



CALIFORNIA STATE UNIVERSITY
BAKERSFIELD™

Geological Sciences

DEPARTMENT NEWS

Hello everyone! As another year unfolds, it is with great pleasure that we present the latest edition of the Department of Geological Sciences newsletter. This newsletter serves as an invaluable record of our department's history, accomplishments, and development throughout the year. Happy reading!

THE GEOLOGY TEAM

As the cycle of hellos and goodbyes continues, we extend our heartfelt gratitude to **Elizabeth Powers** who dedicated over 20 years to the Department of Geological Sciences as an instructional support technician. Elizabeth has embarked on a new journey as the chemical hygiene officer for the CSUB Office of Safety & Risk Management. Her contributions will be greatly missed, and we extend our best wishes for success in her new role.



CSUB Geologists learning science and how to stay cool.

Joining us last fall as our new instructional support technician is **Brian Aguilar**, stepping into the shoes vacated by Elizabeth. Brian's adaptability and dedication shine through as he familiarizes himself with his responsibilities and supports faculty and students on a daily basis.

As we continue to enhance our curriculum, making necessary adjustments to meet the strong demand for earth science courses at CSUB, we remain deeply grateful for the invaluable assistance provided by our part-time instructors in teaching courses in 2023: **Jason Cotton, Robert Crewdson, Larry Drennan, Monica Hinson, Alyssa Kaess, Steve Kiouses, Pam Knight, Nick Moreno, Brian Pitts** and **John Yu**.



Death Valley inspires CSUB Geology students.



DEPARTMENT OF
GEOLOGICAL SCIENCES
CSU BAKERSFIELD

GRANTS

We are thrilled to report another successful year in securing and utilizing research funding from sources including the National Science Foundation (NSF), Department of Energy (DOE) and United States Geological Survey (USGS). These grants play a pivotal role in supporting both student and faculty research endeavors, enabling us to access cutting-edge research equipment and further advance our scholarly pursuits.

Adam Guo and **Katie O'Sullivan** were awarded a CSUB California Energy Research Center (CERC) grant to study the viability of repurposing abandoned mine tailings for climate change mitigation and alternative energy production. The project will fund students to catalog the geological settings of nearby mines, collect samples at the best candidate mines and investigate the mine tailing mineralogy for their potential to reduce carbon or generate hydrogen.

Following the devastating Turkey earthquakes in February 2023, **Matt Herman** received continued funding from the USGS to collaborate with the National Earthquake Information Center on their global earthquake response, seismotectonic analyses and earthquake sequence communication and outreach products.

The first year of the funded DOE Reaching a New Energy Sciences Workforce (RENEW) program *Nanopore Characterization for Geologic Storage of H₂ and CO₂* (led by principal investigator **Liaosha Song** and co-principal investigators **Adam Guo**, **Matt Herman**, and **Tony Rathburn**) was a success, funding student summer research projects at Lawrence Berkeley National Laboratory and sending these students and collaborators to the 2023 American Geophysical Union Fall Meeting in San Francisco to present their work.

Tony Rathburn and collaborators at Woods Hole Oceanographic Institute and University of Delaware were funded by the NSF Marine Geology & Geophysics and Chemical Oceanography programs to investigate marine neodymium isotopes. Their project "A porewater perspective on benthic sources of neodymium to the North Atlantic" focuses on constraining deep ocean circulation to understand climate variability throughout Earth's history.

Liaosha Song and **Tony Rathburn**, along with CSUB biology faculty Brandon Pratt and Anna Jacobsen, received NSF funding in 2022 for a scanning electron microscope. Although getting the instrument installed has taken some time, as of May 2024 the machine is up and running!

STUDENT SUCCESS

The CSUB Department of Geological Sciences continues to successfully train and graduate high-quality bachelor's and master's students. Our graduates go on to work in diverse fields across the earth sciences, reflecting the breadth and depth of our curriculum and the commitment of the entire department to preparing our students for their futures. CSUB geology students achieve highly in many activities beyond the classroom, setting themselves up for future success.

Student Research Competition

Briana Acevedo, a geology graduate student, was awarded first place in the 2023 CSUB Student Research Competition for Physical and Mathematical Sciences. Briana presented her research in a 10-minute oral format before a jury of professors and a general audience. Her study focused on analyzing the elemental composition of a newly discovered lunar meteorite, Northwest Africa (NWA) 11788. Briana worked diligently for over two years in Dr. Katie O'Sullivan's laboratory, meticulously classifying the meteorite's rock types and evaluating the magmatic processes that could have formed them, offering valuable insights into the formation of the Moon.

For more details, see the link below:

<https://news.csub.edu/csub-students-recognized-for-research-efforts>

Smithsonian Internship

In Summer 2023, geology undergraduate students **Joshua Barnes** and **Tyler Garza** embarked on an enriching internship at the Smithsonian National Museum of Natural History in Washington, D.C. They dug into the microscopic world of foraminifera, single-celled organisms inhabiting the ocean floor. Guided by Dr. Brian Huber, the museum's esteemed curator of foraminifera, the duo immersed themselves in cutting-edge research.

Both Barnes and Garza had previously ventured into marine research alongside **Dr. Tony Rathburn** and



Joshua Barnes and Tyler Garza enjoying their work at the Smithsonian National Museum.

experts from the Scripps Institution of Oceanography. During their time at sea, they acquired and meticulously analyzed seafloor samples, then honed their analytical skills back on campus. Recognizing the potential for further growth through an extraordinary and transformative experience, Dr. Rathburn sought out the opportunity for Barnes and Garza to be mentored by a world-renowned paleontological researcher. Thanks to funding from the NSF Geopaths internship program at CSUB, Dr. Rathburn facilitated the students joining Dr. Huber's team, where they used their analyses of foraminifera to better understand the history of Earth's climate.

For more details, see the link below:

<https://news.csub.edu/a-paleontological-wonderland>

Internship at Lawrence Livermore National Laboratory

Eder Tavera was one of the first CSUB students to be selected for a highly competitive research fellowship program run by the Livermore Lab Foundation, which supports the groundbreaking science being done at Lawrence Livermore National Laboratory (LLNL). Eder's fellowship is one component of a growing partnership between CSUB and LLNL. The fellowship program, through mentorship and research support, empowers students to work on cutting-edge, societally critical research topics, and then pursue graduate studies and career goals previously considered unattainable. Eder plans to pursue a master's degree at CSUB before embarking on his doctorate and a career at LLNL, recognizing the pivotal role of the fellowship in his scientific journey.

