NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

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MEETING ANNOUNCEMENT

DATE: **November 28, 2007**

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

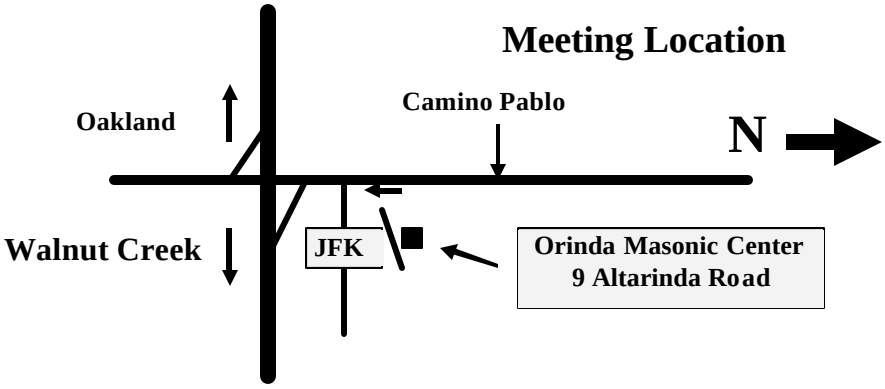
TIME: **6:30 p.m. social; 7:00 p.m. talk (no dinner) Cost: $5 per regular member; $1 per student, and $1 per K – 12 teachers (new!)**

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

SPEAKER: **Dr. Kurtis Burmeister,**
University of the Pacific

Controls on structural architecture and strain partitioning within the Northern Appalachian fold-thrust belt in the Rosendale natural cement region

Deformation in the Hudson Valley foreland-fold thrust belt of southeastern New York State involves a mechanically rigid strut of Late Silurian through Middle Devonian clastic and carbonate sedimentary strata. This rigid strut is sandwiched between thick, relatively ductile units of Ordovician shale (below) and Middle Devonian shale (above). Near Rosendale, units within the Siluro-Devonian rigid strut begin thinning northwards. Here, the most mechanically significant unit within the rigid strut, the Shawangunk Conglomerate, thins from > 100 m thick to 0 m thick in an along strike distance of less than 5 km. The results of recent geologic mapping and cross section construction suggest this stratigraphic change gives rise to significant, along-strike transitions in fold-thrust belt architecture. Northward thinning of the Siluro-Devonian strut corresponds with a decrease in the wavelength and amplitude of megascopic folds, a decrease in the spacing of thrust faults, the occurrence of lateral ramps, and the dying-out of faults into fault-related folds. In addition to controlling the architecture of folds and faults, the rigid strut also appears to have influenced penetrative strain accumulation within the belt. The results of Fry strain analysis of the Binnewater Formation indicate that, although folded and incorporated in thrust sheets, the unit accumulated only very low strains (generally < 3% shortening; max. 8%). Furthermore, the long axes trends of bedding-parallel Fry strain ellipses do not consistently parallel the regional structural grain defined by the trends of fold axes and cleavage in the belt. This scatter suggests that tectonic strain has not completely overprinted primary fabrics, and these ellipses measure composites of depositional/compactional and tectonic fabrics. In contrast,



analysis of the anisotropy of magnetic susceptibility (AMS) performed on the same unit yield fabrics that closely parallel the regional structural grain of the fold-thrust belt. These AMS fabrics reflect the preferred orientation of matrix grains in the sandstone samples, which may provide a more sensitive passive strain marker than the distribution of detrital grains. The results of these fabric analyses suggest that the rigid strut transmitted penetrative strain further into foreland and/or directly into brittle, macroscopic mechanisms.

