CALIFORNIA STATE UNIVERSITY
LONG BEACH
College of Natural Sciences
& Mathematics

FALL 2022

Geology & Earth Science Newsletter

DEAR ALUMNI AND FRIENDS,

Welcome to our first department newsletter! We'd like to use this letter to summarize all of the amazing activity that has happened in our department over the past year! Our students and professors have had a productive summer and we want to share what is happening in the Department of Geological Sciences at CSULB. We started a new department alumni group on LinkedIn to foster continued connections between our alumni and current students and professors. If you haven't seen it yet, we have >75 members already! (To join, search for "CSULB Geology & Earth Science Alumni" on LinkedIn).

We hope that you and yours are safe and well.

If you have news to share in these eNewsletters, please let us know by emailing Dr. Alyssa Abbey (alyssa.abbey@csulb.edu). We also can print the newsletter if you'd like a hard copy. Just email us the name and address where you'd like to receive the newsletter.

Sincerely, Alyssa Abbey, Andrea Balbas, Matt Becker

PASSING THE TORCH:

FORMER DEPARTMENT CHAIR DR. RICK BEHL MOVES INTO RETIREMENT & DR. LORA STEVENS TAKES OVER LEADING OUR DEPARTMENT

Dear CSULB Geology Family,

Happy Autumn! We hope that you are all doing well and that your lives are returning mostly to normal. Many of us had our first real summer vacations this year, and have been out camping or traveling, and we hope that you have been too.

We are undergoing many transitions here in the department. The pandemic was extraordinarily challenging for everyone – staff, students, and their families. We had to become incredibly creative to teach without normal lab or field experiences. Faculty and students created virtual field trips, and interactive 3D models and near-infinitely zoomable images for mineralogy, paleontology, etc. Try these out for yourselves:

- Landslides
- Sketchfab Models
- CSULB Geology

But virtual is not the same as real life and doesn't give our students the training that they need and deserve. Over the last year-and-a-half, most of our classes have returned to in-person instruction, we are running all three of our field classes and many other class field trips, and having labs, as usual. Of course, there still are many precautions, and we still wear masks when working closely together indoors but we are back to teaching, studying, and researching with all of our might and creativity.

It was with our alumni and friends' generous help that we were one of only a few colleges in the entire state of California who gave their students real (not "virtual") field training during the first year of the pandemic, thereby qualifying them to take the Fundamentals in Geology exam and earn their Geologist-in-Training certificate. Students who graduated from the schools are often shocked to learn that they must go back to take a real summer field course! See this great article on the CSULB website about the support we received.

continued on next page...

The pandemic coincided with a major transition. The Geology Department is blossoming with new energy and people as a few familiar faces are cutting back a little. Drs. Finney, Kelty, and Behl are in FERP (Faculty Early Retirement Program) where they teach one semester/year. As of last year, Dr. Francis has fully retired.

In their place, we have received an infusion of energy, creativity, and new geologic expertise. We were joined by 2 new faculty members in 2020-21 and one this Fall 2022. Dr. Andrea Balbas is a geochronologist that applies cutting edge techniques to address a wide array of important geologic problems. Dr. Alyssa Abbey is a structural geologist who employs thermochronology to unravel the history and rates of crustal deformation in a range of tectonic settings. And Dr. Jillian Pearse just joined us from leading the Geosciences Department at the University of the Andes, Columbia. Jill is a multitalented geophysicist who has great experience engaging students in applied geophysics research. We are lucky and excited to have Andrea, Alyssa and Jill bring their energy and expertise to our department.

Finally, after a few-year hiatus, we look forward to restarting our family-friendly Alumni Reunion Field Trip this year, likely in the spring. Please look out for information in future communications.

Rick Behl (Department Chair, 2016-2021) and Lora Stevens (Department Chair, 2021-Present)

WELCOME DR. JILLIAN PEARSE AS OUR NEW GEOPHYSICIST!

DR. JILLIAN PEARSE

We welcomed our new Geophysicist Dr. Jillian Pearse this fall! Jill was previously an Associate Professor in Colombia at the Universidad de los Andes, and we are excited to welcome her to the faculty where her focus on using geophysical and satellite imaging to study changes in the surface of the Earth, and how they relate to the dynamics of the Earth's interior, will be a wonderful complement to the other fun research we do!

