

# Geosciences

NEWSLETTER FALL 2021

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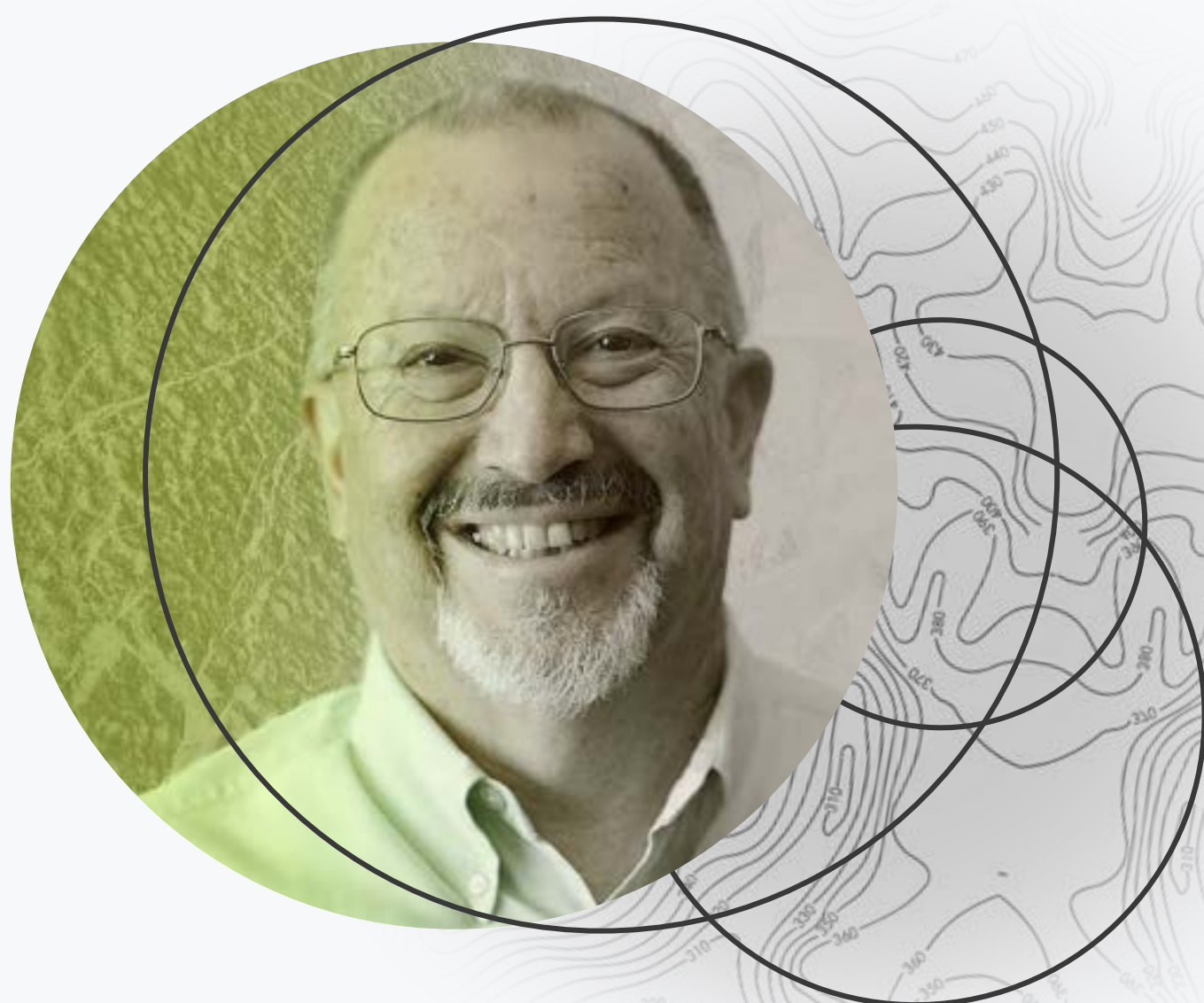
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## JOE C. YELDERMAN JR.

CHAIR

**“LET’S GET TOGETHER”. THAT PHRASE SOUNDS FAMILIAR, BUT SINCE OUR ABILITY TO MEET HAS BEEN RESTRICTED, IT IS EXCITING TO BE ABLE TO SAY IT AGAIN.**

**T**his message is written as we plan for 100% capacity in-person learning this fall. Although things may change depending on CDC guidance and Baylor University policies, we hope we can travel safely and gather as faculty, students, alumni, and friends throughout this coming year. We especially hope you can come for homecoming when we plan to have an open house Friday evening October 15th. However, if you are in the area at any time, stop by the department offices and catch up with us.

This message begins with a somber note as we remember Dr. Scott James, who passed away unexpectedly, May 2, 2021. He is on our minds and in our hearts. There’s a page honoring Scott in this newsletter. His passing was a shock to us all. He was such a great faculty member, and we all miss his ideas, inspiration, motivation, and camaraderie.

We also want to say “thank you” as we say goodbye to faculty members who are retiring. This year Dr. Vincent Cronin, Dr. Steve Driese, and Dr. Don Greene will teach their last scheduled classes at Baylor. Thank you, Don, Steve, and Vince. We will miss your presence and your many contributions to the department. We will think of you as we take on the challenge of finding new faculty members who can follow you and contribute to the advancement of Baylor Geosciences in their own unique ways.



**AS I BEGIN SERVING THE DEPARTMENT, I THOUGHT IT MIGHT BE PRUDENT TO DO TWO THINGS.**

**F**irst, I want to thank our staff for their excellent work and dedication. As a faculty member you appreciate the staff but as a chairman you depend on the staff. Paulette Penney, affectionately known as “Queen Bee”, leads our staff and is responsible for much of our success as a department. Thank you, staff. Second, I’d like to look at our departmental history and some of the previous Chairs.

The geosciences at Baylor have a long and storied history that started with a remarkable woman, **Dr. Lula Pace**. She served as Chair of the Botany and Geology Department from 1907 to 1925. Dr. Pace was the only woman instructor in the university sciences at the time and the first female professor at the university to hold a PhD. She was elected as a fellow of the AAAS in 1912 and was known for taking her students to the field in Central Texas, the Rocky Mountains, and Yellowstone National Park. Much of the field emphasis that characterizes Baylor Geosciences can be traced to Dr. Lula Pace. I am grateful to Dr. Pace’s dedication to the geosciences and will strive to continue to advance the geosciences at Baylor University with the help of our departmental personnel. After Dr. Pace, Baylor Geosciences went through some trying years. Several departmental chairs had to “hold the fort” during the Great Depression and two world wars. Dr. Dixon became chair during WWII in 1942 and his tenure lasted 36 years. Few people know much about the earliest years of Baylor Geosciences, but most of our alumni would have known **Dr. Jim Dixon**. I came to Baylor as a student in 1970 and my first geology class was taught by Dr. Dixon. I have known all the subsequent chairs and faculty since then. I have been humbled to serve as a Baylor Geoscience faculty member and even more so now, as the chair. We’ve had a great history, and a great future is ahead of us.

We were excited to teach the summer field course “in the field” this year, and we’re grateful to our loyal and generous supporters who helped make it possible for **all** qualified students to participate (see the photos later in the newsletter showing experiences from the summer field course).

Under the excellent leadership of our Graduate Program Director, Dr. Dan Peppe, and complimented by an outstanding faculty, we welcome another great group of graduate students to fill a gap created by this year’s large graduating class. I am proud of our students, who with the help of a supportive faculty, did a remarkable job managing Covid-19 restrictions and unusually harsh winter conditions to finish their degrees.

## BELOW IS A SUMMARY OF A FEW HIGHLIGHTS FROM LAST YEAR:

**Dr. Peter James** co-authored a study identifying tectonic deformation on Venus that was published in the Proceedings of the National Academy of Sciences. The tectonic processes are similar but not identical to those of Earth and provide new insight into our solar system.

**Dr. Dan Peppe**, Graduate Program Director for Geosciences, and **Dr. Steven Driese**, Associate Dean for Research in the graduate school and former chair of Geosciences, were awarded a National Science Foundation grant combining geological and paleoecological research.

**Dr. Bill Hockaday** published an article in Nature Geosciences and was recognized for his contribution to science as an outstanding reviewer of scientific research publications by the American Geophysical Union.

**Dr. Jay Pulliam** was elected a Fellow of the Geological Society of America. An honor and indication of his contributions to geosciences.

**Dr. Kenny Befus** was awarded a prestigious National Science Foundation career grant, received tenure, and was promoted to Associate Professor.

**Dr. Steven Forman** published two articles in Science Advances and was awarded two grants. One of the grants was with the National Park Service in collaboration with Dr. Lindsey Yann of the Waco Mammoth National Monument. Dr. Yann is also a research scientist affiliated with Baylor Geosciences.

Emeritus professor, **Dr. Don Parker**, published an article on the Newberry Volcano of Central Oregon in *LITHOS*. The Newberry Volcano is an unusual Cascade volcano in that it is dominantly basaltic and geochemically bimodal between basalt and silicic rocks.

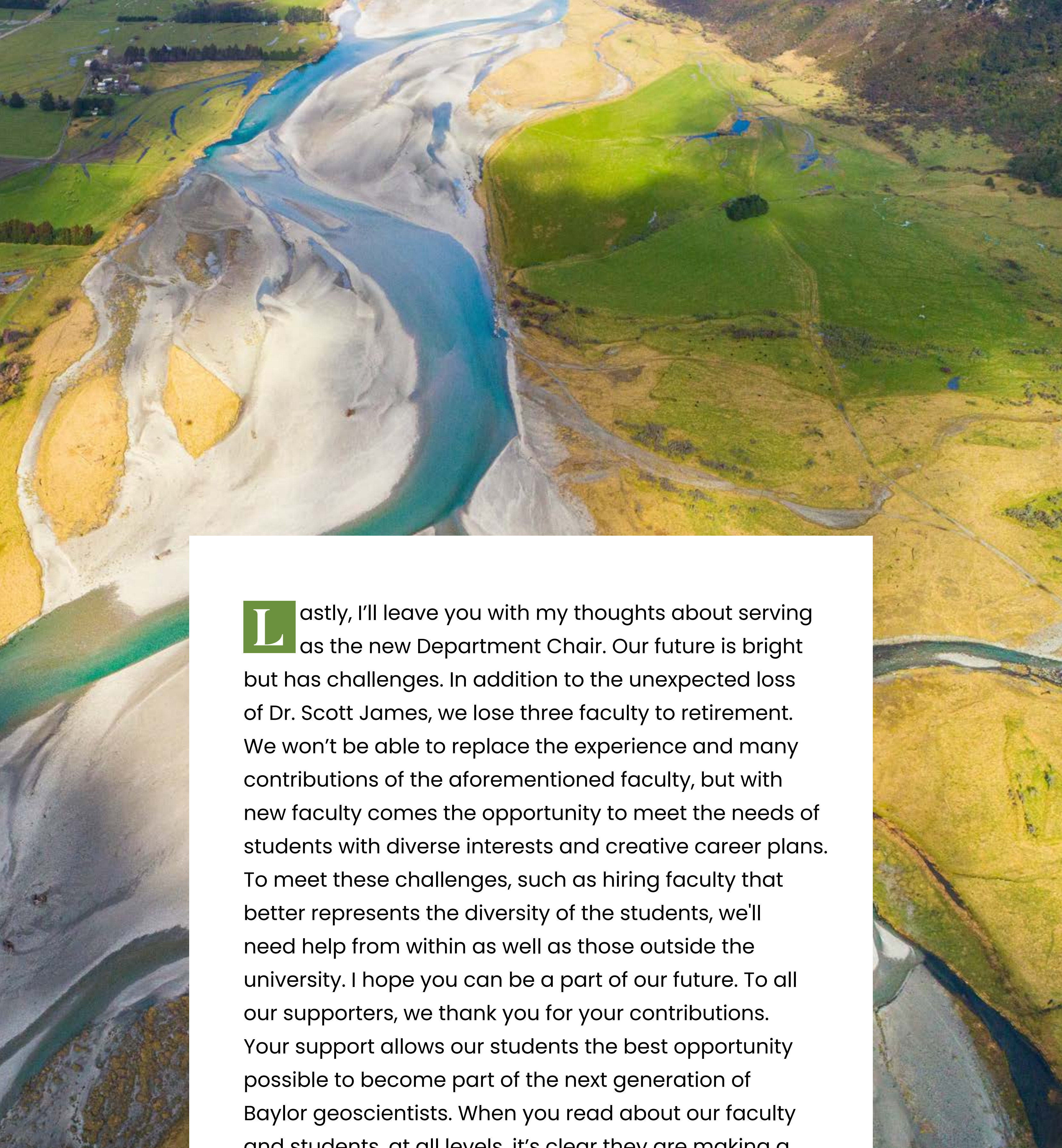
**Rebecca Taormina, PhD candidate**, served on the GSA council as the chair of the Student Advisory Council, was a student representative for the GSA Geoarchaeology Division, and received a teaching Postdoctoral appointment awarded through her advisor, Dean Lee Nordt. However, she also received an offer for an appointment at the National Park University in Hot Springs, Arkansas and is on her way now to educate geoscientists in Arkansas.

We now have five Postdoctoral appointments in the Geosciences Department who are contributing to our research and teaching efforts. The department will also welcome an additional postdoctoral researcher this fall. **Dr. Jon Richey** who will work with Dr. Lee Nordt.

**Claudia Dawson** won the Elan Allen Safety Scholarship for her safety plan working with gravel-pit lakes.

Incoming freshman **Allie North** is the first Science Fellow (science honors program) at Baylor University to major in Geology. **Henry Lima** is an incoming Business Fellow (business honors program) seeking a secondary major in Geophysics. Perhaps these students are a sign of things to come.

Baylor alum and former Baylor professor, **Dr. Robert Font**, produced a YouTube video - *A Brief Introduction to Well Logs and Their Uses* - for the American Institute of Professional Geologists.



**L**astly, I'll leave you with my thoughts about serving as the new Department Chair. Our future is bright but has challenges. In addition to the unexpected loss of Dr. Scott James, we lose three faculty to retirement. We won't be able to replace the experience and many contributions of the aforementioned faculty, but with new faculty comes the opportunity to meet the needs of students with diverse interests and creative career plans. To meet these challenges, such as hiring faculty that better represents the diversity of the students, we'll need help from within as well as those outside the university. I hope you can be a part of our future. To all our supporters, we thank you for your contributions. Your support allows our students the best opportunity possible to become part of the next generation of Baylor geoscientists. When you read about our faculty and students, at all levels, it's clear they are making a difference, and I think they're even more impressive in person. Therefore, "let's get together."

Joe C. Yelderman Jr.,  
Chair

REMEMBERING

## DR. SCOTT JAMES

ASSISTANT PROFESSOR OF GROUNDWATER MODELING



*Dr. Scott C. James arrived at Baylor in 2014 and immediately became an integral part of Geosciences and Mechanical Engineering. In the midst of his multitude of contributions, Scott was taken from us suddenly and unexpectedly. Scott had an incredible work ethic. The passion for his projects and commitment to his students often kept him busy until late in the evening. Scott did not keep late hours to meet an advancement metric. He simply loved his job. It brought him so much joy, that Scott had confessed to a few different colleagues that he loved his job so much he would have done it for free. Scott built a reputation amongst students for his “challenging” assignments, but he was also known as a willing helper whenever students encountered problems. Scott lifted weights and exercised routinely, and he was an impressive, if not intimidating, physical presence. However, he was also one of the most generous and kindest people you could ever meet. Scott wanted the best for his students. He took pride in mentoring them and watching them succeed. He spent just as much time with undergraduates as graduate students, and he was able to witness his students build careers in places like Lockheed, NASA, and Sandia National Laboratory. Perhaps one of the best insights into this friend we all knew as Dr. Scott James can be found in a note taped to his office door after his passing, “R.I.P. Mr. Scott - third shift Housekeeping.” Scott will be remembered by all who knew him, and he will be missed.*

*Dr. Joe, Geosciences Chair  
and Faculty Mentor to Scott James*

OBITUARY

# SCOTT CARLTON JAMES

APRIL 20, 1971 – MAY 2, 2021

Born April 20, 1971 in Pasadena, California – died suddenly May 2, 2021 while visiting family in California. Memorial services and final arrangements, handled by Dignity Memorial of Oceanside, California.

Scott is survived by grieving parents, Christina and Dal Williams, Ed and Tong James, brothers Monty, Michael, and Joe and sisters, Samantha, Brittany and Alyssa and love relation, Angie, as well as a host of other relatives, friends, and colleagues that deserve recognition, but the list would be too long to serve the purpose of this notice.

Suffice it to say, Scott's untimely passing has shocked and saddened so many. The grief is a shared experience locally, nationally, and internationally. He was a source of great pride. He was respectful of others. He was respected, admired, and loved. He had a friendly unpretentious manner. He inspired others along the way. He was a role model. He approached life with zest, with wonder, with accomplishment and with joy. What an awesome human being.

Scott was an Associate Professor at Baylor University in the Department of Geosciences and Mechanical Engineering. He joined the faculty in 2014 and was tenured August 2020. Scott received his bachelor's degree in Engineering Science and his master's degree in Mechanical Engineering from the University of California San Diego. He earned his PhD in Civil and Environmental Engineering from the University of California Irvine.

Dr. Scott James was a sought after and valued researcher and scholar in both private industry and at several US national laboratories before he took on a position at Baylor. He thrived professionally because of his research and was delightfully fulfilled as a teacher and mentor of undergraduates, graduates and postgraduates.

Many of Scott's students and PhD recipients have gone on to continue his work in search of environmental solutions to climate change scenarios and alternate energy sources.

While at Sandia National Laboratories, Scott worked on the Waste Isolation Pilot Plant, the only operating transuranic nuclear waste repository in the world for high-level nuclear waste storage. His more recent work focused on Artificial Intelligence (AI) solutions to solve large scale environmental evolutionary problems. Aside from his academic pursuits and accomplishments, Scott was passionate about physical development and fitness. He was a rare combination of athlete and scholar. He also possessed a magnetic personality and a refined unpretentious unassuming (down-to-earth) set of relationship skills. He loved life, liberty, and the people with whom he interacted – and they loved him. His untimely departure is our loss. His life is a 'cherry bowl' of accomplishment and joys. We abhor the departure. We celebrate the life.





Scott Carlton James  
April 20, 1971 - May 2, 2021

“What we have done for ourselves alone dies with us; what we have done for others and the world remains and is immortal.”  
~Albert Pike

Heavenly Father bless Scott and have mercy on his eternal soul; forgive his trespasses; grant him peace for he was a devoted teacher, researcher, athlete, son, brother and friend who loved his fellow man. Bless his departed soul and welcome him into the joy of everlasting brightness in heaven.  
Amen.

“The more I study science, the more I believe in God.”



2021 GEOSCIENCES

# GRADUATES & AWARDS





## DECEMBER 2020 GRADUATES

### BACHELOR OF SCIENCE IN GEOLOGY

GABRIEL L. GARCIA  
ILSE L. MARTINEZ  
MICHAEL MCNAIR  
JAIRON E. MCVEA  
ALMA A. TIPPETTS

### MASTER OF SCIENCE IN GEOLOGY

TEW-TODD, VICTORIA L.  
*Late Quaternary stratigraphy and chronology by thermal-transfer luminescence dating of quartz grains for the Monahans eolian system, Winkler County, Texas*  
MENTOR: DR. STEVE FORMAN

### DOCTOR OF PHILOSOPHY

SEPULVEDA, FRANK  
*Edge Computing with an "Internet of Things" Based Sensor Array: An Innovative Approach to Near Real Time Seismic Exploration and Monitoring*  
MENTOR: DR. JAY PULLIAM

## MAY 2021 GRADUATES

### BACHELOR OF SCIENCE IN GEOLOGY

ASHLEY M. EMERSON

STEPHANIE A. KRILL  
*In-depth well study of the Trinity Aquifer: How pumping, land use, climate, and weather have a combined effect on a deep, confined aquifer in McLennan County, Texas.*  
ADVISOR: DR. JOE YELDERMAN

ZOE S. MIMS

SHANDELL A. THOMAS

### MASTER OF SCIENCE IN GEOLOGY

BARBER, SAMUEL T.  
*Assessing the Magnitude and Frequency of Hydrological Processes and their Effect on Threshold Bedrock Channel Morphology, North Bosque River, Texas*  
MENTOR: DR. PETER ALLEN

## AUGUST 2021 GRADUATES

### BACHELOR OF SCIENCES IN GEOLOGY

VICTORIA D. BENITEZ

TAYLOR L. WATSON  
*Sustainability of groundwater within a confined alluvial terrace.*  
ADVISOR: DR. JOE YELDERMAN

### BACHELOR OF SCIENCE IN GEOPHYSICS

NATASHA BARRINGTON

### BACHELOR OF SCIENCE IN EARTH SCIENCE

ANDREW T. TILTON

### MASTER OF SCIENCE IN GEOLOGY

FRUCCI, MASON  
*Regional Elemental and organic Geochemical Character of the Devonian/Mississippian Exshaw Formation across Alberta, Canada.*  
ADVISORS: DR. JAMES FULTON & DR. STACY ATCHLEY

HOOD, MADISON  
*Hydrocarbon development potential of the Early Jurassic Gordondale member of the Fernie Formation, Alberta, Canada.*  
ADVISOR: DR. STACY ATCHLEY

LUBIANSKI, LAUREN  
*Effluent-Impacted Groundwater-Surface Water Interactions in the Brazos River Alluvium Aquifer: A Study on Bullhide Creek.*  
ADVISOR: DR. JOE YELDERMAN

MALANOSKI, COOPER  
*Phanerozoic trends in the ecological tolerance of Lingula and ecological tolerance extinction selectivity of marine invertebrates through the analysis of environmental affinity.*  
ADVISOR: DR. ELIZABETH PETSIOS

MAYHACK, CONNOR  
*Late Quaternary sedimentary architecture and depositional history of the Monahans Dune Field, Winkler County, TX.*  
ADVISOR: DR. STEVE FORMAN

RUEFER, ANNA  
*Embayments in Explosive, Silicic Eruptions: A Textural, Numerical, and Experimental Assessment.*  
ADVISOR: DR. KENNETH BEFUS

SMITH-SALGADO, CLARA  
*The Springshed and Potential Recharge Areas for the Downtown Salado Spring Complex, Salado, Texas.*  
ADVISOR: DR. JOE YELDERMAN

WEEDEN, TAYLOR  
*Was there a Northern Dust Bowl? Evidence for heightened wind erosion and dust sources during the 1930s in the Northern Great Plains, USA.*  
ADVISOR: DR. STEVE FORMAN

### DOCTOR OF PHILOSOPHY

BASSOO, ROY  
*Guiana Shield diamonds, the sub-cratonic lithosphere, and kimberlite emplacement in the upper crust.*  
ADVISOR: DR. KENNETH BEFUS

WONG, STEPHANIE  
*Developing methodologies for supporting groundwater monitoring, management, and sustainability in Central Texas and Northern Uganda.*  
ADVISOR: DR. JOE YELDERMAN

An aerial photograph of a winding river in a desert landscape. The river is a vibrant greenish-blue, contrasting with the tan and beige tones of the surrounding dry earth. The river meanders through the terrain, creating a series of loops and curves. The background shows a textured, cracked earth surface, typical of an arid environment. The overall scene is captured from a high angle, providing a clear view of the river's path and the surrounding landscape.