For more details, see the link below:

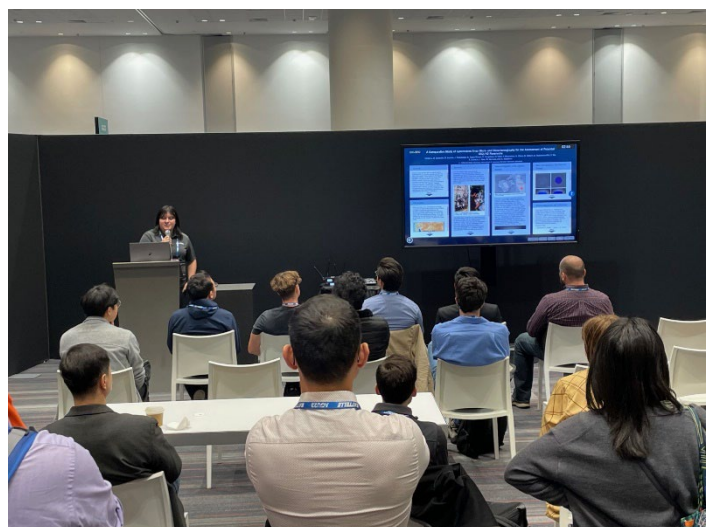
https://www.bakersfield.com/news/csub-students-doing-research-with-world-s-best/article_8c615e50-36fb-11ee-af38-475919a2fbac.html



Eder Tavera, former CSUB President Zelezny and Julnar Al Azzam at the Carbon Management Symposium. Photo courtesy of Livermore Lab Foundation.

Internships at Lawrence Berkeley National Laboratory

Funded by a \$2.2 million Department of Energy grant, five CSUB undergraduates (including geology majors **Jennifer Rubalcaba, Samantha Taylor-Moore, and Ryan Tengelsen**) spent the summer at Lawrence Berkeley National Laboratory (LBNL) to work on characterizing subsurface reservoirs for carbon storage. Under the mentorship of LBNL scientists, the students used cutting-edge tomography techniques at the Advanced Light Source to evaluate the microstructure of rocks in potential sequestration regions. They traveled to San Francisco to present their research findings at the 2023 American Geophysical Union Fall Meeting, the largest gathering of earth scientists in the world.



Jennifer Rubalcaba presenting her cohort's research from Lawrence Berkeley Lab at the 2023 AGU Fall Meeting.

CSUB Alumni Hall of Fame

CSUB geological science alumnus **Ken Haney** has been inducted into the CSUB Alumni Hall of Fame, recognizing his outstanding contributions to his field. Haney earned his B.S. in geology in 1984 and currently serves as strategic advisor on carbon for California Resources Corporation (CRC). With over 30 years of experience in the upstream petroleum industry and more than five years dedicated to carbon management, Haney brings a wealth of expertise to his role. He oversees the engineering aspects of CRC's Carbon TerraVault, which aims to capture, transport and store carbon emitted from industrial sources and directly from the atmosphere. These initiatives align with the goal of reducing greenhouse gas emissions and achieving carbon neutrality for CRC and California by 2045.



Ken Haney was inducted into the 2024 CSUB Alumni Hall of Fame.

Haney remains committed to giving back to CSUB, both as a donor and as a speaker at campus events. He has actively supported geology students in their research endeavors and facilitated recruitment efforts within Occidental Petroleum/CRC to hire and mentor CSUB graduates in geology and engineering roles.

His induction into the CSUB Alumni Hall of

Fame underscores his dedication to advancing the field of geological sciences and his ongoing commitment to fostering the success of future generations of students and professionals.

For more details, see the link below:

<https://news.csub.edu/csub-announces-2024-alumni-hall-of-fame-inductees>

COMMUNITY ENGAGEMENT

Tony Rathburn has been actively engaged in various community outreach initiatives. He delivered a presentation at the Kern High School District School counselors meeting, shedding light on the significance

of the energy, environment, and utilities pathway within our community. His discussion emphasized the pivotal role of the CSUB California Energy Research Center and its implications for future job opportunities.

Dr. Rathburn was also featured in an interview for Kern Living on March 24, where he discussed the CSUB Emergency Preparedness event. On June 8, Dr. Rathburn was interviewed live on KGET to highlight marine science on World Ocean Day, underscoring how the ocean impacts daily life in Kern County.

Dr. Rathburn's reach extends beyond local boundaries; in June he was interviewed about energy security by foreign journalists from five Central Asian countries during their visit to our department. Moreover, his live radio interview on ABC radio in Australia demonstrates his global impact and commitment to sharing knowledge beyond borders.



Tony Rathburn being interviewed by foreign journalists. Photo by Abel Núñez-Guerrero.

For more details, see the links below:

Tony's Interview with Central Asian Journalists (by Kelly Ardis): <https://news.csub.edu/touching-the-future>

Tony's KGET interview: <https://www.kget.com/guest-interviews/world-ocean-day-how-the-ocean-affects-daily-life-in-kern-county>

After the devastating magnitude 7.8 and 7.5 earthquakes in Turkey in February 2023, **Matt Herman** provided information about the events and their relevance for understanding California earthquakes in interviews with *The Bakersfield Californian* and KGET. He discussed how rare events of this magnitude (approximately eight times larger than

the 2019 magnitude 7.1 Ridgecrest earthquake) are in this part of Turkey and noted that magnitude 7.8 is about as large as the biggest San Andreas earthquakes. He particularly emphasized the importance of understanding how the earthquake sequence unfolded in the context of the plate boundary setting. He explained how he used the events as learning opportunities for his students; geophysics student **Liberty Rasmussen** told *The Bakersfield Californian*, "Speaking about real-world events kind of brings it all together from a theoretical sense into a real-world sense." Dr. Herman worked closely with USGS colleagues to produce a Story Map that communicated the developing science of the earthquake sequence and was later interviewed about earthquake triggering processes for an article in the American Geophysical Union's science news magazine *Eos*. Dr. Herman also pointed out that studying the earthquake is not purely academic; constraining the earthquake relative to local infrastructure and societal awareness allows us to define its devastating impact and deliver urgently needed aid. Reflecting on his work, Dr. Herman highlighted comparable earthquake hazards in regions like California and emphasized the importance of community preparedness and proactive mitigation measures. One such approach is called "earthquake early warning" (EEW) which is based on rapidly analyzing faster P-waves that produce less shaking than more destructive but slower surface waves. California's Shake Alert EEW system notified everyone in Bakersfield about a small earthquake near Ojai in August, and Dr. Herman talked to KGET about the system.

Dr. Herman also traveled through the community to give talks about the general science of earthquakes. In February, he discussed the physics of the 2023 Turkey earthquakes at the CSUB Physics Colloquium. In June, he was invited to the Ridge Route Communities Museum in Frazier Park to talk about faults in southern California, how they were formed by geologic and tectonic processes, and the hazards they pose in Kern County. Finally, he was the December School of Natural Science, Mathematics, and Engineering (NSME) Teacher-Scholar Lecture Series speaker, looking back on the earthquakes that occurred throughout 2023 and how he and his students studied them to move science forward.

