

# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



Website: [www.ncgeolsoc.org](http://www.ncgeolsoc.org)

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## MEETING ANNOUNCEMENT

**DATE:** April 30, 2008

**LOCATION:** Orinda Masonic Center, 9 Altarinda Rd., Orinda

**TIME:** 6:30 p.m. social; 7:00 p.m. talk (no dinner) Cost:  
\$5 per regular member; \$1 per student or K – 12  
teachers

**RESERVATIONS:** Leave your name and phone number at  
925-424-3669 or at [danday94@pacbell.net](mailto:danday94@pacbell.net)  
before the meeting.

**SPEAKER:** **Dr. Leonard Sklar**  
San Francisco State University

### *How pebbles destroy mountains: the role of sediment in river incision into bedrock*

Rivers cut vertically and laterally into bedrock, creating valleys and canyons. River incision into bedrock is the fundamental erosional process that links climate and tectonics to topography and sets the pace for landscape evolution. River sediments play an essential role in controlling the efficiency of bedrock erosion, by providing abrasive tools to the flow but also by forming transient deposits that bury and thus insulate bedrock channel beds from the erosive forces of the flow. The saltation-abrasion bedrock incision model captures the physics of bedrock wear by bedload impacts, and can be used to explore the sensitivity of river profiles and topographic relief to changes in rates of tectonic and climatic forcing. This theoretical model, which has been calibrated with laboratory experiments, predicts that the grain size and supply rate of coarse sediment are the dominant controls on bedrock river channel slope, with rock strength only of secondary importance. Field studies in the Henry Mountains of Utah, and other landscapes, confirm several key predictions of the model, including potential for growth of fluvial hanging valleys at tributary junctions. A key outstanding question that emerges is: what controls the size distribution of sediments supplied by hillslopes to channels in tectonically active terrain? Coupling the saltation-abrasion incision model with models for the influence of climate on sediment production and orographic precipitation leads to new predictions of possible positive feedbacks that could drive mountain growth as a result long-term climate change. *Continued on back page...*

# NCGS 2008 Calendar

**Wednesday April 30, 2008**

***How pebbles destroy mountains: the role of sediment in river incision into bedrock***

Dr. Leonard Sklar, San Francisco State University, San Francisco, 7:00 pm at Orinda Masonic Center

**Wednesday May 28, 2008 *A Dinner Meeting!!***

***Reserve by May 24 – Sorry No Walk Ins***

***Past and Future Earthquakes in the San Francisco Bay Area - Commemorating the 140th Anniversary of the 1868 Hayward Earthquake*** Dr. David Schwartz, Senior Earthquake Geologist, US Geological Survey, Menlo Park – A talk in support of the *1868 Hayward Earthquake Alliance*

**6:00 pm at Orinda Masonic Center**

**Wednesday June 25, 2008**

***Dark holes in Muir's "Range of Light": Insights from southern Sierra Nevada caves and karst*** - Dr. John C. Tinsley, US Geological Survey, Menlo Park  
7:00 pm at Orinda Masonic Center

**As Usual – Our Summer Break!**

**Wednesday September 24, 2008**

***Granites in the Franciscan formation*** – Dr. Rolfe Erickson, California State University, Sonoma  
7:00 pm at Orinda Masonic Center

**Wednesday October 29, 2008**

***The impact of fire on hydrologic systems***  
Dr. Laura Rademacher, Univ. of the Pacific, Stockton  
7:00 pm at Orinda Masonic Center

**Wednesday November 19, 2008 *(One Week Early!)***

***Late Pliocene to Recent stratigraphy and tectonics in the Death Valley area, California*** – Dr. John Caskey, San Francisco State University, San Francisco  
7:00 pm at Orinda Masonic Center

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## Upcoming NCGS Field Trips

**May 10 & 11, 2008 *Point Lobos to Point Reyes: Evidence of ~180 km Offset of the San Gregorio & Northern San Andreas Faults***, Kathleen Burnham, Independent Researcher

**August 23, 2008 *Field Trip to the Calaveras Fault in Santa Clara County, California***, Dr. Phil Stoffer, US Geological Survey and Dr. Richard Sedlock, San Jose State University (A part of the 1868 Earthquake Alliance)

Do you have a place you've wanted to visit for the geology? Let us know. We're definitely interested in ideas. For those suggestions, or for questions regarding, field trips, please contact Rob Nelson at: [rlngeology@sbcglobal.net](mailto:rlngeology@sbcglobal.net)

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## Peninsula Geologic Society

