SMU

December 2024

Hilltop Geospheres

An Occasional Newsletter for Alumni and Friends from the Roy M. Huffington Department of Earth Sciences

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A remembrance of Hamilton Endowed Chair Professor David Blackwell

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New Beginnings. Meet the recent additions to our faculty.

An ice core sample taken from Lake Mendota, Wisconsin, Feb. 2023 as part of the workshop on integrating remote sensing with in-situ and modeling approaches to understand global lake ice dynamics, co-organized by Dr. Xiao Yang. Photo provided by Yang.

SMU Roy M. Huffington Department of Earth Sciences

Heather DeShon

Professor of Geophysics
Chair, Roy M. Huffington Department of Earth Sciences

Heather DeShon, an earthquake seismologist, currently serves as department chair of Earth Sciences. She joined the SMU faculty in 2012 and succeeded Dr. Robert Gregory in academic year 2021-2022. She holds a PhD from the University of California Santa Cruz in Earth Sciences (Geophysics) and BS in Geophysics and Mathematics from SMU.

Chairs Report

I am excited to restart the Department of Earth Sciences occasional newsletter, newly named Hilltop Geospheres. As an alumna of this department, I always looked forward to the updates on friends, professors and staff and was excited to see the research advancements being made by all.

It has admittedly been too long.

The goal of Hilltop Geospheres is to ignite your wonder for earth sciences research and your appreciation of the role of earth sciences research in tackling some of the largest challenges facing societies across the world. In 2020 the Earth Sciences faculty wrote a strategic plan to guide our success.

Our vision is that we engage in cutting-edge fundamental and applied research that addresses societally relevant problems facing the planet and that we train the next generation of researchers, scientists and citizens to be world changers.

In this issue, we introduce you to the new faculty that have joined us since 2019. You will meet our students and recent graduates and read about our field classes. Finally, you will see how teaching and research interthread. We remain a research-intensive department with focus on geology, geophysics and remote sensing – over the last 3 years we have annually published over 60 peer-reviewed papers and brought $3-5M in external research dollars to SMU.

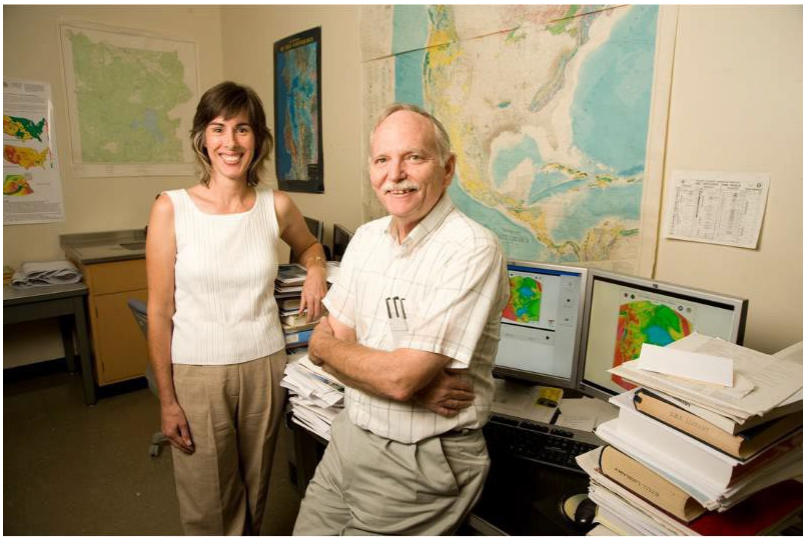
We also take opportunity to celebrate current and past faculty members. Special to me is a remembrance of Dr. David Blackwell. I took many courses from Dr. Blackwell as an undergraduate, and I was fortunate to serve on the faculty with him for a short time. I will not soon forget those first weeks when he brought me my old assignments and gifted me with autographed papers he had collected over his career.

Pony up!

Life and Science

Remembering Hamilton Professor David Blackwell, an innovative scientist with a deep connection to the Hilltop

By Robert Gregory



David Blackwell and colleague, Maria Richards, in the SMU Geothermal Laboratory.

David Blackwell, founder of the Geothermal Laboratory and Professor Emeritus, passed away on July 16, 2024. He was the William B. Hamilton Chair in Earth Sciences in Dedman College and renowned for his studies of the thermal structure of the continental crust. Blackwell joined the faculty in 1968 after completing a PhD at Harvard and was a proud SMU alumnus with BS in Geology and Mathematics, 1968.

For full story, see:
https://www.smu.edu/news/research/remembering-david-blackwell

Blackwell was a major proponent of the commercialization of geothermal energy – a renewable resource derived from the heat that originates from the Earth's interior. A founding member of the Geothermal Resources Council (now Geothermal Rising), Blackwell also played an important role with the creation of the International Geothermal Association. His leadership in developing the U.S. Department of Energy's National Geothermal Data System continues to impact the development of geothermal energy to this day. Blackwell's research helped develop a detailed understanding of complex temperature profiles in geothermal systems and introduced the concept of how the temperature profiles change with time in dynamic geothermal systems.

Blackwell's legacy includes two maps representing major contributions to the earth sciences: the Geological Society of America's Decade of North American Geology (1992) Geothermal Map of North America and the American Association of Petroleum Geologist's Geothermal Map of North America (2004). In 2004, the detail of the original map was dramatically increased by including data from oil exploration of sedimentary basins and again in 2011 for the continental USA. These maps and the related databases stored at SMU still provide the foundation for future work on the thermal structure and the economic potential of crustal heat.

Blackwell was a fellow of the Geological Society of America. He served as chair of the Department of Geological Sciences (now Earth Sciences) from 1982-1986. He supervised two dozen graduate student dissertations as well as numerous undergraduate students. Blackwell's legacy is carried by his students, the attendees of workshops that he hosted over the life of his career, and through the SMU Geothermal Database, the primary geophysical data set that the geothermal industry first looks to acquire in assessing geothermal prospects in the United States.