## **AWARDS & SCHOLARSHIPS**

### **TAYLOR WATSON**

*Robert T. Hill Award for Academic Excellence in Geology.*

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### **CLAUDIA R. DAWSON**

*Elan Allen Safety scholarship for outstanding safety plans in field work.*

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### **AUGUST DRYER** and **SHANDELL THOMAS**

*Represented the Geosciences Department at the spring College of Arts & Sciences Honors Convocation.*

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**DANIELLE GYGI** received Scholarships to assist with field research work from the Evolving Earth Grant, the Colorado Scientific Society, the Paleontological Society, and the Dallas Paleontological Society Frank Crane Memorial Scholarship.

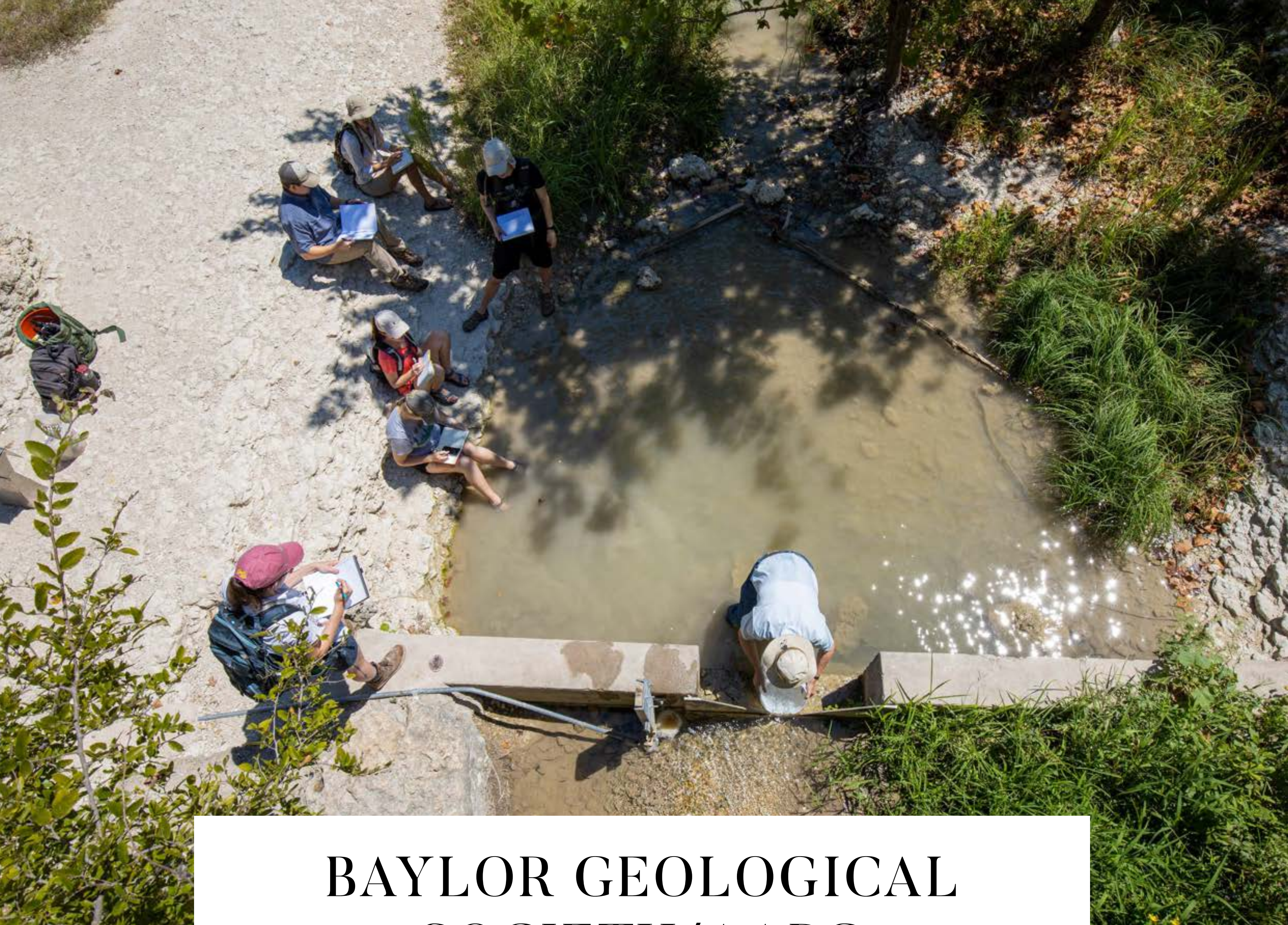
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**STEPHANIE WHITE** received Scholarships to assist with field research work from: East Texas Communities Foundation which includes the East Texas Geological Society and the Natural Gas Society of East Texas.



2021 GEOSCIENCES

# STUDENT GROUPS



## BAYLOR GEOLOGICAL SOCIETY/AAPG

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**THE BAYLOR GEOLOGICAL SOCIETY HELD A FIELD TRIP TO ARKANSAS LAST OCTOBER, LED BY DR. KENNY BEFUS, TO VISIT THE CRATER OF DIAMONDS STATE PARK.**

The field trip included hands-on experiences which allowed students to learn about geologic terrains conducive for diamond formation, as well as gem and mineral mining techniques. Additional stops on the trip provided world-class mineral collecting opportunities including a trip to a quartz mine where students met with the mine owner and learned about the history and dynamics of quartz mining.

In addition to our fall field trip, BGS held its annual executive officer elections this past spring, and we are excited to announce our 2021-2022 executive roster! Stephanie White was elected to the role of President while Ben Sadler was elected as Vice President. Josh Ford was elected as Treasurer, and Marisa Oppedisano and Danielle Gygi were elected as Historian and Secretary, respectively. Anna Lesko was elected as BGS's AAPG Representative, and Victoria Holcomb was elected as our Undergraduate Representative. The Baylor Geological Society is excited for the 2021-2022 academic year, and we look forward to the many occasions it will provide our members to further themselves both as students and individuals.

**Stephanie White**, *BGS President*

An aerial photograph of a rugged coastline. The water is a deep, dark green, transitioning to a lighter, brownish-green near the shore. White foam from waves is visible as they crash against a large, light-colored rock formation. The rocks are covered in patches of bright green moss or algae. The overall scene is dynamic and natural.

2021 GEOSCIENCES

# FACULTY UPDATES

## DR. STACY ATCHLEY

PROFESSOR OF PETROLEUM  
& STRATIGRAPHY

**HELLO FROM BAYLOR UNIVERSITY, HOME TO BAYLOR GEOSCIENCES AND EVERYTHING GREEN AND GOLD. BAYLOR RECENTLY LIFTED THE MASK-MANDATE FOR EVERYONE THAT HAS BEEN COVID-VACCINATED. A SENSE OF NORMALCY IS RETURNING TO CAMPUS, AND WE ARE BREATHING A COLLECTIVE SIGH OF RELIEF.**



**A** “normal” academic year is on the horizon...and all the people said, “amen”! In spite of being hamstrung by COVID restrictions over the past year, the drumbeat of progress has been maintained on both the teaching and research fronts:

**TEACHING** – In response to the necessity of online teaching, I developed a new online version of GEO 1306 (Historical Geology, aka The Earth Through Time) during Summer 2020. The course was unveiled during Fall 2020 and is being offered during the second summer session of 2021. It’s “different” from a normal face-to-face course, but I think still quite thorough and effective. All lectures, quizzes and exams were revised, and the course includes lots of extra credit opportunities. Geo 5343 (Graduate Field Sequence Stratigraphy) was cancelled (due to COVID) during Summer 2020 but ran without a hitch during May 2021.... See the accompanying photos.

**RESEARCH** – The APS (Applied Petroleum Studies) research group is focused on three western Canadian projects:

Devonian Duvernay Formation (PhD students Elisabeth Rau and Bart Yeates and former M.S. students Anna Thorson and Marilyn Wisler), the Devonian/Mississippian Exshaw Formation (M.S. students Mason Frucci and Julia Visy), and the Jurassic Gordondale/Nordegg Member (Madison Hood). The Duvernay study is the most mature, and the first manuscript from this effort (with Anna Thorson as lead author) is currently in review within the Bulletin of the American Association of Petroleum Geologists. At least 1-2 additional manuscripts will likely be submitted by Elisabeth Rau and possibly Bart Yeates before the end of 2021. M.S. theses for the Exshaw and Gordondale projects will almost certainly be completed by the end of 2021, if not earlier, and the listed M.S. student participants should be graduating. Dr. Jamie Fulton and I anticipate that a journal article will be forthcoming from the Exshaw study, and Advantage Energy of Calgary, Alberta is providing funding that will expand the Gordondale project into the dissertation project of incoming PhD student Tyler



Dowdy. In addition to the Canadian projects, first year PhD student Stephanie White is being co-advised by myself and Dr. Elizabeth Petsios on a detailed environmental and ecosystem reconstruction of late Paleozoic shelf carbonate deposits of the Paradox Basin, Utah.

**PERSONAL** – Janelle continues her work as the Department of Geosciences Budget Coordinator, and our daughters Dallas and Audra both reside in Waco and are continuing their studies. Dallas is pursuing an online applied anthropology Master’s degree through the University of North Texas, and Audra is a first year student in Baylor’s Law School. Best wishes to you all.



*2021 Geo 5343 “Advanced Field Sequence Stratigraphy” students hiking along Honaker Trail within the San Juan River Canyon of southeastern Utah.*



*PhD student Stephanie White and advisor Stacy Atchley describing the Late Pennsylvanian section exposed along Honaker Trail, Utah.*



*APS students Elisabeth Rau (PhD), Madison Hood (MS) and Julia Visy (MS) at “Horn Point”, San Juan River Canyon, Honaker Trail, Utah.*



*Geo 5343 class photo at Grand View Point, Canyonlands National Park, Utah. From left to right, Danielle Gygi, Julia Visy, Nicole Price, Cooper Malanoski, Madison Hood, Stephanie White, Josh Ford, Stacy Atchley, Nick Wagner, Anna Lesko*



*Geo 5343 students working on Jurassic Navajo Sandstone project at Aztec Butte, Canyonlands National Park, Utah. From left to right students include Danielle Gygi, Josh Ford, Nick Wagner, Cooper Malanoski, Anna Lesko, Julia Visy, Stephanie White, Nicole Price.*



*Josh Ford, Cooper Malanoski and Madison Hood at the Triassic-Jurassic boundary exposed at our Buckhorn Wash campsite, San Rafael Swell, central Utah. The massive cliff face in the background is the Jurassic Wingate Sandstone.*



*Stacy Atchley and Danielle Gygi inspecting an outcrop of the Jurassic Wingate Sandstone within Buckhorn Wash, San Rafael Swell, central Utah.*



*Anna Lesko and Julia Visy describing an outcrop of the Jurassic Wingate Sandstone within Buckhorn Wash, San Rafael Swell, central Utah.*



*Geo 5343 students measuring outcrop exposures of the Desert Member of the Blackhawk Formation, Thompson Canyon, Utah. From left to right students include Josh Ford, Cooper Malanoski, Stephanie White, Julia Visy, and Nick Wagner*



*Geo 5343 class photo at Thompson Canyon, Utah. First row (left to right): Cooper Malanoski, Nicole Price, Madison Hood. Second row (left to right): Stacy Atchley (instructor), Stephanie White, Julia Visy, Josh Ford, Nick Wagner, Danielle Gygi, Ana Lesko, Elisabeth Rau (T.A.).*



*Nick Wagner, Cooper Malanoski and Madison Hood providing an assignment presentation at our campsite located at Buckhorn Wash, San Rafael Swell, central Utah.*



*Stacy Atchley and Geo 5343 TA Elisabeth Rau at Thomson Canyon, Utah.*

## DR. KENNY BEFUS

ASSOCIATE PROFESSOR OF  
MINERALOGY & PETROLOGY

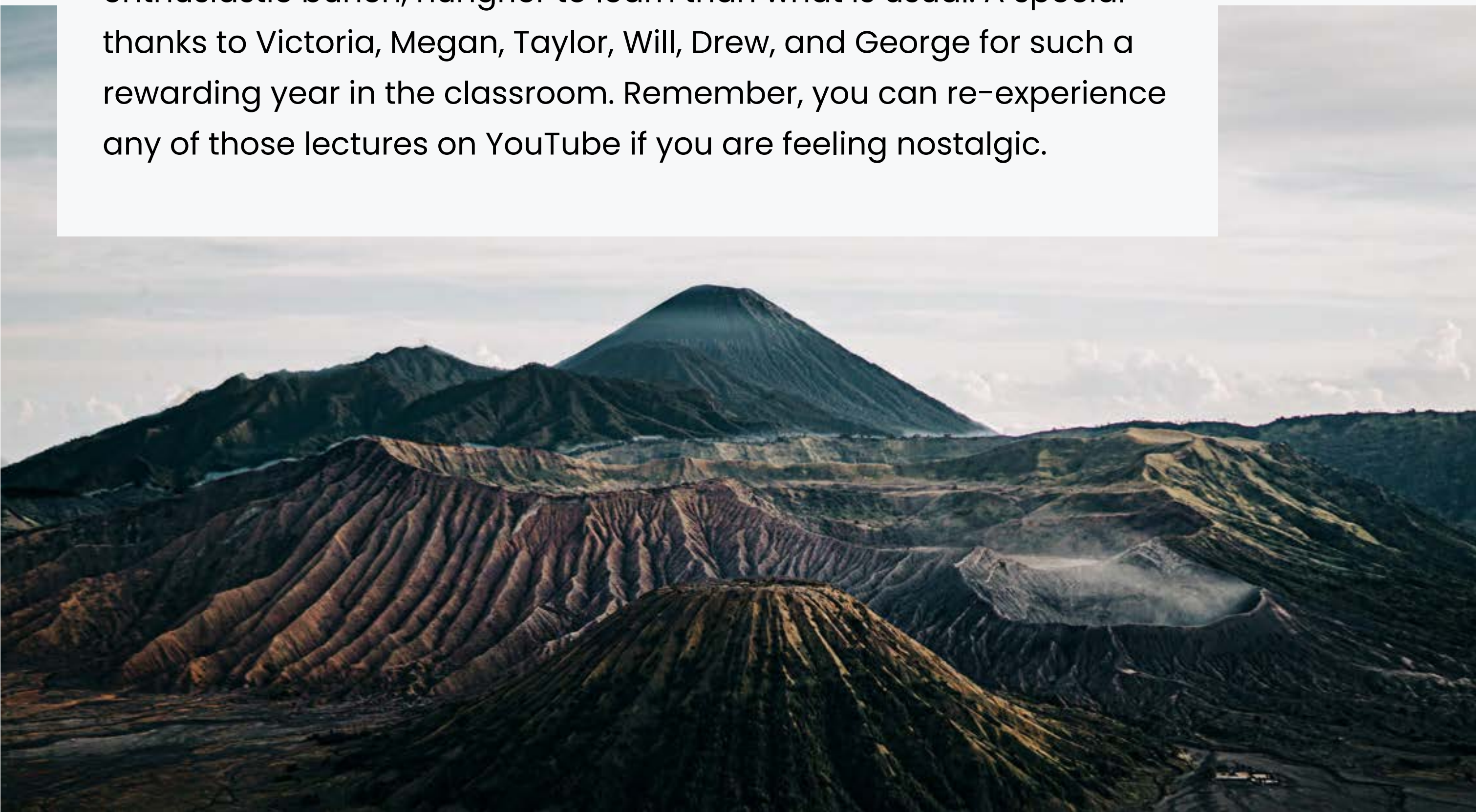
**WE SHOULD DWELL ON THE HIGHLIGHTS OF LAST YEAR. THE ADVENTURES. THE SUCCESSES. MY STUDENTS AND I HAVE SHARED MANY OF THOSE THIS PAST YEAR.**



**M**y graduate students Anna Ruefer and Roy Bassoo were in the final year of their degrees. That means they were incredibly productive and valuable members, knowing how to complete research tasks and write papers. Anna is headed off to Stanford in the Fall 2021 to pursue her PhD in volcanology. Roy landed a prestigious postdoc with the Gemological Society of America, and he will be starting there in September 2021.

I welcomed 2 postdoctoral researchers to my group this year. James Thompson joins us from Pitt. He is a remote sensing volcanologist who is very skilled with drones. James and I will be working on the use of thermal imagery to understand volcanic eruptions. Chelsea Allison joined us from Arizona State/Cornell in the Spring of 2021. Chelsea is a petrologist that cares about magmatic triggers for volcanic eruptions. Chelsea and I will tackle some complicated experiments that explore how fast magma rises conduits during eruptions.

I got to teach the same bunch of undergrads for both Mineralogy and Igneous and Metamorphic Petrology. They were a really fun and enthusiastic bunch, hungrier to learn than what is usual. A special thanks to Victoria, Megan, Taylor, Will, Drew, and George for such a rewarding year in the classroom. Remember, you can re-experience any of those lectures on YouTube if you are feeling nostalgic.





*Lauren Lubianski and Kenny Befus pan for gold unsuccessfully.*



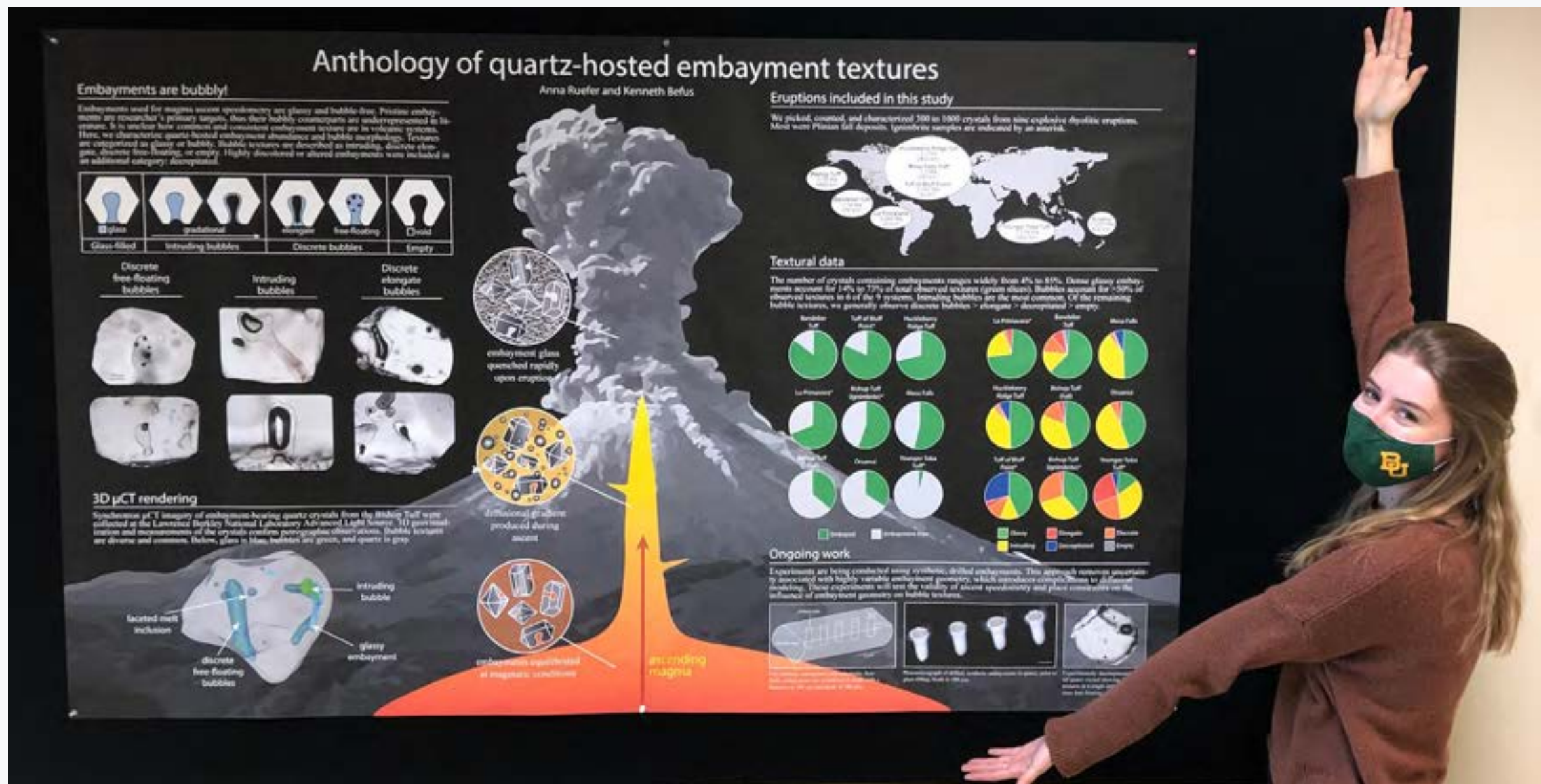
*Anna Ruefer, Lauren Lubianski, Madison Hood, and Bart Yeates adventure through a limestone landscape with Dr. B.*

STAGED BY BAYLOR FOR A BILLBOARD PHOTOSHOOT.

