FALL 2025

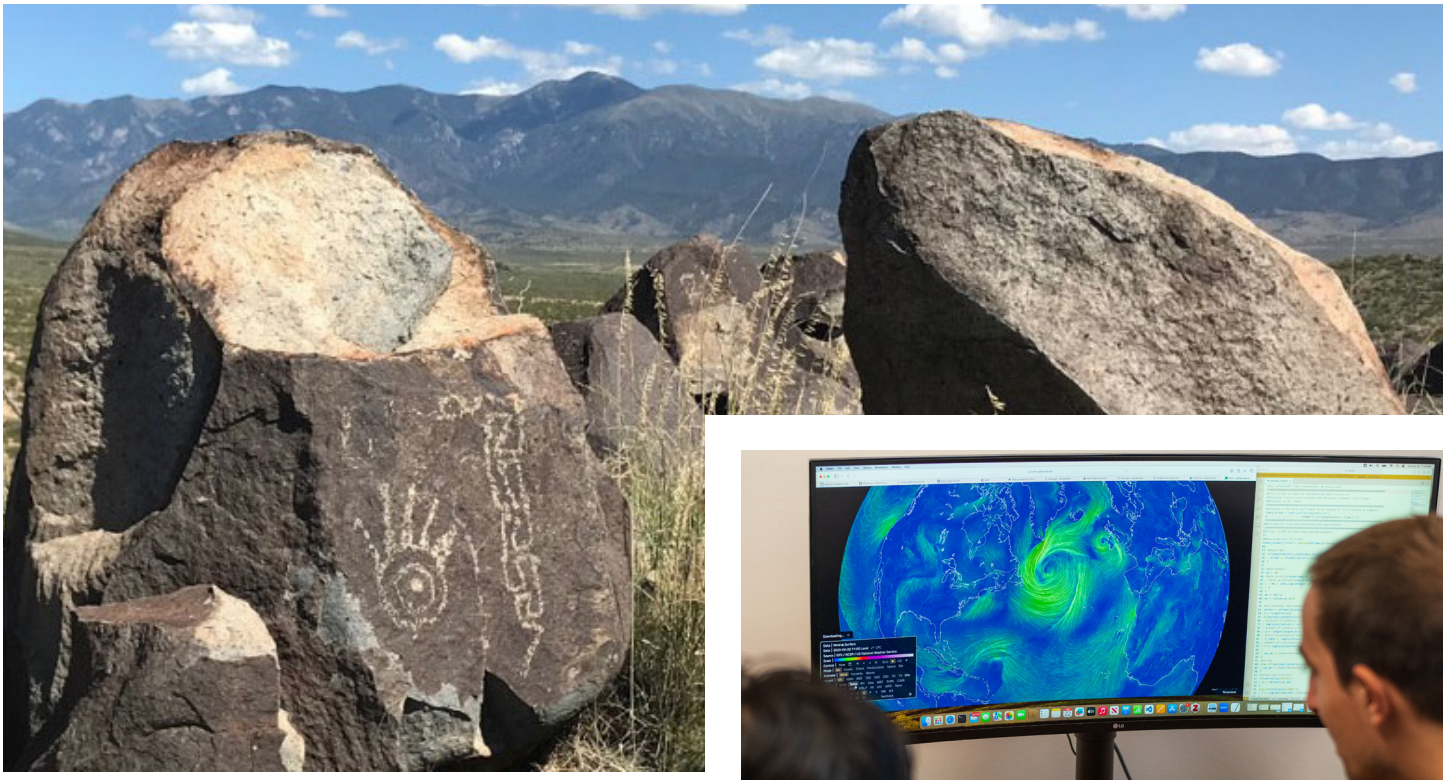
TECHTONICS

ALUMNI NEWSLETTER

The photo shows bleached and unbleached portions of the Entrada Sandstone in an outcrop north of Canyonlands National Park in Utah. A mixture of EES undergraduates and graduate students in the photo. Photo by Emeritus Professor Peter Mozley.

New Mexico Tech
Department of Earth and Environmental Science

www.ees.nmt.edu



CHARTING
A NEW COURSE

Dear Alumni and Friends

Well we live in interesting times and that is even before Covid. Since we last published Techtonics (2018) the department has been undergoing a generational transition due to a cohort of senior faculty retiring and difficulties retaining some of the replacement faculty. Retirees include (Gary Axen, Jan Hendrickx, Peter Mozley Fred Phillips and myself), others have moved onto other positions, Jolante Van Wijk (Los Alamos) Chloe Bonnamici, (University of Wisconsin) Ronni Grapenthin, (University of Alaska Fairbanks Geophysical Institute) Andrew Luhman (Wheaton College), Kierrran Maher (consulting). We have been fortunate that we have been able to replace the departing faculty. As if that was not sufficient, Francesca Denton, our very experienced Administrative Assistant, left to take a position in Magdalena and was replaced by Jaclyn Ulibarri who has done a stellar job keeping the departmental administration functioning through the busy times.

The changing department demographics has resulted in there being one and sometimes two faculty searches every semester since 2018 putting a considerable load on the faculty and staff.

At the beginning of the fall 2023 semester there were11 untenured faculty which is a relatively unique situation. Because of the low numbers of tenured faculty the department was allowed to undertake an external search for a new department chair which took over a year to complete and was another major time commitment for all department faculty and staff.

The new department hires have resulted in new areas of expertise within the department such as experimental and environmental geochemistry. Dr. Ranalda Tsosie has been hired to the newly created position of Director of the Environmental Science program for the school and is located in the E&ES Department. Two faculty have part time positions in the Center for Hydrologic Innovation, the chair of which is an endowed position.

Despite the significant turnover of faculty over the last five years, the department has maintained a very high research output, reflected in research grants and graduate student numbers. This is a reflection of the high level of activity in a very young department. The departmental success has been greatly assisted by a very synergistic relationship with the Bureau of Geology (The State Geological Survey).

We have also strengthened relationships with other campus research entities such as PRRC, IRIS Pascal (Earthscope) and the new Center for Hydrologic Innovation.

Welcome to the latest edition of the Earth and Environmental Science Department.

Bruce Harrison
FORMER CHAIR AND EMERITUS

EES FACULTY UPDATES

Susan Bilek, PhD

PROFESSOR, GEOPHYSICS

Dr. Sue Bilek has continued to work on research problems in the field of environmental seismology. These include quantifying bedload transport during the summer monsoon flash floods in a local Socorro ephemeral tributary and using seismic data to better understand karst aquifer systems in Florida. She and Dan Cadol also participated in some preliminary experiments to record flow and sediment transport using seismic and DAS cable recording in a controlled flume setting at U. Texas at Austin. She's very proud of her students, Jessica Aerts and Jacob Gochenour, who graduated with their PhDs in 2024 and are both working in the national security industry. Dr. Bilek was also honored with the 2024 NMT Distinguished Researcher Award and was elected to serve the Seismological Society of America as President in 2025.

Daniel Cadol, PhD

ASSOCIATE PROFESSOR, HYDROLOGY

I am a hydrologist with research interests at the intersection between ecosystems and the hydrological cycle. This includes the study of the hydraulic effects of vegetation in flow, sedimentation and scour around vegetation, controls on the rate and temporal distribution of water extraction and use by plants by means of evapotranspiration, and the transport and fate of vegetative material such as large woody debris and post-fire debris within the fluvial network. It is easy to observe that the distribution of vegetation is largely controlled by the distribution and flow of water; plants need water to live. Less obvious, but equally fascinating, are the ways that vegetation turns around and alters the distribution and flow of water. The resultant feedback mechanisms between the two, as vegetation alters its environment and either limits or promotes its own opportunities for expansion, can lead to the emergence of complex, and sometimes counterintuitive, behaviors and landforms.

My research group is always looking for motivated, capable students who enjoy both intense fieldwork and advanced numerical analysis. Please contact me at the email address above if you are interesting in joining the NMT Hydrology Program.

Rachel Coyte, PhD

ASSISTANT PROFESSOR, ENVIRONMENTAL GEOCHEMISTRY

Education

PhD., Earth and Ocean Sciences, Duke University, 2021
BA, East Asian Studies, Oberlin College 2013

Research Interests

Hydrogeochemistry of (especially redox-sensitive) trace elements
Drivers of drinking water quality in aird environments
The role of methane hydrates in the carbon cycle and their potential as an energy source
The environmental fate of waste by-products of energy resources
Trace element geochemistry of pregnancy and lactation
Isotopic tracers of environmental contamination and low-temperature chemical transformations

Publications

My most recent publications can be found on Google Scholar or Research Gate.

Lab website (under construction): rcoyte.github.io

Alex Gysi, PhD

ASSOCIATE PROFESSOR, ECONOMIC GEOLOGY

I currently have a dual appointment as an Economic Geologist in the New Mexico Bureau of Geology and Mineral Resources and as an Associate Professor in the department of Earth & Environmental Science at New Mexico Tech. I am the head of the Ore Deposits and Critical Minerals Research group and Experimental Laboratory in the bureau. I also maintain the MINES thermodynamic database for simulating ore-forming processes and fluid-rock interaction. My main research interests include: 1) hydrothermal ore-forming processes and crustal metasomatism, 2) critical mineral deposits and geochemistry of rare earth elements (REE), 3) petrology of pegmatites, carbonatites, and (per)alkaline rocks, and 4) thermodynamic modeling of fluid-rock equilibria.

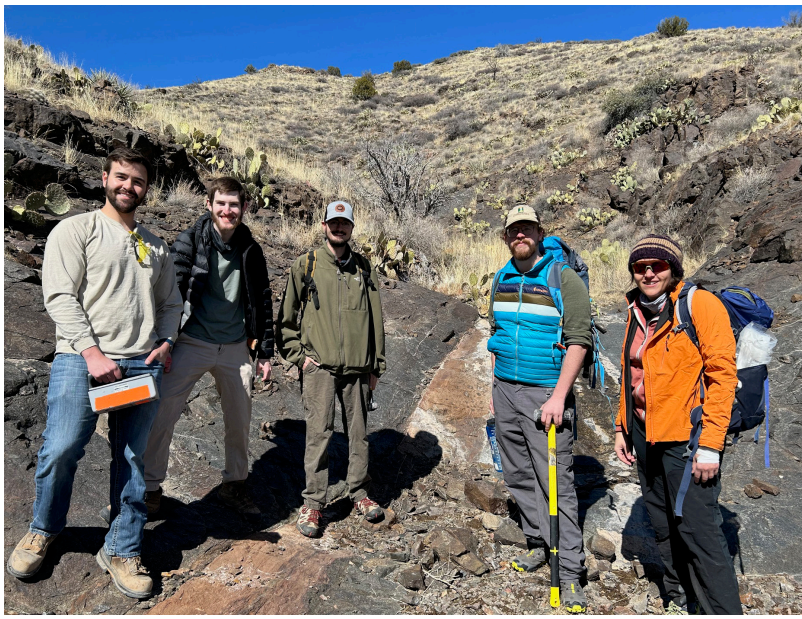
I have a M.Sc. in Mineralogy and Petrology from ETH Zurich in Switzerland. My thesis topic was on the petrology of mantle pyroxenites from the Beni Bousera massif in Morocco. I then moved to Reykjavik to complete a Ph.D. in Geochemistry at the University of Iceland where I had the opportunity to participate in the Carbfix project between 2007 and 2011. This pilot project aimed at injecting CO2 from a geothermal power plant into geologic rock formations. For my dissertation, I carried out experimental and thermodynamic modeling work to assess the mineral carbonation potential in basaltic rocks. In 2011, I moved to Montreal in Canada where my journey began in studying critical minerals and ore-forming processes as a Postdoctoral Fellow at McGill University. For my Postdoc I had the opportunity to work on the world class Strange Lake REE-Zr-Nb deposit in Canada to study alteration and the role of hydrothermal processes for REE transport and deposition in peralkaline granitic systems. I also started designing new hydrothermal and calorimetric experiments to study the properties of critical minerals in the lab and building a thermodynamic database to simulate hydrothermal processes in ore deposits. From 2014 to 2020, I was an Assistant Professor in Lithogeochemistry at Colorado School of Mines before moving to NMT in Summer 2020.

