New Mexico State University
Department of Geological Sciences
Newsletter 2022

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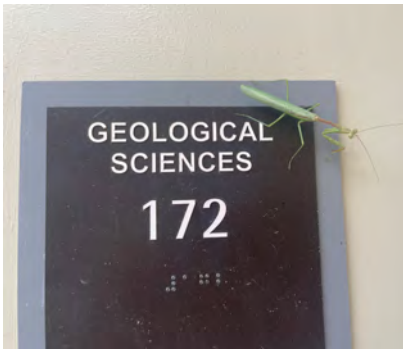
Front cover: View of the Franklin Mountains and the Organ Mountains in the background (looking north). Photo by Jeff Amato.

Check out our Twitter account to keep track of some of our activities:

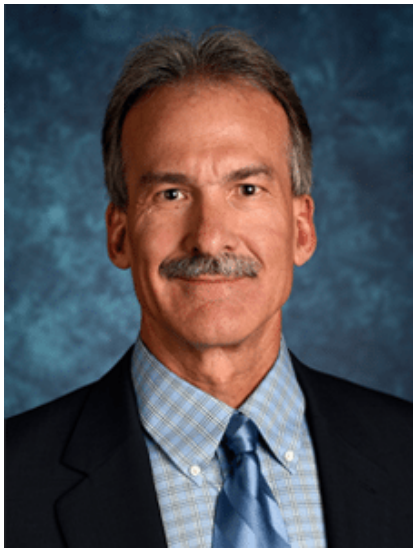
@NMSUGeology



Above: Graduate students and faculty enjoying a classic fall day in southern New Mexico on the 72nd Annual NMGS Field trip. This year, the trip was to the Socorro Region. From left to right, Elinor Davis, Mikayla Earnest Nico Martinez, Brian Hampton, Brian Garcia, and Alexis Salmeron. Below, Hammerhead Shark infestation at Dr. Amato's graduate class. See his faculty page for details.

November 29! see p. 15.

Message from the Interim Department Head: Dennis Giever



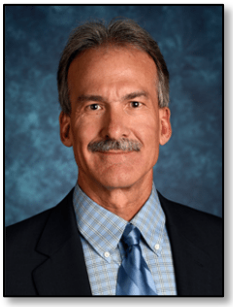
Dr. Nancy McMillan is currently on a well-deserved sabbatical. For those of you who are not familiar with academia, let me briefly explain the purpose of sabbaticals. Depending on the university, research faculty are eligible to take a sabbatical once every seven years of full-time service. A sabbatical is a continuation of your work, but you are relieved from both your teaching and most service/outreach responsibilities. The goal is really two-fold, it allows faculty members to focus on their research and also spend time increasing their competence in the field. Faculty must apply for a sabbatical and detail policy on sabbatical reads as follows: "The purpose of a sabbatical is leave is to promote professional growth and increased competence among faculty members by subsidizing significant study and research, creative work, or some other program which is judged to be of equivalent value and which cannot be accomplished during the fulfillment of normal academic duties and responsibilities." We all wish Nancy the best during her sabbatical and look forward to her return.

While my time in the department will be a short one, I have really enjoyed the opportunity to work with the outstanding faculty here. My role is to ensure that they are able to continue their outstanding work in the classroom, in research, and service. It has also been my extreme pleasure to meet a large number of alumni from the program. Programs such as ours are judged by the quality of the graduates, and I have very quickly learned how outstanding the program really is by listening to all that has been accomplished by our graduates. I am sure each of you is a proud alumnus of the program. The department always welcomes our alumni back to campus – so please, if you are in the area, stop by and say hello or drop us an email and let us know how you are doing. Finally, let me very briefly tell you about myself. My name is Dennis Giever and my normal role at NMSU is to serve as the Academic Department Head of Criminal Justice. I have been in the field of Criminology/ Criminal Justice for about 30 years, and have served as the department head or department chair for over half of those 30 years. I am originally from Las Cruces and have a rather long history with NMSU. My father was a math professor from 1959 – 1984 (you might have had him in class). I received both my bachelors and masters' degrees from NMSU before heading to the northeast to obtain my Ph.D. I retired from a university back east about five years ago and accepted the position of Department Head in Criminal Justice here at NMSU. The goal for me and my wife was to get back to the warm weather and excellent Mexican food that Las Cruces is famous for. We both are really happy to be back home!!

