

TEXAS TECH UNIVERSITY Department of Geosciences^{**}

Caprock Connections Fall 2022

Welcome to the Fall 2022 Department of Geosciences Newsletter

I hope this message finds you well and looking forwards to the Holiday season. Many things have changed in the Department and we are excited to share our achievements with you.

In the last 2 years we have celebrated the storied careers of Tom Lehman, Cal Barnes, George Asquith, Kevin Mulligan, Sankar Chatterjee and Lucia Barbato who all made tremendous contributions to the Department and University. We enjoy their occasional visits to the Department and thank them for continuing to share their knowledge and experience with colleagues and students. At the same time, we are equally pleased to have welcomed 5 new colleagues to the faculty (Ardill, Bhattachan, Nittrouer, Rana and Xu), with a 6th (Tung) scheduled to join us in January 2023; a short introduction to them all may be found below.

In a period of flux and uncertainty for many departments that focus on Earth, Planetary, Atmospheric and Environmental sciences, Geosciences at Texas Tech has realized significant gains in the last 2-3 years. Negative enrollment trends have been reversed, with our number of declared majors, graduate students, and undergraduates enrolled in general-science courses all increasing. The Department's research footprint is well aligned with

University strategic priorities, and our relevance to many State and National priorities is reflected in our robust success in the pursuit of external funding to support research and education.

At the heart of it all remain our students who continue to do great things. Our students are successful in the learning environment, contribute to excellence in research, and secure employment across a broad spectrum of disciplines. Many remain in Earth, Atmospheric, Environmental and Geographic Sciences, whilst others enter a broad diversity of careers demonstrating the value of the solid foundational education they receive at Texas Tech. Their success draws upon many inputs, with some of the most important contributions coming from alumni and friends of the Department who generously give their time, expertise and guidance through the provision of workshops, seminars



and mentorship.

Many alumni and friends generously support students through contributions to scholarship and research funds. In the next few newsletters we will showcase a few examples of how students use funding awards to promote academic success, and more broadly, gain opportunities to participate in experiential learning and research experiences. Examples include tuition support, field trip participation, conference and workshop travel, and support of research expenses. Partnering with alumni and friends to support student success is one of the great privileges of this job to and I thank you for all that you do to promote student success.

Regards,

Callum Hetherington Ph.D. Department Chair callum.hetherington@ttu.edu

Faculty News

This past year we welcomed several new faculty members to the Department of Geosciences, learn more about them here!

Xuantong Wang is an Assistant Professor at the Department of Geosciences at Texas Tech University. He received his Ph.D. in Geography from the University of Denver. In his dissertation, he developed a GeoAI-based method for mapping GDP at sub-national levels using multi-source data to support the request for rapid and spatially explicit assessment of socio-economic development.

His research is in the broad area of geospatial big data analytics. He brings a geographic perspective and an expertise in GIS and spatial data analysis to bear on interesting interdisciplinary questions of sustainability, spatial representation of socioeconomic activity, human mobility, and the utilization of artificial intelligence to facilitate our decision and policy-making processes.



To learn more about Dr. Wang check out his faculty webpage here: <u>https://www.depts.ttu.edu/geosciences/peo-ple/geography/Wang.php</u>

Dr. Nittrouer's teaching and research focus on geomorphology – the study of dynamic processes impacting the Earth's surface – with a particular emphasis on components of river systems, including their channels, floodplains, and deltas. His scientific methods combine detailed measurements from modern rivers with numerical models, to explore hydrology and patterns of sediment transport, deposition and erosion.

This research has many applications. For example, river landscapes are some of the most dynamic environments on Earth, and yet are heavily relied upon for societal welfare because they promote and enhance transportation, commerce, water management and recreation. As such, evaluating river operations is critical for efforts that preserve environmental integrity, as well as mitigate impacts to, and sustainability of, critical infrastructure.



Furthermore, Dr. Nittrouer examines how natural climate perturbations in Earth's history have shaped rivers in the past: the stratigraphy of ancient sediment deposits provides evidence that is used to reconstruct the impact of past climate-change events on hydrology and sedimentation. Combined with an expertise of modern systems, Dr. Nittrouer's science informs about the fate of rivers impacted by ongoing climate change.