*Petrology 2021 posing on the top of Enchanted Rock on our annual field trip to the Llano Uplift.*



*MS student Anna Ruefer displays her research poster for AGU Fall 2020.*



*Nose down, we examine crystal textures in Yosemite's granodiorite under the watchful gaze of Half Dome in the distance.*

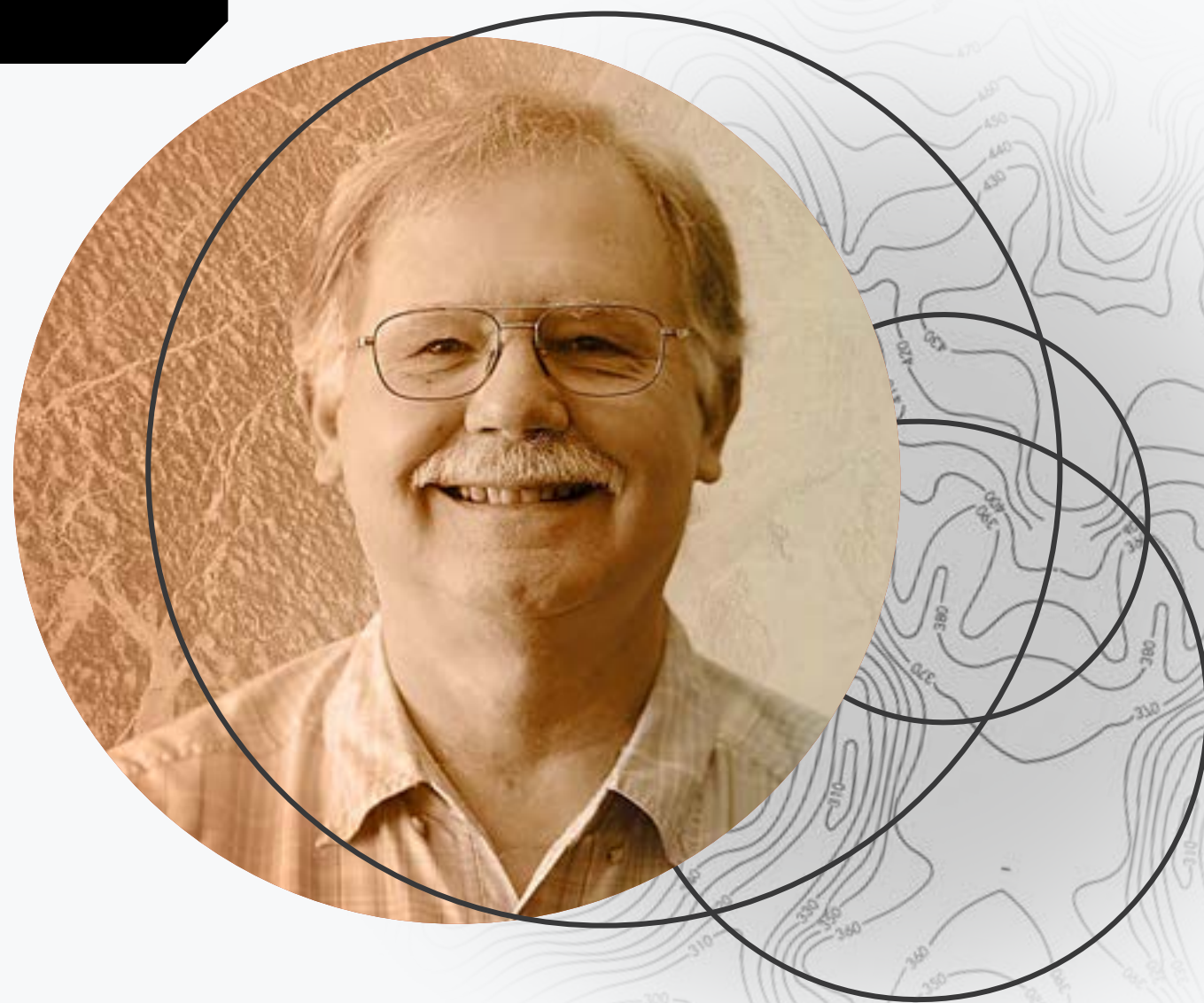


*James Thompson and Chelsea Allison, front and center, joined Baylor as new postdocs, and joined Anna and I in a field venture to the Sierra Nevada in eastern California.*



**DR. VINCE CRONIN**PROFESSOR OF STRUCTURE  
& NEOTECTONICS

**MY FAMILY MOVED ALL OUR BELONGINGS (INCLUDING 96 BANKER-BOXES OF ROCK AND MINERAL SPECIMENS) FROM MILWAUKEE, WISCONSIN, TO BAYLOR DURING THE SPRING AND SUMMER OF 2002.**



**I** had taught, advised graduate students, and conducted research at the University of Wisconsin for fourteen years, covering courses in engineering geology, structural geology, and tectonics along with introductory physical geology. We moved south for me to be professorial at Baylor and for our family to be closer to Cindy's clan.

During my first year as an assistant professor in Milwaukee, the senior faculty member in my department had a heart attack and died one morning along the short path between the parking lot and his office. I have lost a number of mentors, colleagues, friends, and family members over the intervening years. Both of my brothers passed away too young, before my parents passed, and I have yet to find the words to describe the loss. Now, in my last year as a professor at Baylor, my friend and colleague Scott James passed away suddenly at just 50 years of age.

Every day is a gift, and every person you encounter provides you with opportunities to learn and to be kind -- opportunities for kinship. "Sooner or later, we all discover that kindness is the only strength there is," says Father Greg Boyle, founder of Homeboy Industries. I knew Scott to be a good, honest, and kind person who was generous in sharing his knowledge. His presence will certainly be missed. An appropriate way to honor Scott's memory is to follow his example. Be good, honest, kind, and generous with your hard-earned stores of knowledge, sharing abundantly in kinship with others.

**I will teach my last classroom courses for Baylor in the fall semester of 2021**, and my final graduate advisee, Kate Hobart, will graduate in December if not sooner. She recently earned a passing grade on the ASBOG exam and is all set to pursue a career in engineering/environmental geology. Her MS thesis research has advanced our knowledge of the active Dog Valley fault in the northern Walker Lane, north of Lake Tahoe in California. It is a remarkable achievement to complete a successful research project during a global pandemic that imposed significant constraints on virtually all aspects of her work.



My dad used to say that on the Friday afternoon that he retired; he went from being the CEO in charge of a \$13 billion investment portfolio to being the assistant dishwasher in our kitchen. My transition to retirement will be considerably easier, I think. Aside from leaving behind my classroom teaching and direction of student research, my routine will be largely unchanged. I will continue to have my book-authorship projects, my geoethics work, and my exploratory studies of seismogenic faults that I need to summarize for publication. Relieved of the time commitments to teaching classes and labs at Baylor, I will be able to do fieldwork and take more field photos to use in the AGI/ NAGT Laboratory Manual without having to squeeze-in quick trips during academic breaks.

It has been my joy and privilege to work with college students to help them learn about science and the Earth. ...And, at least to a small extent, to help them develop as good persons. I will miss those frequent interactions.

I plan to continue teaching through workshops, lectures, and the creation of educational videos for the foreseeable future. I was invited to join an international group of geoscientists to help teach a short course on geoethics at the European Geosciences Union virtual meeting in March. Dave Mogk presented "[Responsible conduct of research and professionalism](#)", and I talked about "[Geoethics in natural hazards from the perspective of an engineering geologist](#)". These and all the rest of the geoethics presentations from this short course are available via the International Association for the Promotion of [Geoethics website](#).



**O**ur new house in Tyler is finally under construction and should be finished in the late spring or early summer of 2022. Last April, seven 350-foot-deep vertical wells were drilled in a grid pattern on 20-foot spacings in the back yard of our lot. As each was completed, a loop of 1" HDPE tubing was lowered to the bottom of the well and grouted in place. After the entire well field was established, the seven loops were linked together to form a continuous sealed geothermal network. Water will circulate through the interconnected well loops, moved by an electric pump in the geothermal HVAC system. The result will be that heat will be transferred between the house and the uppermost layer of Earth. [This geothermal heat pump](#) will heat and cool our house as well as provide all the hot water we will need. In the fall of 2022, several months after we occupy the new house, we plan to install solar panels on a south-facing roof so that much of the electrical power, heating, and cooling in our house will be accomplished using sustainable energy from the Sun and Earth.

Cindy and I will be sorting and packing hundreds of boxes of books, specimens, files, and computer paraphernalia (along with all our household stuff) and moving it all from Waco to Tyler throughout the coming year. Tyler is Cindy's hometown, where her mom, siblings, and various other family members still live. It will be a good place for our descendants and friends to visit, and a base from which we will travel to see the world beyond Texas. Friends and former students are welcome to check-in on us via our website [CroninProjects.org](http://CroninProjects.org) and email Cindy\_Cronin or Vince\_Cronin @ CroninProjects.org, and Vince\_Cronin@baylor.edu.



*The geothermal wells were drilled using the same sort of rig used for water wells. Forms for the concrete foundation of the house are in the background.*



*A loop of 1" HDPE tubing filled with water is lowered into one of the geothermal wells using the rig cable.*



*The ends of a well loop are thermally welded to the connecting pipes to form a circuit with the other 6 well loops and with the geothermal system in the house.*



*Connections in the 7-well field are made along a U-shaped trench, so that all of the plastic piping will be 4 feet below the finished ground surface. Two plastic pipes will connect the well circuit with the house just beyond the camera tripod, at the far end of the trench in front of the concrete foundation.*

## DR. STEVE DRIESE

PROFESSOR OF PALEOPEDOLOGY  
& SEDIMENTOLOGY

**I FEEL THAT WE BAYLOR UNIVERSITY FACULTY, STUDENTS, AND STAFF ARE NOW MUCH STRONGER, HAVING SURVIVED MORE THAN A YEAR OF EXTREMELY CHALLENGING CONDITIONS DUE TO THE COVID-19 PANDEMIC.**



**F**or many of us (myself included), with no prior online teaching experience, the mandate to offer all on-line instruction during the last half of spring 2020 and during summer 2020, made us all “seasoned veterans” at online instruction (well, sort of). Nevertheless, in the fall semester of 2020, I was very grateful to teach two sections, face-to-face, of the graduate GEO 5V90 “Seminar in Grant Proposal-Writing” with my colleague Bill Hockaday, which included 15 graduate students from the Biology, Environmental Science, Geosciences, and Public Health Departments. And I am happy to report that after continuously teaching this course yearly as 5V90 since 2006, it now has a “real” graduate course number, GEO 5222! In the spring semester of 2021, I taught GEO 5340 Paleopedology to 4 graduate students, which was also a face-to-face course, and we were approved by Baylor to attend a field trip to Lake Brownwood Spillway; incidentally, this was my first field trip in over a year. During the fall semester of 2021 I will be teaching GEO 5222, which will be my last course taught at Baylor – yes, you read that correctly, after 40 years in academia (22 years at the University of Tennessee and 18 years at Baylor) I am retiring in May of 2022 and moving back to Knoxville, TN to be near family.

I continued serving as the Interim Chair of Geosciences, but my 2-year term ended in May of 2021, and an internal search was conducted for my replacement, who will be Dr. Joe Yelderman – I wish him well as he accepts this new challenge and will do all that I can to help him make the transition. During the summer and fall of 2021 I will continue with my part-time appointment as Associate Dean for Research in the Graduate School, overseeing the start of another cycle of 3 Department-per year external evaluations of Baylor Ph.D. programs, as well as the launch of GBL 5201, a course focused on improving English language (ESL) skills for International Teaching Assistants (ITAs). Dr. Sara Dolan from the Department of Psychology & Neuroscience will be my replacement and we will overlap in the fall semester before I step down.

**T**his past year I continued to focus on helping my last two doctoral students progress towards completion of their Ph.D. dissertations. Yohan Letourmy continues his Ph.D. research at Joggins, Nova Scotia, on the stratigraphy and paleopedology of 1,000 m of Carboniferous fluvial and paleosol-bearing rocks, and he has one paper published in the *Journal of Sedimentary Research* and hopes to submit a second paper soon, and finish in the fall of 2021. My last Ph.D. student, Sarah Kogler, arrived in 2018 and after a field season with me in 2019 we had to take a COVID-19 hiatus; however, in the summer of 2021, she resumes conducting her research on the effects of rising sea-level on Gulf Coast soils at Aransas National Wildlife Refuge, near Rockport, TX. She will also apply results of studies of these modern Texas soil analog systems to interpreting Upper Mississippian Pennington Formation paleosols, which crop out in eastern Tennessee and were “drowned” by repeated episodes of rising sea-level.

A field trip (with Stacy Atchley and Steve Dworkin) to Petrified Forest National Park in northern Arizona, initially scheduled for April of 2020 and then rescheduled to April of 2021, would have been held in conjunction with an international meeting (combining SEPM and the IAS and that was to have been convened in Flagstaff, AZ); unfortunately, it was again cancelled due to the COVID-19 pandemic and restrictions on international travel. My completed invited chapter for an AGU 100<sup>th</sup> Centennial Book Volume on Weathering and the History of Soils (with Lee Nordt and Gary Stinchcomb as co-authors) finally came out in 2021. My own research continues to focus on interdisciplinary paleoclimate and paleolandscape reconstructions using fossil soils, or paleosols, as well as conducting studies of modern soil systems (especially Vertisols) to develop climate proxies and analogs of ancient soils.



During the summer of 2020 (and in 2021), Marylaine and I traveled to Knoxville, TN, which is our retirement destination where we own a second home. We vacationed with our children Mary Catherine, Nathan and Trevor, and daughter-in-law Lindsay, in coastal South Carolina for five days in 2020, but did no other travel due to COVID. The beaches and scenery were beautiful, and we hope to do much more travel once restrictions are lifted. On the Waco home front, after Marylaine's retirement in March of 2020 from McLennan Community College, she is enjoying her time to do other things. We will be selling our condominium in downtown Waco in December of 2021. Mary Catherine continues in the Ph.D. program at Arizona State University, majoring in medical anthropology but living in Antigua, Guatemala, and is about to defend her dissertation this summer. Our oldest son Nathan Cox has announced his engagement to Quynh Lam, a graduate student in Art and a Fulbright scholar from Vietnam, who has been attending the University of Tennessee for the past several years. Finally, Trevor and Lindsay had our first two grandchildren, twins Ryan and Madeline, born in Knoxville on November 19, 2019, and Marylaine and I are greatly enjoying grandparenting with our first attempt at keeping them overnight at our house this summer.



## DR. STEVE DWORKIN

PROFESSOR OF GEOCHEMISTRY  
& SEDIMENTARY PETROLOGY

**IT WAS WONDERFUL TO BE BACK IN THE FIELD TO TEACH FIELD CAMP THIS SUMMER. WE HAD A GREAT GROUP OF STUDENTS AND THEY HAD TO ENDURE SOME REALLY COLD CAMPING WEATHER.**



**O**ne night in the Spring Mountains, it got so cold that a big icicle formed on the open drain plug of the cooler. Everyone toughened up quickly and we had a good summer of mapping and measuring section. Back on campus things are slowly returning to normal. I taught my introductory classes face-to-face this past year and all the students politely protected me by always wearing face masks. Getting vaccinated was one of the best days that I had all year, and I am proud to be part of the public health movement to keep everyone safe and healthy.

I continue to carry out my duties as Undergraduate Program Director and we are currently reevaluating the curriculum for our undergraduate majors. We are considering adding a new major in Biogeosciences, adding tracts to the existing Geology major, and beefing up our offerings on geochemistry for the undergraduates. We have been struggling with keeping the numbers of our majors up and perhaps the recent uptick in oil prices will help.





**M**y Master's student, Nicole Price, is using quantitative X-ray diffraction to characterize paleosol mineral assemblages in paleosols within the San Juan basin. Her research involves reconstruction of environmental conditions right after the K/Pg boundary and she should finish up with her project in the Fall semester. My Ph.D. student, Anna Lesko, is just getting started on her research. Anna is working on paleosols in the Big Bend region, and she just finished writing up her first abstract for a GSA presentation. Stacy Atchley, Anna, and I had planned on doing field work in Big Bend last December but we had to cancel because of Baylor's Covid travel policy. I'm looking forward to getting out in the field with Anna next semester.

Sandy and I are doing well as we continue to creep into our golden years. We missed going to Colorado last summer because of the pandemic but we are really enjoying being back in Pagosa Springs for the summer. As always, we have lots of cats and dogs to keep us occupied and there never seems to be an end to house updates and repairs.



*Steve and Sandy hiking in the San Juan mountains.*



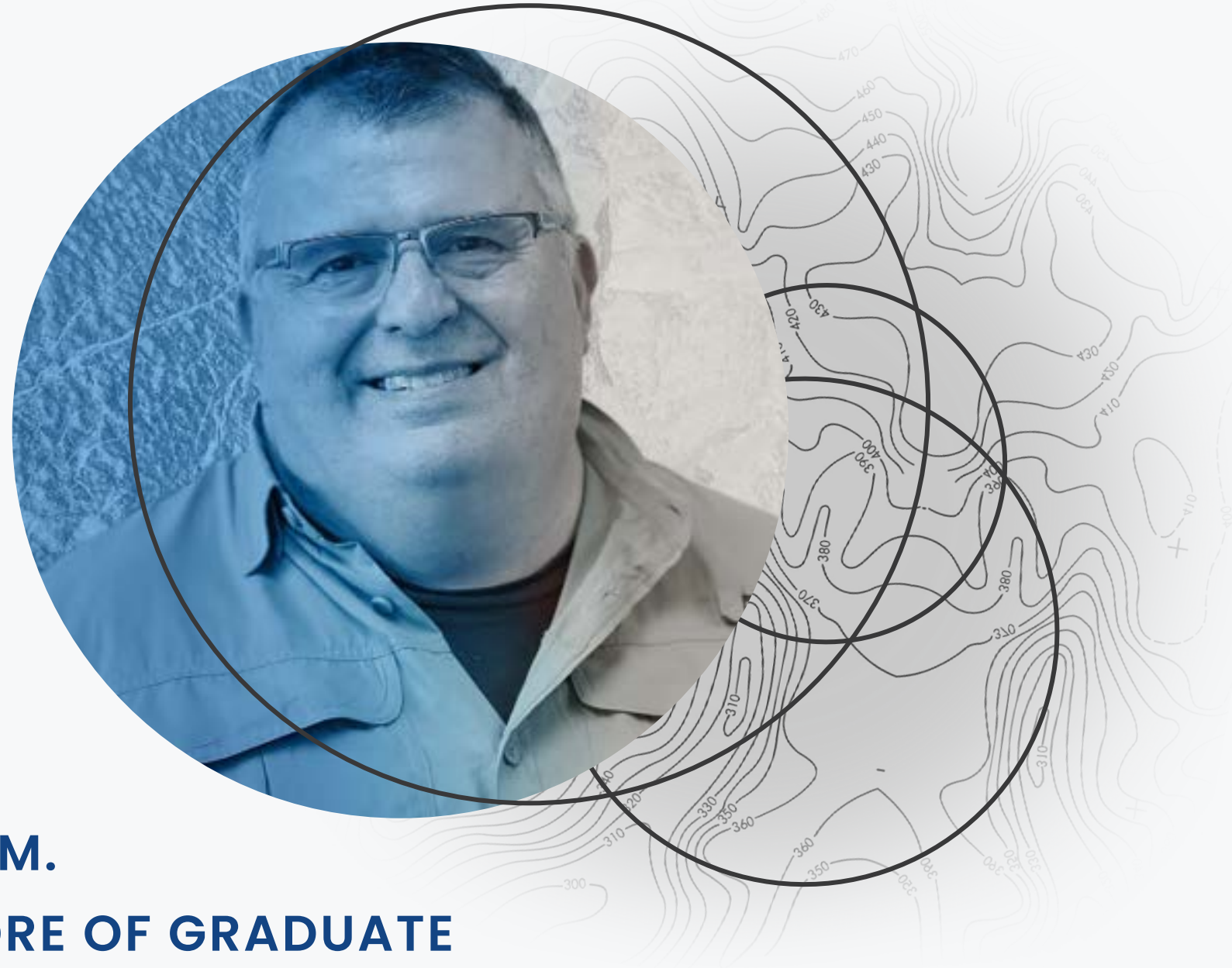
*Will Brewer (teaching assistant) and Lyndsay DiPietro (co-instructor) taking a tourist moment during field camp.*

## DR. STEVE FORMAN

PROFESSOR OF PALEOCLIMATE  
& GEOHYDROLOGY TECTONICS

### STUDENT RESEARCH AND ACCOMPLISHMENT


THE COVID YEAR HAS BEEN A CHALLENGING TIME FOR STUDENTS WHICH THRIVE ON ONE-ON-ONE AND RESEARCH GROUP INTERACTIONS TO MAKE THE MOST OF THEIR RESEARCH PROJECTS FOR THE FEW YEARS IN THE PROGRAM. DESPITES THESE CHALLENGES A CADRE OF GRADUATE STUDENTS HAVE SUCCESSFULLY DEFENDED THEIR THESIS OR MOVED FORWARD WITH PHD STUDIES.



**T**ori Tew-Todd confidently defended her thesis in October 2020 on the use and resultant optical-luminescence chronology for Geoprobe-obtained sediment cores from the Monahans dune field. She advanced a relatively new dating approach that taps deeply stored signals in quartz grains to resolve a chronology of eolian deposition stretching back 500,000 years, possibly back to one million years! We are currently working on a manuscript for publication which provides new insights on paleoclimate significance of the Blackwater Draw Formation in west Texas. Tori has landed on her feet with acceptance into the Univ. of Texas-Austin PhD program to work with Prof. Tim Shanahan on biogeochemistry/paleoclimatology of lake records from the northern Andes. We are very proud of Tori who we have mentored through BSc and MSc degrees at Baylor. She is ready to prosper in the PhD program in the Jackson School at UT.



*Steve Forman and Tori-Tew Todd at the Atlas sand mine, Monahans dune field, TX*



**T**aylor Weeden, a MSc student, faced significant challenges to move forward on her MSc research, which she surmounted nicely. A primary data source for Taylor's MSc research was the National Archives near Washington, D.C., a source of 1930s aerial imagery for GIS analyses to address the question if there was 1930's dust bowl in the Northern Great Plains, was shuttered for the pandemic. To Taylor's credit she found another source of imagery with the state of South Dakota and a treasure-trove of unreported meteorological data from county-based weather stations during the 1930s deep within the state archives. Prof. Mark Sweeney, our collaborator at the Univ. of South Dakota, helped substantially by a field excursion to the dusty counties in the 1930s with his Pi-SWRL technology to measure the dust potential of land surfaces. Taylor showed that there were many times (40-70 days/year) of highly severe dust storms in dis-synchrony with the southern Dust Bowl, linked to extraordinary wind speeds of 40 to 60 mph, recording breaking summer temperatures, and the lowest precipitation on record. This full expression of extreme climate variability in the Dakotas is forecasted for greenhouse-gas enhanced climate in the mid-21<sup>st</sup> century. Taylor successfully defended her thesis in May 2021 and is moving out west to an idyllic small town on the eastern slope of the Cascade Range, to teach or lend her talents for environmental geosciences. It went too fast Taylor, and you are missed!