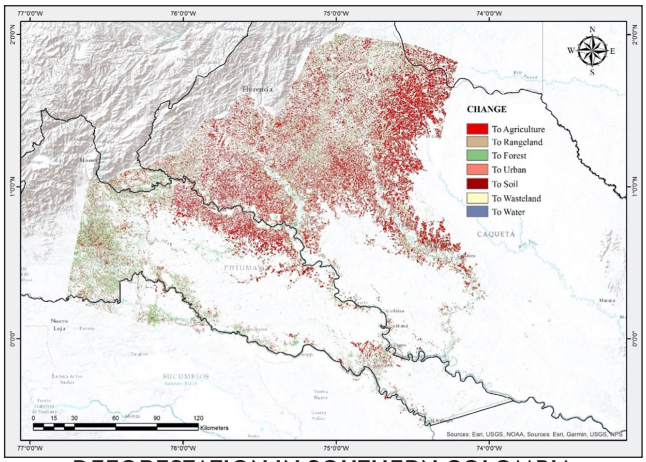
Some of her current projects include:

- Combining gravity and deformation data to infer the internal structure and behavior of active volcanoes
- Monitoring surface effects of resource extraction activities
- Using radar and optical satellite images to study land use and land cover changes
- Lineament analysis for exploration of structurally-controlled mineral deposits

VOLCAN PURACE COLOMBIA

VOLCAN PURACE COLOMBIA

VOLCÁAN TURRIALBA, COSTA RICA

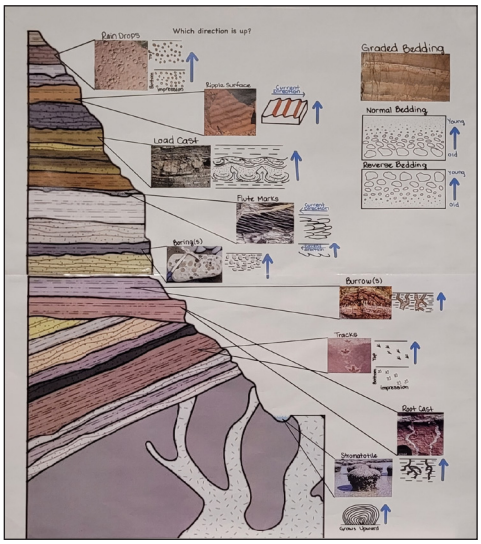


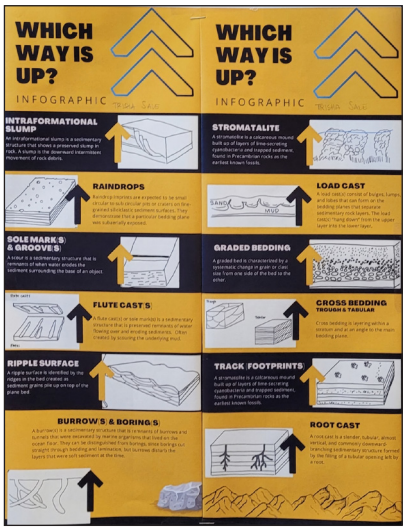
DEFORESTATION IN SOUTHERN COLOMBIA

ASSISTANT PROFESSOR ALYSSA ABBEY PUBLISHES A CHILDREN'S BOOK!

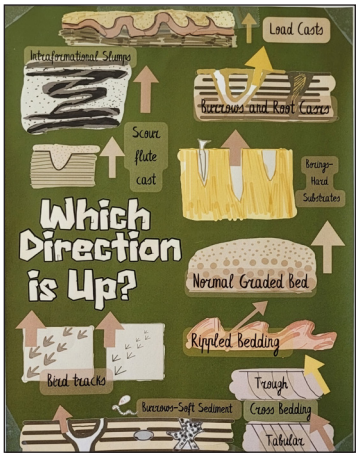
Dr. Alyssa Abbey, who started in January 2021, and runs the TASTe Lab (Thermochronology Analyses for Structure and Tectonics) is also a huge fan of science communication and combining art with science. In February of this year, she published her first children's graphic novel about how mountains are made and how they change over time. The book is called Unearthing Mountains. Check out information about the project on Alyssa's personal website (alyssalabbey.com). The Spanish version of the book, will be available soon as well!