For more details, see the links below:

<https://www.kget.com/guest-interviews/csub-professor-gives-insight-on-turkey-syria-earthquakes/>

<https://earthquake.usgs.gov/storymap/index-turkey2023.html>

<https://eos.org/features/the-2023-turkiye-syria-earthquakes-shifted-stress-in-the-crust>

In November 2023, **Liaosha Song** was interviewed about his research on geologic storage methods to combat climate change by Kelly Ardis, a communications specialist for NSME. Dr. Song highlighted his work on carbon sequestration to permanently remove CO₂ from the atmosphere and hydrogen storage to bolster renewable energy initiatives. Dr. Song emphasized the need for these solutions considering the increasing severity of climate change impacts, and how geologic storage will also serve to create jobs and power local industries. Dr. Song explained how his research team and collaborators use advanced imaging techniques to understand the chemical composition and pore systems of rock samples. Dr. Song's work, supported by recent National Science Foundation and Department of Energy grants, aims to evaluate the integrity of caprocks for long-term carbon storage and the temporary storage of hydrogen for renewable energy applications.



Liaosha Song holding a sandstone core in the California Well Repository during his interview for Kelly Ardis. Photo by Albert Baker.

Collaborating with scientists at Lawrence Berkeley National Laboratory, Dr. Song's research has broadened perspectives and opened opportunities for students like **Jennifer Rubalcaba**, who is studying potential storage sites in the Central Valley. Dr. Song's research has the potential to impact global climate change efforts and could lead to economic development in Kern County through repurposing subsurface resources for safe gas storage. This interview led to Dr. Song being featured on the front page of *NSME Impact*, a magazine dedicated to showcasing the outstanding work being done in NSME.

For more details, see the links below:

<https://news.csub.edu/geologic-storage-and-the-fight-against-climate-change>

<https://www.csub.edu/nsme/impact.shtml>



Jennifer Rubalcaba standing in front of Lawrence Berkeley National Laboratory. Photo by Albert Baker.

Emergency Preparedness Event

The Department of Geological Sciences, in collaboration with the Kern County Office of Emergency Services, other county agencies, and the CSUB President's Office, hosted the second annual Emergency Preparedness Event on campus. This family-friendly gathering aimed to educate all ages about various emergencies and how to prepare for them, offering hands-on educational activities and

exhibits. Held on March 25 on Don Hart Lawn East, the event boasted over 25 booths, exhibits and demonstrations. **Chris Krugh, Matt Herman, and Tony Rathburn** organized the logistics, while the **CSUB Geology Club** curated three engaging geology-oriented booths. Among the highlights were CSUB geology's augmented reality sandbox and stream table, where attendees could experience creating streams, causing erosion, building mountains and more.



The CSUB Geology Club dinosaur demonstrates how to be prepared for emergencies.



Geology's augmented reality sandbox booth was approved by all sorts of dinosaurs.

The event featured a diverse array of interactive exhibits, including the Fire Safe Trailer and the Quake Cottage, providing a simulated earthquake experience. Booths from CSUB were set up by nursing, chemistry and biochemistry, Safety and Risk, and the University Police Department. The Red Cross,



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Geology Club@CSU Bakersfield

Buena Vista Museum of Natural History and Science and the Kern County Mineral Society also set up booths that enriched the event. Emergency responders showcased their gear, including a helicopter, fire engine and SWAT and rescue vehicles. As a special attraction, the Geology Club even brought a trained velociraptor to visit the booths. The event garnered significant media coverage, with Tony Rathburn participating in a TV advertisement and live interview on KGET.

For more details, follow the link below:

<https://www.kget.com/studio17live/csub-hosting-family-friendly-emergency-preparedness-event-3-25-experience-interactive-demonstrations-and-experiments/>



*The **CSUB Geology Club** booth was a big hit with kids at the Emergency Preparedness Event.*

CERC CARBON MANAGEMENT SYMPOSIUM

In April, the California Energy Research Center (CERC) once again hosted the Carbon Management Symposium on campus, marking another successful year of engagement and collaboration. To accommodate the growing size of the event, a reflection of widespread community interest, the 2023 Carbon Management Symposium was moved to the CSUB Student Recreation Center. The event aimed to bring together community members, industry leaders, policymakers and academics to delve into the pressing topic of reducing atmospheric carbon dioxide. Organized in partnership with Climate Now,

The California Council of Science and Technology (CCST) and Lawrence Livermore National Laboratory (LLNL), the symposium featured a dynamic lineup of speakers and panels. Attendees had the opportunity to participate in a pre-event mixer, explore student research posters and engage with informational booths.

Discussion sessions delved into carbon capture and storage (CCS), examining methods for capturing CO₂ emissions and securely storing them underground to combat climate change. Speakers and panelists openly discussed the challenges and considerations involved in implementing sequestration initiatives in the Central Valley, emphasizing the importance of thorough planning and community involvement. Additionally, concerns regarding potential impacts on air and water quality in the areas where sequestration efforts are undertaken were addressed with transparency and diligence.

For more details, see the link below:

<https://news.csub.edu/experts-discuss-carbon-management-at-csub-symposium>



*Tony Rathburn at the Carbon Management Symposium.
 Photo by EJ Medellin.*



Find the CSUB Geology Department on Instagram!
@CSUB_geology

PARTNERSHIPS

In September, CSUB announced a groundbreaking partnership with the renowned **Lawrence Livermore National Laboratory (LLNL)**, a leader in cutting-edge science and technology. This collaboration is poised to transform our institution and positively impact Kern County as a whole. As California sets ambitious goals for carbon neutrality by 2045, LLNL's influential report identified Bakersfield as a pivotal hub for the state's clean energy transition. This partnership signifies a significant step towards realizing a sustainable future, as CSUB and LLNL join forces to advance research on clean energy solutions tailored to our local community.

For more details, see the link below:

<https://www.kget.com/news/local-news/csub-enters-research-partnership-with-lawrence-livermore-national-laboratory-hopes-for-new-future-in-kern/>

In December, CSUB and Aera Energy announced a significant development in their partnership, marking a nearly three-decade collaboration that aims to advance research in the energy transition. Aera Energy will invest \$2.5 million to endow the Executive Director for Energy Research position at CSUB's California Energy Research Center (CERC), elevating the university's role in the energy research sector. The goal of this partnership is to unite the community in shaping the future of energy and preparing the workforce for success. The position will enhance CSUB's research capabilities and facilitate collaboration between innovators in Kern County and the energy industry. Aera Energy's continued support for CSUB spans various initiatives, including endowments, support for student research, and event sponsorship. The partnership reflects a shared vision to foster cooperation, innovation, and research in building a sustainable energy economy. CERC, housed within CSUB's NSME, will leverage Aera Energy's support to advance research in carbon management and climate change mitigation.

For more details, see the link below:

<https://news.csub.edu/aera-energy-csub-partner-to-advance-research-into-energy-innovation>

SEMINAR SERIES

The CSUB geology seminar series continues to bring in experts from diverse fields to discuss their exciting research. In March 2023, Professor Kevin Furlong from Penn State University (perhaps better known around CSUB as **Matt Herman's** Ph.D. advisor) delivered an enlightening lecture on "How to Make the San Andreas Plate Boundary." Clever geophysics students in the audience recognized that Professor Furlong gave them all the answers to their midterm project in his talk!




Dr. Kevin Furlong presenting his research in the Geology Seminar Series.