Nicole Hurtig, PhD

ASSISTANT PROFESSOR, GEOCHEMISTRY

Nicole Hurtig is an assistant professor of Geochemistry in the Department of Earth and Environmental Science at New Mexico Tech (NMT). Her research focuses on ore deposits, hydro/geothermal fluids, CO2 sequestration, trace metal systematics in petroleum systems and metal transport in hydrothermal fluids. She refurbished the fluid inclusion laboratory in MSEC which is now equipped with a combined fluorescence-transmitted light microscope continuing research on hydrothermal fluids and their role in ore formation. In 2021, a new Raman Spectroscopy laboratory was established by Nicole and her collaborators which was supported by an NSF-MRI grant and promotes new research directions at NMT. Dr. Hurtig also has an experimental hydrothermal geochemistry laboratory, where she and her students perform experiments to determine thermodynamic properties of metal species at elevated temperature and pressures and perform CO2 sequestration experiments.

Prior to starting her position at NMT in 2020, Nicole was a research assistant professor at Colorado School of Mines. She started her career in geosciences with a MSc degree in Petrology and Geochemistry from ETH Zurich in 2008, where she worked on MVT-type Pb-Zn and U-Mo-F mineralization. Prior to starting her PhD, she worked as a field geologist in Australia in U Exploration, as a researcher in Iceland working on geothermal waters and as a geologist working on groundwater mapping and safety in Switzerland. She received her PhD degree in 2014 from McGill University. Her dissertation focused on metal solubility in vapor-like fluids and active geothermal systems. Thereafter, she was a postdoctoral fellow with the AIRIE Program at Colorado State University for four years working on the Re-Os geochronometer applied to hydrocarbons with applications to petroleum systems.



Field picture of Nicole Hurtig with her students in the field looking at Carbonatites, Lemitar Mountains, NM.

Left to Right: Eric Ruggles (MSc GEOC -24), Jakob Newcomer (MSc GEOC), Charles Kershaw (PhD), Jonathan Adams (PhD), Nicole Hurtig

Daniel Jones, PhD

ASSOCIATE PROFESSOR, GEOMICROBIOLOGY

I am a geomicrobiologist and biogeochemist specializing in microbial sulfur cycling and microbe-mineral interactions in cave systems. In addition to my work on caves and karst, I have diverse research interests in the field of geomicrobiology, including microbial processes in mine waste, marine sediments, and wetland ecosystems.

Prior to my position at NMT and NCKRI, I served as the program coordinator for the bioremediation-focused MnDRIVE Environment initiative at the University of Minnesota, and was a research associate in the University of Minnesota BioTechnology Institute. I am also graduate faculty in the Department of Earth and Environmental Sciences at the University of Minnesota.

Ryan Leary, PhD

ASSOCIATE PROFESSOR, GEOLOGY

Hello! I joined the NMT faculty in January of 2018 and was just promoted to Associate Professor. My teaching and research interests are in sedimentology, stratigraphy, basin analysis, and tectonics. Specifically, I am interested in studying the tectonics and evolution of mountain belts through the lens of the sedimentary record. Mountain belts are some of the most geologically and geochemically dynamic features on the planet, and they have far-reaching impacts on earth history and earth processes. However, because of this dynamism and because mountains are easily eroded on geological timescales, it is often difficult to study mountain building processes in deep time. Some of the best and most complete records of these processes are contained in sedimentary basins filled with sediment eroded off of mountain belts, and these deposits are the focus of most of my research. I employ sedimentology, stratigraphy, basin analysis, geochronology, thermochronology, geochemistry, and stable isotopes as my primary geological tools.

My lab group's current research includes a large collaborative project focused on dating the timing of uplift of the Mongolian Altai in western Mongolia and a new project with the goal of understanding the paleohydrology of drainage reorganization in response to the Laramide orogeny in the western United States. My past research includes study of a series of basins formed within the India-Asia collision zone in southern Tibet, a series of projects on Pennsylvanian-Permian basin deposits in the western United States designed to better understand uplift of the Ancestral Rocky Mountains, and work on dating the onset of Laramide deformation in the western US.

Joel Leonard, PhD

ASSISTANT PROFESSOR, GEOLOGY/GEOMORPHOLOGY

I am a tectonic geomorphologist interested in how mountain ranges evolve through time and space. My research focsuses on quantifying how interactions between different forcings like tectonics and climate shape topography, and understanding the rates and mechanics of erosional processes. I use a combination of field, laboratory, and computational approaches to investigate both tectonically active and tectonically quiescent mountain ranges around the world.

John Naliboff, PhD

ASSOCIATE PROFESSOR GEOPHYSICS

My research interests broadly focus on understanding coupling between distinct Earth processes across large spatiotemoral scales and developing open-source community tools to address these problems.

Within this domain my externally funded research group is working on a wide range of topics including

- Reactive fluid volatile transport across distinct tectonic systems
- The large-scale dynamics of subduction systems
- Interactions between ice sheet evolution, lithospheric deformation, and volcanism
- Coupled landscape and basin evolution during continental rifting and compression
- The effects of fault zone rheology on long-stress states and seismogenic processes within complex fault networks.

My long-term goals are to build on the knowledge and computational infrastructure developed in these projects towards addressing key societal challenges relating to earth resources, natural hazards, climate change.

Mark Person, PhD

PROFESSOR, HYDROLOGY

My research interests are primarily focused on studying how groundwater flow systems evolve over geologic time scales and how subsurface flow systems affect geologic processes. One focus of my research has been centered on assessing how Pleistocene glaciations have influenced regional groundwater flow systems within sedimentary basins (Person et al. 2007; Bense and Person, 2008) and on the continental shelf (Person et al. 2003; Cohen et al. 2009; Defoor et al. 2011; Post et al. 2013). While this topic may sound esoteric, it is relevant coastal cities in arid regions of the world as well as to high-level nuclear waste repository siting efforts in countries such as Sweden, Canada, and Switzerland. Another focus of my work has been on assessing the role of groundwater flow in petroleum generation (Person and Garven, 1992; Person et al. 1995), petroleum migration (Person et al. 2012), and triggered seismicity (Zhang et al. 2013; 2017). I am also interested in how permeable fault systems affect groundwater flow and hot spring formation within the extensional tectonic settings (Bense et al. 2008; Person et al. 2012; Howald et al. 2012; Pepin et al. 2015). In 2014, my lab acquired a magnetotelluric, audio-magnetotelluric (AMT), transient electromagnetic (TEM) system from Zonge International. Zonge International (http://zonge.com/). Along with Dr. Shari Kelley of the NM Bureau of Geology & Mineral Resources and assistant professor Jesus Gomez-Velez, we are using these systems to study deep groundwater flow systems within fractured crystalline basement rocks along the Rio Grande Rift.

I have been actively involved in developing new hydrologic models that reconstruct groundwater flow system during the geologic past. Early in my career, my graduate students and I developed RIFT2D (Wieck et al. 1995; Mailloux et al. 1999), a Fortran based groundwater flow code which simulates basin evolution (i.e. sedimentation, subsidence, erosion) along with heat and solute transport within evolving continental rift basins. More recently, Denis Cohen, Peng Wang and I developed PGEOFE. This three-dimensional groundwater flow model is parallel and represents variable-density groundwater flow, heat and solute transport over geologic time scales. We used this model to simulate the emplacement of freshwater in continental shelf environments in New England during periods of glaciations (Cohen et al. 2009). Currently I am developing a control volume finite element model with professor Vaughan Voller at the University of Minnesota and Yipeng Zhang (doctoral student). We are using this hydromechanical code to study the effects of ice sheet loading on groundwater flow and rock failure/permeability increases during the Pleistocene glaciations.

Daniel Portner, PhD

ASSISTANT PROFESSOR, GEOPHYSICS

Daniel Portner is a new Assistant Professor of Geophysics since August 2023 and is excited to be a part of the New Mexico Tech Geophysics tradition! Daniel's research focuses on a range of problems in the tectonics and geodynamics of subduction zones, including the structure and behavior of slabs in the mantle, mantle dynamics and magma storage in arcs. As a structural seismologist, Daniel studies these problems using a variety of seismic imaging techniques that can characterize the seismic velocity structure of the subsurface from crustal to mantle scales. Recent and upcoming research projects in his research group include imaging slab structure in the South American subduction zone, characterizing melt storage in the Cascade arc, imaging the Socorro Magma Body and more.

Before arriving at Tech, Daniel was a SESE Exploration Postdoctoral Fellow at Arizona State University and a Carnegie Postdoctoral Fellow at Carnegie Institution for Science in Washington, DC. He received his BS in Geological Sciences from University of North Carolina at Chapel Hill and his PhD in Geosciences at University of Arizona in Tucson.

Veronica Prush, PhD

ASSISTANT PROFESSOR, GEOLOGY

Assistant professor Veronica Prush joined the EES faculty in July of 2022. Prior to joining the faculty, she received a master's in Geophysics from Cornell University, a PhD in Geology from the University of California, Davis, and completed a postdoc at McGill University. Her research focuses on how strain localizes in the lithosphere, and much of her prior work has been dedicated to characterizing earthquake behavior and resultant hazard. Courses she has taught since joining the faculty include Structural Geology, Thermochronology and Geochronology, Cross-section Analysis for Geological Applications, and 10 of the 12 weeks of Field Camp offered since 2023. She is also the department's Geology Field Camp Director. She is the advisor for three graduate students, including a master's student who graduated in December 2024 (see pg. 26).

Jaakko Putkonen, PhD

PROFESSOR, GEOLOGY, DEPARTMENT CHAIR

My name is Jaakko Putkonen. I am a Geomorphologist and the new Chair of the EES department since the Fall 2024. My specialty is the surface processes in the cold regions which has taken me to Greenland for my Master's thesis with University of Helsinki, Finland, to Spitsbergen for my dissertation research with University of Washington, Seattle. After defending my research on climate driven permafrost degradation I started to work both in High altitude Himalaya and Antarctica. Eventually I shifted exclusively to Antarctica which led to the discovery of the oldest ice on Earth (~5 Myrs).

During this time I was spending a significant portion of my time living in a tent (in the field) while also managing to move from University of Washington to University of North Dakota, Grand Forks. For the last several years with UND I was promoted the Chair of the Harold Hamm School of Geology and Geological Engineering. Although we (myself and

my spouse) both enjoy Nordic sports like ice skating and cross country skiing, due to our upbringing in Finland (there is plenty of snow and ice in ND), we started to crave a change. After the tall volcanoes in Washington state and endless evergreen forests in Finland, the flat open prairie just started to feel bland (like Lutefisk in holiday dinner).
Fortuitously Tech came calling (not literally, but with all the mountains and deserts ready for exploring). The vigorous department and the can-do attitude has really sold me on the Tech and the natural beauty and endless opportunities for exploration are keeping us busy on bike and hiking trails. We could not be happier living in the Faculty Hill.

Alex Rinehart, PhD

ASSOCIATE PROFESSOR, HYDROLOGY

Alex Rinehart is an associate professor of hydrology and a fellow of the new Hantush-Deju National Center for Hydrologic Innovation. Since he joined in 2019, he was proud to advise Jason Simmons, Samuel Otu and Ethan Williams through their MS degrees, and is currently advising Marissa Fichera, Dylan Morrison, and Lily Newton. Before joining the faculty in 2019, he worked for five years as a hydrogeologist at the NM Bureau of Geology, after completing his PhD in Geophysics at New Mexico Tech through the Rock Mechanics Lab at Sandia National Labs. His research is diverse, with current projects using repeated gravity and surface deformation measurements to understand aquifer behavior (hydrogeodesy), chemical and rate effects on rock fracture, carbon sequestration in brine aquifers and basalt formation, and ecohydrology in agricultural and desert environments. Geoffrey Rawling and he were awarded the 2021 John C. Frye Award for the publication of “Lifetime projections for the High Plains Aquifer in east central New Mexico” by the Association for American State Geologists.

Glenn Spinelli, PhD

PROFESSOR, GEOPHYSICS

I came to New Mexico Tech in 2003 after receiving my Ph.D. from the University of California, Santa Cruz (Go, Banana Slugs!) and a brief post-doc at the University of Missouri. My research is focused on marine geology and hydrogeology. I am particularly interested in fluid flow in oceanic crust approaching and entering subduction zones. Much of my recent work examines how hydrothermal circulation in oceanic crust affects subduction zone temperatures and thermally-controlled processes in subducting material. Being involved with this research means that I’m frequently straddling the frontier between geophysics, hydrogeology, and geology.

In the fall of 2025, I will be the chief scientist on a research cruise offshore southern Mexico in an area with flat slab subduction. We will map the sediment distribution on the subducting Cocos plate and make heat flux measurements to understand the thermal state of the plate. The goals are to improve estimates of subduction zone temperatures and understand their controls. At least one NMT grad student will sail on this research cruise, along with collaborators from UNM and CICESE (in Ensenada, Mexico).

