NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

NCGS Newsletter & Website Editor:
Mark Detterman
mdetterman@blymyer.com

Secretary:
Dan Day: danday94@pacbell.net
***NCGS Voice Mail:* 925-424-3669**

Website: www.ncgeolsoc.org

NCGS OFFICERS

COUNSELORS

MEETING ANNOUNCEMENT

DATE: **Wednesday, March 28, 2007**

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 member**

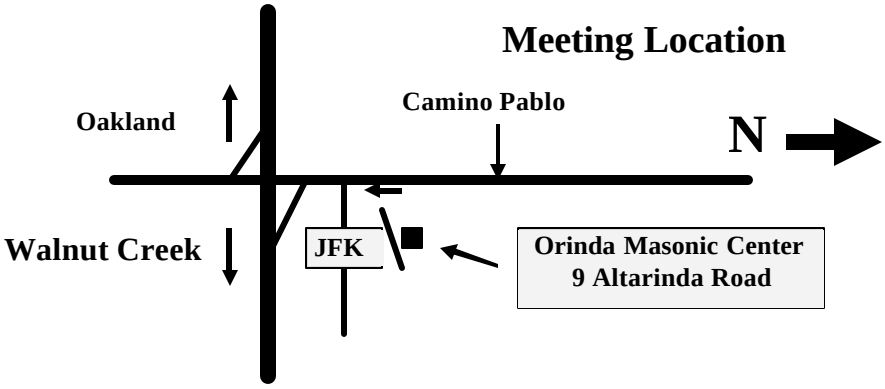
RESERVATIONS: **Leave your name and phone number at 925-424-3669 or at *danday94@pacbell.net* before the meeting.**

SPEAKERS: ***Dr. Jeff Unruh*, U.C. Davis and William Lettis and Associates**

Geologic History of Mt. Diablo

Mt. Diablo is a large, actively growing anticline that has formed between two major strike-slip faults of the San Andreas system. Uplift of Mt. Diablo anticline during the past 3-5 million years has produced unique 3-D exposures of normal faults that were active in a forearc basin during late Cretaceous-early Tertiary time, coeval with plate convergence and subduction beneath western California. Stepwise restoration of Mt. Diablo anticline and other late Cenozoic structures reveals that the Mesozoic-early Tertiary normal faults are related to low-angle structures that attenuate the ophiolitic basement and juxtapose deeply metamorphosed blueschist-facies rocks of the Franciscan complex with relatively unmetamorphosed marine sediments. Apatite fission-track analyses indicate that the Franciscan rocks were exhumed and cooled from depths of 20-30 km in the subduction zone while normal faulting and extension were occurring in the overlying forearc crust. The uniquely exposed structural relations at Mt. Diablo support models for exposure of Franciscan blueschists through sun-subduction extension and attenuation of the overlying forearc crust, rather than uplift and erosion of the accretionary prism.

Biography: **Dr. Jeffrey R. Unruh** is a Senior Principal Geologist and Vice President at William Lettis & Associates a consulting firm headquartered in Walnut Creek that specializes in geologic hazard analysis. He has been with WLA since 1991. Jeff received his B.S. (1985) and Ph.D. (1990) degrees at UC Davis. He also has a courtesy appointment as an Associated Research Geologist at U.C. Davis. At



William Lettis he is actively involved in geologic research and resolving geologic problems with a neotectonic and structural geology focus, including subsurface analyses, surface geophysics, remote sensing, numerical modeling and field mapping. At UC Davis his research includes structural geology, neotectonics, and seismic hazard assessment. Primary research interests include the kinematics and dynamics of continental deformation, with applications to seismic source characterization. Current projects include: large-scale kinematics of the Sierra Nevada microplate; the role of buoyancy forces in localizing and driving deformation in southern California; and neotectonic evolution of the Coso geothermal field, eastern California. Additional research interests include the crustal structure and evolution of the northern California Coast Ranges; kinematic analysis of seismogenic deformation in southern California; and transpressional tectonics of the San Andreas system in northern California.