The Fall 2023 geology seminars were sponsored by California Resources Corporation (CRC) and titled the *CRC Energy Transition Lecture Series*. These lectures focused on topics related to energy solutions for a sustainable California. We were privileged to host three speakers who talked about a diverse range of issues.




Dr. Richard Behl from CSU Long Beach discussed his research on "Depositional Environment and Rock Properties in the Miocene Monterey Formation of California." Dr. Alex Simms from University of California, Santa Barbara presented fascinating insights into "Interactions Between Ice Sheets and Relative Sea Levels: Lessons from Antarctica and NW Scotland." Finally, Dr. Caleb Woodall from the United States Department of Energy showed an economic perspective, sharing his work on "Assessing the Optimal Uses of Biomass: Carbon and Energy Price Conditions for the Aines Principle to Apply."



We welcome anyone interested in giving a presentation to reach out to us. Our seminar series

CRC Energy Transition LECTURE SERIES 2023

Presented by  CALIFORNIA STATE UNIVERSITY
BAKERSFIELD | California Energy Research Center

Join the conversation on future energy solutions for a sustainable California.

SEPTEMBER 20	OCTOBER 18	NOVEMBER 8
<p>From Depositional Environment to Rock Properties in the Miocene Monterey Formation of California</p>  <p>Richard J. Behl, PhD <i>CSU Long Beach</i></p>	<p>Interactions Between Ice Sheets and Relative Sea Levels: Lessons from Antarctica and NW Scotland</p>  <p>Alex Simms, PhD <i>UC Santa Barbara</i></p>	<p>Assessing the Optimal Uses of Biomass: Carbon and Energy Price Conditions for the Aines Principle to Apply</p>  <p>Caleb Woodall, PhD <i>US Department of Energy</i></p>
4 pm to 5 pm Room: SCI 3 - 108		

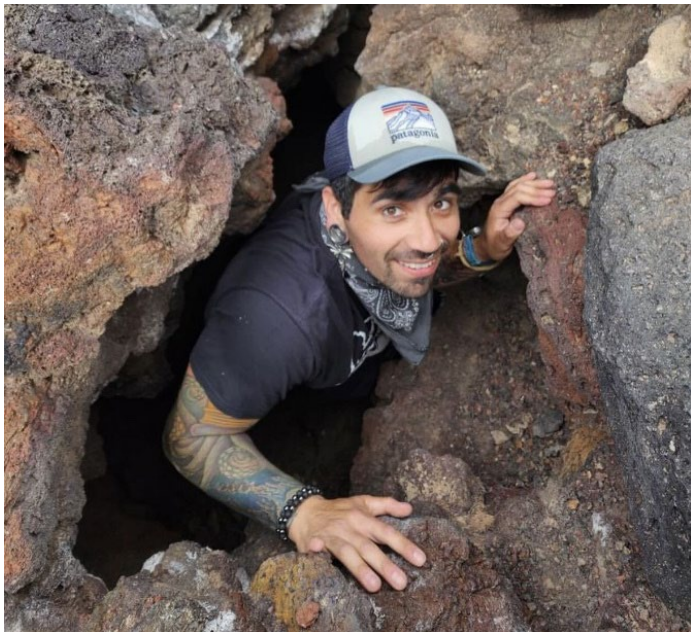
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offers a diverse range of topics suitable for all interests. Be sure to follow our Facebook page and join our email list for notifications of upcoming talks and events. We look forward to your participation!

FACULTY AND STAFF NEWS

Brian Aguilar

Hi, my name is Brian Aguilar, and I am the new instructional support technician for the Department



Brian Aguilar, the newest IST for the Department of Geological Sciences.

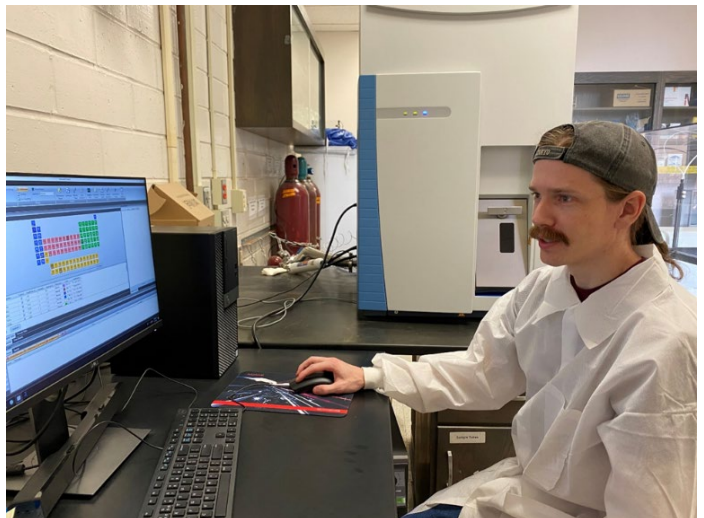
of Geological Sciences. I have big shoes to fill by taking over Elizabeth Powers' old job, but every day I am learning something new! I recently graduated with my B.S. in geology from CSUB in 2022 and plan on pursuing my master's degree here as well. I enjoy being a part of the department and I feel welcomed by staff, faculty and students.

Anna Cruz

This year (2023) has been truly remarkable. It has underscored the value of in-person interactions and close engagement with students, reaffirming how rewarding it is to be back in the classroom. I had the opportunity to teach a range of courses, including geological oceanography and applied geochemistry in the Spring semester, and geochemistry, California geology and society, and a special topics course in paleoclimatology in the Fall.

The paleoclimatology course was particularly special to me, as it was a vision I had since arriving at CSUB. Bringing this course to life was incredibly fulfilling, and the deep discussions my students engaged in about paleoclimate made it one of the highlights of the semester. I'm thrilled to announce that the course, GEOL 4040 Paleoclimatology, is now a permanent fixture in our curriculum and will be offered again soon.

During the fall semester, I attended the COAST annual meeting, where I had the chance to meet with fellow CSU researchers to discuss potential collaborations. Additionally, I mentored an undergraduate student, **Garrett Cooper**, in the lab, guiding him through various techniques for sample processing and



Garrett Cooper calibrating the ICP-MS in the Geochemistry lab.

analysis using the ICP-MS. Together, we were calibrating the instrument for Mg/Ca analysis in carbonate samples.

Furthermore, I collaborated on a paper published in the *Radiocarbon* journal in December 2023, alongside colleagues from Federal Fluminense University. Our paper focused on refining data treatment for core samples collected in Lagoa Salgada, Brazil, utilizing a new Marine20 curve to enhance the discussion of environmental evolution through more accurate calibration.

On a personal note, my family and I were able to take a short trip to Monterey, where we visited California's renowned aquarium. It was a fantastic experience, especially for Benjamin, who was fascinated by the "big fish," as he kept calling them.

I am looking forward to another wonderful year ahead!



Anna, Benjamin, and Chris enjoying a day at the Monterey aquarium.