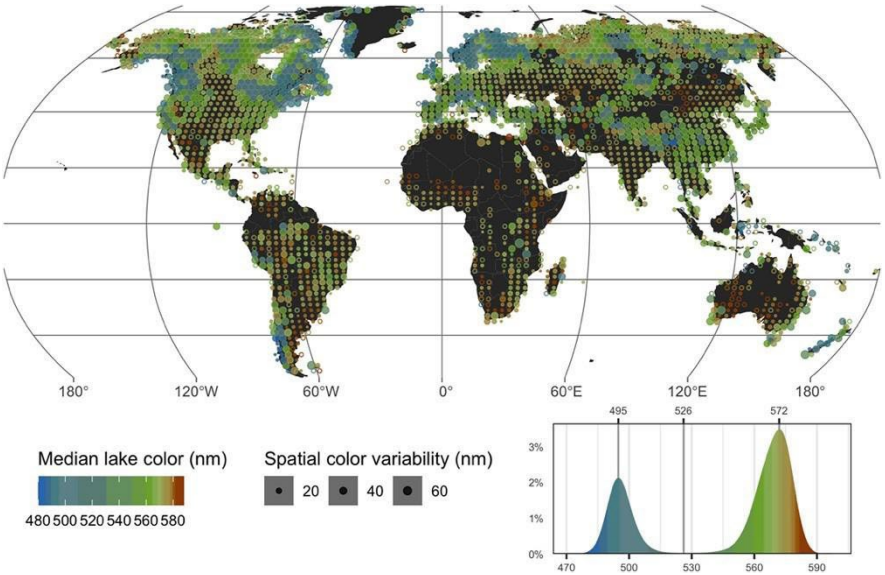
New Beginnings: Meet our newest faculty

Assistant Professor Xiao Yang
Joined SMU in August 2022

Remote Sensing of Hydrology and Limnology Lab, Earth Hazards and National Security Research Cluster

Surface freshwater such as that stored in rivers and lakes is critical for human society and for the health of ecosystems. Unlike the global oceans storing a large quantity of water in a few basins, terrestrial surface water is stored in distributed environments that are affected by the characteristics of climate, watershed geology and landcover. Dr. Xiao Yang (pictured at far right) and the current members of his lab (from left, graduate students Steve Yoon & Umanga Weerasingha; postdoc Dr. MD Mamun) use satellite remote sensing as the main tool to study the status and changes in surface water bodies. Their work aims at improving our understanding of the basic science and its applications in managing our precious freshwater resources. Trained as a geophysicist, Yang pivoted towards his current research interests in hydrology during his postdoc while working with Dr. Tamlin Pavelsky at University of North Carolina, Chapel Hill. His research broadly concerns the recent changes in global freshwater due to changes in climate and other direct human activities. In the past, Dr. Xiao Yang has worked on a diverse range of research topics, ranging from mapping human-made river barriers to investigating the pattern of water-color across tens of hundreds of lakes on our planet.

Yang's lab focuses on two major themes—freshwater ice cover and inland water quality. The lab specializes in using cutting-edge computation resources to analyze decades of satellite images to reveal patterns and changes and collects field data to benchmark and better interpret said data.



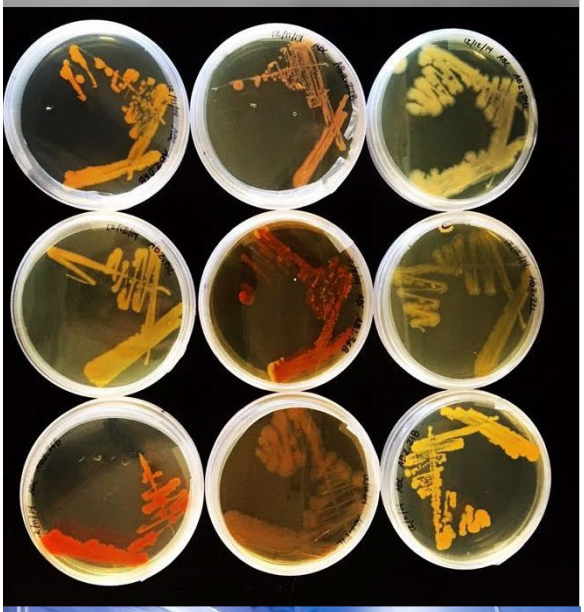
NASA satellite images from 2013-2020 reveal global lake water color distribution. Read more at: https://doi.org/10.1029/2022GL098925

Graduate, undergraduate and postdoctoral researchers currently work with diverse types of satellite data to improve monitoring capabilities of ice on lakes and rivers, investigate the drivers of ice cover durations on the freshwater bodies and to monitor water quality to help track ecosystem health. Through field data collection and collaboration, the group is ready to take advantage of the next-generation satellites that are currently planned.

Assistant Professor Alexander Chase

Joined SMU in August 2022

Environmental Microbiology & Biogeochemistry, Earth Hazards and National Security Cluster



Microbes, like all life on Earth, perform fundamental biological processes: they consume food, excrete waste, reproduce, and die, with those nutrients decomposed and recycled. These unicellular, microscopic organisms have relatively simple metabolic processes to convert energy into biomass. Some photosynthesize (and produce half of our world's oxygen!), others consume dead or living organic matter, and others can even convert gases like carbon dioxide or methane into an energy source. Far from living in isolation, microbes form intricate communities known as microbiomes and develop diversity to thrive in every known environment on Earth.

The Chase research lab focuses on the movement and transfer of carbon, particularly how organic matter is decomposed and turned over within an ecosystem. This essential process regulates the amount of carbon stored in soils and sediments versus carbon that will be returned to the atmosphere via respiration. Accordingly, we are extremely interested how these processes may shift under projected anthropogenic changes, such as drought or increased temperatures. To explore these potential changes, we employ experimental manipulation of microbiomes in the field to predict and examine their responses to changing environmental conditions.

Despite their fundamental role in regulating Earth's biogeochemical cycles, the vast majority of microbial diversity remains unknown. Estimates suggest that <1% of microbial diversity has been characterized, particularly in species-rich but understudied environments like soils and sediments. Our metagenomics research seeks to understand microbial community assembly and its governing mechanisms, with applications ranging from climate change response to biogeochemical cycling, pharmaceutical drug discovery, and human health.

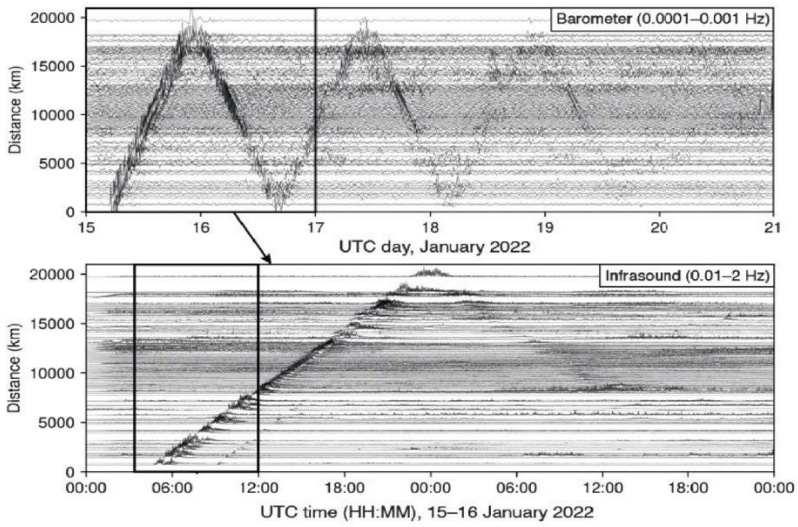
We live in a microbial world. Uncovering which microbes live where, what they are doing, and how they are cycling carbon through the solid earth and atmosphere represents one of the most exciting frontiers in modern science.