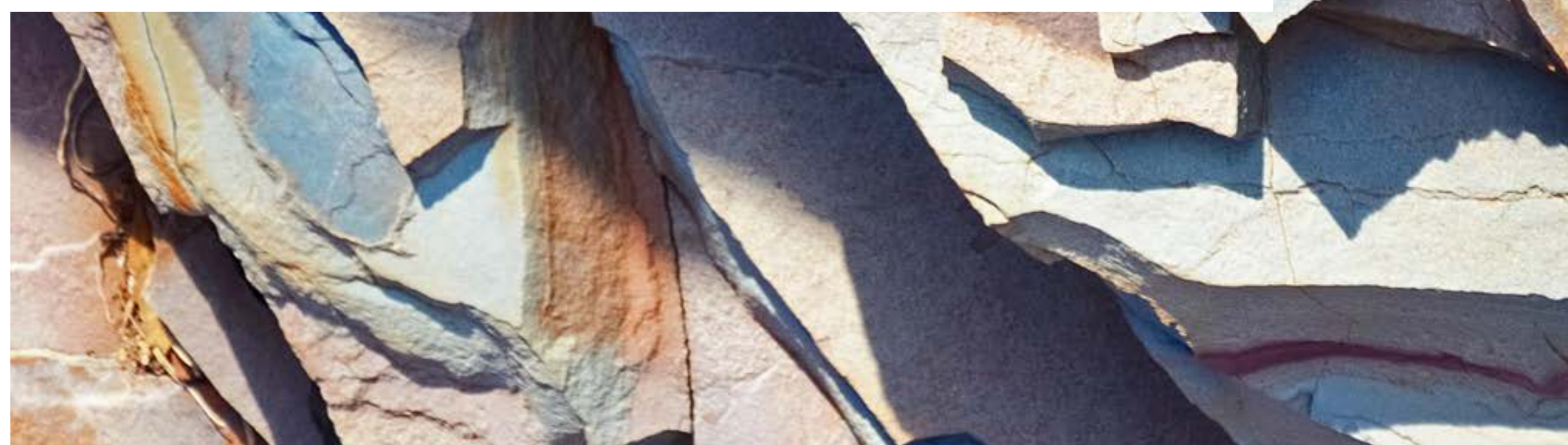
**C**onnor Mayhack has moved steadily through his MSc research to compile the better half of a PhD, which was successfully defended in May 2021. He has assembled the stratigraphic, lithologic, and chronologic record of eighteen Geoprobe cores spanning the past half-million years for the Monahans dune field. He identified at least nine eolian depositional events often separated by well-developed paleosols. Luminescence dating suggests heightened eolian deposition during transitional periods e.g., from interglacial to glacial conditions, with weakening of the Subtropical Jet Stream. Connor has also refined a subsurface 3D model based on industry borehole data, passive geophysics surveys, and insights gleaned from Geoprobe cores. This model reveals a Pliocene fluvial surface descending toward the Pecos River, with common sink holes from dissolution of deeper Permian strata. These sinks holes and buried fluvial terrace sequences show no expression at the current surface. Connor has taken advantage of many opportunities while at Baylor. He is an adept user of the Geoprobe, he has become the "master and commander" of our new Mastersizer 3000 for particle size analyses, and he is the go-to-person for sediment preparation for OSL dating. In turn, Connor has a skilled pen and a keen critical eye. He is seeking employment with the USGS or the EPA where his multitude of field, lab and intellectual skills can be well used. Connor will be departing by August 2021, he will be missed, and wish him great future success.





*Connor Mayhack and Alix Fournier  
with the Department Geoprobe in  
the Kermit dune field, TX*

**A**lix Fournier, a new PhD student, who arrived from France a bit late in the fall because of COVID restrictions but landed firmly on her feet! Her research interests are in understanding the hydrology of large dune fields, that are common in west Texas and across the SW USA. She is addressing a perplexing paradox; that tall dune fields stretching 50 to 100 m high often exhibit a perched water table with the top of the saturated zone a few meters below the dune surface! This paradox is in full view in the Permian Basin, TX where fracking sand is mined at the top of the Monahans and Kermit dune fields by a water dredge. These mining operations are plagued by too much water within an active dune field! We hypothesize that much of this water may be old (>20,000 yrs old) like the enclosing sand and may date to wetter and cooler periods during glacials or stadials. Dating the ground water may yield new insights. Alex has stepped up with the able assistance of Connor Mayhack and installed the first groundwater monitoring well (that we know of) for a dune field in w. Texas. Also, we have taken Geoprobe cores < 5 m long to better understand the age and origin of the eolian sand above the water table. This is exciting research which addresses genesis of tall dune fields and quantifies an underappreciated water resource within dune fields, in the drying SW USA.





### **NEW EXTERNAL SUPPORT FOR GRADUATE STUDENTS**

We have been fortunate to garner support for three graduate research assistantships from outside sources, who are partners in our research and additional mentors. Atlas Sand LLC in Austin, TX has provided support for the MSc and post-doctoral research for the past three years, with the latest funding for Brady Spears to undertake passive geophysical surveys of the Monahans dune field. The Bureau of Land Management will support Alix Fournier's PhD research to better define anthropogenic versus natural fluvial and eolian sedimentation on lands that straddle the Texas–New Mexico border, overlapping on to the Kermit dune field. Third, Dava Butler, an entering PhD student, will be supported by funds from Waco Mammoth National Monument to pursue research based at the Monument and translate the latest research results to the broader public. Dr. Lindsey Yann, the new site paleontologist, will co-advise Dava and brings new expertise in paleontology, paleoclimatology and environmental isotopic systems, strengthening our research endeavors. We welcome Lindsey!

### **PASSIVE GEOPHYSICS AS A WINDOW INTO THE ARCHITECTURE OF QUATERNARY DUNE FIELDS**

We have been fortunate to develop a collaboration with Prof. Jay Pulliam, who is sharing his expertise on ambient noise seismology to better understand near surface stratigraphic architecture of big dune fields in far west Texas. These surveys focus on identifying the basal contact between the eolian Blackwater Draw Formation and the underlying clayey gravel-rich Pliocene strata. Such surveys will elucidate preexisting topography prior to infilling by eolian sand, signaling the shift to hemispheric aridity post-Miocene. We have hopes that such surveys may be able to trace 1 to 5 m thick lacustrine carbonates or compound paleosols identified through our stratigraphic studies and perhaps the water table. Jay brought out a fresh crew of five geophysics graduate students to tackle the geophysical survey in late April/early May; and John Dunbar came out as well to help with GPR surveys. This is the MSc research of Brady Spears.

### **NEW RESEARCH AVENUES**

We are a bit aeolian/dune crazy; fascinated on what these systems can tell us about atmosphere–land interactions in the past 1 million years. In this year of confinement, we have turned our attention to dune systems on Mars. In collaboration with Prof. Ryan Ewing at Texas A & M University and with the energy and ideas of Tori Tew–Todd we have penned a proposal to develop a geochronometer for dune systems on Mars and other planets. Dunes on Mars are extensive and serve to shield many habitable areas from damaging cosmic and galactic radiation. A new method is needed to quantify the migration rate of interplanetary dunes, which are composed of basaltic minerals like pyroxene, plagioclase, and olivine, unlike earthly counterparts, dominated by quartz. Tori started experiments with olivine eolian grains from Iceland and Hawaii, which has shown a stable signal and encouraging results as a chronometer. The “olivine” frontier beckons us to develop new dating systematics, particularly with sample return from Mars in the next decade.

## **2020-21 PUBLICATIONS**

1. Sun, N., Brandon A. D., Forman, S. L., Waters, M. R., Befus, K. S., 2020. Volcanic Origin for Younger Dryas Geochemical Anomalies ca. 12,900 CAL BP. *Science Advances* 6(31), 10.1126/sciadv.aax8587.
2. Moraetis, D., Scharf, A., Mattern, F., Pavlopoulos, K., Forman, S.L., 2020. Quaternary Thrusting in the Central Oman Mountains—Novel Observations and Causes: Insights from Optically Stimulated Luminescence Dating and Kinematic Fault Analyses. *Geosciences* 10(5), 166–180,
3. Wiest, L. A., Lukens, W. E., Driese, S. G., Peppe, D. J., Forman, S. L., 2020. Landscape evolution across the K/PG boundary in southeastern North Dakota, U.S.A. *Cretaceous Research* 112 (article 104470).
4. Haws, J. A., Benedetti, M. M., Funk, C. L., Bicho, N., Daniels, M. J., Forman, S. L., Minckley, T. A., Denniston, R. F. 2020. Late Pleistocene landscape and settlement dynamics of Portuguese Estremadura. *J. of Field Archaeology* 45(4), 222–248.
5. Bosso, R., Befus, K.S., Liang, P. Forman, S. L., 2021. The paragenesis and provenance of Guyana’s diamonds. *American Mineralogist* 106, 54–68.
6. Thompson, J. C., Wright, D. K., Ivory, S. J., Choi, J-H., Nightingale, S., Mackay, A., Schilt, F. Otarola-Castillo, E., Mercader J., Forman, S. L., Pietsch, T., Cohen, A.S. Arrowsmith, J. R., Welling, M., Jacob Davis, E., Gomani-Chindebvu, E., Malijani, O., Blome, M.W., O’Driscoll, C., Mentzer, S. M., Miller, C. Heo, S., Choi, J., Tembo, J., Mapemba, F., Simengwa, D., 2021. Chronology of early human impacts and ecosystem reorganisation in central Africa. *Science Advances* 7: eabf9776.
7. Ghfarpour, A., Khormali, F., Balsam, W., Forman, S. L., Cheng, L, Song, Y., 2021. The formation of iron oxides and magnetic enhancement mechanisms in northern Iranian loess–paleosol sequences: evidence from diffuse reflectance spectrophotometry and temperature dependence magnetic susceptibility. *Quaternary International* 589, 68–82.
8. Ramirez-Herrera, M.T., Gaidzik, K., Forman, S.L., 2021. Spatial variations of tectonic uplift— a response to subducting plate characteristics in the Guerrero forearc, Mexican Subduction. *Frontiers in the Earth Sciences*, 8.
9. Tuttle, M.P., Dyer-Williams, K., Carter, M.W., Forman, S. L., Tucker, K., Fuentes, Z., Velez, C., Bauer, L. M. 2021. The Liquefaction Record of Past Earthquakes in the Central Virginia Seismic Zone, Eastern United States. *Seismological Research Letters*.

## **2020-2021 RESEARCH GRANTS**

1. Land surface processes, dust sources and particulate fluxes for the 1930s Dust Bowl Drought area, Great Plains. 6/1/2017–5/31/2022. National Science Foundation, \$266,121,
2. Geomorphology, Paleoethnobotany, and Archaeological Survey of Salado Draw Drainage, eastern New Mexico. P.I. S. L. Forman. 7/30/2020 –7/29/2022. SRI/BLM \$62,368.
3. New insights on subsurface architecture of the Atlas Monahans Dune Field, Texas by active and passive source seismology and microgravity surveys. P.I.s S. L. Forman, J. Pulliam and P. James. 5/1/2020–8/30/2022. Atlas Sand/Brigham Minerals \$45,350.

**DR. JAMES FULTON**ASSISTANT PROFESSOR OF  
GEOMICROBIOLOGY

**THE FALL 2020 SEMESTER WAS A NEW EXPERIENCE FOR ALL OF US AT BAYLOR, AND THE STUDENTS, STAFF, AND FACULTY ALL HANDLED “MASKING” AND “SOCIAL DISTANCING” REMARKABLY WELL.**



**T**hese safety requirements affected classroom teaching/learning, field trips, lab work, and even spontaneous discussions in the hallways of the Baylor Sciences Building as we waited to see how the coronavirus would spread. Fortunately, COVID-19 was not rampant on campus, and it seemed like everyone did their part to maintain low infection rates and keep the university running.

**MICROBIAL BIOGEOCHEMISTRY LAB**

There were three graduate students in the Microbial Biogeochemistry lab group for the 2020–2021 academic year. We continued work on lipid biosignatures and isotope geochemistry of rocks from the Devonian/Carboniferous boundary in the Western Canada Sedimentary Basin. Our aim is to connect changing ancient microbial metabolism in response to changing ocean chemistry during the Hangenberg extinction. We also continued work on a project studying environmental and biological controls on lipids, pigments, and stable isotope distributions in desert biological soil crusts. This project helps us understand basic concepts of desert ecology and also provides information on organic biomarker preservation in ancient sediments. We are currently writing manuscripts on these concepts, based on all the new data we have acquired in the lab over the past few years. Dr. Fulton has ongoing collaborations with Drs. Sascha Usenko (Environmental Science) and Stephen Trumble (Biology) to develop methods for analyzing the isotopic composition of amino acids from whale earwax as a proxy for changing ocean biogeochemistry over the 20<sup>th</sup>–21<sup>st</sup> centuries. We recently published a manuscript on changes in bulk carbon and nitrogen isotopes of earwax deposited during the lifespans of whales. These data inform us on whale migration and feeding habits. He is also collaborating with Dr. Thad Scott (Biology) on the impacts on nitrogen fixation by cyanobacteria on biogeochemical cycling in aquatic ecosystems. These studies all contribute to developing better models for biogeochemical cycling in modern and ancient oceans.

## STUDENTS

Sanjukta Dhar is a third year Ph.D. candidate in the Microbial Biogeochemistry research group. She is studying carbon and nitrogen cycling processes in ocean basins during the late Devonian/early Carboniferous. These cycles are critical for understanding how life on earth responds to changes in climate and environmental conditions. Her work demonstrates the large response of the nitrogen cycle to local variability in ocean circulation compared with the more regional or global response of the carbon cycle. Sanjukta has also worked on new high-performance liquid chromatography (HPLC) and LTQ linear ion trap mass spectrometry methods to study porphyrins from Devonian rock samples. Just detecting porphyrins (derived from photosynthetic pigments) in such an old formation is a great accomplishment, and she is now examining variability in chemical structures that relate to the source organisms. Sanjukta is also preparing samples for compound-specific stable isotope analysis by gas chromatography-combustion-isotope ratio mass spectrometry (GC-C-IRMS) in the Stable Isotope Lab.

**C**ongratulations to Mason Frucci, who completed his MS degree requirements, defended his thesis, and is set to graduate in August 2021. His thesis title is “Regional Elemental and Organic Geochemical Character of the Devonian/Mississippian Exshaw Formation across Alberta, Canada.” Mason was co-advised by Dr. Stacy Atchley, and his thesis reported on the chemical characteristics of organic matter using gas chromatography-mass spectrometry to identify biomarker compounds and Rock Eval pyrolysis to describe kerogen with respect to chemical and thermal history. He also reported on the elemental composition of the formation using X-ray fluorescence to assess water column chemistry at the time of deposition. His data and interpretations are useful in evaluating where subsurface conditions are favorable for petroleum production and understanding the diagenetic history of western Canada.

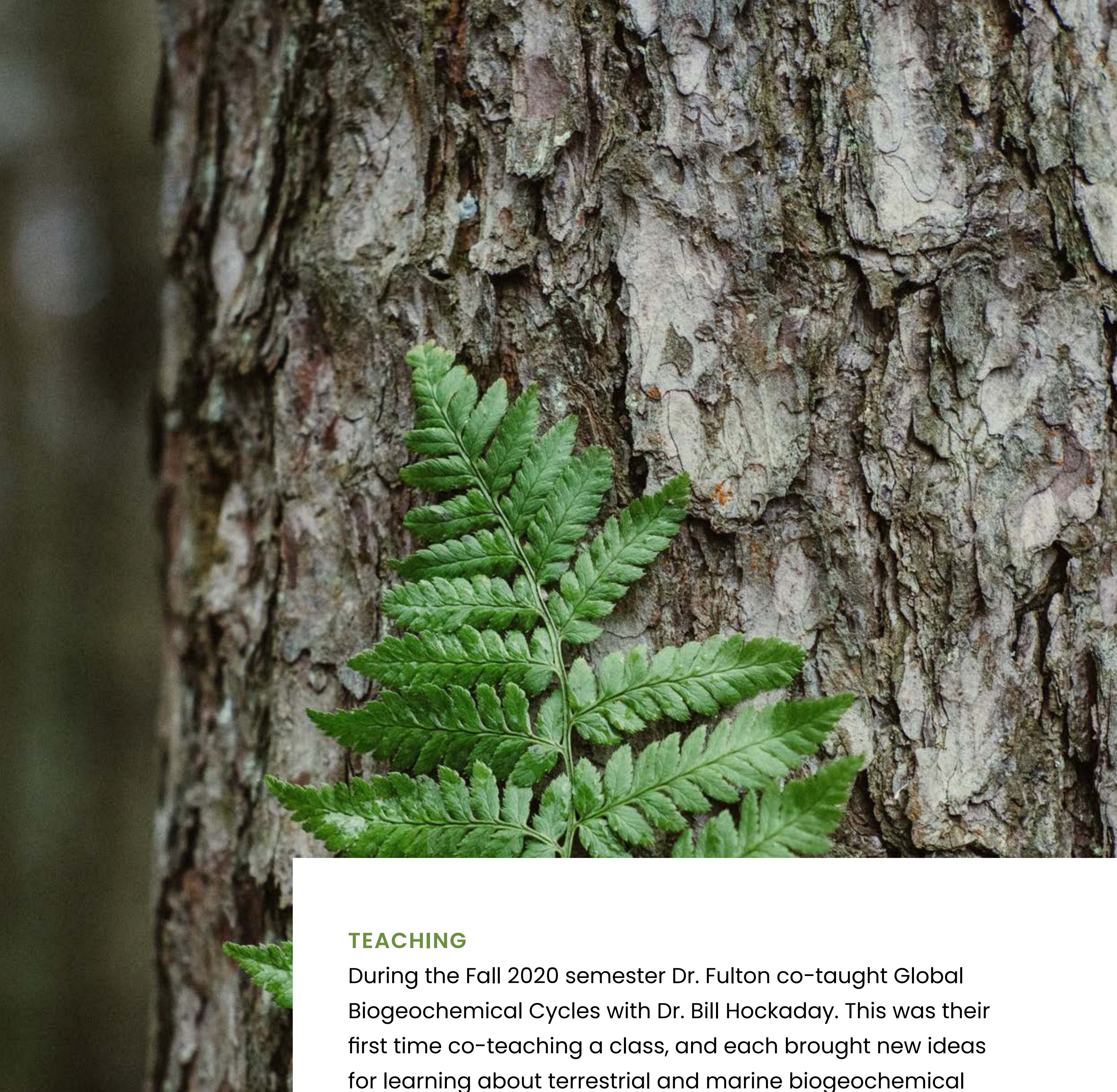
Josh Ford joined the Microbial Biogeochemistry research group in Fall 2020 after completing a master’s degree from Kansas State University. He fit right in with the other students in the lab and contributed greatly to the Global Biogeochemical Cycles class co-taught by Drs. Fulton and Hockaday. Josh’s research interests are in geomicrobiology, specifically biomineralization processes that connect microbial metabolism with the formation of minerals in the environment. He is currently working on sediments from Great Salt Lake, Utah, that have evaporite minerals that might have formed by biomineralization.



*Graduate student Danielle Gygi and Dr. Hockaday prepare to take a wood core sample (approximately the size of a drinking straw) while graduate student Nathan Wright records the sample site coordinates and elevation in Balcones Canyonlands National Wildlife Refuge. Also pictured are graduate students Nicole Price and Josh Ford who were identifying the tree species and describing the location.*



*The team of graduate students were still in good spirits at the end of the day, despite wearing masks in 100-degree heat throughout the day in September 2020. At the time it was standard practice to wear masks even outside while participating in Baylor-sanctioned events. Pictured (L-R) are Danielle Gygi, Nicole Price, Nathan Wright, and Josh Ford.*



### TEACHING

During the Fall 2020 semester Dr. Fulton co-taught Global Biogeochemical Cycles with Dr. Bill Hockaday. This was their first time co-teaching a class, and each brought new ideas for learning about terrestrial and marine biogeochemical cycling processes. The class was organized around a project to study methane production by microbes living in trees, a relatively new discovery that could have a dramatic effect on balancing the global carbon budget. The class field trip was to the Balcones Canyonlands National Wildlife Refuge to collect leaf samples and take wood samples from several species of trees using an increment borer. During sample collection the class detected methane emission from one species. The class collected samples from 12 trees in two parts of the refuge that experience different levels of water stress, a factor hypothesized to affect water retention, anoxia, and growth of microbes in the trees. The samples were returned to the lab, and students spent the rest of the semester analyzing them for physical characteristics, water content, stable carbon and nitrogen isotopic composition, and lipids associated with bacteria, fungi, and methanogenic archaea that might affect carbon cycling and methane production in wood. It was a great semester, and the professors look forward to co-teaching the class again in 2022-2023.

## RECENT PUBLICATIONS

Wang, J., Wagner, N., **Fulton, J. M.**, Scott, T. (2021) Diazotrophs modulate phycobiliproteins and nitrogen stoichiometry differently than other cyanobacteria in response to light and nitrogen availability. *Limnology and Oceanography* 66, 2333–2345.

Mansouri, F., Winfield, Z. C., Crain, D. D., Morris, B., Charapata, P., Sabin, R., Potter, C. W., **Fulton, J. M.**, Trumble, S., Usenko, S. (2021) Evidence of multi-decadal behavior and ecosystem-level changes revealed by reconstructed lifetime stable isotope profiles of baleen whale earplugs. *Science of the Total Environment*, 757, 143985.

Steen, A.D, Abdulla, H.A., Cakic, N., Coffinet, S., Dittmar, T., **Fulton, J.M.**, Galy, V., Hinrichs, K.-U., Ingalls, A., Koch, B.P., Kujawinski, E., Kusch, S., Liu, Z., Osterholz, H., Rush, D., Sepulveda, J., Seidel, M., Wakeham, S. (2020) Analytical and computational advances, opportunities, and challenges in marine organic biogeochemistry in an era of “omics”. *Frontiers in Marine Science* 7, 718.

Uveges, B.T., Junium, C.K., Scholz, C.A., **Fulton, J.M.** (2020) Chemocline collapse in Lake Kivu as an analogue for nitrogen cycling during Oceanic Anoxic Events. *Earth and Planetary Science Letters* 548, 116459.

