli Budzinski, Hayden Manhart, Autumn Hartley, Jason Bridwell

Hellmut H. & Gerda A. Doelling Scholarship

Audra Tessman, Josh Heaps

Hiromi Honda Endowed Scholarship

Savannah Carpenter

Kenneth W. Larsen Endowed Scholarship

Kayleigh Hall, Lila Sorensen, Neo Hill

M. Dane Picard Scholarship

Sam Bagge

Marta S. Weeks Legacy Scholarship

Jessica Kent, Kayleigh Kirkpatrick

Matthew P. & Katharine G. Nackowski Scholarship

Savannah Carpenter

Mikulich Endowed Scholarship

Andreas Cordova

Mineralogical Society of Utah Scholarship

Jenny Hambleton, Mallory Scofield, Sam Bagge, Stephanie Brock

University of Utah T53 Scholarship

Eva Shaw, Brennon Peterson, Eva Bol

Wasatch Gem Society Scholarship

Sarah Smart

Rocky Mountain Power Scholarship

Alaura Beck

UGA Scholarship (Field Camp)

Daniel Burt, Jasmine Garcia

AWG Scholarship (Field Camp)

Jasmine Garcia, Emily Larson, Giavanna Lonardo

Orlo Childs Scholarship (Field Camp)

Stephanie Brock, Daniel Burt, Savannah Carpenter, Isabel Duke, Jasmine Garcia, Jenny Hambleton

Earls Family Scholarship (Field Camp)

Amin Hamidat, Josh Heaps, Jessica Kent, Kayleigh Kirkpatrick

GG Scholarship (Field Camp)

Andreas Cordova, Emily Larson, Sarah Newman, Daniel Ovard, Josh Taylor

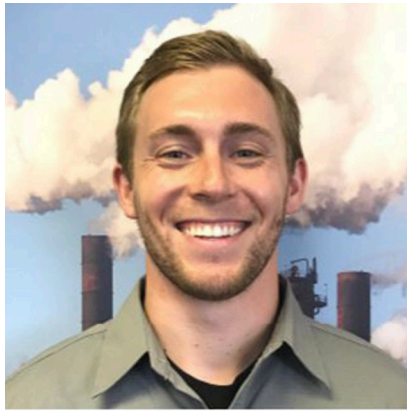
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Student Awards & Achievements

Outstanding Undergraduate Student Awards

Geology
Environmental Geoscience
Geophysics
Geological Engineering
Terril Award (Geological Engineering)
Earth Science Composite Teaching

Daniel Burt
Emily Larson
Justin Krier
Andrew Stropkai
Clayton Russell
Abby Condon



Outstanding Undergraduate Researchers

Justin Krier
Savhannah Carpenter
Samantha Bagge



Student Awards & Achievements

Outstanding Department Volunteers

Undergraduate:
Jenny Hambleton



Graduate:
Jory Lerback



Outstanding Teaching
Assistant: Kevin Mendoza



Outstanding Graduate Students

Masters: Otto Lang
PhD: Courtney Wagner



University Teaching Assistant Award for 2021-2022: Erin Bessette-Kirton
University Graduate Research Fellowship for 2021-2022: Meg Wolfe



Student Awards & Achievements

The 2021 Association for Women Geoscientists (AWG) scholarship and award recipients included several of our own University of Utah students who were recognized in a June outdoor AWG social at Canyon Rim Park.

AWG Susan Ekdale Field Camp Scholarship:

Giavanna Lonardo will be working under a professional engineer at a small geotechnical engineering firm and hopes to eventually pursue an M.S. degree in Hydrology.

Emily Larson is working toward her degree in environmental geoscience and is looking to apply to graduate school in the near future.

Jasmine Garcia plans to attend graduate school and eventually would like to be at a university, non-profit, or governmental organization that is field-based or geoscience focused.

AWG Outstanding Graduate Student awardee:

Courtney Wagner finished her PhD on fossil remains of iron-biomineralizing organisms to fingerprint specific environmental conditions in past aquatic environments. She especially likes sharing how her work will help us predict how today's oceans will respond to climate change. Courtney is headed to the Smithsonian Museum of Natural History for a postdoctoral research fellowship.

