

# UC Santa Barbara Earth Science



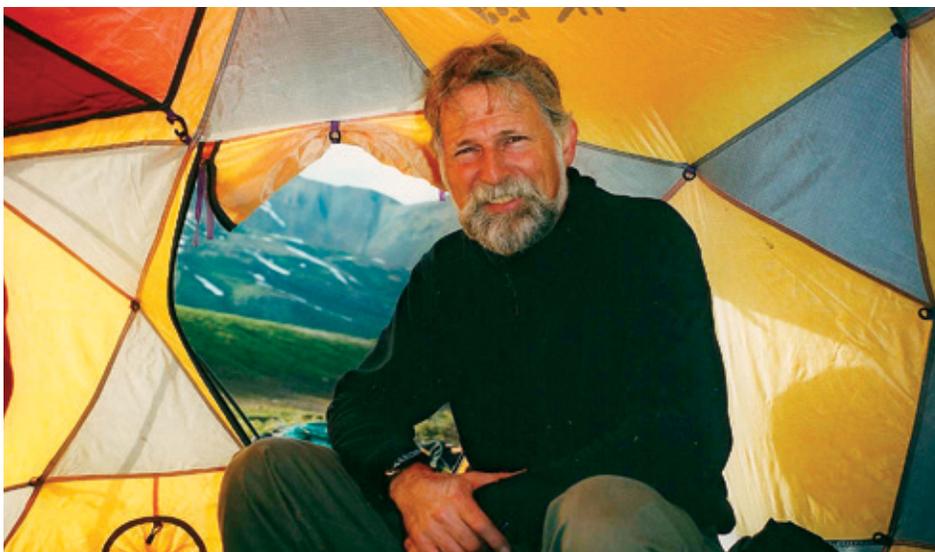
## Chair's Letter: Susannah Porter

As society emerges from COVID, departmental life is inching back to normal. In-class teaching and our celebrated field program have resumed, and the enthusiasm of our undergraduates is without precedent (bagel sales are booming!). Sadly, however, there have also been reminders of the fragility of all we love. Four members of our community passed away this year:

Alumnus Justin Tran, B.S. '16, M.S. '18; Alumna Sarah White, B.S. '06; Professor Ed Keller; and Professor and Alumnus Jim Mattinson, B.S. '66, Ph.D. '70. You can read about Justin, Sarah, Ed and their remarkable lives in this newsletter, but Jim passed away just as we were going to press. We will celebrate his life at length in the next issue, but I want to mention here how much I appreciated Jim as a colleague. He was world-renowned for his fundamental contributions to zircon geochronology; he was also humble, kind, generous, and supportive, and he cared about the well-being of everyone around him. His life was deeply entwined with our department. He was a UCSB Earth Science undergraduate student, graduate student, and professor, twice serving as Chair. He was also the parent of one of our alumnus, Chris Mattinson B.S. '00. We are grateful for his dedication to our community, and we miss him very much.

In addition to celebrating these lives, our newsletter celebrates our undergraduate students, our graduate students, our new staff, our faculty, and our distinguished alumni. I recently came across the German word "freudenfreude", which means "delight in the success of others." That's a great mindset to have in general, I think, and it embodies the spirit of this newsletter.

Wishing you all a happy, healthy, and peaceful year, filled with freudenfreude.



Jim Mattinson in the Chugach Mountains, Southern Alaska. Photo: Matt Rioux

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1006 Webb Hall  
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Header photo: Slickenlines on a fault surface in the Matilija Formation, Gibraltar Road, Earth 2. Credit: Zach Eilon

# Summer Field 2022 New Mexico

*By Alex Simms*



New Mexico, 2022. Photo: Alex Simms

Despite fires, floods, and a pandemic, 16 UCSB undergraduate students and 3 TAs (Elisa Medri, Claire Divola, and Ryan Owings) accompanied Prof. Alex Simms to north-central New Mexico to examine the rocks of the San Juan and Chama basins. During this first half of summer field, the students measured 3 sections and mapped 2 areas encompassing the Triassic through Upper Cretaceous rocks of the region. They were able to document the birth (and death) of the Cretaceous Interior Seaway across the intermontane US as well as the structural features associated with the Laramide Orogeny and initiation of the Rio Grande Rift. These exercises have helped them learn how to visualize geologic features in three dimensions and communicate their geologic observations. They camped at the scenic Ghost Ranch and enjoyed the afternoon monsoon rains that kept the heat at bay for most of the three weeks in New Mexico.