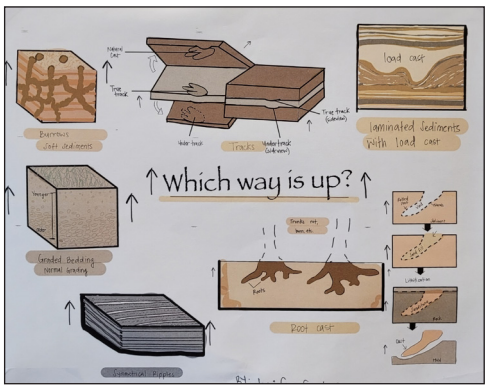
ASSISTANT PROFESSOR DR. ANDREA BALBAS HELD A "WHICH WAY IS UP?" POSTER CONTEST IN SEDIMENTOLOGY CLASS





"Students were asked to make a poster showing sedimentary structures that can show which way was up during the time of sedimentation. The students exceeded expectations! All of the posters were FANTASTIC!" -Dr. Balbas





UPDATES FROM DR. GREG HOLK

Dr. Holk continues to teach the mineralogy and petrology courses, along with making contributions to the California Geology course. He is still serving the department as the Graduate advisor. Dr. Holk is continuing to mentor student research projects for both undergraduates and graduate students. It is exciting to see all the great things our students accomplish.

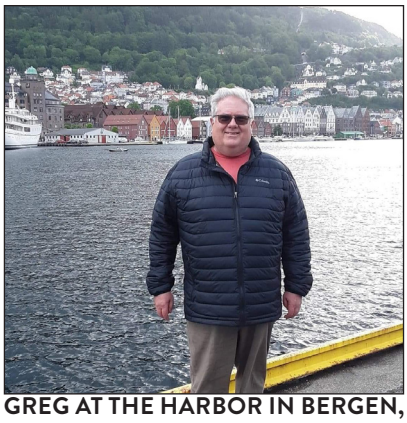
His research into the magmatic evolution of the Coastal Batholith of Peru continues. An invited paper that will be submitted to Lithos about spatial and temporal geochemical trends observed for this 2000-km-long batholith is in preparation with his colleagues at Loma Linda University and USC. His graduate student Jim Conway is directing his Master's thesis study on the transitory part of the batholith in the vicinity of Lima. He is presenting his data and preliminary interpretations at the Annual Meeting of the Geological Society of America in Denver.

Dr. Holk recently co-authored an invited paper with emeritus professors Dan Francis and Trevor Walker, and former graduate student Tor Lacy about their research in East-Central Nevada. This paper is part of a GSA Special Volume that honors the contributions of Professor Eldridge Moores of UC Davis. Dr. Holk presented an invited paper about the fluid evolution of detachment faults in the very shallow crust as part of a GSA special session that honors Professor Cathy Busby from UCSB. This work will continue with the acquisition of clumped isotope data from carbonates at the laboratory of Professor John Eiler at Caltech using finds acquired from a small grant.

Outside of work, Dr. Holk and his spouse have been pretty active with their international travel. They were blessed to visit Malta and Greece during the summer of 2021. Visiting the amazing caldera complex at Santorini was one of the highlights of this trip. "It was pretty exciting to see one of cradles of Western civilization and walk in the same spaces as Socrates, Aristotle, and Paul the Apostle," said Greg.

In addition, they managed to see much of Western Europe during the summer of 2022. Their trip started in Madrid, Spain and continued along the coast of Spain and into Portugal. The next stop was the UK during the weekend of the Queen's Jubilee. The next stop along the way was a visit to the Normandy D-Day beaches on June 6, which is the anniversary of the landing. The timing of their tour was perfect for seeing the commemoration ceremony of the landing at Omaha Beach.

From there they spent one day each in Bruges, Beium and Amsterdam. The trip wrapped up with five days in the land of Greg's ancestors — Norway. They visited fjords and traveled by train from Bergen to Oslo. "Overall, it was an amazing trip. We are planning the next great adventure!" said Greg.



