Pacific Petroleum Geology
NEWSLETTER
Pacific Section • American Association of Petroleum Geologists
September & October 2017

How PSAAPG members spends their summers, and a sneak peak for the year ahead

2017-2018 Officers

Staff

COVER PHOTO: A standard morning view from North Rim to South Rim at Grand Canyon Lodge: Osa (Oza) Butte in the right foreground is capped by Permian Kaibab Fm. Photo by Tim Elam.

- CONTACT THE EDITOR at editor@PSAAPG.org
- Images (graphics, photos, and scans) must be at least 300 dpi resolution. Text should be at least 600 dpi.
- Scanned photos, illustrations (line art) or logos should preferably be submitted as a .tif, .gif, or .bmp; .jpeg is OK.

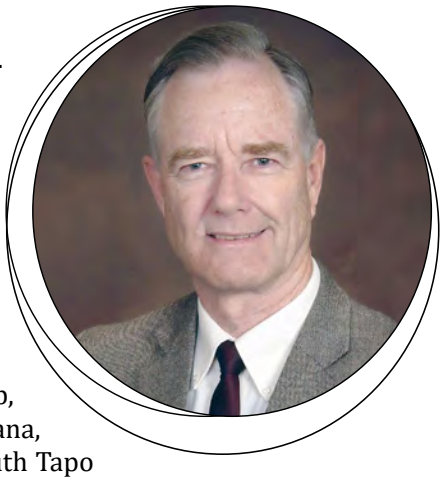
Dear Pacific Section AAPG Members,

It has been forty years since I began my oil industry career as a petroleum geologist with Union Oil Company in 1977 in their brand new Ventura office. There were about eight of us in that incoming class of geologists in that office. The industry was in an upturn after an oil price spike in 1973 during the first Arab oil embargo. Pacific OCS lease sales were taking place about every two years and the industry was aggressively acquiring and developing California offshore leases. Geologists were needed for lease sale evaluations and for development of the new offshore fields. Most major oil companies had offices on the coast including Union, Texaco, Chevron, Shell, Arco, Getty, Sun, Conoco, and others.

It was a boom time and those of us working in the petroleum geosciences enjoyed rapidly elevating salaries and benefits. Company cars came in the early 80s even for the younger staff. The high level of exploration and development activity was a terrific training ground for young geologists. We were sitting onshore and offshore wells and learning to integrate new well data with subsurface geologic mapping. Fortunately, there was a strong bench of experienced older staff and management to guide us in our acquisition of the skills of geologic interpretation. In those days, all subsurface mapping was done with paper and pencil and we spent long hours integrating maps, cross sections, formation tops, dipmeter, paleo, and surface geology. Transposing contour elevations from a subsurface contour map to a cross section, and vice versa, was a tedious exercise, especially when the boss checked it and found it wasn't precise enough. Throw in several faults and you were guaranteed to spend weeks getting it right.

The computer mapping technologies we have today have alleviated much of that tedium. We can generate mapping integrated with well control and seismic on multiple levels far more quickly than was done in the past. But the necessity of fully integrating all data in order to present a valid geologic model has not changed, whether done on paper or in a computer. Multiple cross sections are needed to validate stacked mapping, ensuring that interval thickness between tops and markers remain realistic across the area of interpretation. Wherever seismic, dipmeter, and paleo are available, they must be fully utilized so that the interpretation honors all the data. Subsurface mapping is an inductive science in which a limited dataset has to be synthesized into a coherent geologic model that can be tested and ultimately drilled.

I was fortunate to be assigned to an onshore exploration program in the Ventura Basin when I first started working for Union Oil Company. Several of us newer geologists worked for a veteran oil finder, Ed Hall, a graduate of UC Berkeley in the 1940s. He had discovered about 50 MMBO for the company in the 50s and 60s in the Torrey Deep, Oakridge, Santa Susana, Big Mountain, and South Tapo fields in the Ventura Basin.



