UNIVERSITY OF OKLAHOMA SCHOOL OF GEOSCIENCES

EARTH SCIENTIST

VOL. 44 SUMMER 2020 - SUMMER 2021





CONTENTS

05 08

WELCOMES FROM the director the dean the aac chair

PEOPLE faculty staff

student organizations AWARDS

student awards spring award ceremony



18

HIGHLIGHTS field trips research

ALUMNI news memorials

ABOUT THIS ISSUE

Editor-In-Chief: Lynn Soreghan **Design:** Ashley Tullius **Contributors:** Geosciences Faculty, Students and Alumni

On the cover: Students at field camp with Dr. Kato Dee **Photo Credit:** Steve Adams

CONTACT US:

School of Geosciences 100 E. Boyd St., Room 710 Norman, OK 73019-1007

PHONE: (405) 325-3253 EMAIL: geology@ou.edu

Did You Know... The Earth Scientist has showcased departmental news since 1982. Its earlier incarnation was known as the Sooner Geologist, which debuted in 1967. Thus, accounting for the rare exceptions of years unpublished, we are now on volume 44 of the alumni magazine. And, prior to that, we have records of our alumni newsletters dating to 1959.

The Earth Scientist welcomes short letters from readers, and will print them as space allows. Letters should address some item from a previous issue. Please include your name, city and state, as well as an email address for purposes of correspondence. We may edit your letter for space, style and civility, without distorting the substance or spirit of your piece. We reserve the right to decide whether a letter is acceptable for publication.

For accommodations, please call the School of Geosciences at (405) 325-3253.

Earth Scientist is published annually, reporting on research, activities and programs associated with the University of Oklahoma School of Geosciences. It is prepared and distributed with private funds at no cost to the taxpayers of the State of Oklahoma.

The University of Oklahoma in compliance with all applicable federal and state laws and regulations does not discriminate on the basis of race, color, national origin, sexual orientation, genetic information, sex, age, religion, disability, political beliefs, or status as a veteran in any of its policies, practices or procedures. This includes but is not limited to admissions, employment, financial aid and educational services. For questions regarding discrimination, sexual assault, sexual misconduct, or sexual harassment, please contact the Office(s) of Institutional Equity as may be applicable — Norman campus at (405) 325-3546/3549, the Health Sciences Center at (405) 271-2110 or the OU-Tulsa Title IX Office at (918) 660-3107. Please see www.ou.edu/eoo.





Letter From the Director

We eagerly await a post-COVID normalcy, after enduring the pandemic disruptions of 2020-21. Following the move to all-online classes in spring 2020, we shifted to a mix of online (large classes) and in-person (small classes) for 20-21. Trying to project one's voice for an hour or more through at least one mask turns out to be an experience akin to hyperventilating into a paper bag— admittedly, a small price to pay for trying to protect public health- but the loss of field trips delivered a particularly serious blow, especially to juniors and seniors. These students earned the dubious distinction of having no choice but to learn field geology virtually. Heroic efforts to construct virtual field trips enabled a new form of field learning for fall and spring, and indeed provided just-in-time education in online cartographic tools. Thankfully, Dr. Dulin secured permission for limited in-person summer field camp in Cañon City. Although virtual field trips will live on to provide a needed alternative for occasions when students cannot participate in person, we yearn for the return of the hammer dust, navigational twists, and - yes, even car karaoke- that slake the adventurous spirits of geoscientists everywhere.

Silver linings appeared: for example, we heard colloquium presentations and lunch-and-learns from speakers hailing from far-flung points of the planet. In the wake of the global crash-courses in Zoom and Teams, we now have many options available for distance presentations, so we'll take these gains. Additionally, our students devised extremely creative ways to socialize in pandemic-forced isolation, such as Pick & Hammer's construction of the Sarkeys Energy Center (SEC) in a joint Minecraft project — a beautifully pristine version unaffected by entropy.

We continued progress on ways to strengthen and diversify the school. As we move forward on an Earth increasingly impacted by humans we need all voices and intellects to chart the path, buttressed by strong commitments to academic excellence. A few examples of efforts to move the needle include 1- updates to the undergraduate curriculum, 2- removal of biased barriers to graduate education such as the GRE, 3-addition of a graduate-student onboarding course, and 4- the encouragement (M.Sc.) or requirement (Ph.D.) for graduate students to publish their work in the peer-reviewed literature. Thanks to efforts led by Dr. Chen, OU joins a select group of U.S. geoscience departments in AGU's Bridge Program (read about it here <u>https://www.agu.org/bridge-program</u>). Involvement across campus marks a sure sign of a strong department, and our faculty are extremely active, e.g. Dr. Megan Elwood Madden directs the Center for Faculty Excellence, Dr. Andy Elwood Madden directs the Sam Noble Microscopy Center, Dr. Rick Lupia is the associate director and head curator of the Sam Noble Museum, and Dr. Mike Soreghan serves as a Presidential Professor in the Honors College.

Although we continue to endure many retirementsincluding Drs. Elmore, Marfurt, and Westrop in 2021we are successfully rebuilding the school, guided by a shared faculty strategic vision as well as strategic plans issued from the president, vice president for research and partnerships, and dean (MCEE). Part of the VPRP's vision calls for a new Institute for Resilient Environmental and Energy Systems, led by (newly hired) biogeochemist Dr. Tim Filley, who will hold joint appointments in Geography and Geosciences. In the School of Geosciences, we completed searches in Critical Zone studies (Dr. Caitlin Hodges) and Environmental Geophysics (Dr. Sina Saneiyan). In the coming year we hope to secure faculty in structural geology, invertebrate paleontology, and vertebrate paleontology. The extractive industries have lost nearly a quarter million jobs since 2019, and it's said that 2020-2030 will be transformational for the geosciences (Vision and Change in the Geosciences workshop, 2021); if great challenges bring great opportunities, then this time of the "energy transformation" spells a new era for the School of Geosciences, and I am excited by the renewed vibrancy as we reinvigorate our program.

Thank you all for your continued support for our school.



Letter From the Dean

The University of Oklahoma and the Mewbourne College of Earth and Energy are proud of the many accomplishments of the School of Geosciences throughout the past year. The school has been, and continues to be, a leader in a number of key areas. In addition to its reputation in research and education, the school is a campus role model for service, delivering a high-quality general education in geology and geophysics and actively engaged in all aspects of university governance. At the university level, I am excited about the recently completed strategic plan titled Lead On, University. President Harroz has already made an enormous impact by completing the first-ever comprehensive strategic plan enabling each college to align its own plans in support of the university-wide plan. The effort was completed in July and will lay the foundation for change as we embark on key initiatives like doubling research expenditures and expanding enrollment at 3% per year. Closer to home, the School of Geosciences has made amazing progress toward our commitment to increase our ranking from 53rd to a Top 25 School of Geosciences.

RESEARCH

Our new vice president for research and partnerships, Tomas Diaz de la Rubia, has reinforced President Harroz' plans to expand our research efforts at the university. The focus on four areas of existing strength described as strategic verticals includes energy and environmental sustainability, which is an area where the School of Geosciences is uniquely qualified to contribute.

ADVANCEMENT

President Harroz also announced the central-

ization of our development efforts under Guy Patton at the OU Foundation, which includes a rebranding to OU Advancement. This move will create a professional approach to advancement where career professionals can work in a coordinated manner to maximize outreach and contributions from our alumni and donors. This effort was really enhanced by the hiring of a world-class vice president of advancement, Amy Rowe, who is guaranteed to get results.

GRADUATE EDUCATION

Our focus over the past two decades has been the undergraduate experience. These efforts have paid huge dividends to our undergraduate programs and have differentiated us from our peers. However, our graduate programs are the key to improved rankings and the generation of new ideas, resulting in enhanced research, which will lead to growth. President Harroz has expressed his intent to focus on expanding and enhancing our graduate programs by increasing stipends, a focused recruiting effort and a larger graduate student body.

FACULTY SUPPORT

President Harroz recruited five new deans and announced his commitment to pay competitive salaries coupled with a performance-based bonus structure, improving our ability to attract and retain the highest-quality faculty. All of these initiatives will strengthen the university, the college and the school. I personally want to express my full support for President Harroz and Lynn Soreghan as we aggressively pursue our goals. We have a lot to be proud of at the University of Oklahoma and I would like to thank you for your support and confidence in the Mewbourne College of Earth and Energy.



Letter From the AAC Chair

Dear Alumni, Students, and Faculty,

RECONNECTION is the theme for our AAC in 2021-2022. Our OU Geoscience alumni are some of the world's best geoscientists. They have traveled and worked around the world in many different industries. The one trait, despite our varied paths, post college, is our tenacity to work hard and achieve greatness. This year the AAC is going to focus on reconnecting a larger swath of our alumni. We want to update our alumni information so alums can organize networking events. We are looking for volunteers who are willing to help us gather your peers by graduation classes to talk, catch up and reminisce about their adventures at OU. Why is this our focus? Because I personally believe we are always stronger together than as lone individuals. We have a connection with all our fellow G&G alums; that is something we should celebrate and utilize to our advantage.

In addition to reconnecting our alumni, we want to CONNECT our alumni with the current G&G students. We all remember what it was like to navigate the course load and internships and trying to tackle that grand question – what do I want to do when I grow up? A question that as we now know is never answered permanently but morphs and flows as opportunities arise. The alumni have navigated those waters- some peaceful and some rougher waters, but we've all made it and learned valuable lessons we can share with the students who are just starting their journey.

The School of Geosciences and the student organizations have done well with community outreach. Each year I love to hear the stories/updates from the Pick & Hammer Club, which has led the way with many K-8 STEM programs. Dean Stice and Lynn Soreghan have all indicated a desire to keep nurturing the K-12 STEM and Geoscience Programs in our community, the state, and eventually beyond. I think this is a common area that if we all collaborate and work together – we can come up with some amazing ways

to strengthen our impact and evolve the concept to bigger events, which evolve into a permanent and supportive pipeline for our program. Partnerships and thinking out of the box, while preserving the integrity of what's in the box is key to advancement. This year, led by our Gifts and Endowments Committee, chaired by Tyler Howe, we're tackling an amazing opportunity to support the school and community by focusing our fundraising efforts toward the Sarkeys Plaza renovation project, which will build several educational spaces. The school is raising money to transform the plaza of Sarkeys into a dynamic learning environment. The addition of mapping exercise stations, U.S. and Oklahoma specific geologic displays, and general beautification represent a significant step forward for our school. This opportunity can help generations of all ages learn and appreciate geology.

Please be watching your email for communication from the school in conjunction with the AAC for how to participate in the fundraiser: <u>https://giving.oufoundation.org/OnlineGivingWeb/</u> <u>Giving/OnlineGiving/SarkeysPlaza</u>

Please verify/update your contact information by visiting this website or reaching out to any of the AAC officers: <u>http://www.ou.edu/mcee/geosciences/people/alumni</u>. Nicole Fritz (nbaylor@gmail.com), Tiffany Stephens (Tstephens@wdoil.com), or Jason Currie (geojcurrie75@gmail.com).

The world never stands still and neither should we. I hope to see more alums reconnecting with their peers and becoming excited about what we can do as a group. Let's continue to push forward, enhance our skillsets, expand our network, and change the world.

Cheers, Nicole Fritz, AAC Chair Fall 2021 - Spring 2023

GEOSCIENCES FACULTY



LYNN SOREGHAN DIRECTOR AND EBERLY FAMILY CHAIR



KATO DEE ASSISTANT PROFESSOR



YOUNANE ABOUSLEIMAN PROFESSOR AND LARRY W. BRUMMETT / ONEOK CHAIR

DIRECTOR, INTEGRATED POROMECHANICS INSTITUTE (IPMI)



SHANNON DULIN ASSISTANT PROFESSOR



HEATHER BEDLE ASSISTANT PROFESSOR



ANDREW S. ELWOOD MADDEN FRANK AND HENRIETTA SCHULTZ CHAIR



BRETT M. CARPENTER ASSISTANT PROFESSOR





XIAOWEI CHEN LISSA AND CY WAGNER PROFESSOR AND ASSOCIATE PROFESSOR



MEGAN E. ELWOOD MADDEN

ROBERT & DORIS KLABZUBA CHAIR, STUBBEMAN-DRACE PRESIDENTIAL PROFESSOR OF GEOSCIENCES

DIRECTOR, CENTER FOR FACULTY EXCELLENCE

MICHAEL H. ENGEL CLYDE BECKER CHAIR

GEOSCIENCES FACULTY



TIM FILLEY PROFESSOR



JOHN D. PIGOTT ASSOCIATE PROFESSOR



CAITLIN HODGES ASSISTANT PROFESSOR



MATTHEW PRANTER

VICTOR E. MONNETT CHAIR IN ENERGY RESOURCES PROFESSOR OF GEOSCIENCES

DIRECTOR, INSTITUTE FOR CHARACTERIZATION AND MODELING LABORATORY



JUNLE JIANG ASSISTANT PROFESSOR



SINA SANEIYAN ASSISTANT PROFESSOR



XIAOLEI LIU ASSISTANT PROFESSOR



MICHAEL J. SOREGHAN JAMES ROY MAXEY PROFESSOR ASSOCIATE PROFESSOR



RICHARD LUPIA NORMAN R. GELPHMAN PROFESSOR ASSOCIATE PROFESSOR OF GEOSCIENCES

ASSOCIATE DIRECTOR AND HEAD CURATOR, SAM NOBLE MUSEUM



BARRY L. WEAVER ASSOCIATE PROFESSOR

EMERITUS FACULTY



JUDSON L. AHERN PROFESSOR EMERITUS



KURT J. MARFURT PROFESSOR EMERITUS

SHANKAR MITRA PROFESSOR EMERITUS



M. CHARLES GILBERT

R. DOUGLAS

ELMORE

PROFESSOR

EMERITUS

PROFESSOR EMERITUS



R. PAUL PHILP PROFESSOR EMERITUS

ZE'EV RECHES PROFESSOR EMERITUS

STEVE WESTROP PROFESSOR EMERITUS



CHARLES W. HARPER, JR. PROFESSOR EMERITUS



G. RANDY KELLER PROFESSOR EMERITUS



DAVID LONDON PROFESSOR EMERITUS

GEOSCIENCES STAFF



REBECCA FAY

ACADEMIC PROGRAMS COORDINATOR



LEAH MOSER MANAGER OF OPER-ATIONS



GAIL HOLLOWAY INSTRUCTOR AND UNDERGRADUATE RE-CRUITER



ASHLEY TULLIUS COMMUNICATIONS AND EVENTS COORDINATOR



GINGER LEIVAS FINANCIAL ANALYST



ROBERT TURNER LAB TECHNICIAN

Reel



Dr. Sina Saneiyan Assistant Professor

Sina Saneivan is a geophysicist whose research mainly focuses on near-surface environmental and engineering problems. Saneiyan began his professional geophysical work as an ore exploration engineer right after finishing his B.Sc. but soon after, he realized there is much more to learn and study in his field. He started his Ph.D. in 2015, working on the novel and interesting idea of bridging geophysics and engineering. Sina chose the environmentally friendly microbial-induced carbonate precipitation (MICP) soil stabilization (a process to reinforce the soil for building purposes) method as his primary research focus and aimed to study this relatively new engineering ground improvement approach with geophysics. By the end of his Ph.D., he successfully showed geophysical methods (particularly induced polarization) are excellent in monitoring MICP in a non-invasive manner and can provide much more details compared to the old-fashioned direct monitoring techniques (such as soil sampling).