To learn more about Dr. Nittrouer, visit his webpage here: https://www.sedimentology.geo.ttu.edu/



Dr. Birendra Rana joins Texas Tech from the University of Nevada - Reno where he earned his doctorate degree. Dr. Rana is an award-winning researcher, instructor, and consultant in methodological application of GIS to answer research questions in Renewable Energy, Sustainable Development, Climate Change, Environmental Justice, and Human-Environment interaction.

He is passionate about Geospatial Analysis and its applications in Eco-

nomic, Environmental, Health, Transport, & Urban Geography. He has demonstrated excellence in conducting research, and securing external grants.

To learn more about Dr. Rana check out his website here: <u>https://www.birendrarana.com/</u>

Dr. Chao Xu joins Texas Tech as a Professor of Practice from Florida Atlantic University. Dr. Xu has a passion for reading maps which has been his hobby since he was a child. Originally, Dr. Xu had planned on becoming a software engineer with dreams of working in Silicon Valley. After some consideration, Dr. Xu changed his major to geosciences focusing on geospacial sciences and technologies. This allowed him to intersect his lifelong hobby and his expertise in computer science.

Dr. Xu's research laid a foundation to investigate the long-term spatiotemporal dynamics of tidal flats in the conterminous U.S.. The first project on the characteristics of tidal flats explored a novel perspective to observe and understand the spatiotemporal change patterns in the real world. In the second project, he exported the annual extents of tidal flats throughout the conterminous U.S. from 1984 to 2020 with the spatial resolution of 30 m. Based on the maps generated from the second project, as well as the annual maps of urban extents generated by peers,



the third project implemented a comprehensive assessment in terms of tidal flat loss associated with the massive urban expansion in the conterminous coastal U.S. from 1985 to 2015.



Dr. Katie Ardill joins Texas Tech as an Assistant Professor specializing in Igneous Petrology. Dr. Ardill's research focuses on the behavior of continental arc systems, and how magmatism evolves across space and time. She is interested in how arcs are modified by events such as flare-ups in magma or focusing of magma, the connection between magma storage regions and volcanoes, and how magmas physically and chemically evolve during solidification. She enjoys geologic mapping and fieldwork to explore and develop my research questions and complement this with petrography and lab analyses.

This year, I am setting up a new lab that will house research-grade petrographic microscopes and an optical cathodoluminescence instrument to analyze zoning patterns in common rock-forming minerals. I am currently looking for students to join my new research group, starting next summer with fieldwork in the Sierra Nevada in California to study plutonic-volcanic relationships and magmatic-tectonic links.

Dr. Abinash Bhattachan joins us as an Assistant Professor in Geography! Dr. Bhattachan is a broadly trained environmental scientist who studies the effects of climate change and land-use change on dryland, coastal and urban systems. He will combine field and lab experiments, geospatial data analyses and socioeconomic data to answer interesting research questions. He is committed to pursuing research that is actionable, solution-oriented, and policy-relevant.





Dr. Jay Sui Tung will join us for the Spring 2023 semester as an Assistnat Professor in Geophysics. Dr. Tung is an active researcher and you can learn more about his research and his latest work by checking out his website <u>here</u>. Once Dr. Tung has settled in Lubbock, we will have a full feature in a future newsletter!

Department Highlights



Congratulations to Dr. Sankar Chatterjee on his recent retirement! Dr. Chatterjee has served Texas Tech University for over 40 years stepping away from his roles as Paul Whitfield Horn Distinguished Professor and Curator of Paleontology. We want to thank Dr. Chatterjee for his years of service and dedication to the Department of Geosciences. We look forward to hearing about Dr. Chatterjee's new adventures as he begins his next chapter. A feature on Dr. Chatterjee and his career and retirement can be found here.

In Memory

The Department was sad to hear about the passing of Ben S. Harrison Jr. (1927 - 2022). Mr. Harrison earned a Master of Science in Geophysics in 1981 and taught in the department for 10 years.

Mr. Harrison's obituary can be found here.