### Upcoming meetings

For an updated list of meetings, abstracts, and field trips go to <http://www.diggles.com/pgs/>. The PGS has also posted guidebooks for downloading, as well as photographs from recent field trips at this web address. Recent field trips include: *The 1906 Earthquake and the San Andreas Fault on the San Francisco Peninsula* (2006), *Granites in the Franciscan* (Fall 2005), *San Andreas Fault - Carrizo Plain* (Spring 2005), *Panoche and Tumey Hills* (2004), *White-Inyo Range* (2002), *Napa Wine County* (December 2001), *Mount Shasta and the Klamath Mountains* (May 2001), *Big Sur (Salina / Nacimiento Amalgamated Terrane, Big Sur coast Central California, 2000)*, and the Northern Sierra Nevada (*Geologic Transect of the Northern Sierra Nevada Along the North Fork of the Yuba River*, 1982). Posted upcoming meetings include the following topics and dates:

- May 13, 2008, John Hagstrum, TBA
- June 10, 2008, Tom Moore, Presidential Address.
- September or October, 2008, Field trip dealing with geology of the Owens Valley (Angela Jayko) and central White-Inyo Range (Gary Ernst).

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## Association of Engineering Geologists San Francisco Section

### Upcoming meetings

Meeting locations have been rotating between San Francisco, the East Bay, and the South Bay. For further meeting details go to: <http://www.aegsf.org/>.

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## 1868 Hayward Earthquake Alliance

### Dare to Prepare Bay Area

October 21, 2008

October 21, 2008 marks the 140th anniversary of the 1868 Hayward earthquake, which was the first great "San Francisco earthquake" and one of the most damaging earthquakes in the nation's history. The 1868 Hayward Earthquake Alliance was formed to

help coordinate and promote efforts and activities between organizations throughout the greater San Francisco Bay Area planning to commemorate the earthquake.

### **Why commemorate the 140th anniversary?**

The average interval between the past five large earthquakes on the Hayward Fault is 140 years. With the 140th anniversary another large Hayward Fault earthquake can occur at any time. The 140th anniversary of the 1868 Hayward earthquake provides a unique opportunity to:

- Increase public awareness of seismic hazard posed by the Hayward Fault
- Promote earthquake preparedness and mitigation

Explore the ways in which the 1868 Hayward earthquake affected the personal lives, culture, economy and development of the greater San Francisco Bay Area.

No doubt most members are aware of the Alliance, but here is a convenient link: <http://1868alliance.org/> If you have not been to the website you'll find web pages on how to prepare (for your friends and family no doubt), activities and events (for all), news article links (for educational moments), member organizations (including NCGS!), stories, speaker information (line up your next speaker; such as Dr. Schwartz!), and other resources. It's well designed and worth a visit! And where you'll find more information on the next item.

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## **Third Conference on Earthquake Hazards in the Eastern San Francisco Bay Area**

California State University, East Bay  
Hayward Campus  
October 22-24, 2008

This conference will highlight information on Eastern San Francisco Bay Area earthquake hazards that has been developed since 1982 and 1992 conferences. The activities and publications will take advantage of interest generated by the 140<sup>th</sup> anniversary of the 1868 Hayward fault earthquake. In addition to technical sessions, the conference will include a public forum, field trips and tutorials for educators. For details see: [www.consrv.ca.gov/cgs/news/eastbayconference.htm](http://www.consrv.ca.gov/cgs/news/eastbayconference.htm) or email [3rd.E.Bay.EQ.conf@conservation.ca.gov](mailto:3rd.E.Bay.EQ.conf@conservation.ca.gov) for information. Conference sponsors include the California Geological Survey, U.S. Geological Survey,

UC Berkeley, CSU East Bay, EERI, and URS Corporation.

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## **SHLEMON CONFERENCE**

### **The Geological Assessment of Naturally Occurring Hazardous Substances**

**June 4 – 6, 2008**  
**Folsom, California, USA**

Naturally occurring hazardous geologic substances include arsenic, mercury, uranium and other heavy metals, radon, and asbestos. The conference will focus on the geologic assessment of these substances including the strategies for sampling and problems with the current analytical methods. However, we will also discuss the interactions between the geologic community and the risk assessment and toxicology communities with regards to the collection of data and inter-professional communication. The conference will emphasize those principles common to the investigation of naturally occurring hazardous geologic substances in general, using the substances listed as examples. Topics covered will also include those characteristics and concerns unique to the assessment of naturally occurring particulates, heavy metals, and gases. Examples will be presented from throughout the United States, as well as from other countries. Key-note presenters have been selected based on topic and diversity of experience and additional presenters will be selected to enhance the conference content.