Adam Guo

It was a fulfilling year filled with teaching, research and valuable moments in academia. I had the pleasure of

instructing a variety of courses, including how the earth works, water in the west, sedimentation/stratigraphy, & California geology and society. Coming back to the classroom provided the opportunity to reestablish personal connections with my students. I cherished every moment spent with my students in the field. Looking ahead, I am eager to welcome new students and embark on exciting research projects. Currently, backed by funding from the California Energy Research Center at CSUB, my students and I are investigating the sequestration of CO₂ in the natural environment through the analysis of mine tailings and the essential minerals contained within them.



Sedimentology students learning in the field.

I maintained my active engagement in service within the academic community throughout the year, participating in several committees, including the NSME Scholarship Committee, CSUB's Graduate Students' Support & Services Committee, and serving as the geology program director.

At home, Yan and the children are doing well. This fall, Yushan embarked on her high school journey, dedicated to pursuing a career in architecture. Meanwhile, Belinda relished her inaugural semester in junior high. As we welcome the new year, I am filled with gratitude for the experiences and opportunities of 2023. I look forward to what lies ahead in 2024 and am excited to continue making meaningful contributions in both my professional and personal life.

Matt Herman

The beginning of 2023 was a busy one for me. The devastating magnitude 7.8 and 7.5 earthquakes in Turkey captured everyone's attention and, as CSUB's resident earthquake expert, I was tasked with explaining the science. I gave interviews about the events with *The Bakersfield Californian*, KGET, and *Eos* (the American Geophysical Union's science news magazine); I worked with USGS colleagues to put together a story map explaining the seismotectonic of the sequence; and I gave a few public lectures about the earthquakes.

I also used the events as a learning opportunity for my students, incorporating aspects of the earthquake into all my Spring classes: natural disasters, physical geology, and geophysics. This was the first semester I taught geophysics. The five students who took the course with me (**Abdullah Masri, Leonardo Menchaca, Javier Perez, Liberty Rasmussen, and Samantha Taylor-Moore**) were up to the task, tolerating my last-minute adjustments and lots of broken geophysical equipment. [Side note: if anyone wants to donate working geophysical equipment to the department, feel free to reach out to me!] In the Fall, I taught natural disasters again, doubling the number of students in the course to 48. It looks like we will be able to continue expanding the course!

Lithospheric geodynamics research at CSUB took exciting steps forward in 2023. I continued working with **Danny Dorado** on an earthquake sequence in the Kermadec subduction zone. I also began working with **Alissa Montejo**, showing her the basics of the computational tools we use in geodynamics research. I received funding from the USGS to collaborate with them on their earthquake response, seismotectonic analysis and communication of earthquake science. I also kept working in the SZ4D Modeling Collaboratory for Subduction to advance subduction zone science



Matt Herman teaching Alissa Montejo the basics of seismology and geodynamic modeling.

with computational approaches. I was a co-author on a paper published in *Journal of Geophysical Research: Solid Earth* on unusual post-earthquake displacements observed in subduction zones and I led a paper published in *Tectonics* on the Kaikoura, New Zealand earthquake, which had some of the largest strike-slip faulting offsets ever seen. I contributed to conference presentations at meetings run by the European Geosciences Union, the International Union of Geodesy and Geophysics, and the American Geophysical Union (but alas, I only got to travel to AGU in San Francisco...).

I participated in activities on and off campus to make sure everyone in the community recognizes me! I worked on the CSUB Emergency Preparedness Event; I talked to students, parents and high school teachers at several events; I judged the Southern California Region Junior Science and Humanities Symposium



The Herman family takes over Murray Family Farms.

and the CSUB Student Research competition; and I did workshops associated with the Carbon Management Symposium and the CSUB-LLNL MOU signing. Whew!

The most exciting news of all, though, was the addition of a Herman family member! Lou joined the Herman family in July. Kate, Evie, and I could not be more excited!

Chris Krugh

Wow, 2023 was a busy year! In Spring 2023, I taught GEOL 3080 geomorphology, and we had a great field trip to explore the amazing geology and geomorphology of the southern Sierra Nevada and Owens Valley.



Students in GEOL 3080 Geomorphology measuring channel sinuosity on the stream table.

The start of the field trip focused on the incision history along the lower Kern River with a review of previous work that CSUB students had conducted in the region. Our route took us along State Route 178 and allowed us to look at changes in trunk and tributary channel morphologies as well as the distribution and location of boulder deposits along the river. We discussed knickpoint migration as a mechanism for changes in channel steepness as well as its influence on the potential for earthquake induced rockfall and landslides within the Kern River watershed. As we crested Walker Pass, we were the first on the scene of a single car accident. CSUB student and veteran **Eder Tavera** provided medical assistance to the driver while the other students made calls to 911 and helped slow down and direct traffic until emergency services arrived. I was extremely impressed with the way in which all the students pitched in to help out a stranger in a very difficult

situation. Once cleared to leave the scene, we continued with the field trip and made our way northward through Owens Valley. Some highlights from Owens Valley include examination of alluvial fans offset by surface rupture from the 1872 Owens Valley Earthquake; the use of lidar imagery to constrain offset of a small cinder cone along the Fish Springs Fault zone; and the investigation of faulted glacial moraines at Hilton Creek and Convict Lake. In Spring 2023, I also co-taught GEOL 4908 with **Dr. Katie O'Sullivan**. Students used their geological skill sets for mapping projects in the classic field areas of Rainbow Basin and Poleta Folds.



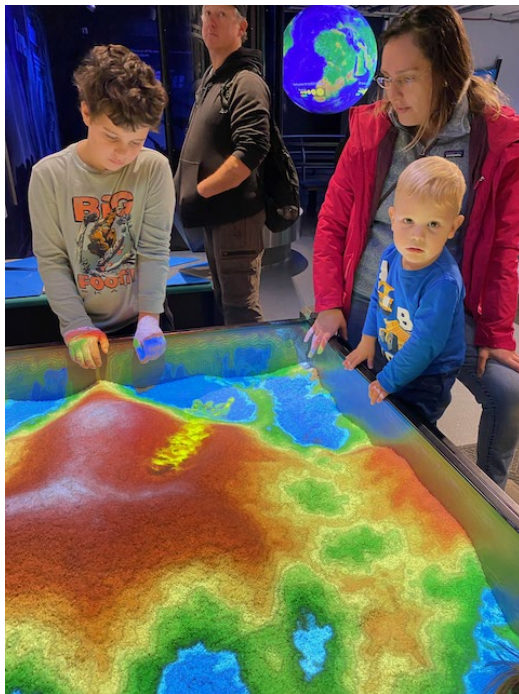
Traffic Jam at Rainbow Basin! CSUB was joined by groups from Occidental College, USC and CSU Fullerton. Spring 2023 Rainbow Basin Field Trip for GEOL 4908 Senior Field Seminar.



Students in GEOL 3080 Geomorphology pondering the incision history of the lower Kern River at the mouth of the Kern River Gorge.