Northern California Geological Society
c/o Mark Detterman
3197 Cromwell Place
Hayward, CA 94542-1209

Would you like to receive the NCGS newsletter by e-mail? If you are not already doing so, and would like to, please contact **Dan Day** at danday94@pacbell.net to sign up for this service.

NCGS 2006 Calendar

Wednesday March 28, 2007
Jeff Unruh, U.C. Davis & William Lettis and Assoc.
Geologic History of Mt. Diablo
7:00 pm at Orinda Masonic Center

Wednesday April 25, 2007
Isabel Montanez, UC Davis
Evidence for Rapid Climatic Variation in the Geologic Past
7:00 pm at Orinda Masonic Center

Wednesday May 30, 2007 DINNER MEETING!!
Book signing opportunity! Details to follow!
Dr. James Moore, US Geological Survey
America's Renaissance Man: Clarence King's Discoveries in the American West
7:00 pm at Orinda Masonic Center

Wednesday June 27, 2007
Jeffery P Schaffer, Napa Valley College
Constraints on Sierra Nevada Uplift and Glaciation
7:00 pm at Orinda Masonic Center

Wednesday September 26, 2007
TBA
7:00 pm at Orinda Masonic Center

Upcoming NCGS Field Trips

April 21, 2007	***Field Trip to the World's Smallest Mountain Range: The Sutter Buttes*** **Dr. Brian Hausback Martin Steinpress, Organizer**
May 12, 2007	***Devils Slide*, Thomas Whitman,** CalTrans
Spring 2007 (Tentative)	***Extraordinary Fluid Pressure Release at Cantua Creek,*** **Dr. Mel Erskine** , Consultant
Spring / Summer 2007 (Tentative)	***Modern Geophysical Techniques for Site Characterization,*** **Dr, Mitchell Craig,** Cal State University East Bay
July 7 & 8, 2007	***Crustal Deformation of the Eastern Sierra Frontal Fault,*** **Dylan Rood**, LLNL and UC Santa Barbara

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

Devil's Slide Field Trip Information

(Thomas Whitman of CalTrans sent this field trip information just prior to release of the March newsletter. A flyer should be available at the March meeting)

Devil's Slide is a large, active landslide in steep, ocean fronting slopes, approximately 15 miles south of San Francisco. This slide has impeded efforts to provide transportation to the coastal communities for over 100 years. Numerous road closures have resulted in a large expense to the California Department of Transportation (Caltrans), significant inconvenience to local residents, and bankruptcies to local business. Debate about proposed solutions cut across environmental, geologic, social, political and engineering fronts, and represents a microcosm of real world issues. The slide has been the subject of heated litigation for 35 years and may finally be settled with the completion of tunnel construction in 2011.

Located 4 miles west of the San Andreas Fault, the slide is within the Salinian Block of northwesterly migrating basement terrain. It occurs within Jurassic to Lower Cretaceous quartz diorites, in complex fault contact with Paleocene marine sandstones, shales and conglomerates. Most of the section was overturned, intensely deformed by folding and faulting and obscured by landslide deposits. Landslide conditions are further exacerbated by groundwater conditions.

Highway 1 crosses the Devil's Slide area and has been closed numerous times due to landslide activity since it construction and has been a constant source of debate within the Department on how to correct this costly roadway section. The most recent landslide occurred in 2006, closing the road April 2, 2006 until August 4, 2006. Before any investigation could be conducted a rockfall situation had to be addressed. Using blasting and mechanical and hand scaling the majority of unstable rock was removed. In addition, a rock catchment ditch was constructed above the roadway to mitigate future rockfall events within this section of the bluff. The repair strategy for the roadway section consisted of improving the bearing capacity of the area immediately below the failed portion of roadway by installing long rock bolts which were covered with a 4" thick reinforced shotcrete layer. In addition, four rows of 150' deep tiebacks where than placed within the center of the sliding blocks to hold the roadway inplace.

Finally, a 150-foot micro pile wall was constructed from the north end of the tie-back wall to prevent the head scarp from migrating up slope.