Please reach out to me if I can be of any service to you! My goal is to keep the department moving forward until Nancy returns.

Message from the Department Head

This has been a year of transition for the Department of Geological Sciences. Dr. Emily Johnson and Dr. Reed Burgette left our department for employment in the Pacific Northwest. Emily is a staff scientist at the USGS Cascades Volcano Observatory and Reed works for the Oregon State Geological Survey. Both of them enriched the department through their attentive teaching and excellent research. We hope all the best for them and their family!



Another big thank you goes to Dr. Dennis Giever, who is Interim Department Head of Geological Sciences while Nancy McMillan is on sabbatical from July 2022 through June 2023. Dr. Giever also serves as the Department Head of Criminal Justice, and is making his way through a crash course in geology during his time in our department! His presence is an asset for us…many thanks!

Thanks also to Dr. Jennifer Thines and Dr. Casey Duncan, who are joining us this year to teach classes during the transition. We love having you around!

Karen Hancock, our administrative assistant, continues to hold down the fort in the office and keep everything running for students and faculty. Please feel free to contact her at geology@nmsu.edu or 575-646-2708 if you need anything from the department!

Our students keep graduating and finding jobs or go on to graduate degrees…the department's commitment to quality education has not wavered. Shaping the next generation of geologists to solve earth problems large and small is the central part of our mission. We appreciate your support and your continued affiliation with the department. Please keep in touch by emailing us at geology@nmsu.edu. If you know any department alumni who are not receiving the newsletter and other information from the department, please let us know! We really enjoy hearing about your paths through life.

Peace

Nancy J. McMillan

2022 Alumni Hall of Fame Ceremony

Our 2022 Alumni Hall of Fame inductee is Joe Galemore. Joe received his B.S. in Geology from the University of Alabama in 1983, where he met Greg Mack. Then he came to NMSU where completed his Master's degree in 1986 studying the mid-Cretaceous Mojado formation in southwestern New Mexico.

Joe Galemore's lunchtime speech at the Double Eagle ballroom with alumni, faculty, and students.

Joe is a Senior Vice-President at Intera, an environmental and water resource company based in Austin. His specialties include contaminate fate and transport, contamination remediation, and regulatory agency requirements. He is based out of Albuquerque and has hired some of our other alumni, including Austin Hanson (MS '2018).

Joe spoke eloquently about his time at NMSU and about the supportive culture he found in our department in the mid-'80s. He offered insights regarding a successful career in the field for current students. These included the ability to critically think and to be able to clearly communicate verbally and in writing. These abilities were deemed as "musts" in the current job environment. Congratulations, Joe!

2022 Homecoming Field Trip

In addition to festivities associated with Friday's Hall of Fame, faculty members Brian Hampton and Frank Ramos led a Saturday morning field trip to the Franklin Mountains (along Trans Mountain highway) and Tom Mays State Park. We ate lunch at one of the Tom Mays campsites and students hiked to the Thunderbird rhyolite outcrops in this area of the Franklin Mountains.

Ray Irwin, alumni, students and Dr. Brian Hampton looking at the Mesoproterozoic Castner Marble along Trans Mountain. Students could see grossular garnets, some original sedimentary bedding planes, and cross cutting dikes of the younger Red Bluff granite. Although the day started cool, lunchtime weather was perfect for a hike up North Franklin Mountain.

View looking southwest along Transmountain Road with Castner Marble and intruding Mundy basalts.

Lunch was served at Tom Mays State Park on the western foothills of the Franklin Mountains.