The field trip held in conjunction with the conference will visit the Mother Lode region of the central Sierras in El Dorado and Amador Counties to view and discuss exposures of asbestos-bearing rock; view areas where elevated metals including arsenic, nickel and chromium occur, including the site of a United States Environmental Protection Agency arsenic cleanup action; and visit an area where naturally occurring radon gas associated with regional granitic rocks occur. Sites visited will include areas of historic mining where we will discuss the role of mining in providing a preferential exposure pathway.

Conference attendance will be limited to 50 participants. The registration fee of \$375 for AEG Members and \$400 for Non-Members will cover technical sessions on Wednesday, June 4, and Friday, June 6, the field trip on Thursday, June 5, lunches on Wednesday and Thursday, and a dinner on Thursday. Participants will be responsible for transportation to Folsom, California; and lodging costs. The conference hotel, Lake Natoma Inn, is in the historic mining town of Folsom, California. For detailed information and the application form, visit [www.aegweb.org](http://www.aegweb.org).

## FYI!

### Subject: Geologists in the Uncyclopedia

In case you don't know what a geologist really does (What; who me?), or really need something to do, you might be interested in exploring this link. It's a must read...

<http://uncyclopedia.org/wiki/Geologist>

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## Exploring Global Warming and Climate Change in Pre-Quaternary Times

*Submitted by Dan Day  
(Yeah Dan!)*

On October 16, 2007, **Dr. Kirk Johnson** of the Denver Museum of Nature and Science, visited into the Bay Area and delivered an inspiring AAPG Distinguished Lecture that focused on past global climate change. **“Crocodiles in Greenland and Hippos in London: A Fossil-Fueled Tour of Past and Future Climates”** gave the audience a revealing look at what scientists have learned about past global climate change, and its link to current climate conditions on earth.

Kirk playfully dubbed this lecture “Moving Forward into the Past with Kirk Johnson.” But using this vehicle, he opened up a realm of climatology that is perhaps quite unfamiliar to the layman, and scarcely mentioned by today's media. Dr. Johnson's passion lies in past climates – Tertiary, Mesozoic, and beyond, although the best climate records are preserved in more recent eras. He has had an unusual opportunity to explore a broad spectrum of global environments and apply his knowledge of paleobotany to the fossil record. His research has literally taken him from the equator to the poles. He generously shared some of his research with the audience to help them better understand his views on global climate change.

Paleoclimatology, which Kirk refers to as “Deep Time Climate Research,” is based upon sophisticated geochemical techniques, the most powerful being stable isotope analysis of carefully dated ocean cores. This refers to the oxygen isotope ( $O^{18}/O^{16}$ ) temperature scale that has been extracted from the carbonate shells of tiny planktonic foraminifera that lived in the ambient seawaters. The time component is provided by exhaustive paleomagnetic analysis of these cores that can be linked to the timing of the earth's orbital eccentricity. This isotopic time scale has been extended back to the Paleocene, although the most intensive work has focused on Pliocene-Pleistocene cores. The Tertiary paleotemperatures indicate that the

earth was significantly colder 65 million years ago than it is today.

A cooler climate began near the Tertiary-Cretaceous boundary, representing a major global shift from a greenhouse climate to an ice cap-dominated climate. Kirk noted that the continents in lower Tertiary times were in essentially the same positions they are in today. Hence continental drift has not relocated what we see in the rock record today. But to delve into past climate changes requires a closer look at today's.

Dr. Johnson has had the unique opportunity to travel around the world studying the flora and fauna for comparison with the fossil record. One of his journeys took him to the Amazon River basin. This vast tropical rain forest is home to an enormous plant ecosystem. The basin is bounded on the west by the veritable rock wall of the Andes Mountains, and flows eastward on a very shallow gradient to the Atlantic Ocean. It receives over 100 inches of rainfall annually. Kirk studied the basin and its tributaries west of Manaus, about 1000 miles from the delta. Here the annual river level fluctuates 35 feet. Trees are therefore flooded to this level in the rainy season. Consequently, there are many floating plants in the river. Aquatic life appears quite primitive, particularly the fish. Floating ferns and lily pads often cover an entire lake surface. The dominant flora and fauna in Amazonia are fish, insects, and trees. These life forms are incredibly prolific in the Amazon. Tree leaves are unusually large compared with those in temperate climate zones. Most have long, pointed drip-tips to keep moisture from accumulating on the leaf surface, which prevents fungus growth. The species biodiversity is extraordinary. A one hectare plot (100 m x 100 m) can contain 500 different types of trees representing 400 species! When botanical pursuits were completed, Kirk's field team examined sedimentary bedforms after the floodwaters subsided. He and his colleagues literally dissected a river bar. Their excavation revealed alternating layers of compressed leaf beds and sediment that are the beginnings of the fossilization process. These observations can provide an explanation for similar features preserved in the fossil record.

