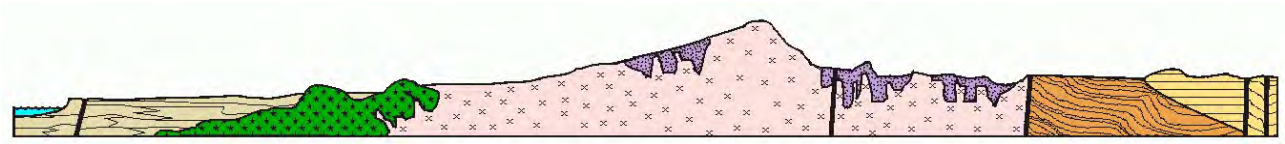

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Volunteer for this 2024 Position

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SDAG MEETING ANNOUNCEMENT

Wednesday, November 15, 2023

Where: **Marina Village**
Marine Room
1936 Quivira Way
San Diego, CA 92109

When: 6:00 pm – Social Hour
7:00 pm – Dinner
8:00 pm - Program

Dinner: Mona Lisa Italian

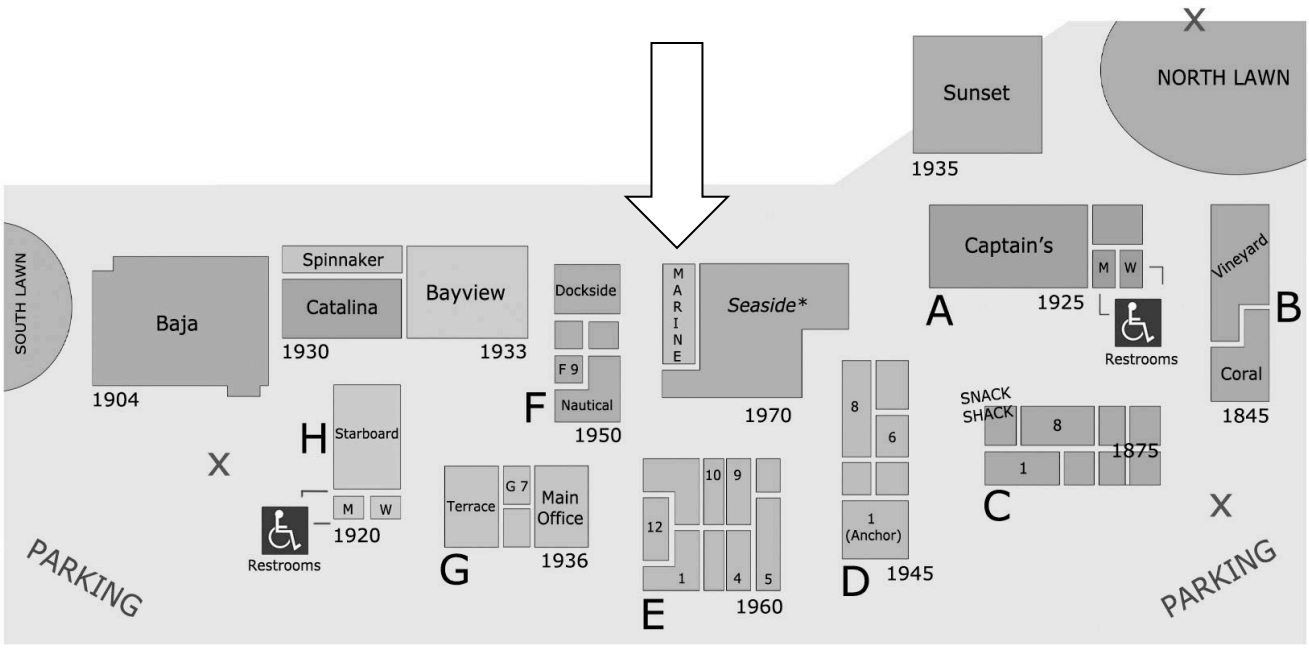
Cost: $ 50.00 Member; Non-Member $55.00; Students $ 25.00

Reservations: Make/Pay your reservation **online** through the SDAG website, **before 5:00pm Monday, November 13**. (*Please note beginning January 2024 all meeting reservations will require on-line pre-payment due to venue costs, venue contracts, and loss of money due to no shows.*)

Meeting Location Directions:

FROM INTERSTATE 5: Take the SEA WORLD DRIVE exit. From SEA WORLD DRIVE, take WEST MISSION BAY DRIVE on your right. When you see the large green sign that says QUIVIRA ROAD, get in the farthest left of the two left turn lanes. Turn left, go one very short block and turn left again. Drive about one-half mile and MARINA VILLAGE will be on your right.