As a long-term solution to the problems at Devil's Slide, Caltrans, as directed by the voters of San Mateo County, is in the process of constructing two highway tunnels approximately 4400 feet long to by pass the Devil's Slide area. The tunnel complex is schedule to be completed in 2011.

For the upcoming field trip we will be looking at the existing unstable coastal bluff, the different repair strategies utilized over time, and finally the tunnel project.

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 / Nacimento 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:

- April 10, 2007, Jason Saleeby, CalTech. *Exposed Deep Crust of the southern Sierra Batholith* Dinner in 320-109. Lecture in 320-105
- May 8, 2007, Jacob B. Lowenstern, USGS, Scientist In-Charge, Yellowstone Volcano Observatory - *What's cooking at Yellowstone*. Dinner in 320-109. Lecture in 320-105
- June 5, 2007, Elizabeth Miller, VP address, *on the Wrangell connection.* Also, Elections. Dinner in Hartley. Lecture in 320-105

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/.

- April 10, 2007, Nick Sitar, Professor & Director of the Earthquake Engineering Center, U.C. Berkeley, Debris Flow Mechanics
- May 8, 2007, Prem Attanayake, Chief Hydrogeologist, Bechtel Corp, Identifying Environmental Impacts due to Underground Excavations
- November 13, 2007, Bruce Hilton and Tim Bech, Kleinfelder, Ferguson Rockslide on Highway 140 near Yosemite.

Rock Slope Stability Analysis & Design

Association of Engineering Geologists
Sacramento Section

Two Day Short Course
April 20 – 21, 2007 (Friday and Saturday)
McClellan, California
$350 AEG Members; $375 Non-Members
$400 at the Door

For Engineering Geologists and Geotechnical Engineers seeking intermediate level instruction on methods and new technologies applicable to rock slope stability investigation, analyses and design. A basic knowledge of rock slope stability investigation, data analysis, and design are assumed; however, the first half-day will provide a refresher on techniques. CEU credit will be earned upon completion. For further details and an application form, go to: www.aegsacto.org.

---Preliminary Announcement--- Paleoseismology in Seismic Hazard Assessment; Distinguishing Active Faults from Neotectonic Features That Look Like Them (with a Field Trip to Ridgetop Spreading Zones)

Dr. James McCalpin, President,
GEO-HAZ Consulting; Crestone, Colorado

AEG-approved 2-Day Short Course with Field Trip (Day 1: Classroom Lecture; Day 2: Field Trip in San Gabriel Mountains). Friday-Saturday, April 27-28, 2007 16 hours (8 hours per day) CEU Credits: UCR-Extension and AEG accreditation.

All details to be announced in Extension Center brochure/flyer with course details and enrollment/registration information in a week or so.

Cost will be about $300 (Members), $350 (non-Members). Day 1 at Extension Center, University of California, Riverside

Sponsored by AEG and AEG Inland Empire Chapter, Southern California Section, Association of Environmental and Engineering Geologists.

WATCH FOR an official announcement with course details, agenda, instructor biography, itinerary, and enrollment and registration details.

This course is complimentary to another 3/4ths-day course scheduled Saturday May 12, 2007, involving 6 speakers, like a seminar with the topic 'Earthquake Hazards and Seismic Evaluation'. The announced course or more intensive in the subject matter and areas it is focused to. March 9, 2007

Association of Environmental and Engineering Geologists Inland Empire Chapter, Southern California Section www.aegsc.org/chapters/inlandempire **Phone (951) 924-6756**

Geologists Reveal Secrets Behind Supervolcano Eruption

(Long Valley Caldera Eruption)

Troy, N.Y. — Researchers at Rensselaer Polytechnic Institute have discovered what likely triggered the eruption of a "supervolcano" that coated much of the western half of the United States with ash fallout 760,000 years ago.

Using a new technique developed at Rensselaer, the team determined that there was a massive injection of hot magma underneath the surface of what is now the Long Valley Caldera in California some time within 100 years of the gigantic volcano's eruption. The findings suggest that this introduction of hot melt led to the immense eruption that formed one of the world's largest volcanic craters or calderas.