From the tropics Kirk shifted to polar Ellesmere Island in the Canadian Northwest Territories. In doing so, he mentioned that the average annual temperature in the tropics is about 30°C, and at the poles, -30 °C to -40 °C. This gives an average annual equatorial to polar temperature gradient of 60 to 70°C. Ellesmere Island is crossed by the Arctic Circle at the 66th parallel. It is a barren, desolate land inhabited by about 300 people in an area the size of Great Britain. Ice caps are scattered

across the surface, and are now receding. Paleocene and Eocene sediments crop out above the snow fields. Permafrost goes down 1 km and produces a mudcrack type patterning at the ground surface. The only living plant is a diminutive woody shrub less than a foot tall. Daylight varies to extremes. There are four months of almost total daylight and four months of total darkness. Musk oxen and white wolves are the only visible fauna. A harsh land far from civilization.

Ellesmere's unique fossil treasures were first noted by the early explorers Dr. Oswald Heer (German) and British explorer Adolphus Greely. Swedish adventurer Otto Sverdrup explored the island in 1903-1904, and found numerous fossil beds and coal seams. The coal is found in Cretaceous, Paleocene, and Eocene sediments, and forms beds up to 100 feet thick. Some layers contain fossilized tree trunks protruding awkwardly from the outcrops. Cypress, lotus, and various exotic floras now found in Mexico and Japan were also exhumed. Animal fossils included lemur (primate) skulls. Since the continents have not shifted significantly over the last 50 million years, one must conclude that a major climate change had occurred since the lower Tertiary. In the upper Cretaceous-lower Tertiary the overall climate was warmer. The ensuing climate change was most extreme in the temperate and polar regions, and was very minor at the equator. The north to south temperature gradient essentially flattened out, with average annual temperatures increasing about 30°C at the poles, and by only a few degrees (to 36°C) at the equator.

Other polar climate evidence was gathered by the 2004 Arctic Coring Expedition (ACEX). It cored the Lomonosov Ridge in the Arctic Ocean north of the Bering Sea. Some of the Lower Tertiary sediments contained freshwater foraminifera and dinoflagellates. Scientists have hypothesized that this condition may represent a freshwater layer floating on saline seawater. Whatever the case, it is further evidence for warmer conditions at the poles.

Another piece to the climate puzzle was discovered in the Denver Basin, Colorado. Many fossil flora and fauna have been found there; in the 1990's a Tyrannosaurus Rex skeleton was unearthed. The basin has been extensively cored and its stratigraphy is well characterized. The Denver Airport construction in the 1990's excavated coal beds and numerous intermittent volcanic ash layers. The ash layers have been accurately dated by the Ar<sup>39</sup>/Ar<sup>40</sup> technique to provide a detailed geochronology. Paleontologists unearthed palm fronds and alligator fossils. These came from above the K/T boundary and proved that subtropical conditions existed then at this latitude, assuming that

subsequent continental drift has been negligible. Thus, greenhouse conditions were present in lowermost Tertiary time. Another site excavated by Dr. Johnson along a freeway south of Denver is Castle Rock. This locale has a well-preserved leaf population with lobate drip tips identical to those seen in the Amazon basin flora. In all, 165 species of plant life were recovered from another Denver Basin site at 39°N latitude. These were also tropical species. The inescapable conclusion is that an extensive tropical rainforest existed here during lower Tertiary times. These fossil beds occur 1 to 8 million years after the K/T boundary, where a cataclysmic 60% species reduction occurred. By 65 million years ago a new flora had been established – not a resurgence of the pre-K/T flora. The 50 to 85 floral species discovered at Castle Rock reflect an unusual level of biodiversity, possibly due to the Rocky Mountains Front Range effect on the local climate.

The Antarctic has also added vital paleoclimate evidence. Antarctica drifted away from the tip of South America 35 million years ago. When it became encircled by seawater, its climate cooled substantially. At this point, Kirk discussed the oxygen isotope paleotemperature scale derived from deep sea core planktonic foraminifera. The isotope-time curve from present to 65 m.y. ago clearly shows a drop in temperature in Quaternary (post-Miocene-Pliocene) times. This indicates a shift to an "icehouse" climate. Grasses evolved at this time. Since early Quaternary times, major continental ice sheets have advanced and retreated 26 times. Greenland ice cap cores span a 740,000 year time interval. This data gives valuable continuous climate information. Additional information can be acquired from carbonate reef terraces on islands in tropical climates. Uranium-series dating of terrace corals indicate there have been three major Ice Ages over the last 350,000 years, occurring at approximately 100,000 year intervals. Warm (pluvial) conditions lasted about 10,000 years and colder (interstadial) conditions accompanied by glacier advance persisted for 90,000 years.