Biography: Dr. Kurtis Burmeister is an Assistant Professor in the Department of Geosciences at the University of the Pacific in Stockton, California. Kurtis obtained his BA degree in Biological Sciences from the University of California at Santa Barbara in 1996 intending to pursue a career in medicine. However, a general education course in geology during his senior year changed those plans. Kurtis obtained a MA degree in Geology and Vertebrate Paleontology at the University of California at Santa Barbara under André Wyss in 2000, and a PhD in Structural Geology under Stephen Marshak at the University of Illinois in 2005. While questions regarding lithospheric deformation form the core of Kurt's experience and interests, his interdisciplinary research approach draws heavily on aspects of geophysics, stratigraphy, petrology, and even paleontology. Kurt's current research projects integrate field-based structural analyses and geologic mapping with lab-based analysis of strain and magnetic fabric analyses to examine the controls on strain partitioning and deformation styles. In addition ongoing research into the controls on the structural architecture of the northern Appalachian foreland fold-thrust belt, Kurt is actively involved in collaborative research projects examining: (1) the structural evolution of the Nankai & Boso accretionary prism complexes of eastern Japan, and (2) the use of magnetic fabrics as a proxy for tectonic fabrics in the Colorado Plateau and the Alisitos arc of Baja California, Mexico.

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 2007 Calendar

Wednesday November 28, 2007
Controls on structural architecture and strain partitioning within the Northern Appalachian fold-thrust belt in the Rosendale natural cement region - Dr. Kurt Burmeister, University of the Pacific, Stockton
7:00 pm at Orinda Masonic Center

Wednesday January 30, 2008
Geomorphic response of river systems to land use and land cover changes – Dr. Jeffery Mount, University of California, Davis
7:00 pm at Orinda Masonic Center

Wednesday February 27, 2008
Impacts and evolution: astrobiology and near-earth object impacts – Dr. David Morrison, NASA Ames Research Laboratory, Menlo Park
7:00 pm at Orinda Masonic Center

Wednesday March 26, 2008 (Date To Be Confirmed):
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

Thursday March 27, 2007 (Date To Be Confirmed)
(AAPG Distinguished Lecture)
The Episodic History of Cretaceous Carbonate Platforms: An Aptian Case Study
Dr. Peter Skelton, Open University, UK
1:00 pm at Chevron, San Ramon

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
TBA - Likely a Hayward fault talk through the 1868 Alliance
7:00 pm at Orinda Masonic Center

Wednesday June 25, 2008 (Date To Be Confirmed; Likely a Dinner Meeting) ***Earthquakes in the San Francisco Bay area in the past 2000 years - commemorating the 140th anniversary of the 1868 Hayward Earthquake*** – Dr. David Schwartz, Senior Earthquake Geologist, 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 (date TBC)
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

Upcoming NCGS Field Trips

January 26, 2008	***Wilson Grove & Petaluma Formations, Sonoma County, California,*** **James Allen,** PG California State University, East Bay, and **Peter Holland** CEG, Vector Engineering **(See Attached Flyer!!)**
May 2008	***Point Lobos to Point Reyes: Evidence of ~180 km Offset of the San Gregorio & Northern San Andreas Faults,*** **Kathleen Burnham**, Independent Researcher

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

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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 / 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:

- November 13, 2007, Gary Fuis, U.S.G. S., ***The Plate Boundaries in Southern California and South Island New Zealand: New Observations and Implications for Plate Tectonics***
- December 4, 2007, Marty Grove, UCLA / Stanford Geochronology, ***Evolution of the Colorado River: Culmination of a Major Cenozoic -- Transformation of SW North American Drainage Patterns***
- January 8, 2008, Steve Kirby, ***Putting Some Fizz into Geofizzics: Plumes and Earthquakes***
- September or October, 2008, Field trip dealing with geology of the Owens Valley (Angela Jayko) and central White-Inyo Range (Gary Ernst).

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/.