Excellence in Research

Dr. Nittrouer has had a recent publication reach national attention! Dr. Nittrouer and a former postdoctoral research scientist in his lab were recently featured on their work on showing that dams may enhance flood risk. Dr. Nittrouer publication can be found <u>here</u>. This work was also featured in a Texas Tech Today article which can also be found <u>here</u> as well as a feature on NPR in Arizona that can be found <u>here</u>.

Excellence in Teaching



Congratulations to our very own Dr. Aaron Yoshinobu for winning the Texas Tech Presidential Excellence in Teaching Award! The award recognizes excellence in a teaching role.

When asked about how COVID affected his teaching:

"I found the past few years to be the most rewarding yet! I have witnessed such compassion, empathy and resilience in my students. I engage with students in new ways and different levels, all of which sum to more fulfilment in my teahcing mission than I have experienced in the past. I am very grateful for these opportunities," - Dr. Aaron Yoshinobu

We are very proud of Dr. Yoshinobu's teaching efforts!

Excellence in Support

Congratulations also go to our Associate Director of Student Affairs and Academic Advisor for recieving an award for Excellence in Support from the College of Arts and Sciences.

As many faculty, staff, and students can attest, Celeste is a vital part of the Geosciences team and is more than deserving of such a prestigeous award!



Alumni Spotlights



Cindy Welch who graduated with an bachelor's degree in Geosciences in 1999 and completed a master's degree also in Geosciences was named a 2022 Arts and Sciences Distingushed Alumni! Since graduating from Texas Tech, Cindy has gone on to become a Texas licensed Professional Geoscientists with over 20 years of experience in the industry. Cindy has worked for companies such as Texaco, and Chevron along with other large independent and private equity firms. Currently, Cindy is a principal partner at Tier 1 Resource Partners. In 2019, Cindy was honored as one of Oil & Gas Investor Magazine's 25 Most Influential Women in Energy which can be found here. Congratulations to Cindy on all of her accomplishments!



Congratulations to Dr. Tarek Kandakji for his appointment as Remote Sensing Specialist and Manager of the Yale Center for Earth Observation at Yale University! Dr. Kandakji earned his Ph.D. in Geosciences in 2020 where he focused on identification and spatio-temporal analysis of dust point sources in the southwestern United States using remote sensing, and applying robotics in wind erosion studies. To learn more about Dr. Kandakji's appointment and research activities visit the Yale Center for Earth Observation <u>here</u>.

Student Spotlight

Geography and GIScience M.S. Student Tarak Aziz is a recipiant of the 2022-2023 Helen DeVitt Jones Graduate Fellowship! Helen DeVitt Jones Fellowship is one of the prestigious fellowship in Texas Tech University. Which was established in 2003 from the generous donation from the Helen Jones Foundation. The Helen Jones Fellows is recruited and selected from the most outstanding graduate students available.

"It is my great honor to tell you that I have received Helen DeVitt Jones Fellowship for the year 2022-2023," Tarek.

With support from donations to the Department, Tarek was able to attend STOREP 2022: "Economics and the Economic System: The Ecological Transition". Tarek wrote about his experience here:

STOREP annual conference 2022 was organized in Viterbo, Italy focusing the young researchers to come up with innovative ways to navigate the Ecological Transition. I have presented my paper on 'Geospatial analysis of

flood risk and exploring the feasibility of flood micro-insurance in Bangladesh' under regional environmental case studies. I was able to attend numerous sessions. I gained valuable experience that could not be obtained anywhere else. I was able to focus on topics that directly relate to my ongoing research and find some innovative ideas that will help me in my present research. In addition to the conference sessions, the chance to network with other colleagues in similar situations was an extremely valuable experience. I was able to speak with several experts who provided tips and useful information for my particular dilemmas and work projects.

I want to thank department of Geoscience, Texas Tech University for giving me the opportunity to go and present my research in STOREP 2022 conference.