# Summer Field 2022 Santa Cruz Island

*By John Cottle*

For the second half of summer field, sixteen students traveled by Exxon crew boat to Santa Cruz Island with Prof. John Cottle and TAs Eliel Antilla, Lindsay Buff, and Ryan Eden. This year, the group undertook two projects on the western portion of Santa Cruz Island (“Limuw” in Chumash). They used a combination of iPads and GIS to further develop their digital geologic mapping skills and produce professional digital geologic maps and cross-sections. Santa Cruz Island provides an excellent challenge for our undergraduate students, exposing them to a wide range of geology, including exposures of metamorphic and plutonic rocks, highly variable volcanoclastic units as well as active tectonic processes. The students returned from Santa Cruz Island having better developed their core field mapping skills, as well as gaining exposure to a broad range of digital mapping techniques—an experience that will serve them well as they embark on their post-UCSB geoscience careers. We wish to thank Exxon for their continued support, Brian Guerrero at the UC Santa Cruz Island Reserve for logistical help, and The Nature Conservancy for use of the facilities at Christy Ranch.



Santa Cruz Island, 2022. Photo: John Cottle

# Field Petrology (Earth 127/227)

by *Matt Rioux*



Sierra Nevada Mountains, 2022. Photo: Matt Rioux

In September 2022, Professor Matt Rioux and teaching assistant Lindsay Buff led a two-week field course to the Sierra Nevada Mountains to study how plutonic rocks form. Models for the formation of plutons and what mapped plutons represent are currently debated, and range from the crystallization of large magma chambers (tens of kilometers across) to the incremental assembly of plutons through repeated meter-thick intrusions of melted rock. The eleven undergraduate students and one graduate student in Field Petrology (Earth 127-227) read papers discussing models of pluton formation and the development of magmatic structures, then visited key outcrops. The field localities included world-class

exposures in Yosemite Valley, Tuolumne Meadows, and along the eastern side of the Sierra Nevada. The students spent the final two days of the trip studying how magmas move within the crust in the White Mountains and Deep Springs Valley. During the trip, the class stayed at UC Natural Reserve System field stations in Yosemite National Park, near Mammoth Lakes, and at 10,000 feet in the White Mountains. The trip was a great experience for both the students and instructors, and was full of high-level debates on the different models and outcrop features. We are grateful to the generous support of the York T. Mandra Fund and donations to our department field fund, which made this trip possible.

## LinkedIn

Seeking to strengthen and enliven our department network, we encourage you to follow our new “UCSB Department of Earth Science” page on LinkedIn. Former students, please follow instructions on the page that will identify you as a department alum. <https://lnkd.in/gt3VTrk>

# Update from the Justice, Equity, Diversity and Inclusion (JEDI) Faculty Committee

by Zach Eilon and Andy Wyss, JEDI Faculty Committee Chairs

The Department's JEDI committee continues to promote policies that expand the diversity and accessibility of our academic program at all levels. Our student-led GEMSS mentoring group continues to build on its successes. Their outreach to nearby CSU campuses is mirrored by new faculty-level connections, research collaborations, and the flow of talented graduate students in both directions. Our new *104G: Digital Analysis and Interpretation of Field Data* course, enables undergraduates to major in Earth Science irrespective of physical ability. In light of recent studies that highlight the potential equity barriers associated with field research, three faculty members helped draft a

UC-wide "code of conduct for fieldwork" at a recent UC-wide field instruction retreat. Applicants to our graduate program are now evaluated through a holistic process that takes into consideration qualities such as resourcefulness, perseverance, experience, and problem solving as much as it does grades and test results (indeed the GRE is no longer required). In Spring, postdoc Dr. Alex Phillips offered a new reading seminar on diversity, equity, and inclusion in geoscience higher education. We also re-wrote departmental bylaws to include policies for more equitable and supportive faculty hiring. This coming year, look out for a new JEDI lecture series!