William B. Hamilton Endowed Chair
Professor Stephen Arrowsmith
Joined SMU in January 2019

Seismoacoustic Research & Monitoring Programs

Stephen Arrowsmith is a geophysicist who specializes in understanding how seismic and acoustic waves are excited, how they propagate through the solid earth and atmosphere, and how to unravel the information they contain. His group tackles both fundamental and societally impactful problems using seismic and acoustic waves. He joined SMU after spending 12 years working for the national laboratories on the use of seismic and acoustic waves for national security applications.

Since making the move, Arrowsmith has conducted research on seismoacoustic sources, propagation, and algorithms. As an example of a source, his group participated in an international effort to study the waves generated by the eruption of Hunga Tonga in 2022. The atmospheric waves from this event were truly unique: Hunga Tonga produced the largest sound recorded instrumentally since the eruption of Krakatoa in 1883. The event provided a unique opportunity to study how Earth's atmosphere responds to a sudden kick, producing waves that have not been observed since atmospheric nuclear testing era (see the figure below).



Hunga Tonga volcanic eruption 2022. Figure showing the observations of acoustic-gravity waves (top) encircling the planet four times and the acoustic waves (bottom) generated from the first pass.

Access the publication about this work in 2022 Science.

Arrowsmith's favorite thing about being at SMU has been working with students and seeing them do things he never could do himself [his quote]. For example, during the 2023 Solar Eclipse, we excited acoustic waves using an 18-wheeler truck converted into a low-frequency subwoofer to understand how the eclipse changed the atmosphere above the ground. His students have also developed a new method for detecting infrasound and seismic signals called Cardinal (the name is inspired by the Cardinal pair that nested by my window during the pandemic).

Focus on Teaching

by Lecturer Dr. Weimin Feng
Joined SMU in August 2024

Roy M. Huffington Department of Earth Sciences has a long tradition of teaching excellence. I experienced this firsthand when I completed my PhD under the guidance of Dr. Crayton Yapp in this department over a decade ago. Our department hosts world renowned scientists at the forefront of the field, an ever-changing, and always dynamic, group of graduate students from all around the globe and an increasingly diverse undergraduate student population. It behooves us to fully lean into this strength and provide an unmatched experience for our undergraduate majors and minors.

Beyond our majors and minors, Earth Sciences also occupies an important juncture of college education at SMU and across the nation. We are an essential part of the common curriculum of the institution and interface with numbers of the students well above our share of student and faculty would indicate. This provides us with opportunities to support the institutional goal of the university as well as recruit future generations of Earth Science students.

The faculty believe that learning occurs best when students are encouraged to engage with material beyond memorization, developing problem-solving skills that apply to complex environmental and geological issues. This fundamental includes getting students out into the field and into the research labs. I aim to inspire intrigue and a sense of responsibility in our students—both to their learning and to the planet. By connecting the classroom with the awes of nature and our fast-changing society, I and my colleagues hope to equip students with the tools they need to think critically about Earth's resources and their roles as future scientists, educators, or informed citizens.

Highlights from Spring Field Studies, 2022-present

From left, clockwise: Grand Canyon & Taos 2023 (Tabor, Economos), Death Valley 2024,(Economos) Mono Lake 2022 (Magnani, Hornbach), Mono Lake 2022, Death Valley 2024

Spring Field 2025: Field Experiences in Northern Belize

SMU students, under leadership from Professor Neil Tabor, are headed to Belize to study modern deposition!

The Spring 2025 Field Studies course will provide a unique experience for 20 of our undergraduates. They will spend ten days in northern Belize studying modern depositional environments in a clean-water marine system dominated by biologically-driven carbonate accumulation.

On the Ambergris Caye Peninsula, students will study fringing/ barrier/patch reefs, back-reef shallows, littoral (beach) shoreline, eolian (wind-dominated) carbonate depositional systems and lagoonal (still/slack water) depositional systems, including mangrove swamps.

They will inspect and study Pleistocene stratigraphic successions and learn to interpret their origins from modern analogs.

Finally, students will investigate the ruins of constructed environments manufactured by peoples of the pre-Columbian Mayan culture.

Group exercises are used to engage the students, including activities such as measuring air temperature, water temperature, aqueous solution pH, and ionic activity of solutions across environments.

Financial support from you allows us to support field trip costs so that all students can participate in these courses. **Thank you to our generous donors** for your continuing support of students' field & research goals. **Your contributions matter!**

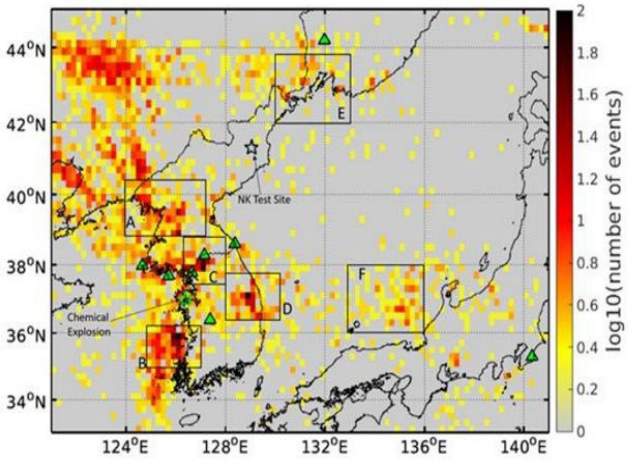
Highlighting Our Staff & Labs

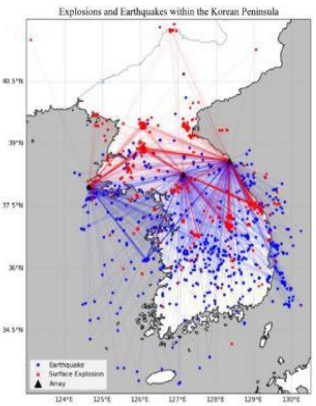
Research and teaching benefit from our professional staff scientists!

by Dr. Junghyun Park

Associate Director of Research, Seismoacoustic Research Program

I am happy to highlight the various research projects that the Seismoacoustic Research Group has focused on this year. Since 1999, our group and the Korea Institute of Geoscience and Mineral Resources (KIGAM) have cooperatively designed, built, operated, and upgraded six seismoacoustic arrays in South Korea. I published the Korean Infrasound Catalog from 1999 to 2022 (GJI, 2024), the most extended duration infrasound catalog in the world (left, figure below). Most events occur during working hours and days, suggesting a dominance of human-related signals, and those are from many anthropogenic sources such as an industrial chemical explosion, limestone open-pit mines, quarries, and North Korean underground nuclear explosions. Miro Ronac Giannone (graduate student) developed a neural network fusing both seismic and infrasound array data to improve source characterization and event discrimination across the Korean peninsula (right, figure below). The results indicate that the deep multimodal learning method can improve earthquake-explosion discrimination by correcting seismic predictions with infrasound detections (GRL, 2024).