GREG AT THE HARBOR IN BERGEN, NORWAY

UPDATES FROM DR. LORA STEVENS

MASTERS STUDENT ERNEST JACKSON AND UNDERGRADUATE STUDENT MELISSA ZELAYA COLLECTING SEDIMENT SAMPLES FROM ONE OF THE "POO PLOTS".

The Stevens Lab is branching out from paleoclimate research into geoarchaeology. My current NSF-funded grant is exploring the potential and limitations of the use of fecal biomarkers in archaeological research. Fecal stanols are an emergent technique for tracking changes in ancient populations and human migration routes. But the limitations have not been well established.

The grant includes expanding the stanol database of organisms to include elephants, bears, wolves, warthogs (to name just a few) and to test the idea that diet can be tracked from the biomarkers left in the sediment. We are also exploring how stanols move in the environment post "deposition" with laboratory soil columns and field plots.

RESEARCH IN TAHITI!

This August, Master's students Francine Cason, Ellen Justis, Megan Ward-Baranyay, and Brittney Maine traveled to French Polynesia with Professors Matt Becker and Ben Hagedorn to research the freshwater interaction with seawater in coastal environments.

The group spent three weeks drilling wells, collecting water samples, and conducting electrical resistivity profiling on the islands. Here the students are sampling groundwater samples on the atoll of Tetiaroa. Groundwater is a conduit for nutrients from the land to the sea, impacting the health of the reef. This work is funded by two National Science Foundation grants and is collaborative between geoscientists at CSU Long Beach and marine biologists at CSU Northridge.

LEFT TO RIGHT: MEGAN WARD-BARANYAY, BRITTNEY MAINE, BEN HAGEDORN

LEFT TO RIGHT: BRITTNEY MAINE, ELLEN JUSTIS, MEGAN WARD-BARANYAY

DR. STAN FINNEY

SECRETARY GENERAL OF THE I.U.G.S.

Stan Finney has overseen the rejuvenation of the IUGS Commission on Geoheritage and participated as a co-leader with the chair of the Commisssion, Dr. Asier Hilario of Zumaia, Spain, in an ambitious project to select the "First 100" IUGS Geological Heritage Sites. The sites to be recognized by IUGS, such as Sicar Point, the Grand Canyon, Mount Kilimanjaro, the Namib Sand Sea, the top of Mount Everest, Santorini Caldera, and the Solnhofen fossil beds, are iconic. These sites have served to advance the science of geology. They are the world's best demonstrations of geologic features and processes. They are the sites of fabulous discoveries of the Earth and its history.

The purpose of IUGS recognition is to identify these sites and then to make them widely known to the greater geoscience community and to the public through special announcements and events and through attractive books and online products. The attention that these sites will gain by IUGS recognition will promote their conservation and their educational value and use. It is likely that 400-500 sites will be recognized over the next 5 years.

The "First 100" IUGS Geological Heritage Sites will be presented and formally announced at a 60th Anniversary IUGS Event in Zumaia, Spain, 25-28 October 2022. There, an attractive coffee-table style book on the "First 100" will be released. The La Brea Tar Pits is one of the "First 100". The value of IUGS recognition is well expressed in the announcement on its web page.

SUMMER FIELD IN CALIFORNIA AND MONTANA

For the first two weeks of summer field, the class camped in south Lake Tahoe and worked on bedrock geology of the Sierra Nevada mountain range, active faults along the eastern side of the range, and investigated the glacial history of the area. Students learned to recognize, map, and study active faults in the Genoa fault zone in the southwestern Genoa Valley. These faults are well-expressed as scarps in glacial and fluvial deposits. They also spent 1 week doing bedrock mapping in the Desolation Wilderness along the SW side of Lake Tahoe where they studied Mesozoic metavolcanic rocks and plutons.

The second half of the class was taught in southern Montana and northwest Wyoming where the students worked mainly in the Elk Basin Area, Wyoming. Students studied the Elk Basin Facies Descriptions in order to map the Sedimentary Strata Elk Basin (sandstone, mudstone and siltstone beds). The Facies showed the rising and lowering of the sea-level, fair-weather storm waves and severe storm waves. The Elk Basin is an active oil field, so students were able to observe on going production, mapping techniques used by petroleum geologist and training with sulfur dioxide.