Fine scale evidence indicates climate change is very abrupt. During transitions from warm to cold periods the mean annual temperature in polar regions changes from about -60°F to -82°F. Cold climate animals like musk oxen migrated further south during the cold periods, and tropical species like hippopotamus were as far north as London, England during warm spells. A particularly important climatic turning point in the last Ice Age was the Younger Dryas. Precise dating of Greenland ice core GISP2 shows that the Younger Dryas lasted 1300±70 years and terminated abruptly, with a 7°C temperature rise, at about 11,640 years B.P.

This sudden temperature rise occurred over a 3 to 10 year interval. After this critical temperature swing, major civilizations flourished.

The late Quaternary mean annual temperature curve discussed above is very closely followed by the atmospheric CO<sub>2</sub> curve. However, CO<sub>2</sub> concentration has increased significantly in recent years to over 375 ppm, fueling global warming fears. Carbon dioxide levels measured atop Mauna Loa volcano in Hawaii, were 316 ppm in 1960 and 380 ppm in 2005. At this rate, the atmospheric CO<sub>2</sub> level is increasing by 2 ppm every year. This represents an enormous increase in atmospheric carbon input. Another global warming indicator is the Arctic sea ice area. In 1979, satellite images show the minimum sea ice extent still completely blocking the Northwest Passage. In a 2005 satellite photo the Autumn ice minimum barely reached the Passage. In 2007, it was ice-free. The 1979 to 2007 “thaw” represents a reduction in Arctic ice area from 6 million km<sup>2</sup> to 3.8 million km<sup>2</sup>. The CO<sub>2</sub> curve decoupling from the mean temperature curve is also disturbing, and probably signals the approach of another rapid climate change.

The NCGS extends its sincerest thanks to Dr. Kirk Johnson, Curator of the Denver Museum of Nature and Science, for his most enjoyable discussion of earth climate change. His comments were very thought provoking, and stimulated a lengthy audience question-and-answer period after his presentation. Dr. Johnson’s careful research of past and present ecosystems provide an indisputable climatic link between modern species and paleo-species preserved in the fossil record.

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## **CLIMATE SCIENCE: All Stirred Up**

**Editors' Choice:**

**Highlights of the recent literature**

**March 7 2008, 319 (5868)**

Around 55 million years ago, at the height of the Paleocene-Eocene thermal maximum, the world was a much warmer place than today. Sea surface temperatures were higher everywhere than now, and the equator-to-pole thermal gradient was much shallower. Climate for much of the past 500 million years has been warmer than it is now, and during the warm periods the surface meridional temperature gradient generally appears to have been weak. Explaining how the climate system might have transferred heat from low to high latitudes to maintain such a shallow thermal gradient has been

difficult, and many hypotheses have been advanced, including those involving effects from radiative forcing by high concentrations of atmospheric carbon dioxide, more intense ocean heat transport, differences in the amounts and locations of polar stratospheric clouds, and extratropical atmospheric convection. Korty *et al.*, using a coupled model of intermediate complexity, investigate another possibility: that tropical cyclones could have caused enough ocean surface mixing in the tropics to cool the sea surface there and drive the strong poleward heat flux needed to produce the shallow thermal gradients that seem to have prevailed during warm climates. This solution, if correct, also has implications for how we might expect the climate system to respond to anthropogenic warming. –J. *Clim.* **21**, 638 (2008).

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## **Migration Dates to the New World**

**This Week in SCIENCE**

**March 14 2008, 319 (5869)**

The Americas were the last major habitable continents to be settled by humans. Goebel *et al.* review recent archaeological finds, more accurate dates, and genetic evidence that have changed some ideas about how this migration occurred. The data favor an initial migration along a coastal ice-free corridor about 15,000 years ago from populations that were in Beringia, including Alaska, and perhaps a second migration around 13,000 years ago that led to the Clovis culture in North America.

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## **Ancient Volcanic Gas in Glass**

**This Week in SCIENCE**

**March 21, 2008, 319 (5870)**

The influence on climate of massive volcanic eruptions that have formed flood basalts, such as the Deccan traps at the end of the Cretaceous, has been difficult to assess, in part because of the lack of data on the gas contents of most of the magmas (much of the erupted basalt degassed as crystals formed or during later alteration). Self *et al.* screened many samples of the Deccan basalts and found a few samples preserving glass inclusions in crystals or glassy rims that could preserve information on the original sulfur and chlorine contents of the Deccan magma. The results imply that the Deccan basalts released huge amounts of sulfur, perhaps nearly an order of magnitude or more than recent global anthropogenic emissions, for decades or centuries.

# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



## **Pt. LOBOS TO Pt. REYES: EVIDENCE OF ~ 180 Km OFFSET OF THE SAN GREGORIO & NORTHERN SAN ANDREAS FAULT**

**Saturday - Sunday May 10-11, 2008**

**Leader: Kathleen Burnham**

Back by popular demand: NCGS member Kathleen Burnham will lead another two-day field trip to Pt. Lobos and Pt. Reyes. Roughly 50 million years ago, the granitic rocks and conglomeratic turbidites of Point Lobos and Point Reyes were parts of a single deep submarine canyon system. During the past 27 million years, they've been separated approximately 180 km by dextral slip of the San Gregorio and northern San Andreas faults. Similarity of these rocks has been noted as far back as 1899, but Kathleen's research establishes details which nail down the correlation. Her paleogeographic reconstruction has proved predictive: since its first introduction, other geologists have proposed five geologic and geophysical correlations which fit her model. Point Reyes and Point Lobos are stunningly beautiful, and may be the only pair of localities on earth in which evidence of a large lateral offset is preserved in public parks at both ends.

On day one, participants will examine granitic rocks, conglomerate, and trace fossils at Point Lobos State Park, near Monterey, and then drive ~180 km along the San Gregorio and northern San Andreas faults to Olema, north of San Francisco. On day two, we will examine correlative rocks at Point Reyes National Seashore, as well as a 16 ft. (5m) offset of the 1906 San Francisco earthquake. This will be an interactive, rather than lecture-style field trip.

**Participants are requested to refrain from the use of aftershave, hand lotion, hair tonic, cologne, or other fragranced personal products, as the field trip leader is disabled by chemical sensitivity. THIS FIELD TRIP WILL BE LIMITED TO 27 PEOPLE.**

\*\*\*\*\* Field Trip Logistics \*\*\*\*\*  
Time & Departure: 8:30 am May 10 from Point Lobos. Cost: \$125/person

Cost includes lunch on Saturday and Sunday, Dinner on Saturday, Saturday night camping, and the field trip guide. You may also arrange your own hotel room in Olema; however, this will be on your own. Please provide email addresses to arrange carpools and cell phone numbers in case we lose you!

\*\*\*\*\*REGISTRATION FORM (Pt. Lobos – Pt. Reyes Field Trip) \*\*\*\*\*

Name: \_\_\_\_\_ E-mail: \_\_\_\_\_ Address: \_\_\_\_\_

Phone (day): \_\_\_\_\_ Phone (evening): \_\_\_\_\_ Cell: \_\_\_\_\_

Lunch: Regular: \_\_\_\_\_ Vegetarian: \_\_\_\_\_ (Please check one) Check Amount: \_\_\_\_\_

Please mail a check made out to NCGS to: Rob Nelson, 269 College View Drive, Rohnert Park, CA 94928

Questions: e-mail: Rob Nelson at [rlngeology@sbcglobal.net](mailto:rlngeology@sbcglobal.net) or phone: 707-548-3268

A report of the 2006 trip can be found at [www.ncalgeol社.org/](http://www.ncalgeol社.org/)

# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



## NCGS DINNER IN COMMEMORATION OF 140<sup>th</sup> ANNIVERSARY OF THE 1868 HAYWARD EARTHQUAKE

*Past and Future Earthquakes in the San Francisco Bay Area*

Wednesday May 28, 2008

Speaker: Dr. David Schwartz, U.S. Geological Survey, Menlo Park  
6:00 pm at Orinda Masonic Center

(Reservations are required by May 24, 2008)

We are sorry but we will not be able to accommodate "walk-ins"

Stepping out of our normal routine, the Northern California Geological Society is pleased to announce this *special dinner and evening* with **Dr. David Schwartz**. Come listen to Dr. Schwartz on the history of earthquakes in the San Francisco Bay Area and what are the chances in the next 30 years. For this special event, planned for our normal monthly meeting date, but starting one-half hour early, we are planning in typical NCGS style, a Back Forty Texas BBQ dinner consisting of Pork Ribs and BBQ Chicken, Tossed Green Salad, BBQ Beans, Fresh Corn Cobettes. For vegetarian dinners deluxe veggie burger will be served in place of BBQ. Desert will include assorted cookies and brownies. Wines from Rosenblum Cellars of Alameda. Please also note that a vegetarian option is available if notified ahead (see attached form).