## PRESENTATIONS

Dhar, S., **Fulton, J. M.**, Goldschmidt, "Paleoenvironmental interpretations of Late Devonian biotic turnover in Western Canada Sedimentary Basin: Evidence from stable isotopic analyses of geoporphyryns," Geochemical Society, Virtual Conference. (June 2020)

**Fulton, J.M.** Membrane lipids in virus infection and coccolithophore bloom termination in the ocean. Department of Biology, Baylor University, Waco, TX. (Feb. 2020)

Mansouri, F., Crain, D.D., Winfield, Z.C., **Fulton, J.M.**, Trumble, S.J., Usenko, S. Tracing change in marine ecosystem using compound specific stable isotope analysis of amino acids archived in baleen whale earplug. AGU Ocean Sciences Meeting. San Diego, CA. (Feb. 2020)

**Fulton, J.M.**, Herckes, P., Fraser, M., Collins, J., Van Mooy, B.A.S. Diel variability in atmospheric microbiology demonstrated in the lipidome of particulate matter. AGU Fall Meeting, San Francisco, CA. (Dec. 2019)

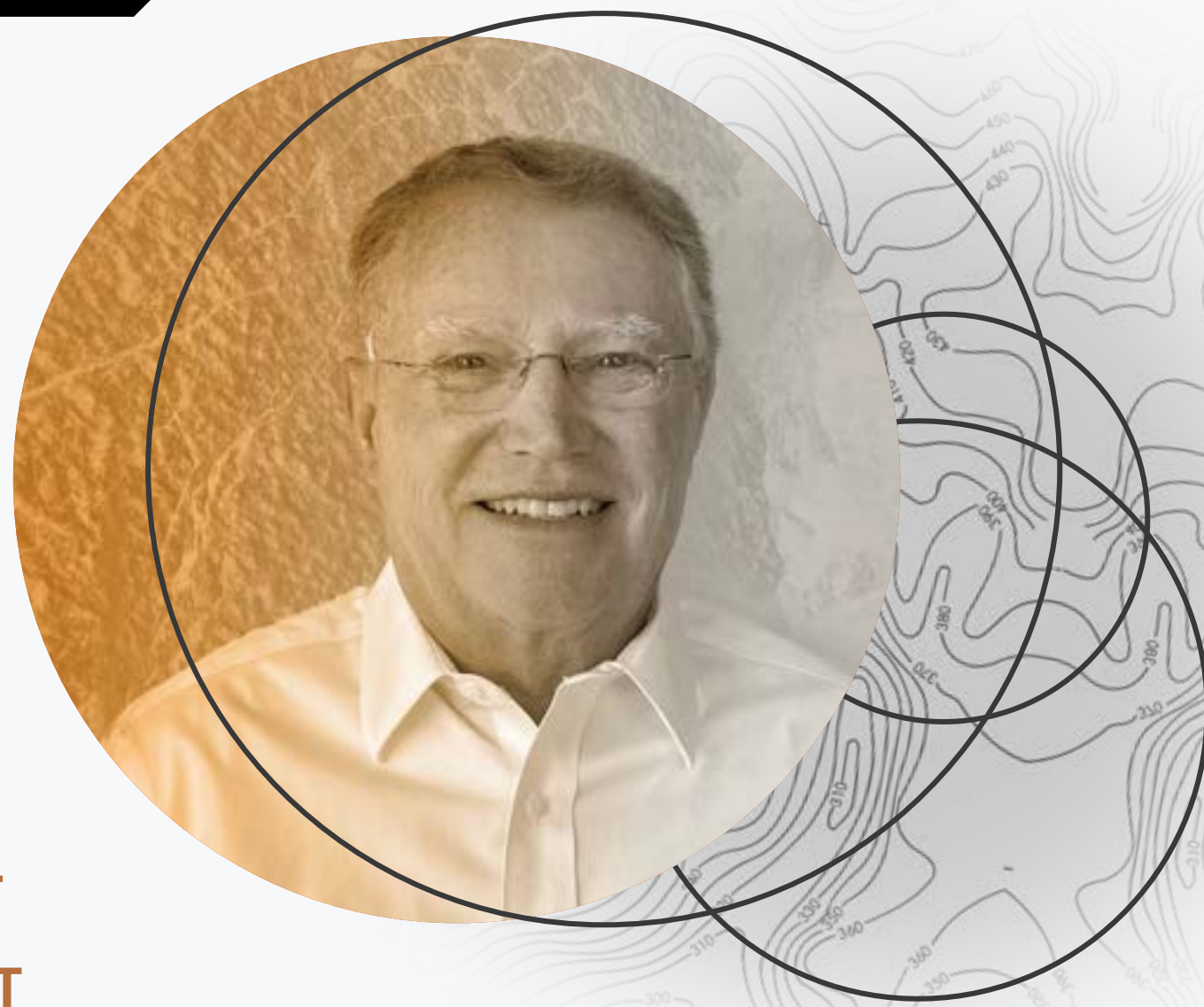
Dhar, S., **Fulton, J.M.** Paleoenvironmental interpretations for the End Devonian faunal crises using carbon isotope distributions from the Western Canada Basin. AGU Fall Meeting, San Francisco, CA. (Dec. 2019)

Frucci, M., **Fulton, J.M.**, Atchley, S. The end Devonian mass extinction across Alberta: elemental indicators of widespread anoxia. AGU Fall Meeting, San Francisco, CA. (Dec. 2019)

Mansouri, F., **Fulton, J.M.**, Crain, D., Winfield, Z., Trumble, S., Usenko, S. Reconstruction of amino acids' carbon and nitrogen stable isotope profiles in baleen whales earplug. World Marine Mammals Conference. Barcelona, Spain. (Dec. 2019)

**DR. DON GREENE**PROFESSOR OF METEOROLOGY  
& GEOGRAPHY

**I AM FACING RETIREMENT FROM A SIX DECADE PERSPECTIVE. THE PROSPECT OF RETIRING HAS GENERATED WITHIN ME MIXED FEELINGS OF BOTH SADNESS AND JOY. THE JOY PART IS READILY UNDERSTANDABLE, BUT THE SADNESS IS NOT THE USUAL DEPRESSION REPORTED IN SCIENTIFIC JOURNALS.**



**F**or me, the retirement blues was blunted by our “pre-positioning” for retirement when Alison and I moved to Sun City eight years ago. I can honestly report that we have many friends and activities to keep us busy. Our Sun City perspective is always forward looking to see what happens next. In contrast, this year’s activity report is looking back in time; a retrospective summary of life in the Geoscience Department and the changes that have occurred during my tenure. By the numbers: I taught 22,396 students in 404 classes for 43 years, spanning six decades starting at Baylor in the fall of 1979, ending in the spring of 2022. Also let’s not forget Alison’s labor for the green and gold as she taught 23 years (1984–2007) in Family and Consumer Sciences. Alison and I will treasure forever the friends and memories of Baylor and the Christian family in which we shared!

In terms of social norms, Baylor was behind the times. Baylor in the seventies was a throwback to any other University during the 1950’s. The movie “Mona Lisa Smiles” is an accurate characterization. Class dress for women included make up, skirts or dresses, hosiery, and heels. Shorts and jogging made their appearance in the eighties. We lived in “Fort Faculty”, the fenced-in compound on the edge of a much smaller campus. Our three children grew up on the Baylor campus, mostly remembering all the doughnuts on Parents’ Weekend, and climbing on the homecoming floats after the parade. They visited my office often accompanied by a romp around Strecker Museum in the basement.



*On the hike  
around Bear  
Lake, Rocky  
Mountain  
National Park.*





**B**ack then the Geology Department was located on the first and second floors of Sid Richardson and shared space with Biology, Mathematics, and Strecker Museum in the basement. At the time, Baylor was a provincial University with over half the enrollment coming from nearby Texas towns. Undergraduate Geology majors were the “good-old boys” who loved field work, in training for the oil industry. We had just enough graduate students to teach freshman labs. In 1984 our Geology Chairman Professor Harold Beaver was issued one of the first computers. With his enthusiastic foresight he made sure the rest of the faculty had a computer by the late eighties. Geology was ahead of most other departments, first proposing a doctoral degree in 1988 and achieving approval in the early nineties.



Camping has always been a family affair for us with one or more kids tagging along. In 49 years of married life, Alison and I tallied over two years of sleeping in bedrolls in the great outdoors. Knowing this cannot go on forever, Alison and I called the summer vacation of 2021 “the last round-up”. This one covered over 3,500 miles, and at its peak we had ten family members in attendance. Starting out from Austin we traveled clockwise to Durango, Arches, Colorado National Monument, Dinosaur National Monument, Flaming Gorge, Grand Tetons, Yellowstone, Devils Tower, Mount Rushmore, and Rocky Mountain National Park. Enclosed are some of the photos we collected along the way.



Arches National Park



*Double Arch, Arches National Park*



*Don, daughter Adriel, and granddaughter Julia James.*



*Bones older than Don, Dinosaur National Monument, Vernal, Utah*



*In the Grand Tetons. Don with the camper along with daughter Adriel and twin granddaughters Hannah and Macey.*



*Playing dominoes on the veranda of the Old Faithful Lodge with Old Faithful erupting in the background. Don, Adriel, Hannah, and Macey (left to right)*

## DR. BILL HOCKADAY

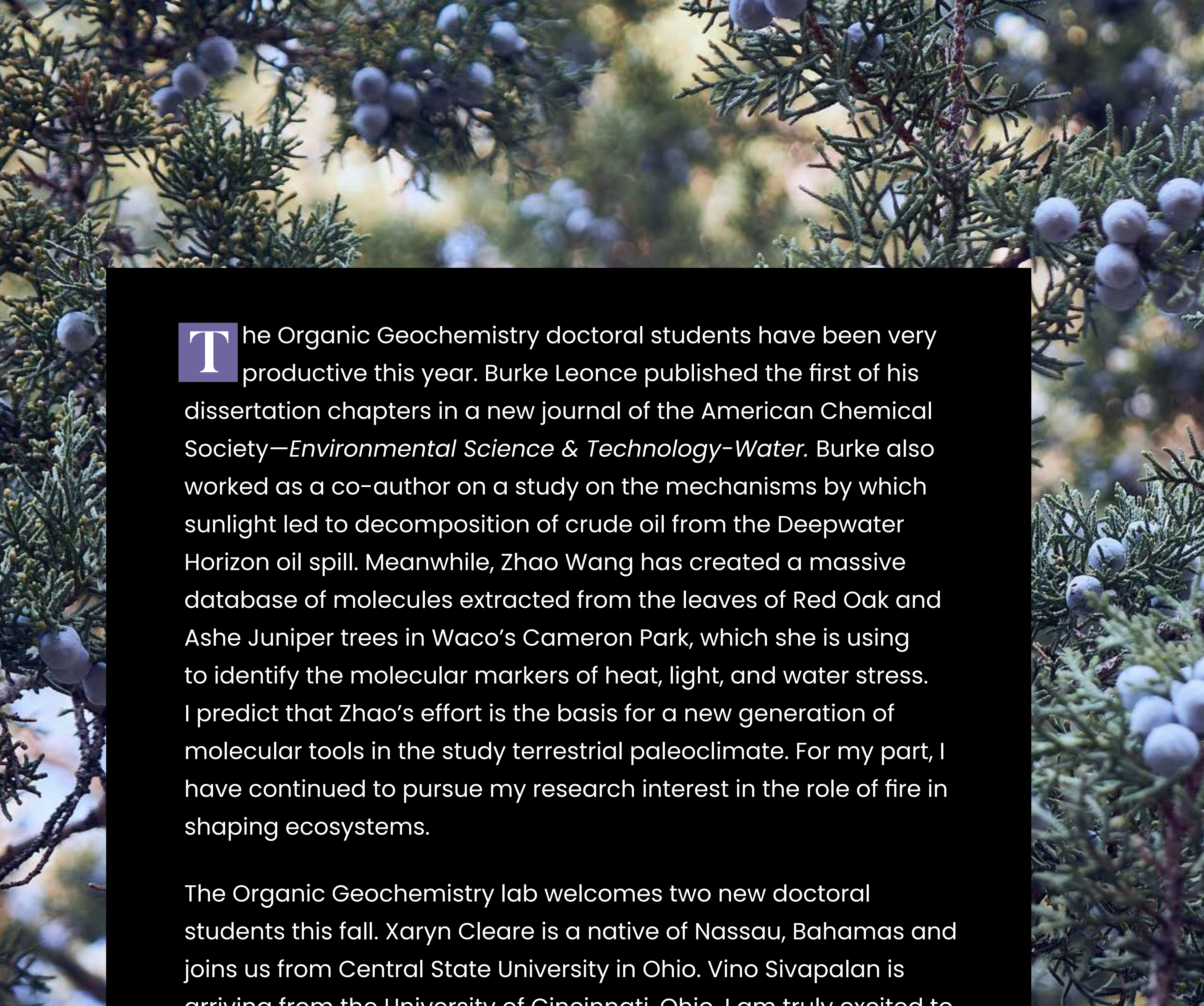
ASSOCIATE PROFESSOR OF ORGANIC  
GEOCHEMISTRY & BIOGEOCHEMISTRY

**DESPITE ALL THE INTERRUPTIONS AND ISOLATION CAUSED BY SHELTERING IN PLACE DURING THE PANDEMIC, MY FAMILY AND I MANAGED TO STAY HEALTHY, HAPPY, AND PRODUCTIVE.**



**O**ur children, Abigail celebrated her 8<sup>th</sup> birthday, and William recently turned six years old. The kids were able to participate in abbreviated seasons of soccer, basketball, and baseball/softball. Mary and I both managed to teach classes in-person this year, while also managing get our course content online for students working remotely. Mary taught 4<sup>th</sup> grade math, science, and social studies for Robinson ISD. I was fortunate to team teach two graduate courses last fall to an outstanding group of students—Grant Writing with Dr. Steve Driese and Biogeochemistry with Dr. Jamey Fulton. In the Spring semester, the World Oceans course had 60 students, mostly freshmen. At the end of the academic year, we took a much-needed family vacation to Utah, Colorado, and New Mexico. The highlight of the trip were Arches, Canyonlands, Mesa Verde, and the Great Sand Dunes National Parks.





**T**he Organic Geochemistry doctoral students have been very productive this year. Burke Leonce published the first of his dissertation chapters in a new journal of the American Chemical Society—*Environmental Science & Technology-Water*. Burke also worked as a co-author on a study on the mechanisms by which sunlight led to decomposition of crude oil from the Deepwater Horizon oil spill. Meanwhile, Zhao Wang has created a massive database of molecules extracted from the leaves of Red Oak and Ashe Juniper trees in Waco’s Cameron Park, which she is using to identify the molecular markers of heat, light, and water stress. I predict that Zhao’s effort is the basis for a new generation of molecular tools in the study terrestrial paleoclimate. For my part, I have continued to pursue my research interest in the role of fire in shaping ecosystems.

The Organic Geochemistry lab welcomes two new doctoral students this fall. Xaryn Cleare is a native of Nassau, Bahamas and joins us from Central State University in Ohio. Vino Sivapalan is arriving from the University of Cincinnati, Ohio. I am truly excited to see where their interests will lead our future research endeavors!

Although we were not able to present our research at conferences this year, we have a very nice list of publications that are already making an impact in the field.

### LATEST PUBLICATIONS

Tai McClellan Maaz, William C. Hockaday, Jonathan L. Deenik, Biochar volatile matter and feedstock effects on soil nitrogen mineralization and soil fungal colonization, *Sustainability*, 13, 2021 DOI: 10.3390/su13042018

Christopher I. Roos, Thomas W. Swetnam, T. J. Ferguson, Matthew J. Liebmann, Rachel A. Loehman, John R. Welch, Ellis Q. Margolis, Christopher H. Guiterman, William C. Hockaday, Michael Aiuvalasit, Jenna Battillo, Josh Farella, Christopher A. Kiahtipes, Chris Toya, Paul Tosa, Native American Fire Management at an Ancient Wildland-Urban Interface in the Southwest US, *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.2018733118

Burke Leonce, Zygmunt Gryczynski, William Hockaday, Nathaniel Adegboyega, Omar Harvey, Structure-Photochemical Activity Relationships in Fluorophoric Water-Extracted Organic Matter from (un)charred Plant Materials, *Environmental Science & Technology – Water*, DOI: 10.1021/acsestwater.0c00208

Liu J., Mulenos, M.R., Hockaday, W.C., Sayes, C.M., Sharma, V.K., Ferrate (VI) pretreatment of waters containing natural organic matter, bromide, and iodide: A potential strategy to control soluble lead release from PbO<sub>2</sub>(s). *Chemosphere*, January 2021, 128035. DOI: 10.1016/j.chemosphere.2020.128035

Qing Wang, Burke Leonce, Meredith Evans Seeley, Nathaniel F. Adegboyega, Kaijun Lu, William C. Hockaday, and Zhanfei Liu, Elucidating the formation pathway of photo-generated asphaltenes from light Louisiana sweet crude oil after exposure to natural sunlight in Gulf of Mexico, *Organic Geochemistry*, DOI: 10.1016/orggeochem.2020.104126

### AWARDS

**Burke Leonce** – Received the 2021 Wayne Harrison Scholarship from the Association for Fire Ecology – in support of professional growth and academic research in the area of wildland fire science.

**Bill Hockaday** – Received the 2020 Editor’s Citation for Excellence in Refereeing for the American Geophysical Union’s *Journal of Geophysical Research - Biogeosciences*



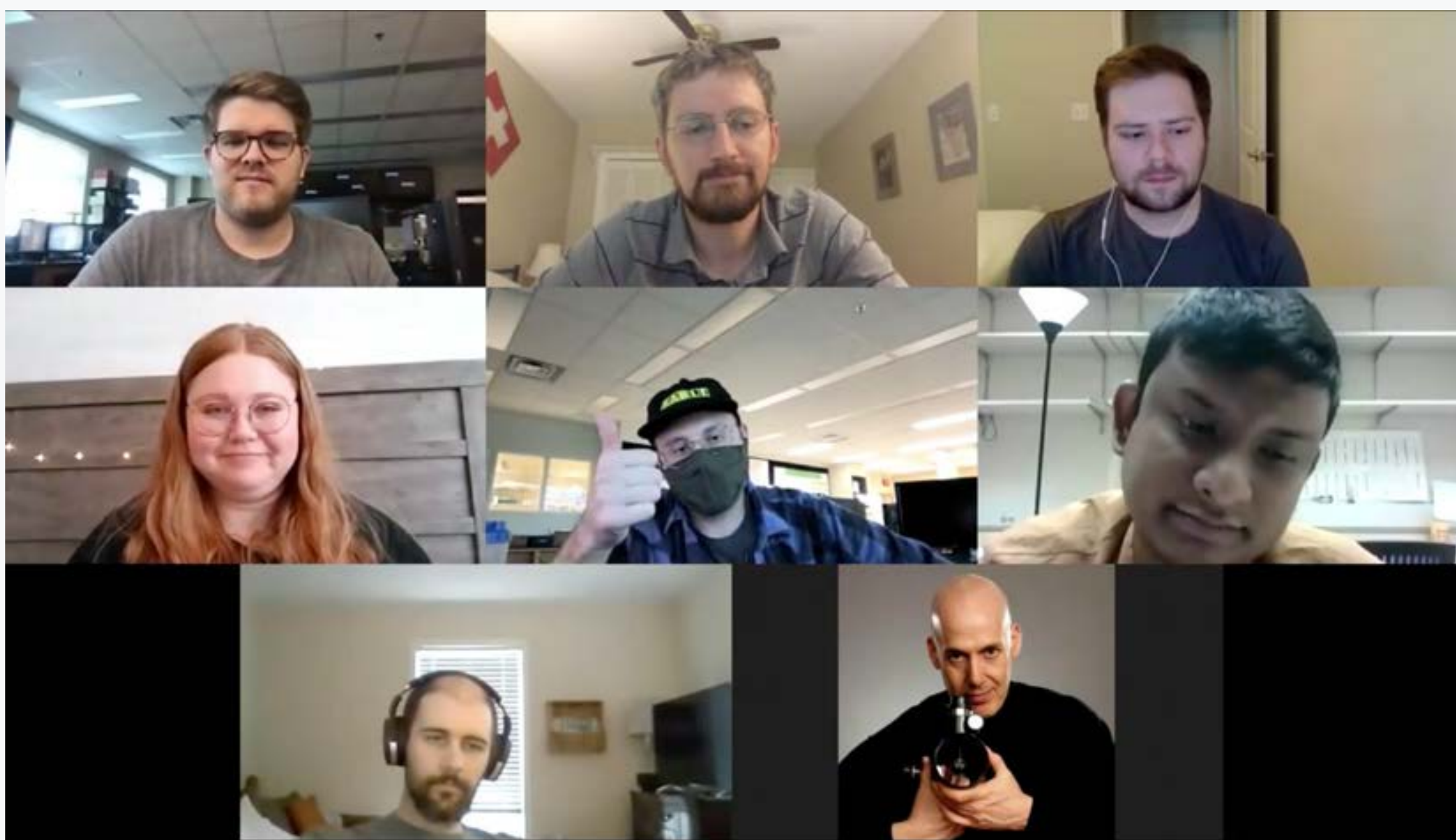
## DR. PETER JAMES

ASSISTANT PROFESSOR OF GEOPHYSICS  
& PLANETARY SCIENCE

**THE COVID-19 PANDEMIC SHOOK UP THE ROUTINE FOR THE PLANETARY RESEARCH GROUP: THE OPEN-CONCEPT GEOPHYSICS LAB HAS BEEN SPARSELY POPULATED FOR MUCH OF THE PAST YEAR AS STUDENTS AND FACULTY ALIKE SPENT MANY WORKING HOURS AT HOME.**



**N**evertheless, we have continued to stay enthusiastic about the wonderful vocation that we share – exploring the workings of our solar system. Our weekly in-person lab group meetings have been replaced by Zoom meetings; while we have grown surprisingly accustomed to these virtual meetings, we are certainly looking forward to a return to the pre-pandemic norms within a few months' time.



While many of us have remained tethered to our computers at home, I'm happy to report that the planets continue to orbit as they always have. Great mysteries remain, and much of my scholarly efforts this year have focused on future advancements in space exploration. In response to a call by NASA, I led a white paper delineating the science objectives that could be addressed with gravimetric data by astronauts on the planned Artemis III mission to the Moon (see the illustration below from that white paper, depicting the operation of a gravimeter on the Moon). In terms of community service, I was invited to chair a NASA grant review panel for the first time. I also gave an invited talk at a workshop organised by the Keck Institute at Caltech, titled "Next-Generation Planetary Geodesy".


**T**his workshop brought together an eclectic mix of scientists and engineers to discuss the instrumentation and spacecraft architectures that could enable high-precision measurements of the shapes, geoids, and tidal deformation of planets and moons in the next 50 years.

The most notable contribution to the scientific literature from our research group was a paper published in PNAS, titled “A globally fragmented and mobile lithosphere on Venus”. While we’ve long known that the planet



*Illustration from the 2020 Artemis III white paper (Illustration by Derek James)*

Venus doesn't have plate tectonics like Earth, this paper announces the discovery of networks of crustal blocks on Venus that move similar to jostling pack ice. Earth is the only planet in the Solar System with plate tectonics, so our planet is quite exceptional in that regard. That raises an interesting question: why does a planet like Venus—roughly the same size as Earth and made of the same types of rocks—not behave the same way as Earth geologically? This new work found that Venus is a little more like Earth than we previously realized, with block motion and even localized subduction. My contribution to this paper was to show that Venus's mantle is primarily responsible for providing the driving force behind this block motion. I did some calculations of the various mechanisms that could be contributing, and I found that the slow churning of Venus's mantle is the predominant driver of this block tectonic motion. NASA's Magellan spacecraft measured the gravity field of Venus (i.e., the very subtle changes in the strength of gravity in different places on the planet), and I used this gravity field to demonstrate that viscous churning in the mantle is strongly coupled to the crust. These calculations of the driving forces corroborated the discovery of block motion and helped us have a better understanding of how it works.



Science related to Venus is especially timely: earlier this year, NASA announced that it would be sending two new spacecrafts to Venus (VERITAS and DAVINCI+). These will be the first NASA missions launched to Venus since the 1980's. Additionally, the European Space Agency announced that it would be sending its own spacecraft called "Envision" to Venus. In last year's newsletter, I shared my experience travelling to French Space Agency headquarters to give an invited talk on the scientific merit of the hypothetical Envision spacecraft. Many of these theoretical exercises in planetary science go nowhere, but this time we will have the satisfaction of watching the spacecraft become a reality!

**T**he students in my research group have kept equally busy over the past years. Two of my students (Rudger Dame and Nick Wagner) have been honored with 2021 summer internships at NASA's Jet Propulsion Laboratory. Rudger is working under the advisement of Dr. Sue Smrekar, the PI of the recently announced Veritas spacecraft, and he will be scowring decades-old data from Venus in search of evidence of subduction. Nick is working with Dr. Ryan Park to analyze the Martian gravity field and to study its largest preserved crater, Hellas basin.

We will be welcoming three new faces to our research group this fall: Katie Broad is an incoming Ph.D. candidate, who earned her bachelor's degree from Purdue University. Jeff Lee is also joining our department as a Ph.D. candidate after he finishes another doctoral dissertation in the Physics department this fall. Jeff intended to work with Prof. Scott James prior to Scott's untimely passing, so I will step in as Jeff's advisor. It goes without saying that Scott is deeply missed as a colleague and as a friend.

Finally, we are fortunate to welcome Dr. Don Hood into our research group as a postdoctoral research fellow. Dr. Hood is an expert in Martian geology and geomorphology and comes to us from Texas A&M University.