Another area of study was the Frontal Fault System. The Frontal Fault System is present just outside of Red Lodge and is the bounding fault along the edge of the Beartooth Mountains. This style of faulting is also developed throughout the eastern Rocky Mountains and is present from to Montana to New Mexico (possibly Arizona). It developed during the Laramide Orogeny.





SUMMER INTERNSHIPS AND REU'S

Many of our students participated in internships of research experiences for undergraduates (REU's) this summer!

- Undergraduate Desiree Guzman completed an REU at Stanford this summer where she focused on utilizing the rock record from past volcanic eruptions to understand the behavior of active silicic magmatic systems.

- Undergraduate Aaron Martin completed an REU at Oregon State University that focused on refining the tempo of the Cambrian explosion by using a dynamic time warping algorithm to align carbon isotope data sequences taken from sedimentary rocks that contain small shelly fossils.

- Undergraduate Demetria Eves completed an REU at Oregon State University which involved collecting and analyzing discrete greenhouse gas and stable isotope measurements in stratigraphically altered Antarctic ice from core samples dated between 549ka and 792ka.

- Undergraduate Darren Westby completed an internship at Geosyntec this summer where he participated in geotechnical investigation and environmental remediation projects including: soil vapor probe installation, soil logging, CPT investigation, mud rotary drilling, and dry well installation.

- Undergraduate Cheyenne Senesac completed an internship at NASAs Jet Propulsion Lab (JPL) this summer and used their Ice Sheet and Systems Model (ISSM) to simulate glacier behavior across multiple timescales, which lead to ISSM becoming more effective at modeling contemporary and future mountain glacier change.

OTHER STUDENT NEWS

Congratulations to:

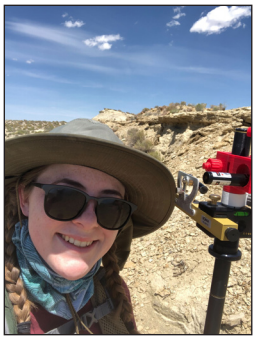
• Graduate student Bedig Charkhutian won the following research awards: 2022 SEPM Student Research Grant; 2022 PSAAPG/LABGS Scholarship Award

• Four undergraduate students (Lexi Ceballos, James Wiseman, Joseph Gunter, & Aaron Martin) conducted research in the Mojave Desert studying pluton emplacement and large-magnitude normal faulting in the Barstow area. Working with Dr Balbas and Dr. Onderdonk, they made structure measurements and collected Miocene plutonic and volcanic rocks for K-Ar dating.

BARSTOW, CA

• Undergraduate students Spencer Cooper, Alec Billmeier, Amanda Curranco, and Roxy Schulman conducted research in the Stewart Valley NV, working with Dr. Abbey and collaborators. They worked on mapping Miocene sedimentary sequences, and studying the tectonic and climatic history of the basin using prevenance dating, thermochronology, and GIS analysis.

STEWART VALLEY, NV



PONCHA SPRINGS, CO

• Undergraduate Student Cheyenne Senesac conducted research on the Poncha Block in southern CO, working with Dr. Abbey and collaborators to understand the effect of fault block uplift on the paleo-Arkansas River system

• Undergraduate students Darren Westby and Spencer Cooper helped Dr. Abbey with setting up her mineral separation lab with innovative ideas for saving water when using the Wilfley shaker table for mineral separation. Darren Westby is also doing research on the uncertainty that should be attributed to crystal size measurements for thermochronologic dating methods.

BUILDING PARTS TO TEST THE WATER TABLE

STUDENTS AT CONFERENCES!

Several of our graduate and undergraduate students attended and presented at national conferences this year!

The GSA joint Rocky Mountain/Cordilleran section meeting in Las Vegas (March 2022):

Undergraduate Spencer Cooper, working with Dr. Alyssa Abbey, presented a poster on fault analysis in the Stewart Valley of western NV, and graduate student Faith Burkett, working with Dr. Onderdonk, presented on her thesis work, doing something.