Emily Cunningham participated in the Rift2Ridge workshop to discuss the future of the NSF GeoPRISMS program.

University of Utah - Undergraduate Research Opportunities Program

Fall 2020 Recipients

Alex Dzubay (Jeff Moore)
Hayley Lind (Richard Fiorella)
Mack Tawa (Courtney Wagner)
Mallory Philliber (Gabe Bowen)

Spring 2021 Recipients

Samantha Bagge (Brenda Bowen)
Savannah Carpenter (Mark Loewen)
Alex Dzubay (Jeff Moore)
Boe Ericksen (Michael Thorne)
Sydney Dowben (Bill Johnson)

Summer 2021 Recipients

Stephanie Brock (Brenda Bowen)
Savannah Carpenter (Mark Loewen)
Annie Matzke (Brenda Bowen)
Sarah Smart (Pete Lippert)



Ralph W. Marsden Award



Dr. Erich Petersen, Professor Emeritus of Geology and Geophysics, is honored by the Society of Economic Geologists as the recipient of the 2021 Ralph W. Marsden Award. The award was established to recognize “outstanding service to the Society” and is awarded to persons that have a record of exceptional stewardship and contribution to Society affairs. Dr. Petersen (SEG Fellow '86) has been active in numerous SEG committees as chair or member (Committee on Committees, Research, Lindgren Award,), chaired sessions at national and international SEG annual meeting (SEG-GSA, SEG-AIME), Program Chairman at three national meetings (SEG-GSA-AIME), editor of numerous field trip guide books including co-author of SEG Special Publication 22 on the on Selected Mineral Deposits of Vermont and the Adirondack Mountains, N.Y., organizer of dozens of international student and professional stand-alone, post, and pre-meeting field trip courses, short courses, workshops and mapping courses nationally and internationally (USA, Peru, Chile, Spain, Portugal).

Dr. Petersen was founder and Faculty Advisor for the CMES-SEG Student chapter (No. 3 of now 100+ chapters). Under his leadership the CMES-SEG student chapter hosted multi-day field trip courses for SEG student chapters from Ludwig Maximilian University, Aachen University, Technische Universität Bergakademie Freiberg, ETH, des Sciences de la Terre d'Orleans, McGill, Laurentian, Quebec, Montreal, Universidad Nacional de Colombia. With the establishment in 2007 of the International Student-dedicate Field Trip Courses by SEG students world-wide could be introduced to ore deposits anywhere on Earth. Petersen, together with Dr. William X. Chavez Jr., organized the inaugural trip to Chile and thirteen successor trips. Economic geology students from more than 45 countries, 56 universities, along with 15 faculty and 105+ mentors, with 10+ ethnic groups and 14 language groups interacted with their peers. In 2019, the Michael J. Fox field mapping course was endowed and the inaugural was run by Petersen and Chavez.

The Marsden Award was presented at the SEG Centenary Conference in Whistler, B.C., Canada on September 14, 2021.

Faculty Awards & Highlights

Outstanding Faculty Teaching Award

Dr. Brenda Bowen

Outstanding Faculty Research Award

Dr. Kip Solomon

EAG Geochemistry Fellow

Dr. Thure Cerling is recognized by the European Association of Geochemistry for contributions in the field of isotope geochemistry and climatology, having created the sub-discipline of reconstructing past environments using stable isotopes of soil carbonates.

2021 SEPM Science Award

Dr. Cari Johnson was awarded the William R. Dickinson Medal from the Society for Sedimentary Geology for recognition of a mid-career research geoscientist who is “Significantly influencing the sedimentary geology community with innovative work.”