FROM INTERSTATE 8: Take the WEST MISSION BAY DRIVE exit to the right. You will be on INGRAHAM STREET for a short distance from which you will take the next exit marked WEST MISSION BAY DRIVE on your right. When you see the large green sign that says QUIVIRA ROAD, get in the farthest left of the two left turn lanes. Turn left, go one very short block and turn left again. Drive about one-half mile and MARINA VILLAGE will be on your right.


NORTH LAWN
Sunset
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SOUTH LAWN
Baja
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Spinnaker
Catalina
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Bayview
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PARKING
PARKING


Perez Cove
SeaWorld San Diego
P
Quivira Basin
San Diego River
Ocean Beach Freeway
Robb Field
Ocean Beach Athletic Area

Speaker: **Vic Camp**

Talk Title: ADVENT OF THE YELLOWSTONE HOTSPOT: THE CATACLYSMIC 800,000-YEAR MAIN-PHASE ERUPTION OF COLUMBIA RIVER FLOOD BASALT

BIO:
Vic Camp's interest in geology was partially shaped by his rural roots in West Virginia. He graduated with a B.S. degree from Geology at Marshall University, followed by graduate degrees from Miami University (M.S.) and Washington State University (Ph.D.). His research interests have been varied and productive, focusing on volcanology, igneous petrology, and the tectonic evolution of volcanic terrains. After finishing his graduate studies, he spent a year teaching at the University of Ibadan in Nigeria, followed by eight years of field mapping and related research on a Mesozoic belt of plate collision in eastern Iran and both Proterozoic and Cenozoic volcanic provinces in western Saudi Arabia. After moving back to the U.S., he began teaching as a "freeway flyer" at a variety of community colleges in the San Diego/LA area before settling into a stable professional life at San Diego State University in 1993. At SDSU, he has taught a variety of courses, from General Education (e.g., Natural Disasters) to courses in Petrology and Volcanology, while also being an advisor or committee member on 17 senior theses and 41 M.S. theses. He officially retired from SDSU in 2019 but came back to the department in 2021 to help fill a gap in the teaching curriculum. Vic is a Fellow of the Geological Society of America and a long-standing member of AGU and IAVCEI. His current research focus is on Cenozoic volcanism and related tectonic evolution of the inland Pacific Northwest, which forms the basis of today's more specific talk on the genetic association of the Yellowstone hotspot and the Columbia River flood-basalt province.

Abstract: Recent advances have led to new and innovative ideas on our understanding of the Yellowstone hotspot (YHS) track and its genetic relationship to the Columbia River flood basalts. A recent seismic tomography study has resolved the YHS as a deep mantle plume descending from the Yellowstone caldera to the core-mantle boundary (Nelson and Grand, 2019). We now believe that the YHS originated offshore of northern California to produce the Paleocene-to-Eocene Siletzia terrane, an oceanic plateau that accreted to the North American continent at ~50 Ma. After the hotspot itself entered the Farallon trench at ~48-45 Ma (Wells et al., 2014), the plume and related melts of plume-modified magma were shielded by the Farallon slab from ~45 to 17 Ma. Despite this lack of plume-derived surface magmatism, we have restored the location and orientation of the hotspot track from ~40 Ma to the present using the orientation and rate of plate motion (Camp and Wells, 2021). Today, a large hole in the Farallon slab is evident in the mantle tomography that may have been created by thermomechanical erosion above the Yellowstone plume. Breaching of the slab at ~17 Ma resulted in massive, decompressional partial melting of plume-modified mantle, manifested in the dramatic flood-basalt eruptions of the Columbia River Basalt Group (CRBG). New U-Pb zircon ages on interbedded ash deposits (Kasbohm et al., 2023) show that 98 percent of the CRBG volume (~205,000 km^3) erupted in only ~800,000 years. In this talk, I will describe a new two-stage model for this cataclysmic event that is consistent with field, geochemical, geochronological, geophysical, and plate-motion constraints.