Ranalda Tsosie, PhD

ASSISTANT PROFESSOR IN ENVIRONMENTAL SCIENCE

My current research interests are leading an Indigenous Science interdisciplinary research lab focused on supporting climate change impacts, human exposures to anthropogenic contaminants, Indigenous food sovereignty, and water resource management and policy in Indigenous populations, Indigenous data stewardship, developing methods for community-based water challenge research and resilience; and supporting pathways for students interested in research in areas that make an impact, create change in their communities and solving grand environmental challenges.

My research group is currently looking for motivated, capable students who enjoy fieldwork, community engagement and have a passion to addressing, solving and creating solutions for the environmental challenges we are currently facing. Please contact me at the email address above if you are interested in joining the NMT Earth and Environmental Science Program.

Laura Waters, PhD

ASSOCIATE PROFESSOR, IGNEOUS PETROLOGY

I am primarily interested in constraining the processes that govern the evolution, differentiation and stratification of continental crust through petrographic (studying minerals and whole-rock compositions) and experimental studies of volcanics related to subduction and extension.

My research program leverages high temperature, high pressure experiments, thermodynamics and petrology (the study of mineral and rock chemistry and textures) to understand magmatic processes on Earth (e.g., what igneous processes result in the formation of continents?) and to aid in questions related to applied science, such as understanding the mass transfer of critical minerals into fluids and resource assessment for CO2 sequestration.

As an outdoor enthusiast and geologist, I enjoy discovering how the combined effects of tectonics and magmatism lead to the production of continents and fabulous landscapes in the US. My research on the origin and evolution of continental crust (silica-rich, buoyant sections of Earth's crust) incorporates both field and experimental work, with several field sites in the western US, Caribbean and the Aleutians. I currently have an active undergraduate research group examining compositions, the mineral phases, and pre-eruptive conditions (i.e., temperature, pressure, and dissolved volatile contents) of volcanics that erupted from South Sister Volcano, OR.

Enrico Zorzetto, PhD

ASSISTANT PROFESSOR, HYDROLOGY

Enrico Zorzetto obtained undergraduate and master of science degrees in civil and hydraulic engineering at the University of Padua, Italy. He then moved to North Carolina to pursue a PhD in Earth and Ocean Science at Duke University, where his research focused on studying the frequency of rainfall extremes using satellite observations. After graduating in Fall 2020, he moved to Princeton University as a postdoctoral researcher, working on climate science and large-scale hydrological modeling, before joining NMT in January 2024.

Enrico's research focuses on the intersection of climate science and hydrology, particularly understanding and predicting future changes in the water cycle at the continental scale, including rainfall, snowpack, and streamflow. He uses remote sensing data from satellites along with hydrological and land surface models.

Recently, he has been improving snowpack predictions over the Western US and characterizing the uncertainty of snow models used in climate models. He found that the presence of black carbon and dust can accelerate snowmelt by almost a month at some sites in the Western US, affecting streamflow magnitude and seasonality.

Andrew Phillips

LAB TECH II

Andrew and his wife Tamara mushroom foraging in northern NM.

Alicia Armijo

ADMINISTRATIVE SECRETARY

Hello! I'm Alicia Armijo, the Administrative Secretary for the Earth & Environmental Sciences Department. In my role, I collaborate with professors, graduate students, and undergraduate students, providing assistance with a variety of needs. Whether it's ordering supplies for their offices or acquiring equipment for lab or field work, I am the primary contact. In my free time, I love to spend time outdoors and cherish moments with my family. I have a passion for sports, particularly softball and basketball. Activities like camping, hiking, hunting, and fishing are some of my favorites! As the youngest of four daughters, my father ensured that we all learned about the great outdoors. I also enjoy being actively involved in my community, coaching both youth baseball and basketball, which has become a rewarding experience for me.

Mark Person (center) along with Michael Steckler (right) and Kerry Key (left) of Columbia University aboard a country boat. RV Kokilmoni (mother ship) in the background.

NM Tech graduate students Nafis Sazeed (taking selfie) and Adrien Camille (gray shirt, raised hand) on country boat heading for shore.

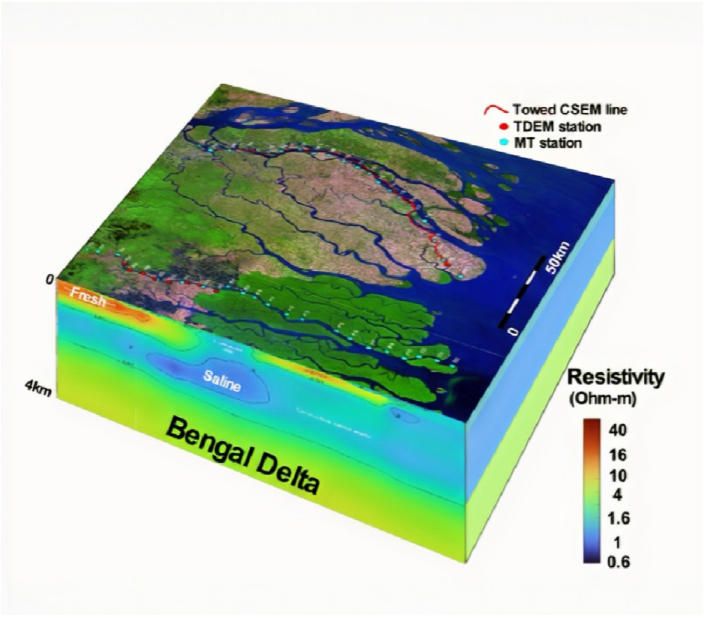
EXPLORING BENGAL DELTA

New Mexico Tech Grad Students Participate in Hydro-geophysics Fieldwork along the Bengal Delta, Bangladesh

During March and April of 2022 Mark Person along with two NM Tech graduate students (Nafis Sazeed and Adrien Camille) participated in NSF funded project searching for deep fresh and brackish water resources along Bengal Delta. The goal of the field campaign was to collect electromagnetic data to map the quantity and distribution of subsurface formations containing fresh and brackish water. With two colleagues from Columbia University (professors Kerry Key and Michael Steckler) as well as students and faculty from the University of Dhaka, they traveled by river boat down the Pusur River. At each site, they collected electromagnetic (EM) soundings using magnetotelluric (MT) and time domain electromagnetic (TDEM) equipment along a 120 km transect. Inversions of this data revealed two electrically resistive (formation resistivity > 40 Ohm-m) freshwater bodies extending to 600m depth. These deep, unconventional aquifers represent a new source of drinking water.

Kerry Key collecting electromagnetic soundings in a rice field along the Pusur River using TDEM equipment.

Each day the team went ashore in the morning to collect the MT equipment from the previous day's deployment. They then travel down river to a new field site. At each site, they dug shallow trenches for three magnetometers oriented in the east-west, north-south and vertical directions. Over night, the magnetometers recorded incoming electromagnetic waves from lightning storms and interactions between solar winds Earth's magnetosphere over a wide range of frequencies. They also installed electrodes in shallow holes that were oriented in the east-west and north- south directions. The electrodes recorded the arrival of secondary electromagnetic waves generated by interactions between the incoming EM waves and subsurface formations hosting fresh and more saline pore fluids. These secondary waves (eddy currents) were detected as they migrated back to the earth's surface.



Three-dimensional block diagram showing formation resistivity along the Pusur River by Huy Le and Kerry Key of Columbia University.

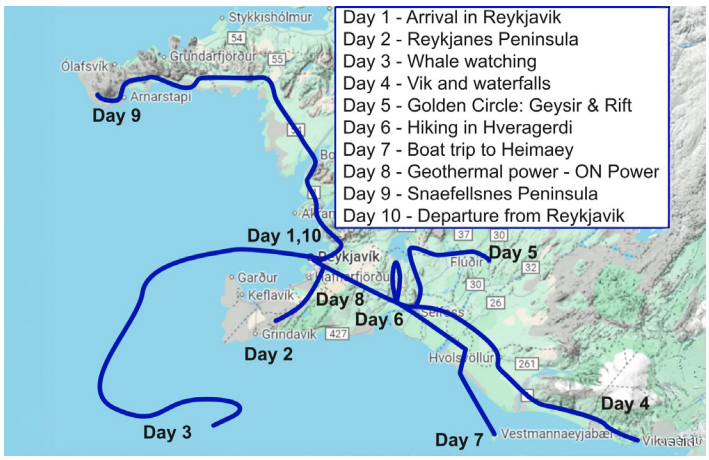
ICELANDIC ADVENTURES

Tech alumni unleashed

Our adventure started on July 31st with a hectic “Where is Waldo’ at the airport, trying to identify all the Techies arriving and leading them to our travel bus. In the evening, we could finally relax and get to know each other with a pleasant Ice Breaker at the hotel and the first lecture co-lead by Alex Gysi about the Geology of Iceland and Bill McIntosh about volcanic processes.

The next day we headed out to explore the Reykjanes Peninsula, with our first stop at the recent eruption site at Fagradalsfall volcano looking at the flows from the 2021 and 2022 eruptions. Nelia pointed out the pahoehoe texture on the surface of the flows, which shows smooth, bollywood and ropy surfaces that form from when low viscosity basaltic lava cools. Bill and Alex discovered Pele’s hair, which is thinly stretched volcanic glass that forms from lava fountains bursting through the queued surface of a lava flow. Next we explored the geothermal field in Krysuvik, which is an active area with fumaroles, hot springs and mud pools forming along a fissure. Nicole pointed out that this area is also well known for their copper minerals that form in

the fumarolic fields on top of the ridge and that the mud pools are highly acidic and from through SO2 and H2S degassing of the magma below, which become oxidized at the surface forming sulfuric acid. We stopped for lunch at Kleifarvatn and Sandi set up the first busside BBQ of the trip and Bill and Nelia lead a group of Techies up the mountain to visit some volcaniclastic rocks that tell a story of the ice age volcanism in this area.



Sandi Lucero organizing the first bus-side BBQ of the trip next to the lake Kleifarvatn.

Nelia Dunbar pointing out fumaroles and mud pools in the Krysuvik geothermal field.

Shirly choosing the best viking beer downtown Reykjavik.

Group of Techies posing for a photo on the basalt columns.

On Day 3, we explored the Viking Museum in Reykjavik, learning about the bloody past of the Viking settlers who traveled to Iceland in the early days. After a delicious meal at the harbor, having some lobster soup, we headed out on a boat to see the whales. It was spectacular! Not too soon after we were far enough out, we spotted a humpback whale showing off his hunting skills. We followed him for a little while and enjoyed watching the puffins and seagulls diving for fish that were brought up by the humpback, then we headed out a bit further and encountered another whale. This one was even larger, and used the famous “bubbling net” technique to catch fish. After a few hours of enjoying the cold sea air and watching the whales hunt, we returned to shore, where we headed out to celebrate Shirly’s Birthday! Tom even made a new Viking friend…

The next morning we had an early start at 4 am loading the bus with all of our luggage and leaving for a road trip with many stops to Vik. It was a rainy day, but we were lucky to get some sunshine for visiting the beautiful waterfalls Seljalandsfoss and Skogafoss, which are connected to the famous glacier Eyjafallajokull and its namesake caldera volcano, which erupted in 2010 disrupting air traffic in Europe. We also stopped

Ken and Gina Osburn wrapped up in rain gear hiking into the rift zone at Thingvellir National Park.

Group of techies at Laugarvatnshellar marveling at the pillow basalts and hyaloclastites and Alex explaining how it works!

Water bubble of the Strokkur geyser bursting at Geysier geothermal area.

Thingvellir National Park with Thingvallatan in the background and the

at the Volcano Center and saw Hekla in the distance. Around Vik we explored the basalt columns along the hard coastline with huge waves at the Reynisfjara Black Sand Beach.

Next we were going up to the lighthouse Dyrholaey cliffs, which are famous for puffins nesting on the steep cliffs. Unfortunately the weather turned on us and we were completely drenched and soaked by rain and pummeled by wind. Exhausted, wet and hungry we arrived at our first group dinner at the Dyrholaey hotel. After enjoying a wonderful meal we returned to the Greenhouse Hotel in Hveragerdi, where we stayed for the next couple of days.

Our next stop was at Laugarvatnshellar home to farming families living in a cave dug into the soft hyaloclastite formations. A guide was already waiting for an indoor tour. The last people living in the cave in Iceland include one cow and a family with two kids, with the last one born in the cave during a storm. Behind the cave a

small path leads up into the flanks of the large hyaloclastite volcano. After 5-10 minutes walking we arrived at an absolutely stunning geological site with pillow basalts. Since Nelia and Bill were out that day, Alex and Nicole had to put on their volcanologist hats for a 101 petrology class, and explain how this all works. During the last ice age, these volcanoes formed under glaciers that melt through lava eruption underneath glacial lakes, the whole unit is overlain by ash and basalt fragments formed by explosive volcanism.