Sina's current research builds upon his initial goal of bridging geophysics and engineering. He is now trying to find the geophysical signatures of soils under dynamic forces (heavy rain, landslides, earthquakes, etc.). We, humans, depend on the stability of the soil that we live upon and understanding the mechanical properties of soils play a crucial role in site assessment for construction and infrastructure. Soils with low shear strength can become unstable as a result of natural and/or anthropogenic induced forces; therefore knowing their state under such forces is vital. Geophysical methods have proven to be sensitive to changes in the soils caused by dynamic forces. In his future research, Saneiyan is aiming to show that geophysical methods (particularly electrical methods, such as spectral induced polarization and electrical resistivity) can be used as reliable and permanent site characterization tools for monitoring areas prone to soil failure, such as active landslide zones. Although this would require developing new tools and software capable of conducting large-scale surveys and analyzing data fast and intelligently, ultimately such monitoring methods can be used as effective geo-hazard mitigation tools in the future.

Saneiyan holds a bachelor of science degree in mining engineering from the University of Tehran, a master of science degree in petroleum engineering from Shahrood University of Technology, and a doctoral degree in environmental sciences from Rutgers University. His postdoctoral research is on the assessment of soil deformation and failure with complex electrical methods. Saneiyan is an experienced geophysicist and knows a wide range of geophysical techniques. He has research experience from his small laboratory to surveying Lake Michigan. He also is a skilled programmer. Saneivan is a core developer of ResIPy (2D/3D modeling and inversion of geoelectrical data), SIPy Studio (1D spectral induced polarization data analysis), and has contributed to developing EMagPy (modeling and inversion of electromagnetic data). Saneivan has an extensive teaching portfolio and believes that a diverse and inclusive environment is vital for preparing students for a successful future, therefore he is committed to promoting diversity and inclusion at the University of Oklahoma. Aside from work, Saneiyan is an avid cyclist with thousands of miles ridden on his bike, Red! He also loves photography and backpacking, because there is nothing more fascinating than nature.

Caitlin Hodges is a critical zone geoscientist working at the interface of soil science and biogeochemistry, pursuing fundamental research in soil C cycle-weathering feedbacks and redox cycling in upland soils. She uses the understandings gained from this fundamental work to address the challenges we face in a world of rapid environmental change. Specifically, Hodges's research addresses two of the grand challenges in the environmental sciences: the global C cycle and water quality. She asks questions that span from mineral interactions at the micron scale to broad gradients that cross ecosystems. Hodges's analytical toolbox consists of both laboratory and field techniques, including traditional soil mineral extractions, field monitoring of elemental and nutrient fluxes, geophysical proximal sensing, and novel in situ sensor arrays. Her interdisciplinary approaches and interests lend themselves to diverse

Dr. Caitlin Hodges Assistant Professor

CN

research questions, both applied and fundamental, poised to address soil's role in modulating element and nutrient fluxes across scales.

Hodges received her bachelor of science in environmental science and master's degree in ecology at the University of Georgia. She obtained her doctoral degree in soil science and biogeochemistry at Pennsylvania State University.

During her Ph.D. studies, Hodges led fieldtrips and field-based classes for graduate and undergraduate students and is passionate about providing students at the University of Oklahoma with similar fieldbased learning experiences in soil and critical zone science. She is excited to explore the diverse soils and landscapes of Oklahoma with her students through her teaching and research programs.



Marta Anson, President

The COVID-19 pandemic has affected our lives in so many different ways, so new ways to communicate and stay in touch emerged this past year. With all the restrictions and policies present at the University, OU's AAPG Student Chapter's main goal this past year was to provide the best Technical Talks and personal development opportunities to our students. With all of our events being hosted online, international students from South America and Europe were able to participate, creating a bigger geoscience community. We also organized a machine learning event with OU SPWLA Student Chapter for both petroleum engineers and geoscientists, followed by a peer-to-peer learning where two Ph.D. students from our college showed how they incorporate machine learning in their research. We hosted several local professionals from the oil and gas industry in Oklahoma providing some insights about how the industry keeps growing despite the pandemic. We had the honor to host former AAPG president Denise Cox, who talked about how crucial it is nowadays learn how to develop our leadership skills in the energy industry. We are also proud to have participated in two in-person outreach activities this year, serving our community in different ways. Overall, the OU AAPG Chapter had a successful year filled with a lot of online events and opportunities to our students to keep learning and growing from home.

SEG Student Chapter

Clayton Silver, President

The OU SEG Student Chapter embraced the challenges imposed by the COVID-19 pandemic to expand our reach to an international audience for the 2020-2021 school year and used virtual events to our advantage. Through the connections of our diverse and multi-national exec team, we were fortunate to bring in high-impact speakers from

around the nation and world for virtual lectures. lunch and learns. and interactive software workshops. We maintained our flagship "SEG Week" event this year - but this time as "SLB Week." Four consecutive technical talks were hosted in September over wellbore geophysical methods by expert geoscientists from Schlumberger. Topics ranged from small-scale well bore geophysical logs to larger-scale fiber-optic micro-seismic methods. The Student Chapter also made an effort to provide a diverse variety of speakers. Technical talks were hosted over near-surface

geophysics, python in geoscience, professional development, and a plethora of reflection seismic methods as well. Despite the lack of face-to-face activities, the SEG Student Chapter was thrilled at the amount of participation and attendance at all of our events throughout the school year. We are thankful for our adaptive student members, faculty, staff and alumni who supported us throughout this unique year and unprecedented school year.





Bren Cable, President

With the onset of the COVID-19 pandemic in the spring of 2020 pick and hammer had to alter the way the club conducted business. Quarantine locked down campus and the entire spring semester moved to online zoom classes. Because of the quarantine many of our spring events had to be canceled, but officer elections were still able to take place. President Bren Cable, vice president John Smith, treasurer Conley Thom, secretary Hayden Noakes, historian Jeremy Colburn, and outreach officers Tucker McCoy and Rania Altahini were elected to their positions in the spring of 2020. We were unable to access our office until the beginning of the fall semester, yet once we did, we immediately got to work. The office was transformed from a donation dump into a workable and spacious area. We were able to sort through our inventory of rock specimens and put any "hidden gems" on display in what we now refer to as the "Rock Garage."

Typically, many of Pick & Hammer's events are held throughout the semesters, like Eat and Meets with professors, movie nights, and field trips to many interesting places in Oklahoma. However, with everyone being in lockdown, we had to find new solutions to help us stay in touch with the student body and keep up with our outreach mission. A new project that was the brainchild of President Bren Cable was to start a newscast to better keep in touch with the student body. Part of the Rock Garage was transformed into a podcast studio! We were able to film experiments for our Genius Boxes to send to schools around Oklahoma to help gain interest in the geosciences. Each activity contained within the Genius Box was completed and filmed by an officer. This way, when the kids received their Genius Boxes it felt like Pick & Hammer was there with them to teach them about the science experiments, even if it was on screen. The head outreach officer, Tucker McCoy, created multiple virtual field trips for students to go on. We were also able to maintain involvement with the student body by creating our own Minecart server where we built a full-scale version of Sarkeys Energy Center.

Pick & Hammer volunteers under Bobby Melton from Putnam City area/UCO to gain involvement with Science Olympiad. This year, instead of being able to proctor tests in person, we created online versions of our exam. We were able to reach over 1,000 kids with our online Science Olympiad exams! Another virtual success we had this past year was our Instagram Mineral Auctions. The profits we earned from these sales went to buying our podcast supplies.

Toward the end of this scholastic year, when the COVID-19 restrictions began to ease up, we were able to participate in person at Sooner Saturday on the South Oval, and Space Day at the Oklahoma Science Museum in OKC. Both events involved a table with some of our best samples on display. At Sooner Saturday, we were able to meet incoming freshman and transfer students and explain to them how much fun the club has during the semesters. We got to meet the new students and give away fun stickers. At the Space Day event, we recreated meteorite impact craters using flour, cocoa powder and bouncy balls.

Despite a mountain of setbacks, the 2020-2021 Pick Hammer officers were able to improvise, adapt, and overcome many of the obstacles thrown at them. In April of 2021, a new group of officers was elected to continue our mission. The officers for the 2021-2022 school year are president John Smith, vice president Chris Bodzioch, treasurer Sam Sundberg, secretary Emma Steiner, archivist Bren Cable, and outreach officers Connor Whitley and Spencer Cross. The ushering in of a new officer group brings about exciting new ideas and opportunities for the future!



Geology in Unlikely Places: A New Look at Virtual Outreach Through Minecraft

Pick & Hammer Club

Over the past year outreach opportunities have posed a tough challenge for student organizations, especially those like Pick& Hammer that have historically focused on working with local Oklahoma schools to teach geology to K-12 students. With this in mind, we took the chance to find new ways to connect with students of all levels with geology through the most popular videogame in history: Minecraft. With over 200 million copies sold, it is a massive icon of popular culture. Before we look at P&H's projects and successes using this new tool, let's have a quick look at what Minecraft actually is.

Minecraft at its core is a simulation. You are dropped into a landscape of trees, mountains, deserts, oceans, and caves. In fact, there are nearly 80 different and distinct categories of biomes that can be found in the game, representing almost every major type of environment found in the real world, from birchwood forests to snow-covered tundra. Your goal is to gather food, tools, and supplies to travel the randomly generated world and discover as much possible. At over a decade old, this game has been continuously reworked and even has an update planned for the summer of 2021 that will bring in more advanced caves and karst topography. For this reason, it would be impossible to summarize the entire game in one article, so we will have to focus on its geologic aspects as we go through P&H's work with the game.

Sandstone, basalt, diorite, andesite, diamonds, emeralds and lava are only a handful of the many geologic materials you can find in this world. The depth of earth science is amazing, which how Minecraft caught our attention, but it is also a building game. Using the materials you gather, you can craft and build almost anything you can imagine if you put enough effort into it. The game is also cooperative, with people able to work together on the same projects. We soon realized that having a common goal would go a long way toward getting students involved, and decided to recreate our home away from home; the Sarkeys Energy Center.

So where did it all begin? A community garden and small camp were the first things to appear, as food and shelter are key to survival in this world. But soon after, as players began to join, small houses started to crop up nearby. Once we had a stable outpost, we decided on outlining an area big enough to start construction on Sarkeys. We knew from measurements taken from Google Earth that we needed a flat area of about 16,000 square meters. After moving 32,000 cubic meters of dirt in a large plains biome, we had our foundation set. The real challenge in our effort was finding the incredibly large number of bricks needed to build the main tower of Sarkeys. At 28m wide and 64m tall, this was a massive undertaking in a survival game where you have to gather your resources by hand. The most common way to gather bricks in the game is by baking clay you find in streams and oceans with a furnace. Luckily, there is another way to get the massive amounts of raw material we needed - villagers in the game who will trade various things. Using a bartering system based on emeralds as currency, we bought, bartered, and traded for the tens of thousands of bricks that we needed. After we secured the materials, half a dozen players worked for almost a week putting up the walls and roof, using pictures and memory for reference. As seen on the previous page, we were able to get an uncanny level of detail in replicating Sarkeys. Everything from the number and

size of windows to the central elevator system was recreated in our Minecraft world, able to be viewed by any player who joins our server.

That now brings us to our current point. Sarkeys was not the only thing built in the world, with players building undersea greenhouse farms, extensive exploratory mines, castles, cabins, everything in between. One of our most impressive projects to date is the Pick & Hammer Headquarters (pictured below). Built as a large library inside an glass-domed castle, it houses items important to the Minecraft world such as the first block placed in the Sarkeys build and a history book recording all the names of the players who participated. The floor is made of a huge map that covers the region and was put together by exploring and carefully mapping several dozen square kilometers across seven different environments.



Community Garden

OU AAPG Student Chapter Donates Rock and Mineral Kits for Blind and Visually Impaired Students

Hannah Morgan, M.S. Student

With the help of OU alum Galen Miller, Louise Whitworth, CTVI, from the Jefferson City School District in Missouri, Gail Holloway with the OU School of mineral and rock properties such as: touch, taste, cleavage, smell, crystal habit, specific gravity, hardness, magnetism, rounding, extrusive vs. intrusive

Geosciences, and the ADRC at OU, the 2019-2020 OU AAPG Student Chapter officers were able to create rock and mineral kits with activity booklets in braille for blind and visually impaired students. Through these kits, we aimed to make geoscience accessible for those who curious and interested. With our initiative and the help of AAPG funds, we were able to create and donate 12 kits to the Oklahoma School for the Blind, the Jefferson City School District in Missouri, and to Skiatook High School in Oklahoma.



characteristics, texture, layering, and mineral content.

So far, the kits have been a success. According to Louise Whitworth, CTVI, her students "love the rock boxes and so do the teachers who have borrowed them." One of her students has already memorized all the rocks and minerals by touch! Our hope with these kits is that we inspire future scientists and that we inspire students to stay curious about the Earth and its processes. Hopefully, we inspire some future geoscientists!

If you are inter-

ested in learning more about the kits, contact Hannah Morgan at hannah.m.morgan-1@ou.edu.

The kits contain a variety of minerals, rocks and fossils. The activities are associated with different

Mewbourne College Spring



HAYDEN NOAKES Charles Gould Award for Outstanding Senior in Geology



CHRIST RAMOS Alan Witten Award for Oustanding Senior in Geophysics



TUCKER MCCOY David Stearns Award for Outstanding Achievement

Awards Ban-

The annual spring Student and Alumni Awards Banquet, unfortunately, was not held due to the COVID 19 pandemic. Five geology and geophysics students would've been recognized for their outstanding achievements this year.



AUTUMN ROCHE Estwing Hammer Award for Outstanding Work Ethic and Commitment to Academic Excellence



KENZI FREEMAN Estwing Hammer Award for Outstanding Work Ethic and Commitment to Academic Excellence

Geosciences Spring Awards



ALICIA BONAR Stan Cunningham Excellence in Teaching Award



WILL KIBIKAS Ben Hare Excellence in Research Award



ZACH TOMLINSON Ben Hare Excellence in Research Award



PAUL GILBERT Frank A. Melton Memorial Research Award



LILY PFEIFER Excellence in Research Award



NINA WEBB Excellence in Research Award



MATT HAMILTON Staff Rock

Student Honors and Awards



- Lily Pfeifer received the 2020 Provost's Ph.D. Dissertation Award
- Abidin Caf received the Provost's Certificate of Distinction in Teaching Award for Fall 2020
- The **OU SEG Student Chapter** was awarded Summit Level
- **Cansu Floyd** received the Paul and Rose Sharp Outstanding International Student Scholarship
- **Christ Ramos** received the 2021 OU Summer Field Camp Scholarship from the Geophysical Society of Tulsa
- **Britt Bray** received the OGF Frederick Black Field Camp Grant
- Hannah Morgan received the OGF Frederick and Lois Kate Fellowship
- Zach Tomlinson was awarded an OU Graduate College Robberson Research Grant.
- Logan Dickson was awarded the Mineralogical Society of America Undergraduate Prize
- Karelia La Marca was featured in an interview with AAPG Explorer
- The **OU SEG Evolve team** (Clayton Silver, Dallas Cook, David Lubo-Robles, Hannah Morgan, Hope Williams and Edimar Perico) was recognized at the annual SEG conference for: Third best investment opportunity, Multidisciplinary integration and Team management

ConocoPhillips Student Research Symposium

The ConocoPhillips Student Research Symposium was held virtually on April 9. Students presented five-minute "lightning talks" about their research. Below are the winners for the Ph.D., Master's and Undergraduate categories:

PH.D. Steve Adams Abidin Caf Cansu Floyd

MASTER'S

Bailey Abney Chelsey Gallagher Zach Tomlinson

UNDERGRADUATE

Wijdan Aljabri Cecilia Baker Taylor Ramsey















Congratulations to our 2020-2021 graduates!