- **December 11, 2007**; *Liquifaction*; Ross Boulanger, UC Davis
- **January 8, 2008**; TBA
- **February 12, 2008**; *Dam Removal and River Restoration;* Leonard Sklar, San Francisco State University
- **March 11, 2008;** Student Night

Dealing with the Devil

Mile-Long CalTrans Project Includes Twin Tunnels to be Bored Behind Devil's Slide Area of Highway 1

Reported by Anne Sanquini
Photos from Anne Sanquini, John Karachewski, CalTrans, Local Residents

On this sunny day in May, the NCGS got a preview of an ambitious CalTrans project which is scheduled for completion in 2011: construction of twin tunnels, each 4,200 feet long, plus a 1,000-foot bridge which together will circumvent the geologically unstable Devil's Slide area of Highway 1 between Pacifica and Montara.

Grant Wilcox, **Senior Engineering Geologist, CalTrans**, lead off this trip with a presentation about the history of the region and current activities on the project. He reviewed the basic geology of the area, some of the many landslides and rockslides that have occurred along the roadway, various alternatives that had been proposed to deal with the area and described the tunnel and bridge project now underway.

Grant has been working for about 18 years here, and was a staff geologist in the area during the big 1995 slide. The photo of Highway 1 below was taken by Mike Wong owner of the Spring Mountain Gallery in Half Moon Bay.

1995 Slide Area; View to North

The roadbed had dropped by several feet and there was concern that an entire lane will fall into the ocean, as happened in 1980. This was not an easy repair as the slide seen is actually a slide within a slide within a slide. At that time it was not possible to cut back further into the slope, or to build a bridge over the active slide area. The road remained closed for over five months while CalTrans cleared the area and essentially stitched together the edge of the mountain using concrete "whalers" attached to tiebacks. A similar repair was required in 2006, this time using much deeper, 150-foot tiebacks.

After a great presentation, we donned hardhats and safety vests at the CalTrans construction trailer in Pacifica and carpooled to the slide area to get a firsthand view of the work that Grant described.

At Devil's Slide, Grant Wilcox described the repairs following the 1995 slide. The rockslide at the level of the roadbed and also higher up the mountain was cleaned up using explosives to bring down loose rock, and a curious piece of machinery called a Spider

worked it's way down the steep slopes to pluck large boulders from the upper end. The area was then secured with rock dowels and shotcrete.

Grant Wilcox, Center, Describes Repairs Following 1995 Slide

The Current Road; View to South

This fix cost almost $3 million and although it held pretty well, was considered temporary. Indeed, prior to the current road, three previous roads were constructed and then abandoned along this stretch of coastline. In addition, one can still see the trace of an old railroad bed (it looks like a geologic feature), below the current roadway, abandoned in 1922.

Highway 1 is built on a dynamic coastline that experiences frequent mass wasting. The road has sunk over 47 feet since its current alignment was built in 1937. The bedrock here is hydrothermally altered quartz diorite and granodiorite in fault contact with claystone, siltstone, sandstone and conglomerate. The area includes several additional thrust faults and is affected by seasonal rains, year-round springs and fog water accumulation. The geologic cross-section on the NCGS website shows rock type and fault location relative to the tunnel location.

Cross-Section: Roadway Repair. Dotted Red Line is a Slide Plane

On the photo below (from the CalTrans project website http://www.dot.ca.gov/dist4/dslide/) note how the tunnel is well behind the landslide area. In this view, east is to the top. The bridge will connect the north end of the tunnel to the current Highway 1 roadbed.

Aerial View of Tunnel

The tunnels are being bored from south to north, with a 2% grade for drainage. Estimated cost for the whole project, including the bridge, is about $300 million. The two tunnels are each 4200 feet long and 30 feet wide, have 11 cross-linking passages between them and are also accessible to bicyclists.

As the tunnel boring is being done, there will be opportunities to capture geologic information. The

following link is to an article in the Half Moon Bay Review describing how Marjorie Schulz from the USGS and George Hilley from Stanford will be using the tunneling to study the weathering and erosion of Montara Mountain.

http://halfmoonbayreview.com/articles/2007/08/14/news/local_news/story04.txt

Next we traveled to the southern end of the slide area to look at the culverts being built to get tunnel and spring water out and also to be used for sediment settling purposes. Building the tunnels and their drainage network also effectively dewaters the mountain, to the point where some of the farmers' ponds may dry up. Accordingly, water systems have been designed as part of the tunnel construction that will be used to replace that pond water if it becomes necessary to do so.