If you would like to learn more about the fledgling Planetary Research Group, visit the page for our research group: <http://baylorplanetary.com>

Follow the Planetary Research Group on Twitter: @baylorplanetary I periodically tweet about research snippets and various science topics with my Twitter handle: @peterbjames



## DR. DAN PEPPE

ASSOCIATE PROFESSOR OF PALEOMAGNETISM & PALEOBOTANY, GRADUATE PROGRAM DIRECTOR

**THIS PAST YEAR IS A YEAR THAT NONE OF US WILL SOON FORGET. THOUGH IT WAS ANYTHING BUT NORMAL, THE YEAR WAS STILL A PRODUCTIVE AND SUCCESSFUL ONE FOR MY RESEARCH GROUP AND FOR THE DEPARTMENT.**



**O**ver the past year, I've continued my tenure as the graduate program director and continued my research on reconstructing terrestrial ecosystems in the Paleocene and Neogene. I continue to work on several projects including on early Miocene and Plio-Pleistocene environments in eastern Africa, on early Paleocene ecosystems in the San Juan Basin in New Mexico, and on developing and refining fossil leaf based proxies for reconstructing climate and ecology in the past. This past year, two new students, Kahsay Nugsse Tesfay and Danielle Gygi, joined PhD student Joe Milligan in my lab group.

Kahsay Nugsse Tesfay is a PhD student who plans to work in the main Ethiopian Rift (MER) and the Afar Depression (AD) in Ethiopia with a focus on understanding the development and rift rotation of the AD and MER at the Gona Paleoanthropological Research area. His work will utilize paleomagnetism to help reconstruct rift block rotation and to date a series of formations which document some of the oldest stone tools and a remarkable record of early hominin fossils. We are hoping to conduct fieldwork in winter 2022 and will update you on our progress in the next newsletter!

*Fieldwork in the Washakie Basin looking for Late Paleocene mammals with University of Kansas research team led by Dr. Chris Beard.*



*MS student Danielle Gygi collecting fossil leaves on Mesa de Cuba in the San Juan Basin in New Mexico.*



Danielle Gygi is a MS student working on the early Paleocene floral record in the San Juan Basin in New Mexico. Danielle conducted fieldwork in the San Juan Basin this summer and collected a series of fossil leaf sites, which she is working on in my lab this year. Her work is focused on understanding the composition of the early Paleocene plant communities, their diversity, and the paleoclimate of the region. She will be comparing her results to the work of my former PhD student, Andrew Flynn, and to the floral record from other parts of North America. I was excited to get the change to join Danielle in the field for my first fieldwork since 2019 and we had a great time finding and collecting fossil leaves. Danielle is now in the process of unwrapping and photographing her gigantic fossil leaf haul and I look forward to seeing the amazing fossils she found this summer.

Joe Milligan just completed his 5<sup>th</sup> year. He is in the final stages of his dissertation on track to graduate in December 2021. His first paper, which focuses on a set of growth experiments where he grew Sycamores at the Lake Waco Wetlands under different light conditions. He found that there is a remarkable strong relationship between aspects of cell morphology and light availability, which also be quantified in fossils. Using these relationships, Joe is working to develop a proxy for shade cover that can be applied to fossil leaves that we've collected in the San Juan Basin in New Mexico. This work is in review and American Journal of Botany and will likely be published this fall. The other parts of his dissertation focuses on developing a Sycamore-specific proxy for CO<sub>2</sub> and on reconstructing ancient CO<sub>2</sub> levels from early Paleocene floras in the San Juan Basin. This summer Joe was selected for a Deep Time: Peter Buck Postdoctoral Fellowship at the Smithsonian, which he'll start in January!



*Partial fossil palm frond from ~60 million year old deposits in the Nacimiento Formation in the San Juan Basin in New Mexico.*

Baylor Geosciences undergraduate Megan Lever, MS student Danielle Gygi, and PhD student Joe Milligan in the San Juan Basin, New Mexico.



In addition to my research and teaching, I've continued to enjoy my work as the Graduate Program Director and getting a chance to interact with the graduate students in Geosciences. We have a great group of students, and I look forward to continuing teaching and working with them in the future. We've been regularly updating our [Facebook](#), [Twitter](#), and [Instagram](#) pages with information about what is happening in the department, so please follow us!



Halloween 2020 with the Peppe family.



MS student Danielle Gygi and Geosciences BS student Megan Lever in the San Juan Basin, New Mexico.

**DR. ELIZABETH PETSIOS**

ASSISTANT PROFESSOR OF PALEONTOLOGY

**I'M EXCITED TO SEE THE GEOLOGY DEPARTMENT, MY LAB AND STUDENTS, AND BAYLOR AS A WHOLE STARTING TO GET BACK TO 'NORMAL' WITH THE UPCOMING FALL SEMESTER, AND AM HOPEFUL THAT THE NEW ACADEMIC YEAR WILL BRING IN TERMS OF OPPORTUNITIES AND COLLABORATIONS.**



**W**hile it's not an exaggeration to say that last year was academically and personally challenging, I have been encouraged by how our Baylor family has supported each other through these challenges.

My graduate students, Cooper, Nathan, and Stephanie, weathered the storm of COVID-19 quite admirably, making substantial progress in their coursework and research despite interruptions in travel plans and class scheduled. Cooper is graduating with his M.S. degree in August, and had received multiple offers from several Ph.D. programs nationally and internationally. He will be moving on to a Ph.D. position at Oxford University in the Fall. Nathan is entering his second year in the Ph.D. program, and will be taking his qualifying exams soon. Stephanie is preparing an application for to graduate student research fund program through the National Science Foundation. We are all currently in the process of preparing for this year's Geological Society of America national meeting in Portland, Oregon.

**T**he past year saw some new additions to the lab as well. Two undergraduate students, Dakota Gavin and Victoria Holman, began research projects involving with fossil collecting and preparation. In the summer of 2020, Dr. Brendan Anderson came to work in my lab as a postdoctoral researcher. He graduated in 2018 with his Ph.D. from Cornell University, my undergraduate *alma mater*, before working as a postdoc at the University of West Virginia. His substantial knowledge in the field of evolution, ecology, and undergraduate education has inspired a number of new collaborative research projects in my lab. I look forward to collaborating with Brendan for years to come.



With field work opportunities becoming more plentiful with vaccination availability, I have been able to take my lab to some local fossil collecting sites, and have been able to plan for more substantial field excursion in the near future. As a lab, we've been fossil hunting locality in areas around the cities of Jacksboro, Brownwood, and College Station and around the shores of Lake Texoma. Later in July, my students and myself are also visiting the Florida Museum of Natural History for some museum and field work. In August, I plan to visit Stephanie's field locality in the 4 Corners region of Utah.

The past year brought us plenty of heartache at all scales, from the global tragedy of the pandemic to the loss of one of our own, Dr. Scott James. I am inspired by the strength and kindness that our Baylor family has exhibited through these hardships, and look forward to another year facing these challenges as a part of this family.



*An ammonite imprint in a block of limestone, Lake Texoma, TX*



*Students at the Brownwood Spillway, Brownwood, TX*



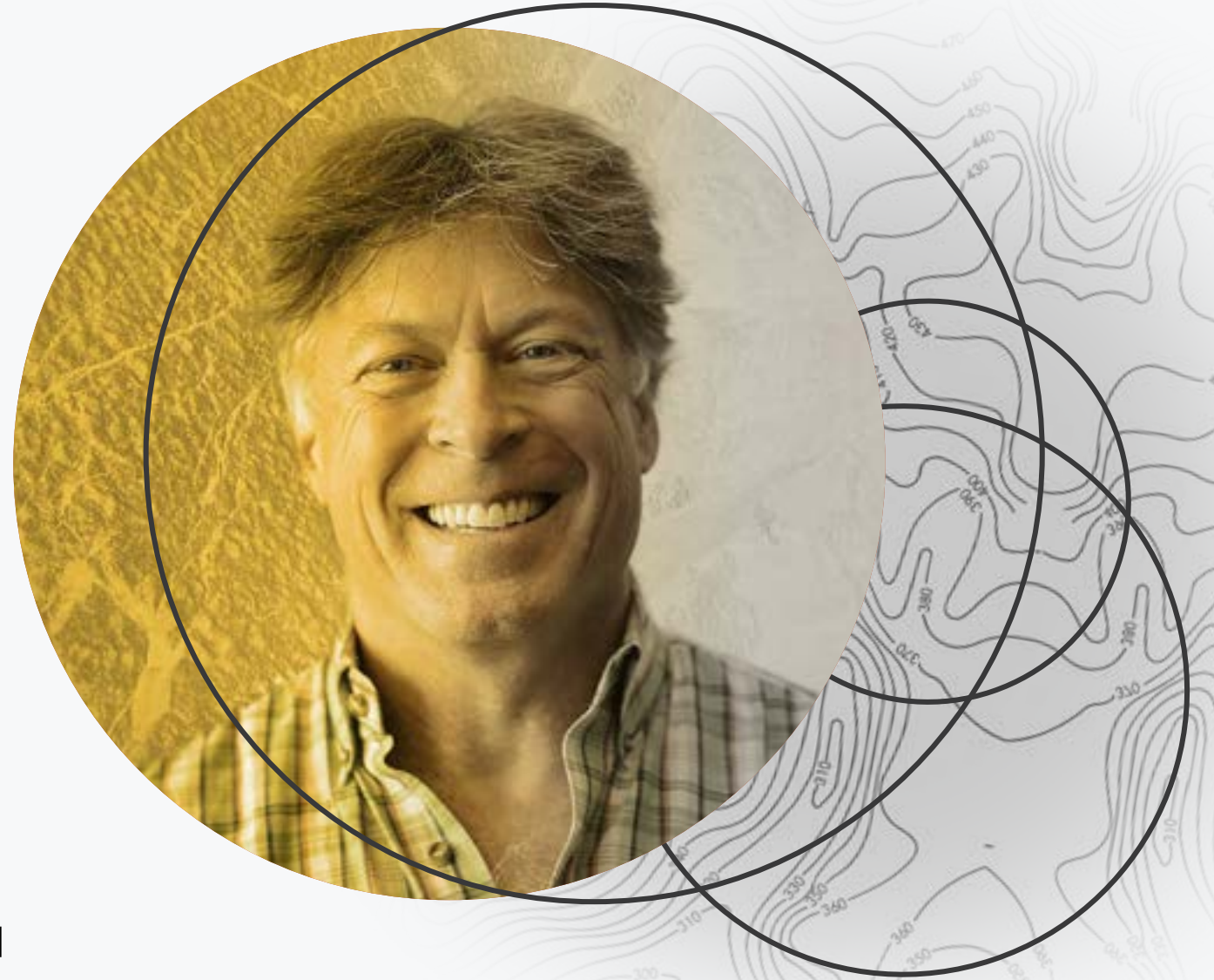
*Students with Dr. Atchley at the Brownwood Spillway, Brownwood, TX.*

## DR. JAY PULLIAM

W.M. KECK FOUNDATION PROFESSOR OF GEOPHYSICS,  
SOLID-EARTH GEOPHYSICS & SEISMOLOGY

**WE WERE UNABLE TO PERFORM  
FIELDWORK LAST YEAR BUT  
WE MADE A GOOD DEAL OF  
PROGRESS WITH THE ANALYSIS  
OF EXISTING DATA.**

**W**e “graduated” two members of the group: Frank Sepulveda received his PhD and moved on to a job with Datastax and Diego Quiros accepted and started a faculty position at the University of Cape Town, South Africa. Frank and Diego were both major contributors to the DOE project in which we designed, built, and tested a new, wireless seismic array for automated processing of continuous ground-motion data. Joseph Thangraj was also a significant contributor and he will finish his PhD this Fall and move on to a postdoc. He is now pursuing applications of unsupervised machine learning to seismic interferometry that we hope will allow us to design seismic data acquisition that are optimal in terms of configuration and duration. Among continuing members of the group, Hannah Mejia and Debajeet Barman continue their work on the NE Caribbean and southeastern United States, respectively, and Ben Sadler is working on innovative approaches to receiver function computation and modeling with applications to the greater Texas region. We added three new members this year: Brady Spears and Aicha Coulibaly are M.S. students from the University of New Mexico and Texas Tech, respectively, and Yashwant Soni, from the Indian School of Mines, started his PhD work in January 2021.



*Monahans sand dunes at sunset*



*Brady Spears, Debajeet Barman, Ben Sadler,  
Yashwant Soni, Jay Pulliam at Monahans State Park*



*Aicha Coulibaly at Monahans sand dunes*

The entire group spent two weeks at the Monahans sand dunes in May, acquiring active and passive seismic as well as ground penetrating radar (GPR) data. Professor emeritus John Dunbar joined us for the second week and camped with us at the Monahans Sandhills State Park and were treated to a beautiful rainbow that followed a brief storm. This trip was clearly the highlight of the academic year for me. After more than a year of enforced distance, remote classes and seminars, and relatively little one-on-one contact, we were able to resume “normal” research activities. I am always encouraged and rejuvenated by the student’s great enthusiasm and energy. We had a successful outing, despite challenges posed by the heat, wind, and rugged terrain.



*Ben Sadler with GPS*

Aside from the Monahans effort, which will provide data for Brady Spears’ M.S. thesis and support the research of Steve Forman and his group, I continue to operate a seismic network in the Dominican Republic, with colleagues from the National Center for Seismology, an organized research unit of the Autonomous University of Santo Domingo, and pursue lithospheric-scale research in India and in the southern United States. For the first time in my professional career I did not attend any meetings, or make any trips, during the academic year. I miss the in-person meetings so I hope we return to normal soon. Lastly, I was honored to be elected as a Fellow of the Geological Society of America this Spring.



*Ben, Jay, Yashwant*

## DR. JOE YELDERMAN

PROFESSOR OF HYDROGEOLOGY

**STUDENTS WERE THE HYDROGEOLOGY LAB STARS THIS YEAR. THEY SHOWED COURAGE AND RESILIENCE WHILE FINISHING STRONG THROUGH A PANDEMIC, THE LOSS OF A FACULTY MEMBER, AND AN UNUSUALLY HARD FREEZE.**



Therefore, congratulations to:

Ph.D. Stephanie S. Wong

M.S. Lauren Lubianski; Clara Smith-Salgado

B.S. Stephanie Krill; Taylor Watson

**S**tephanie Wong's residence at Baylor has been exceptionally productive and her contributions to Dr. Joe's lab and Baylor University Hydrogeology will be sorely missed. However, it will be her leadership and camaraderie that will be missed the most. In addition to her degree requirements, Stephanie went on 7 mission trips which included Restoration Gateway, Uganda, and Hacienda Baru, Costa Rica. We wish Dr. Wong the best as she takes the next step in her career. We hope she remembers us as fondly as we will remember her.

The dynamic duo of Lauren Lubianski and Clara Smith-Salgado started their graduate studies at the same time and finished together in a timely manner. They too, will be missed. I am confident they will make great contributions to hydrogeology during their career. Lauren used the SWAT model to help assess impacts from the Brazos River Alluvium Aquifer and the Bull Hide Creek wastewater treatment plant to the quantity and quality of Bull Hide Creek.



*Dr. Stephanie S. Wong sampling Chlorofluorocarbon gases in spring flow.*





*Lauren Lubianski measuring water levels in a mini piezometer during a class field trip to her thesis area.*



*Clara Smith-Salgado titrating bicarbonate at Stillhouse Hollow Reservoir.*

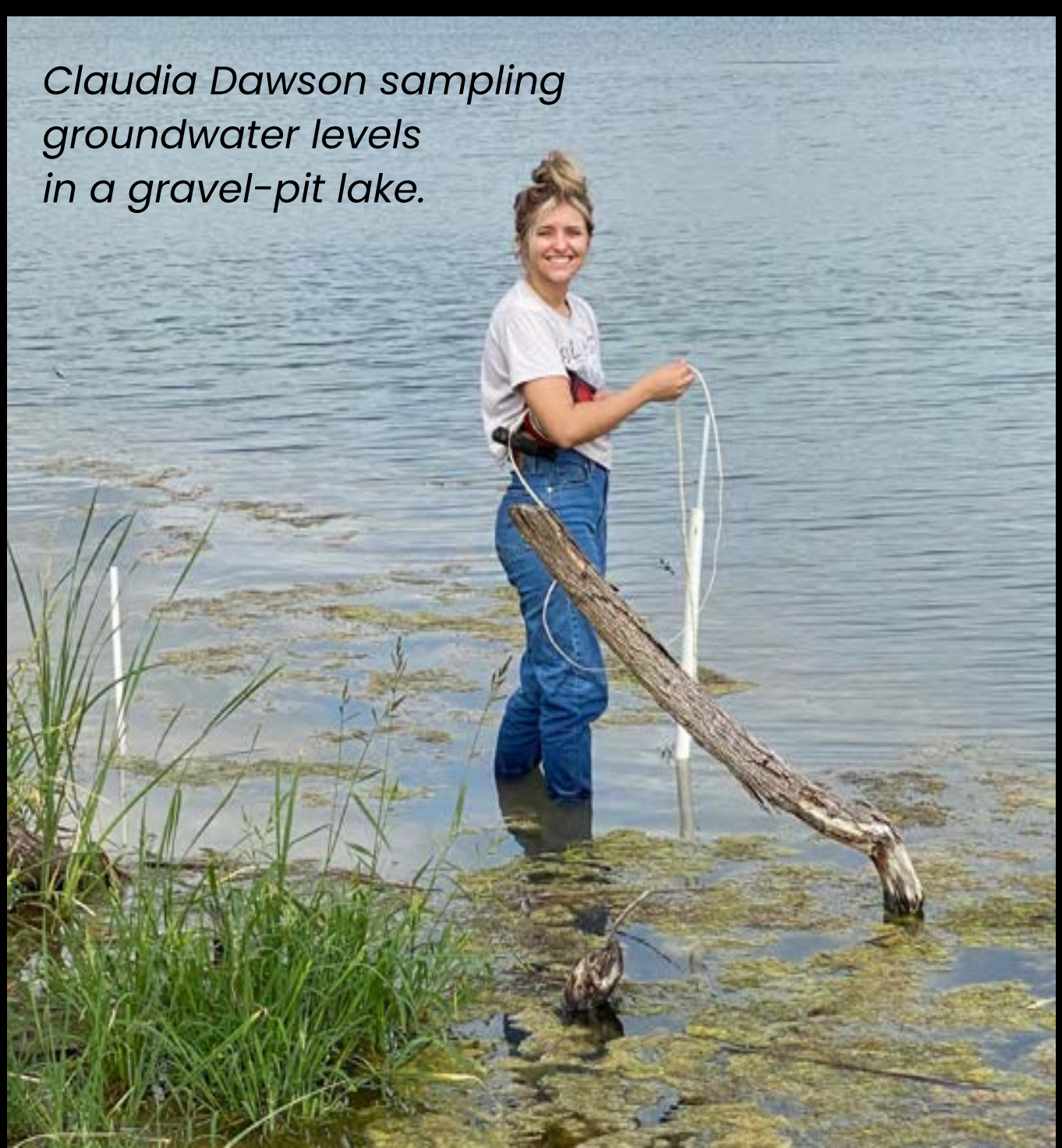


*Taylor Watson measuring water levels at the World Hunger Relief Farm.*

**L**auren's research was supported through an internship with the Southern Trinity Groundwater Conservation District. Clara used isotopes, ionic chemistry, and 88-D radar precipitation data to better understand recharge to Salado Springs. Clara's research was supported by the Clearwater Underground Water Conservation District and the Texas Water Development Board. Lauren and Clara both presented their work virtually at the National Geological Society of America meeting.

Stephanie Krill and Taylor Watson both finished senior theses on hydrogeology and are headed to graduate school at Auburn and Arkansas, respectively. Stephanie studied the impacts of climate on residential and industrial wells in confined aquifers. Taylor assessed the sustainability of a Brazos Terrace aquifer to support the World Hunger Relief farm north of Waco.

Ph D. candidate, Will Brewer, has passed his preliminary exams, defended his proposal, and is writing his first paper as part of his PhD in the Institute of Ecological, Earth, and Environmental sciences. He is working with MS student Claudia Dawson studying gravel-pit lakes in the Brazos River Alluvium Aquifer. Claudia was awarded the Elan Allen Safety scholarship for her field safety plan in preparation for her work with the gravel-pit lakes.



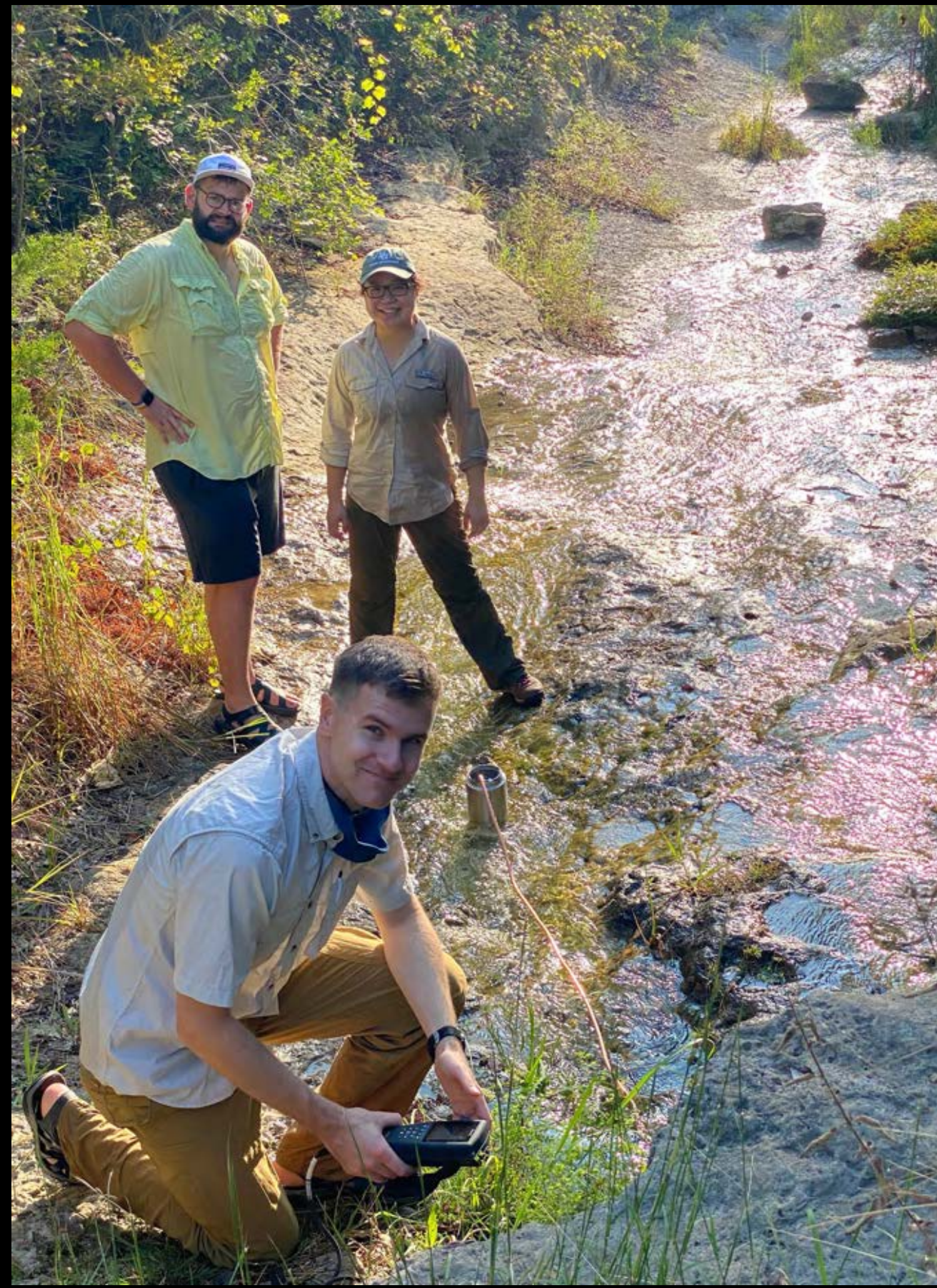
*Claudia Dawson sampling groundwater levels in a gravel-pit lake.*

**D**ue to the passing of Dr. Scott James, Dr. Joe's lab has inherited several students at different levels of progress. Toluwani Soares is finishing her MS degree this fall on modeling deep sea water irrigation for growing algae to be used as a biofuel. Jairon Mc Vea is in the middle of an MS degree and will propose this fall. Jairon is using a finite element model to determine potential flow rates in the Brazos River Alluvium Aquifer to better understand groundwater/surface-water interactions. Toluwaleke Ajayi (A.J.) is a new PhD student who plans to work with Dr. Joe and Dr. Peter James.