B.S. GEOLOGY

Zeniab Albeesh Ryan Behar Brittany Bray Tyler Delzer Kenzi Freeman Branson Harris Tucker McCoy John Nguyen Chris Ramos Sanchez Taylor Ramsey David Sanger Jessica Stromp Berri Tamfu Tailah Williams

B.S. GEOPHYSICS

Gary Davison Jean Joel Legre

M.S. GEOLOGY

Caron Broaddus Julian Chenin Lindy Dingmore Joy Foluso **Chelsey Gallagher** Paul Gilbert Dalila Jesus Patrick Kelly **Brandon Maples** Jose Pedro Mora Ortiz Hannah Morgan **Jordan Renner** Derek Parks Aimee Plowman **Emily Simpson Elizabeth Smith** Delcio Teixeira Nina Webb Katie Welch

M.S. GEOPHYSICS

Roberto Clairmont Max Firkins Edimar Perico Clayton Silver

PH.D. GEOLOGY

Greg Connock Lily Pfeifer Tengfei Wu

PH.D. GEOPHYSICS

Thang Ha Bin Lyu Yan Qin Javier Tellez Jiewen Zhang



Sarah Warren

For geoscientists, field trips are many things: Necessary. Eye opening. They are an initiation, the first taste of a profession that exists equally in the lab and in the field. They are magic – bringing to life concepts known only in charts or formulas. They invite students to return home with more questions than when they embarked.

At the University of Oklahoma, field trips have been part of the geology curriculum for almost as long as the program itself. OU's long history in the field was part necessity and part ingenuity. From the very beginning, the School of Geosciences has shifted, problem solved and innovated to meet the needs of the day.

This year marks the 120th anniversary of the first OU Geosciences field trip. It is a milestone that could not be more meaningful to faculty and students alike. When the OU community banded together to slow the spread of COVID, field trips were cancelled for an entire year.

"I always knew field work was important," said geology junior Faith Thompson, "but when I couldn't go and see the volcanic field that my Igneous Metamorphic term paper was over, I realized how important field work really is. Everything was harder without it."

This year, 120 years after we first ventured into the expanse of Oklahoma, we returned. Already in 2021, students and faculty have ventured to the fields of Oklahoma, Colorado, France and Tanzania.

In celebration of the anniversary, we ventured back 120 years to see what got us here in the first place. The answers are amazing but not surprising. OU Geosciences has a legacy of professors willing to break barriers, change when needed and dream of the future.

GOING TO THE FIELD

When Charles Gould, who would come to be known as the father of Oklahoma geology, arrived at the University of Oklahoma in 1900, he was one of seven OU faculty members. The entire campus consisted of one

building, 300 students and exactly zero supplies for teaching geology. All he was given was a desk in the corner of biology professor A.H. Van Vleet's office.



OU geology students in the field, 1905. Image courtesy of the University of Oklahoma Western History Collection.

"There was absolutely no equipment for carrying on the work of the department," Gould recalled later in his life, as recorded in University of Oklahoma, A History, Vol. 1 by David Levy. "No classrooms, no laboratories, no collections, no library, nothing but a young chap just out of college, turned loose on his own resources and permitted to sink or swim."

Not to be waylaid, Gould brought his personal collection of fossils, rocks and 200 books for students to use. Supplies were still thin, and Gould wondered how he would teach his students. The answer came from a providential friendship with well-known paleontologist E.O. Ulrich, who urged Gould to bring students to the field.

Gould took Ulrich's advice and developed a style of instruction that would use Oklahoma itself as one vast geological laboratory.

Norman is an ideal location from which to launch geological field work. It lies in the heart of the Mid-Continent region and virtually atop two paleo plate boundaries – conferring a wealth of unique geological areas. It is 90 miles from the Wichitas – one of very few fossilized mountain ranges in the world – and 60 miles from the Arbuckles' famed outcrops. Within a day's travel are Precambrian and Cambrian granites and gabbros, and a full spectrum of both siliciclastic and carbonate sedimentary rocks spanning the Phanerozoic. A very long day's drive leads to the Ozarks to the east and the Rockies to the west.

During the 1901 Christmas break, Gould took OU ge-

ology students on their first field trip to the Arbuckle Mountains to look for fossils. Three students came that year. Four the second year.

The course was set. For OU geology students, the land was the laboratory.

Academic geological field trips were not a common practice in this area of the country at the time. John Wesley Powell led what is believed to be the first academic geological field trip in 1867 at Illinois State University, but did not become a trend, especially in this area of the country. According to a representative at the Geological Society of America, records of the introduction of academic geology field trips in the Midwest are scant. Anecdotal and verbal history places OU's entrance into the field among the earliest.

Despite the lack of needed equipment, (or perhaps because of it), Gould's teaching philosophy would launch the study of geology at OU and grow it quickly. It would also save the program on its darkest day.

Levy recounts the night of Tuesday, Jan. 6, 1903.

The night watchman spotted the flames shortly after 11 o'clock. He noticed them issuing from the southeast basement, the room where Professor Gould taught and kept his geological collections. The watchman shouted the alarm...and within minutes almost the entire citizenry had gathered at the site. Campus lay outside the town limits and the longest hose was too short to reach the nearest hydrant. Bystanders grabbed some buckets and... began 'a heroic effort' to save the building.

The wood floors of Building One had just been oiled, propelling the flames to burn hot and fast. Students and faculty worked valiantly to save a small number of items from the top floor of OU's only building, but the geology department suffered a total loss.

Once again without supplies, Gould did what he had always done in his short teaching career: he stepped outside. Oklahoma was waiting. The plains, mountains, fossil beds and outcrops of this future state were always his true lab. The program lost no momentum, and 11 months later, Gould hosted his third annual geology field trip. This time a dozen students attended, including the university's first female geology students. It was during that trip that Pick and Hammer, a student organization still active today, was formed.

All was not lost. In fact, it was just beginning.

CONTINUING THE TRADITION

As the program grew, so did the students' field experiences. A.J. Williams joined the faculty in 1916 and headed up freshman field trips. According to OU Geosciences professor emeritus and author of History of the School of Geology and Geophysics: The University of Oklahoma, by the time geology students finished their first year, they had been to the Arbucknon Dulin, OU Geosciences assistant professor and director of Bartell Field Camp. "By showing students geological processes and helping them make observations, they are able to come to a better understanding of their surroundings and how geology and meteorology interact in their everyday lives and spaces."

IDENTIFYING BARRIERS TO A GEOLOGY EDUCATION

Geological field trips were nothing new at the dawn of the 20th century.

"In the late 18th century, geological field excursions were conducted at universities in Italy, France, Germany, Sweden and Scotland, including the University of Edinburgh, which is where Darwin trained as a geologist," said Kerry Magruder, curator and John

les, "to geologSical processes along the South Canadian and Washita Rivers, the oil field at Pauls Valley, the view from Seven Sisters Lookout, asphalt pits, Turner Falls, the Vendome well at Sulphur, the rocks in the Camp Classen area. the granite exposures south of Mill Creek, East Timbered Hills, White Mound, and the geological section along old Highway 77."



At the Arbuckle Mountains, geology students stand at the Burning Mountain Spring in 1910. Image courtesy of the University of Oklahoma Western History Collection.

Upperclassmen also traveled around the

region for class field trips, some by bus, others by train. Some trips involved tent camping. Eventually, a bunkhouse was built for female students at a site south of Davis. Programs and trips evolved and changed, adapting with the times, embracing new technology, adjusting for two World Wars, and growing with the program.

The legacy of field work continues at the OU School of Geosciences. Today nearly all geology courses, including general-education classes for non-geology majors, have some sort of field component.

"Field work is necessary for geoscience students because our sphere of interest is outside," said Shanties like Cambridge and Oxford. "William Buckland at Oxford University and Adam Sedgwick at Cambridge University led field excursions, with students riding on horseback," said Clary.

Just as today, field trips provided students with valuable experiences to contextualize lectures. But still, the trips and studies did little to expand the field of geology beyond the upper echelons of society.

"Geology was considered a gentlemen's profession in the UK during modern geology's early years and its emerging professionalization," explained Clary.

Not only were the degrees issued from England's

H. and Drusa B. Cable Chair of the History of Science Collections at the University of Oklahoma.

According to Renee Clary, Ph.D., professor of geology at Mississippi State University and committee chair for the Geological Society of America's Education Committee, geological field trips in England date back to the early 1800s during the Golden Age of Geology.

At the time, geology was

taught at top universi-



Dr. Charles Harper at Field Camp in 1973. Image courtesy of OU alumnus Otto Knight.

most prestigious universities, but there was another barrier to enter geology: students had to own their own horse. It was a luxury reserved for those at the top rungs of the societal ladder.

Owning a horse. It was that simple requirement that first kept the field of geology relegated to the elite. Centuries later, faculty at the OU School of Geosciences set out to ask an important question: What are our barriers to entry? Like the horses in the earliest days of the discipline, are there structural or systemic impediments keeping students from the profession?

As it turns out, there are. So, like Gould who famously pivoted to provide the best education to his students, OU Geosciences is embracing something new and creative to meet the needs of our students today.

BRINGING THE FIELD HOME

Faculty identified three core barriers that prevent students from entering or completing a degree in geoscience. A recent structural renovation to the Sarkeys Energy Center's O'Brien Plaza necessitated the removal of landscaping. This blank canvas has the potential to address all three barriers.

Still in the fundraising stages, Mewbourne College is preparing to bring parts of the field home.

Proposed renovations to the O'Brien Plaza will transform it into a one-of-a-kind collection of interactive geologic learning spaces. The renovation will not replace field trips or stifle a 120-year academic culture that prioritizes field education. Rather, it will prepare students to enter the field and succeed once there and help remove barriers that keep students from studying geosciences in the first place.

Barrier 1: Retention

"One of the first barriers to entry is commonly geological maps," said Lynn Soreghan, director of the School of Geosciences.

Incoming geoscience students must quickly develop 3-D visualization skills and learn to interpret geological maps in their first geology course. Soon thereafter, they must begin to learn how to make such maps themselves

Addressing this barrier is the Geoscape, a life-size, walkable geological map complete with a fault line and stream, all defined by different types and shades of rocks. Classes will visit the Geoscape together, but the space will also be available for those students who need to spend extra time outside of class when they can walk the map.

When students do not gain mastery of this essential skill, they often struggle in upper-level courses. Some leave the program entirely.

"The O'Brien Plaza will allow students to easily practice field skills during the short intervals of class and lab times, and thus be able to hit the ground running when they get into the field."

Barrier 2: Equity

Geology field trips are integrated into classes, which mean they are not optional add-on experiences for affluent students. Thanks to the scholarships from generous alumni, the school is able to cover incidental expenses that could hinder some students. But



OU Geology students at the Oklahoma Geology Camp bus in 1977. Image courtesy of OU alumnus Otto Knight.



OU Geology Field Camp in 1957. Images courtesy of OU alumnus Otto Knight.

students often find value in venturing into the field during the weekends or evenings.

"That is a significant barrier for students who work one or more jobs or those who are caregivers," explained Soreghan. "So, we began looking at how we can provide a modicum of field experiences for all of our students."

With a goal to bring realistic field experiences to campus, the O'Brien Plaza's specimens must be massive and realistic. Just as if they were in the field, students will be able to make outcrop-scale observations, take compasses measurements, and collect field data.

In addition, an Oklahoma stratigraphy display will consist of slabs of rock, each 6 feet wide and 3 feet thick, representing geologic periods through time. The slabs' 45-degree incline will allow students to practice taking strike-and-dip measurements.

For petroleum geology and petroleum engineering students, rocks representing environment and landscape changes in Oklahoma through time will showcase economically important formations and provide background information on their geological setting and post-depositional histories.

This unique collection will be a big step forward in creating equitable opportunities for all students.

Barrier 3: Accessibility

What if a student's only hinderance to becoming a geologist was a wheelchair?

While accommodations for disabled students are already in place, there are a unique cacophony of challenges for students with physical disabilities in undergraduate programs that comprise three years



of geology classes laden with field trips and outdoor excursions.

"The truth is, we simply don't know how many prospective geologists – the ones who grew up marveling at outcrops from the backseat window – have elected to not even apply. At Mewbourne College, we want every student to be greeted with the opportunity to learn and thrive," said J. Mike Stice, dean of Mewbourne College.

The O'Brien Plaza will feature wheelchair paths and provide flexible fieldwork. Class accommodations have and always will be provided, but the Plaza will afford students with accessible and readily available field experiences.

"It is my hope that the Plaza will help reinforce that all are welcome here. A physical disability should not dissuade anyone from pursuing their dreams," said Stice.

The renovated O'Brien Plaza will be a space open for all.

Along with the goals of retention, equity and accessibility, Soreghan and the other visionaries behind the project hope the O'Brien Plaza solidifies Oklahoma as a destination for future geologists young and old.

"It will be an important feature that helps the School of Geosciences recruit prospective undergraduate students, and it will serve as an outreach and education resource for the community and visiting K-12 students," said Soreghan.

The O'Brien Plaza will be open to all. Soreghan and her team dream of quiet Norman evenings and busy OU gamedays where children venture to Sarkeys Energy Center O'Brien Plaza to climb on giant boulders, investigate rocks from around the nation, saunter across a life-sized map, and hopefully fall in love with geology in the process.

THE MAGIC OF THE FIELD

The O'Brien Plaza renovation is an important tool that will help many students in the OU School of Geosciences, but it will never replace the school's commitment to abundant, informative and robust geological field experiences.

"The magic of field trips occurs when classroom learning meets the real world," said Dulin. "It isn't until you go out into the field that all the pieces fall together and you begin to look at the world like a geologist."

Charles Gould knew that Oklahoma was a geological destination 120 years ago. He understood the value – the magic – that the field brings to budding geoscientists. He built those values and experiences into a program that has lasted more than a century, produced some of the nation's leading geoscientists, and helped shape a university.

Gould approached challenges and constraints with nimbleness, ready to pivot when needed and willing to do things differently when required. It is a legacy that "Lives On" at the School of Geosciences to this day.

We have gone to the field. We have identified new barriers in a field that should be open to all. We have adjusted for a pandemic. And now it is time to return to the field.

But this time, we're bringing some of it home to stay.