The Goldschmidt Conference in Honolulu, HI (July 2022):

Gradudate student Matt Schweiger, working with Dr. Ben Hagerdorn, gave a poster presentation about his thesis work on Coral Reefs

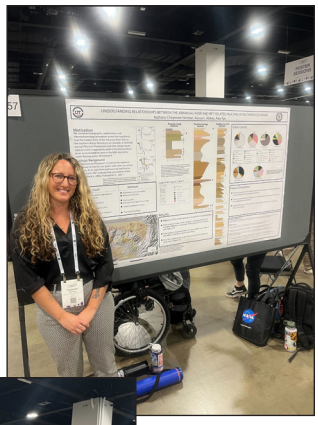
The GSA Annual Meeting in Denver (October 2022):

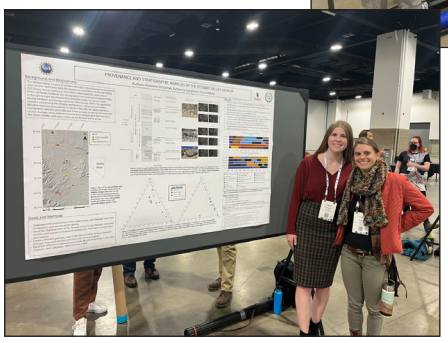
Undergraduate Cheyenne Senesac, presented a poster on Miocene stratigraphic sequences in CO, undergraduate Roxy Schulman, presented a poster in sediment provenance in the Stewart Valley in western NV, and undergraduate Darren Westby presented a poster on modifying two lab techniques to quantify uncertainty on measurements and to reduce water waste! All three students are working with Dr. Alyssa Abbey. Undergraduate Aaron Martin also presented a poster on research he did during his internship/REU in Oregon over the summer! Graduate student Jim Conway, working with Dr. Greg Holk, presented a poster on is his data and preliminary interpretations for his Master's thesis study on the transitory part of the batholith in the vicinity of Lima.

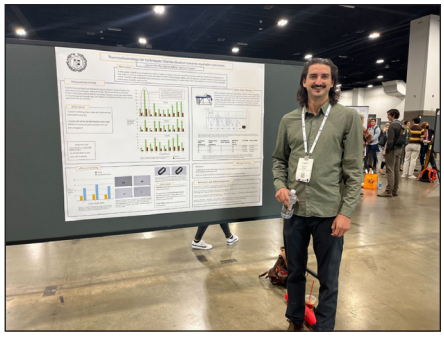
The Pacific Section AAPG/Coast Geological Society Montery Formation Research Conference in Ventura, CA (November 2022):

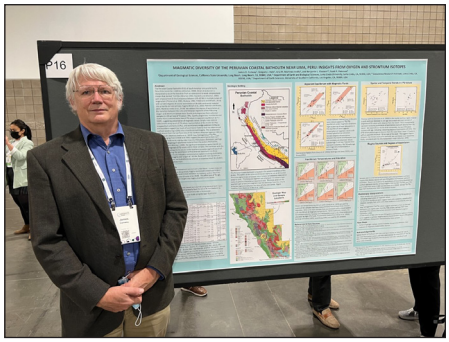
Graduate students working with Dr. Behl presented on their thesis research: Justin Arakaki on formational-scale differences in styles of deformation in the Pismo syncline and implications for petroleum migration and basin evolution; Bedig Charkhutian on depositional mechanisms of biosiliceous lithofacies in the Upper Modelo deep-water clastic system, Eastern Ventura basin, Lake Piru, California; Kenton Crabtree on the influence of tectonics, burial history and sediment composition on the temperature and depth of diagenetic transition from opal-A to opal-CT in the subsurface San Joaquin Basin, California; and Amanda Seckington on organic carbon accumulation and distribution in the Miocene Monterey Formation of the San Joaquin Basin, California.

GSA 2022 in Denver









NEW DEPARTMENT PUBLICATIONS

Abbey, A. L., Wildman, M., Goddard, A. L. S., & Murray, K. E., (2022). Thermal history modeling techniques and interpretation strategies: Applications using QTQt. *Geosphere*, 18(5), 1622-1642.

Abbey, A. L., Choi, E., Neumann, F., Ortiz-Guerrero, C., Tondi, R., (2022). Tectonophysics Perspectives on Integrated, Coordinated, Open, Networked (ICON) Science. *Earth and Space Science*, 9(5). e2021EA002144.