Over the five year period after I joined the company, seven exploratory onshore wells were drilled in the basin. The first two were discoveries, both in 1979. The Sulphur Crest field was a Monterey producer in the western Ventura Basin. The Oat Mountain field was in the eastern basin, producing from a shallow marine sand in the Eocene Llajas Formation. In each discovery, the original objectives were not oil-bearing; the targets were wet or not present. However, unexpected oil zones were encountered in each discovery well due to structural or stratigraphic complexity. It certainly showed me that the subsurface is not entirely predictable and complexity can sometimes work for us in oil-rich areas. The company had a big discovery party at a local country club to celebrate the back-to-back discoveries. It was great occasion to celebrate. It is good that we celebrated then because the next five exploratory wells were dry holes. No serendipity at work in those five. It was humbling and discouraging and brought us back to the reality of exploration at that time – one in ten exploration wells are successful. I could not have predicted in advance which of the seven wells would be successful.

A successful drilling program spreads risk over a number of wells instead focusing on just one. The nature of our business is to participate in successes and failures. We work hard to drill successful wells based on sound geologic interpretation. But because of limited data and geologic unpredictability, some wells are unsuccessful. We learn from those failures so that we can have greater success in the future.

Mike Nelson
PSAAPG President, 2017-2018

Paying-It-Forward to the Next Generation.
How to Strengthen Your Alumni by Paying-it-Forward.

by Afton Van Zandt, July 31, 2107.

This year marked the ninth annual San Diego State geology trip to Bakersfield lead by Kip Hering, a retired geologist from Oxy who teaches Petroleum Geology. For the past five years, SDSU alumni and friends have pitched in to guide Kip and his students through a 2-day overview of the San Joaquin Valley, and it's associated petroleum system.

The field trip was kicked off Friday evening with a unique core viewing of area reservoirs on the driveway of Cameron Campbell and Afton Van Zandt's home and home base for the students. The Core Repository at Cal State University Bakersfield, overseen by Charles James, was gracious enough to loan the core from the Spellacy sands of Midway-Sunset for the occasion. Viewing the core served as an excellent way to talk about the regional tectonic/sediment interaction before heading out into the field.

The next morning, the students awoke to travel throughout the valley to take a look at the San Andreas Fault Zone within the Carrizo Plain National Monument, the Lakeview Gusher, McKittrick Brea Pits, and Spellacy outcrops. Students also got to listen to short lectures about local oil fields by alumni Cameron Campbell, Aaron Hebeler, Jason Parizek, and William Munson. Students were very interested in the geologic challenges of deep water and shallow marine petroleum systems on the west side.

The mighty Kern River. Left to Right: Kip Hering, Dillon Murphy, Andrew Wilson, Kristan Watkins, Matt Skakun, Alex Laws, Afton Van Zandt, Cameron Campbell, Sarah Hebeler, and Mark Nahabedian.

MUNGER MAP BOOKS

The CA Well Sample Repository is seeking donations of MUNGER MAP BOOKS. The collection is incomplete, so any donations would be kindly appreciated!!!
Please contact Larry Knauer at laknauer@aol.com

On the last day, we switched gears to discuss the many challenges of working a fluvial reservoir, the Kern River Formation. This year the mighty Kern River stole the show at the Kern River Gorge with a 'waterfall' from diverted flow. It was quite a contrast to see the fast moving water and giant boulders compared to the lazy meandering leg with fine grain sediments along the Alfred Harrell Highway at the Kern discovery site, just a few miles downstream. Geologists John Abeid and Sarah Hebeler, who are both adept with the Kern River oilfield operations, gave a series of talks describing complexities of drilling wells within a freshwater aquifer.

The best part of the field trip was that students got to network with Alumni who are now geologists working with California Resources Company, Chevron, and the DOGGR, to name a few. In practicing "Paying-it-Forward," the Alumni provided the students with meals and refreshments over the 2-days, which was topped off with a BBQ Saturday evening. The President of the San Joaquin Geological Society and former student of Kip, Cameron Campbell said: "SDSU students travel 240 miles to see Bakersfield geology, and we are going to make it worth their time!"

2018 PSAAPG Annual Convention

April 22-25, 2018, Marriot Downtown Bakersfield.
Contact General Chair: Becca.Schempp@crc.com
Planning is well under way and we need volunteers, exhibitors, sponsors, and technical submissions.
Keep an eye on your inbox and the website: www.PSAAPG.org

The PSAAPG West Coast Student Expo

October 6-7, 2017 at the California State University Northridge Campus.
Sponsored by CRC (Platinum), Aera Energy (Gold), Chevron (Silver), and PSAAPG (Silver).
Includes Students posters, CRC Round Table, Lunch, Booth Exposition, and interviews.
http://www.csun.edu/science-mathematics/geology/ps-aapg-west-coast-student-expo.