The research, which is featured in the March 2007 edition of the journal *Geology*, sheds light on what causes these large-scale, explosive eruptions, and it could help geologists develop methods to predict such eruptions in the future, according to David Wark, research professor of earth and environmental sciences at Rensselaer and lead author of the paper.

The 20-mile-long Long Valley Caldera was created when the supervolcano erupted. The geologists focused their efforts on Bishop Tuff, an expanse of rock that was built up as the hot ash cooled following the eruption. The researchers studied the distribution of titanium in quartz crystals in samples taken from Bishop Tuff.

A team from Rensselaer previously discovered that trace levels of titanium can be analyzed to determine the temperature at which the quartz crystallized. By monitoring titanium, Wark and his colleagues confirmed that the outer rims of the quartz had formed at a much hotter temperature than the crystal interiors. The researchers concluded that after the interiors of the quartz crystals had grown, the magma system was "recharged" with an injection of fresh, hot melt. This caused the quartz to partly dissolve, before starting to crystallize again at a much higher temperature.

Analyses of titanium also revealed that the high-temperature rim-growth must have taken place within only 100 years of the massive volcano's eruption. This suggests that the magma recharge so affected the physical properties of the magma chamber that it caused the supervolcano to erupt and blanket thousands of square miles with searing ash.

"The Long Valley Caldera has been widely studied, but by utilizing titanium in quartz crystals as a geothermometer we were able to provide new insight into the reasons for its last huge eruption," Wark said. "This research will help geologists understand how supervolcanoes work and what may cause them to erupt, and this in turn may someday help predict future eruptions."

The research was funded through a grant from the National Science Foundation.

Wark was assisted in his research by Wes Hildreth of the U.S. Geological Survey; Frank Spear, Rensselaer professor of earth and environmental sciences and department chair; Bruce Watson, Institute Professor at Rensselaer, and Daniele Cherniak, research associate professor of earth and environmental sciences at Rensselaer.

Rensselaer Polytechnic Institute

March 5, 2007

Bacteria Could Steady Buildings Against Earthquakes

UC Davis Press Release
February 21, 2007

Soil bacteria could be used to help steady buildings against earthquakes, according to researchers at UC Davis. The microbes can literally convert loose, sandy soil into rock.

When a major earthquake strikes, deep, sandy soils can turn to liquid, with disastrous consequences for buildings sitting on them. Currently, civil engineers can inject chemicals into the soil to bind loose grains together. But these epoxy chemicals may have toxic effects on soil and water, said Jason DeJong, an assistant professor of civil and environmental engineering at UC Davis.

The new process, so far tested only at a laboratory scale, takes advantage of a natural soil bacterium, Bacillus

pasteurii. The microbe causes calcite (calcium carbonate) to be deposited around sand grains, cementing them together. By injecting bacterial cultures, additional nutrients and oxygen, DeJong and his colleagues found that they could turn loose, liquefiable sand into a solid cylinder.

"Starting from a sand pile, you turn it back into sandstone," DeJong said. Similar techniques have been used on a smaller scale, for example, to repair cracks in statues, but not to reinforce soil.

The new method has several advantages, DeJong said. There are no toxicity problems, compared with chemical methods. The treatment could be done after construction or on an existing building, and the structure of the soil is not changed -- some of the void spaces between grains are just filled in.

DeJong and his collaborators are working on scaling the method up to a practical size, and applying for funds to test the method in the earthquake-simulating centrifuge at UC Davis' Center for Geotechnical Modeling. The centrifuge is part of the national Network for Earthquake Engineering Simulation, funded by the National Science Foundation.

A paper describing the work has been published in the Journal of Geotechnical and Geoenvironmental Engineering. The other authors are Michael Fritzges, a senior engineer at Langan Engineering, Philadelphia; and Klaus Nüsslein, associate professor of microbiology at the University of Massachusetts, Amherst. The work was supported by the National Science Foundation.