Next up is the Geysir Geothermal Area. This place was packed with tourists. After a busy lunch, we went to the main attraction, Strokkur! Walking next to a couple of boiling hot springs we approached the continuously, every 20 minutes or so, erupting geyser. Everyone cameras out! Waiting... Woosh the geyser spits water in the air, people and kids laugh and shout, movies are being made, some people are too close on the wrong side and get all of the water in their faces (Nicole and Marta, lol...). Next up there is an overview hike, a couple of smaller geysers and the Great Geysir which hasn't erupted for years, but we never know, let's have a peek inside.

Back to the bus... Next stop Gullfoss! This stop yields an amazon view of Langjökull, Iceland's second largest glacier. After walking down a set of long stairs below the tourist center, we reach a gorge with a big river. Walking towards Gullfoss, one can feel the water droplets on the face with a soon appearing large waterfall commonly showing a beautiful display of rainbows. After several group fotos and debates with the

rift graben on the left.

A group of hydrologist with Nicole and Alex at Gullfoss.

Dinner inside the Friðheimar greenhouse, which is a closed ecosystem with the largest bee colony in Iceland, heated by geothermal power with a high CO2 atmosphere to enhance plant growths and fully reticulated water systems with calibrated nutrient inputs.

hydrologists about the annual water flow rates, we went for a quick tour to the tourist shop before heading for dinner.

Night starts settling in, people on the bus are full of great memories and pictures, but start feeling hangry, at least I do. We are driving back through Geysir towards the Friðheimar farm. Woah what a greeting when we enter the tomato greenhouse. This is a family run business, growing tomatoes indoor all year long, even during the long Icelandic winters. A group of waiters are ready to greet us, one of them stands on a podium and starts explaining how this all works without going into too much detail (don't forget people are hungry at this point), people are standing in line in front of the bar, tomato beer, tomato gin, tomato soda, all made of tomatoes!!! Behind us a beautiful set of tables and tomato soup, each table with some basil plants. After straddling through the tomato plants, bees, and greenhouse lamps, we are called for dinner. A fantastic and delicious three course dinner, followed by table discussions.

On day 6, one of the highlights of the time that we spent in the small town of Hveragerdi was enjoying a swim in the Reykjadalur Valley thermal river. The route to the bathing spot was a several kilometer hike up a beautiful green valley. During the hike, we saw lots of evidence of local geothermal activity steaming on the hillslopes. And, a beautiful, complicated waterfall that could be observed from above on the trail. Once we arrived at the bathing site, we found a beautiful clear river with a clean gravelly bed that was the perfect temperature for a relaxing soak. A perfect spot to relax and chat with friends before a nice downhill hike back to the trailhead.

Hellisheidi power plant and the geothermal exhibition.

Icelandic horses and seals on the day trip to the Snaefellsnes Peninsula.

On Day 8, we traveled back to Reykjavik and stopped at the Hellisheidi geothermal power plant which is owned and operated by ON Power. This power station is the 8th largest geothermal power plant in the world and the largest one in Iceland situated on the flanks of Hengill volcano. Hengill is still active and tholeiitic basalt flows erupted ~2,000 years ago. Electricity is produced using steam turbines and CO2 and H2S gases are reinjected into the subsurface onsite for efficient greenhouse gas reduction. The reinjection system Carbfix is a pioneering project that started in 2007 and is now being expanded to a larger project the Coda Terminal located closer

to Reykjavik with direct harbor access. Direct air capture of CO2 is operated by Climeworks and is designed to capture any excess gas that was not collected in-line for reinjection. After this exciting exhibition we returned to Reykjavik for a relaxing afternoon downtown and ended the day with a lecture by Alex Gysi on CO2 sequestration and his work with Carbfix and a glass of Icelandic whisky.

Our last day was spent travelling to the Snaefellsnes peninsula, which is featured in Jules Verne's 'Journey to the Center of the Earth'. Snaefellsnesjokull is an impressive, ice-capped stratovolcano rising more than 5900 feet above sea level. Dramatic views of columnar basalts along the cliff provide a backdrop for amazing pictures. We also got to see seals, Icelandic horses, seagulls and puffins. All too soon, we had to return to Reykjavik and gathered for an excellent dinner at Jorgensen Kitchen & Bar to say our goodbye and reminisce about our adventures. A huge shout out and thank you to Sandi Lucero from Advancement for organizing the trip and keeping it all together!

Dr. Benjamin Tobin (left) became NCKRI's new Director in 2024 and joined Valerie Davis, Operations Director.

UPDATE
NCKRI

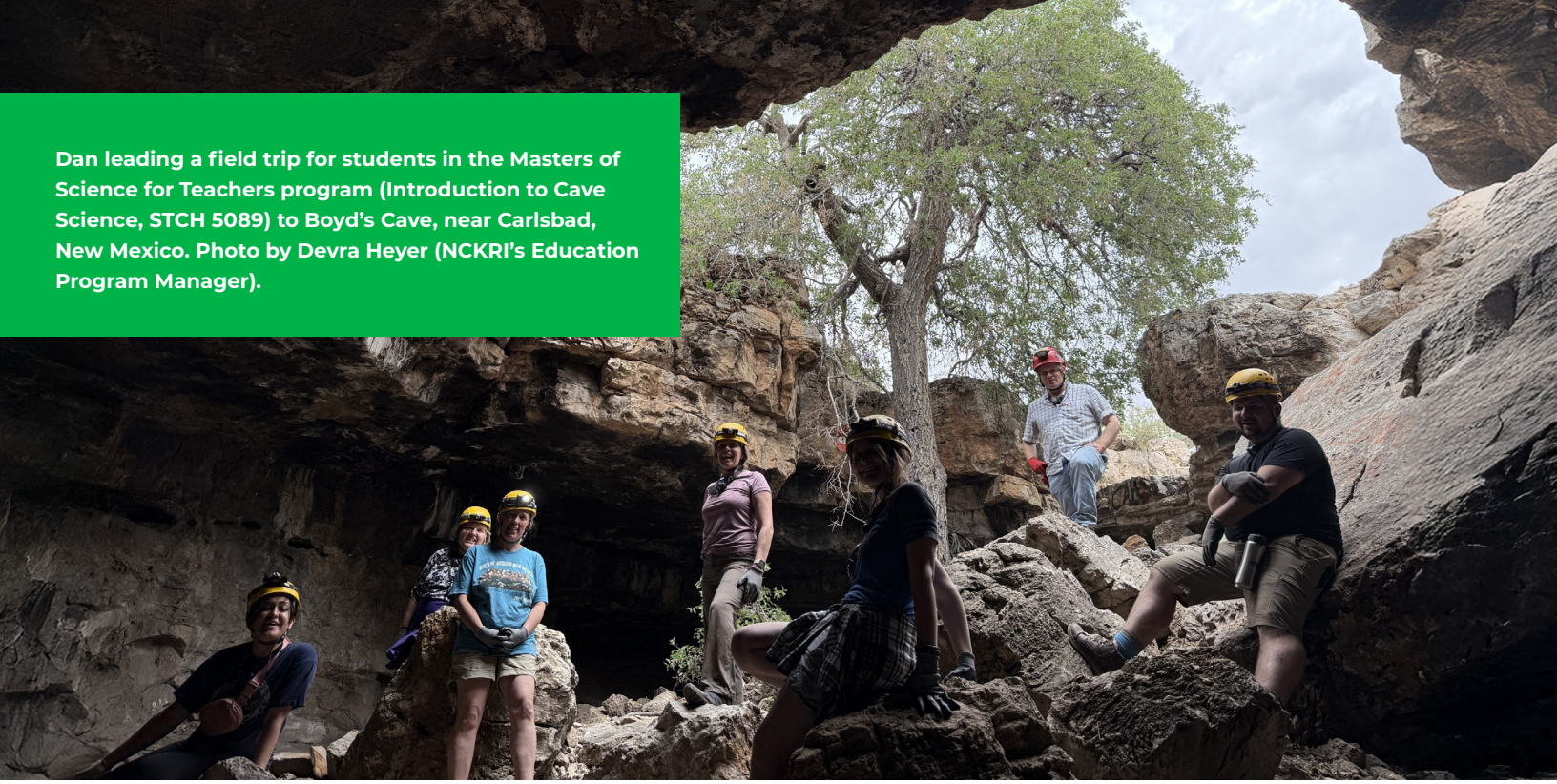
Updates from the National Cave and Karst Research Institute (NCKRI)

Caves are found on every continent and attract hundreds of millions of visitors each year, often as the primary attraction in National Parks and World Heritage Sites. Beyond their recreational and cultural value, caves are scientifically important. They preserve detailed records of past climates, ecosystems, and human activity; host rare and specialized lifeforms; and even serve as analogs for subsurface environments on other planets. Most caves are part of broader karst systems—landscapes shaped by the dissolution of soluble rocks like limestone. Karst covers roughly 20% of the planet's ice-free land and provides drinking water to over 700 million people. But these same features that make karst so important also make it uniquely challenging: cavernous and highly permeable karst aquifers are vulnerable to contamination, and sinkhole collapse results in over $300 million per year in road damage in the United States alone.

The National Cave and Karst Research Institute (NCKRI) was created by Congress to conduct and support cave and karst research, education, and management. NCKRI is a research center of NMT that is headquartered in the City of Carlsbad, New Mexico, and its primary partners are the National Park Service, State of New Mexico, and the City of Carlsbad. NCKRI maintains strong ties to NMT's Department of Earth and Environmental Science, where Dr. Dan Jones, Associate Professor of Geobiology, serves as NCKRI's Academic Director. Dan started in 2019, after Dr. Penny Boston departed NMT to become the Director of NASA's Astrobiology Institute.

Devra Heyer (Education Program Manager, left) and Raquel Lugo (Communication Specialist, right) at NCKRI's Headquarters in Carlsbad, NM.

Dan leading a cave microbiology field trip to Cottonwood Cave in the Guadalupe Mountains. Photo by Devra Heyer, NCKRI Education Program Manager.



Dan leading a field trip for students in the Masters of Science for Teachers program (Introduction to Cave Science, STCH 5089) to Boyd's Cave, near Carlsbad, New Mexico. Photo by Devra Heyer (NCKRI's Education Program Manager).

Earth and Environmental Science students on a field trip to Robinson's Cave as part of GEOL 2089: Introduction to Cave Science.

Jones with Students

The last several years have been and exciting time for NCKRI. In 2019, NCKRI initiated two national grant programs, a seed grant program and a student grant program, which have supported 13 principal investigators and 11 graduate and undergraduate students across the country. NCKRI supports cave and karst research at NMT in many ways, including through an internal seed grant program for faculty and research staff and by awarding research fellowships for NMT undergraduates through the Undergraduate Research Opportunities in Caves and Karst ("UROCK") program. Since 2019, NCKRI has supported 20 fellowships for undergraduates from 7 departments at NMT, and has awarded 6 seed grants to NMT researchers. Other programs and opportunities at NMT include classes in cave and karst science, a regular seminar series, science communication internships, and more. NCKRI's education and outreach programs have also grown, and NCKRI staff engage with local students and teachers (over 18,000 engagements, including 3,000 K-12 students and 130 teachers since 2022) and share information on cave and karst science via social media (reach of over 2 million through all platforms and efforts since 2023).

Our latest update is that we are pleased to announce new leadership at NCKRI! Dr. Benjamin Tobin joined as Director in 2024 following the retirement of Dr. George Veni, who led NCKRI from 2007 to 2023. Dr. Tobin is a geologist and hydrologist who previously worked at the National Park Service and the Kentucky Geological Survey. He has already hit the ground running by building collaborations with EES faculty members, expanding NCKRI's reach and scientific portfolio, and developing new relationships in the Carlsbad area.

Stay tuned for more exciting developments to come, and please stop by our headquarters if you pass through Carlsbad!

ANNUAL EES
DEPARTMENT PICNIC

The Annual EES department picnic took place in 9/4/2025. This year the faculty, staff, students, friends and family gathered in the Sedillo Park. Just a few blocks East from the campus. The large grass field was put in use by picnickers of all ages; frisbee, soccer, baseball, volleyball, until the cooks announced that the hamburgers were ready.

Enrico Zorzetto (left) and Mark Person (right) prepping the picnic food in the EES department Fall Picnic.