In Summer 2023, I took over as department chair while **Tony Rathburn** left for sabbatical (in Tasmania!) during the 2023-2024 academic year. This means that I became very busy dealing with a wide variety of issues for students, faculty, and staff as well as for the department, university, and community. I also had to attend a seeming endless string of (mostly boring) meetings. I'm honored and happy to serve the department and our students and I'm sure I'll be even happier for Dr. Rathburn to return. In addition to being department chair, I also taught GEOL 3070 structural geology and GEOL 3318 California geology and society in Fall 2023. I also spent a lot of time, along with other faculty in the department, to put together a proposal for a new BS in environmental sciences program (hopefully some updates on this in next year's newsletter). Whew... that was a blur of a semester.

During Winter break, my wife **Anna (Dr. Cruz)**, my son Benji and myself visited my parents as well as my sister and her family in Harrisburg, Pennsylvania over Christmas. We had fun visiting with family, seeing the Christmas lights in Hershey, PA and even had the opportunity to take Benji fishing at the Whitaker Center for Science and the Arts. They had lots of interactive exhibits that included an augmented reality sandbox, a Magic Planet projection globe, and a stream table... Just like CSUB!



Anna (Dr. Cruz) and Benji checking out the augmented reality sandbox at the Whitaker Center for Science and Art in Harrisburg, PA.

Katie O'Sullivan

In the Spring of 2023, I taught an exciting new class: advanced igneous and metamorphic petrology. The class was offered for both graduate and senior undergraduate students. We had many great discussions on mantle plumes, layered mafic intrusions and lunar petrology. The class culminated in a field trip to Eastern California where I got my first flat tire as a trip leader! We had to change the plan and spend the night in Barstow. But we managed to see some fantastic igneous rocks along the way... overall a great adventure!



Group photo in front of a mystery outcrop in Mosaic Canyon.



Dyanna Oregon, Maggie Izumi, Madison Tarpley, and Tyler Garza examine a geologic map almost as old as the rocks themselves.

I had the privilege of announcing that **Conner Lesh** received the 2023 outstanding NSME undergraduate paper at the NSME awards ceremony. Conner has interned at NASA Jet Propulsion Laboratory for the past year working on the Mars 2020 mission. This fall Conner will attend graduate school at University Tennessee, Knoxville where he will continue his work on Martian alluvial deposits.

The faculty met for a department retreat in early summer 2023. The goal of the two-day meeting was to update the geology curriculum. We are very excited about the changes we made.

This past fall I offered a Death Valley field trip course for all geology majors. We camped at Furnace Creek for four nights and toured geology sites in and around the park. We were there just months after the late summer hurricane damage, so we got to see the return of Lake Manly and many new erosional features - some of them destroyed major roads! Overall, it was a fantastic trip and I hope to offer more field trip courses in the future.



Dyanna Oregon and Brooklyn Macross on the shore of Lake Manly.

This Spring semester **Briana Acevedo** will graduate with her Master of Science degree! Her thesis, "Geochemistry of Lunar Meteorite Northwest Africa 11788: Expanding understanding of lunar rock types

through detailed investigations of clast and matrix fragments" is uncovering exciting new rock types on the Moon. These never-before-seen rock fragments have the potential to redefine lunar geologic history!



Briana Acevedo and Katie O'Sullivan celebrate Briana's graduation!

As I write this, I am packing for yet another season of field camp with Sacramento State. I have had the privilege of co-teaching this class for the last two years. This upcoming season is especially exciting because, for the first time in many years, CSUB students are eligible to enroll! This is an incredible opportunity for CSUB students to attend a field camp at a minimal cost because it is tuition-free. Both Sacramento State and CSUB hope to continue this offering in the coming years.

Tony Rathburn

This was a year of changes for me. I am eligible for a sabbatical leave, and I decided to take a year-long sabbatical starting in August 2023. After six and a half years as department chair I turned the helm over to **Chris Krugh** in July. **Liaosha Song** took over my role as director of the California Well Sample Repository and **Katie O'Sullivan** assumed the role of dual credit coordinator. My job as chair and my other roles would be impossible without the teamwork, dedication, and support from everyone, including **Cecily, Chris, Adam, Liaosha, Katie, Matt, Anna, Alyssa, Jason, Larry, Pam, John Y., Bob C., Brian P., Bill, Brian A., Jan, Dirk, Rob** and **Bob H.**



Tony Rathburn turned the helm over to **Chris Krugh** this year and is spending the 2023-2024 academic year on sabbatical in Australia.

During the Spring Semester I taught historical geology and helped organize the Emergency Preparedness Event (March) and the CERC Carbon Management Symposium in April (see stories about these events elsewhere in this newsletter). In my role as interim director of the California Energy Research Center I was able to join a CSUB delegation in February 2023 to visit Lawrence Livermore National Laboratory and tour the ignition facility where fusion ignition was first demonstrated, and history was made in December 2022.

I co-authored a research paper with Ashley Burkett from Oklahoma State University, two CSUB undergraduates and one CSUB graduate student. The paper is based on research from seafloor experiments deployed at 4000 meters off the coast of California and focuses on the colonization of plastics. Four abstracts were presented by co-authors, two at a regional Geological Society of America Meeting, and two at the International American Geophysical Union conference in December.

My community engagement activities were quite varied this year. In addition to several interviews and a couple of TV appearances, I was invited to be the moderator for the Kern Economic Summit Panel of Carbon Capture and Storage which aired on May 13 (see the Kern Economic Summit link on the CERC webpage: <https://www.csub.edu/cerc/>; scroll to 1:07). I also hosted several journalists from Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, who visited the department on June 5 during a trip organized by the United States Department of State (see the story elsewhere in this newsletter).



The Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania, Australia where **Tony Rathburn** is conducting research during his sabbatical.

Two of my undergraduate students conducted two-month-long summer research internships at the Smithsonian Natural History Museum in Washington DC (see story elsewhere in this newsletter). Funding for these internships was made possible by my NSF Geopaths grant, which ends this year. When I return from sabbatical leave, I will begin preparing for the 2025 NSF-funded research voyage off the coast of Greenland (using a recent NSF grant, in collaboration with colleagues from Woods Hole Oceanographic Inst. and the University of Delaware).

I am spending my sabbatical leave as an adjunct senior research scientist at the Institute for Marine and Antarctic Studies at the University of Tasmania in Australia. I am collaborating with world-renowned scientists on research projects that include using the trace element content of microfauna (benthic foraminifera) to assess bioavailability of contaminants

and to evaluate the history of pollution in the region using the biogeochemistry of microfossils. Other research interests include the paleoceanography of ancient oceans surrounding Australia and Antarctica. In addition to research activities, I gave an interview with ABC radio on the ABC Statewide Mornings program about my research. I am also giving community-oriented talks and sharing ideas about hands-on learning techniques in marine science. For example, a community talk that I recently gave was part of a series of science seminars (called “Beer Aquatic”) given at a local brewery and sponsored by the Antarctic Climate and Ecosystems Cooperative Research Center and the Hobart Brewing Company. The format is informal, and speakers are not allowed to use PowerPoint slides for these seminars, so the speaker basically tells science stories and answers questions from the audience, using only a few props. The concept of Beer Aquatic talks is based on the salons of Paris in the 19th century when people would gather to talk informally about science. The practice of organizing informal talks in café settings with plenty of time for questions was revived in the 1990s by groups in the United Kingdom and France. The concept has now spread around the world. Over 100 people showed up to drink beer and hear my stories (probably in that order). As my students will tell you, I enjoy telling science-oriented stories and frequently teach without PowerPoint, so the Beer Aquatic format was nothing new to me, and the experience was a lot of fun. See <https://www.facebook.com/beeraquatic/>

In addition, I gave a research talk and a talk about experiential learning at sea. More talks, including a community talk using PowerPoint, experiential learning discussions, research activities and a workshop are planned for 2024.



