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, June 28, 2006**

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**

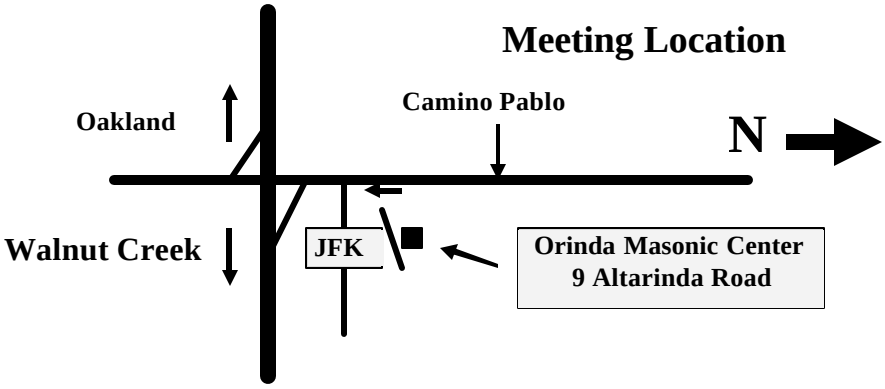
RESERVATIONS: **Leave your name and phone number at 925-424-3669 or at *danday94@pacbell.net* before the meeting.**

SPEAKER: ***Dr. Mitchell Craig,* California State University, East Bay**

Near-Surface Geophysical Imaging Using Seismic and Radar Methods

Seismic refraction and ground-penetrating radar (GPR) methods were used to study active faults in the San Francisco Bay area and a relict shoreline deposit in Death Valley. The Bay Area sites are located along the Hayward and Green Valley faults. The Hayward fault site is located at Tyson's Lagoon, a sag pond between two strands of the fault. Both seismic and GPR data indicate a near-horizontal interface 7-9 m deep that apparently coincides with the Holocene-Pleistocene boundary. Seismic velocity increases from 300-1000 m/s in the overlying material to 1700-1800 m/s beneath. At the Green Valley site, the fault location is constrained on the basis of seismic velocities, and channel features 5-10 m wide are imaged using GPR.

The Beatty Junction Shoreline Deposit in Death Valley National Park is a beach barrier bar approximately 500 m long, 50 m wide, and 5 m high, that corresponds to a relict shoreline of the former Lake Manly. A seismic refraction line was recorded along the crest of the bar, and used to map the interface between the base of the bar sediments and the underlying fan deposits. GPR profiles image the internal structure of the barrier bar, showing that the crest of the bar migrated in a shoreward direction as the upper portion of the bar was deposited during a transgression.



Biography

Mitchell Craig is Assistant Professor in the Department of Geological Sciences at California State University, East Bay (formerly Hayward), where he has been since 2002. He received a PhD in Geophysics from Georgia Institute of Technology in 1990, worked for Chevron for 9 years as a geophysicist and computer system analyst, and was Senior Lecturer in the Department of Geological Sciences at the University of Papua New Guinea for 3 years.

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 June 28, 2006
Dr. Mitchell Craig, Cal State University, East Bay
Near-Surface Geophysical Imaging Using Seismic and Radar Methods
7:00 pm at Orinda Masonic Center

Wednesday September 27, 2006
Dr. Doris Sloan, University of California, Berkeley
Dr. John Karachewski, Weiss Associates
Slide Show Lead-in to Book Publication **(*Geology of the San Francisco Bay Region*, UC Press; (http://www.ucpress.edu/books/pages/9237.html)**

Wednesday October 25, 2006
Dr. Richard Stanley, **Dr. Russell Graymer**, **Dr. Carl M. Wentworth**, U.S. Geological Survey, Menlo Park
Subsurface geology, hydrology, basin evolution, and climatic cyclicity of the Santa Clara Valley area
7:00 pm at Orinda Masonic Center

Upcoming NCGS Field Trips

Mid - 2006	***Panoche Hill Paleocene and Cantua Creek Cretaceous Fossil Overpressure Zone Cold Seeps*, Dr. Mel Erskine,** Consultant, **Dr. Hilde Schwartz,** University of California, Santa Cruz
September 2006	***Field Geological Mapping Using Modern Technology*** **Dr. George Brimhall,** U.C. Berkeley

For questions regarding these field trips, please contact Tridib Guha at: tridibguha@sbcglobal.net

NCGS UNDERGRADUATE SCHOLARSHIP AWARD

The NCGS is pleased to provide details to the earlier announcement of the award of the ***2006 Undergraduate Scholarship*** for $500 to **Ms. Holly Olson**. She was a student in the Department of Geosciences at **San Francisco State University**. Her thesis topic is/was *"Temporal and Spatial Variations of Coastal Marine Terrace Deposits along the Coast of the Point Reyes Peninsula"*. Her advisor was **Dr. Karen Grove**. The area of her study is characterized tectonically by a syncline whose northwest trending axis is located on the western side of Drakes Estero. Previous work had shown that the area is being uplifted due to folding and thrust faulting, and the uplift is recorded by coastal marine terraces formed at sea level and now found at varying elevations along the peninsula. Lateral differences in the Miocene deposits were proposed to be studied in part by the construction of detailed measured stratigraphic columns between Limantour Beach and Bolinas. By correlating the sequences to climate data from other studies, it was hoped to explain increased sediment supply in terms of observed climate changes. Additionally, the columns were to be incorporated into a northwest–southeast trending cross section, and integrated into previous work in order to help reconstruct the tectonic and paleogeographic history of the area.