Dr. Joe was invited to present *New and Innovative Techniques to Assess Groundwater/Surface-water Interactions* at the American Groundwater Trust Annual Texas Groundwater Conference in Austin, Texas July 1, 2021.

#### **FAMILY**

Daughter Abigail and son-in-law Jared White live in Plano, Texas with granddaughter Kennedy (4 yrs.), grandson Hamilton (4<sup>th</sup> grade), and granddaughter Madison (6<sup>th</sup> Grade!). Son Cal, daughter-in-law Rachel, and granddaughters Elizabeth (4 yrs.) and Ada-Marie (2 yrs.) live in Buda, Texas where Cal is a product owner for Mitrastech. Son Logan completed his fifth year as an assistant professor at Prairie View University in the psychology department. Logan and daughter-in-law Rachel Beth, grandson Bryce (7 yrs.), grandson Nolan (5 yrs.), grandson Beau (3 yrs.), and the newest addition, grandson Ty (1 yr.) live near Brenham, Texas. Diane is enjoying retirement while helping on the home front babysitting grandchildren, staying active in Bible study with friends, and serving at Columbus Avenue Baptist Church with internationals and the food pantry. Dr. Joe continues to serve as a deacon at Columbus Avenue Baptist Church with his loving wife of 46 years. The Yeldermans still live at 706 Woodland West, Woodway, Texas and visitors are always welcome.



*Will Brewer, Stephanie Wong, and Will Anderson (intern with Clearwater Underground Water Conservation District) sampling spring in the Northern Segment of the Edwards Balcones fault Zone aquifer.*



*Future hydrogeologist, Beau Yelderman, conducting a pumping test at Mayborn Museum.*

2021 GEOSCIENCES

# STAFF UPDATES



## SHARON BROWNING

GEOLOGY FRESHMAN LABORATORY COORDINATOR

### THE YEAR OF RAPID ADJUSTMENT, CANCELLATIONS, AND ZOOM. WHAT A YEAR THIS HAS BEEN!

**I** certainly could not have anticipated all that 2020 brought the geoscience department and the world. From January to March, we became increasingly aware of the COVID-19 virus emerging in China and watched as it spread to other countries. Our students were on track to complete a successful semester of learning and engagement prior to spring break, but little did I realize how quickly we would need to adjust to a new normal. Baylor's decision to extend spring break by one week gave us time to consider how to best duplicate the rich hands-on experiences our introductory labs provide. Fortunately, only three weeks of labs were affected after the extended spring break. Working with the faculty and our graduate teaching assistants, we utilized a combination of photos and videos of our lab apparatus to complete the semester successfully. Students who struggled with the online learning environment were granted consideration and grace when necessary.



As the year progressed and fall approached, we considered how best to minimize exposure of our students and teaching assistants to COVID-19 while maintaining an environment conducive to learning. Our goal was to hold labs in person if at all feasible, allowing student, instructor, and peer interaction. Fall enrollments were limited to allow for required social distancing, and the Geoscience department and Aramark worked in collaboration to provide gloves and sanitizing supplies. Online versions of all labs were developed over the summer for students in quarantine status. We also utilized online assessments and discussion boards through Canvas to ensure students could interact with classmates regardless of quarantine status. Although only a small percentage of our students were quarantined at any one time, the availability of developed material was critical for continued classroom participation. One of our introductory courses was taught exclusively online, which also gave graduate teaching assistants the ability to minimize exposure to the virus if necessary. Four of our graduate students requested this option. Our weekly TA meetings were held via Zoom when possible, to further minimize exposure. I consider Fall 2020 to be a successful semester, but student and TA feedback strongly indicate online learning is not ideal for most. Hopefully 2021 will see a return to normal instruction and the easing of the virus's grip on our planet.



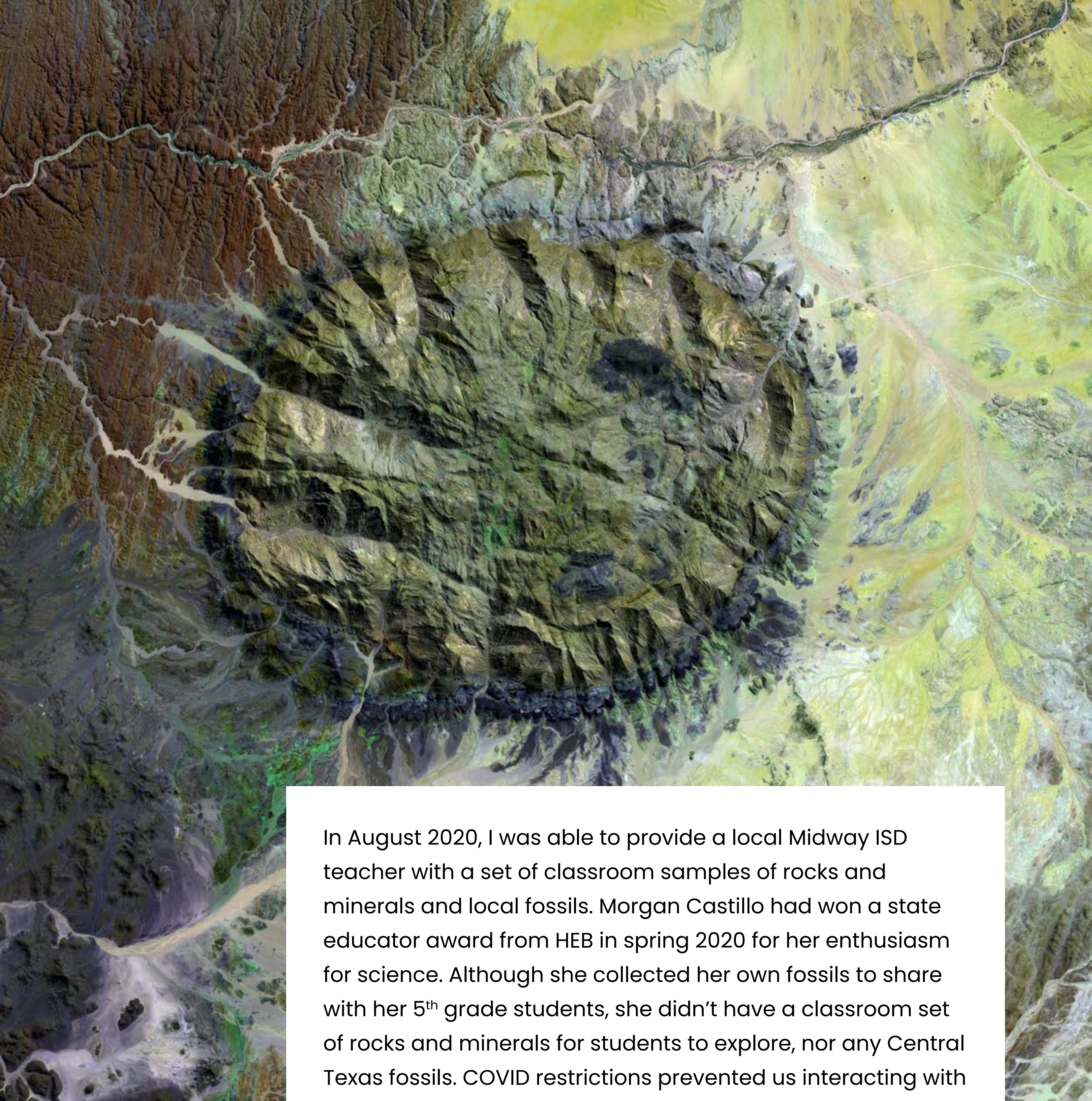
Graduate student, Kathy Breen, discusses rock identification with some visitors.



Graduate students, Joe Milligan and Cooper Malanoski, wait for Mayborn visitors to arrive.

Another change in 2020 was the rapid adjustment of professional conferences to virtual versions. I was scheduled to lead a workshop on Imposter Syndrome at the 6<sup>th</sup> annual meeting of the Earth Educator Rendezvous in July 2020, a follow up from the previous year's informal round table discussion of the same topic. Presenters were asked in early April to determine if they were willing to continue with the virtual presentation, at a time when many of us had little exposure to Zoom or similar platforms. However, with support from personnel from the Science Education Resource Center (SERC), we made a successful transition. It was a new experience to interact with colleagues in a Zoom window instead of face to face, but we learned that lunchtime meetings and chats over coffee can still occur, continuing or establishing relationships with colleagues across institutions.

Most of our normal outreach activities in 2020 were cancelled quickly in March, including our scheduled time at the Lake Waco Wetlands with all 4<sup>th</sup> grade classes in the Midway ISD. We were able to keep our commitment to "Meet a Scientist Day" at the Mayborn Museum on March 13<sup>th</sup> during the week of spring break. Our activities included our rock and mineral identification, fossil identification, and one of our earthquake hazards houses. Graduate student participants included Joseph Milligan, Kathy Breen, Cooper Malanoski, and Benjamin Sadler. I look back at that day now with fondness, as it was one of few outreach activities we were able to do prior to mask mandates and social distancing.



In August 2020, I was able to provide a local Midway ISD teacher with a set of classroom samples of rocks and minerals and local fossils. Morgan Castillo had won a state educator award from HEB in spring 2020 for her enthusiasm for science. Although she collected her own fossils to share with her 5<sup>th</sup> grade students, she didn't have a classroom set of rocks and minerals for students to explore, nor any Central Texas fossils. COVID restrictions prevented us interacting with her students, but I have no doubt they will benefit once they return to the classroom.

I was able to give an adapted presentation to the Waco Master Naturalists in November 2020. This is our 5<sup>th</sup> year to work with this excellent community group in their engagement with the natural world. The presentation was outside at Mother Neff State Park, followed by a fossil hunting trip to the Comanche Peak Limestone outcrop near Oglesby.

**O**n a personal note, my daughter graduated from Baylor in December 2020 with her Bachelor's in Film and Digital Media. I am looking forward to her moving on to the next phase of her life, and excited to see where she lands. She was able to celebrate this milestone and walk across the stage in May 2021. I hope 2021 sees us celebrating all we've learned and adapted to this year and has emphasized to our students the value of being a lifetime learner.

## WAYNE HAMILTON

PROGRAM CONSULTANT &  
LAB SAFETY COORDINATOR

**THE FOLLOWING DESCRIBES  
MY WORK SERVING STUDENTS,  
STAFF AND FACULTY AT  
BAYLOR UNIVERSITY AND THE  
GEOSCIENCES DEPARTMENT.**



### TEACHING ASSISTANCE

**I** assisted Dr. Joe with his fall 2020 Hydrogeology and Water Management classes and observed how he planned, organized, and presented the subjects in a COVID restricted teaching environment. The COVID restrictions made classes and the field a continuously challenging teaching and learning environment for us as well as the students. However, once we developed several weeks of lectures, assignments, and streaming class videos, the daily class rhythm emerged. I prefer face-to-face classes due to the interactive and immediate body language cues, but the online teaching stretched our flexibility, creativity and learning that I believe will help students function in a virtual learning and work world.

During the spring of 2021 I assisted Dr. Joe with Water Management class and in a COVID adjusted teaching environment. My support work was streaming and recording Dr. Joe's lectures and keeping Canvas current by posting class assignments and due dates, that kept students aligned with the class schedule. Video recording of student presentations was particularly useful to the students by providing individual feedback on how to improve their speeches. The classroom COVID requirement challenge was met with an unexpected snow and ice storm that made roads impassable, cut electric power and stopped the flow of water to Baylor and our homes. So COVID and winter storm taught us to be flexible, fluid, and fabulous, and Dr. Joe adjusted the class schedule, and we successfully completed another semester.

Also, during the spring, I assisted Kenny Befus with poster preparation and presentation in his Petrology class. Poster development is a great way to teach students how to read technical papers, then use the scientific method and synthesize reading into a clear poster. The petrology students presented their posters on the last day of class, and it was great to see them excitedly present their work in a professional manner.



## RESEARCH AND PRESENTATION

**T**he focus of my research was assisting undergraduate student Taylor Watson and graduate student Lauren Lubianski with their planning and conducting field work.

First, I assisted Taylor with assessing World Hunger Relief Incorporated (WHRI) property that is a fifteen-minute drive north of campus. The assessment work consisted of drilling borings, obtaining sediment cores and cuttings, installing piezometers, gauging piezometer water levels, surveying piezometer casing, installing, and obtaining datalogger information. Then the WHRI research was presented by Taylor as a virtual poster at the 2020 National GSA meeting.

Second, I worked with Lauren and field permeameter tests, plus installation of mini piezometers on tributaries of the Brazos River and then returned to gauge the water levels to understand if the creeks were losing or gaining streams. Also, we stream gauged several creeks to gain additional data supporting as to how the stream flow is hydraulically connected to the groundwater.

My goal was to help Taylor and Lauren with field work, to work both safely and effectively in the field to acquire high quality research data for the BS and MS theses.

During December I assisted Dr. Joe and his hydrogeology students with a 24-hour aquifer test in Bell County. This aquifer test provides students with an understanding of field methods and data collection that helps the Clearwater Underground Conservation District manage the community's groundwater resource. Finally, at Baylor I've appreciated the high-quality research equipment and opportunities to learn, teach and do research. The Center for Microscopy and Imaging has powerful optical and scanning electronic microscopes plus the Department's new Mastersizer 3000 are examples of such instrumentation. I used and plan to apply these and other instruments to classroom teaching and research.



During the Fall and Spring, I guest taught subsurface methods and hydrocarbon release assessment methods in two Environmental Science classes. There are interdepartmental opportunities between Geoscience and Environmental Sciences to share knowledge and experience in the subsurface assessment field. Due to field work COVID restrictions, I had to modify and bring the field assessment methods to the students in their classroom. I hope to continue pursuing these cross-department opportunities that benefit Baylor students.

### DEPARTMENT SUPPORT

Knowing the importance of getting things done and the sense of accomplishment administrative activities provide, I enjoy assisting the department in two areas. The first is with departmental vehicle use, such as Texas required annual inspections, regular maintenance, repairs, and cleaning. Even with COVID travel restrictions, I assisted with vehicle maintenance by starting them and taking care of normal maintenance. Taking care of the vehicles helps to assure that the vehicles would operate when COVID restrictions were lifted from field work. The second activity is helping with Dr. Joe's lab safety requirements and general safety support to the department. Last year, general safety support was primarily helping with Baylor's guidance to meet COVID compliance with signage and resupplying materials. In addition, safety activities included annual lab reviews, monthly audits, that are compliant with Baylor's BioRAFT program, fire safety audits, and disposal of waste.



*Taylor Watson surveying piezometers on World Hunger Relief Inc property as part of her BS thesis research.*



*Lauren Lubianski stream gauging on Bullhide Creek as part of her MS thesis research work.*



*Clara Smith-Salgado, GSA National meeting virtual Zoom poster presentation of her MS thesis research*

**B**aylor rolled out and completed a Bear Care “Coaching” program to encourage undergraduate students in response to uncertainty that COVID caused in the classroom. So once a week, I emailed or texted encouraging messages through the summer and early fall to undergrads to be confident and we’ll make it through this challenging chapter of their life.

#### **PERSONAL**

On May 4, 2021 our second grandson was born and now we have double the reasons to visit Dallas. These grandchildren have enlivened our quiet grandparent lifestyle by helping the parents manage two children. No vacation or family travel last year to Wisconsin or Iowa due to COVID restrictions. However, we stayed connected with family via FaceTime which is a wonderful way to communicate when you can’t travel. Once COVID restrictions were relaxed we returned to church and I continued leading music for pre-school children. Being a consistent music leader each week with the same songs, connects with the children and is one of my most significant life activities. The weekends I enjoy taking care of the yard. Usually it is mowing, edging, and trimming shrubs that gives me exercise and an immediate sense of satisfaction from a beautiful yard. And finally, as a car guy---in November I went to the Circuit of the Americas racetrack to watch vintage and modern sports car races.

#### **CLOSING**

I’m thankful for Baylor giving me this second life career after retiring from Shell Oil Company six years ago. These six years of learnings and relationships with students, staff and faculty have greatly enriched my life. I’m looking forward to continuing to serve Baylor University and the department.

## LILIANA MARIN

LAB MANAGER  
GEOLUMINESCENCE DATING RESEARCH LAB

**THE GEOLUMINESCENCE DATING RESEARCH LABORATORY (BG LAB), WITHIN THE DEPT. OF GEOSCIENCE AT BAYLOR UNIVERSITY IS A FACILITY UNIQUE IN TEXAS, ONE AMONG FEW LABS IN THE U.S., AND IT IS QUIPPED FOR OPTICALLY STIMULATED LUMINESCENCE (OSL) DATING THAT CAN PROVIDE DEPOSITIONAL AGES FOR THE PAST 0.5 MILLION YEARS.**



OSL dating is a form of geochronology, quantifying the radiation and dosimetry properties of common minerals, such as quartz and potassium feldspar. These chronologies inform tectonic, hydrologic, paleoenvironmental, paleoclimatology and anthropological studies for internal and external research groups.

**T**he BG Lab promotes cutting-edge research visibility for the University and provides a “home” for wishful graduate and undergraduate students. The research in the lab focusses on addressing “grand challenges” such as evaluating the timing and pace of climate change, as reflected in drought and flood records, the spatial and temporal distribution of intraplate seismicity, and the timing of the inhabitation of the Americas.

Because of the volume of data produced, the lab works 24 h/7 day/week, through projects advanced with external partners, the lab generates funds that support expenditures for lab needs and assists with stipends for graduate and undergraduate students. This year we advanced 37 concerted research projects with collaborators in the Americas, Europe, Africa and Asia, preparing 148 samples for dating. Although the COVID pandemic restricted interactions with collaborators, we continued working analyses during this period. The lack of backlog in analysis with field work suspended for much of 2020 yielded time to shore-up chronologies, seek additional external funding and publication of many studies. The lab returned to about 80% capacity in May 2020, with restricted access to Baylor for research endeavors. as soon as Baylor opened the doors after the lockdown. We augmented the lab safety procedures following the CDC and Baylor guidelines to protect the lab personal from the coronavirus, and to this day, we report no cases of COVID caught or passed on by lab personnel.

Despite the pandemic there have been many opportunities for students to continue learning, most importantly we have experimented with new techniques of TT-OSL, IRSL and OSL in the lab. Also, we have tried to date new mineralogy, e.g., olivine for basaltic eolian terranes. Lastly, I have been able to join numerous online trainings and attended the graduate seminar “Anthropocene.”

**W**e are proud to point-out that Connor Mayhack defended successfully his thesis entitled “*Late Quaternary Architecture and Depositional History of the Monahans Dune Field, Winkler County, TX*”. Also, there are two papers submitted or in the final stages of preparation for submission reflecting a full lab effort: *Isolation of quartz grains for optically stimulated luminescence (OSL) dating of Quaternary sediments for paleoenvironmental research*. By Liliana Marín, Steven Forman, Victoria Tew-Todd, Connor; and Mayhack, and Ashley Gonzalez (JoVE): *Late Quaternary stratigraphy and chronology by thermal-transfer optically stimulated luminescence (TT-OSL) dating of quartz grains for the Monahan’s aeolian system, Winkler County, Texas (Aeolian Research)*.” By Victoria Tew-Todd, Steven Forman, Connor Mayhack, Liliana Marín, Logan Wiest respectively.

**A**fter teaching continuously Geology 1401 class in Earthquakes and Other Natural Disasters for five years, I took time off from class and taught the course online in summer 2020 and summer 2021. It has been rewarding teaching freshman and incoming freshman students that are part of the Baylor “*Summer of Discovery Program*”.

An important mission of the lab is to provide research opportunities for undergraduate, and graduate students through learning the underlying physics, math, and techniques of OSL dating; building chronologies for understanding environmental/tectonic records and the scholarship that underpins discovery and research. Beyond, OSL techniques the students learn subjects related with research, critical thinking, sedimentology, mineralogy, solid-state, physics, statistical analyses, laboratory safety procedures, and data, and time management. Students can work within a diverse group and learn to collaborate to achieve high goals in a mutually respectfully, research-based and safe atmosphere. We host a learning community where the students’ educational and personal needs are supported, and offer assistance to balance academic, family, and individual demands through the semester. After 6 years, two graduate students will be leaving the Lab at summer’s end. Thus, there is a natural turn-over of students. I look forward to training, guiding and working with PhD candidate Alix Fournier (first year PhD student), graduate student Daniel Shi (starting in Fall 2021), and undergraduates Bradley King and Annabeth Castronovo, who will join Ashley Gonzalez and August Dreyer, senior undergraduate students that have been working with us for almost 2 years.



### THE STUDENTS' STORY:

MSc. Research Assistant: **Victoria Tew-Todd**: An undergraduate from Baylor, also graduate in the fall of 2020 with a MSc. in Geology. She has worked in the lab for six years, starting in her sophomore year. Tori continued working as a research assistant for the lab through her MSc and during the COVID year. Currently, she is tasked to assemble the chronology, sedimentology, and stratigraphy of the Monahans dune field, particularly the oldest strata, > 250 ka. To this end, with the help of OSL personal, she is advancing the TT-OSL technique to push the dating limit to > 500 ka. She will begin her Ph.D. in Geology at the University of Texas at Austin in the fall of 2021. In the interim, Tori has worked on a manuscript for publication and a proposal to NASA to develop a new chronometer based on olivine grains for eolian systems on Mars.



Graduate-student **Connor Mayhack**: Another undergraduate from Baylor, who graduated with his MSc degree in August 2021. He has been working for the lab close to 6 years since his early days as an undergraduate. Connor's thesis entitled "Late Quaternary Architecture and Depositional History of the Monahan's Dune Field, Winkler County, TX" presents paleoclimate-linked stratigraphy of the past ~550,000 years in west Texas. Connor is a multi-talented student who excels in the field, the lab, and is a skilled writer. He has broad abilities and horizons.