**Abstract:** *The History of Earthquakes in the San Francisco Bay Area*

Dr. Schwartz will describe the timing of prehistoric earthquakes in the San Francisco Bay Area for the past 2000 years, showing that at some times earthquakes appeared to occur closely together in time. Dr. Schwartz will discuss the chances for future earthquakes in the Bay Area during the next 30 years.

**Biography:** A leading earthquake geologist at the U.S. Geological Survey, Dr. David Schwartz is credited with having pushed forward the newly developing fields of earthquake geology and paleoseismology (the study of prehistorical seismic events). One of his major contributions is the characteristic earthquake recurrence model, which has become a cornerstone of many seismic hazard analyses.

Dr. Schwartz formerly headed the San Francisco Bay Area Earthquake Hazard Project and he co-chaired the Working Group on California Earthquake Probabilities that issued the 2003 Bay Area 30-year earthquake forecast. In addition, Dr. Schwartz served as the regional Coordinator for the USGS Northern California Earthquake Hazard Program. Dr. Schwartz traveled extensively outside the U.S. looking at the ground cracking produced by large earthquakes around the world. He has described the Hayward Fault as a tectonic time bomb.

\*\*\*\*\* Dinner Logistics \*\*\*\*\*

Meeting Details: Social Hour: 6:00 – 7:00 pm; Dinner: 7:00 – 8:00 pm Presentation: 8:00 – open  
Time: May 28, 2008, 6:00 pm, Orinda Masonic Center 9 Altarinda Road, Orinda, CA. Cost: \$20/person

\*\*\*\*\*REGISTRATION FORM (Dr. David Schwartz Dinner)\*\*\*\*\*

Name: \_\_\_\_\_ E-mail: \_\_\_\_\_  
Address: \_\_\_\_\_ Phone (day): \_\_\_\_\_ Phone (evening): \_\_\_\_\_

Dinner: Regular: \_\_\_\_\_ Vegetarian: \_\_\_\_\_ (Please check one) Check Amount: \_\_\_\_\_

Please mail a check made out to NCGS to: **Tridib Guha, 5016 Gloucester Lane, Martinez, CA 94553**

Questions: e-mail: [tridibguha@sbcglobal.net](mailto:tridibguha@sbcglobal.net) Phone: (925) 370-0685 (evening) (925) 363-1999 (day)

# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



By Popular Demand!

## THE SECOND NCGS FIELD TRIP TO THE WILSON GROVE & PETALUMA FORMATIONS, SONOMA COUNTY, CA

Saturday June 28, 2008

**Leaders: James Allen, MS, PG, Dept. of Earth and Environmental Science, CSU East Bay**  
**Peter Holland, CEG, Vector Engineering**

The Petaluma Formation, located in Sonoma County, California, is a Late Miocene to Late Pliocene nonmarine formation with important, recently identified marine interbeds. The formation is located in Sonoma County, California. The formation was originally divided into two members. After further study, we have divided the formation into three informal members based on lithology. The "lower" member is predominantly shale with both nonmarine and newly discovered marine microfauna. This member is prone to sliding. The "middle" member is predominantly conglomerate derived from Franciscan sources, the upper member is conglomerate derived, in part, from the Monterey Group of the East Bay area. Understanding of the three members allows for stratigraphic correlation in areas of poor exposure, such as in core data from the Santa Rosa valley. Other fluvial, conglomeratic formations in the North Bay are the volcanoclastic Huichica and Glen Ellen formations, both younger than the Petaluma. The Petaluma intertongues with the coeval Wilson Grove Formation to the west and both, as a continuous through-going fluvial- to marine system, have been offset from units with identical age, lithologies and source rocks east of the Hayward fault.

The Petaluma Formation has been the focus of geologists' attention for over a century. In the early part of last century, oil was discovered in structural traps east of Adobe Road and there are still active oil seeps in that area, for example at Lynch Creek. Some ranchers near the oil field area have reported hydrocarbon abundance in their groundwater wells, forcing them to abandon the water wells. There are also a number of natural gas wells in the Cotati Gas Field within the paleo-shoreline area where the Wilson Grove is interbedded with the Petaluma. There have been numerous nonmarine and marine microfossil, invertebrate and vertebrate fossils recovered from both the Wilson Grove and Petaluma formations as well. Marine microfauna in the "lower" shale of the Petaluma potentially may shed light on sources of oil. Diatomite analysis reveals new information about the "upper" member of the Petaluma.

The interbedded nature between the Petaluma and Wilson Grove formations has been difficult to understand by previous researchers. This is due in large part to poor exposures. Also, the Wilson Grove formation is largely flat lying with relatively minor deformation affecting it, while the Petaluma Formation has been highly folded and faulted and is overlain in many places by equally deformed Sonoma Volcanics and underlain by Donnell Ranch Volcanics. The geographical location the Petaluma Formation roughly coincides with the major strike-slip fault system in the North Bay, which has led others to erroneously believe that the Petaluma is an older, more deformed formation relative to the Wilson Grove. New paleontological and radiometric data helps to further constrain stratigraphic relationships between both formations.