HOW I SPEND MY SUMMER VACATIONS.

by Tim Elam, July 31, 2107.

Summer is almost over, and you may be planning your next trips with family or friends . As PSAAPG folks, traveling is in our blood…even if it is just within California, Oregon, or Alaska. As geologists, we often have fond memories of studying or working "in the field." I know I do. For seven summers since I retired in 2009, I have been able to not only work "in the field" but live in it as well. This article, encouraged by Larry Knauer, touches on some of my post-retirement experiences.

I have been fortunate enough to live and work seasonally as a National Park Service Ranger in four locations: Grand Staircase-Escalante (UT) Natl. Monument (2009), Petrified Forest (AZ) N. P. (2012), Crater Lake, (OR) N.P. (2013-2015), and Grand Canyon (AZ) N.P. (2016-2017.) I have functioned both as a volunteer and a paid seasonal employee. I am currently a seasonal NPS employee at the North Rim of Grand Canyon. It is amazing how parks "staff-up" with as many as 8000 seasonal or temporary employees for the summertime rush…and then staff back down. North Rim is a challenge to operate, since it is closed for 7 months out of the year. Attendance at national parks has steadily been creeping upward, and last year…the Centennial of the Park Service…many visitation records were broken.

For 3 ½ to 5 ½ months in six of the eight summers since 2009, I have lived within a park. I have thoroughly enjoyed each of my seasons at the four locations. Given the often remote locations, and being away from family, working in parks is not for everyone. In cities, you don't travel 80 miles to the nearest "real" grocery store. You have to adjust to living with folks you don't know, since housing is usually shared with two or three people in a three-bedroom duplex. However here at Grand Canyon, I have a cabin, built in 1928, all to myself.

I function as what is called an Interpretive Ranger. Interpretive rangers are the folks you most commonly associate as being "park rangers." Other "ranger-types" are Fee Rangers and Law Enforcement Rangers. Interpretive rangers staff Visitor Centers and answer your questions, present adult and kids programs, rove the trails, swear in Junior Rangers, play travel agent, even function as back-up tour boat captains (Crater Lake). Interpretive rangers don't wear guns, and we don't take money. Our most common question is "Where is the nearest bathroom?" Another one is "I'm here…what should I do?" In short, we try to optimize the visitor experience. I enjoy talking with visitors, because most of them WANT to be at the national park and WANT to interact with a ranger.

You may detect a theme to my park locations. I apply for positions where geology is a significant part of the attraction. But geology is only a part of the story in each of the parks. I have spent much time learning about Native American cultures and history, local plants and animals, park history, archaeology, paleontology, limnology, endangered species, and other themes. Interpretive rangers are responsible for researching, preparing and giving presentations that they develop; I have nine programs. We have great latitude in what we present, and are evaluated by peers and supervisors. That is partly because of the varied backgrounds of interpretive rangers; many studied English, History, Biology, or Education and the age range varies immensely. *I have never worked an NPS season with more than one other geologist in the park!*

In my geology presentations I always try to show rocks minerals or fossils, and let the visitors look and handle them. I like to show graphics too. We geologists take those things for granted on our field trips…every stop has a cross-section, map, rock, etc. to view. But if your background is arts or languages or education, those may not be part of your modus operandi.

There are social events amongst the ranger/park service staff, but for the most part you are on your own to create fun outside of work time. A lot of park workers are young, well-educated, and "free-spirits," who have already had amazing life experiences. At Crater Lake, a game was invented called "Volleyfriz." It is basically playing volleyball with a frizbee… not a ball. Great fun!

Internet access for personal computers…even I-phones… is a challenge at each park I've worked at. There simply isn't the bandwidth available for personal computer use. It is a good day when I can download all of my e-mail. Forget about streaming, unless you pick an off time. However, there is no problem with access to doing real work through the NPS system computers. I must walk or drive to a hotspot where I can receive a cell phone signal.