NMSU GEOLOGY ALUMNI

It's always great to run into our alumni. Here are a few photos from this year:

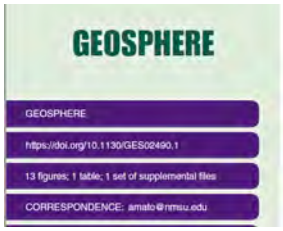
Left: Alicia Bonar (MS '18) doing field work with current MS student Nicole Salladin in the Guadalupe Mountains. Below: At GSA in Denver, Brian Hampton with former NMSU undergraduate Rita Adamec, who is pursuing a MS degree at the University of Alabama.

Above: Jeff Amato and Brian Hampton with Tom Peryam (MS '06) who was in town recruiting for Devon. Thanks Tom!

Right: Also at GSA, Brian Hampton with former MS students Shay Ridl (MS '20) and Alicia Bonar (MS '18). Shay is a Ph.D. candidate at the University of Iowa, and Alicia is a Ph.D. candidate at the University of Oklahoma [https://www.aliciabonargeology.com]

Faculty Profile: Dr. Jeff Amato

In 1994 as a graduate student at Stanford University, I had the opportunity to travel to St. Lawrence Island, in the Bering Sea between Alaska and Russia, as part of my graduate research. It is a critical link between the geology of both the U.S. and Russia. It has exposures of Late Paleozoic to Triassic sedimentary rocks intruded by Cretaceous plutons. Although I didn't visit the sedimentary rock outcrops on that first trip, the pioneering USGS geologists working there in the early 1970's did, and they archived the samples. 50 years later I was able to obtain these rocks and extract zircons for detrital zircon geochronology. Our results have just been published in Geosphere with USGS coauthors and my former student, Eric Gottlieb (MS '08), who was extremely helpful in finishing the manuscript!



Detrital zircon ages from upper Paleozoic–Triassic clastic strata on St. Lawrence Island, Alaska: An enigmatic component of the Arctic Alaska–Chukotka microplate

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In my graduate class "Tectonic Evolution of the Southwest U.S." We did an "icebreaker" conversation to start the class, and the topic was "What is your irrational fear?" Mine was "hammerhead sharks". Two weeks later, the class showed up all dressed up in hammerhead shark costumes! I took a few photos and posted them to my twitter account (@ZirconsForever). The post went viral with over 15 million views, >350K likes, and it was reposted by others to Instagram (>550K likes) and Reddit (>50K upvotes). Easily over 20 million people saw this prank by the students! Thanks to student Amahi for putting this together, it was certainly one of the more memorable few days I've had as a professor. Personal news: Stephanie is now the Communications Director of the Amphibian and Reptile Conservancy, a non-profit organization helping to conserve habitat for endangered amphibians and reptiles. Sofia is 14 and started at Las Cruces High School where she is on the basketball team. Wesley is 12 and is in the Science Magnet at Sierra Middle School.

Top left: The viral Twitter Post. Top right: Wesley, Jeff, and Sofia at City of Rocks.

New students in the Amato Research Group

There are three new MS students in the Amato Research Group. Top left, Alexis Salmeron on the NMGS field trip near Socorro. Alexis comes from Cal State Northridge and is working on Proterozoic rocks on the White Sands Missile Range. Top right, Lee Hughes from Sonoma State, who is doing a geochemical and geochronological study of the Uvas volcanic field. Bottom left, Amit Millo, who received his undergraduate degree from Cal Berkeley, is working on acquiring drone imagery from the Red Rock area of the Burro Mountains to better understand the structural geology of the region.

Undergraduate Paulina Burnside has returned from her semester in Italy and is continuing to work on dating and correlating ignimbrites in City of Rocks State Park.