After lunch, we walked a bit further south and saw the large fake-rock wall that was applied over a "soil nail" wall to stabilize the road-cut area. In the opinion of the author it is a real shame to cover a road-cut with fake rock. However, had this not been done, CalTrans would have had to remove even more of the mountain, so I suppose it is a good solution and I will have to satisfy my geological curiosity elsewhere.

Drainage Culvert at South Entrance to Tunnels; View to South; New Road Bed to Left

Our final stop was at the northern end of the bridge that is under construction. Standing on the banked plywood one can imagine cars zipping by, over a gracefully curving bridge into the mountain and emerging on the other end. So will end the next but likely not last chapter in the saga of Devil's Slide.

Fake Rock Wall at Southern Approach to Tunnels; View to South

Bridge Under Construction; View to South

The **Northern California Geological Society** thanks **Grant Wilcox** for leading this most informative trip. We would like to be able to visit the site again in the future, when the actual drilling is well underway, and we also extend a standing invitation to Grant to join us on other NCGS field trips. We also thank **Rob Nelson** for his work in organizing this trip.

The Gift of Giving

This Week in SCIENCE
June 15 2007

In Europe, taxation rates are high, and services are funded by government spending, whereas in the United States, low taxes and higher philanthropic donations are the norm. **Harbaugh *et al.*** (p. 1622) have carried out a neuroeconomic study to assess the degree of personal reward (as indexed by neural activation of reward-related brain areas) in response to mandatory (via taxation) and voluntary contributions

to charity. Subjects experienced a hedonic reaction when tax revenues were transferred to a charity, and subjects who showed greater neural activation under this regime were more generous when charitable contributions were made voluntary. The sense of well-being in the voluntary giving condition surpassed that seen when subjects were taxed.
CREDIT: HARBAUGH *ET AL.*

Speedier Yellowstone Uplift

This Week in SCIENCE
October 19, 2007

The Yellowstone caldera is the remnant of three giant eruptions 640,000 years ago, as well as numerous smaller eruptions prior to 70,000 years ago. The region is still very active and experiences earthquakes, heat flow, and ground deformation, as well as hydrothermal activity. ***Chang et al.*** (p. 952) present satellite radar and global positioning satellite measurements which show that the caldera underwent a period of accelerated uplift between 2004 and 2006. The highest rate of about 7 centimeters per year is more than three times faster than uplift rates measured since the 1920s. The uplift may reflect ongoing magma recharge and fluid redistribution.
CREDIT: ROBERT B. SMITH/UNIVERSITY OF UTAH

Warming from the Cold Places

This Week in SCIENCE
October 19 2007

The details of how the different parts of the climate system act and interact during changes from glacial to interglacial states are still being resolved. **Stott *et al.*** (p. 435; published online 27 September; see the 28 September news story by Kerr) construct a chronology of high- and low-latitude climate change at the last glacial termination, in order to help answer the questions of where warming originated, and why. Their data, derived from both benthic and planktonic foraminifera recovered from the same marine sediment core, indicate that deep-sea temperatures in the western tropical Pacific warmed about 1500 years before the surface waters did, a result of the earlier warming of the high-latitude surface water from where the deep water originated. The deep-sea warming also preceded the rise in atmospheric CO_2, which suggests that increasing insolation at high southern latitudes caused a retreat of sea ice that led to warming there and further a field.