President's Corner

Hello SDAG Members!

I hope you are all happy and healthy!

A big thank you to everyone who attended the field trip this year! We are happy to report it was a great success, except for the loss of two tires. We all know that sometimes a sacrifice is deemed necessary by the geo-gods, it's just a shame both tires were on the same car.

Congratulations to John Teasley for putting on such a well thought out trip. We are all grateful for his time and effort this year. Thanks are also in order to the rest of the SDAG/SDGS officers who all came together to support John and really helped the trip to go as smoothly as it did.

Now, this year I have been very fortunate to convince a few of my old college mentors to come and give talks to our group. This month will be the final of those mentors and I couldn't be more excited to welcome Dr. Vic Camp to the SDAG stage! He is a vulcanologist who got his start in West Virginia and then Florida before realizing all the fun vulcanology was here on the west coast. He has worked across the globe, however this month will be giving us all an update on the recent studies and discoveries from the Yellowstone hotspot. His talk is titled "Advent Of The Yellowstone Hotspot: The Cataclysmic 800,000-Year Main-Phase Eruption Of Columbia River Flood Basalt" and is sure to be a lot of fun. Join us!

Please fill out and send in your membership forms if you haven't already (and sponsorship forms, too).

Cheers,
Luke Weidman
President, 2023

SDAG FIELD TRIP PHOTOS

Another Successful Field Trip "EASTERN SAN DIEGO COUNTY PENINSULAR RANGES" was held Oct 6-8th, organized by SDAG VP John Teasley, and inspired by Mike Walawender:

Perfect weather, excellent campground, and great speakers: Dave Kimbrough, Monte Marshall, Dave Bloom, Brian Olson, Chuck Houser, Diana Lindsay, George Morgan, Chris Wray, & Norrie Robbins.
Rough roads and only two flat tires! 😊 😊

Microbial Ecology of the Buckman Springs Lithia Water Seep Site
By Eleanora (Norrie) Robbins (10/15/23)

The SDAG 2023 Field Trip (Boulevard to Jacumba) took us to a great site on 10/8/23 that falls inside my microscopic expertise. Red Fe, black Mn, and green/red coated $CaCO_3$ allowed the collection of bacteria that precipitate iron and manganese, and the cyanobacteria that precipitate calcium carbonate.

Field Site

The field site is along Old Highway 80, close to the ruins of the bottling plant (search Buckman Springs on Google Earth, red dot is the ruins of the bottling plant). Three distinct red seep sites were seen along the south/west side of the highway (Fig. 1).

Fig. 1. Seeps along Old Highway 80.

Across the road is a culvert that is filling with calcium carbonate (Fig. 2).

Fig. 2. Culvert filling with calcareous tufa.

As best as I can figure out, coordinates are 32° 46’ 05.82”N and -116° 29’ 28.74”W. No smell of H_2S was noted.

Procedures

Two samples were collected and studied. One was a vial of red orange flocculate (‘floc’) (Fig. 3) collected at the south/west side of the road (Fig. 4).

Fig. 3. Red floc sample

Fig. 4. Floc collected here at seep site.

The second sample was a piece of tufa at the discharge of the culvert on the east/north side of the road, collected by Monte Murbach. The top of the tufa was green (Fig. 5) and the bottom red (Fig. 6).

Fig. 5. Green top of tufa precipitate.

Fig. 6. Sample of tufa precipitate inverted to show red bottom.

Samples were examined by light microscopy at 250x and 400x power. Both transmitted and reflected light were used. Subsamples of the red and green parts of the tufa were subjected to 10% HCl to dissolve calcite. Photomicrographs were taken of selected bacteria and other interesting/diagnostic organisms. pH of the water was analyzed two days later using pH indicator sticks. Identifications were strictly made on the basis of morphology.