There are often unusual situations we deal with.:

- Last year, I redirected a 5-foot gopher snake. This snake decided to join the BBQ buffet in an auditorium and was within 7-8 feet of entering an open door. Had he gotten inside, it would not have been good for business! But the diners never knew about the snake.
- At Crater Lake 2014, I was halfway around the lake on a two-hour tour. But a thunderstorm creeped over the crater rim. We had about 25 lightning strikes hit the water as we creeped back to the dock, staying dangerously close to the shoreline. We averaged about 3-4 knots, trying to not function as a lightning rod. We succeeded.
- Another day that year, after an 11 hour day of boat tours, three of us had to go back on the water. We tried to locate someone who allegedly committed a felony that day. To elude Law Enforcement, the felon crawled inside the steep-walled crater into brush. We were unsuccessful that evening, but the alleged felon was caught a week later.
- At Petrified Forest in 2012, we noticed a small car that was "riding low." Turns out the occupants had illegally collected 400 pounds of petrified wood. We notified the nearby fee gate, and the occupants got busted before leaving the park. Unfortunately, it is suspected that more than 1000 pounds of stolen wood leaves the park every month (on average.)

Geologically, there are park libraries that provide access to all that we need to know. But obviously, our public presentations are what I would call "Geology Light." I like to focus on early explorers…such as John Wesley Powell, Clarence Dutton, and J.S. Newberry.

One tidbit that I like to relate is the expedition of Lt. Joseph Christmas Ives in 1858. It was not as famous as the Powell expeditions of 1869 and 1871…with good reason. The U.S., via the treaty that ended the Mexican/American War in 1848, acquired most of Arizona. However, U.S. knowledge of the lower Colorado River was minimal. So, the U.S., seeking to colonize the area, sent out survey expeditions to gather information about transportation corridors, mineral deposits, agricultural and grazing land, etc. Ives expedition was the first of those surveys.

Ives final report on the Grand Canyon yielded memorable quotes. He found no minerals, no agricultural land, no navigable waters up the canyon, and no realistic means to cross the canyon. In summary, he said: *"The (Grand Canyon) region . . . is, of course, altogether valueless. It can be approached only from the south, and after entering it there is nothing to do but leave. Ours has been the first, and will doubtless be the last party of whites to visit this profitless locality. It seems intended by nature, that the Colorado River, along the greater portion of its lonely and majestic way, shall be forever unvisited and undisturbed."* And you thought Mark Twain was the only 19th Century humorist! Unvisited? Undisturbed? The Grand Canyon had six million visitors in 2016.

Another interest is presenting geologic theories of canyon formation. The "standard" story is that Grand Canyon began to form about six million years ago when two opposite flowing rivers joined, largely through stream piracy. The "young" boundary of canyon dating (6 MYA) is based on volcanic and other deposits at the downstream end of the canyon and western Arizona. But in the last ten years, new radiometric dating, particularly of speleothems (Grand Canyon has more than 900 caves) has tweaked theories regarding timing of upstream canyon formation. Let's see what survives scientific peer review!

The youth of the canyon is apparent when compared to other topographic features. For instance, the North Rim, elev. 8300' is 1200' HIGHER than the South Rim, which is ten miles away. And yet the same layer of rock, the relatively thin Permian Kaibab Formation is at the surface on both rims. That is because the Kaibab Plateau (a pre-canyon feature) dips about 1.5 degrees south. Grand Canyon simply cut into a gently sloping surface.

I like to ask kids if they saw a dinosaur fossil while at Grand Canyon. They shouldn't. (Except for volcanics, the youngest rock is 270 MYA…the oldest dinosaurs are 240 MYA.) Yet dinosaur fossils are found in younger rocks in every direction away from Grand Canyon.

One surprising thing we tell visitors is that a tiny fraction of canyon cutting is due to erosion by the Colorado River. The River is about 100 yards wide at Grand Canyon. It is unlikely the river has ever been much wider than that. Yes, it may have meandered some during geologic time, but the dominant erosion has been done by violent summer monsoon storms and Spring snowmelt that…assisted by gravity…move massive rocks down side canyons, particularly on the North Rim. Creeks within side canyons create base levels that are near Colorado River elevation far upstream from where the creeks enter the Colorado River.