STUDENT AWARDS

Jonathan Adams	Wyckoff Memorial Scholarship
Debarati Banerjee	Wyckoff Memorial Scholarship & Don Yardley Fellowship
Antonio Chavez	R. Bowman Award
Dakota FitsEmons	Outstanding Graduating Senior & NMGS, Fall Field Conference scholarship
Joe Hoberg	New Mexico Geological Society, Beverly Wellnitz Award
Johnathan Morain	New Mexico Geological Society, Pipkin Book Award
Jakob Newcomer	D. Norman Award
Siobhan Niklasson	Dr. Allan R Sanford Memorial Fellowship award
Teagan Skinner	Durtsche Award

Dakota FitsEmons receiving the Outstanding Graduating Senior Award in the Spring 2025 Awards ceremony.

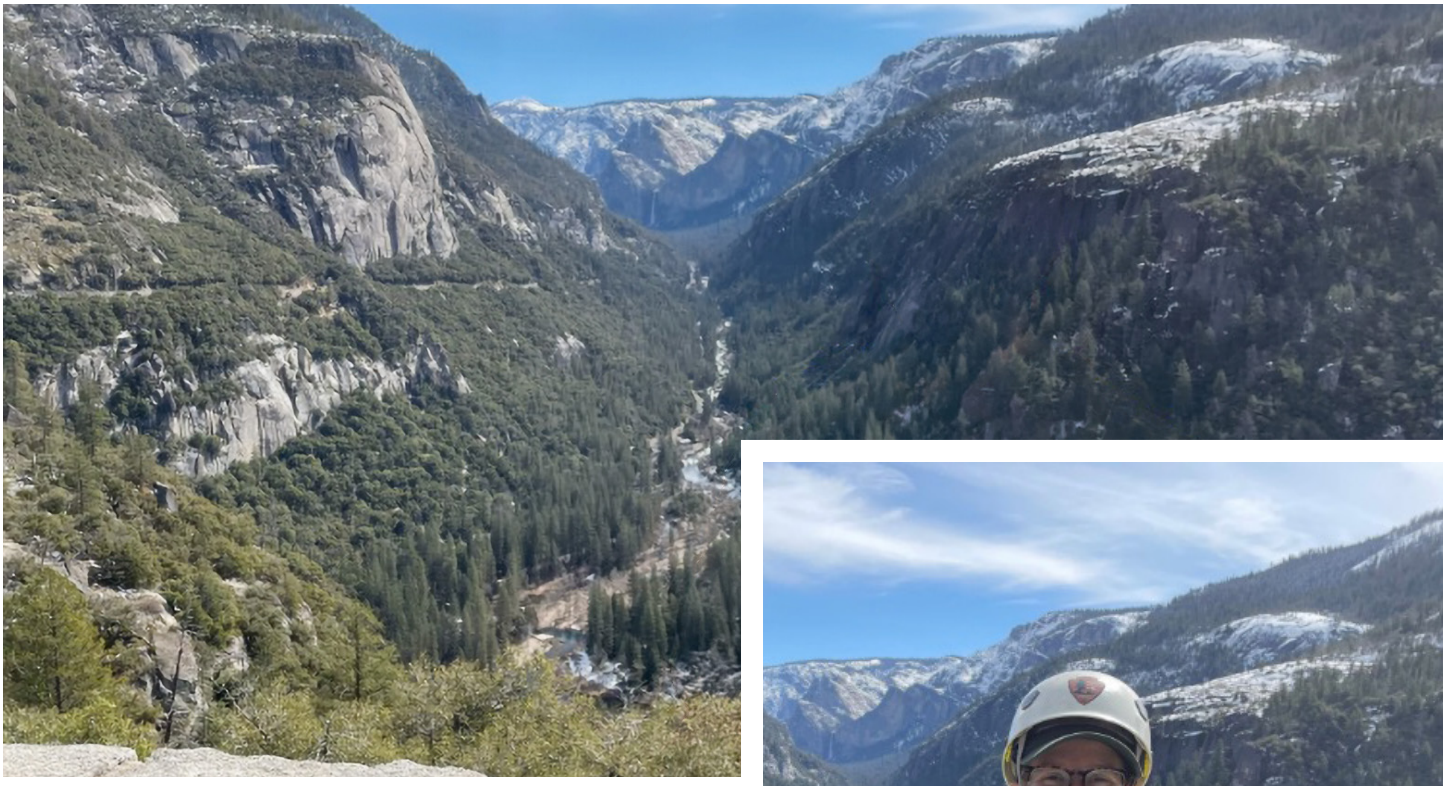
Joe Hoberg receiving the NMGS Beverly Wellnitz Award in the Spring 2025 Awards Ceremony.

MS AND PHD
THESIS/DISSERTATIONS

AUTHOR	YEAR	TITLE	DEGREE
Luong, Loc	2025	Quantifying Bedload Transport in Ephemeral Channels Using Seismic Methods	PhD
Scholten, Oscar	2025	Geochemistry and Petrology of the Taos Plateau Volcanic Field in New Mexico: mantle heterogeneity beneath the Rio Grande Rift and Jemez Lineament	MS
Velmani, Aadish	2025	Hydrothermal Partitioning of Rare Earth Elements (REE) Into Fluorite and Bastnäsite-(Ce): A Vein Mineralogy and Fluid Inclusion Study From the Gallinas Mountains, New Mexico	MS
Hashberger, Kristen R.	2025	Eocene Fluvial Provenance of Central New Mexico: Insights From the Baca Formation in the Baca and Carthage-La Joya Basins	MS
Figueroa Penarrieta, Yerko	2025	Speciation of Neodymium Hydroxyl and Chloride Complexes in Hydrothermal Aqueous Fluids: Calorimetry, Solubility Experiments, and Thermodynamic Modeling	PhD
Kuljis, Joseph	2025	Modeling Ephemeral Snowpack Evolution for Water Resource Analysis in the Santa Fe Watershed, NM	MS
Newcomer, Jakob R.	2025	Arsenide Five-Element Vein Mineralogy, Paragenesis and Phase Relationships in Selected Samples From the Black Hawk Mining District, New Mexico and the Cobalt, Ontario Area in Canada	MS
Best, Mackenzie B.	2025	Astrobiology and Microbial Biogeochemistry of Secondary Cave Deposits and Mine Waste	PhD
Grismer, Magdalen Ann	2025	Assessing Magmatic Storage and Ascent Conditions Through Crystalline Assemblages in Natural Samples, Experiments and Models: A Case Study From Valles Caldera, NM (USA)	PhD
Lucero, Dolan Diego	2025	Characterization of Complex Hydrogeological Environments Using Numerical Simulations	PhD

AUTHOR	YEAR	TITLE	DEGREE
Havlena, Zoë Elizabeth	2025	Geomicrobiology and Biosignature Preservation Potential of Acidic Gypsum Deposits From Sulfidic Caves	PhD
Kyritz, Thomas	2024	Examining Controls on Fluid Overpressure in Buried Basement Highs of Oceanic Crust	MS
Pharris, George	2024	Evaluating Strain Localization Along the Alamogordo Fault, Central New Mexico, Using Neotectonic Mapping, Soil Chronosequences, and Geodynamic Modeling	MS
Ruggles, Eric L.	2024	Mineral Paragenesis, Mineral Chemistry, and Rare Earth Element Mobility Related to the Magmatic-Hydrothermal Transition of the Lemitar Mountains Carbonatite, New Mexico	MS
Newton, Lily A.	2024	Paleohydrology of the Ancestral Rio Grande: 5 - 1 Ma Response to Climate Change and Implications	MS
Adams, Jonathan Reed	2024	The Solubility of TeO₂ and Te Speciation in Water Vapor at 250-320°C	MS
Norvell, Benjamin Scott	2024	Locating Buried Seamounts and Analyzing Their Effects on Fluid Seepage and Smectite Alteration	MS
Owen, Evan Jackson	2024	Mineral Paragenesis and Geochemistry of Hydrothermal REE-F Bearing Veins and Breccias in the Gallinas Mountains, New Mexico	MS
Thomas, Bryan R.	2024	Temporal and Spatial Variations in Foreland Basin Geometry	MS
Aerts, Jessica R.	2024	Earthquake Relocation and Characterization Methods and Their Application to the Area Above the Socorro Magma Body in Central New Mexico and to Icequake Swarms in the Beaufort Sea	PhD
Han, Kyungdoe	2023	Deciphering Paleo-Hydroecology: Integrated Model Analysis of Hydrologic Connections in the Southern Great Basin, USA, Over the Past 12 Ma	PhD
Gochenour, Jacob Alexander	2023	Data-Driven Modeling of a Karst Aquifer System	PhD
Moskal, Rebecca	2023	Comparison of Bedload Discharge Equations to Measured Bedload in an Unarmored Ephemeral Channel	MS
Tevis, Leah	2023	Spatio-Temporal Patterns of Fluid and Sediment Transport Over Three-Dimensional Bedforms	MS
Hobbs, Noah Frederick	2023	Intraplate Deformation: Case Studies of the Late Paleozoic Se Laurentian Margin and the Cretaceous-Eocene Laramide Orogeny	PhD
Duff, Alexander J.	2023	Improving the Catalog of Seismic Events in the Delaware Basin Through the Use of Large-Scale Template Matching	MS
Woodard, Mason	2023	Using ⁴⁰Ar/³⁹Ar Geochronology and Clinopyroxene Geothermobarometry to Re-Evaluate the Emplacement History and Tectonics of the Cornudas Mountains, Southern New Mexico	MS
Williams, Ethan	2023	Quantifying Surface Water and Groundwater Exchanges in the Southern Albuquerque Basin	MS
Otu, Samuel	2022	Effects of CO₂ on Creep Deformation in Sandstones at Carbon Sequestration Reservoir Conditions: An Experimental Study	MS
McLaughlin, John Mitchell	2022	Characterization and Optimization of Seismic Methods for Use in Ephemeral River Studies	MS
Roussel, Stephanie Anne	2022	Riparian Evapotranspiration Response to Disturbance: a Comparison of Remote Sensing and Groundwater Methods	MS
Glasgo, Sandra Jean	2022	Connectivity and Rainfall-Runoff Relationships in Flashy Ephemeral Systems	MS

AUTHOR	YEAR	TITLE	DEGREE
McLain, Katie	2022	Hydrological Controls on Flow Conveyance Losses on the Middle Rio Grande	MS
Vieceli, Rhiannon E.	2022	Contributions to Improving Detection Capabilities for Global Seismic Networks, Characterization of Socorro Region Seismicity, and Modeling of Seismic Wave Propagation	PhD
Payne, Madison Rose	2022	Hydrothermal Ree Partitioning Experiments between Fluorite and Aqueous Fluids at 100 to 250 °C	MS
Cantrell, Tyler B.	2022	Ultra-High Precision ⁴⁰Ar/³⁹Ar Geochronology: Resolving Complexities of Sanidine Age Distributions	MS
Schmidt, Jonathan Preston	2022	Using Earthquake Location and Coda Attenuation Analysis from Large-N Deployment to Explore Shallow Crustal Structures Above the Socorro Magma Body, Central New Mexico, USA	MS
Stark, Kyle A.	2022	Sediment Transport in Desert Channels Driven by Flash Flooding	PhD
Haar, Kimberley	2022	A Demonstration of Geologic and Geophysical Modeling with Legacy Seismic and Well Data	MS
Blocho, Reilly M.	2022	Cyclic Stratigraphy on Ocean Margins: Discriminating between Variations in Eustatic Sea Level, Dynamic Topography, and Sediment Flux	MS
Eberle, Beth Ann	2021	Quantitative, Qualitative, and Spatial Evaluation of Groundwater Recharge in the Salt Basin, NM/TX	MS
Hollingworth, Spencer	2021	Detrital U-Pb Zircon and 40Ar/39Ar Muscovite Geochronology and Reservoir Properties from Middle Pennsylvanian Strata in the Anadarko Basin, Texas Panhandle, USA	MS
Pimentel, Sharllyn M.	2021	Changes in Bed Morphology and Sedimentology at the Confluence of Ephemeral Tributaries and the Rio Grande	MS
Martin, Samuel G.	2021	Structural Evolution of the Reserve Graben, New Mexico, USA: Implications for Late Cenozoic Extension in the Rio Grande Rift-Southern Basin and Range Province	MS
Evenocheck, Elizabeth	2021	Assessment of Safe Aquifer Yield within the Salt Basin in New Mexico and Texas	MS
Lutz, Brandon Michael	2021	Large-Magnitude Extension in the Death Valley Region, Sw Usa: Thermo-Kinematic Modeling, Whole-Lithosphere Shear, and Disruption of Drainage Systems	PhD
Simmons, Jason Dylan	2021	Quantifying Chemomechanical Reservoir Sensitivity to CO₂ Injection Using Paragenesis, Flow-Through Experiments, and Strength Testing at in situ Conditions, Farnsworth Unit, Texas	MS
Stewart, Andrew	2021	The Sedimentary Architecture of the Lower Permian Darwin Canyon Formation, Southeastern California: A Potential Analog to the Deep-Water Deposits of the Permian Basin	MS
Reuter, Sarah Elaine	2021	An Investigation of Focused Aquifer Recharge in the Jornada Experimental Range Using Chloride as a Tracer	MS
Hinojosa, Johnny Ray	2021	Surface Geologic Mapping and Subsurface Characterization near the Loma Blanca Fault, Central New Mexico	MS
Pearce, Alexandra Rose	2020	Implications of Cryptic, Nonstoichiometric Uranium Mineralization on the Formation and Leachability of Sandstone-Hosted Uranium Ores, Grants District, New Mexico	PhD
Wang, Chao	2020	Baseflow Generation from Multiscale Groundwater-Flow Systems	PhD