2020 Class of American Geophysical Union (AGU) Fellows

Dr. Tonie Van Dam

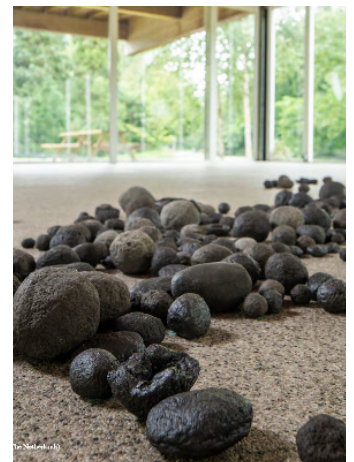
2020/2021 L. Jackson Newell Fellow

Dr. Jeff Moore

This University of Utah award normally has the fellow give a public lecture. Due to COVID restraints, in lieu of a lecture, a film was produced and is available online [HERE](#).



Science & Art: Professor Marjorie Chan collaborated with Amsterdam artist Irene Kopelman in a 3D sculpture project on iron oxide concretions of Grand Staircase Escalante National Monument, Utah. Irene and field assistant Cory Dinter (B.S. 2014) took meticulous field measurements which were key to the painstaking realistic reproduction of >500 concretions made out of fired clay. The resemblance and precise layout is amazing. The project spanned 3 years and finally debuted this fall 2021 at the Zone2Source art gallery in Amsterdam, known for its international platform for art, nature, and technology. Connections between art and science are critical to sharing stories with broad audiences, and we hope Irene’s “Here and Elsewhere” art installation will eventually come to the U.S.! Check it out online: <http://www.irenekopelman.com/projects/here-and-elsewhere/>



Alumni Highlights

Susan L. Beck (BS, 1979; MS, 1982) was awarded the 2020 Walter H. Bucher Medal at the virtual AGU Fall Meeting in December 2020. Susan is a professor in Global Seismology and Tectonics in the College of Geosciences at the University of Arizona.

Marcel Gastambide (BS, 2015) recently took then Governor Hickenhooper of Colorado, and others out on the Animas River to show them the hydrological restoration and water quality issues to be resolved.

Doug Hollett (MS, 1979) is currently President of Melroy-Hollett Technology Partners, which provides consulting on advanced technology solutions in aerospace, earth and energy systems. My wife Pam Melroy (a former astronaut and Space Shuttle Commander) is the CEO and super busy. I worked for Marathon Oil for 29 years and retired in 2011 as Director Unconventional New Ventures. Looking for new challenges, we then moved to the Washington DC area where I was Director of the DOE Geothermal Technologies Office for 3 years, and where I originated the FORGE Geothermal Test Site Program. I was also the Deputy Assistant Secretary Renewable Power, and Assistant Secretary Fossil Energy until leaving DOE in 2017. Over the same period, Pam was senior advisor/director of Field Operations, Office of Commercial Space Transportation at the FAA, and Deputy Director of the Tactical Technologies Office at DARPA. More recent stuff: we lived in Australia all of 2018, where Pam helped start the new Australian Space Agency, and I consulted on renewable energy technologies, CCUS, and advanced digital solutions for complex energy systems. I just finished up a wonderful time on the National Academy of Sciences CORES Committee, which published the “Earth in Time: A Vision for NSF Earth Sciences Priorities 2020-2030” report. I’m currently working with Universities, National Labs and industry on a diverse set of fun challenges, and was just elected as a Trustee of Wellesley College in Massachusetts.

Bob Smith (PhD, 1967), Emeritus Professor, shares his expedition to the Antarctic in 1962-63. It was the adventure of a lifetime, but a very dangerous one at that as they lost one colleague and he was injured in a crevasse incident. Bob received the Gold Medallion from the British Antarctic Survey and the U.S. Antarctic Medal. His report with a map, additional information, and photos can be found at <https://drive.google.com/file/d/1s5RncIDjZq547Al8rUFpMcmYKy-H87qfA/view>.



Bob Smith, with elephant seals, South Georgia

In memory of Past Alumnus:

Ricardo Presnell (PhD, 1992) is recognized as a trailblazer. Ricardo was a student under advisor, Dr. Bill Parry. Aside from his great thesis project on the Barneys Canyon Deposit, Ricardo participated in many departmental economic geology and SEG field trips with fellow students. The department now carries the Ricardo Presnell Memorial Scholarship fund. In the photo below, Ricardo is wearing the orange hardhat.