Logan Fink, a Geosciences Undergraduate sophomore, is a recipiant of the Goldwater Scholarship for Future Researchers! Of his experience, Logan says:

This was a weeklong research camp focusing on Rare Earth Elements in hydrothermal solutions. This camp was a neat introduction into hydrothermal processes in a geologic context as well as the formation of ores with Rare Earth elements. We has several lectures on these topics as well as some time in the microscopy lab to view this sections of hydrothermal veins of carbonatite and fluorite that we viewed in the field trip in the previous day. We also had a day of 100% lab work where we were introduced and taught how to use machines such as UV-Vis, X-ray diffraction, Raman spectrometer, And two ICP machines I believe ICP-OES and ICP-MS. After this we were given a rudimentary review of thermos dynamics to prepare us for using the thermodynamic modeling software

GEMS where we were taught and made our own model of a roc alteration process using the MINES database. This Camp was a great introduction to the classes I am about to take but also made it a little challenging to understand something but overall this camp is a great experience for anyone trying to figure out what hey want to do. It gives you a taste of geochemistry, minerology and a little economic geology and would be a great camp for someone who wants to be in this field to get a good introductory experience and to make contact with some people wo can help you succeed in the future. It is also a very great way for a young aspiring geologist to get out there and make some friend outside of your classroom that have similar career goals as you and who can be a great resource in graduate school hunting, networking and much more.

Logan was also recently hired by Freeport-McMoRan for a summer internship focusted on copper deposits. He will be in Silver City, NM.

Congratulations also go out to Geosciences Undergraduate student Olivia Retería for being awarded a student award for the President's Excellence in Diversity, Equity & Inclusion Award! Olivia is one of two student award winners and has made an incredible imapct on diversity, equity, & inclusion along with maintaining excellence in academic standing. To learn more about Olivia's award and to look at her accomplishments, click <u>here</u>.



Keely Patelski is an inaugural member of the Risk and Equity in Disasters (RED) Lab, co-directed by Dr. Jen Henderson and Dr. Rodolfo Hernández in Geography. She was instrumental in helping to design our <u>RED Lab</u> <u>website</u> and has helped with NOAA-funded research endeavors, including the Envision Lubbock workshop in November 2022 with Estacado and Frenship high school students. Last summer, Keely received a competitive NSF REU fellowship to spent two months at the Natural Hazards Engineering Research Infrastructure RAPID facility at the University of Washington in Seattle. There, she learned to use different types of equipment, such as drones, LiDAR, and the z-boat, to study hazards. She presented her work at a research symposium at the end of summer, a collaboration with Rebecca Napolitano and Saanchi Singh Kaushai from Penn State. Based on the Quad-state tornadoes of December 2021, in Mayfield, KY, Keely used UAV and Lidar data collected by a team in March 2022 to produce accurate combined Structure-from-Motion (SfM) and LiDAR point cloud models of the

damaged historic masonry buildings in Mayfield. Her paper can be found at DesignSafe CI. Keely is currently applying for graduate school programs in Geography, including the M.S. program here at Texas Tech University having graduated Magna Cum Laude.

Link to paper can be found <u>here</u>.



In The Field!

Early Majors Field Trip - New Mexico



With a grant from the Pevehouse Foundation, the Department of Geosciences offered our inaugural Early Majors Field trip designed for students who have nearly completed their first year in our curriculum. This typically included students currently enrolled in History of the Earth through Deep Time. For this first trip, students embarked on a four-day, chartered-bus excursion across the southwest visiting three national parks and a state park in New Mexico. Students particularly enjoyed the visit to Petrified National Forest and Grand Canyon National Parks. We spent two nights camping and a full day hiking along the south rim of the Grand Canyon. The goal of the trip was to get students rock experience in the field earlier in their studies, while simultaneously building foundational personal connections between students and faculty before they enter the core of the geosciences curriculum. An article that Texas Tech Today put out on the trip can be found <u>here</u>.

The funding from the Pevehouse Foundation, in addition to supporting this field trip, also provided funding to purchase tents, sleeping pads and a range of camp-cooking equipment for us on field trips. This reduces the financial burden on students, reducing the need for students to purchase equipment. The balance of the funding was used to support students who participated in other field-based learning opportunities including the Bahamas field trip to study active carbonate systems and to travel to Ireland to study sedimentary systems with Jeff Nittrouer







Thank you, Dr. Sweet for leading this field trip! We know that students enjoy getting out into the field and applying the knowledge they learn in class! The connections made during this field trip are very beneficial! Our aspiration is to continue to offer a trip such as this each year to the new cohorts.