Faculty Profile: Dr. Brian Hampton

2021–2022 found members of the Basin Research Lab swapping COVID masks and sanitizer for rock hammers and hand lenses, and making up for lost time by spending **A LOT of time in the field for research projects and course work!!** This year the group has been working on a range of research projects throughout the Desert Southwest (more detail below). In addition to research and teaching, Hampton is serving as the Chair of the ***GSA Sedimentary Geology Division*** as serves as Vice President for the ***NM Geological Society*** in addition to serving a 1-year term on the ***NMGS Foundation*** board.

On the research front, M.S. student **Justin Friend** will soon defend his thesis on provenance and feldspar alteration trends from Permian strata throughout New Mexico. Justin is seeing some very interesting alteration trends in these strata and presented findings at the ***2022 GSA Cordilleran and Rocky Mountain Joint Section Meeting*** in Las Vegas and the ***2022 NMGS Spring Meeting*** in Socorro. Present and past members of the Basin Research lab represented well at the Las Vegas GSA meeting with 4 abstracts that included authorship from **Cody Spopka-2017**, **Alicia Bonar-2018**, **Shay Ridl-2020**, and **Justin Friend** (current). Second year M.S. student **Ethan Schneider** has made steady progress on his project on closed-basin sedimentation during the early stages of the Rio Grande Rift. Our final round of U-Pb detrital zircon analyses for Ethan's project is scheduled for January, 2023. The Basin Research Lab welcomed 2 new graduate students this past fall (**Nicole Salladin** and **Thomas Valenzuela**). As I write, Nicole and Thomas are just returning from a **COLD** few days of November field work in the San Juan Basin. Finally, **Greg Mack** and I are collaborating on a Permian-themed book that will be distributed/sold at national parks around the Desert Southwest. We spent several weeks this summer traveling to some of the classic Permian sites in around the Colorado Plateau (see photo above from Monument Valley, UT).

On the teaching front, my primary aim has been to ramp up instruction in the field and we managed to get our Petroleum Systems course on several field trips this last fall. We spent several days in the Guadalupe Mtns./Carlsbad region this past October getting students experience with the Permian Basin petroleum system. We just returned in early November from a 4-day field trip in the Marathon Mtns. and Big Bend National Park. The course also had a classroom visit from **Devon Energy** (alum **Tom Perman-2012** and **Josh Bedell**). We are so fortunate to have support from our alumni and have access to work and learn in these world-class geologic systems that outcrop so close to the NMSU campus!

Dr. Nancy J. McMillan

This summer, I completed 18 months of service as Interim Department Head of Psychology in addition to Department Head of Geological Sciences. That was a whole lot of memos, and I am grateful that I am back to my home department full-time. And even better, I am enjoying a 12-month sabbatical that ends in summer 2023.

My research team has done a great job this year! Four students completed their MS degrees: Carrie Mullins, José Marmolejo, Anna vanDusen, and Jacob Piper. Congrats to all on your hard work and thanks for working with me on such interesting projects!

Graduate student Marie Gibson is working with me on zoned tourmaline crystals, combining Laser-Induced Breakdown Spectroscopy, Electron Microprobe, and X-ray Absorption Near Edge Structure data to understand color changes and petrogenetic processes in these lovely crystals. Marie and I used the synchrotron at Argonne National Lab this fall to collect the XANES spectra and got to ride tricycles around the synchrotron in the wee hours of the night! I thought the tricycle ride was pretty terrific, but Marie was more intent on doing science. Here she is changing samples in the beam line.

My research in applying chemometric analysis of Laser-Induced Breakdown Spectroscopy to a variety of earth science problems continues well. This year, alumna Kate McManus and I finalized invited two book chapters in the new book "Laser-Induced Breakdown Spectroscopy (LIBS): Concepts, Instrumentation, Data Analysis, and Applications." Our chapters are "Full-Spectrum Multivariate Analysis of LIBS Data" and "Application of Multivariate Analysis to the Problem of the Provenance of Gem Stones (Ruby, Sapphire, Emerald, Diamond)." I also gave invited talks at two conferences this fall: SCIX (sponsored by the Federation of Analytical and Spectroscopic Societies) and the Eastern Analytical Symposium held each year at Princeton University.