## IN MEMORIAM: JUSTIN TRAN

By David Valentine



The Department is saddened to have lost our (2016/2018) dual alumnus, Justin Tran. Justin came to UCSB from the Bay Area and received his undergraduate degree with us, majoring in Geophysics. Justin also participated in our graduate program and received his Master's Degree in 2018 working with the Valentine group on high-resolution mapping of seafloor terrains using data from autonomous underwater vehicles. Justin was a recipient of a SMART scholarship, which brought him to New Orleans after graduation, in the employ of the US Navy. He worked for several years as a Marine Geophysicist in the Naval

Oceanographic Office, and more recently as a Geophysicist for the U.S. Naval Research Laboratory. We in the Valentine Lab have many great memories of Justin, from serving as the group social planner to being a key member of our geophysical "dream team" aboard the SEEPS 15 expedition of the R/V Atlantis. During that cruise, Justin was able to dive in the submarine Alvin, an experience which he wrote about for UCSB's Current: ([link: tinyurl.com/y9w7sypw](https://tinyurl.com/y9w7sypw)). We are all saddened by the loss of Justin and send our best wishes to the Tran family and all those who were close to him.

# Retreating California Coastal Cliff

by Gen Li

Cliffs are typical features in coastal landscapes, representing popular tourist destinations and hosting large populations of diverse plants and animals. Around 70% of the California coastline is backed by cliffs. However, sea cliffs are undergoing accelerated retreat worldwide in recent decades—mostly caused by the warming climate, sea-level rise, and human activities. In Santa Barbara, the current rate of sea cliff retreat averages around four centimeters per year and can be up to ten centimeters per year locally. Whereas cliff retreat induces severe hazards to the coastal communities, infrastructures and ecosystems, a mechanistic understanding of cliff erosion processes is urgently needed to mitigate the hazardous effects. Earth Science Professor Gen Li teamed up with postdoc Paul Alessio and Geography Professor

Vamsi Ganti to investigate sea cliff erosion in California, combining remote sensing analysis, fieldwork, and laboratory analyses. They are particularly interested in the role of beaches as instruments to erode sea cliffs by supplying sands for grinding and as covers to protect sea cliffs from sea wave attacks. They also want to learn the role of cliff systems in the carbon cycle. Sea cliff erosion rates are affected by sea level change, and cliff erosion rates in turn can have a significant influence on the delivery of organic carbon to the ocean—a key process in the global carbon cycle that regulates the amount of carbon dioxide in the atmosphere. Thus sea cliffs have the potential to serve as an important modulator of long-term climate. Their research will provide a holistic picture of erosion mechanics and carbon cycling in California coastal cliffs.



Campus Point, UCSB. Photo: Gen Li

## STAFF SPOTLIGHT: DOUG MARKS



Originally from Oklahoma, I earned my BA in linguistics from the University of Oklahoma (OU) in 2014. After spending four years teaching English at Beijing Normal University and Beijing Jiaotong University in China, I returned to OU in 2019 to complete my M.Ed in English education. I took an IT job with our education research center to pay tuition, and although I had not taken computer classes since high school, I ended up moving forward with a career in IT. I joined LSCG in September of 2021 and am excited now to be here in Earth Science, combining my passions of technology and education.

# Undergraduate Spotlight



## Odalys Callejas

Odalys Callejas, an Earth Science undergraduate student also working with Roberta Rudnick, is studying the timing of lower crust formation in the NE Siberian Craton.



## Jacquie Hoot

Jacquie Hoot, an Earth Science undergraduate student working with Roberta Rudnick, is testing the homogeneity of detrital zircon populations in Neoproterozoic glacial diamictites.



## James Hansenbury

James Hansenbury worked with Professor Robin Matoza in 2019 and 2022 on finite difference numerical modeling of seismic-acoustic wave propagation.

# Faculty Awards

## ALEX SIMMS

Alex Simms served as an AAPG Distinguished Lecturer for his talk titled *Interactions Between Ice Sheets and Relative Sea Levels: Lessons From Antarctica and NW Scotland*.



## JOHN COTTLE

John Cottle was elected a Fellow of the Mineralogical Society of America. This award is bestowed on MSA Members "who have contributed significantly to the advancement of mineralogy, crystallography, geochemistry, petrology, or allied sciences" and is given to fewer than 0.5% of MSA membership each year.



# We Wish For

**Preston Cloud Memorial Fund**, which supports student attendance to annual, national meetings of their professional organizations.

**Unrestricted funds**, which support revitalization of department space; field equipment, essential to our field classes; and microscopes, essential to our lab classes.

## Your Ideas Welcome

We truly welcome your thoughts. What lessons did you take away from your time at UCSB? What would benefit the most from improvements? We solicit your input, and greatly value your perspective.

## Your Donation Dollars at Work



Summer field 2022, Santa Cruz Island. Photo: John Cottle

We are deeply grateful to our many alums, colleagues, and friends of the department who have helped us financially this past year!