Bahamas





In the fall of 2021 and 2022, Texas Tech graduate and undergraduate students observed modern carbonate environments in San Salvador, Bahamas. Due to travel restrictions, the course was postponed a year and our group was the first students on the island in over two years. San Salvador is a small island on the eastern edge of the Bahamian archipelago with water depths of over 2 km on all sides of the platform. Students map the abundance of fossils in Pleistocene reefs and compare to modern patch reefs. Navigating the island also allows the students to study the ecosystems and sedimentology in open and protected bays. This was the fifth undertaking of the trip and the department is planning on getting back to an every other year schedule by going this fall for our SIXTH time.

Thank you Dr. Dustin Sweet & Dr. Neo McAdams for leading this memorable and impactful field trip!







Interested in a video from a previous Bahamas trip? Check it out here.

Study Abroad - South Africa

Geosciences and Social Media Communication in Pretoria, South Africa



MS Student Emily Fischer holds an impromptu chemistry lesson with children in Makgane village, Limpopo Province

In the summers of 2021 and 2022 a total of 21 Texas Tech students participated in a 4-week Study Abroad program to South Africa, based around the University of Pretoria. Students integrated field, classroom and laboratory learning on the occurrence of strategic minerals that underlie the modern, high-technology world economy. Simultaneously, students developed photo-journalism skills and learned about social-media communication strategies to communicate the outcomes of their experiences.

Thank you to Dr. Hetherington and TJ Martinez (MCOM) for leading these trips!



Chromite + Anorthosite layers the Dwars River national Heritage Site, Mpumalanga, South Africa



Texas Tech students with the statue of Nelson Mandela at the Union Buildings, Pretoria

For more information on this study abroad opportunity please visit the <u>Study Abroad informational website</u>.

Ireland

By Kryss Betzen Geology & Geophysics M.S. Student



The "Sedentary processes and stratigraphy: the delta to deep-water continuum, western Ireland" class began with a general overview of basin formation of the Western Irish Namurian Basin, or the WINB. The WINB is a time transgressive basin in Western Ireland that began forming during the Namurian in a subsiding basin. Throughout the class, we dived into several processes that affected the deposition of formations we now see in the WINB today such as river avulsions, cyclothems, shelf and slope deposits, turbidity currents, and deep-water deposits. We also reviewed the syn-depositional and post-depositional regional tectonics that affected the deposits. As a cap to the course, we had the amazing opportunity to travel to the WINB in Ireland to see real world examples of these formations and apply what we learned during the class in the field.

We traveled to Kilkee, Ireland to examine the vast WINB. Kilkee is situated in County Clare, Ireland, where the WINB spans across the county and several spectacular outcrops of formations deposited in the WINB are exposed. I saw the complete costal-to-deep-water system with field visits to deformed, overturned folds in sand and mud bodies, amalgamated channel bodies, a phosphate bed, turbidites, slump deposits, and deep-water shales with pyritized goniatites. Examining these different deposits in the WINB helped me picture the environments these deposits were found in and will assist me when interpreting outcrops with similar facies in the future.

Examining the different depositional environments located spatially across County Clare helped me picture how deposits moved across the basin over time across, which will help me apply time transgressive sequences to different basins. This Ireland trip had an incredible impact on me as a field geologist and greatly improved my understanding of time transgressive shelf to deep-water deposits in a subsiding basin. Thanks to the donors incredible generosity in helping support the trip, I was able to have an experience I will never forget and will con-

tinue to apply what I learned to my future career as a geologist.

This outcrop (pictured to the right) is located at Point of Relief and shows the contact between the Gull Island Formation and Tullig Cyclothem. In the Gull Island Formation (the bottom half of the outcrop), there are incredible examples of growth faulting and soft sediment deformation.



Impacts of Research Funding Featuring Jason Post Ph.D.