STUDENT ACCOMPLISHMENTS

Pharris Roadcut

I finished my master's thesis in December 2024, studying strain localization along the Alamogordo fault in south-central New Mexico with assistant professor Veronica Prush. After graduating, I drove out to California to start a Scientists-in-the-Parks internship at Yosemite National Park. I worked as the Geomorphology Assistant with Yosemite's Park Geologist, Dr. Greg Stock, for 5 months. My primary objectives were to update the Yosemite Rock Fall Database and to assess slope stability adjacent to roadways in the park. The Yosemite Rock Fall Database records over 150 years of rockfalls in the park, with the earliest records taken from the writing of John Muir. My efforts contributed to an updated USGS publication of the database. I also assessed roadcut stability using the Unstable Slope Management Program, which various federal land management agencies use to assess slope stability adjacent to roadways. I collaborated with teams from the United States Geological Survey and Federal Highway Administration to assess over 200 unstable slopes along 20 miles of roads, improving hazard assessments on Yosemite's major roadways. Additionally, I had the opportunity to respond to rock falls within and near Yosemite.

My internship with Yosemite National Park ended in April, after which I headed south to Sequoia National Park to begin a new position. I am currently at a seasonal position as the Logistics Coordinator for the Sierra Nevada Inventory and Monitoring Network, which monitors park resources in the Sierra Nevada. My job involves coordinating fieldwork to study wetlands, lakes, and forest mortality in Sequoia, Kings Canyon, and Yosemite National Parks. I am looking forward to improving my skills as a field scientist through my work with the National Park Service!

Yosemite Rock Fall Database
https://experience.arcgis.com/experience/03e5fb490eaf4bef92494923a99c4fa0/

2024
GEOLOGY FIELD CAMP

The best part of Field Camp in 2024? Probably the views. Jimmy Swift and Teagan Skinner appreciate the Tetons rising over the Snake River (extra credit points will be awarded to any reader who can correctly trace out the normal fault scarp in the background).

Photo credit: Dakota FitsEmons

Greetings to alumni and other subscribers to theTechtonics newsletter! I'm the (relatively) recently hired structural geology professor – you can read more about my background on pg. 8. I took over as the department's Field Camp Director when I started at NMT in 2022.

Field Camp – as many of you may remember! – is our capstone course for Earth Science majors. For six weeks every summer, instructors march undergraduate and graduate students deep into the hills to hone their quads and ripen their tan lines for the rest of the summer months. Beyond practical field geology experience, Field Camp provides students with an opportunity to experience the life cycle of a research project first-hand, from hypothesis development to data collection and synthesis, in the best laboratory there is – the great outdoors of the western United States. Though we faculty do what we can to provide hands-on research experiences at the undergraduate level, very few opportunities in a junior geoscientist's early career provide the same level of immersion, focus, and interdisciplinary synthesis as field camp.

Big changes have taken place since I took over as director, the most exciting of which was our move to Utah and Wyoming in 2024! Our northward migration was facilitated in large part by the regional expertise of associate professor Ryan Leary and the invaluable logistical and instructional support of teaching assistant Kyle Gallant (PhD candidate, structural geology). Prof. Leary taught sedimentology and stratigraphy-focused modules in the Uinta Basin of northeastern Utah for the first two weeks (within spitting distance of Sherman Ranch, for the paranormally inclined). Mr. Gallant and I led bedrock and Quaternary mapping projects amongst the robustly forested hills of Grand Teton National Park for the last four weeks of the camp – a true learning experience in inferring contacts across poorly exposed topography. Among their many projects, students had the opportunity to map ~15,000-year-old glacial moraines offset by the Teton fault, the structure responsible for the charismatic topography of the park.

The immersive learning experience provided by field camps is unique among STEM fields, and a certain fraternity exists amongst field camp graduates. All initiates can recall negotiating dense forests while juggling (and losing) their gear, nursing rolled ankles while switch-backing across steep rocky grades, enduring the smell of classmates for hours of monotonous driving, and deciphering the lofty (if at times questionably executed) interdisciplinary learning objectives of overly ambitious instructors. Our program aims to integrate material from across the curriculum, including mineralogy, igneous petrology, historical geology, and more. And I can promise you that when it rains and snows – as it did for much of the mapping (and, more crucially, the camping) in the Uinta Basin – hydrological principles are the center of everyone's attention. We hope that students leave field camp with a more tangible understanding of disparate concepts learned – or perhaps endured – across an undergraduate curriculum that can sometimes feel like a cold drink from a fire hydrant.

But learning at Field Camp is as much practical as geological. In 2024 we spent 30 of 42 nights camping at such iconic grounds of the American West as Flaming Gorge, Grand Teton National Park, and Yellowstone's south gate. None of these locales, however, are sufficiently breathtaking to make students forget that they are camping for a month. Reflections on the camping experience ranged from "character-building" to "sucked" and other, bluer descriptions. I can attest to a quasi-exponential increase in the hue of the language when the weather is anything less than beautiful and the cell phone service lacking. But we hope that students discover their appreciation for field camp's lessons long after they've left our department when they find themselves pondering the proper pressure to efficiently chop six pounds of onions on flimsy plastic cutting boards and the importance of teamwork (and conflict negotiation skills) when pitching a tent in an unrelenting downpour.

Although most of our time is spent testing the integrity of our knees, eating cheese and semi-stale crackers on picturesque outcrops, and debating the differences between a packstone and a wackestone and whether it even really matters when your fold is overturned, there is plenty of time for fun. A highlight in 2024 was a guided visit to Menor's Ferry, the only homestead west of the Snake River in the Jackson Hole area as late as the 1890's. Our park ranger guide told us how an intrepid but surly pioneer moved people and property across the Snake River using a self-constructed, pontoon-elevated platform guided by cables, the controversy surrounding John D. Rockefeller Jr.'s involvement in the founding of Grand Teton National Park (did you know that the Jackson Hole airport is the only commercial airport located inside a U.S. National Park?), and the bewilderment experienced by the first Euromericans when they summited Grand Teton (elevation 13,775') only to find archaeological evidence of Native American activity just shy of the summit.

No field camp summary would be complete without a catalogue of the group's collective wildlife sightings, and in 2024 we tallied the most charismatic fauna the region has to offer. Poignantly, we had the opportunity to acquaint ourselves (at a respectable distance) with Grizzly 399, referred to frequently as the most famous bear in the world. Grizzly 399 was well-known to Grand Teton tourists, wildlife photographers, and conservationists alike due to the number of cubs she reared (18 total) and her comfort in regions of the park that brought her within frequent safe viewing distance of visitors. Sadly, this dowager empress of a bear was lost this past October after a vehicle incident in the park. Her importance to conservation efforts and the park system at large was recognized on May 1, 2025, when Static Peak was renamed to Peak 399. I'm grateful that we had an opportunity to see her and her final yearling this past summer.

Teaching assistant and PhD student Kyle Gallant explains the nuances of Laramide tectonics in front of a classically Basin and Range background.

Photo credit: Veronica Prush

As any Field Camp initiate knows, the experience is transformative and memorable. But despite increasing demands for trained geologists with broad field experience, geoscience programs across the country are shuttering these capstone programs in the wake of low enrollment after the Covid Pandemic and diminished federal funding to higher education. I count our department as immensely fortunate to be able to continue providing this experience to our students and those who join us from other institutions.

If you are interested in contributing to the continuation of our field camp, there are several ways to do so. The Clay T. and Sallie Smith Student Fund provides scholarships to students to offset the cost of Field Camp (~$6,000/student in 2024, even with 30 nights of camping!). All donations directly contribute to lifting the financial burden of field camp from our students, helping to keep this experience alive and contributing to the professional development of Earth Science students moving on to the next stage of their careers. Please reach out to the Office of Advancement and Alumni Relations to donate to this fund. If you're interested in making a monetary or material donation directly to our field camp program, please reach out to me directly. And of course, if you have any questions about our Field Camp or want to share Field Camp tales from days gone by, I am always happy to speak with alumni.

Roheel Pashtoon relaxes at D.O.G., the best burrito spot in Jackson Hole, WY.

Photo credit: Teagan Skinner.

NMT HYDRO
FACULTY

Past, present and future of water resources research at New Mexico Tech

In 1956, New Mexico Tech established one of the first known groundwater hydrology programs in the world. The program started out with the work of two of the fathers of modern groundwater hydrology: Mahdi Hantush and C.E. Jacob. Together, they developed a new theory for quantifying the hydraulic properties of aquifers, which is still a cornerstone for the study and management of groundwater and other geological resources.

In the following decades, the hydrology program at NMT continued its path of excellence in water resources research through the work of multiple professors. These include Lynn Gelhar, whose work was pivotal in understanding how contaminants spread through the subsurface. The hydrology program grew with the contributions of Dan Stephens, John Wilson, Fred Phillips, and later on with the work of Robert Bowman and Jan Hendrickx. The extent to which these scientists shaped the scientific discussion on contaminant hydrology, groundwater modeling, basin-scale hydrology, and soil hydrology is testified by their many national awards received through the years. During the last 70 years, the NMT hydrology program continued to balance applied needs with basic science, following in the footsteps of Hantush and Jacob.

Despite NMT's small size, the hydrology program alumni are leaders in water in industry, research labs and academia. Almost no matter where you go in the water world, you will run into a Techie.

In recent years, the hydrology program at NMT has expanded with the institution of the Hantush-Deju National Center for Hydrologic Innovation. Boosted by the philanthropic contribution by Raul Deju, a student of Mahdi Hantush, the Hydrology Innovation Center is dedicated to developing solutions for water management challenges in New Mexico and globally by fusing new sources of information, data science, and hydrologic insight. The new director, Dr. Adrian Harpold, will be starting in Summer 2025.

Students gauging the Rio Grande at Escondida.

Today, the hydrology program includes 8 faculty whose expertise is wide ranging, and encompass groundwater and water-rock interactions, hydrogeochemistry and water quality, geomorphology, hydrometeorology, and snow hydrology. Ongoing collaborations include those with water stakeholders, with state and federal laboratories, as well as with researchers in geophysics, atmospheric physics, mathematics and computer science.

Water research at NMT leads the way in using new technology to characterize hydrological processes. Ongoing research efforts include the use of large scale hydrological models, harnessing AI methods to learn from increasingly large datasets, including from remote sensing observations from multiple sensors. These research areas will receive a boost by the upcoming NMT high performance computing system, expected to come online in fall 2024. Examples of field based activities include the seismic monitoring to study solid transport, linking surface deformation and changes in gravity acceleration to changes in groundwater storage, and monitoring of stream and groundwater quality throughout the state of New Mexico. Projects based on remote sensing tools are used to study water stored in groundwater and snowpacks.

FACULTY
RECOGNITIONS

Mark Person

Joined the hydrology faculty at NM Tech in January, 2009 from Indiana University. Person received his MSc. degree in hydrology from NM Tech in 1984. In 2016, Person received the O.E. Meinzer Award from the Hydrogeology Division of the Geological Society of America for his work on paleohydrology and the role of groundwater in geologic processes. Person is the fifth NM Tech faculty member to receive this award following in the footsteps of Madi Hantush, Lynn Gelhar, Fred Phillips, and John Wilson.

This summer, Person will be part of the ship board team of scientists on a drilling campaign sponsored by the IODP3 (https://www.ecord.org/expedition501/). The drilling will take place on the Atlantic continental shelf offshore of Nantucket and Martha's Vineyard. This will be the first hydrogeology focused drilling project sponsored by the IODP. We will be exploring for offshore freshwater in permeable Pliocene and Miocene sands.

Global estimates of offshore freshwater in continental shelf environments are on the order of 105 km3. To put this volume in perspective, the USA consumed about 103 km3 in 2015. Offshore freshwater represents a potential future water resource for coastal urban communities.