During sabbatical, I am working on a variety of projects, including the enormous amount of tourmaline LIBS data generated by my last NSF grant. I hope to move about six papers forward from this data set! Oh, and publish papers from my students' theses….. Yipes! Looks like I should sign off and get back to science! Thanks for reading!

Faculty Profile: Dr. Frank Ramos

It was another exciting year for the Ramos research group. We had a new student join the group, one recently graduated student published his thesis, and one student successfully defended her thesis. Elinor Davis came aboard from Wisconsin in August and is working on U/Th/Ra isotopes of mafic volcanic rocks from Tenerife in the Canary Islands, Spain. She will join Mike Murphy in applying Ra isotopes to better understand magma generation on the largest island of the Canary chain, Tenerife. In addition, Mike Murphy recently finished a summer internship at Mt. St. Helens and gave a talk about flank- and edifice-related phonolite generation at Tenerife at the GSA Annual Meeting in Denver in October that received many positive comments. He is now back in Las Cruces working on isolating single crystals for further age-dating determinations as part of his thesis project. Recently graduated Bryce Brown (MS, 2022) had part of his thesis work published in the October edition of Geology. "Unleashing alkali feldspar: Ra/Th ages and chemical and isotopic constraints on Holocene phonolite magmatism, Canary Islands" is the title and offers an excellent example of using the Ra/Th technique to date single feldspar crystals in phonolites. Dating of common crystals such as feldspar in magmas has been elusive to say the least. And in contrast to zircon, which commonly records older ages associated with assimilants or the earlier histories of the magmas in which they are found, alkali feldspar (and feldspar fractionation) is key to understanding the chemical changes occurring during magmagenesis and thus, the ages of these crystals are critical to accurately evaluating the timescales of processes affecting magmas. Bryce's work 1) demonstrates that the ages obtained for alkali feldspars in phonolites are consistent with known eruption ages and 2) identifies crystals that are xenocrystic and antecrystic in nature, which should not be used to evaluate magmagenesis directly. The work is a great contribution in evaluating the origins of crystals in magmas and the timescales of magma formation. It is also a quick read so get a copy and see what cutting-edge science NMSU students are doing in the Johnson Mass Spectrometry Lab. Since graduating in May, Bryce and his wife Annie headed back to Indiana and he now works for the Indiana Department of Natural Resources. Last heard, he was inspecting old coal mines to assess their environmental and hazard impacts. Go Bryce!

In addition to students publishing their thesis work, Jenelle Hansen successfully defended her thesis titled "Ra/Th Dating of Single Feldspar Crystals and Crystal Fragments from Young Phonolites, Mt Erebus, Antarctica." She focused on using the Ra/Th technique to date alkali feldspar from a volcanic bomb that was ejected from the Mt. Erebus lava lake in Antarctica. She was provided a volcanic bomb ejected in 2016 from the New Mexico Tech group that had plenty alkali feldspar crystals for which she dated 17 crystals or crystal fragments. She had a strong defense presentation and a submitted a very thorough thesis that included sections on radium diffusion, estimates of feldspar crystal growth rates, and models to account for the isotope characteristics of the magma upwelling in the Erebus lava lake, in addition to the 17 crystal ages. She is now doing final edits and getting the thesis ready to file. She will then start looking for lab jobs and soon join the "real" world. She is great in the lab and has mastered undertaking highly challenging U-series chromatographic separations and analyses. No doubt that she will be running a lab soon. Great job Janelle!