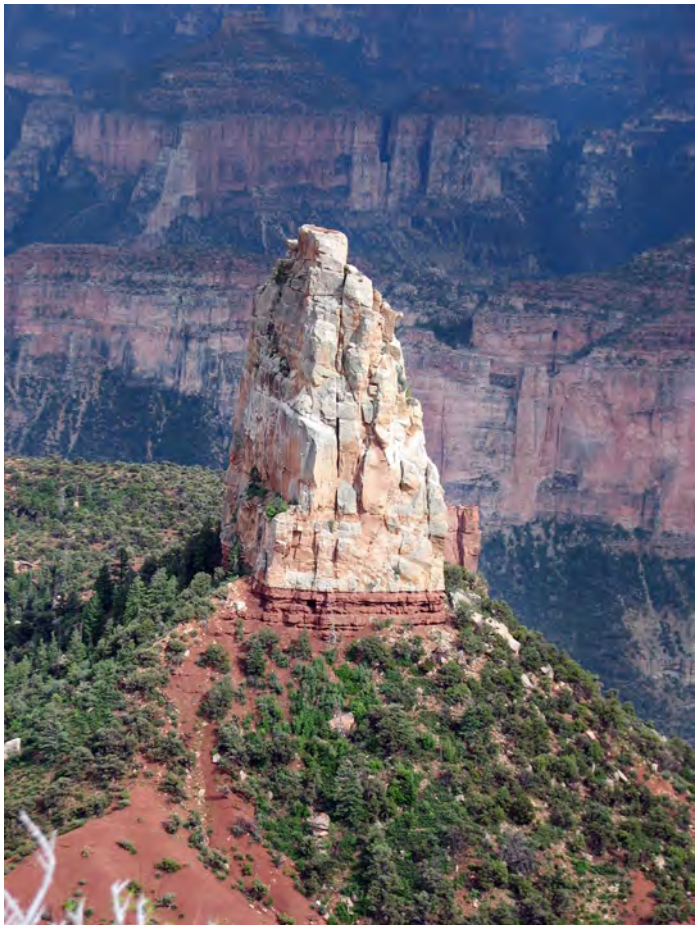
Another surprising geologic/topographic thing is surface and groundwater flow. Water that hits the ground on the South Rim only a few miles from Grand Canyon's South Rim is unlikely to flow into the nearby Colorado River. It will flow south, away from the canyon, via fractures and may enter the Colorado far downstream in southeastern Arizona. On the other hand, North Rim sediments dip toward the river, leading to long, tortuous drainage and creation of massive side canyons.

Geologists are just beginning to understand how complex the groundwater avenues are. With all the dissolution of limestone units, there are numerous springs throughout the lower reaches of the canyon. But one spring has no equal: Roaring Spring. On the North Rim, Roaring Spring is visible from the North Rim, 3300' below viewpoints. The volume of water issued from Roaring Spring is about six MILLION gallons a day. All of the water used in the park…North Rim or South Rim… comes from Roaring Spring. And the park only uses one million gallons a day…the remainder flows into the Colorado River. Roaring Spring waters basically occupy a cave within the Mississippian Redwall and Cambrian Muav Limestones.

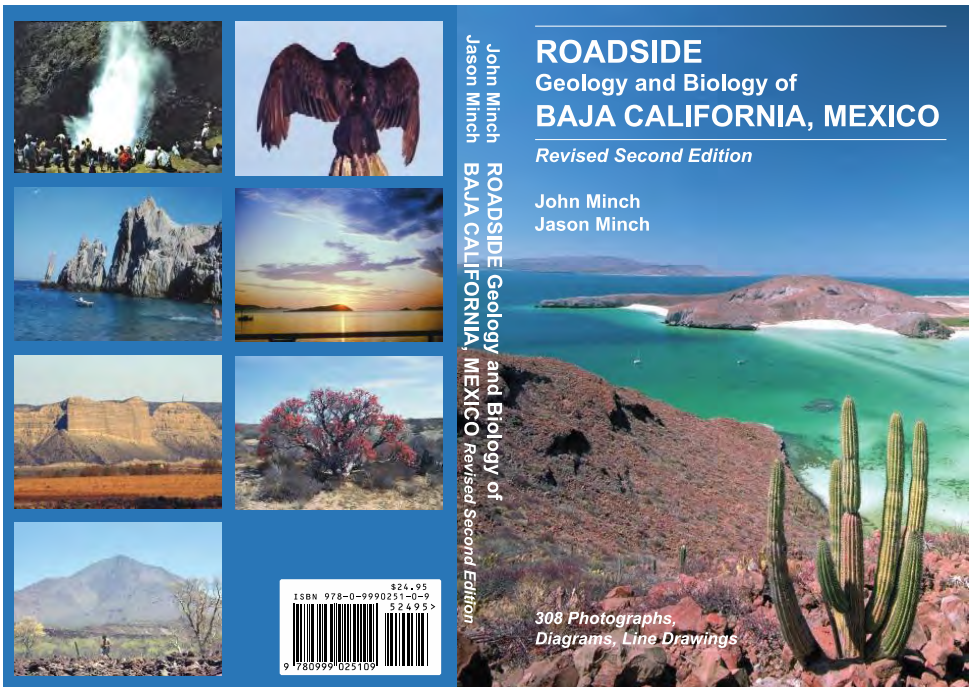
The benefits of working in national parks outweigh any disadvantages. The geology is spectacular…Grand Canyon is one of Earth's Seven Natural Wonders.... The people I have worked with over the years…particularly the full time employees… are good people, well-qualified for their work. Headed to Grand Canyon North Rim this summer? Look me up…I'll be here until mid-October.