“ The Walrus and the Carpenter  
Were walking close at hand;  
They wept like anything to see  
Such quantities of sand:  
If this were only cleared away,  
They said, it *would* be grand!”

If seven maids with seven mops  
Swept it for half a year,  
Do you suppose, the Walrus said,  
That they could get it clear?  
I doubt it, said the Carpenter,  
And shed a bitter tear.

”

—The Walrus and the Carpenter by Lewis Carroll, a favorite poem of Ed Keller's, a beloved professor that we lost too soon.

# With Appreciation

The Department of Earth Science profoundly thanks the following individuals and institutions for their generous donations between July 2021 and June 2022

Beverly and Richard Abrams  
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Although we've endeavored to make our list of donors complete, please excuse any oversights.

## Thank you

*Receiving this award is a huge encouragement to me and I am grateful for the support as well as the continued support of this award for graduate students.*

*Your generous gift will help me get through the summer months for tuition and my preparation for my first quarter as a graduate student.*

*Thank you for your generosity and support. It is difficult to put into words how much I have loved being a part of Earth Science. This award will help me in my future as I make the move to start my PhD.*

*This extra financial support means the world to me, especially this summer. I look forward to returning the favor as a future alumnus.*

*Thank you for the donation, these funds will support my attendance at an upcoming international conference and will be presenting my work.*

# The Passing of Dr. Edward A. Keller

by Tom Rockwell



Dr. Edward Keller, Professor of Earth Science and Environmental Sciences, passed on September 10, 2022 after a long illness. He will be sorely missed. From his early years as a graduate student, Ed made a name for himself in fluvial geomorphology; these studies led him towards tectonic geomorphology and studies of active tectonics in the Transverse Ranges of southern California, of which I was his first graduate student studying

active tectonics in the Ventura Basin over 40 years ago. During my stay at UCSB, Ed was Chair of the Environmental Studies program as well as professor of Geology (now Earth Science). He would head to the Redwoods in NW California nearly every summer to continue his work on river geomorphology (and to fish), while staying engaged in our new tectonic geomorphic work in southern California. In the years since, Ed has mentored a large number of students in fluvial geomorphology, active tectonics, earthquake hazards, and landslide hazards, many who have become quite prominent in their respective fields. He supported most of his students by writing grant proposals, of which I certainly benefited. Needless to say, our dear Professor Keller has left an enduring academic legacy.

Ed was a prolific writer. His book, *Environmental Geology*, became the industry standard and has been used at numerous universities. Most of his books have gone through multiple editions, demonstrating their popularity. And I have lost count of his numerous professional papers—we published a major paper on tectonic geomorphology of mountain fronts in *The Treatise of Geomorphology* (Elsevier, Academic Press) earlier this year, and we had started to work on a new book; his loss will be sorely felt.

Professor Keller the consultant: Ed was tapped as an expert witness and consultant in numerous cases that involved landslides, debris flows and other natural hazards and disasters.

Ed Keller is survived by his wife, Valery, and two children, Jamila and Sarah.

## GEMSS

The Geoscience Enrichment and Mentoring for Students by Students (GEMSS) is a student-led peer-mentoring program that was founded in 2020 by students in the Department of Earth Science at UCSB. The mission of the program is to supplement the undergraduate experience through one-on-one peer-mentoring, and through professional development events and workshops. GEMSS also works hard to build community between undergraduate and graduate students by hosting mixers, trivia nights, and other social events. GEMSS is currently recruiting undergraduate students to be on the leadership team! Please reach out to [gemss@geol.ucsb.edu](mailto:gemss@geol.ucsb.edu) if you are interested in joining. To find out more information about the program you can visit: <https://www.geol.ucsb.edu/jedi>.

Photo at right: The 2022-2023 leadership team (L to R): Brian Penserini, Lena Capece, and Molly Crotteau (missing from the picture are Devin Rand and Brennan Brunsvik).