Jason DeJong, Civil and Environmental Engineering, jdejong@ucdavis.edu or Andy Fell, UC Davis News Service, ahfell@ucdavis.edu

This Week in SCIENCE
New Clovis Culture Dates

February 23 2007, 315 (5815)

The first well-established culture in the New World has been long thought to be that of Clovis, characterized by a distinctive shape of their hunting points. **Waters and Stafford** (p. 1122; see the cover and the news story by Mann) present a series of new radiocarbon dates on several Clovis sites and reassess previous more scattered dates. Together, these imply that Clovis persisted for only a few hundred years and occurred somewhat later than was previously thought. The dates are similar to dates for other cultures such as Folsom and Goshen and may imply that the Clovis culture may have emerged in the New World after a previous colonization.

THIS WEEK IN *SCIENCE*
Insights into Ice Stream Discharge

March 16 2007, 315 (5818)

How quickly sea level will rise as climate warms depends mainly on how much the ocean expands from warming, how fast the polar ice sheets melt, and how fast the ice sheets discharge frozen ice into the ocean. This third process is by far the most poorly constrained, but in recent years large and rapid increases have occurred in the discharge rates of some of these outlet glaciers--as much as doubling in less than 1 year (see the Perspectives by Vaughan and Arthern and by Truffer and Fahnestock). **Fricker *et al.*** (p. 1544, published online 15 February) analyzed ice-surface elevations obtained from satellite laser altimetry in the vicinity of two important Antarctic ice streams and found rapid, local changes in the height of the ice on annual time scales. They interpret these results as the signatures of subglacial water movement between lakes at the base of the ice sheet. **Howat *et al.*** (p. 1559, published online 8 February) show that glacial discharge from ice streams in Greenland can decrease as suddenly as it can increase. Their findings illustrate the difficulty of extrapolating short-term trends in ice mass balance to longer intervals.

USGS to Offer $7 Million in Earthquake Research Grants: Online-Only Applications due May 16, 2007

The U.S. Geological Survey announced today that it will award up to $7 million in grants and cooperative agreements for earthquake research in 2008. Interested researchers can review the priority research described in the grant announcement and apply online at http://www.grants.gov/. Applications are due May 16, 2007, in an electronic-only format. Paper applications will not be accepted.

"Earthquakes are one of the most costly natural hazards nationwide - 75 million Americans in 39 states face significant risk from earthquakes," said Elizabeth Lemersal, external research support manager for the USGS Earthquake Hazards Program. "Science research is critical to helping prevent natural hazards like earthquakes from becoming disasters."

As part of the multi-agency National Earthquake Hazards Reduction Program, the USGS has the lead federal responsibility to provide notification of earthquakes, assess seismic hazards, and conduct targeted research needed to reduce the risk from earthquake hazards nationwide. Last year, the USGS awarded 100 research grants to universities, state geological surveys and private institutions. Key topics include studying active faults to determine recurrence

intervals for large earthquakes and the physical processes that control rupture, improving seismic hazard estimates so communities and critical institutions can engineer their buildings and roads to be structurally sound; and characterizing ground shaking and other earthquake effects to help minimize damage.

For a complete list of funded projects and reports, visit http://earthquake.usgs.gov/research/external, or contact the USGS libraries in Reston, Va., at 703-648-4303; in Flagstaff, Ariz. at 520-556-7272; in Denver, Colo., at 303-236-1000; or in Menlo Park, Calif., at 650-329-5027. Released: 3/8/2007 7:12:25 AM Reston, VA

Origins of Thursday's Earthquake Unclear

One theory cites part of a shear zone

By Betsy Mason, MEDIANEWS STAFF

03/05/2007

The moderate quake that struck near Lafayette on Thursday March 1st has geologists weighing in on the potential for bigger earthquakes in the area.

The magnitude 4.2 earthquake could be a sign that larger quakes are possible in the area. Or it could indicate that smaller earthquakes are the norm in this area. The epicenter of the Lafayette quake was around 10 miles below the surface, so the nature of the fault is unclear.

The location of Thursday's quake is near the trace of a relatively unknown fault called the Reliez Valley fault which crosses beneath Highway 24 and the BART tracks at the Pleasant Hill Road overpass near Acalanes High School.