During April-May of 2022, Person and two NM Tech graduate students (Adrien Camille and Nafis Sazeed) participated in a magentotelluric (MT) amphibious field campaign across the Bengal Delta. MT is a surface based electromagnetic geophysical technique capable of imaging fresh and saline waters to depths of 10km or more. Person and his students traveled across the Bengal Delta on the river boat MV Kokilmoni.

This was part of an NSF Frontiers in Earth Sciences grant awarded to Person. The goal of this field work was to map out deep, unconventional aquifers across the Bengal Delta. We found previously unknown aquifers hosting freshwater beginning at depths of 500m.

THERMOCON
2024

In early June, the Hydrothermal Geochemistry and Critical Minerals conference—aka ThermoCon 2024 was held at the New Mexico Bureau of Geology in Socorro, NM. The meeting was hosted by Alexander Gysi, Nicole Hurtig, and Laura Waters and focused on critical minerals, thermodynamics, molecular dynamics, ore forming processes and extraction techniques for a range of critical elements that are of strategic importance to the US. Critical minerals are mined form ore deposits that from in magmatic-hydrothermal systems, which often involve high temperature fluids that are responsible for the transport and enrichment of these elements. Surprisingly little is known about the thermodynamic properties of critical elements, in particular at the high temperature and pressure conditions of ore-forming processes that are important to understand their enrichment in the crust.

The field of thermodynamics touches many aspects of geosciences, chemistry, material sciences, and much more, and is currently seeing a renewed interest because of critical minerals. This renewed interest is echoed by governmental agencies, the public, and scientists because of the importance of critical minerals for high-tech and green technologies. In all, 43 participants from all over the world attended, including about 12 PhD students, three Master's and four Bachelor's students, and two postdoctoral fellows. The goal of the meeting was to form a community across disciplines to advance cutting-edge science on critical minerals and hydrothermal geochemistry. Representatives from geothermal energy industry attended, from national laboratories (Sandia, Ames, LANL, PNNL), from the USGS, from several research institutes (Paul Scherrer, GEOMAR, CSIRO, GFZ Helmholtz Center Potsdam) and from academia (University of Wyoming, University of Texas-El Paso, Washington State, Washington University in St. Louis, Institut des Sciences de la Terre d'Orléans, France, University of Cologne, Germany).

In the evenings at Deju House, the graduate and undergraduate students presented posters of their research projects. The meeting fostered a collegial environment for networking and professional development, highlighting the exciting research focused on critical minerals and thermodynamics that the students are involved in. Throughout the day talks were held at the New Mexico Bureau, including a GEM-Selektor workshop and lab tours visiting the new ODCM (Ore Deposits Critical Minerals) lab from Dr. Gysi, the Raman Spectroscopy lab from Dr. Hurtig, and the high temperature high pressure laboratory from Dr. Waters at the department of Earth and Environmental Science.

In addition to presentations and workshops, there were excursions to Bosque Del Apache Wildlife Refuge and a field trip to the Lemitar Mountains, just north of Socorro. Dr. Gysi talked about REE occurrences and resources in New Mexico and the relevance of mobilization of REE in hydrothermal fluids. Eric Ruggles, a Master's student in Earth and Environmental Sciences, presented some of his findings on the hydrothermal veins that contain REE minerals overprinting the Lemitar carbonatite dikes. Waters and Hurtig introduced the general geology of the Rio Grande Rift, Socorro magma body and the volcanic activity in the area.

Left to right front to back: Emily Wright, Emma Carlsen Kindall, Nathalie Yaw, Hannah Han, Perla Rodriguez Contreras, Hermann Lebit, Tanya Prozorov, Aadish Velmani, Nicole Hurtig, Alexander Gysi, Dmitrii Kulik
Marion Louvel, Sophia Stuart, Daniel Harlov, Kevin Padilla, Debarati Banerjee, Laura Waters, Sarah Smith-Schmitz, Xin Zhang, James Chapman, John Kazuba, Juejing Liu, Fernanda Loza, Hongwu Yoon, Dan Miron, Eric Ruggles, Shaul Hurwitz, Hongwu Xu, Artas Migidsov
Jonathan Adams, Xiaofeng Guo, Jeff Catalano, Xiadong Zhao, Quishi Guan, Lars Ruepke, Jasper Egelmann, Sandro Jahn, Charles Kershaw, Yerko Figueroa-Penarrieta, Byan Maciag, James Kubicki, Jan Dreschmann

ThermoCon 2024 - Hydrothermal geochemistry and critical minerals Meeting

ThermoCon meeting was held at the New Mexico Bureau of Geology June 3-7 with a total of 43 participants from all over the world including ~20 students (12 PhD, 3 MSc, 4 BSc) and postdocs (2).

The meeting focuses on critical minerals, thermodynamics, molecular dynamics, ore forming processes and extraction techniques for a range of elements that are of strategic importance to the US.

Participants from industry (geothermal energy), national laboratories (Sandia, AMES, LANL, PNNL), USGS, Research institutes (Paul Scherrer, GEOMAR, CSIRO, GFZ Helmholtz Center Potsdam), Universities (U. of Wyoming, U. Texas El Paso, Washington State, Washington University, NMT, University of Orleans, U. Cologne)

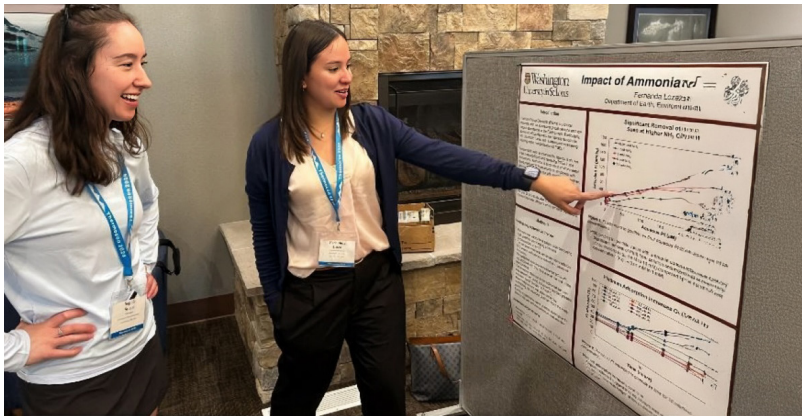
Hosts: Alexander Gysi (EES faculty and NMT bureau staff), Nicole Hurtig (EES faculty) and Laura Waters (EES faculty)

Project Funding: Office of Science, U.S. Department of Energy, Basic Energy Science, Grant DE-SC0022269 to Dr. Alexander Gysi, Dr. Nicole Hurtig, Dr. Laura Waters NSF CAREER EAR-2039674 to Dr. Alexander Gysi NSF-EAR 2039271 to Dr. Gordon Moore and NSF-EAR 2022465 to Dr. Laura Waters

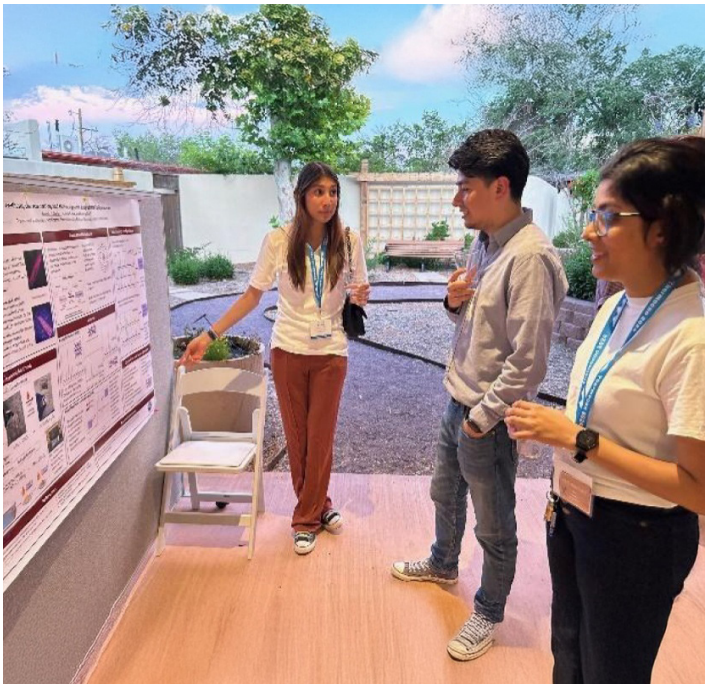
Meeting was also supported by the NM bureau of geology and it was held there.

Talk sessions Monday through Friday

Student posters Monday and Tuesday: Held in the evening at the Deju University House, provided an ideal setting for participants to interact and have discussions with each other. Students had the opportunity to present their research during two sessions, 7–9 p.m. on Monday and Tuesday. (You can find info on all the posters and talks in the bulletin.)



Fernanda Loza (BSc student, Washington University) presenting on her research of PGE elements to Sophie Stuart (PhD student Los Alamos National Laboratory)

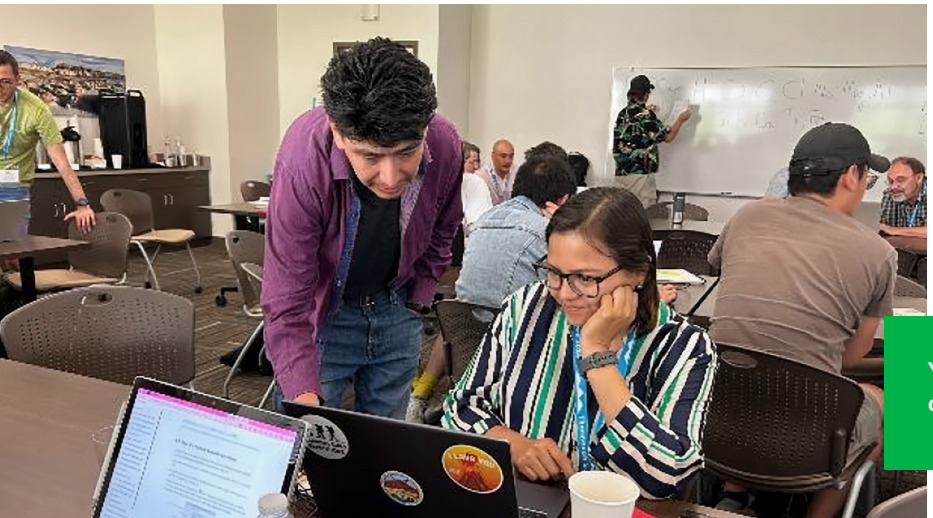


Yecenia Cortez (BSc student, Washington State University) presenting her work on Eu reference materials to Yerko Figuera-Penarrieta (NMT PhD student) and Debarati Banerjee (NMT PhD student)

Jonathan Adams (PhD student NMT) presenting his work on Te speciation in water vapor to John Kazuba (University of Wyoming)

Jan Dreschmann (PhD student, University of Cologne, Germany) presenting his research on speciation in of REE in carbonatite brine-melts to Bryan Maciag (NMT postdoc) and Sarah Smith-Schmitz (NMT postdoc)

Lemitar Mountains, amphibolite dike, Alex Gysi is talking about the Proterozoic host rocks that contain the REE-bearing carbonatites (left to right: Bryan Maciag, Debarati Banerjee, Lars Ruepke, Quishi Guan, Xiadong Zhao, Jasper Engelmann)



GEMS-Geochemical Modelling workshop Wednesday afternoon
Lead by Alexander Gysi (who developed the GEMS tutorials https://geoinfo.nmt.edu/mines-tdb/tutorials/) with help from Dimitri Kulik (GEMS developer, Paul Scherrer Institute) and Dan Miron (GEMS developer, Paul Scherrer Institute
Train students and researchers using the software and provide them with some test projects that they can later change and use for their own purposes.

Yerko Figuera-Penarrieta (NMT PhD student) helping Perla Rodriguez Contreras (PhD student (University of Texas)

Left to right: Lars Ruepke, Alexander Gysi, Laura Waters, Marion Louvel, Bryan Maciag, Debarati Banerjee, Eric Ruggles, Aadish Velmani, Jasper Englemann, Quishi Guan, Xiadong Zhao, Hermann Lebit

Field excursion Wednesday morning to the Lemitar Mountains Carbonatite Alexander Gysi talked about REE occurrences and resources in New Mexico and the relevance of mobilization of REE in hydrothermal fluids. Eric Ruggles (MSc student EES) presented some of his findings on the hydrothermal veins that contain REE minerals overprinting the Lemitar Mountains carbonatite dikes.
Laura Waters and Nicole Hurtig introduced the general geology of the Rio Grande Rift, Socorro magma body and the volcanic activity in the area.