Generalizations about Iron Bacteria

Iron bacteria that oxidize iron are found all over the Earth. Robbins (1987) and Robbins et al. (1987) showed that they go back as far as 3.8 Ga in the Isua Iron Formation. These bacteria get energy by oxidizing reduced iron. This reaction gives off H^+ (protons), so they tend to slightly acidify the water. Iron bacteria precipitate the highly hydrated red/orange iron oxide metastable mineral ferrihydrite ($Fe_2O_3.9H_2O$). Chuckrov at al. (1973) showed that ferrihydrite can lose its bound water and become (dehydrate to) hematite only with added heat or salinity. The iron bacteria also precipitate brown/black manganese (Mn). They get no energy from oxidizing Mn, so one typically finds that the iron precipitates first and when it is used up, then Mn precipitates. So Fe and Mn become slightly separated in space. This separation can be seen along the road.

Generalizations about Calcium Carbonate Precipitation

Calcium carbonate precipitation takes three forms—soft marl, hard tufa (in cold water), and semi-translucent travertine (in hot water). Cyanobacteria are known to catalyze the precipitation of all three forms. I have less expertise with calcium carbonate but I have published on microbial ecology of marl and tufa (Robbins 2021; Robbins et al. 2018). [Don't mix up volcanic ash tuff with calcareous precipitate tufa.]

Red Seep Site (pH 7)

The red seep sites have a distinct dark red-orange color of iron oxide. I collected one small vial of the red flocculate ('floc') (Fig. 3). The seep we focused on also had the shiny films of what is known as the 'oil film' bacterium.

Bacteria

1) The dominant iron bacterium is *Siderocapsa* (Fig. 7). First, that distinct dark red-orange color is diagnostic (says me) for this taxon. The *Siderocapsa* were really interesting—most were the orange color of ferrihydrite. But some spots were intense red (Fig. 8); under reflected light it was obvious that the intense spots were not crystalline and therefore not hematite (Fig. 9). This says to me that the

ferrihydrite was losing some of its bound water but not enough to become hematite. *Siderocapsa* requires organic matter, from which it derives energy—not from oxidizing iron.


Fig. 7. *Siderocapsa* capsule

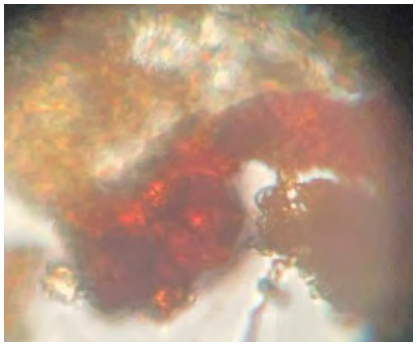
Fig. 8 Transmitted light


Fig. 9. Reflected light

2) Next in abundance is a species I never found a name for—in print I've called it *Leptothrix inside* (Fig. 10). I am loath to call it *Leptothrix ochracea*, which grows inside its sheath and then crawls out, abandoning the sheaths. I didn't see any empty sheaths. This taxon precipitates ferrihydrite on its sheath, and then crawls out, abandoning its overcoated sheath.


Fig. 10. *Leptothrix inside*

3) Holdfasts of the oil film bacterium (Robbins and Hayes, n.d.), *Leptothrix discophora* were also present (Fig. 11).


Fig. 11. Holdfasts of *Leptothrix discophora*.

4) Cyanobacteria: Two species of cyanobacteria were present, *Oscillatoria* and unidentified.

Tufa Precipitating Site in the Culvert (pH 8)

I didn't climb down to the culvert, but my photograph shows that tufa is in the process of filling up the culvert. The tufa is green on top and red on the bottom. The green on top and red on bottom samples were semi-lithified, but could be broken easily by hand. These solid phases are bumpy and thus not crystallized. However, some individual calcite crystals could be separated from the groundmass.

Green Tufa at Top

The green was the distinct color of the cyanobacteria forming and colonizing the calcium carbonate. Grass seedling were also seen growing on the tufa.

Cyanobacteria

Cyanobacteria were abundant and diverse. These included cf. *Anabaena*, *Oscillatoria*, *Phormidium*, and *Rivularia* (or *Gleotrichia*?).