-Tim Elam

Angels Window: Angels Window, a "hole in the rock" of Kaibab Formation carbonate rock near Cape Royal, on the North Rim. (Photo by Tim Elam)



Hayden Peak is a buff-colored monolith of Permian Coconino Sandstone that sits above red Pennsylvanian/Permian Supai Fm shales and sands; photo taken by author at Point Imperial on the North Rim. (Photo by Tim Elam)



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John Minch and Jason Minch

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Step 2

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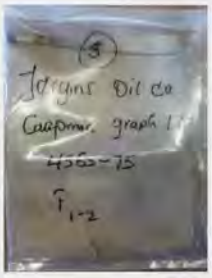
Step 3



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Alaska Geological Society

September 19th, 2017.
Speaker: Dr. Birgit Hagedorn, UAA.
Talk: Awaiting title.

Coast Geological Society

September 19th, 2017.
Speaker: Laura Reynolds, UCSB.
Talk: "Evidence for Holocene coseismic subsidence along the Rincon Creek Fault, Carpenteria, CA".

October 17th, 2017.
Speaker: Thom Davis, Independent Geologist .
Talk: "The Santa Susana Fault at the Aliso Canyon Gas Storage Field, Southern California: Fault Rupture Hazard to Gas Well Integrity".

CGS would like to thank everyone who came out and made the 18th Annual 2017 Woolley Golf Tournament a huge success! CGS would also like to thank all the sponsors and speakers that helped create a successful 2016-2017 season!

L.A. Basin Geological Society

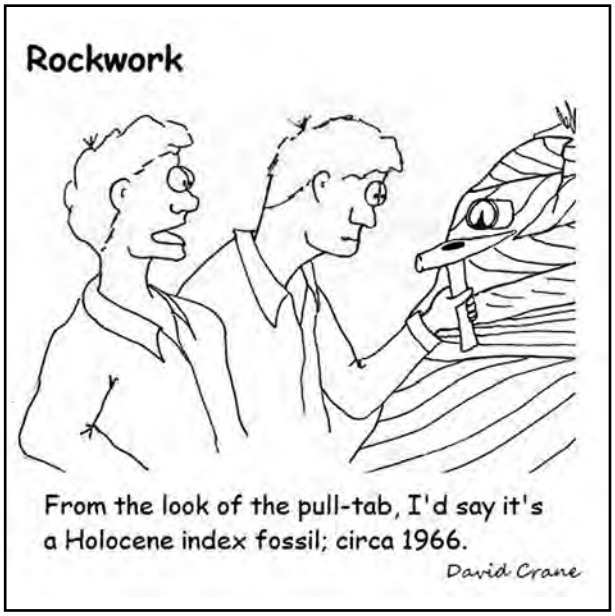
September 21st, 2017.
Speaker: Working on details
Talk: Awaiting title.

Northern California Geological Society

September 27th, 2017.
Speaker: Dr. Slawomir M. Tulaczyk, UC Santa Cruz.
Talk: "Glaciology and recent behavior of the West Antarctic ice sheet".

October 25th, 2017.
Speaker: Megan Nguyen, UC Davis Center for Watershed Sciences.
Talk: Title to be determined.

November 29th, 2017.
Speaker: Dr. Marjorie Schulz, USGS.
Talk: "Marine Terraces of California: Landscapes from the Waves".



Northwest Energy Association

Working on dinner meetings and speakers.

Sacramento Petroleum Association

Seeking volunteers for speakers.

San Joaquin Geological Society

In lieu of the annual SJGS Golf Tournament, Dan and Cynthia have graciously offered to host a BBQ at their place on September 21, 2017.
An email will be sent with details (or contact SJGS for further details).