In Memoriam

Andrew Stropkai (BS, 2020) was a well-respected and beloved member of our department community who passed away in November 2020. He was a senior in the Geological Engineering undergraduate program and was on track to graduate in Fall 2020. Andrew was a member of the Association of Environmental and Engineering Geologists Phi Kappa Phi, Honor Society Sigma Alpha Pi, and Leadership Honor Society Bennion Center Community Service and Involvement. His major focus was in Environmental and Geological Engineering and he studied in areas of Geology, Environmental Remediation, Biology, Biomedical Sciences, and Civil Engineering and Construction. His goal was to work in the sector of water management (storm water, sewage, coastal hazards, groundwater resource, etc.) and/or



environmental planning and preservation. In Spring 2020, Andrew was awarded the Ronald Terrill Award-Geological Engineering, one of our departments most prestigious awards. He was also chosen as the Outstanding Undergraduate Student in Geological Engineering for our Spring 2021 Awards. In January, the university awarded Andrew his Bachelor of Science in Geological Engineering posthumously. The diploma was presented to his wife, Sarah, who is also a student in the department studying Geoscience with an emphasis in Environmental Geoscience.



Emeritus Professor **M. Dane (Duke) Picard** passed away on March 29, 2021. Duke was faculty at the university from 1968 until his retirement in 2002, and taught many undergraduate and graduate students. He authored papers in sedimentary geology and also was a prolific reviewer of geological books. His love for geology and inspirational essays and poetry made for a unique contribution to our science. Duke was president of the Society for Sedimentary Geology and received their Pettijohn Medal for excellence in sedimentology. He is also remembered for his tales of Wyoming, his good game of tennis, and his love of desserts.

The M. Dane Picard Fund for Sedimentary Geology is aimed at helping promising undergraduate students. For those interested in supporting students in Duke's honor, there are two options.

A check can be made out to the University of Utah (Picard endowment in the memo line) and send it to:

University of Utah Advancement Office

ATTN: TJ McMullin

P.O. Box 58006

Salt Lake City, UT 84158

OR use the following link: [https://auxiliary.apps.utah.edu/ugive/designation/108?specialInstructions=For+the+M.+Dane+Picard+Endowed+Fund+For+Sedimentary+Geology+\(MI14477-40165\)](https://auxiliary.apps.utah.edu/ugive/designation/108?specialInstructions=For+the+M.+Dane+Picard+Endowed+Fund+For+Sedimentary+Geology+(MI14477-40165))

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from July 1, 2020 - June 30, 2021

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Hobart Willis
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Michael & Olga Zhdanov

**Denotes donors who have passed away*

We sincerely apologize if we have inadvertently left anyone off this list.



*Part of a 500 meter-long crack in the Jurassic Entrada Sandstone delineating a toppling mode rock slope instability. The fracture is site instrumented with a UofU seismometer and a crackmeter.
AEG (Association of Engineering Geologists) GeoHazard field trip, March 2020*

SAVE THE DATE

**Department Virtual Reunion
November 18, 2021
2:30pm-4:00pm**

Stay tuned for special DLS lecture following reunion featuring Kathleen Ritterbush

Visit www.earth.utah.edu for more info



Inclusive Earth (IE) is a student-led organization that aims to advance Diversity, Equity, Justice, and Inclusion (DEJI) principles to maximize the potential of students, scientists, engineers, and professionals within the Earth Sciences. Our events focus on personal, community, and professional development. IE events this fall will include *Study for Swag*, professional development workshops, group hikes, and more. IE is open to both undergraduate and graduate students, staff, and members of the faculty. If you'd like to get updates on planned IE events, email inclusive-earth@utah.edu.

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www.earth.utah.edu

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115 South 1560 East, Room 205
Salt Lake City, UT 84112

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Bob Smith's email response to the GEO Dept Refreshment Hour: "Wish I could join you but am protecting our house in Grand Teton NP from grizz 399 and 4 kids just a mile from our house. Actually they just went into hibernation."