Learn More

Learn all about the renovation plans and fundraising efforts for the O'Brien Plaza at ou.edu/mcee/connect/SECplaza or contact the Mewbourne College Advancement Team.

Share your memories

We want to hear your favorite OU School of Geosciences field trip memories! Send us pictures and stories of your favorite OU field trip memories so we can share and archive them for generations to come. rebrand.ly/OUgeo120



Stephanie Buettner

OU Foundation Executive Director of Advancement sbuettner@ou.edu (405) 615-6750

Tyler Junell OU Foundation Director of Development tyler.junell@ou.edu (806) 674-2376



Steve Adams, Ph.D. Student

Traditionally, Depositional Systems and Stratigraphy (GEOL 4113) takes students on a field trip to the Sacramento and Guadalupe Mountains of New Mexico and Texas. Students were unable to attend last fall, so a replacement virtual trip was developed by Dr. Lynn Soreghan, Steve Adams and Alicia Bonar. The goal of the project was to retain essential field experience elements and skill development while providing flexibility for students.

On past trips students would follow Dr. Soreghan to dozens of outcrops, make observations, and learn about the local stratigraphy, depositional environments, and how they fit into a broader global Late Paleozoic system. To replicate this experience, outcrops were marked with a pin in Google Earth Web, students would click on each pin and follow the route of the field trip. Each location has a video of Dr. Soreghan providing information and guidance relevant to that outcrop. Links took students to interactive images where students could make observations at different scales.

Students were able to create a stratigraphic column from a series of virtual outcrops, with nested images at the outcrop, hand sample, and hand lens scales (Figure 2). Panoramic photos were used to tie outcrops together. The Permian Reef Trail hike, a highlight of the field trip, led students along more than 20 different stops to the top of the trail where they could follow Dr. Soreghan and explore the rocks of the ancient reef system.





Landscapes of Deep Time: Research Training in Paleoclimate

Dr. Lily Pfeifer

After COVID cancelled our 2020 field season, we conducted the third and final season of our International Research Experiences for Students program funded by the National Science Foundation this summer in France and Spain. Four undergraduate geology majors (including OU's Bren Cable, Declan Martin and Taylor Ramsey) and Alicia Bonar (Ph.D. student) have joined Dr. Soreghan and Lily Pfeifer (postdoc) in the field to conduct paleoclimate research and prepare for advanced work in geoscience. In past summers (2018-2019), the IRES team pursued research exploring low-latitude climate conditions in eastern equatorial Pangea during the Late Paleozoic (300 Ma), primarily documenting the sedimentology of redbed sediments in southern France. In the last year, this work appeared in GSA Bulletin and Frontiers in *Earth Science*, and has also been shared by several undergraduate student IRES participants at various GSA conferences. This summer, in collaboration with French colleagues, the IRES team returned to France with an aim to build on this work – studying volcanic deposits from the Late Paleozoic before moving east to explore Permian redbed deposits in the southern

Alps. The team also ventured into new territory this year, studying and sampling modern soil profiles along the Mediterranean coast of Spain to study weathering processes that Bonar will continue to pursue as part of her doctoral research.

The students had a chance to meet up with - and be mentored by – international colleagues of Dr. Soreghan's. They learned about Paleozoic stratigraphy of Western Europe from the Pyrenees to the Alps, and had several immersive international cultural experiences in between – from tasting pa amb tomàquet (and other traditional Catalan food prepared by our hosts in Spain), to celebrating Bastille Day at a citadel (in Entrevaux, France), a dip in the Mediterranean, and an afternoon at La Sagrada Família (Barcelona). Bonar and Pfeifer will return with samples that will propel their research projects forward, and undergraduate student participants will be encouraged and mentored to participate in this research and present preliminary findings at scientific conferences later this year.



Geology Field Camp

Dr. Shannon Dulin

The 10th anniversary of Bartell Field Camp passed relatively quietly this summer. Bartell Field Camp hosted its first class of students in the summer of 2011. The camp was the vision of Dr. Doug Elmore and was made possible from generous alumni gifts from many of you reading this article, particularly Denny Bartell, for whom the facility is named. That summer we had a big celebration that was attended by the Bartell family, many alumni, the first class of students, the Fulton family (our caretakers), and the Conner family, who built the facility. A big celebration of the facility and OU's geology field camp presence for nearly 75 years in Cañon City, Colorado, will have to wait out the current pandemic. Regardless of these set-backs, this summer a small class of six students made the trek to field camp for three weeks of instruction, after two weeks learning online-the first class of students to engage in "hybrid" field camp.

Last year's online field camp was a success and taught the students many technical skills, but online is no replacement for seeing rocks in the field. Because of the changing nature of COVID-19 protocols, we were unsure until May 2021 if we would be able to attend camp in-person. Thanks to Dr. Lynn Soreghan and Dean Mike Stice, the university granted us the all-clear to take students into the field for a limited amount of time. Eighteen students began summer field camp online and completed the course, as was done the year before. Six students elected to come to the field and experience the rocks in person at Bartell Field Camp. These students completed mapping exercises at Grape Creek and Blue Ridge and learned hydrology and structure on the regional trip to Leadville with Dr. Kato Dee. The hybrid experience was a good one and is a model that will give students the best of both worlds – the computer experience they will need as professional geologists, along with the fun and 3D visualization of geologic structures that you can only get by putting hammers on rocks in the field.

Cañon City holds a special place in my heart. Growing up, my family and I would camp in and around this area nearly every year. I celebrated my 20th anniversary of field camp this summer; in 2001 OU field camp was housed at Holy Cross Abbey in town and we stayed in former dormitories. I am fortunate to have TA'd most summers of camp before stepping into my job as assistant professor at OU, and now the director of Bartell Field Camp. I travelled on spring breaks and took side trips from my research in north central Colorado to help put together bunk beds and buy furniture for the facility. In the last year the cabins received new coats of stain and new roofs – (no) thanks to a huge hailstorm a few years ago. I am always excited to teach field camp and introduce new students to the geology of Colorado and to stay in OU's remarkable facility in the Wet Mountains.





Dr. Lily Pfeifer

The most intense phase of the Late Paleozoic Ice Age (LPIA) occurred around 300 million years ago and has long been thought contained to the southern polar region (Gondwanaland). But some research, including work conducted here at OU, has suggested the possibility of relatively low-elevation upland glaciation in equatorial regions. Such claims are controversial because they imply much colder global temperatures than have been modeled for this time in Earth's history. The plot thickened when we began studying enigmatic, crystal-like marks on bedding planes of tuffaceous mudstones from this time period during trips to France to study ancient loess (dust deposits).

In 2019, as part of Dr. Soreghan's International Research Experiences for Students (IRES) program funded by the National Science Foundation,



Lily Pfeifer (Ph.D. student, now postdoc at OU) and Brooke Birkett (undergraduate IRES participant) documented the morphologies of these features in the field, and upon returning home, Lily and Brooke designed lab experiments to test the hypothesis that these markings recorded crystallization of water ice. They were able to experimentally replicate the features (in exact scale and form) by freezing water-saturated mud, supporting the hypothesis that these structures are traces of ancient ice crystals evidence of ephemeral freezing at the equator during this time.

This work was presented at GSA South-Central by Brook Birkett in March 2020 (and won best student poster). More recently, it has been published in *Geology* and is now available online.



The Evolution of Primary Productivity and Marine Redox During Past Biotic Crises

Dr. Xiaolei Liu and Gregory Connock, Derek Parks, Olawale Alo

Several mass extinctions in the geological history coincided with widespread ocean anoxic events (OAEs) or even photic zone euxinia. Records of long-term and/or abrupt perturbations in marine biogeochemical cycles suggest that OAE and photic zone euxinia must have contributed to the Kellwasser event of late Devonian, Permian-Triassic, Cenomanian-Turonian and many other mass extinctions. Development of anoxia is usually induced by enhanced primary productivity and poor water ventilation caused expansion of oxygen minimum zone. Abrupt changes of water redox condition will interfere the biochemical cycles in the ocean, which often exert negative feedbacks to the planktonic primary producers who initially contributed to the anoxia. More importantly, photo-autotrophic microorganisms, as the base of marine food webs, also play a key role in the post-extinction recovery and subsequent macro-evolution in the ocean. Therefore, knowing the population dynamics of marine planktonic microbial communities, especially primary producers, and corresponding water chemistry is crucial for understanding the killing mechanism of extinctions and following reconstructions of marine ecosystem. For broader implications such work will provide key insights to assess the trajectory of modern oceans subjected to continued anthropogenic forcings.

The reduced condition of marine anoxia promotes the preservation of organic carbon. If not geothermally cracked during later burial, well preserved fossil molecules can be used to investigate the evolution of marine ecosystem during these events. Fossil porphyrins are diagenetic derivatives of chlorophylls produced by phototrophic primary producers. Owning to their poly aromatic molecular feature, fossil porphyrins can be preserved as distinct molecular biomarkers in sedimentary rocks up to billions of years old. Metalloporphyrins are a group of fossil porphyrins with the substitution of the original Mg of chlorophyll precursors by other redox-sensitive metals available in water column or sediment, such as V, Ni, and Fe, which have long been recognized in various environmental and petroleum samples. The distribution and speciation of metals chelated to fossil porphyrin are determined by the availability of metal ions under specific redox conditions. The occurrence of fossil porphyrins in sedimentary environments offers ecological and metabolic fingerprints of once living phototrophic organisms, while associated trace metals are robust indicators of past marine redox chemistry.

Both biomarker and trace metal records are commonly used to delineate the evolution history of marine ecosystem during these geological transitions. However, due to the specific analytical instruments required for biomarker and trace metal analyses, these experiments must be conducted separately, and both are very labor-intensive and time-consuming. In the past vear, Dr. Liu and graduate students, Gregory Connock, Derek Parks and Olawale Alo have developed liquid chromatography and electrospray ionization coupled quadrupole time of flight mass spectrometry (LC-ESIqTOF-MS) method enabling simultaneous metalloporphyrin analysis and direct detection of chelated to fossil porphyrins trace metals. The LC-ESI-qTOF-MS method provides signals of trace metals and their isotopes from metalloporphyrins separated through LC, which can be considered as compound-specific trace metal analysis. Such an approach integrates both biomarker and trace metal proxies in one analysis and eliminates issues of isobaric interferences that are commonly concerned for traditional trace element analysis with inductively coupled plasma mass spectrometry (ICP-MS) method.



Extracted ion chromatogram of LC-qTOF-MS showing the distribution of VO-, Fe- and Ni-porphyrins in Cretaceous black shale, and MS/MS of Ni-C30-DPEP showing the detection of Ni isotope:



Reservoir Characterization and Modeling Laboratory

Dr. Matthew Pranter

The RCML focuses on the sedimentology, stratigraphy, chemostratigraphy, structure, and reservoir quality heterogeneity of subsurface reservoirs – in particular, petroleum reservoirs, but also conventional hydrothermal resources and reservoirs for hydrogen and CO₂ storage.

Last year, we lost a major figure in the field of reservoir characterization. To honor Dr. Roger Slatt, I requested that AAPG hold a special technical session at the AAPG annual conference in 2021 with speakers on reservoir characterization, petroleum geology of deepwater systems, and other related topics – it was accepted with great support. I have been very pleased to help prepare and organize the session with Wayne Camp and Neil Hurley and will serve as co-chair at the SEG-AAPG IMAGE conference in Denver in September 2021. The session is titled: Reservoir Characterization of Siliciclastic Systems Honoring Dr. Roger Slatt.

My students (Javier Tellez, Michael Miller, Laynie Hardisty, Hope Williams) and I recently completed a large integrated reservoir characterization research project with petroleum engineering faculty and students on Mississippian reservoirs in the STACK play of the eastern Anadarko Basin. The research was funded by Marathon. Our results include an improved understanding of the stratigraphic and structural controls on the distribution of reservoir facies, mineralogy, and petrophysical properties. Recently, we published several manuscripts that illustrate the key findings in a special issue of *Interpretation* and in other journal articles. Several of my former students also worked on the Mississippian of northern and central Oklahoma and have published their results.

We now commonly use machine learning (ML) with more conventional reservoir characterization workflows in our research to classify and predict lithologies, facies, or architectural elements using well and seismic data. Results of these techniques serve as valuable inputs and constraints for 3D reservoir modeling we conduct. Javier Tellez (now Professor Tellez), recently presented two invited virtual talks – one to geoscience students at the Universidad Nacional de Colombia entitled: "General application of machine learning for geosciences" and one to the Dallas Geological Society on the "Structural and stratigraphic characterization of Mississippian strata using seismic-constrained reservoir modeling, STACK play, Anadarko Basin, Oklahoma." Javier also published two journal articles on his research on fluvial sequence stratigraphy of the Burro Canyon Formation and on the mechanical stratigraphy of Mississippian strata in the STACK play using machine learning and seismic-constrained reservoir modeling.

David Lubo-Robles (Ph.D. student; advised with Kurt Marfurt), is developing and applying modern ML and pattern recognition techniques, quantitative interpretation, and seismic attribute analysis for seismic facies prediction, ML model interpretability, selection of optimal input attributes for classification, and reservoir characterization. Currently, we are applying and testing these techniques on Gulf of Mexico datasets to differentiate between salt, mass transport deposits, and conformable sediments. David presented his research virtually at the 2020 SEG Meeting on "Machine learning model interpretability using SHAP values: application to a seismic facies classification task" and also published a journal article in *Interpretation*: "Exhaustive probabilistic neural network for attribute selection and supervised seismic facies classification".

David Duarte (Ph.D. student) is studying the stratigraphy and reservoir quality of the Sycamore Formation in the Ardmore Basin and plans to graduate in fall 2021. He focuses on microscopy, spectroscopy (XRF and XRD), machine learning techniques, and multiscale workflows to link results from thin-section petrography with 3D facies modeling. David presented at the OU Geosciences Research Symposium on the "Diagenetic controls on reservoir quality of a mixed carbonate-siliciclastic system: Sycamore Formation, Sho-Vel-Tum Field, Oklahoma." David submitted his first manuscript for publication and will submit a second manuscript soon.



Abidin Caf (Ph.D. student) has also used quantitative seismic interpretation and supervised machine learning methods for reservoir characterization and modeling workflows. His work ranges from seismic-scale mapping of dolomitized Permian carbonates to the assessment of injectivity and storage potential for CO₂. Caf presented a virtual talk at the 2020 AAPG ACE on the "Seismic determination of dolomitization and associated reservoir quality using supervised machine learning techniques: Lower-Middle Permian carbonates of the Midland Basin." He also presented at the OU Geosciences Research Symposium on the "Injectivity and storage potential assessment of Arbuckle Group for CO₂ sequestration via supervised neural network: Wellington Field, Kansas".

My M.S. students have also been busy with research, presentations, completing theses, and especially preparing proposals. Hannah Morgan is completed a study on the sedimentology and stratigraphy of fluvial deposits of the Lower Cretaceous Burro Canyon Formation for a locality in the southern Piceance Basin of Colorado. Grace Barber is evaluating the stratigraphy and reservoir characteristics of the Springer-Goddard Formation in the southeastern Anadarko and northwestern Ardmore basins. Her study aims to further define the environment of deposition and related stratigraphy based upon core and well-log-based mineralogies, lithologies, and lithofacies. Brittany Stroud (advised with Abbas Seyedolali of the OGS) is conducting an integrated regional subsurface characterization of the Mississippian Caney Shale for the Ardmore Basin in Oklahoma with a focus on the spatial variability of lithologies and chemofacies and how they relate to porosity.