Some items we will address on the field trip will be the "type" lithology and stratigraphy of the Petaluma Formation in the Cotati area. From there, we will determine stratigraphic position of spotty outcrops exposed between Cotati, Sonoma Mountain and Sonoma Valley based on the "type" section in Cotati. Items to discuss will be strike-slip displacement, source rocks and location of active faulting.

\*\*\*\*\*Field Trip Logistics\*\*\*\*\*

**THIS FIELD TRIP WILL BE LIMITED TO 30 PEOPLE. Time & Departure: 8:30 A.M. Sharp! Cost: \$25/person**

We will meet at the **Southbound** Park and Ride lot at Highway 101 and Rohnert Park Expressway, in Rohnert Park. Take the Rohnert Park Expressway exit. There are northbound and southbound lots; go to the smaller lot on the **west** side of Highway 101. We will try to consolidate into as few cars as possible and **leave at 8:30 sharp**. Bring boots; the first exposure is about a 1/4 mile hike across a grassy hillside. We should finish by 4:00 PM. **Call me on my cell phone at 707-548-3268 if you have any problems.**

\*\*\*\*\*Registration Form (Wilson Grove & Petaluma Formation Field Trip)\*\*\*\*\*

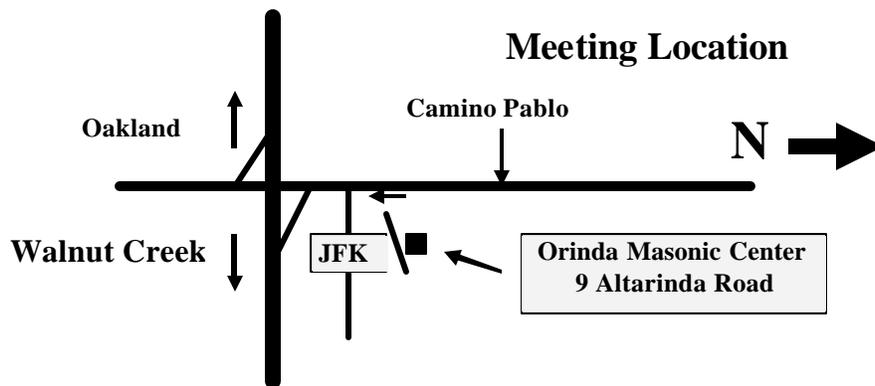
Name: \_\_\_\_\_ E-mail: \_\_\_\_\_ Address: \_\_\_\_\_

Phone (day): \_\_\_\_\_ Phone (evening): \_\_\_\_\_ Lunch: Regular: \_\_\_\_\_ Vegetarian: \_\_\_\_\_ (Please check one)

Check Amount: \_\_\_\_\_ Please mail a check made out to **NCGS to: Rob Nelson, 269 College View Drive,**

**Rohnert Park, CA 94928; Carpooling is suggested for this fieldtrip. Parking onsite is very limited. Please let us know if you can provide a van and NCGS can reimburse your gasoline expenses.**

Questions: e-mail: [rlngeology@sbcglobal.net](mailto:rlngeology@sbcglobal.net) Phone: (707) 795-8090 (evening) (707) 548-3268 (day)



**Biography:** **Dr. Leonard Sklar** is a geologist and civil engineer, currently Assistant Professor in the Department of Geosciences at San Francisco State University. He earned a MS in Civil Engineering and PhD in Geology and Geophysics from U.C. Berkeley and has worked as a consulting engineer in Northern California. Dr. Sklar's research interests include experimental, field and theoretical studies of river incision into bedrock, and the role of debris flows in cutting headwater channels in tectonically active terrain. He is also studying river channel incision on Saturn's frozen moon Titan, and the rheological properties of ice and silicate rock that control material resistance to abrasion. Dr. Sklar also works on questions related to restoration of rivers downstream of dams, including dam removal, coarse sediment management, and river channel design. He is currently co-leading an interdisciplinary group studying the feedbacks between biotic and fluvial-geomorphic processes in Fossil Creek, a spring-fed travertine stream in Arizona, following decommissioning of a large diversion dam. Dr. Sklar also serves as faculty manager of the experimental geomorphology laboratory at U.C. Berkeley's Richmond Field Station, in collaboration with William Dietrich, Professor in the Department of Earth and Planetary Science.

Northern California Geological Society  
 c/o Mark Detterman  
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