Deeper Surface Mixing

This Week in SCIENCE
October 19 2007

Eight episodes of massive iceberg discharge into the North Atlantic Ocean, called Heinrich events, have occurred in the past 65,000 years. These events caused intense regional cooling, and disrupted global deep ocean circulation for hundreds to thousands of years each time they happened. Their impact on the surface waters of the North Atlantic Ocean is of special interest as those waters sustain the most biological activity and are most directly involved in climate processes. **Rashid and Boyle** (p. 439, published online 20 September) show that Heinrich events modified the upper water masses of the North Atlantic Ocean by causing them to increase in thickness and to deepen. Such a change would have had major impacts on the ecology of the region. The authors suggest that the change was the result of windier conditions during those times.

ECOLOGY/EVOLUTION:

Globalization via Drift

Editors' Choice:
Highlights of the recent literature
September 7 2007

The evolutionary consequences of plate tectonic movements on biological organisms are often hard to reconstruct. The twin processes of extinction and dispersal tend to obscure biogeographical patterns that might otherwise be interpreted straightforwardly in the context of continental drift. The ideal group of organisms for such a study would be one that is ancient (originating before the breakup of Pangaea roughly 200 million years ago), that disperses poorly or not at all, and that still survives worldwide. Boyer *et al.* have focused on Cyphophthalmi--a suborder of the spiderlike long-legged harvestmen that inhabit leaf litter--which originated around 400 million years ago. A phylogeny constructed from DNA sequence data shows that almost all families of these harvestmen show clear biogeographical patterns that can be traced backward to the breakup and dispersal of the major land masses and continental islands. Relationships between the families suggest that the New Caledonian fauna (Troglosironidae) is more closely related to that of the former Gondwanan tropics (Neogoveidae) than to those of Australia and New Zealand, and this shared origin explains why they both exhibit the unusual row of teeth on the second walking-leg claw.
-- Andrew M. Sugden ; *J. Biogeogr* **34**, 2007

CLIMATE SCIENCE:
More Water in the Air

Editors' Choice:
Highlights of the recent literature
October 12 2007

Anthropogenic influence on the climate system is manifest not only in the rise of near-surface tropospheric temperatures (the effect people experience most directly), but also in the hydrological cycle. Recent observational studies have shown that continental river runoff, zonal-mean rainfall, and surface humidity all display trends that can be ascribed to the results of human activity, primarily the temperature rise caused by increasing concentrations of atmospheric greenhouse gases. Another atmospheric attribute of great importance, the total amount of atmospheric water vapor, *W*, has been more difficult to study. Santer *et al.* use data from the satellite-based Special Sensor Microwave Imager (SSM/I) to show that the total atmospheric moisture content over the oceans has increased by 0.41 kg/m^2 per decade since 1988. They then use results from 22 different climate models to show that the size of the observed increase in *W*, and the pattern of changes that it has displayed over that interval, can be explained only if the primary cause is the human-induced increases in greenhouse gases in the atmosphere. In this way, they show that the "fingerprint" of anthropogenic impact can be seen in the moisture content of Earth's atmosphere, and that the increase is consistent with theory, thereby strengthening confidence both in those models and in how well the mechanics of climate are understood. -- H. Jesse Smith

Proc. Natl. Acad. Sci. U.S.A. **104**, 2007

GEOLOGY:
Carved from the Surface

Editors' Choice:
Highlights of the recent literature
September 21 2007

Hawaii is sometimes referred to as Earth's greatest mountain because its height above the seafloor exceeds the height of Mt. Everest above the plains of India. Recent work has identified several huge submarine slides extending off of several of the Hawaiian islands, and the large-scale topography of these islands, including underwater features, in part reflects the feedback between growth of the islands by volcanism and this mass wasting. Lamb *et al.* argue that these slides may trigger some of the more dramatic smaller topographic features found in some of the wetter parts of the islands, specifically, amphitheaters containing a series of large waterfalls. They show that waterfalls can drill into the Hawaiian basalt at a rate sufficient to cut these amphitheaters from a cliff produced by a slump in a few hundred thousand years. An alternative model has been that erosion from groundwater seepage or springs produced these features, and that this process may have produced similar features on Mars, but the rates of spring flow and other features seem insufficient to have produced the observed features on Hawaii. -- Brooks Hanson

Geol. Soc. Am. Bull. **119**, 2007

CALIFORNIA

An Interesting Collection of Maps and Links on the Web

The following USGS website:
http://education.usgs.gov/california/resources.html

provides a number of examples of maps and educational reference materials about California that are available free on the web. It notes that many thousands of publications exist that deal with California geography, geology, and natural resources and hazards, and many of these can be found with simple topical searches on the Web. It also notes that the most comprehensive library collection of Earth Science is the USGS Library; the library's catalog is on-line at http://library.usgs.gov.