Two-dimensional map of the density of infrasound source locations across the Korean Peninsula from 1999 to 2022 with regional infrasound arrays (green triangles). (right) Locations of earthquakes, surface explosion, and seismoacoustic arrays used in the machine learning seismic event discrimination study. Lines represent individual array detections.

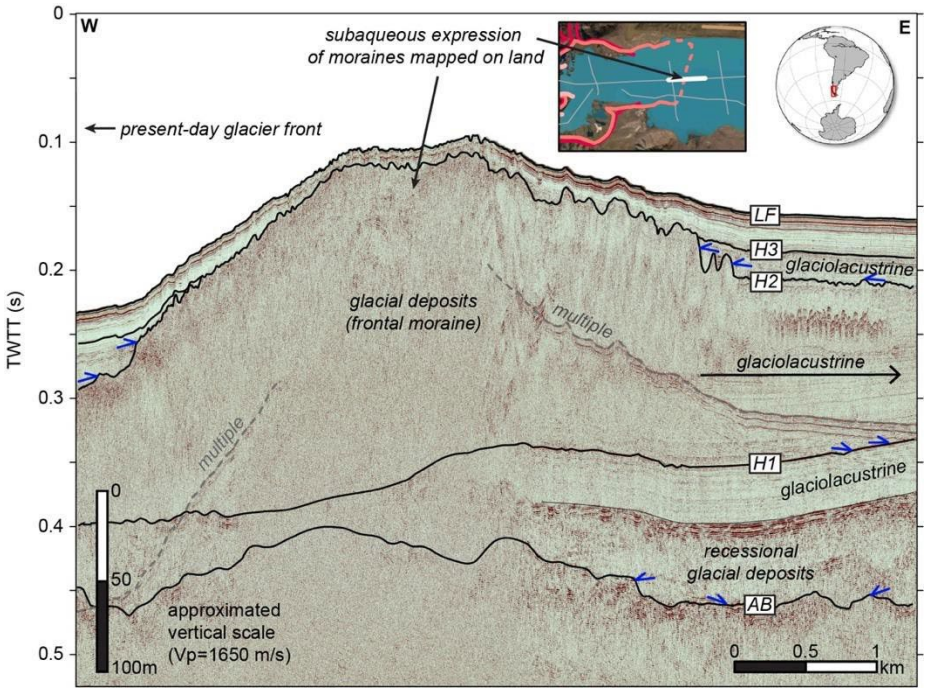
To investigate the source characteristics in Area D (figure at right), we deployed 21 Sapphire sensors developed by Dr. Chris Hayward (research scientist) at a limestone quarry in South Korea with KIGAM. We observed clear acoustic signals from three blasts deployed on the surface and carried on an airborne drone during the experiment.

Finally, Ketan Singha Roy (graduate student) developed a new method to detect and locate earthquakes based on the signal coherence and backprojection. The method can detect very small events (90% more events) using a small number of sensors and minimal tuning (SRL, 2024)

Junghyun Park installing Sapphire sensors at the surface, and on an airborne drone during an experiment in South Korea, summer 2024.

Focus on Graduate Research

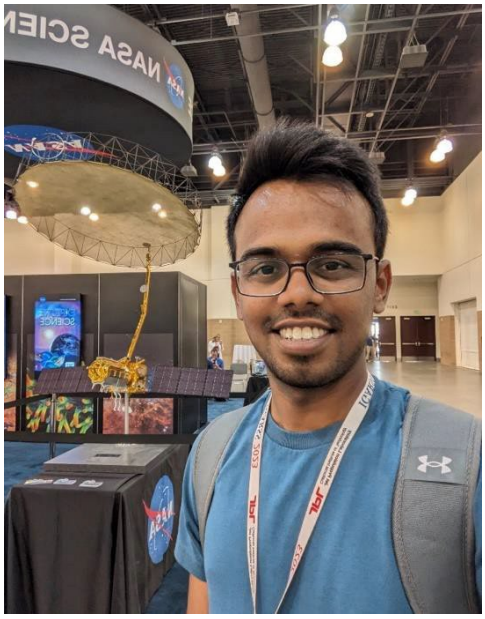
Anastasia Fedotova is a Geophysics Ph.D. candidate with Professor Beatrice Magnani who studies the interplay between climate and tectonics under the effect of an evolving cryosphere. Her research focuses on Patagonia, where tectonic forces are building the lofty Andean mountains from within, while climate simultaneously erodes them from the outside, through the action of glaciers. To understand and quantify the erosive power of glaciers, their response to climate forcing and their ultimate effect on mountain building, Anastasia uses seismic reflection imaging methods to illuminate the sediments trapped in Lago Argentino, a proglacial lake that today drains eight major calving glaciers of the Southern Patagonian Icefield. The existing glacial chronology of the area, established from moraines mapped and dated on land, suggests that the lake preserves a >20,000 year-long sediment record of glacier response to climate and tectonic forcing. Anastasia deciphers the subaqueous expression of the glacial evolution, where she finds evidence of multiple glacial re-advances in the form of subaqueous moraines that correlate with the positions of dated moraines on land, constraining the timing of the seismic stratigraphy (see figure below). These data allow Anastasia to quantify time-varying sediment volumes and basin-wide glacial erosion rates from the end of the last Ice Age to the precipitous warming of the past century. By assessing how glacial erosion rates have changed over millennial, centennial and decadal time scales, as well as over phases of ice advance versus retreat, Anastasia unravels the properties and sensitivities of past glaciers to better inform our understanding of modern ice sheets within the context of ongoing climate change.



Multi-channel reflection data acquired across Lago Argentino. The position of the imaged subaqueous moraine correlates with the position of a mapped and dated moraine on land and is interpreted as its subaqueous counterpart, thereby anchoring the chronology of the seismic stratigraphy. Horizons AB (acoustic basement), H1-H3, and LF (lake floor) are interpolated across the lake and used to define age-constrained sediment volumes, from which glacial erosion rates are calculated (Fedotova & Magnani, in press).