Birdwatching Thursday morning to the Bosque del Apache
The birdwatching trip was led by Dr. Hurtig and her two PhD students Jonathan Adams and Charlie Kershaw.

Dan Miron (GEMS developer team, Researcher Paul Scherrer Institute) is discussing GEMS with Jasper Engelmann (PhD student GEOMAR).

Dabbler and Diver Deck, participants watching out for birds.

Desert Arboretum, Emily Wright, Sarah Smith-Schmitz and Sophia Stuart observing hummingbirds at the feeding stations.

Lab tours at the New Mexico Bureau and EES highlighting the new laboratories such as the ODCM (Ore Deposits Critical Minerals) lab from Dr. Gysi, the Raman Spectroscopy lab from Dr. Hurtig and the high temperature high pressure laboratory from Dr. Waters.

Alexander Gysi (center) showing participants the new hydrothermal diamond anvil design, that lets him and his postdoc Bryan Maciag explore REE speciation in high temperature and high pressure hydrothermal fluids.

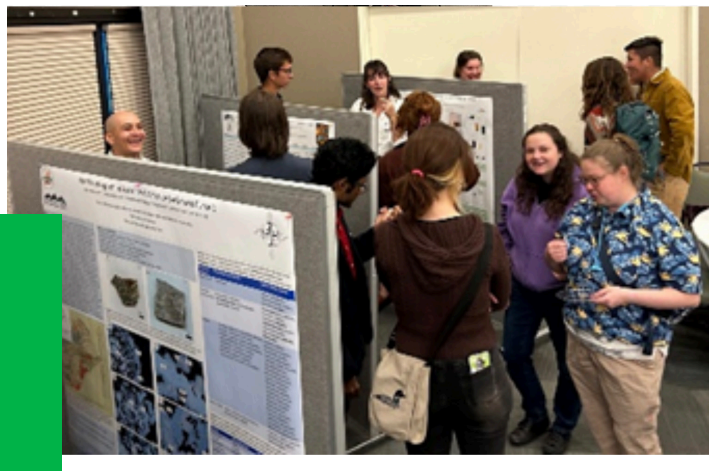
2024 49ER EES ALUMNI RECEPTION

The Earth, Wind and Fire - 49er EES Alumni Reception

On October 18th, we gathered at the Macey Center for an EES Reception to celebrate the memory of former faculty members Clay T. Smith, Dave Norman, Bob Bowman and Al Sanford, welcome back former EES students, showcase the research, achievements and impact of endowed funds on current students and introduce the new EES faculty members.

Mike Camara graduated in '74 with a degree in Geology and had the longest legacy of the alumni attending the event. We also welcomed back a group of students who earned their degrees in the late '70s, Gilbert Snell, Bill Chavez, Ron Broadhead, Kim Frazier, the late '80s to early '90s Nelia Dunbar, Bill McIntosh and Ellen Santistevan. Special thanks to our graduate students who attended and brought along their recent conference posters to engage with alumni and showcase their research.

It was great to hear stories from former students and colleagues of Clay Smith, Dave Norman, Bob Bowman and Al Sanford, whose legacies live on in the department today through endowed funds that have a lasting impact on students and new faculty carrying on research in their respective fields.



Images from the reception showing Gilbert Snell (former student) sharing his memories of Al Sanford, Alex Gysi (EES faculty) showing pictures of the Alumni Trip to Iceland in August 2024 and the current EES graduate students presenting their research.

Clay T. Smith was a Professor of Geology at New Mexico Tech from 1947 – 1987 teaching mineralogy, geology and mineral deposits. Emeritus Professor John Wilson shared a memory of arriving at Tech to start his career as a new faculty at NMT and being invited to live with Clay and Sallie. Bill Chavez, faculty of Mineral Engineering and former student of Clay Smith, shared a story of doing field work in one of Clay's classes, where they were sent out to map. Clay promised his students to pick them up if the snow did not stop by the afternoon. Earning a B in the mineral deposits class taught by Clay was a big achievement. Andy

Campell further highlighted how Clay was the driving force for establishing an Economic Geology program with a strong field mapping and petrology focus at NMT. Foremost Clay and Sallie Smith were fabulous people, and their endowment today is supporting EES undergraduate students to attend field school, which is an important capstone experience led by Assistant Professor Veronica Prush (current Geology faculty).

Dave Norman joined the EES department in 1978 as a Professor of Economic Geology until 2008. Dave was very beloved by his colleagues and students as Nelia Dunbar stated. Dave was on her thesis committee and provided a lot of great feedback and advice. He and his wife Mary were also very welcoming to and supportive of, graduate students coming from overseas. We also heard from Andy Campell how Dave was famous for wearing colorful Ghanaian shirts and building up the first fluid inclusion laboratory at NMT. The fluid inclusion laboratory is still active today under the guidance of Nicole Hurtig (current Geochemistry faculty). Kent Condie remembers that on long road trips to field areas in Canada, Dave used to make sure that there were enough glazed Krispy Cream donuts available to drive through the night and stay awake. Dave also did a lot of work on environmental science in Ghana (image), where he worked on mitigation of arsenic pollution from artisanal gold mining. Today the environmental science program is under new leadership by Ranalda Tsosie and Rachel Coyte (current EES faculty). The Dave Norman endowment has supported Eric Ruggles (MSc GEOC, graduated 2024) working on REE-bearing carbonatites and Jakob Newcomer (MSc GEOC) working on the 5-element (Ni-Bi-As-Co-Ag) Blackhawk deposit with funding for analytical work. We are hoping to grow the endowment to support a named student fellowship in Economic Geology with a strong field component for students who aim to have a career in the mineral industry.

Rob Bowmen was a Professor of Hydrology from 1987 – 2009. Emeritus Professor Fred Phillips gave us a heart-felt account of Rob as a colleague and friend with whom he collaborated over many years developing new ideas and designing field experiments. Fred shared a story about Rob caring for one of his students who was struggling significantly at the time and ultimately saving the student's life! Emeritus Professor John Wilson shared memories of working with Rob on tracers and designing field experiments and how instrumental Rob's contributions were in his field. Emeritus Professor Andy Campell shared a funny story about the quirky character of Rob's, who at the time repainted his car to the nice olive-green color depicted in the image and how he enjoyed a good joke. The recent Bowman awardee was Ethan Williams (MSc HYD graduated 2023) who studied agricultural drainage systems in New Mexico under Alex Rinehart (current HYD faculty).

Rob Bowmen

Al Sanford was a Professor of Geophysics from 1957 – 1997, shown in the image attending a Christmas tree cutting event. Anecdotes of Al highlighted his inquisitive character that led to the discovery of the Socorro Magma Body and important work on micro seismicity. The Sanford endowment has been supporting Jessica Aerts (PhD GEOP graduated 2024) working on seismic swarms above the Socorro Magma body and Loc Luong (PhD GEOL/HYD) working on seismicity of bedload transport in alluvial channels and new applications of Geophysics in surface processes and hydrology.

If you are interested to donate into one of the memorial funds, you can find more information using the QR code or contact Megan Van Winkle (megan.vanwiknkle@nmt.edu) from the Advancement Office or Jaakko Putkonen (jaakko.putkonen@nmt.edu) Department Chair of EES. Your gift will be supporting the education of students in EES today and will have a huge impact on their careers and experience as a student.

THANK YOU FOR PARTICIPATING AND STAYING IN TOUCH!

https://host.nxt.blackbaud.com/donor-form/?svcid=tcs&formId=0d-b43e21-96ef-4eb4-90c8-2bf3e3b0e49e&envid=p-N6Brq-II4ECDESAqpI7RbQ&zone=usa

INSTRUMENTATION & NEW FACILITIES

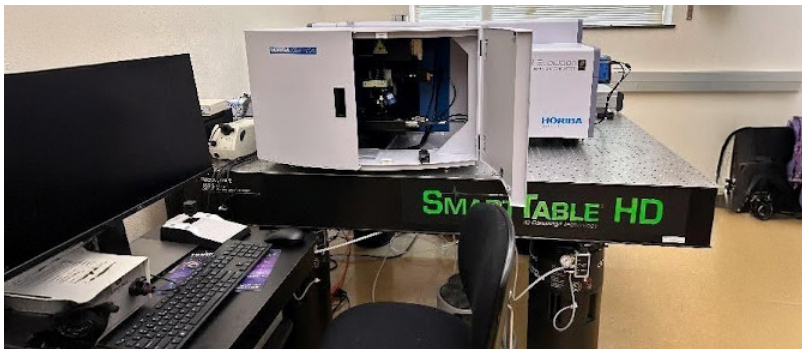
Over the last four years EES faculty have been heavily involved in acquiring support for state-of-the-art analytical and computational facilities. In 2021, an Agilent 5900 Inductively Coupled Plasma Optical Emission and to support a STEM outreach program (Water Resources Education Program WREP) was acquired and integrated into the Analytical Chemistry Laboratory at the New Mexico Bureau of Geology and Mineral Resources (NMBG). This National Science Foundation NSF – Instrumentation and Facilities (IF) grant application (2054299) was led by PI Frey (NMGB staff) with support from Hurtig (EES), Schaefer (former EES), Duval (BIO) and Rubasinghege (CHEM).

Installation of the ICP-OES with Agilent Tech, Dustina Bacca, Hannah Han, Bonnie Frey and Alex Gysi.

Magdalena Teen Science Café sampling water with WREP with Laila Sturgis and Bonnie Frey.

In the same year, the first NSF- Major Research Instrumentation (MRI) grant since 1995 was awarded to a multi-disciplinary team lead by Hurtig (EES) with support from Kalugin (MTLS), Gysi (NMGB-EES), Jones (EES) and Rubasinghege (CHEM). This grant (NSF-MRI/EAR-2117061) enabled the acquisition of a high-resolution confocal Raman microscope with capabilities to perform liquid and solid experiments. The Raman Laboratory was also supported by the New Mexico Higher Education Department (NMHED).

Raman Spectroscopy is a non-destructive analytical technique, that can provide detailed information about chemical structure, composition, crystallinity, and molecular interactions in solids and liquids, thus finding broad applications in geologic, life and material sciences. The strategic mission the new Raman spectroscopy laboratory aims to: 1) strengthen interdisciplinary research at the New Mexico Institute of Mining and Technology (NMT), 2) foster external collaborations, and 3) promote the education mission of NMT. The laboratory is a service center since November 2023 and is accessible to internal and external customers, you can find us using the QR code or on the New Mexico Bureau of Geology website under analytical laboratories.



Horiba LabRam HR Evolution confocal Raman Spectrometer located in the Bureau of Geology and Mineral Resources (room 230). Raman lab team from left to right: Alexander Gysi (Associate Professor EES, Economic Geologist), Nicole Hurtig (Assistant Professor EES, lab PI), Bryan Maciag (NMGB Postdoctoral Fellow), Eric Ruggles (MSc graduated 2024), Sarah Smith-Schmitz (NMGB Postdoctoral Fellow, Raman lab manager).

This year we published our first article on REE phases (Hurtig et al. 2024), which also contains a reference library of Raman spectra for REE oxides, hydroxides, xenotime, monazite and rhabdophane endmembers and solid solutions. Our laboratory has also supported several student research projects across Earth and Environmental Science, Material Science, Chemical Engineering and Chemistry and has participated in several outreach activities, such as the NSF-funded Summer school in 2022 (PI Gysi), WREP (PI Bonnie) and engagement with the local mineralogy community and citizen scientists.

AGU
ANNUAL MEETING

Department of Earth and Environmental Sciences Alumni and Friends,

Will you be attending the AGU Annual Meeting in New Orleans this December? What about the Tucson Gem and Mineral Show in Arizona in February 2026? Do you plan to participate in any other professional conferences or events next year?

Several New Mexico Tech and EES Department faculty and staff will be at these and other conferences during the 2025-2026 academic year and we'd love to use these opportunities to catch up with you.

If you will be in New Orleans in December or Tucson in February, or if there are other conferences on your travel schedule for 2026, please contact:

Cindy Hoffmann at (575) 835-601 or cynthia.hoffmann@nmt.edu.

EMERITUS
FACULTY

Peter Mozley and Andy Campbell, are enjoying their retirement on the White Rim trail (a 100 mile Jeep trail) in Canyonlands National Park, Fall 2025.
— Photo by Emeritus Professor Peter Mozley.

TECHtonics
ALUMNI NEWSLETTER

Thank You.

Contact Us

Office: MSEC 208
Phone: (575) 835-5634
Email: earthenv.dept@npe.nmt.edu

Address

801 Leroy Place
Socorro, NM 87801