This fall, the Ramos research group also hosted Drs. Shane Cronin and Ingrid Ukstins from the University of Auckland. Cronin is a volcanologist commonly seen on BBC News and BBC documentaries addressing recent volcanic eruptions and their aftermaths. Ukstins is a petrologist that undertakes a range of NASA and NSF funded projects targeting recent volcanic eruptions. Both were passing through NMSU on their way to sampling hydrothermal rocks in Yellowstone National Park in Wyoming. Dr. Cronin gave a department colloquium describing the January 15th, 2022 Hunga Tonga eruption, the biggest eruption since Krakatoa in 1883. We quietly refer to him the "volcano whisperer" as he seems to visit dormant volcanoes that miraculously come back to life soon after his visit. Suffice to say, Tonga is on the "whisperer" list. In addition to the colloquium, Dr. Cronin also gave a lecture describing his career working with volcanoes to the Honors Introductory Geology class. After his lecture, we were all worried about whether Yellowstone would erupt after his visit. Fortunately for us, things are still quiet up there.

Faculty Profile: Dr. Frank Ramos (cont.)

Drs. Cronin and Ukstins also worked with MS student Allison Mrotek who is working on young basaltic andesite eruptions at Fantham's Peak, a satellite cone found on the south flank of Mount Taranaki, a stratocone located on the North Island of New Zealand. She learned much from the duo, which resulted in an outstanding talk at the GSA Annual Meeting in Denver. Allison's project is going very well and she hopes to defend her thesis in December or January so be ready. Her work has confirmed the rapid ascend (≤800 years) of mafic magmas originating from ~180 km depths, which had to transit at least 30 km of continental crust… which is incredible for basaltic andesite magmas! Allison and Ramos are already working on writing the results up with our Kiwi colleagues for a Geology submission. Allison is becoming a very strong scientist who is greatly expanding her geochemical background and critical thinking abilities. Keep a look out for her upcoming defense.
In addition to his students, Ramos also has been busy himself. He has been involved in organizing the Annual GSA Meeting for the last four years and this year was able to give a talk in a GSA Special Session on the Tonga eruption in Denver. He described the first (and only available) geochemical and isotope assessments of the 2022 Tonga eruption. Overall, three magmas are thought to have been involved in the VEI 6 Tonga eruption. These magmas all retain andesitic compositions but have different Nd and Pb isotope characteristics that confirm there uniqueness as separate magmas. All the work has been done in the Johnson Lab here at NMSU. We are also hoping to obtain earlier erupted materials from Hunga islands so that we can evaluate the longer-term magmatic evolution of the Hunga Tonga volcano. As his collaborators have indicated, they want Ramos to take the lead on writing the results up so I guess Christmas break will be busy. The results have been critical to understanding this massive eruption and having the Johnson Lab available for these timely analyses has been crucial to getting results out as fast as possible. We hope to be expanding our studies on Hunga Tonga in the near future, please look for them.

In contrast to current work, we also have updates from earlier graduates. Nick Butterfield and Jake Buettner are still at Los Alamos National Laboratory. Nic Slater now works for Unity Lab Services, the technical arm of FisherScientific that services mass spectrometers. Nic and Darren Tollstrup, Ramos' 1st MS student from when he was at Washington State University, are both at FisherScientific. Daddy Sean Scott is still at the Wisconsin Department of Hygiene in Madison operating a Neptune, with mom and his one-year-old daughter. Corey Dimond has also made contact and now works with Jamie Shafer at the New Mexico Environmental Department. Those grads are everywhere.

In addition to Ramos group research, the Johnson Mass Spectrometry Laboratory was humming along and we have had many more visitors now that COVID requirements have eased. Amanda Semanko (MS, 2020, NMSU Anthropology) visited three times to undertake rodent and bird bone, Sr and Pb isotope analyses for her dissertation research at University of Arizona. She and Ramos were coauthors on her NMSU thesis research focusing on the isotopic signatures of dogs in southwest US native American burial sites that came out in the January edition of Kiva. Dr. Corina Kellner visited from Northern Arizona University to analyze turkey bones of southwest US burial sites too. Drs. Kellner and Ramos are also coauthors on a paper evaluating Peruvian Trophy Heads (i.e., human heads worn on the belts of victors 2000 years ago). The title of the paper will likely be the most bizarre of Ramos's career but the work is fascinating. Ramos also submitted grants to obtain internships for NMSU students at Los Alamos National Lab and for undertaking research sequestering CO2 during agricultural production with Curtis Monger, now back from his USDA role in Nebraska. In any case, there is always lots going on in the Johnson Lab. Come visit if you get the chance.