*This is the view from **Tony Rathburn's** office window at IMAS. Watching sailboats float by, seaplanes land and cruise boats dock provides great breaks from the computer and microscope.*

Liaosha Song

2023 was a remarkable year filled with numerous accomplishments and exciting developments. My research focused on the geologic storage of hydrogen and carbon dioxide, exploring innovative methods to enhance sustainability and reduce greenhouse gas emissions. This year marked a significant milestone in my career as I was recipient of the Promising New Faculty Award. I was also awarded tenure and promoted to associate professor, an achievement that fills me with immense excitement and gratitude.



*Another view of the research building in Hobart, Tasmania where **Tony Rathburn** is spending his sabbatical.*



***Liaosha** receiving the Promising New Faculty Award.*

Moreover, I am proud to share that I established the CAL-EPIC program with DOE funding support. Five of my students in this program had the opportunity to conduct their summer research internships at the renowned Lawrence Berkeley National Laboratory. Their dedication and hard work culminated in remarkable contributions to our field, with their research being published and presented at the American Geophysical Union's 2023 annual conference. This recognition underscores the quality and impact of their work, and I am honored to mentor such talented individuals.



Liaosha advising engineering students in the SEM Lab about characterizing nano-synthetic material.



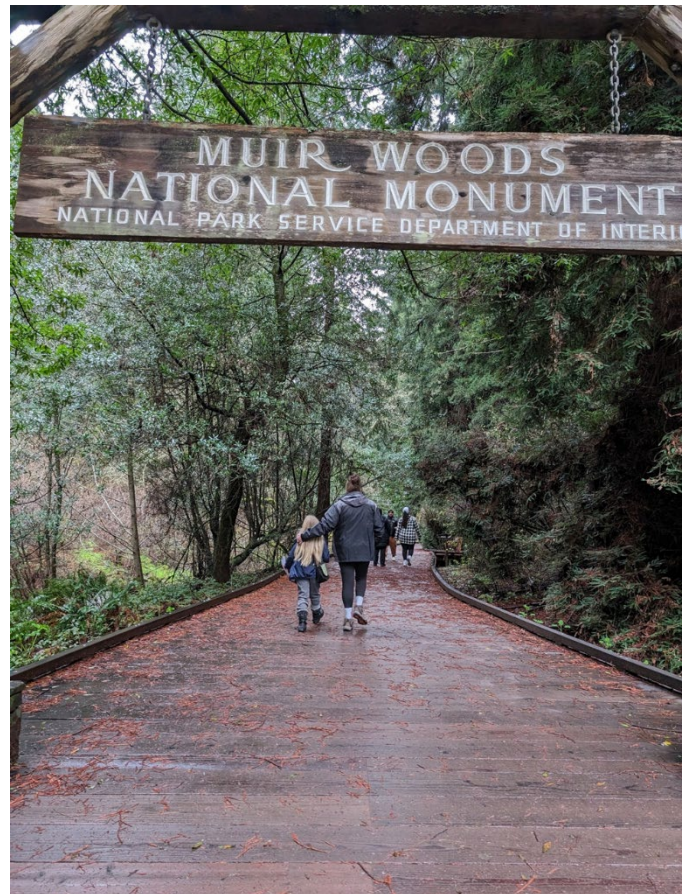
CSUB students at the 2023 AGU Fall Meeting, including Geology majors (starting 2nd from the left) Jennifer Rubalcaba, Ryan Tengelsen, and Samantha Taylor-Moore.

Cecily Rink

2023 was a great year for me in the geology department. I have really found my spot here with the geology family. I am continuing to learn new things

about my role as the administrative support coordinator, as well as a lot about geology. In fact, so much so, that I have been changed my major and will be starting in 2024 as a geology student. We had the turn out with the 2023 Future Runner Day as well as the Emergency Preparedness Day. There were well over 1,200 visitors to the event. The CERC Carbon Management and Sequestration Symposium was a great success, and I am so pleased to be able to help **Dr. Rathburn** and CSUB with such a large event.

This year I helped **Dr. Song** with the CAL-EPIC summer internships at Berkeley Labs in Berkeley, CA. I also was able to support **Dr. Rathburn** with the student internship with the Smithsonian in Washington D.C as part of the GEOPATHS grant. I became an advisor for the Geology Club for the fall 2023 Geology Club field trip, we went rockhounding, and exploring in Cambria and Morro Bay, CA. It was so much fun to get to bond with the students on another level, learn about different minerals that are found locally to the beach, and to explore new places.



Cecily going into the woods...

While not at work, I spent much of 2023 exploring California. The most memorable trip was when I took my niece hiking in the Muir Woods National Monument. I hope to do more hiking in this area of California, it was absolutely stunning.



Cecily has good instincts for geology photograph lighting.

GEOLOGY CLUB

The Geology Club had an eventful 2023, engaging in many activities highlighting their passion for earth science and community involvement. The club participated in CSUB Chemistry Day, showcasing the augmented reality sandbox and the stream table to local high school students.



Tony Rathburn and geology students showing off samples from our collection during the CSUB Runners Day event.

Club members volunteered at several local elementary school science nights, sparking curiosity and excitement among young students through fun activities and showcasing different rocks and minerals the department has to offer. The club hosted our 14th

annual BBQ fundraiser, bringing together members and supporters for a memorable and enjoyable night. The club took a field trip to Cayucos, exploring the region's unique geological features. Additionally, they enjoyed an educational visit to the Los Angeles Natural History Museum, exploring different exhibits on paleontology, mineralogy, and the natural history of California. Through different events, the Geology Club is building a "gneiss" community of passionate earth science enthusiasts.



The CSUB Geology Club paints rocks because the rocks are not pretty enough for them.



Jennifer Rubalcaba and Madison Tarpley at the Los Angeles Natural History Museum.



Find the CSUB Geology Club on Instagram!
[@geology_club_at_csub](https://www.instagram.com/geology_club_at_csub)

CSUB GEOLOGY STUDENT AWARDS

San Joaquin Geological Society (SJGS) and Pacific Section AAPG Field Camp Scholarship Awards

SJGS raises funds throughout the year in large part to support CSUB geology students. They provide generous scholarships to geology majors attending field camp, a BS degree requirement.