Spencer Corbett is conducting seismic structural characterization and 3D lithology modeling using machine learning and multi-attribute analysis of the Cretaceous Lower Williams Fork Formation in the Piceance Basin, Colorado.

Ryan Rosol is planning to study the sedimentology, stratigraphy, and reservoir quality of the Pennsylvanian (Missourian) Marchand Sandstone in the southeastern Anadarko Basin. The Marchand Sandstone has been the focus of recent exploration and reservoir development.







Lindy Dingmore (M.S. Geology, 2020) recently graduated and both "Ming" Suriamin (Ph.D. Geology, 2020) and Javier Tellez (Ph.D. Geology, 2021) were hooded during the May 2021 graduation ceremony. Lindy is now a high school science teacher in Aledo, Texas, and Javier is a tenure-track Assistant Professor of Geosciences at Colorado Mesa University in Grand Junc-tion, Colorado. Ming has been a senior research petroleum geologist and petrophysicist with the OGS since January 2018. The RCML is pleased to welcome Ph.D. geology student Anna Turnini. Anna earned her master of science degree in geology from OU in 2015, and we are excited to have her back.

OU Permian Basin Research Group

Dr. John Pigott

The OU Permian Basin Research Group headed up by Dr. John Pigott focuses upon integrating the outcrop with the subsurface and comparing the modern with the ancient in order to understand aspects of the petroleum system evolution of one of the world's most prolific basins: The Permian Super Basin of West Texas-New Mexico. Supervision of graduate students in their thesis and dissertation investigations in geological-geophysical-petroleum engineering studies are conducted by Dr. Pigott, Matt Pranter and Zulfiquar Reza with collaborations of Drs. Heather Beedle, Shannon Dulin, R. Douglas Elmore, and Kulwadee Pigott. Data for analyses range from public and proprietary domains of acquisition and are without exception state-of-the-art.

Theses completed by the group in 2020-21 are:

- Broaddus, Carson, Global Reconnaissance of Reef Spur and Groove Variability: A Systematic Geomorphic Classification.
- Brown, Andy, High Resolution Sequence Stratigraphy of the Leonardian Bone Spring Formation Outcrop of Bone Canyon, Guadalupe Mountains, West Texas and Its Correlation to the Subsurface
- Dingmore, Lindy, Stratigraphic variability of mineralogy, rock types, and porosity of the Wolfcamp Formation using multi-mineral petrophysical analysis and seismically constrained reservoir modeling, Northwest Shelf, Delaware Basin
- Layden, Andrew, High Resolution Xrf-Schmidt Hammer Based Sequence and Geomechanical Stratigraphy of the Leonardian Bone Spring Formation, Shumard Canyon, Guadalupe Mountain National Park
- Lynch, Matthew, Integrated Petrophysical-Seismic Sequence Stratigraphy of the Mixed Carbonate Clastic Sediment Gravity Flows of the Bone Spring Formation, New Mexico
- Plowman, Aimee, Paleoenvironment, Depositional History, and Process Sedimentology of the Upper

Guadalupian Yates Formation: Northwest Shelf, New Mexico

• Renner, Jordan, Data-Driven Analysis of Horizontal Well Performance in the Anadarko Basin Using Digital Well Log Clustering Techniques and Sequence Stratigraphy.

Theses/Dissertations by the group in progress in 2020-2021:

- Neher, Rachel Signal Processing Interpretation of laser imaging, detection, and ranging analysis and its application to lithologic analysis\
- Xu, Chenxi Analysis and Modeling of the Permian Basin Carbon Cycle: Effects of Changes in the Carbon Flux Efficiency as Compared to Modern Oceans
- Zhai, Jerry 1. High Resolution Seismic Stratigraphy in the Wolfcampian and Leonardian 2. Regressive System Tract Analysis in Fluvial Systems 3. Carbon Sequestration of the East Atlantic Seaboard
- Dewitt, Dustin Seismic Attribute Classification
- Crandall, Kurt Sediment Textural Analysis of Big Island Hawaii Beach Sands via DGSA
- Lewis, Keaton Application of DGSA to the Holocene Rio Grande, Origin to Delta







Integrating Machine Learning and Seismic Attribute Analysis: Towards a New Energy Era in the SDA and AASPI Research Groups

Dr. Heather Bedle

Research in the Subsurface Detective Agency has been booming over the last year. In the 2020-2021 academic year, we have graduated five M.S. students (Julian Chenin, Jose Pedro Mora, Edimar Perico, Roberto Clairmont, and Clayton Silver), two UG researchers (Peter Reilly and Christ Ramos Sanchez), and welcomed three new Ph.D. students (Carl Buist, Karelia La Marca, and Alex Vera) and one new M.S. student (Laura Ortiz). In 2020 we were additionally joined by visiting scholar, Karen Leopoldino Oliveira from Brazil, and UG intern. Diana Salazar Florez from Colombia. On the AASPI side, Dr. Kurt Marfurt graduated four Ph.D. students this last academic year: Swetal Patel, Yuji Kim, Bin Lyu, and Thang Ha. And we are keeping Thang Ha on as a post-doc to help AASPI running smoothly. Coming from different academic and cultural backgrounds, our students make AASPI and SDA a robust group for creating new ideas and workflows.

Using a mixture of seismic reflection attributes in combination with a variety of machine learning methods to illuminate the geology hidden beneath our feet, the SDA has published 10 peer-reviewed manuscripts in a variety of scientific journals, as well as three newsletter articles with AAPG and GSH. Eight additional journal articles have been accepted and are in revision, and by the end of the summer, a total of 11 articles will be under review. Despite the pandemic, we had six presentations at AAPG ACE, six at SEG, two at GSA, and seven at AGU, all in the fall of 2020. Taking advantage of the virtual format, we began to record our student presentations, as well as tutorials, for AASPI workflows, and these, and our publications are available on the AASPI website (http://mcee.ou.edu/aaspi/). Presentations in other languages such as Spanish are available as well, in an attempt to make AASPI more accessible and inclusive.

While Kurt Marfurt remains an integral member of the AASPI consortium, Heather Bedle will take over as PI of AASPI in the fall of 2021. As we look toward the future of seismic reflection research, our efforts are pivoting to use and test our unique and successful imaging and analysis methods, previously developed by AASPI for frontier energy applications, including carbon capture and underground storage, geothermal reservoirs and hydrogen storage. We continue to look toward our alumni and industry colleagues for guidance, ideas, data, and support. Also, if any alumni would like a three-month evaluation license to explore and see what we are up to, just contact me!





Save the date: May 17 to 19, 2022 MAPPING THE EARTH BENEATH OUR FEET Seismic Reflection Centennial

Seismic Reflection Centennial

Dr. Heather Bedle

GEOPHONE

CAR

We will be celebrating the 100th anniversary of the seismic reflection technique during a three day conference hosted by SEG from May 17-19, 2022. Day 1 will be hosted at the University of Oklahoma, and will consist of oral and poster presentations, as well as a tour through the History of Science archives at Bizzell Memorial Library. The second day will also include technical sessions, as well as seismic demos at Oklahoma State University. Day three will consist of a field trip around the region, discussing the regional geology and visiting sites of historic interest. The Call for Papers for presenters and additional details will be released this fall, and for additional details, or interest in participating, please contact me, the conference co-chair.

AGU BRIDGE PROGRAM

Dr. Xiaowei Chen

As part of a national effort funded by the National Science Foundation – the "Inclusive Graduate Education Network," AGU (American Geophysical Union) is developing sustainable model bridge programs that improve the access to and culture of graduate education for all students, with emphasis on those underrepresented in doctoral programs in geoscience. A significant component of the program also includes developing a national network of doctoral-granting institutions to provide substantial mentoring for students to successfully complete Ph.D. programs.

In 2019, the AGU Bridge Program was launched to increase the number of underrepresented minority students in Earth and space science graduate programs (https://www.agu.org/bridge-program). URM students (defined in this project as African American, Hispanic America, and Native American) make up a third of all college-age U.S. citizens, yet they earn only 12% of U.S. geoscience master's degrees and 8% of geoscience Ph.D.s (American Geosciences Institute, 2016). This program offers opportunities for students from underrepresented populations to obtain graduate degrees and create a network of peers, mentors, and advisers to support career development in geoscience. Students who are eligible for this program only need to submit one common application, and their applications will be available to all Bridge partner institutions. Undergraduate URM students are encouraged to take advantage of the Bridge program to increase success rate in graduate education.

In December 2020, the School of Geosciences at the University of Oklahoma was approved as a Bridge partner institution through 2025, joining a network of national doctoral-granting institutions committed to the principles underlying the Bridge Program. The approval is a recognition of our commitment and previous efforts in improving diversity in geosciences and graduate education. By participating in the Bridge program, our institution is featured on AGU and EOS webpages, and we will have access to a diverse and broad pool of student applicants in Geoscience, Chemistry (through American Chemical Society) and Physics (through American Physical Society). The Bridge Program provide resources and IGEN training workshops to help partner institutions improve admission and mentor practices in graduate student education. In the next few years, we anticipate welcoming Bridge fellows to the School of Geosciences, and build a diverse and inclusive department.







Doug Elmore Dr. Michael H. Engel

My how time flies! It was almost 40 years ago that Doug began his academic career at OU and I had the privilege and pleasure of working with him during that time. Doug is a dedicated teacher, and his awards and the accomplishments of the multitude of students that worked with him at the graduate and undergraduate levels is unmatched in our school. In addition to teaching classes in Introductory Geology, Sedimentology, Clastic Facies, etc., Doug established the facility for Paleomagnetic Research at OU and is recognized internationally for his contributions to this field, not the least of which being the application of remanent magnetism for constraining the timing of fluid migration in sedimentary rocks. Doug was the recipient of many grants from industry, the National Science Foundation, the Department of Energy, and the National Geographic Society in support of his research, further evidence of his stature in this field.

dedicated much of his time to administrative duties to help improve the university. This included terms as the associate dean of the College of Geosciences, associate provost of the University and, most importantly to many of us, director of the School of Geology and Geophysics. These are typically thankless jobs but are critical for the betterment of academic life.

Like many others, I was fortunate to accompany Doug on field expeditions, starting in our own backyard in Oklahoma, and extending to other areas in the United States and abroad, including collaborative projects in England, Scotland, Wales, Germany, Austria, and Italy.

It is hard for me to believe that Doug is retiring, but I am sure that he will continue to work on new projects that present themselves to him down the road. Please join me in wishing Doug and his wife, Karen, a big THANK YOU for all that you have done for us and the best of luck with your future adventures in Colorado!

In addition to his stellar academic career, Doug also





















Kurt Marfurt

Dr. Bradley Wallet

Kurt Marfurt arrived at OU in August of 2007. Rumor has it, he was acquired in a trade with the University of Houston in a deal that involved John Castagna and two future draft picks. To my knowledge, those picks have never materialized. For his part, Kurt said that he was compelled to return to somewhere in Oklahoma because he held a lifetime fishing license in the state.

A native New Yorker, Kurt grew up on Long Island where he met his beloved Stephanie. They met in high school, and they have been together ever since. Kurt attended Hamilton College ,where he received an undergraduate degree in both physics and French. While at Hamilton College, he was also a member of the Lucky Shot Society commemorating the infamous dual between Aaron Burr and Alexander Hamilton, the namesake of his alma mater.

After completing an undergraduate degree, Kurt undertook graduate studies at Columbia University. While there, he learned a valuable lesson in proper software coding after a runaway loop in his code used a year's worth of CPU funding in a matter of minutes. Finally, after nearly bankrupting his advisor, Kurt obtained a Ph.D. in applied geophysics in 1975.

Upon completion of his Ph.D., Kurt accepted a position as an instructor and then assistant professor of mining in the School of Mining at Columbia University. Then, in 1981, Kurt and Stephanie "became tired of being poor," and he accepted a research position with Amoco in Tulsa.

While with Amoco, Kurt did much pioneering work in seismic attributes. Amongst his achievements was inventing the semblance attribute which, in its various forms, is still one of the most important tools in attribute analysis. As Kurt would often describe it, "I managed to get a patent of variance, of all things. Amoco made a fortune, and all I got was a fishing rod that I was allowed to pick out of a catalog." During his time at Amoco, Kurt established himself as an important figure in exploration geophysics.

In 1999, Kurt returned to academia when he accepted a position at the University of Houston. Kurt would often say that by moving from Oklahoma to Texas, he simultaneously improved the average IQ of both states. There, his bubbly sense of humor and his charming personality made him an instant hit. He was the SEG Distinguished Short Course instructor. He also wrote a book with Satinder Chopra that is a must read for those interested in seismic attributes.

Then, in 2007, Kurt accepted the position of Frank and Henrietta Schultz Chair as a professor of geophysics at OU. He taught classes in seismic interpretation and processing that were always overflowing with eager students. He also taught courses in seismic exploration to petroleum engineers that had up to 200 students. Kurt would have as many as 20 graduate students at a time that he was funding and mentoring. He was relentless in his support of his students. In his classes, he was known for his good humor, and the street Spanish that he would often speak. I don't know much Spanish, but the native speakers would always laugh at what he said.

The Attribute Assisted Seismic Processing and Interpretation Consortium that Kurt founded has been an important source of funding for graduate students, postdoctoral researchers, and junior faculty. It helped to establish OU as one of the preeminent centers of seismic exploration, and it is one of his most enduring legacies.

In 2018, Kurt stepped back from teaching to focus on his research and to spend more time with his grandchildren. He continued at OU as a research professor. In that same year, he was again selected to be the SEG Distinguished Short Course instructor, demonstrating the durability of his relevance at a time when many others would have chosen to rest upon their laurels.

After three more years, Kurt decided to step back even further. As a final tribute, Kurt was elected by the faculty of the School of Geosciences to Professor Emeritus status. He has bought a ranch and some cattle, and he is looking into getting some sheep. He intends to speak French to his cows and spend even more time with daughters and grandkids.

Throughout his career, Kurt has achieved too many honors to name. He is an Honorary Member of both the SEG and the Geophysical Society of Houston, and he has won countless awards for his many posters and presentations at various conferences. Even now, he is the AAPG/SEG Distinguished Lecturer.

Kurt has forever changed the field of geophysics. Most importantly, he has forever changed the lives of his many students and others who have had the honor of knowing him. Kurt will forever be my most important mentor and my friend.



Steve Westrop

Drs. Lisa Amati and Talia Karim

Steve Westrop (B.S., 1976, University of Wales at Swansea; M.S., 1980, University of Toronto; Ph.D., 1984, University of Toronto) was a valued professor at Brock University before coming to the University of Oklahoma. He retired as the Willard L. Miller professor at the University of Oklahoma in 2021.

Steve is well-known and respected in the field of trilobite paleoecology and evolutionary biology and I feel lucky to work with him. Through his career, Steve has contributed extensively to the understanding of trilobite evolutionary relationships. Focusing mainly on the Cambrian, Steve's work illuminates extinction events and documents biomere boundaries, allowing more detailed biostratigraphic control during that time.