Jonathan Reiter is a Geophysics Ph.D. student working under Dr. Stephen Arrowsmith. He works as a research assistant and is funded under the Seismoacoustic Monitoring Program (SAMP). He has lived in the Dallas area his entire life, attending the University of Texas at Dallas for a BS in Geology, minor Geospatial Information Sciences. His senior capstone project addressed low-magnitude precursory earthquake detection prior to the induced magnitude 5.5 Pohang seismic event via deep learning. He is currently working on a high-frequency infrasound catalog for areas in Korea and Nevada, with strong interests in pursuing seismic discrimination and earthquake mechanics through means of seismoacoustics. Regarding future research he says, **"I plan on continuing to take advantage of the vast resources and knowledge that SMU affords by proposing a research idea in low-magnitude, shallow earthquake detection, using seismic and infrasound signals to better understand the coupling mechanism, especially as anthropogenic, fluid-induced earthquakes become a societally relevant topic. The expertise, reputation, and environment that the university and department fosters make me extremely excited for what the future holds."**

Vamshi Karanam is a Ph.D. candidate in Geophysics working with Dr. Zhong Lu. He is currently supported by the NASA FINESST Research Grant. He holds a master's degree in Remote Sensing and GIS from the Indian Institute of Technology (IIT) Roorkee, India. He has a keen interest in using satellite data to understand the environmental impact of energy production.



His research focuses on analyzing satellite data to assess geohazards related to hydrocarbon operations in the Permian Basin, a crucial area for U.S. energy self-reliance. He has observed significant surface deformation associated with hydrocarbon production and wastewater injection, providing insights into how these activities affect infrastructure and environmental stability. His recent publications explore the links between oil well blowouts, wastewater injection, earthquakes and surface deformation. The lessons learned from the Permian Basin will be valuable to other oil-producing regions. He says, "**I seek to enhance industry practices & contribute to the ongoing conversation about sustainability in the energy sector, preparing for a career that connects academic knowledge with real-world applications."**

Faculty Research Updates

Heather DeShon The earthquake seismology lab conducts research on earthquake physics and subsurface imaging associated with subduction systems and intraplate faults. Under Texas Seismic Network funding, we completed a series of studies constraining the depths of induced earthquakes in the southeastern Delaware basin from 2009-present and continue to develop methods to use converted seismic phases to improve earthquake location (Aziz Zanjani et al. 2024a,b). We have also been rebuilding and expanding earthquake catalogs using machine learning techniques, with focus on ocean bottom seismic data, New Madrid seismic zone and Texas and conduct collaboratives with many faculty in the department. With the 2024 Hamilton Visiting Scholar, Dr. Deepak Chamlagain, the DeShon and Magnani groups are building out new research focused on the Nepal/Bhutan Himalaya.

M. Beatrice Magnani My lab focuses on the study of continental lithosphere using man-made seismic waves. In the last few years we have become interested in the interactions between the solid earth and climate. While one could hardly imagine a more striking contrast than that between the slow evolution of hard, dense tectonic plates and the fluid, rapidly changing atmosphere, the connections between the climate and tectonic systems are in fact quite deep and subtle. In Patagonia my students and I are finding that glaciers have been keeping pace with tectonics by profoundly eroding the landscape at rates modulated by climate for the past 20,000 yrs. Correlating climate, glacier dynamics and subglacial morphology, we have established constraints on the factors that control the elusive glacial erosion, a critical process for understanding the feedback between climate and tectonics.

Crayton Yapp Common iron oxides (e.g., goethite and hematite) are dominant minerals in the ancient iron ore deposits that are a fundamental resource in the modern global economy. The specific conditions that produced ore-grade enrichment of these iron oxides in surficial weathering environments at various times and places in Earth's history may be revealed by analysis of natural variations in the stable isotope compositions of the oxygen and/or hydrogen in the ore minerals themselves – with caveats. Data from controlled mineral synthesis experiments suggest that, in addition to temperature, there is a systematic relationship between the acidity (pH) of ambient water and the oxygen isotope composition of iron oxides crystallizing from that water. We have developed a mechanistic model that predicts the existence of such a relationship because of different rates of certain sequential reactions in the crystallization process. Although this research suggests possible complications, it points to the richness of environmental information that might be gleaned from these economically important rusty relics of Earth’s history.

Brian Stump I will retire at the end of the Fall 2024 semester. The opportunity to teach at both the undergraduate and graduate levels at SMU has been a privilege. Especially important has been teaching at the introductory level to provide a lab-based science experience to our undergraduates. My research will continue as work with faculty and colleagues at SMU provides opportunities to improve our understanding of Texas earthquakes, to develop new monitoring techniques for underground nuclear explosions, and to investigate the role seismoacoustics play to delineate natural and human made sources at the solid earth atmosphere boundary.

Matthew Hornbach Matt has been on leave at the US Naval Research Laboratory (NRL) where he works closely with three SMU alumni (Ben Phrampus, Joey Renzaglia, Annie Li). As a professor on-leave, Matt remains affiliated with the department and continues to collaborate and serve on committees both in the Earth Sciences Department and Lyle School of Engineering. His research team currently focuses on real-time marine environmental awareness, subsea instrumentation testing/development, and DoD energy resilience. Matt's SMU interactions (and student recruitment from SMU) will only continue, as our department maintains a strong research focus on hazards and national security—both areas that closely align with NRL/DoD research priorities.

Robert Gregory David Blackwell helped recruit me to SMU at the end of 1988. My interest in ancient hydrothermal systems and the use of conservation of energy arguments involving heat flow to constrain fluid fluxes at midocean ridges was a source of common interest with Dave. During my Cretaceous south polar paleoclimate studies of Victoria, Australia, Dave's understanding of near surface thermal gradients was extremely useful for work that demonstrated the possibility of high latitude subfreezing mean annual temperatures during a time commonly interrupted as a global greenhouse time. I continue to oversee the Stable Isotope Laboratory and am currently working with my graduate students on studies of the Wichita Mountains and CO2 tracers in local Dallas waters that track large-scale atmospheric patterns and change.

Neil Tabor Our research program continues to work with collaborators to understand the environmental context of the Permian-Triassic extinction, Earth's largest biodiversity loss, which occurred about 252 million years ago. Current work is focused on western China, South Africa, and north-central Texas. Professor Tabor works closely with Drs. John Robbins and Nessa Keene in supporting activities of the Stable Isotope Laboratory and the X-ray facilities, respectively. Ph.D. students within the "Taboratory" include Jerod Aguilar who is working on origin of life studies, Meklit Dirirsa who is working on Middle Stone Age human occupation sites in northwestern Ethiopia, and Cody Schulte who is working with stable isotope geochemistry of Permian-age fossil pelycosaur teeth, which are the distant ancestors of modern mammals. Dr. Bukola Ogungbe continues to function as the organizational leader in the laboratories. Finally, visiting scholar Dr. Farhad Khormali will be working with the Taboratory in 2025 to study modern soil processes in Iran, Tajikistan and California. Things are keeping busy in the Taboratory!