Dr. Post with his unmanned craft

I received my PhD in Geosciences in 2017 and my MS in Geography in 2014. My dissertation focused on the human dimensions of the Los Angeles River, a 51-mile-long urban waterway. It is heavily altered by concrete channelization, flood control infrastructure, and pollution, but has been the subject of major restoration efforts in recent years. In 2015 a received a Summer Research award from the Department, funded by donations from friends and alumni. The support was transformational, and the success of this project is a testament to those who support the Department.

A major goal of the research was to explore how human activity shaped the biological and physical geographies of the river. Amongst the most important goals were to describe the exotic fish communities (and resulting fishing opportunities) on the LA River by mapping aquatic habitats. The summer research funding allowed me to purchase a Humminbird Helix 5 side-imaging sonar and a kayak. Later, the sonar was mounted on a remotely operated vessel built specially to map shallow water reaches of the LA River. Sonar imagery was processed, georeferenced, and imported into the GIS software and used to classify and delineate substrate and microhabitats. The summer research funds also helped pay for permits for fish sampling.

With assistance from the research funding, I was able to complete by dissertation and it has generated three publications:

Drill, S., and J.M. Post*. 2022. Urban Aquatic Ecology, Fishing and Community Connection on The Los Angeles River – Making it Just Blue Enough. In Yang, Y. and A. Taufen (eds.) Routledge Handbook for Sustainable Cities and Landscapes in the Pacific Rim.

Drill, S., Post, J.M.*, Aguilar, A., and R. Dagit. 2022. Ichthyofauna of the Middle and Lower Los Angeles River. Cities and the Environment – Accepted with Revisions (in review)

Post, J.M.*, and P.L. Carter. 2021. Unnatural Nature: Anglers Reimaginings of the Los Angeles River as Parkland. Geographical Review 112:2.

I now collaborate with numerous scholars and practitioners to promote access and use of the LA River. The maps have been shared with local stakeholders to help redefine the LA River recreation zones. The equipment purchase is still used by Texas Tech geography students to participate in field research.

Today, I teach geography and GIS courses at Tohono O'odham Community College in Sells, Arizona. I also administer the GIS degree and certificate programs. Much of my work at tribal colleges has focused on indigenous geographic education and creating educational experiences (including field research opportunities) for Native students. I continue to build off my experiences as a TTU graduate student, and now use them to empower the next generation of scholars and tribal leaders.



Kayak used by Dr. Post

Staff News



We would like to announce that Celeste Yoshinobu has been promoted to Associate Director for Student Affairs! Celeste will continue to serve as the undergraduate advisor for Geology & Geophysics. Please help us in congratulating Celeste on her promotion!

Celeste's tireless efforts have had a positive impact on the department and we are so proud of her on the team. Congratulations, Celeste!



Please help us welcome a new face in the department! Matt Saldana joined the team in August and serves as Assistant Director of Research Administration & Strategic Initiatives! Matt has previously worked for the Renewable Energy program and the Teaching, Learning and Professional Development Center at Texas Tech.

Matt's role includes putting this newsletter together so please feel free to reach out to Matt with any story ideas by contacting him <u>here</u>.



Another new face in the department is Alexa Williams. Alexa joined the team in September and has many years of administrative experience. Alexa serves as an Assistant and is truly a welcomed addition to the Geosciences team.

Alexa has numerous responsibilities throughout the department and will be the first person that guests will come into contact with when visiting the department. When you stop by for a visit, please welcome Alexa to Texas Tech!

Special Thank You!



The Department of Geosciences would like to thank John Akoto and Hannah for a generous gift to Dr. Gurrola's lab. Of the donation, John writes:

"Since my first day at Texas Tech, the geoscience department has been extremely welcoming. With the assistantship and resources the department has given me, they provided me with a platform to be successful during my time at Texas tech and beyond. Hannah and I are excited to donate to Dr. Gurrola's seismology lab so that future students may have positive experiences like mine in the department."

Thank you for your kind words and we are very grateful for your generousity!

Donate Here! *Texas Tech Department of Geosciences* 1200 Memorial Circle Sciences Building Room 125 Lubbock, TX 79409-1053 (806)742-3102

Keep in touch! Update your contact information here!