He also worked with colleagues to elucidate the role trilobites played in diversification and extinction events from the Cambrian through the Silurian. Most notably perhaps is his work documenting trilobite generic diversity through the Ordovician Radiation.

As an adept field researcher, Steve has worked from

the Canadian Rockies to the Avalon Peninsula in Newfoundland and across much of the United States from Nevada to New York. Paleoecological interpretations require detailed reconstructions of depositional environments using facies analysis, and Steve is skillful in both siliciclastic and carbonate settings. He logged many of the sections in the Great Basin of the United States and learned sequence stratigraphy to better correlate sections.

Steve successfully obtained a number of important NSF grants. These allowed him to spend valuable time in the field and to mentor graduate students through their field-based research. As a professor, Steve imparted his extensive knowledge about the fields of geology and paleontology clearly and creative. He asked his students to work hard but was clear on what he expected and made it easy to comply.

Steve was and is the best advisor anyone could ask for. He really knows his science and can communicate what he knows to students in clear and often entertaining language. In addition, Steve is patient, understanding, funny, and is always available.

Memorials In memory of our alumni gone too soon

O. Adams Gerald Allen Lawrence Bartell Lloyd Biddick David Bryant David Campbell James Cantrell John Carter Mitzi Chamberlain Edward Chew Floyd Clawson James Condreav Donald Davis **Phyllis Dotson Ralph Edwards** D. Fidler **James** Gorman Gene Goss Thomas Green **Douglas Hargrove** John Higgins

Robert Johnston A. Jones Flovd Lashly Dorothy Mach Lewis McCord Gary McDaniel **Olen Medley** Marjorie Polk Michael Pollok Kenneth Sala Alvin Smith Earl Smith Wendell Smith **Thomas Spear** Staffan Van Dyke David Vosburg Llovd Waner **Betty White** Amos Whitten Scott Williams Fox Wood

*as reported to OU Development through July 2021

Alumni News

Tim Drexler ('81) was recently awarded a United States Environmental Protection Agency gold medal as a part of the USS Lead Superfund Site residential cleanup team in north-west Indiana.

In Memory of David G. Campbell

H. W. "Dub" Peace II

We lost another of our distinguished alumni on Oct. 10, 2020, when David G. Campbell passed from this earthly life at age 90. David was born May 2, 1930 in Oklahoma City. During his growing up years his family moved to several different cities and finally settled in Tulsa, where he graduated from Tulsa Central High in 1948. He then attended Tulsa University and became a member of Pi Kappa Alpha fraternity. While there, he joined the U.S. Naval Reserve and graduated in 1953 with a bachelor of science degree in geology. He then entered the Army and served in the Artillery as an instructor at Fort Sill, Oklahoma. Upon his release from active duty he matriculated to the University of Oklahoma where he, in 1957, received his master of science degree in geology. While at T. U. he met his future wife and lifelong loving companion Janet G. Newland. Jan preceded him into their future by only a few days after 62 vears together on this earth.

David's career was as a petroleum geologists' geologist. It began with Lone Star Production in Oklahoma City, then Tenneco Oil Co. in 1965, then Leede Exploration Co. in 1977 and finally in 1980 he formed his own consulting company, Earth Hawk Exploration, which he maintained till his passing. While maintaining his consulting business, he also headed up the Mid-Continent Division of Petrocorp Inc. until his retirement from that position in 1998. While at Tenneco he rose to Mid-Continent district geologist and later division geological consultant and during this period had several exploration discoveries. At Leede he was the exploration manager responsible for many of their successes in both the Anadarko and Arkoma Basins. During his working period, David joined many professional groups and professional societies where he became very active in their activities and rose to officer positions in many of them. Some of these are: American Association of Petroleum Geologists where he was chairman of the House of Delegates in 1981-2; Oklahoma City Geological Society where he held several positions; SIPES; Oklahoma City Geological Foundation: and the University of Oklahoma School of Geology and Geophysics Alumni Council, where he held several officer positions culminating in its' chairmanship. David was an enrolled member of the Cherokee Tribe where he published Articles on Cherokee studies and history. He was most proud of his work in representing them in the formation of the American Indian Cultural Center in Oklahoma Citv and the Red Earth Cultural Center, where he was elevated to the Elders Council. He was very proud of this heritage and encouraged all those presenting a positive image of American Indians.

David is one of the giants of the many who have graduated from the now School of Geosciences at OU. As an alum he believed most strongly that the school should maintain its foundation as the first truly school emphasizing petroleum geology in its curriculum though none of the titles on the diplomas have the words petroleum geology. He encouraged many to major in geology and actively visited with the professors and students on campus and in their classes providing anecdotes of his and others experience in the search for petroleum. He told of the extreme "high" that accompanied a successful well on an individual's prospect which came from an idea in that person's mind to find something that no one else had thought of. During the 1980s he was a member of the alumni futures and curriculum Committees that worked successfully with the schools director and university provost to reinvigorate the school's direction back toward its petroleum geology foundation. He was a member of the alumni committee that convinced OU President David Boren to employ Dr. Roger Slatt as the school's director with additional funding from the alumni. He was always available to help out the school and its students in anything they may ask of him. For many years he was in charge of the judging of posters presented by students from many colleges and Universities at the Spring Student Expo that Dr. Slatt initiated at OU.

Geology alum and longtime friend of David, Pat Clare wrote: "I first met Dave Campbell in 1973 when I opened the OKC office for Stolz, Wagner & Brown in the 100 Park Ave Building. My office was immediately next to Lone Star and that is where I first became friends with him and Lone Star employees Bill Jezek and Bob McCall. We were all part of the geological fraternity, swapping logs and OU stories. A few years later I moved across the street into the Liberty Tower with what became Wagner & Brown, and Dave moved out on Classen Blvd. with Tenneco. We continued to swap 'tite hole' E-logs with the help also of B. J. Patterson, scout with Exxon. We became sort of a trifecta for obtaining hard to obtain critical E-logs. Occasionally I would meet Dave after work at the 'Gusher Club' in the Hilton Hotel on NW Expressway where we would have a toddy and watch the crazy disco dancers. We would stay later than we should have sharing jokes and geological stories about some of our cohorts, drilling wells, acreage acquisitions, etc. Later in life I would sit next to Dave (by choice) at the monthly Exploration Managers meeting in the Chase Tower to hear his stories (his Indian background, AAPG news updates and so many other various tales). Dave was an exceptional storyteller and individual. I was in awe of him when he ran for president of AAPG. His sense of humor was extraordinary. With his passing it leaves a giant hole in the geological community and I will forever cherish our relationship."

I too feel that I have lost a friend and a confidant of many years. In a few cases we competed with each other on leasing where each of our companyie had overlapping prospects. We both joined with other alums in wishing for and helping to forward a belief that the School of Geology at the time of our graduations was what molded us into the successful geologists and businessmen we became. We endeavored to see the school continue its past success move ever forward into the now and future by encouraging students, faculty and the university to maintain the petroleum geology legacy. I believe Dave was the most happy cheerful person I have ever known. He was always smiling and telling happy stories. Even when he was upset at times in the direction the school or college was headed, he managed to present his thoughts in a pleasant manner while smiling and saying how bright the future could be. Though his health and Jan's were poor during his last few months, he always smiled, told happy stories and looked on the brighter side of anything. I will miss him, and the school and its students will have lost a great advocate.

Faculty Year in Review

*This document lists, for each faculty member, publications and grants active in CY 2020, classes taught in CY 2020, and graduate students completed during spring 2020, summer, 2020 and fall 2020. Please note that faculty have varied effort distributions, listed as proportions devoted to Teaching (T), Research (R), and Service (S).

YOUNANE ABOUSLEIMAN Effort Distribution: T20, R60, S20 Journal Articles

Abousleiman, Y., Liu, C. (2020). "Generalized Solution to the Anisotropic Mandel's Problem." *International Journal for Numerical and Analytical Methods in Geomechanics*, Vol. 44, No. 17.

Abousleiman, Y., Mehrabian, A. (2020). "Poroelastic Solution to the Brazilian Test." *International Journal of Rock Mechanics and Mining Sciences*, Vol. 126.

HEATHER BEDLE Effort Distribution: T40, R40, S20 Journal Articles

Chenin, J., Bedle, H. (2020). "Multi-attribute machine learning analysis for weak BSR detection in the Pegasus Basin, Offshore New Zealand." *Marine Geophysical Research,* Vol. 41, No. 4, DOI: 10.1007/S11001-020-09421-X.

Clairmont, R., Bedle, H. (2020). "Mass Transport Deposit (MTD) or Complex Channel System? A case study of the 3D Nimitz Seismic Survey, Taranaki Basin, New Zealand." *Interpretation*, 1–21, DOI: 10.1190/ int-2020-0034.1.

Reilly, P., Clairmont, R., Bedle, H. (2020). "Are bright spots always hydrocarbons? A case study in the Taranaki Basin, New Zealand." *Interpretation*, Vol. 8, No. 4, SR45–SR51, DOI: 10.1190/int-2020-0047.1.

La Marca Molina, K., Bedle, H., Tellez, J. (2020). "Seismic attributes and analogs to characterize a large fold in the Taranaki Basin." *Interpretation*, Vol. 8, No. 4, SR27-SR31, DOI: 10.1190/int-2020-0018.1.

Ortiz-Sanguino, L., Tellez, J., Bedle, H., Martinez-Sanchez, D. (2020). "Seismic characterization of a blocky mass-transport deposit in the Trealla Limestone Formation, North Carnarvon Basin, Australia." *Interpretation*, Vol. 8, No. 4, SR53–SR58, DOI: 10.1190/ int-2020-0049.1.

Leopoldino Oliveira, K. M., Bedle, H., Araujo, G. d., Castelo Branco, M. (2020). "The importance of recognizing multiples in legacy data: A case study from the Brazilian equatorial margin." *Interpretation*, Vol. 8, No. 4, SR17–SR21, DOI: 10.1190/int–2019–0214.1. Clairmont, R., Kolawole, F., Omale, A. P., Bedle, H. (2020). "Controls of pre–existing structures on clino– form architecture and the associated progradation– al system elements." *Basin Research*, DOI: 10.1111/ bre.12487.

Leopoldino Oliveira, K. M., Bedle, H., Castelo Branco, R. M., de Souza, A. C., Nepomuceno Filho, F., Normando, M. N., de Almeida, N. M., da Silva Barbosa, T. H. (2020). "Seismic stratigraphic patterns and characterization of deepwater reservoirs of the Mundaú sub-basin, Brazilian Equatorial Margin." *Marine and Petroleum Geology*, Vol. 116, 104310, DOI: 10.1016/j.marpetge0.2020.104310.

Grants

Bedle, Heather, "Understanding and unraveling the seismic waveforms related to low saturation gas.," Sponsored by American Chemical Society, Petroleum Research Fund, Non Profit, \$110,000.00. (September 1, 2021 – August 31, 2023).

Marfurt, Kurt J., Bedle, Heather, "Attribute-Assisted Seismic Processing and Interpretation Consortium," Sponsored by Various Oil Companies, Industry, \$5,893,915.00. (January 2008 – December 2020).

Teaching

GPHY 4874 Seismic Exploration GPHY 5533 Quant Seismic Interpretation GPHY 5970 Advanced Seismic Exploration GPHY/GEOL 6970 Multidisciplinary Exploration GPHY 6970 Python Workshop for Geophysics

Student Completed (Spring 2020 – Fall 2020) Buist, Carl, M.S., "SUB-SEISMIC REEF CHARACTER-IZATION USING MACHINE LEARNING AND MULTI-ATTRIBUTE ANALYSIS."

Chenin, Julian, M.S., "EXAMINING SEISMIC AM-PLITUDE RESPONSES OF GASEOUS MEDIA USING UNSUPERVISED MACHINE LEARNING."

La Marca, Karelia, M.S., "SEISMIC ATTRIBUTE OPTI-MIZATION WITH UNSUPERVISED MACHINE LEARN-ING TECHNIQUES FOR DEEPWATER SEISMIC FA-CIES INTERPRETATION: USERS VS MACHINES."

MICHAEL BEHM Effort Distribution: T45, R45, S10 Grants

Soreghan, Gerilyn S., Behm, Michael, Dulin, Shannon A., "COLLABORATIVE RESEARCH: Equatorial Glaciation and Landscape Burial in the Late Paleozoic: Implications for Pangaean Climate and Tectonics," Sponsored by National Science Foundation, Federal, \$449,032.00. (September 1, 2019 – August 31, 2022).

Teaching

GPHY 4133 Geophysics Field Camp GPHY 6970 Seismic Processing

BRETT CARPENTER Effort Distribution: T40, R40, S20 Journal Articles

Firkins, M., Kolawole, F., Marfurt, K. J., Carpenter, B. M. (2020). "Attribute-assisted characterization of basement faulting and the associated sedimentary sequence deformation in north-central Oklahoma." *Interpretation*, SP175-, DOI: 10.1190/int-2020-0053.1.

Liao, Z., Hu, L., Huang, X., Carpenter, B. M., Vasileva, S., Zhou, Y. (2020). "Characterizing damage-zones of normal faults using seismic variance in the Wangxuzhuang Oilfield, China." *Interpretation*, DOI: 10.1190/ INT-2020-0004.1.

Zoet, L., Ikari, M., Alley, R., Marone, C., Anandakrishnan, S., Carpenter, B. M., Scuderi, M. (2020). "A framework for glacial stick-slip seismicity." *Geophysical Research Letters*, DOI: 10.1029/2020GL088964.

Ikari, M., Carpenter, B. M., Scuderi, M., Collettini, C., Kopf, A. (2020). "Frictional strengthening explored during non-steady state shearing: Implications for fault stability and slip event recurrence time." *Journal of Geophysical Research – Solid Earth*, DOI: 10.1029/2020JB020015.

Chen, X., Carpenter, B. M., Reches, Z. (2020). "Asperity failure control of stick-slip along brittle faults." *Pure and Applied Geophysics*, DOI: 10.1007/s00024-020-02434-y.

Kolawole, F., Simpson-Turko, M., Carpenter, B. M. (2020). "Basement-controlled deformation of the sedimentary sequences in north-central Oklahoma." *Basin Research*, DOI: 10.1111/bre.12433.

Kibikas, W., Ghassemi, A., Carpenter, B. M. (2020). "Mechanical strength and physical properties of Oklahoma's igneous basement." *Tectonophysics*, DOI:

10.1016/j.tecto.2020.228336.

Grants

Walter, Jacob, Ghassemi, Ahmad, Carpenter, Brett M., "Refining principal stress measurements in reservoir underburden in regions of induced seismicity through seismological tools, laboratory experiments, and theory," Sponsored by Electric Power Research Institute, Inc., Non Profit, \$495,423.00. (October 1, 2018 – September 30, 2022).

Carpenter, Brett M., "Laboratory Constraints on Slip Evolution in Sedimentary Lithologies," Sponsored by Chevron, U.S.A., Industry, \$210,000.00. (September 1, 2019 – August 31, 2022).