The website contains maps and examples of Geography (population density, population centers, the interstate and highway system, elected officials, political boundaries, contacts for the State Senate, and our national representatives), Physiographic Provinces, Parks (links to the National Park Service, BLM, National Forest Service, US Fish & Wildlife, California State Parks), Geology (links to National Geologic Map Database, California Geologic Survey, SF Bay Region Geology, Geologic Information for Southern California), Minerals (more links), Energy (links to CA Energy Commission, Natural Oil and Gas Seeps in CA, Assessment of Undiscovered Oil and Gas Resources in the San Joaquin Province, etc), Natural Hazards (with more links…), Earthquakes (and more links), Volcanoes (and more), Landslides (and, gosh more), Wildfires (and you get the idea), Tsunamis (ad infinitum), Water Resources, Climate, Floods, Drought, Biology, and the Environment (and more!). You might want to check it out!

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY and
AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

K-12 EARTH SCIENCE TEACHER OF THE YEAR AWARD

$750 Northern California Geological Society
$500 Pacific Section AAPG
$5,000 National AAPG

Call for Nominations for the Year 2007 - 2008 NCGS Competition

The Northern California Geological Society (NCGS) is pleased to announce that it will accept applications from candidates in the Northern California region for the Year 2007 - 2008 competition for the Earth Science Teacher of the Year Award. The $750 NCGS award is intended to recognize pre-college earth science programs already in place, and to encourage their organization in districts where they have not been fully developed. Nominations of qualified K-12 teacher candidates are solicited from teachers, school administrators, teacher outreach programs, and other interested parties.

The NCGS awardee's application will be submitted to a regional competition sponsored by the American Association of Petroleum Geologists (AAPG) Pacific Section. The Pacific Section winner will receive a $500 award at the joint national and Pacific Section regional meeting in Bakersfield, California in March / April 2008, plus up to $250 toward meeting expenses. The regional winner's project will be submitted to AAPG headquarters for the national contest. The national winner will receive an expense-paid trip to attend the national AAPG meeting in Denver, Colorado in June 2009 to receive the national award.

At the national level, the AAPG Foundation presents an annual $5,000 award to a K-12 teacher for *Excellence in the Teaching of Natural Resources in the Earth Science*. The award recognizes balanced incorporation of natural resource extraction and environmental sustainability concepts in pre-college Earth science curricula. It includes $2,500 to the teacher's school for the winning teacher's use, and $2,500 for the teacher's personal use.

The deadline for application submittal by candidates for the $750 NCGS award is Friday, February 15, 2008

Interested candidates or nominators can request Application Information and an Entrant Application Form, or submit an application, by contacting:

John Stockwell, Chair, K-12 Geoscience Education Committee
Northern California Geological Society
1807 San Lorenzo Avenue
Berkeley, California 94707-1840
Tel: (510) 526-1646
e-mail: kugeln@peoplepc.com

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

NCGS FIELD TRIP TO THE
WILSON GROVE & PETALUMA FORMATIONS, SONOMA COUNTY, CALIFORNIA

Saturday January 26, 2008

Leaders:

James Allen, MS, PG; Department 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 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 volcaniclastic 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 has 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: January 26, 2008, 9:00 am, at the Stony Point Rock Quarry in Cotati. Maps will be emailed.

Cost: $25/person

*************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 Phone: (707) 795-8090 (evening) (707) 548-3268 (day)