2022/2023 Award Winners (\$1,000 each)

Angel Acevedo
Cristian Acevedo
Monica Hinson
Liberty Rasmussen
Hannah Warner

2023/2024 Award Winners (\$1,000 each)

Abdullah Masri
Leonardo Menchaca
Alissa Montejo
Jennifer Rubalcaba
Samantha Taylor-Moore
Ryan Tengelsen



Monica Hinson, Cristian Acevedo, and Angel Acevedo receiving 2023 Field Camp Scholarship Awards from the San Joaquin Geological Society.

The Pacific Coast Section of the Society of Exploration Geophysicists (PCS-SEG) Outstanding CSUB Geology Major Award

The PCS-SEG award recognizes an outstanding CSUB geology major and helps the student cover the costs of their required summer field camp course. The award demonstrates the commitment by PCS-SEG to encourage the educational and practical development of high-performing students in CSUB's Department of Geological Sciences.

2022/2023 Award Winner (\$500)

Monica Hinson

2023/2024 Award Winner (\$500)

Jennifer Rubalcaba



Monica Hinson receives the 2023 Outstanding CSUB Geology Major award from the Pacific Coast Section of the Society of Exploration Geophysicists. Presenting the award to Monica (holding the certificate) are PCS-SEG Officers Chris Sine, Gary Meyers and Catherine Thatcher.

Kern County Mineral Society Field Camp Award

The Kern County Mineral Society (KCMS) presented two CSUB geology students with awards to help cover the costs of their required field camp. The KCMS was established in 1935 by individuals who shared a common interest in collecting, displaying, and sharing their knowledge of rocks and minerals. Their generous award to CSUB geology students reflects the sincere interest of KCMS in helping young people pursue careers in geology.

2022/2023 Award Winners (\$1,500 each)

Monica Hinson
Hannah Warner

2023/2024 Award Winners (\$1,500 each)

Jennifer Rubalcaba
Samantha Taylor-Moore

Outstanding NSME Undergraduate Paper

Every year, CSUB School of Natural Sciences, Mathematics and Engineering (NSME) recognizes an outstanding undergraduate student paper. The paper can include work published in journals or presented at conferences.

2023 Award Winner

Conner Lesh

Department Awards

The CSUB Department of Geological Sciences honors students with several merit-based awards established through the generosity of donors with ties to CSUB and the local community. Students receiving these annual awards are selected by an award committee consisting of CSUB Department of Geological Sciences faculty.

The following department awards were given in 2023.

Herman W. Weddle Scholarship

This scholarship was established by James Weddle in honor of his father, Herman, a geologist with Standard Oil Company, to support CSUB students majoring in geology. Awards are given to geology majors who

work on well core or well samples and make use of the California Well Sample Repository.

2023/2024 Award Winners (\$989 each)

Leonardo Menchaca
Ryan Tengelsen
Samantha Taylor-Moore

H. Victor and Virginia C. Church Scholarship

This scholarship was established in honor of Dr. H. Victor Church, a geologist and founding member of the Well Sample Repository at CSUB, and his wife Virginia C. Church, a former teacher, to support CSUB students majoring in geology.

2023/2024 Award Winner (\$1,458)

Jennifer Rubalcaba

C.E. Strange Scholarship

This scholarship was established by Mr. C. E. Strange, a local geologist, who wanted to provide financial assistance to undergraduate students majoring in Earth Science.

2023/2024 Award Winners (\$942 each)

Abdullah Masri
Alissa Montejo
Dyanna Oregon
Leonardo Menchaca
Jennifer Rubalcaba
Ryan Tengelsen
Samantha Taylor-Moore

Sam Gonzalez Memorial Scholarship

The family of Sam Gonzalez and friends funded this scholarship to honor their son and friend by supporting geology majors in pursuit of an undergraduate degree and a career in the field of geology.

2023/2024 Award Winner (\$1,068)

Eder Tavera

GRADUATES IN THE CLASS OF 2023

Congratulations to those who graduated with a CSUB geology degree in 2023! We are excited to see what you will do next!

Bachelor of Science in Geology

Izeah Delgadillo
Angel Gonzalez
Cristian Gonzalez
Monica Hinson
Marissa McCosh
Marisela Rodriguez
Cali Terrasas
Hannah Warner
Liberty Rasmussen

Master of Science in Geology

Maryanne Bobbitt
Alex Garcia
Maynor Lopez
Adrian Montoya
Caleb O'Rourke
Jordan Rendel
Jeffrey Whitson

ALUMNI NEWS

Please contact Cecily Rink at crink@csub.edu to update your career and contact information. We are in the early stages of updating the department website and hope to include alumni information there as well.



CALIFORNIA STATE UNIVERSITY
BAKERSFIELD
Department of Geological Sciences

THANKS TO OUR DONORS!

We extend our sincere gratitude to the individuals whose support plays a crucial role in maintaining the quality of education for our students. Your generous contributions enable us to provide enriching experiences and valuable resources that enhance learning outcomes. Thank you for your commitment to excellence and for investing in the success of our community and its future leaders.

To become a donor or continue supporting the Department of Geological Sciences, please see the following page.

In the future, if you would like to receive this newsletter via email, please contact Cecily Rink at crink@csub.edu with your email address.

TO MAKE A DONATION

We are committed to providing students with the quality of education that they need to become successful, contributing members of the community. Please consider becoming a supporter of our scholarship and field camp programs that make it possible for financially-challenged students to continue their studies and attend summer field camp. COVID has created additional financial difficulties for students and the department. The department has a number of outreaches, field experience and educational initiatives to recruit students and enhance student learning. These programs depend on your support. Every donation makes a difference. As a result of budget cuts and changes in priorities, many geology departments across the country have reduced their standards, removed field camp requirements, and reduced field and applied skills from their program. Please give back to the department that is working hard to give current students the high-quality education required to be a successful geologist. Donations from alumni and other engaged community members allow us to maintain the quality of classes and enrich student experiences beyond what state funding alone can provide. You can also help students with field camp expenses (thousands of out-of-pocket dollars not covered by CSUB tuition) by donating to an established scholarship, starting your own annual scholarship, or specifying what you want donated funds to the Department to be used for (see below).

Affiliation (if applicable):

Address:

City, State, Zip Code

Email:

Please indicate the amount you want to donate:

\$100 \$500 \$1,000 \$2,500 \$5,000
Other _____

Please indicate if you want your donation to go to one of these specific causes:

- Sam Gonzalez Memorial Scholarship** (to support students who after exploring other fields have discovered geology as their calling)
- Student Scholarships** (to be added to the CE Strange Scholarship Fund)
- Field Activities** (to be added to the Claude Fiddler Field Endowment)
- Undergraduate Student Research**
- Unrestricted to support current needs identified by the Department of Geological Sciences**

THANK YOU!

Return to the address below, to the attention of the Department Chair.

**Department of Geological Sciences
California State University, Bakersfield
9001 Stockdale Highway,66 SCI
Bakersfield, CA 93311**



**DEPARTMENT OF
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CSU BAKERSFIELD

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