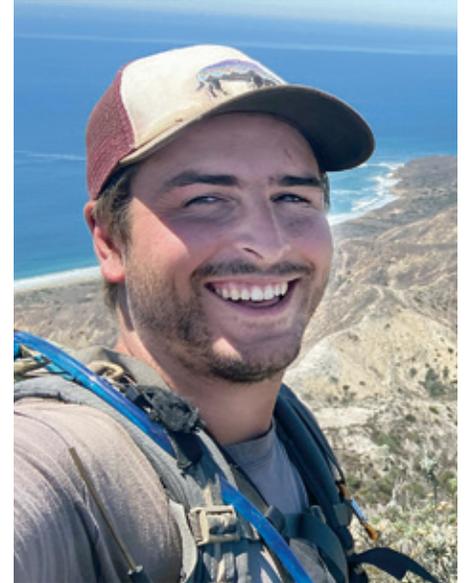
## Eliel Anttila

I'm a fifth-year PhD candidate working in Professor Francis Macdonald's lab, where we use a combination of field geology, geochronology, and geochemistry to better understand the interactions between climate, tectonics, and life throughout Earth history. After earning my BA in Geology from UC Berkeley, I briefly worked as a science educator and cycling guide in Montana, and then started graduate school at Harvard University before moving to UCSB with our lab group in 2018.

My research investigates how, when, and why phosphorites (phosphorus-rich rocks) appear in the geologic record.

One of my projects has focused on constraining the age, sedimentology, and tectonic history of one of the largest phosphorites in the world, located in the Neoproterozoic-Cambrian Khovsgol Group of northern Mongolia. Here, we showed that basin evolution and paleotopography were critically important factors for concentrating phosphorus. A similar story has emerged from my research on the phosphorites and organic-rich rocks of the much younger Monterey Formation—beautiful outcrops of which are located just up the coast from UCSB. Along with sea level changes, local tectonics and basinal paleotopography determined when and where phosphorites were deposited along the Miocene Santa Barbara coastline.

As my time at UCSB comes to a close, I am thankful to have been



part of such a supportive and grounded community, and am grateful every day for the places, people, and ideas that I have encountered through geology.

## Jeremy Francoeur

Jeremy joined Prof. Robin Matoza's infrasound research group during 2020 as a fourth-year undergraduate. The decision ultimately led him to stick around for a fifth year "victory lap" with double majors in Earth Science and Physics, and a minor in Professional Writing. Jeremy is now in his second year as a Master's student with the Matoza group.

Jeremy's research focuses on acoustic noise below the frequency threshold of human hearing, known as infrasound. Crashing ocean waves generate a significant portion of the many sources of such noise. A challenge for researchers is to distinguish between surf infrasound and certain volcanic processes

which generate infrasound with a similar spectral signature. For most researchers, surf noise is just that—noise—that must be filtered out of datasets before processing any signals of interest. However, as a lifelong ocean lover, Jeremy does just the opposite; to him, the surf is the signal.

By studying surf infrasound, Jeremy can remotely monitor many aspects of the coastal sea state, such as breaking wave height, swell period, breaker location, and bathymetric changes over time. Doing so may prove especially useful during the night, when surf cameras fail to show wave conditions and atmospheric temperature conditions allow surf infrasound to travel further from the coast. Indeed, it appears that surf noise may have much more to offer than lulling Californians to sleep every night.



# DISTINGUISHED ALUMNI 2022

Annually, the Department honors two of its alumni—one from academia, and one from elsewhere—celebrating their accomplishments and providing our current students exemplary role models.



## John Lovenburg

John grew up in California where his early interest in the Earth was inspired by his geologist father through frequent outdoor adventures. He earned his Bachelor's degree in geology at USCB and Master's degree in hydrogeology at San Diego State.

John spent over 20 years as a consultant for CH2M HILL (now part of Jacobs) doing water resource, environmental and sustainability work as a technologist, project manager, and ultimately as a global market leader in site remediation and redevelopment.

John honed his interests and expertise in sustainability through

influential mentors, and focused that expertise into sustainable solutions. Particularly meaningful concepts that he often champions include natural capitalism, biomimicry, circularity, and systems thinking.

John is now vice president, Environment & Sustainability for BNSF Railway in Fort Worth, Texas. He leads a team responsible for sustainability and climate change; energy and advanced energy innovation; environmental law; construction permitting, environmental field operations and engineering; remediation; and hazardous materials.

John is excited to be able to lead BNSF's sustainable rail program, working with researchers, engineers

*(Continued on page 11)*

## Tessa Hill

Tessa entered the Ph.D. program at UCSB in 1999, in the second year of the newly formed Interdepartmental Graduate Program in Marine Science, which has deep roots in the Department of Geological Sciences. Under the mentorship of James Kennett, Tessa completed, in 2004, a Ph.D. focused on methane rich environments in modern and paleoceanographic records. She was awarded a UC President's Postdoctoral Fellowship at UC Davis and, at the conclusion of the Fellowship, joined the faculty of the UC Davis Dept. of Earth and Planetary Sciences.