Alaska Geological Society

www.alaskageology.org

P. O . Box 101288
Anchorage, AK 99510

Contact: Dave Buthman
dbuthman@hilcorp.com

Geology meetings/talks are held monthly September through May, usually on the third Thursday of the month, at the BP Energy Center (1014 Energy Court) from 11:30 am to 1:00 pm. Open To The Public. No Charge to Attend.

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Coast Geological Society

www.coastgeologicalsociety.org

P. O. Box 3055
Ventura, CA 93006

Contact: Theresa Heirshberg
805-443-7641

Dinner meetings are held monthly September through May, on the third Tuesday of the month, at Poinsettia Pavilion, 3451 Foothill Road in Ventura. Social hour starts at 6:00 p.m., dinner is served at 7:00 p.m., and the talk starts at 8:00 p.m.
The cost of dinner with reservations is $20 (members), $25 (non-members), or $10 (students and K-12 teachers).
For reservations, please email Shelby Fredrickson (secretary@coastgeologicalsociety.org), and should be made by 4:00 p.m. on the Friday before the meeting.

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Los Angeles Basin Geological Society

www.labgs.org

Contact: Bert Vogler
949-585-3103

Luncheon meetings are held monthly September and October; and January through June, usually on the fourth Thursday of the month, at The Grand at Willow Street Conference Centre (4101 E. Willow Street) in Long Beach. Lunch is served at 11:30 a.m., and the talk starts at 12:15 p.m. The cost is $25 (with reservations), $30 (without reservations), $20 for retired members, and $5 for students. Reservations can be made online at www.labgs.org or by contacting Ryan Weller at 562-637-6019 or ryweller@gmail.com Reservations must be made prior to Tuesday before the meeting.

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Northern California Geological Society

www.ncgeolsoc.org

9 Bramblewood Court
Danville, CA 94506-1130

Contact: Mark Sorensen
msorensen64@earthlink.net

Evening meetings are held monthly September through May, usually on the last Wednesday of the month, at the Masonic Center (9 Altarinda Road) in Orinda. Social hour starts at 6:30 p.m., and the talk starts at 7:00 p.m. (no dinner).
For reservations, contact Dan Day at danday94@pacbell.net before the meeting.
Cost is $5 per regular member; $1 per student member; and $1 per K-12 teachers.

(Continued on next page)

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Northwest Energy Association

www.nwenergy.us

P. O. Box 6679
Portland, OR 97228-6679

Contact: Jim Jackson or John Armentrout

Luncheon meetings are held monthly September through May, on the third Thursday of the month, at the Multnomah Athletic Club (1849 SW. Salmon Street) in Portland, Oregon. Meeting time is at 11:45 AM to 1:00 PM (speaker about 12:15 PM). The cost is $25 for members and $30 for non-members. For information or reservations email NWEnergyAssociation@gmail.com, or our Postal Box: Northwest Energy Association, P.O. Box 6679, Portland, Oregon 97228-6679.

President	Laird Thompson	lbtfracs@gmail.com
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Sacramento Petroleum Association

P. O. Box 1844
Folsom, CA 95630

Contact: Jerry Reedy 916-486-2643 or Pam Ceccarelli 916-439-0400

Luncheon meetings held monthly January through November, on the third Wednesday of the month. Location: Club Pheasant Restaurant in West Sacramento. The meetings starts at noon. The cost is $16 - $20. For information or reservations, contact Pam Ceccarelli.

President:	Jerry Reedy	JWR5532@aol.com
Vice-President:	Scott Hector	Scott.Hector@gmail.com
Secretary	Derek Jones	djones@gasbiz.com
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San Joaquin Geological Society

www.sanjoaquingeologicalsociety.org

P. O. Box 1056
Bakersfield, CA 93302

Contact: Lindsey Thompson lthompson@envirotechteam.com

We have dinner meetings on the second Tuesday of the month, October through June, at the Eagle's Lodge at 1718 17th Street, Bakersfield, CA 93302. There is an icebreaker at 6:00 p.m., dinner at 7:00 p.m., and a talk at 8:00 p.m. Dinner is $25 for members with reservations and $30.00 for nonmembers and members without reservations. Students may attend for free.

President:	Cameron Campbell	cameron.campbell@conservation.ca.gov
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