Carpenter, Brett M, Reches, Zeev, "Geotrib: A Tribological Facility for The Analyses of Friction, Wear, and Lubrication of Geo-Systems," Sponsored by National Science Foundation, Federal, \$302,315.00. (August 1, 2020 – July 31, 2022).

Teaching

GEOL 1114 Physical Geology GEOL 3003 Structural Geology/Stratigraphy GEOL 3114 Structural Geology

Students Completed (Spring 2020 – Fall 2020)

Karam, Pierre, Ph.D., "CHARACTERIZING TRANSFER ZONES WITH SEISMIC AND EXPERIMENTAL MOD-ELS."

Kolawole, Folarin, Ph.D., "THE ROLES OF STRUC-TURAL INHERITANCE IN REGIONS OF INDUCED SEISMICITY AND ACTIVE TECTONICS."

XIAOWEI CHEN Effort Distribution: T40, R40, S20 Journal Articles

Abecrombie, R., Chen, X., Zhang, J. (2020). "Repeating Earthquakes with Remarkably Repeatable Ruptures on the San Andreas Fault at Parkfield." *Geophysical Research Letters*, DOI: https://doi. org/10.1029/2020GL089820.

Deng, K., Liu, Y., Chen, X. (2020). "Correlation Between Poroelastic Stress Perturbation and Multi-disposal Wells Induced Earthquake Sequence in Cushing, Oklahoma." *Geophysical Research Letters*, DOI: https://doi.org/10.1029/2020GL089366.

Chen, X., Abercrombie, R. E. (2020). "Improved approach for stress drop estimation and its application to an induced earthquake sequence in Oklahoma."

Geophysical Journal International, DOI: https://doi. org/10.1093/gji/ggaa316.

Grants

Neeman, H.J., and 30 others, "Acquisition of a Regional Resource for Long-term Archiving of Large Scale Research Data Collections," National Science Foundation, \$967,755.00. (September 1, 2018 – August 31, 2021).

Chen, Xiaowei, "Understanding the triggering process of the foreshock sequence of the 2010 M7.2 El-Mayor-Cucapah earthquake," Sponsored by University of California-Southern California Earthquake Center, University. \$25,000. (February 1, 2019 – January 30, 2020).

Chen, Xiaowei, "Collaborative Research: Multi-scale validation of earthquake source parameters to resolve any spatial, temporal or magnitude-dependent variability at Parkfield, CA," Sponsored by National Science Foundation, Federal, \$224,262.00. (March 15, 2016 – February 28, 2021).

Teaching

GPHY 1103 Adventures in Geophysics GPHY 4970/5970 Into to Seismology

Students Completed (Spring 2020– Fall 2020)

Ortega Romo, Angie, M.S., "ASPECTS OF SEISMICI-TY CLUSTERING, SUBSURFACE STRUCTURE, AND STRESS ORIENTATIONS."

Pennington, Colin, Ph.D., "EARTHQUAKE SOURCE AND RUPTURE CHARACTERIZATION FROM MICRO-EARTHQUAKES TO MEGATHRUST EARTHQUAKES."

Qin, Yan, Ph.D., "ROLES OF FLUID INJECTION, STRESS STATE, GEOLOGICAL STRUCTURE, AND EARTHQUAKE INTERACTION ON OKLAHOMA EARTHQUAKES."

KATO DEE

Effort Distribution: T40, R40, S20 Grants

Dee, Kato T., "Lower Sullivan Climax Mine PA/SI and Lancaster/Tip-Top Mine Post Removal Action Sampling," Sponsored by U.S. Department of Agriculture, Forestry Service, Federal. (May 10, 2019 – May 1, 2020).

Teaching

GEOL 1114 Physical Geology GEOL 5970 Special Studies Hydrogeology GEOL 6633 Aqueous Geochemical Modeling

SHANNON A. DULIN Effort Distribution: T70, R15, S15 Book Chapters

Dulin, S. A. (2020). "Geological Field Methods and Mapping." Encyclopedia of Geology, 2nd edition, United Kingdom: El Sevier, 2nd ed., Vol. 6, 294-300.

Grants

Soreghan, Gerilyn S., Behm, Michael, Dulin, Shannon A., "COLLABORATIVE RESEARCH: Equatorial Glaciation and Landscape Burial in the Late Paleozoic: Implications for Pangaean Climate and Tectonics," Sponsored by National Science Foundation, Federal, \$449,032.00. (September 1, 2019 – August 31, 2022).

Teaching

GEOL 1034 Native Science and Earth Systems GEOL 1114 Physical Geology GEOL 1124 Earth History GEOL 3123 Introductory Field Geology GEOL 4136 Field Geology GEOL 4533/5533 Earth's Past Climate

R. DOUGLAS ELMORE Effort Distribution: T40, R40, S20 Journal Articles

Hamilton, M., Weaver, B. L., Elmore, R. D. (2020). "The Texaco Kohpay L 16-WS: The Osage Microgranite Revisited." *Shale Shaker*, Vol. 71, 108-125. https://www. ocgs.org/shale-shaker/.

Heij, G., Elmore, R. D. (2020). "Burial Diagenesis and Tectonism Inferred from Paleomagnetism and Magnetic Fabrics in the Wolfcamp Shale, Midland Basin, Texas, USA. *JGR Solid Earth*, Vol. 125, 1–19, DOI: https://doi.org/10.1029/2019JB019046. agu.org.

Teaching

GEOL 3233 Sedimentary/Petrology GEOL 5003 Diagenesis

ANDREW S. ELWOOD MADDEN Effort Distribution: T35, R40, S25 Grants

Krumholz, Lee R., Callaghan, Amy V., Madden, Andrew S., Sankaranarayanan, Krithivasan, "RII Track-2 FEC: Building Genome-to-Phenome Infrastructure for Regulating Methane in Deep and Extreme Environments (BuG ReMeDEE)," Sponsored by South Dakota School of Mines and Technology, \$1,414,387.00. (August 1, 2017 – July 31, 2021). **Teaching** GEOL 2224 Mineral Sciences GEOL 6970 Clay Mineralogy

Students Completed (Spring 2020 – Fall 2020)

Maples, Brandon, M.S., "EVALUATING CATION EX-CHANGE AS A DRIVER FOR MANGANESE RELEASE DURING CARBONATE DISSOLUTION."

MEGAN E. ELWOOD MADDEN Effort Distribution: T25, R40, S35 Grants

Elwood Madden, Megan E, Jane, Irungu, Snyder, Lori A, Cerato, Amy, Fahes, Mashhad M, Martin, Elinor R, Soreghan, Gerilyn S, "EAGER Gold Rewards: removing barriers and supporting geoscience diversity leaders through hiring, evaluation, and award criteria and processes.," Sponsored by National Science Foundation, Federal, \$299,878.00. (September 15, 2020 – August 31, 2022).

Elwood Madden, Megan E., "Characterizing the geochemical formation conditions of jarosite and alunite outcrops on Mars in the context of lab experiments and field observations," Sponsored by SETI Institute, Non Profit. \$48,684.00. (November 1, 2019 – April 30, 2022).

Soreghan, Gerilyn S, Elwood Madden, Megan E, "Quantifying Surface Area in Muds from the Antarctic Dry Valleys: Implications for Weathering in Glacial Systems," Sponsored by National Science Foundation, Federal, \$351,785.00. (June 1, 2016 – May 31, 2021).

Elwood Madden, Megan E., "PDART Step-2: Raman Spectral Database of Aqueous Solutions for Planetary Science," Sponsored by NASA – Headquarters, Federal. \$380,855.00. (February 13, 2018 – February 12, 2021).

Teaching

GEOL 3333 Geowriting GEOL 4223/5223 Principles of Geochemistry

Students Completed (Spring 2020 – Fall 2020) Mason, Daniel, M.S., "Raman Spectroscopy and Its Applications to Ice-Sediment-Brine Matrices in Recurring Slope Lineae on Mars."

Rodriguez, Andrew, M.S., "OBSERVATION OF MARS ANALOGOUS BASAL IN NEAR SATURATED BRINES." Webb, Nina, M.S., "EFFECTS OF MASS WASTING ON FLUVIAL SEDIMENTS IN PUERTO RICO FOLLOWING HURRICANE MARIA."

MICHAEL H. ENGEL Effort Distribution: T50, R30, S20 Journal Articles

Connan, J., Priestman, S., Vosmer, T., Komoot, A., Tofighian, H., Ghorbani, B., Engel, M. H., Zumberge, A., Van de Velde, T. (2020). "Geochemical analysis of bitumen from West Asian torpedo jars from the c. 8th century Phanom–Surin shipwreck in Thailand." *Journal of Archaeological Science*, Vol. 117, DOI: 105111. https://doi.org/10.1016/jas.2020.105111.

Frederickson, J. A., Engel, M. H., Cifelli, R. L. (2020). "Ontogenetic dietary shifts in Deinonychus antirrhopus (Theropoda; Dromaeosauridae): Insights into the ecology and social behavior of raptorial dinosaurs through stable isotope analysis." *Palaeogeography, Palaeoclimatology, Palaeoecology*, Vol. 109780, DOI: 10.1016/j.palaeo.2020.109780.

Harper, J. K., McCormick, M., Hamilton, M., Peiffert, C., Michels, R., Engel, M. H. (2020). "Establishing the provenance of the Nazareth Inscription: Using stable isotopes to resolve a historic controversy and trace ancient marble production." *Journal of Archaeolog-ical Science*, Vol. 30. https://doi.org/10.1016/j.jas-rep.2020.102228.

Teaching

GEOL 1104 Dynamic Earth GEOL 3633 Introduction to Oceanography

JUNLE JIANG

Effort Distribution: T40, R40, S20 Journal Articles

Jiang, J., Lohman, R. B. (2020). "Coherence-guided In-SAR deformation analysis in the presence of ongoing land surface changes in the Imperial Valley, California." *Remote Sensing of Environment,* 112160, DOI: 10.1016/j.rse.2020.112160. http://dx.doi.org/10.1016/j. rse.2020.112160.

Grants

Jiang, Junle, "Advancing Simulations of Sequences of Earthquakes and Aseismic Slip (SEAS)," Sponsored by National Science Foundation, Federal, \$47,000.00. (February 1, 2020 – January 31, 2021).

Teaching

GEOL 1114 Physical Geology

XIAOLEI LIU Effort Distribution: T40, R40, S20 Journal Articles

Sardar Abadi, M., Owens, J. D., Liu, X., Them, T. R., Cui, X., Heavens, N. G., Soreghan, G. S. (2020). "Atmospheric dust stimulated marine primary productivity during Earth's penultimate icehouse." *Geology*, Vol. 48, 247–251, DOI: doi.org/10.1130/G46977.1.

Cui, X., Liu, X.-L., Shen, G., Ma, J., Husain, F., Rocher, D., Zumberge, J. E., Bryant, D. A., Liu, X. (2020). "Niche expansion for phototrophic sulfur bacteria at the Proterozoic--Phanerozoic transition." *Proceedings of the National Academy of Sciences*, Vol. 117, No. 30, 17599–17606.

Grants

Liu, Xiaolei, "The isotope composition of complete archaeal tetraethers analyzed separately in parallel and antiparallel glycerol configurations: a potential approach to disentangle signals of heterogeneous sources," Sponsored by American Chemical Society, Petroleum Research Fund, Non Profit, \$110,000.00. (January 1, 2020 – August 31, 2022).

Nanny, M., and 14 others, "NSF-MRI: Acquisition of an Inductively Coupled Plasma Mass Spectrometer (ICP-MS) System to Enable Elemental Analysis in Research, Training and Education," National Science Foundation, \$396,778.00. (August 15, 2018 – July 31, 2021).

Teaching

GEOL 1114 Physical Geology GEOL 6103 Petroleum Geochemistry

Students Complete (Spring 2020 – Fall 2020)

Putri, Tara, M.S., "THE ORGANIC GEOCHEMICAL VARIABILITY IN DEPOSITIONAL ENVIRONMENTAL PROCESSES WITHIN A STRATIGRAPHIC SEQUENCE OF THE WOODFORD SHALE IN THE ARDMORE BA-SIN, OKLAHOMA."

DAVID LONDON Effort Distribution: T35, R,30, S25 Teaching GEOL 4923/5923 Pegmatites

RICHARD A. LUPIA Effort Distribution: T40, R40, S20 (split appointment w/museum) Journal Articles

Richmond, D., Lupia, R., Philippe, M., Klimek, J. (2019). "First occurrence of the boreal fossil wood Xenoxylon meisteri from the Jurassic of North America: Morrison Formation of central Montana, US." *Review of Palaeobotany and Palynology*, Vol. 267, 39–53.

Grants

Lupia, Richard A., Cifelli, Richard L., "Collaborative Research: Time of Transformation: integrating the dynamic biotic, geologic, and climate systems of North America during the Early to Late Cretaceous transition," Sponsored by National Science Foundation, Federal. (August 15, 2019 – July 31, 2024). \$406,609

Landis, Margaret, Lupia, Richard A., "Digitization TCN: Collaborative Research: The Pteridological Collections Consortium: An integrative approach to pteridophyte diversity over the last 420 million," Sponsored by Yale University, University. (August 1, 2018 – July 31, 2021). \$38,937

Teaching

GEOL 1024 History of Earth and Life

Students Completed (Spring 2020 – Fall 2020)

Richmond, Dean, Ph.D., "GEOLOGICAL AND PALE-ONTOLOGICAL INVESTIGATION OF THE UPPER JURASSIC MORRISON FORMATION AT THE BASIN MARGINS OF CENTRAL MONTANA AND THE WEST-ERN PANHANDLE OF OKLAHOMA."

KURT J. MARFURT Research Professor Iournal Articles

Pires de Lima, R., Welch, K., Barrick, J., Marfurt, K. J., Burkhalter, R., Cassel, M., Soreghan, G. S. (2020). "Convolutional neural networks as an aid to biostratigraphy and micropaleontology: A test on late Paleozoic microfossils." *Palaios*, Vol. 35, 391–402, DOI: 10.2110/pal0.2019.102.

Firkins, M., Kolawole, F., Marfurt, K. J., Carpenter, B. M. (2020). "Attribute-assisted characterization of basement faulting and the associated sedimentary sequence deformation in north-central Oklahoma." *Interpretation*, SP175-, DOI: 10.1190/int-2020-0053.1.

Pires de Lima, R., Duarte, D., Nicholson, C., Slatt, R. M., Marfurt, K. J. (2020). "Petrographic microfacies classification with deep convolutional neural networks." *Computers and Geosciences*, Vol. 142, No. 104481.

Grants

Sondergeld, Carl H., Rai, Chandra S., Devegowda, Deepak, Ousseini Tinni, Ali, Marfurt, Kurt J., Pranter, Matthew J., "Reservoir Characterization in Unconventional Oil & Gas Reservoirs," Sponsored by Marathon Oil Company, Industry. \$2,000,000. (September 1, 2017 – December 31, 2020).

Marfurt, Kurt J., Bedle, Heather, "Attribute-Assisted Seismic Processing and Interpretation Consortium," Sponsored by Various Oil Companies, Industry, \$5,893,915.00. (January 2008 – December 2020).

Students Completed (Spring 2020 – Fall 2020)

Kim, Yuji, Ph.D., "MACHINE LEARNING APPLICA-TIONS FOR SEISMIC PROCESSING AND INTERPRE-TATION."