Bacteria

A magnetotactic bacterium tumbled by too fast for me to take its photo. Coccobacilli were also noted.

Algae

1) Green algae included cf. *Microspora*, cf. *Oedogonium*, cf. *Pseudotetracystis*, and the desmid *Cosmarium*.
2) Diatoms included cf. *Gomphospheria*, *Pinnularia*, and cf. *Surirella*.
3) Chrysophytes included *Mastogloa*.

Animals

Worms that resemble nematodes were really abundant. A chironomid (insect larva) was present.

Minerals

Calcium carbonate was mostly punky, but fully crystalline calcite was also present. One crystal was colonized by coccobacilli bacteria.

Red Tufa at Bottom

Colonization by organisms was less obvious in the red tufa. Every grain was coated, but the coatings were amorphous (Fig. 12).

Bacteria

Iron bacteria were ubiquitous but none dominated. These included *Leptothrix inside*, *Siderocapsa*, and *Leptothrix discophora*.

Cyanobacteria

Cyanobacteria included cf. *Anabaena* and unidentified.

Minerals

Calcium carbonate was mostly punky, but fully crystalline calcite was also present. The calcite crystals were mostly coated (Fig. 12). The coatings were nondescript, perhaps *L. discophora* type films.

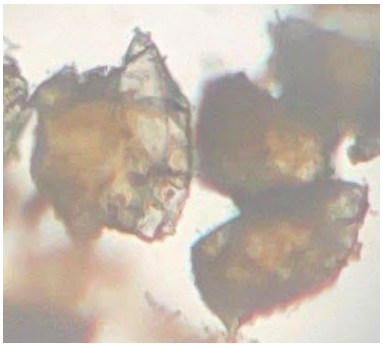

Fig. 12. Ferrihydrite?-coated calcite crystals.

Interpretations

The microorganisms can be used to help define the water chemistry. By the time the water from the spring reached the highway, it carried reduced Fe, reduced Mn, dissolved Ca, and Si (probably in the form of hydrosilicic acid). Sidetrack Adventures (n.d.) stated online that the water chemistry of the spring itself is “naturally carbonated and contained lithia, potassium, sodium, calcium sulfates, and iron.” If Li is present, I don’t know which organisms might interact with it. I didn’t poke around to test

if I could smell H_2S. The availability of Fe and Mn to be oxidized by the bacteria says the discharging water was anoxic.

The presence of a magnetotactic bacterium in smashed calcium carbonate tufa suggests that pore water was suboxic.

I wasn't able to separate out the cyanobacteria that form the calcium carbonate and embed themselves in tufa. However, following HCl dissolution, a taxon resembling *Rivularia* was present (Fig. 13). *Rivularia* is known for precipitating calcium carbonate around its trichomes (Kamennaya et al., 2012.

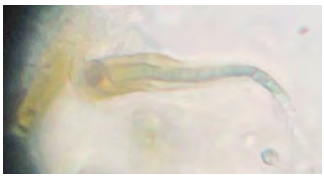

Fig. 13. Possible trichomes of *Rivularia*.

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Sidetrack Adventures, n.d., Visiting the Buckman Springs Ruins: https://sidetrackadventures.com/visiting-the-buckmansprings-ghost-town/ 8 p.

More 2023 SDAG Field Trip Photos


USGS
Preliminary Geologic Map of the El Cajon 30' x 60' Quadrangle, Southern California

UPCOMING 2023-2024 MEETINGS

December 13, 2023	SDNHM – Holiday Meeting, Scholarships, Elections & Dr. Tom Demere Talk
January 17, 2024	TBA
February 21, 2024	TBA
March 20, 2024	TBA
April 17, 2024	Student Research talks by Student Scholarship winners
May 15, 2024	TBA
June 19, 2024	TBA
July 17, 2024	TBA
August 21, 2024	TBA
September/October?	Annual SDAG 2024 Field Trip
November 20, 2024	TBA
December 18, 2024	TBA