Sincerely,
Ramos Research Group

Faculty Profile: Dr. Frank Ramos (cont.)

Picture of Allison Mrotek presenting her thesis work at the Annual GSA Meeting in Denver, Colorado.

Picture of Janelle Hansen at her thesis defense.

Ramos Research Group






Top left: Students in Dr. Hampton's Petroleum Systems course in Mescal Canyon. Top right, same field trip, looking at turbidites. Middle left: Dr. Hampton's field trip to Big Bend National Park. Middle right: turbidites in the Marathon Mountains. Lower left: Graduate student Thomas Valenzuela doing field work in the San Juan Basin. Lower right: Dr. Amato's structural geology class field trip at the Prehistoric Trackways National Monument.

Giving Tuesday is November 29, 2022

Giving Tuesday is a global celebration of the many ways that everyone can help organizations meet their goals. It's a time of giving back to the communities that have given to you. Please consider a gift to one of the Geology Scholarships, especially these three highlighted funds.

Southern Rift Institute

The Southern Rift Institute was created this year to provide support for graduate and undergraduate field-intensive geologic research projects in the Southern Rio Grande rift (see p. 5-6 for more information). Your gift will be used to pay for research costs associated with student thesis projects.

Online Donations Link:
https://nmsufoundation.org/givenow/sri.html

Geology General Scholarship Fund:

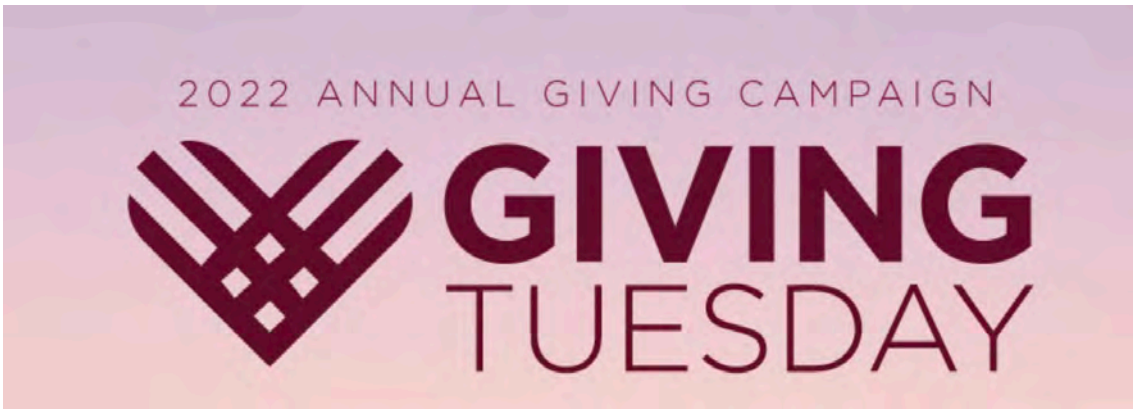
Online Donations Link:
https://nmsufoundation.org/givenow/Geo_General.html

Geology Field Teaching and Research Fund

Your gifts to this account will allow us to fully or partially subsidence our undergraduates who are taking Field Geology in Summer 2023. Each student has to pay $700, plus tuition, to attend our field camp. While this is a bargain compared to other camps, this is still a big committment, particularly for students who have to take time off work to fulfill this requirement.

Online Donations Link: https://www.nmsufoundation.org/givenow/Geo_Field_Teaching.html

Thank you for your continued support of the department, and thank you for considering a gift to the department this Giving Tuesday.



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Dr. Amato's Structural Geology class visited a granite counter shop in Las Cruces to learn about deformed rocks on perfectly polished slabs.