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Fang, J., Y. Hang, Z. Shen, E. Biondi, X. Wang, E. Williams, **M.W. Becker, D. Eslamian,** Z. Zhan, (2022). Directional sensitivity of DAS and its effect on Rayleigh wave tomography: A case study in Oxnard, California, *Seismological Research Letters*.

Finney, S. C., & Gaucher, C. (2022). Hf Isotopes in Detrital Zircon Point to a Mesoproterozoic Orogenic Belt Bordering the Western Margin of the Rio de la Plata Craton. *The Journal of Geology*, 130(1), 1-22.

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Giannetta, L.G., and **Behl, R.J.,** 2022. Chemostratigraphic and lithostratigraphic framework of the Eocene Kreyenhagen Formation: Kettleman area, northern San Joaquin Basin, CA. In Aiello, Barron and Ravello (Eds.), *Understanding the Monterey Formation and Similar Biosiliceous Units across Space and Time, Geological Society America Spec. Publ 556,* DOI: https://doi.org/10.1130/2022.2556(12)

Gibbard, P., Walker, M., Bauer, A., Edgeworth, M., Edwards, L., Ellis, E., **Finney, S.,** Gill, J.L., Maslin, M., Mer ritts, D. and Ruddiman, W., 2022. The Anthropocene as an Event, not an Epoch. *Journal of Quaternary Science*, 37(3), pp.395-399.

Hagedorn, B., & Tsuda, M. (2022). Radon and Salinity Mass Balance Constraints on Groundwater Recharge on a Semi-Arid Island (Catalina, California). *Water*, 14(7), 1068.

Kelty, C., & Onderdonk, N. (2022) Episodic deformation and topographic development along the Santa Ynez River Fault, a blind thrust in the western Transverse Ranges of California. *Tectonics*, e2022TC007320.

Ketcham, R.A., Tremblay, M., **Abbey, A.,** Baughman, J., Cooperdock, E., Jepson, G., Murray, K., Odlum, M., Stanley, J. and Thurston, O., 2022. *Report from the 17th International Conference on Thermochronology*.

Lau, K.V., Hancock, L.G., Severmanne, S. Kuzminove, A., Colef, D.B., **Behl, R.J.,** Planavsky, N.J., Lyon, T.W., 2022. Variable local basin hydrography and productivity control the uranium isotope paleoredox proxy in anoxic black shales, *Geochimica et Cosmochimica Acta,* Volume 317, 15 January 2022, Pages 433-456. DOI: https://doi.org/10.1016/j.gca.2021.10.011.

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NEW DEPARTMENT PUBLICATIONS CONT.

Murray, K. E., Goddard, A. L. S., **Abbey, A. L.,** & Wildman, M. (2022). Thermal history modeling techniques and interpretation strategies: Applications using HeFTy. *Geosphere*, 18(5), 1622-1642.

Onderdonk, N., Garcia, A., Kelty, C., Farris, A., & Tyler, E. (2022). The topographic development of a com pressional mountain belt, the western Transverse Ranges of California, is a combination of localized uplift along individual structures and regional uplift from deeper shortening. *Geosphere*, 18. https://doi.org/10.1130/GES02505.1

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SUPPORT THE DEPARTMENT!

All of the wonderful opportunities that we can provide for our students come from funding and support by YOU—our partners, followers and alumni!

Please consider helping the Department of Geological Sciences with a contribution.

You can choose to support us through various avenues including:

- A one-time donation
- A pledge donation in which you indicate a gift amount and the number of times you wish to make that gift
- A recurring gift. If you would like to create your own named scholarship all you need to do is commit to three years of giving $2,250/year and you'll be able to name your scholarship and stipulate how you'd like it to be used!
- The General Department Fund: provides funds for teaching materials, day and weekend field trips during the semester, and some department supplies
- The Summer Field Fund: helps us run our 4-week summer field class which involves a full geology immersion experience, complete with camping in tents or at field stations, throughout the western US. These funds help pay for the cost of vehicle gas, student food, camp fees, and park fees.
- The Student Scholarship Fund: is a program we recently started in which undergraduate and graduate students can apply for scholarships to help with course and tuition costs, or to use as a stipend while they participate in independent research.

POSTCARDS FROM THE FIELD