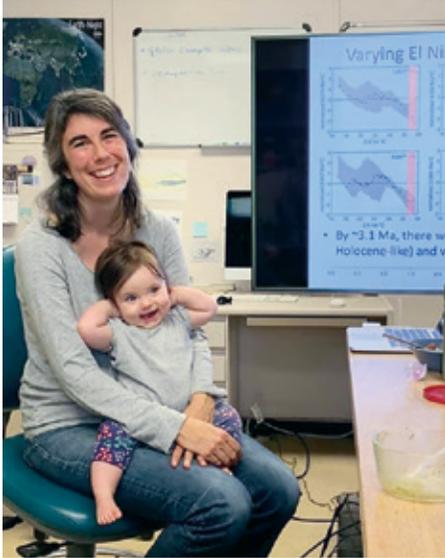
Her research has expanded to include multiple different archives used to reconstruct paleo records of climate change (microfossils, corals, bivalves), as well as modern impacts of climate change including

ocean acidification and hypoxia. President Obama awarded Tessa the Presidential Early Career Award for Science and Engineering (PECASE) in 2016 for her work investigating Holocene records of climate change and integrating these findings with K-12 curriculum and pre-service teacher training. Tessa is part of a team of researchers at UC Davis Bodega Marine Laboratory who seek to understand the impacts of modern climate change on coastal environments and the people who are connected to and reliant upon those places. Tessa is deeply committed to partnering with people and organizations that will

*(Continued on page 11)*

# Sarah White

By James Kennett and Tessa Hill



Sarah was a standout on every step of a wonderful but tragically short academic development and career. All of her mentors recognized this early during each of her academic

leaps. This began with her work as a year-long undergraduate laboratory assistant working in the Kennett lab where she realized the potential of the marine sediment and microfossil record for understanding causes of abrupt climate and ocean change. She attended UCSB from 2002-2006, earning her B.S. degree. Tessa Hill, then a graduate student in the Kennett lab, recognized her potential and later took on Sarah for MS graduate work at UC Davis to study the Santa Barbara Basin sediment record. She flourished, and her work was published (2013; with 4 other authors all with Departmental connections) in an enlightened and pioneering contribution about millennial-scale climate variability, a particularly hot subject in those days. She then completed her Ph.D.

at UC Santa Cruz in 2019, and was awarded a UC President's Postdoctoral Fellowship in 2020 for research based at UC Berkeley and San Francisco State University. Sarah was a loving friend, partner, and mother to two young children, and was conducting important and exciting research at the interface of modern and past climate change. She passed away in July 2022.

## Tessa Hill

*(Continued from Page 10)*

use scientific information in decision making. As part of her research, she has worked with Federal and State policymakers to utilize oceanographic data in decisions, as well as partnered with conservation groups, sustainable shellfish farmers and tribes in pursuing co-generated research. In her current role as Associate Vice Provost of Public Scholarship and Engagement at UC Davis, she supports faculty and students across the university who seek to connect their work directly with communities and society as a whole.

## John Lovenburg

*(Continued from Page 10)*

and manufacturers on R&D and pilot projects to electrify intermodal railyards, and pilot battery-electric and hydrogen locomotives.

John is active in sustainable development, operations, innovation, governance, and markets. He is the Executive Advisor for BNSF's sustainable business markets initiative where he works with customers on supply chain solutions for emerging energy and circular economy markets.

He is on the Board of Directors of the Environmental Law Institute and a member of the Cyclyx Executive Advisory Board for advanced recycling of plastics.

## STAFF SPOTLIGHT: JORGE PICHARDO



Jorge Pichardo was born and raised in Santa Barbara, he received a bachelor's degree in Business Administration from California State University Northridge. Before coming to UCSB he worked as an Accounting Associate for Evans Hardy & Young, an advertising agency. He is excited to work at UCSB and is looking forward to meeting everyone in the Earth Science department. He enjoys dancing and is part of a dancing team for ME Sabor Dance studio. He loves to hike and travel, and enjoys reading books.

Department of Earth Science  
University of California, Santa Barbara  
1006 Webb Hall  
Santa Barbara, CA 93106-9630



Summer field 2022, New Mexico. Photo: Alex Simms

# EARTH SCIENCE NEWS