Zhong Lu The radar remote sensing group is interested in developing satellite radar interferometry processing techniques and their applications in the study of natural and anthropogenic hazards and natural resources. Recent projects include volcano deformation cycle and magma plumbing systems; hydrogeological processes associated with hydrocarbon activity and subsurface fluid movement; groundwater extraction and characterization of aquifer systems; glacier retreat induced by climate change and activation of unstable slopes; and monitoring of infrastructure stability.

Alumni Updates

Vashan Wright Assistant Professor, CIFAR Azrieli Global Scholar, Tectonorock-physics Lab, Scripps Institution of Oceanography University of California San Diego. Vashan studies tectonics, paleoseismicity, and earthquake-triggered hazards by examining the porous sections of planetary crusts using remote (e.g., seismic waves and photons) and direct observation methods (e.g., examining cores). I combine data to understand how internal and externally introduced forcings influence if, when, and how porous planetary materials deform on various length scales.

Yasmin Jackson I am currently employed as a geologist with the U.S. Army Corps of Engineers. Most of my work is currently within Dam and Levee Safety, where I partner with engineers to reduce the risk of mechanical erosion through our earthen dams and levees and maintain the safety of cities and towns near these structures. I have also participated in drilling investigations for military construction projects, in which I examine drill cores for their lithology, rock strength, and any signs of potential foundation problems in the subsurface. These projects are just a few examples of opportunities that engineering geology and hydrogeology can offer future geologists!

Juan Pablo Esparza Exploring national park units in the Field Studies course inspired me to pursue a career with the National Park Service. After graduation, I served as a Community Volunteer Ambassador intern at Dinosaur National Monument. In this role, I assisted park rangers and resource managers with volunteer program operations and community outreach. Most recently, I joined the National Park Service Washington Support Office's Volunteers-In-Parks team as the National Community Volunteer Ambassador Leader, where I now provides peer support to other interns and contribute to projects impacting the nationwide program.

Where have your adventures taken you?

Stay in touch!

Contact
geol@smu.edu

Louis Urtecho After three years in Dr. Arrowsmith's lab studying infrasound, I am now studying remote sensing at Cornell University as a PhD student under the advisement of Dr. Rowena Lohman. My research focuses on the effects of precipitation on remote sensing specifically, synthetic aperture radar (SAR). SAR is a microwave remote sensing technique used to measure a variety of surface processes, and what we have found is that precipitation-induced refraction of SAR microwaves adds errors of up to 15 centimeters to ground deformation estimates. This has serious implications, especially in regions such as Oklahoma, where small, transient signals from fracking or wastewater injection (on the order of 1-2 cm) may be overlooked or misattributed because of storm signatures present in SAR data.

Congratulations to the B.S. and B.A. Earth Sciences graduates!

2020-2021
Adele Marie Carlson, B.S. Geophysics
Rebekah Grace Ensley, B.A. Environmental Studies
Tanyon Bryce Hejny, B.A. Geology
Jason B. Jordan, B.S. Geology
Lars William Koehn, B.S. Geology
Tom Kyritz, B.S. Geology
Benjamin Martin, B.A. Environmental Studies
Lauren Steel, B.S. Environmental Sciences, B.A. Geology
Parker Torres, B.S. Earth Science

2021-2022
Isabelle Galko, B.S. Environmental Sciences
Melodie Malithong, B.S. Environmental Sciences
Terrence Newman, B.A. Earth Sciences
Michelle Solarczyk, B.A. Geology
Chanel Stinson, B.A. Environmental Studies
Alexander Williams, B.S. Environmental Sciences

2022-2023
Sparrow Caldwell, B.A. Earth Sciences, Environmental Studies
Juan Pablo Esparza, B.S. Earth Sciences, Geology
Megan Keller, B.A. Earth Sciences, Environmental Studies
Dylan McAden, B.S. Earth Sciences, Geology
Elena Muir, B.S. Earth Sciences, Geology
Duncan Oliphant, B.A. Earth Sciences, Environmental Studies
Louis Urtecho, B.A. Earth Sciences, Self-designed
Alexandra Walters, B.A. Earth Sciences, Environmental Studies

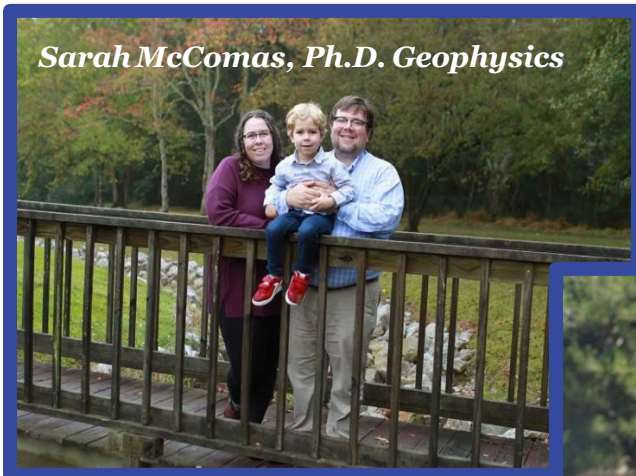
2023-2024
Timothy Chae, B.A. Earth Sciences, Environmental Studies
Millie Metchick, B.S. Earth Sciences, Environmental & Resources
Gracie McKethan, B.A. Earth Sciences, Environmental Studies
Travis Nolan, B.S. Earth Sciences, Self-Designed, Paleontology
Joseph Silver B.A. Earth Sciences, Environmental Studies
Niklaus Day B.A. Earth Sciences, Environmental Studies
Olivia Maddox, B.S. Earth Sciences, Self-Designed
Carson Garrett, B.A. Earth Sciences, Geology
Thor Reneau, B.A. Earth Sciences, Environmental Studies
Boden Svang, B.S. Earth Sciences, Geology Specialization

Say hello to our 2022-2024 MS and PhD graduates!