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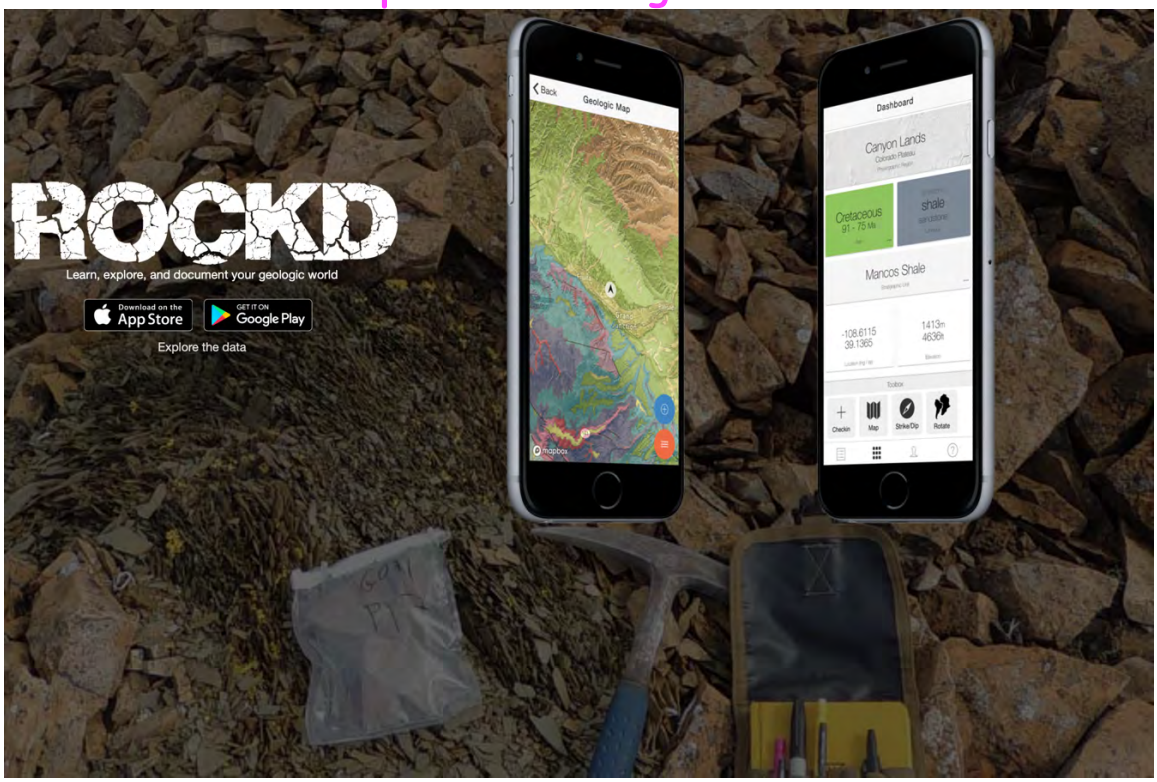

JOB ANNOUNCMENTS

https://www.sandiegogeologists.org/Jobs.html

The California Geological Survey is seeking a geologist to join the CGS Seismic Hazards Program in our Los Angeles office. This dynamic role involves a dual focus:

1. **Seismic Hazard Mapping**: Use a diverse array of data sources, including aerial and satellite imagery, digital topography, field mapping techniques, and subsurface data to create seismic hazard zone maps. These maps are instrumental in identifying areas prone to liquefaction and earthquake-induced landslides.
2. **Geologic Hazard Report Review**: Evaluate geologic hazard and geotechnical investigation reports prepared for public school construction projects statewide to ensure these reports effectively document site conditions and assess potential geological and seismic hazards.

This is a great opportunity to contribute to seismic safety in California. To learn more about the position, its requirements, and application instructions, please visit our official job posting: Job Posting Link [calcareers.ca.gov].

IMPORTANT NOTE: This position requires the submission of a Statement of Qualifications (SOQ). Applications without an SOQ, or those that do not address the provided items/questions and do not adhere to formatting instructions, will be excluded from the selection process. Resumes and cover letters cannot substitute for the SOQ. For detailed information, please review the Statement of Qualifications section.

The final filing date for applications is **November 16, 2023**. Don't miss this opportunity to be part of our dedicated team working to enhance seismic hazard preparedness and resiliency in California.

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