Engineering Geologist Keith Kelson of William Lettis & Associates Inc. in Walnut Creek thinks the Reliez Valley fault is part of a broader zone of four small faults between Lafayette and Walnut Creek that his team has dubbed the Contra Costa shear zone.

Kelson has been studying these faults for five years and found evidence that suggested they are active faults. Thursday's quake supports this theory, Kelson said.

"This is right on the trace and it has all the characteristics that we would expect on one of these faults in the Contra Costa shear zone," he said.

Although the Reliez Valley fault, which appears to be the biggest fault in the shear zone, probably isn't capable of producing large earthquakes, Kelson suspects the faults may be connected at depth and could act as a link between the northern end of the Calaveras fault, which appears to peter out in the Danville area, and the southern end of the West Napa fault near Vallejo.

If he is correct, at some time the small faults could move together to create a quake of magnitude 6 or more that could dislocate BART tracks and cause damage to buildings.

There are other examples of shear zones connecting faults in California. Some scientists think the Hayward fault may be connected to the Rogers Creek fault to the north through a zone that lies beneath San Pablo Bay. If those two faults were to rupture together, the result could be a magnitude 7 or greater earthquake.

But geologist David Schwartz of the U.S. Geological Survey in Menlo Park says the locations of about a dozen small aftershocks following Thursday's earthquake don't match up with the north-northwest trending Reliez Valley fault.

"As aftershocks started to occur, they progressed in a west-southwest direction," Schwartz said. "So fundamentally it almost looks like it's an east-west structure at depth."

If Schwartz and colleagues at the USGS are right, the fault that hosted Thursday's quake is likely a relatively harmless one in the block of earth between the larger Calaveras and Hayward faults that isn't capable of bigger shocks.

"We're pretty confident that it was this west-southwest trending patch of a fault. It's very hard to argue with what the aftershocks and their orientation shows," Schwartz said. "If it was the Reliez Valley fault, you'd see the aftershocks trending along the trace of that fault."

A swarm of more than a hundred quakes shook the San Ramon area in 2002.

Those earthquakes occurred on a previously unknown fault running roughly east-west, perpendicular to the Calaveras fault.

Although the majority of faults in the Bay Area are northwest trending strike-slip faults that move horizontally, areas such as the East Bay Hills are highly deformed and have been faulted and folded for millions of years.

"If you were to slice through the crust anywhere in the Bay Area, you'd find literally hundreds if not thousands of small faults that have formed at different times in the history of these rocks," Schwartz said.

Some of those old faults can end up lining up with local stresses in the earth's crust, causing them to budge a little.

"I think that's what we saw (Thursday) night," Schwartz said.

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

NCGS FIELD TRIP TO THE WORLD'S SMALLEST MOUNTAIN RANGE, THE SUTTER BUTTES

Saturday April 21, 2007
Leader: Dr. Brian Hausback, CSU Sacramento
Trip Organizer: Martin Steinpress

This trip is being conducted under the auspices of the Middle Mountain Foundation (www.middlemountain.org), a non-profit working to protect the Buttes. This trip is difficult if not impossible to do on your own. Bring boots, long pants, hat, water, lunch, rock hammer, hand lens, etc. We will meet at the Pleasant Hill BART station at 7:00 am sharp and carpool to the Buttes. The trip will involve a somewhat strenuous hike over 3 to 4 miles of rough and steep terrain. We will depart the Buttes around 4:00 pm and arrive back at about 7:00 pm. See Brian Hausback's website for references on Sutter Buttes Geology at www.csus.edu/indiv/h/hausback/

An alternate meeting point will be Highway 20 and West Buttes Road (7-8 miles east-southeast of Colusa on Highway 20) at 10:00.

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

THIS FIELD TRIP WILL BE LIMITED TO 25 PEOPLE.

Time & Departure: April 21, 2007, 7:00 am (sharp), at Pleasant Hill BART Station

Cost: $50/person ($30.00 goes to Middle Mountain Foundation)

*********************REGISTRATION FORM (Sutter Buttes 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

Carpool and vanpool is a must for this fieldtrip. Please let us know if you can drive and NCGS can reimburse your gasoline expenses.

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