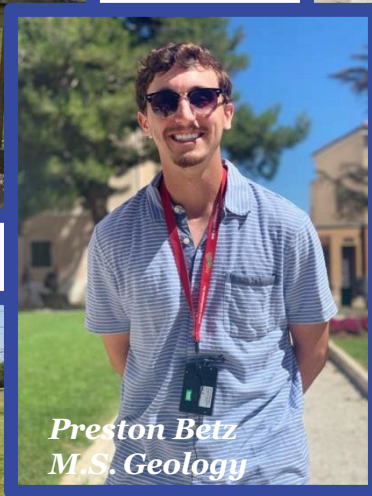

Fransiska Dannemann
Ph.D. Geophysics


Yuankun Xu, Ph.D. Geophysics

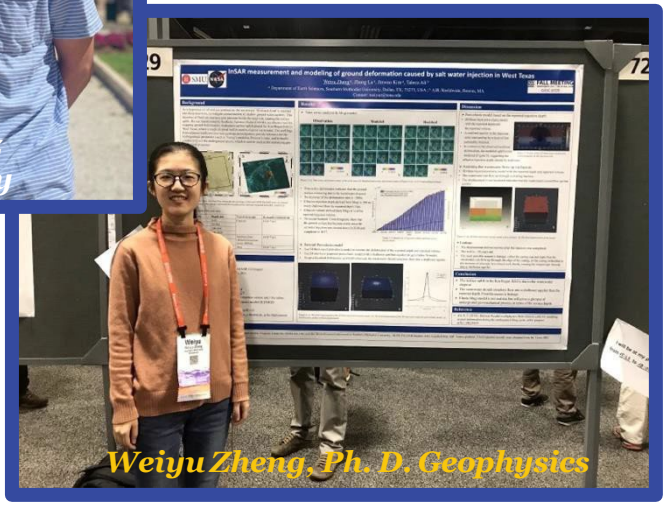

Uma Lad, M.S. Geology

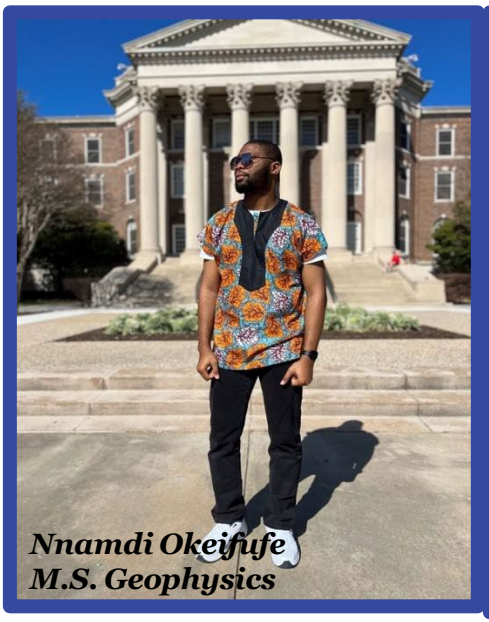

Sarah McComas, Ph.D. Geophysics

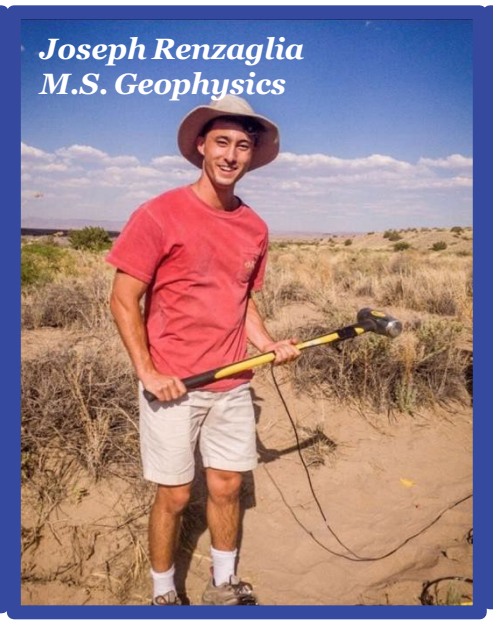

SeongJu Jeong, Ph.D. Geophysics

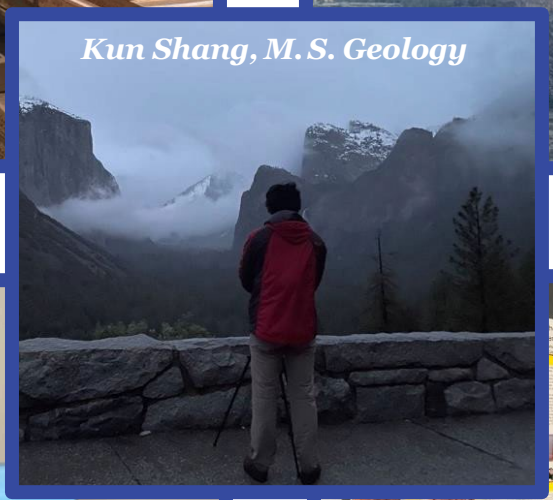

Preston Betz
M.S. Geology

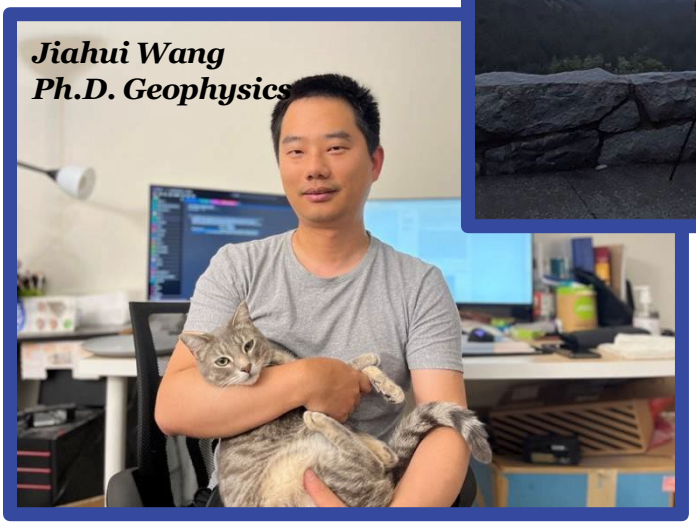

Louis Quinones, Ph.D. Geophysics


Weiyu Zheng, Ph. D. Geophysics





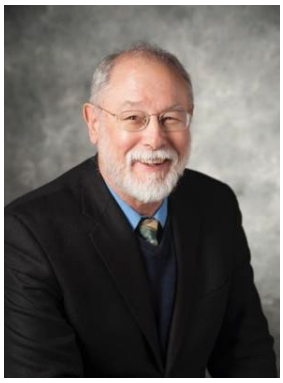




Not pictured: Anastasia Fedotova, Ph.D. Geophysics; Jesse Howard, Ph.D Geophysics; Courtney McCracken, M.S. Geology; Jordan Wright, Ph.D. Geology

Recent Honors and Leadership Recognition of Faculty

Professor Zhong Lu, Shuler-Foscue Endowed Chair in Earth Sciences, **was named an American Geophysical Union (AGU) fellow in Fall 2024.** He is recognized for research relating to volcanoes, landslides, coastal subsidence, and human-induced geohazards. He and his research team use INSAR to quantify surface deformation that is combined with physical models to constrain both natural and human induced hazard.