Undergraduate student **Ashley Gonzalez**: A Senior student with a major in Anthropology and a minor in Geology has been working in the lab for the past 2 years. Along with Connor, she was instrumental in keeping the lab working continuously during the pandemic. Ashley has become a very reliable lab assistant and has gained a keen interest in the geosciences, adding it as a minor. This addition should be helpful for her future graduate studies in Forensic Anthropology. She aspires to venture to graduate school in forensic sciences, perhaps on the east coast. Last semester, Ashley won an outstanding presentation award during the URSA week on the topic of *Morphometric Analysis within the Family Muridae*. Ashley is showing her many talents.



Undergraduate student **Annabeth Castronovo**, she is a rising junior at Baylor, majoring in environmental science with a legal reasoning and analysis minor. She has been in the BG lab for the past 2 months and this opportunity has opened new horizons for her in the environmental geosciences, and geoscience basics like mineralogy. In her short time in the lab, she can be described as focused, well organized, instrumental, and highly dependable. We look forward to her continued presence in the lab and helping her reach her academic goals.



Geoscience undergraduate student **Bradley King**, another rising Junior has worked in the lab in the past 2 months. Bradley is drawn to geosciences to understand planetary geology and space exploration. He is a hard worker, eager to learn and to experiment with new techniques in the lab. Bradley is a gregarious person and has many ideas on future options in the planetary sciences.



Senior Geoscience student **August Dreyer** will be graduating in Spring 2022 with BS in Geoscience and Economics. August is a very dedicated student, for which he was awarded with the Outstanding Student Award from the Department of Geosciences in 2020–21. He has worked sporadically for the past two years in the lab and he expects to gain experience in working in a research lab as he contemplates graduate school options.



PhD student **Alix Fournier** has been in Baylor for almost a year, arriving a bit late from Paris, France because of COVID constraints. Alix comes with broad experience and interest in environmental and hydrologic sciences. She has been taking classes, gathering data, and writing her thesis proposal entitled *Interrelation between Quaternary geomorphic and hydrologic processes for the formation of Monahans and Kermit dune fields, West Texas, USA*. Alix with the able assistance of Connor Mayhack has wrestle with the Geoprobe to extract cores from the Kermit dune field in west Texas. Also, she has set up the first groundwater monitoring well in this dune field. This new research focus on water in dune fields bring excitement to the group, because of the promise to acquire new knowledge on water resource and dune origination and tackle new challenges.

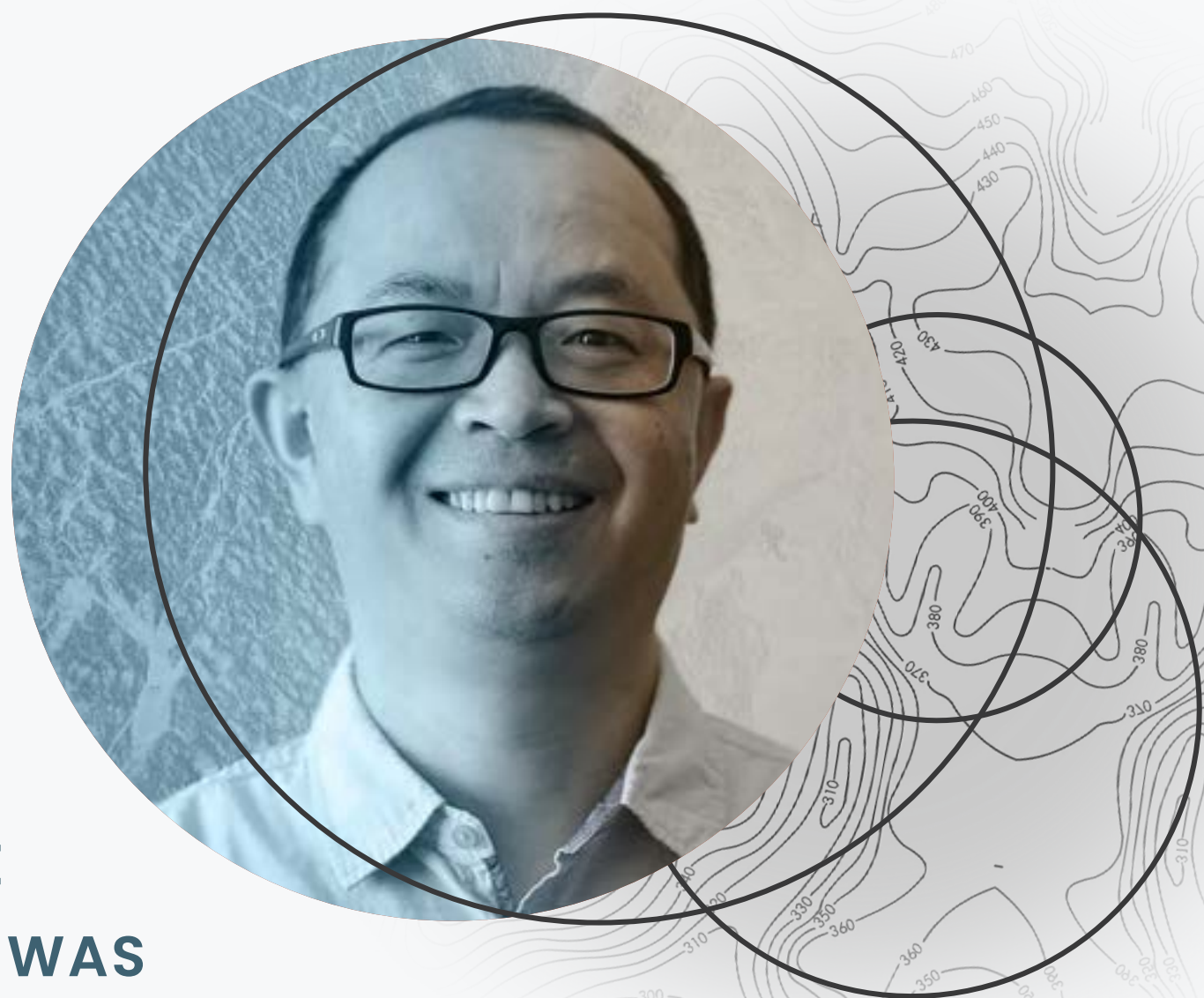


This year was a challenge, but with many positive outcomes for students in the BG Lab, despite the concerns, new safety protocols and restrictions to contain COVID-19 pandemic. We look forward to new normal, with the fieldwork and meeting attendance in person. We are back on working the unknown ages and environments from stacks and cores of sediments. The OSL he ages we produce are often the hinge to open new ideas and discovery; and is the fodder for scholarship and the student success, which are our main priorities for the BG Lab.

**DR. REN ZHANG**

LAB MANAGER - STABLE ISOTOPE SPECTROMETRY LAB

**THE PAST YEAR WAS MY ELEVENTH YEAR AT BAYLOR, AND MY MAIN RESPONSIBILITY IS TO MAINTAIN SMOOTH DAILY OPERATIONS OF THE INSTRUMENTS AT THIS STABLE ISOTOPE LABORATORY. THEREFORE, WHAT I HAVE DONE HERE FOR THE PAST 12 MONTHS WAS NOT SIGNIFICANTLY DIFFERENT FROM PREVIOUS YEARS. HOWEVER, I STILL HAVE SOME INTERESTING STORIES TO SHARE WITH YOU.**



**L**ast July, Gas Bench II experienced sampling problem when I was analyzing water samples for Dr. Joe Yelderman's graduate student. To acquire oxygen or hydrogen isotope ratios of each water sample, the analytical system is designed to load sample gas from the headspace of a 10-ml exetainer vial and then inject it into the Mass Spectrometer for 10 times. As a result, I should be able to observe 10 almost identical sample peaks in the Isodat Chromatogram. Nevertheless, this was not the case for this batch of water samples, and the chromatogram suddenly displayed an abrupt drop in peak numbers and peak heights. I stopped isotope acquisition, removed the sampling needle from its holder and checked the needle bevel. Apparently, the bevel hole was clogged by tiny bits of septum pieces. I tried my best to remove all tiny septum debris that I could see, and then restarted the acquisition sequence. The situation was improved, but the sampling problem was still there. It looked like I couldn't clear all the debris at depth, and thus I decided to change the sampling needle. After the new sampling needle was installed, the problem was gone, and everything was back to normal. However, 5 months later, I had the same sampling problem again for the Gas Bench II. I checked the recently installed sampling needle and didn't see any septum debris inside the needle hole. I also tried to bake out the GC column at 150°C for about an hour, and I was surprised to see how much gas was trapped inside the column, but the problem didn't go away. What else could cause the problem? I used a leak detector to follow helium (the carrier gas) flow path and found out that the vent port of the Valco 8-way valve was somehow clogged—it should have helium flow coming out under the "Load" mode. This was why the system had a sampling issue—helium couldn't move the sample gas into the system as the flow path had a dead end (i.e., blocked).

It was not an easy job to clean the blocked capillary vent port. I had to remove the S.S. capillary coil from the Valco valve, put it into a hot water bath overnight, clean it and then insert it into a sealed glass vial and flush it with a continuous helium flow. After I put the capillary vent coil back to the Valco valve port and resumed isotope acquisition sequence, the sampling problem has eventually gone. This is my first time to learn that the same sampling problem of the Gas Bench may originate from different sources.

**E**arlier this June, when I was analyzing a batch of seal whisker samples on a Costech EA for their nitrogen and carbon isotope ratios, the Isodat chromatogram looked fine, the raw delta data looked fine, and everything seemed to be normal. However, a few hours later, I noticed that there was a gradual decrease in  $m/z$  44 and 45 intensities for reference  $\text{CO}_2$  gas. As a result, the raw  $\delta^{13}\text{C}$  data of the lab standards drifted a little bit. What happened? I first checked my lab room temperature record, which was quite steady, and I didn't see much variations. Isodat software also worked well, and I didn't observe any computation problem. I decided to turn off the source and close the needle valve for further investigation. When my fingers touched the aluminum needle valve, it was quite warm and I knew what went wrong right away: the cooling fan for the analyzer turbo pump stopped working some time ago, which caused the analyzer chamber temperature to rise. I immediately contacted Thermo service engineer for help and had to leave the left cover panel of the IRMS open and use a house fan to cool down the analyzer turbo pump before the new cooling fan arrives. A week later, a new fan was installed and the IRMS has been working very well since then.

In the end, I would like to take this opportunity to thank you all in this great Department for your kind help and support in the past year and look forward to working with you in the coming year!



2021 GEOSCIENCES

# FIELD CAMP





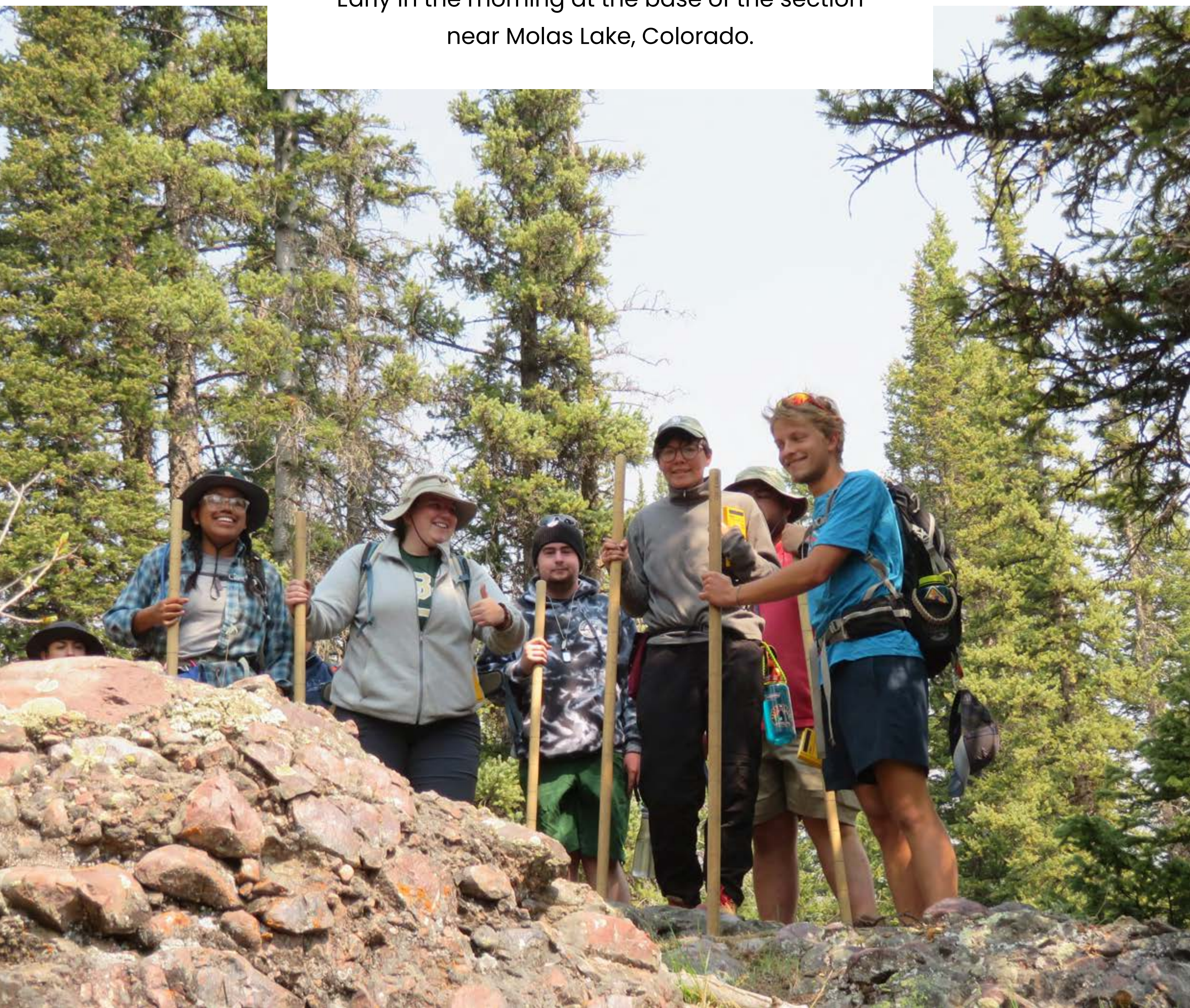
Marissa Oppedisano, August Dryer, Kyle Keeler, and Ashley Gonzalez work on their project in the Sacramento Mountains.

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# FIELD CAMP SUMMER OF 2021

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Early in the morning at the base of the section near Molas Lake, Colorado.



Drew,  
Marissa,  
and Audra  
prepare for  
a long hike  
at Petrified  
Forest  
National  
Park.



Taylor, Drew,  
and Ashley  
looked  
thrilled  
as they  
measure  
section in  
the Chinle  
Formation.



Looking for  
paleosols in  
the Chinle  
Formation.



Everyone looks happy because the field work is almost done for the day.



Ashley and Taylor taking a conductivity measurement on hydrothermal waters at Yellowstone National Park.

Kyle Keeler mapping in the Wasatch Mountains.



Mapping  
in the  
San Juan  
Mountains.



Victoria  
and Audra  
measuring  
section near  
La Luz, New  
Mexico.

Marissa and  
Kyle measure  
section on  
a beautiful  
day in New  
Mexico.



Mapping the worlds longest lava flow at Valley of Fires Recreation area.



Taylor Watson, Victoria Benitez, and Audra Hoover ponder over their pace and compass data before drafting up their map.

The students discuss the correct orientation to hold their Jacob staves while measuring section.



Marissa measuring the orientation of the stoss face of a dune at White Sands National Park.



Victoria working on her dune mapping project.



Drew Tilton claimed he had sand dunes in his ears after working on this project.





2021 GEOSCIENCES

# DEPARTMENT NEWS



CLICK YOUR WAY  
THROUGH OUR NEWS

AGU RECOGNIZES  
REVIEWERS FOR  
THEIR WORK IN 2020  
WILLIAM HOCKADAY



CRUSTAL  
BLOCK  
TECTONICS



ECOSYSTEM  
ENGINEERS



REMEMBERING  
DR. SCOTT C. JAMES

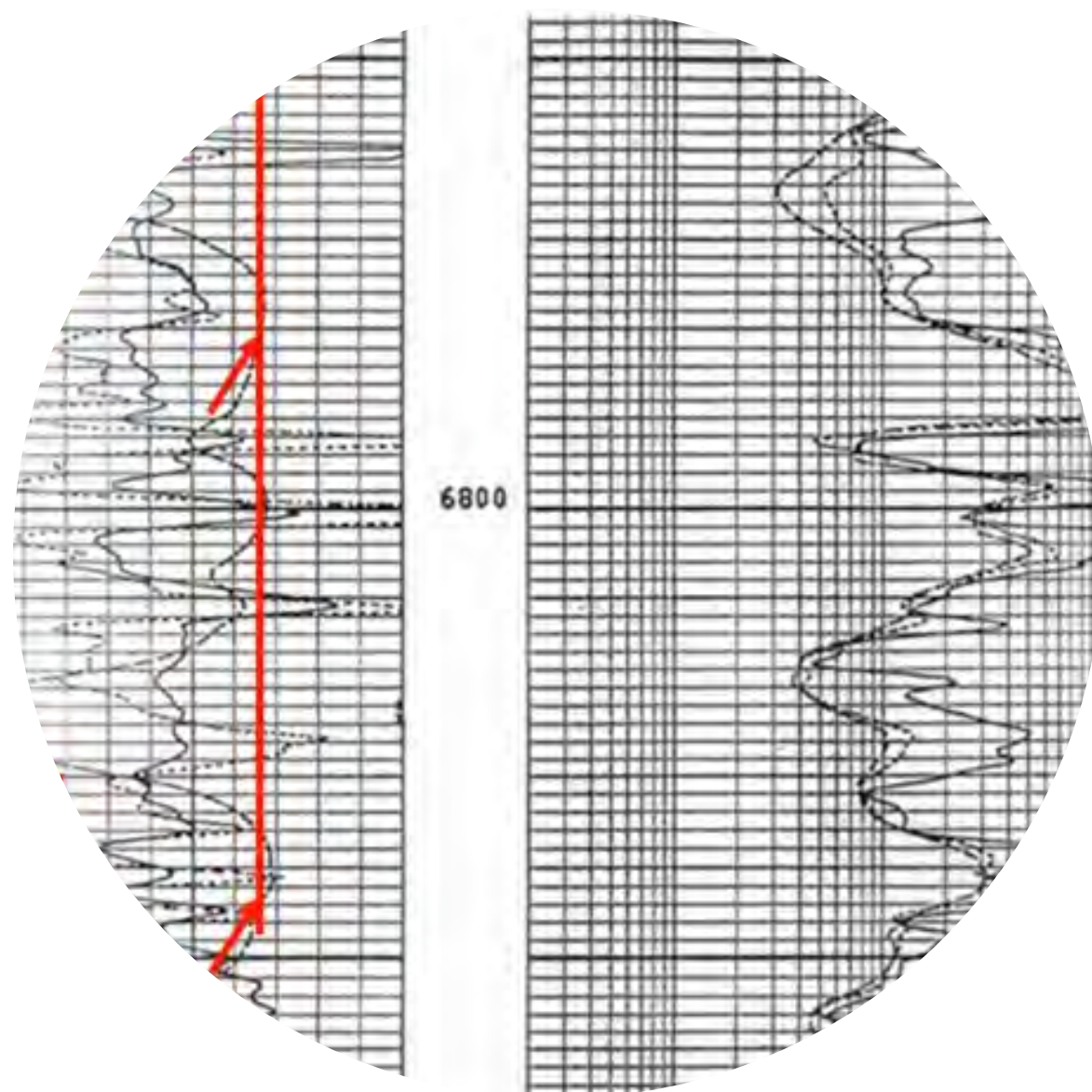


# ALUMNI NEWS



**Dr. Rixiang (Alex) Huang (PhD, 2013)** writes: Time flies, it has been 8 years since leaving Waco. I hope everything has been going well with you all. Attached is a picture of my two daughters - *Grace (4) & Esther (10 months)*.

Baylor alum and former Baylor professor, **Dr. Robert Font**, produced a **You Tube video** - A Brief Introduction to Well Logs and Their Uses - for the American Institute of Professional Geologists.



## ALUMNI MEMORIAM

CONDOLENCES TO THE FRIENDS AND FAMILIES OF:

—  
**DR. SCOTT JAMES**

MAY 2, 2021

GEOSCIENCES PROFESSOR

—  
**GEORGE DRIESE**

SEPTEMBER 16, 2021

FATHER TO DR. STEVE DRIESE

# HOMECOMING 2021

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PLEASE JOIN US!  
FRIDAY, OCTOBER 15TH

GEOLOGY DEPARTMENT  
2021 HOMECOMING OPEN HOUSE  
6-8 PM, BAYLOR SCIENCES BUILDING  
E401 CLOCK TOWER

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We would love to hear updates from our Alumni and friends!



## DEPARTMENT OF GEOSCIENCES

### FACULTY

DR. STACY ATCHLEY  
*Professor*

—

DR. KENNY BEFUS  
*Associate Professor*

—

DR. VINCENT CRONIN  
*Professor*

—

DR. STEVEN DRIESE  
*Associate Dean for Research,  
Graduate School & Professor*

—

DR. STEVE DWORKIN  
*Professor, Undergraduate  
Program Director*

—

DR. STEVE FORMAN  
*Professor*

—

DR. JAMES FULTON  
*Assistant Professor*

—

DR. DON GREENE  
*Professor*

—

DR. WILLIAM HOCKADAY  
*Associate Professor*

—

DR. PETER JAMES  
*Assistant Professor*

—

DR. LEE NORDT  
*Dean, College of Arts & Sciences  
& Professor*

—

DR. DANIEL PEPPE  
*Associate Professor & Graduate  
Program Director*

—

DR. ELIZABETH PETSIOS  
*Assistant Professor*

—

DR. JAY PULLIAM  
*W.M. Keck Foundation Professor  
of Geophysics*

—

DR. JOE YELDERMAN  
*Department Chair & Professor*

### EMERITUS

DR. PETER ALLEN  
*Emeritus Professor*

—

DR. RENA BONEM  
*Emeritus Professor*

—

DR. JOHN DUNBAR  
*Emeritus Professor*

—

DR. TOM GOFORTH  
*Emeritus Professor*

—

DR. DON PARKER  
*Emeritus Professor*

### STAFF

SHARON BROWNING  
*Teaching Lab Coordinator*

—

WAYNE HAMILTON  
*Program Consultant, Laboratory  
Safety Coordinator*

—

LILIANA MARIN  
*Geoscience Instrumentation  
Specialist, Luminescence  
Geochronology Research*

—

TIM MEREDITH  
*Instrumentation Specialist and  
Computer Systems Administrator,  
Paleomagnetism and Geophysics  
Laboratories*

—

DR. REN ZHANG  
*Stable Isotope Mass Spectrometry  
Technician*

### ADMINS

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