Lyu, Bin, Ph.D., "FULL WAVE-EQUATION BASED PASSIVE SEISMIC IMAGING AND MULTISPECTRAL SEISMIC GEOMETRIC ATTRIBUTES."

Patel, Swetal, Ph.D., "GEOPHYSICAL CHARACTERI-ZATION OF RESOURCE PLAYS."

JOHN D. PIGOTT Effort Distribution: T40, R40, S20 Journal Articles

Abdel-Fattah, M., Pigott, J. D., El Sadek, M. S. (2020). "Alam El Bueib Reservoir Characterization, Tut oil field, North Western Desert, Egypt." *Enviromental Earth Sciences*, Vol. 161, 14.

Teaching

GEOL 5363 Carbonate Geology GEOL 5813 Basin Analysis for Oil & Gas GEOL 5970 App. Sequence Stratigraphy GPHY 6970 Permian Basin 3D Seismic for Development

Students Completed (Spring 2020 – Fall 2020)

Brown, Andrew, M.S., "HIGH RESOLUTION SE-QUENCE STRATIGRAPHY OF THE LEONARDIAN BONE SPRING FORMATION OUTCROP OF BONE CANYON, GUADALUPE MOUNTAINS, WEST TEXAS AND ITS CORRELATION TO THE SUBSURFACE."

Layden, Andrew, M.S., "HIGH RESOLUTION XRF-SCHMIDT HAMMER BASED SEQUENCE AND GEO-MECHANICAL STRATIGRAPHY OF THE LEON-ARDIAN BONE SPRING FORMATION, SHUMARD CANYON, GUADALUPE MOUNTAIN NATIONAL PARK." Lynch, Matt, M.S., "INTEGRATED PETROPHYSI-CAL-SEISMIC SEQUENCE STRATIGRAPHY OF THE MIXED CARBONATE CLASTIC SEDIMENT GRAVITY FLOWS OF THE BONE SPRING FORMATION, NEW MEXICO."

Plowman, Aimee, M.S., "PALEOENVIRONMENT, DESPOSITIONAL HISTORY, AND PROCESS SEDI-MENTOLOGY OF THE UPPER GUADALUPIAN YATES FORMATION: NORTHWEST SHELF, NEW MEXICO."

MATTHEW J. PRANTER Effort Distribution: T40, R40, S20 Journal Articles

Tellez, J., Pranter, M. J., Cole, R. D. (2020). "Fluvial architecture and sequence stratigraphy of the Burro Canyon Formation, southwestern Piceance Basin, Colorado." *Interpretation*, 8, 4. DOI: 10.1190/INT-2019-0215.1

Wang, Y., Kabir, S., Pranter, M. J., Reza, Z. (2020). "Immersive diagnostics of reservoirs under WAG injection, Part II – Effect of depositional settings and dynamic spatial correlations." *Journal of Petroleum Science and Engineering*, Vol. 195, 26, DOI: 10.1016/j. petrol.2020.107858.

Grants

Sondergeld, Carl H., Rai, Chandra S., Devegowda, Deepak, Ousseini Tinni, Ali, Marfurt, Kurt J., Pranter, Matthew J., "Reservoir Characterization in Unconventional Oil & Gas Reservoirs," Sponsored by Marathon Oil Company, Industry. \$2,000,000. (September 1, 2017 – December 31, 2020).

Teaching

GPHY 3423 Intro to Petroleum Geology/Geophysics GEOL 4133 Petroleum Geology GEOL 6970 Reservoir Characterization and Modeling

Students Completed (Spring 2020 – Fall 2020)

Dingmore, Lindy, M.S., "STRATIGRAPHIC VARI-ABILITY OF MINERALOGY, ROCK TYPES AND PO-ROSITY OF THE WOLFCAMP FORMATION USING MULTI-MINERAL PETROPHYSICAL ANALYSIS AND SEISMICALLY CONSTRAINED RESERVOIR MODEL-ING, NORTHWEST SHELF, DELAWARE BASIN."

Suriamin, Fnu, Ph.D., "INTEGRATED RESERVOIR CHARACTERIZATION OF A MIXED SILICICLAS-TIC-CARBONATE SYSTEM, MISSISSIPPIAN STRATA OF NORTHERN AND CENTRAL OKLAHOMA." Williams, Hope, M.S., "SEISMIC-CONSTRAINED LITHOLOGY PREDICTION AND RESERVOIR-QUAL-ITY MODELING USING PRE-STACK INVERSION AND BAYESIAN CLASSIFICATION, MISSISSIPPIAN MERAMEC STRATA. EASTERN ANADARKO BASIN, OKLAHOMA."

ZEEV RECHES Journal Articles

Chen, X., Carpenter, B. M., Reches, Z. (2020). "Asperity failure control of stick-slip along brittle faults." *Pure and Applied Geophysics*, DOI: 10.1007/s00024-020-02434-y.

Grants

Carpenter, Brett M, Reches, Zeev, "Geotrib: A Tribological Facility for The Analyses of Friction, Wear, and Lubrication of Geo-Systems," Sponsored by National Science Foundation, Federal, \$302,315.00. (August 1, 2020 – July 31, 2022).

Reches, Zeev, "Rock Mechanics of Reservoir Rocks," Sponsored by China University of Petroleum, Industry, \$33,696.00. (March 1, 2020 – March 9, 2022).

ROGER M. SLATT Effort Distribution: T40, R40, S20 Journal Articles

Pires de Lima, R., Duarte, D., Nicholson, C., Slatt, R. M., Marfurt, K. J. (2020). "Petrographic microfacies classification with deep convolutional neural networks." *Computers and Geosciences,* Vol. 142, No. 104481.

Grants

Slatt, Roger M., "Consortium: Regional Woodford Shale stratigraphy, Oklahoma," Sponsored by Various Oil Companies, Industry. (January 1, 2013 – January 31, 2020).

Students Completed (Spring 2020 – Fall 2020)

Torres, Emilio, Ph.D., "Woodford Shale enclosed mini-basin fills on the Hunton paleo shelf. A depositional model for unconventional resource shale."

GERILYN S. SOREGHAN Effort Distribution: T20, R30, S50 Journal Articles

Oordt, A. S., Soreghan, G. S., Stemmerik, L., Hinnov, L. (2020). "A record of dust deposition in northern, mid-latitude Pangaea during peak icehouse conditions of the late Paleozoic ice age." *Journal of Sedimentary Research*, Vol. 90, 337–363, DOI: 10.2110/ jsr.2020.15. Adams, S., Soreghan, G. S. (2020). "A test of the efficacy of sand saltation for silt production: Implications for the interpretation of loess." *Geology*, Vol. 48, 1105– 1109, DOI: 10.1130/G47282.1.

Lily, P.-J., Soreghan, M. J., Feille, K. K., Soreghan, G. S., Weissmann, G., Ibarra, R., Stroud, A. (2020). "Activation of context diversity concepts in a field-based program for non-traditional students." *Journal of Geoscience Education*, DOI: https://doi.org/10.1080/108 99995.2020.1838850.

Sardar Abadi, M., Owens, J. D., Liu, X., Them, T. R., Cui, X., Heavens, N. G., Soreghan, G. S. (2020). "Atmospheric dust stimulated marine primary productivity during Earth's penultimate icehouse." *Geology*, Vol. 48, 247-251, DOI: doi.org/10.1130/G46977.1.

Pires de Lima, R., Welch, K., Barrick, J., Marfurt, K. J., Burkhalter, R., Cassel, M., Soreghan, G. S. (2020). "Convolutional neural networks as an aid to biostratigraphy and micropaleontology: A test on late Paleozoic microfossils." *Palaios*, Vol. 35, 391-402, DOI: 10.2110/palo.2019.102.

Soreghan, G. S., Coauthors, 1. (2020). "Report on ICDP Deep Dust workshops: probing continental climate of the late Paleozoic icehouse–greenhouse transition and beyond." *Scientific Drilling*, Vol. 28, 93–112, DOI: 10.5194/sd–28–93–2020.

Pfeifer, L., Hinnov, L., Zeeden, C., Rolf, C., Laag, C., Soreghan, G. S. (2020). "Rock Magnetic Cyclostratigraphy of Permian Loess in Eastern Equatorial Pangea (Salagou Formation, South-Central France)." *Frontiers in Earth Science*, Vol. 8, DOI: 10.3389/ feart.2020.00241.

Sardar Abadi, M., Soreghan, G. S., Hinnov, L., Heavens, N., Gleason, J. (2020). "Atmospheric dust flux in northeastern Gondwana during the peak of the late Paleozoic ice age." *Geological Society of America Bulletin*, DOI: 10.1130/B35636.1.

Grants

Elwood Madden, Megan E, Jane, Irungu, Snyder, Lori A, Cerato, Amy, Fahs, Machhad M, Martin, Elinor R, Soreghan, Gerilyn S, "EAGER Gold Rewards: removing barriers and supporting geoscience diversity leaders through hiring, evaluation, and award criteria and processes.," Sponsored by National Science Foundation, Federal, \$299,878.00. (September 15, 2020 – August 31, 2022). Soreghan, Gerilyn S., Behm, Michael, Dulin, Shannon A., "COLLABORATIVE RESEARCH: Equatorial Glaciation and Landscape Burial in the Late Paleozoic: Implications for Pangaean Climate and Tectonics," Sponsored by National Science Foundation, Federal, \$449,032.00. (September 1, 2019 – August 31, 2022).

Soreghan, Gerilyn S, Elwood Madden, Megan E, "Quantifying Surface Area in Muds from the Antarctic Dry Valleys: Implications for Weathering in Glacial Systems," Sponsored by National Science Foundation, Federal, \$351,785.00. (June 1, 2016 – May 31, 2021).

Soreghan, Gerilyn S., Soreghan, Michael J., "IRES: Landscapes of Deep Time in the Red Earth of France: Research Training in Paleoclimate," Sponsored by National Science Foundation, Federal, \$249,953.00. (September 1, 2017 – August 31, 2020).

Teaching

GEOL 4113/5113 Depositional Systems and Stratigraphy

GEOL 4533/5533 Earth's Past Climate GEOL 5353 Carbonates & Sequence Stratigraphy

Students Completed (Spring 2020 – Fall 2020)

Pfeifer, Lily, Ph.D., "PERMIAN LOESS AND EQUATO-RIAL GLACIATION IN EASTERN EQUATORIAL PAN-GEA."

MICHAEL J. SOREGHAN Effort Distribution: T40, R40, S20 Journal Articles

Lily, P.-J., Soreghan, M. J., Feille, K. K., Soreghan, G. S., Weissmann, G., Ibarra, R., Stroud, A. (2020). "Activation of context diversity concepts in a field-based program for non-traditional students." *Journal of Geoscience Education*, DOI: https://doi.org/10.1080/108 99995.2020.1838850.

Lucas, J. S., McGlue, M. M., Kimirei, I. A., Soreghan, M. J., Mbonde, A., Yeager, K. M., Limbu, P., Apse, C., McIntyre, P. B. (2020). "Geophysical benthic habitat mapping in Lake Tanganyika (Tanzania): Implications for spatial planning of small-scale coastal protected areas." *Journal of Great Lakes Research,* Vol. 46, No. 2, 243–254, DOI: 10.1016/j.jglr.2020.01.010.

Ryan, E. K., Soreghan, M. J., Mcglue, M. M., Todd, J. A., Michel, E., Kaufman, D. S., Kimirei, I. (2020). "Paleoenvironmental Implications of Time-Averaging and Taphonomic Variation of Shell Beds in Lake Tanganyika, Africa." *Palaios*, Vol. 35, No. 2, 49–66, DOI: 10.2110/palo.2019.037. Gravina, A., Soreghan, M. J., Bogan, M. T., Busch, J., McGlue, M., McIntyre, P., Kimirei, I., Cohen, A. (2020). "Relationship of sediment influx to ostracode populations on the variably deforested Luiche and Mahale platform coasts of Lake Tanganyika, Tanzania." *Jounral of Great Lakes Research*, Vol. 46, No. 5, 1207– 1220, DOI: 10.1016/j.jglr.2020.07.021.

McGlue, M. M., Ivory, S. J., Stone, J. R., Cohen, A. S., Kamulali, T. M., Latimer, J. C., Brannon, M. A., Kimirei, I. A., Soreghan, M. J. (2020). "Solar irradiance and ENSO affect food security in Lake Tanganyika, a major African inland fishery." *Science Advances*, Vol. 6, No. 41, DOI: 10.1126/sciadv.abb2191.

Grants

Soreghan, Gerilyn S., Soreghan, Michael J., "IRES: Landscapes of Deep Time in the Red Earth of France: Research Training in Paleoclimate," Sponsored by National Science Foundation, Federal, \$249,953.00. (September 1, 2017 – August 31, 2020).

Teaching

GEOL 1104 Dynamic Earth GEOL 3013 Geology of Oklahoma GEOL 3023 Resources of Sub-Saharan Africa

BARRY L. WEAVER Effort Distribution: T60, R20, S20 Journal Articles

Hamilton, M., Weaver, B. L., Elmore, R. D. (2020). "The Texaco Kohpay L 16-WS: The Osage Microgranite Revisited." *Shale Shaker*, Vol. 71, 108-125. https://www. ocgs.org/shale-shaker/.

Teaching

GEOL 1003 Volcanoes and Earthquakes GEOL 3223 Igneous/Metamorphic Petrology

STEPHEN R. WESTROP Effort Distribution: T40, R30, S30 (split appointment w/museum) Monograph

Armstrong, M. A., Westrop, S. R., Eoff, J. D. (2020). Systematics of a survivor: the late Cambrian kingstoniid trilobite Blountia across the Marjuman–Steptoean (Guzhanghian–Paibian) extinction interval in Laurentian North America. *Zootaxa*, 1st ed., Vol. 4804, 1–79.

Grants

Westrop, Stephen R., "Digitization PEN: Expanding and enhancing a TCN digitizing fossils to reconstruct evolving ecosystems the Cretaceous Western Interior Seaway," Sponsored by National Science Foundation, Federal, \$102,369.00. (September 1, 2017 – August 31, 2020).

Teaching

GEOL 3513 Invertebrate Paleontology

Students Completed (Spring 2020 – Fall 2020)

Welch, Katie, M.S., "CAMBRIAN TRILOBITES FROM THE STEPTOEAN-SUNWAPTAN BOUNDARY INTER-VAL (JIANGSHANIAN), NEVADA AND UTAH."



Field Trips Enrichment field trips provide our students the opportunity to gain handson training in the field throughout their educatitonal experiences.



TA Support TAs are instrumental in providing experiential learning to our students. Your support provides crucial assistance needed to fund our TAs and help elevate the impact of our program.



Conference Travel

Our students are highly encouraged to present their research at national and international conferences throughout their academic careers.

Outdoor Classroom

Help us build an outdoor space that showcases geologic concepts and OU Geosciences as a fun and educational magnet for the community.

Keep in touch with the School of Geosciences



Follow us on Social Media

FACEBOOK • INSTAGRAM • TWITTER

@ougeosciences



visit **geosciences.ou.edu** to learn about upcoming events and ways to get involved