Professor Robert Gregory, *ad interim* Matthews Endowed Chair in Geology and past Chair of Earth Sciences, **was named an American Association for the Advancement of Science (AAAS) Fellow in 2022** for distinguished contributions to his field. He was honored particularly for his research on how the Earth's dynamic systems, and his teaching on how the solar system and the cosmos, impact the world around us.

Professor Crayton J. Yapp was recognized as a Fellow of the Geological Society of America in 2021 for his fundamental research contributions to stable isotope geochemistry in low-temperature systems as diverse as land snail shells, modern and fossil plants and iron oxy-hydroxides. He is also recognized for contributing to the growth and development of an entire generation of stable isotope geochemists.

Professor Heather DeShon was elected President of the Seismological Society of America and is now serving in this national leadership role. SSA is "committed to advancing seismology and sharing research with the public to help build an earthquake-aware world."

Professor Beatrice Magnani was elected Vice Chair of the EarthScope Consortium Board of Directors and now serves in this capacity. EarthScope represents educational and research institutions chartered in the United States, with a major commitment to research in geodesy or seismology and related fields. The organization represents 177 voting members and 219 additional associate members from around the world.

Events & Adventures

Our Department Friday Seminar Series is now hybrid! Join our free Seminar Series Fridays at 12 PM featuring visiting speakers from around the world. Schedule here

In Dallas for Family Weekend? Join us for **Rocktoberfest**, a special Friday seminar featuring research and topical science from one alumni, one current graduate student, and one faculty member. Interested in speaking at this event – email Heather DeShon at hdeshon@smu.edu.

In town for May graduation? Alumni are welcome to attend our annual evening gathering celebrating our graduates, field trip memories, and research accomplishments of the department's scientists. Contact Stephanie Schwob at geol@smu.edu to arrange invitation.

Interested in sharing your experiences in Earth Sciences or your pathway following graduation? The Department, in conjunction with GeoClub and Hegi Center, are always looking for **Alumni Panel volunteers**.

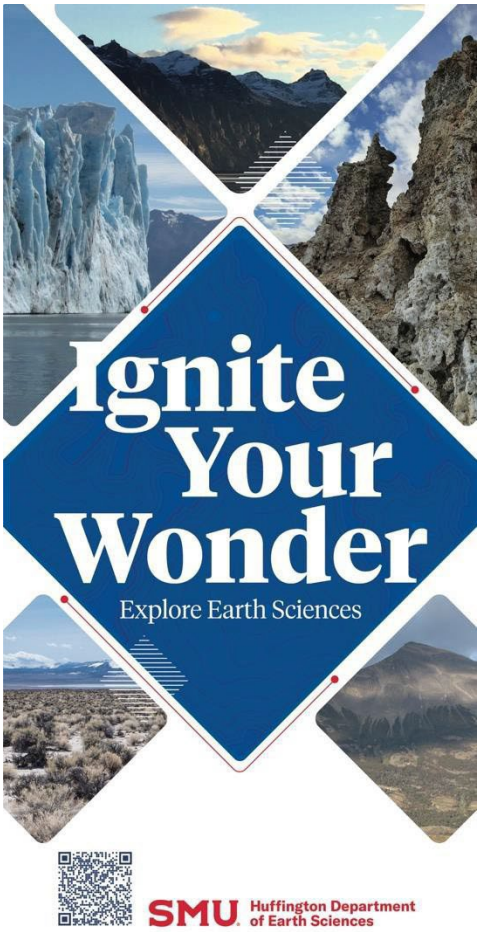
SMU alums, faculty, research staff and students at SSA 2024, Anchorage, Alaska

Don't forget to say hi at AGU, GSA, Goldschmidt, SVP or other meetings!

SMU Giving Day is March 11, 2025

Contributions to the Earth Sciences department support purchases of classroom equipment such as microscopes, field costs for undergraduate and graduate students, and cutting-edge scientific equipment purchases to ensure the continued success of our teaching and research programs.

The Hilltop Geospheres was produced by Brian Stump, Tina Ivey, Stephanie Schwob and Heather DeShon in the Roy M. Huffington Department of Earth Sciences. Thank you to all contributors!



Southern Methodist University
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P.O. Box 750395
Dallas, Texas 75275-0395

Mailing Address Sticker

FACULTY MEMBERS in EARTH SCIENCES

Stephen Arrowsmith, Professor and Hamilton Chair, Ph.D. University of Leeds, United Kingdom.
Alexander Chase, Assistant Professor, University of California, Irvine.
Heather DeShon, Professor, Chair, Ph.D., University of California, Santa Cruz.
Weimin Feng, Lecturer, Ph.D. Southern Methodist University.
Robert T. Gregory, Professor and *ad interim* Matthews Chair, Ph.D., California Institute of Technology.
Matthew Hornbach, Professor, Ph.D., University of Wyoming.
Louis L. Jacobs, Professor Emeritus, Ph.D., University of Arizona.
Bonnie F. Jacobs, Professor Emerita, Ph.D., University of Arizona.
Zhong Lu, Professor and Shuler-Foscue Chair, Ph.D. University of Alaska.
Maria Beatrice Magnani, Professor, Director of Graduate Studies, Ph.D., University of Perugia, Italy.
James E. Quick, Professor Emeritus, Ph.D., California Institute of Technology.
Brian W. Stump, Professor and Albritton Chair, Ph.D., University of California, Berkeley.
Neil J. Tabor, Professor, Director of Undergraduate Studies, Ph.D., University of California, Davis.
John V. Walther, Professor Emeritus, Ph.D., University of California, Berkeley.
Xiao Yang, Assistant Professor, Ph.D., University of North Carolina, Chapel Hill.
Crayton J. Yapp, Professor, Ph.D., California Institute of Technology.

Hamilton Visiting Professor 2023-2024
Deepak Chamlagain, Associate Professor, Tribhuvan University, Nepal. Ph.D., University of the Ryukyus..

SELECTED ADJUNCT FACULTY

Rita C. Economos, Research Professor, Ph.D., University of Southern California.
Anthony Fiorillo, Research Professor, Ph.D., Pennsylvania. Museum of Nature & Science.
Mihan H. McKenna, Research Professor, Ph.D., Southern Methodist University.
Matthew Siegler, Research Professor, Ph.D. University of California, Los Angeles.
H. Troy Stuckey, Adjunct Professor, Ph.D., University of North Texas. EPA. Environmental science and policy.
Alisa J. Winkler, Research Professor, Ph.D., Southern Methodist University.
Dale A.Winkler, Director, Shuler Museum of Paleontology, Ph.D., UT Austin.
Pierre A. Zippi, Research Professor, Ph.D., University of Toronto.