NCGS GRADUATE SCHOLARSHIP for a MASTERS DEGREE AWARD

The NCGS is pleased to provide details to the earlier announcement of the award of the **2006 Graduate Scholarship (Masters Degree)** of $750 to **Ms. Emily Fudge**. She is a student in the Department of Geology at **Humboldt State University** in Arcata, California. Her thesis topic is/was *"Tectonic History and Bulk Geochemistry Analysis of the Grey Rocks Outlier, Klamath Mountains, California"*. Her advisor was **Dr. Susan M. Cashman**. The following synopsis has been greatly simplified from Emily's submittal: The Grey Rocks outlier consists of Devonian greenstone overlying Ordovician ultramafic rocks of the Trinity terrane within the Eastern Klamath Belt (EKB). The Klamath Mountains province consists of a complex series of accreted terranes that extend from Mount Shasta to the current coastline, and are juxtaposed along north-south striking reverse faults. The EKB is the eastern-most accreted terrane in the province. An ambiguity in the nature of the contact between Grey Rocks and the EKB, (correlation to multiple greenstone outcrops in three different terranes within the EKB, interpretation of the contact as either a depositional unconformity, or as a low-angle normal fault), as well as evidence for late Mesozoic or Tertiary extensional faulting in the Klamath Mountains lead to the map project. Field mapping in 2005 identified the basal contact as a fault and the Grey Rocks allochthon exhibited sheared rock sections up to 20 feet thick. The mapping supported previous work that found other allochthons to have faulted basal contacts; extensional faults were

proposed to extend across the region as a result of gravitational collapse. This funding would help pay for lab investigations including petrologic, XRF, and XRD analyses of the Grey Rocks assemblage to help correlate the rocks to other greenstones in the three terranes within the EKB. The data will be incorporated into a digital database of the Klamath Mountains being complied by the Shasta-Trinity National Forest.

There were no applicants for the **2006 Graduate Scholarship (PhD Level)** for this year. This award is set at $1,000.

We look forward to a presentation of the research findings for both winners at a future meeting of the NCGS.

The NCGS Scholarship Committee members for the past year were Phillip Garbutt (chair), Mel Erskine, Randy Kirby, and Bill Perkins. NCGS president David Bero provided some input regarding the graduate scholarships.

Upcoming Meetings of Interest – Bay Area Geophysical Society

Monday June 26th, 2006
Dr. James Gunning, Senior Research Scientist, CSIRO Petroleum
Delivery -- An Open Source Bayesian Seismic Inversion Tool
Location: ChevronTexaco Park, 6001 Bollinger Canyon Road, San Ramon, CA 94583
Lunch: 11:30 a.m., ChevronTexaco Cafeteria
Talk: 12:30 p.m. Building D, Room D1038
In order to get visitor access to ChevronTexaco campus we ask that you contact Peeter Akerberg at (peeter@chevrontexaco.com), preferably a day or more ahead of the talk. A visitors badge will be requested for you and can be picked up at the front desk in the main lobby the day of the talk.
Directions: Please follow these directions!
Map: Map of ChevronTexaco Campus
Abstracts, biographies, directions, and maps can be found at:
http://sepwww.stanford.edu/bags/calendar

Coastal Cliffs-Landslides and Urban Developments

Reported by John Karachewski

On an unusually warm Saturday in mid-November, a group of about 30 NCGS members and friends attended a field trip led by Monty Hampton (retired USGS) to examine the coastal geology and processes at seven stops from Ocean Beach in San Francisco to Half Moon Bay. Tridib Guha organized this field trip as a follow-up to an earlier NCGS lecture by **Monty Hampton** on June 29, 2005. Monty was assisted by several colleagues including: **Robert McLaughlin** (USGS), **Orville Magoon** (retired Corps of Engineers), **Thomas Kendall** (Corps of Engineers), **Peter Mull** (Corps of Engineers), **Leslie Ewing** (California Coastal Commission), **Raymond Sullivan** (emeritus SFSU), and **Julian McCurrach** (Princeton resident / business owner).

The first two stops were located at Ocean Beach in San Francisco near Balboa Street and south of Sloat Blvd. Ocean Beach in San Francisco is relatively wide at its northern end where depositional processes predominate and narrows significantly towards the south where erosional processes pose a threat to city infrastructure. At the first stop, Monty Hampton and colleagues provided an introduction to the sediment dynamics of the San Francisco Bay-Ocean Beach system as well as the history of the 1.5-km long O'Shaughnessy seawall built between 1915 and 1929 to protect the Great Highway. Ocean Beach and the extensive dune fields that covered many areas of San Francisco formed during the post 20,000 year rise in sea level. West of the Golden Gate Bridge, the seafloor is covered by one of the largest sand wave fields in the world as well as the seaward San Francisco Bar, an ebb-tidal delta covering over 100 km^2. Both of these geomorphic features are fed by sediment flushed out of San Francisco Bay and shaped by the strong tidal currents and storm waves originating in the Pacific Ocean. An understanding of these large-scale features is very important because Ocean Beach is strongly affected by tidal currents emanating through the Golden Gate as well as wave refraction around the San Francisco Bar. A strong eddy that spins off Point Lobos, near the Cliff House, during peak ebb flow results in a narrow band of northerly water flow and sediment transport, resulting in a wider beach at this end of the city despite a predominantly southerly flow of water out of San Francisco Bay. Ocean Beach is a high-energy system with classic offshore bars and troughs that are scoured by powerful rip currents.

Historically, the shore line South of Sloat Blvd. was situated several hundred feet landward of its current location. The shore line was extended seaward with fill during the late 1800s and early 1900s to promote urban

development in the Western areas of the city. Since 1995, winter storms have eroded large areas of the bluffs and artificial fill, resulting in the loss of parking spaces within Golden Gate National Recreation Area as well as threats to the Great Highway and to a lesser extent the infrastructure at the city owned wastewater treatment facility. The 1997-98 El Niño exposed the 12-foot diameter transport box that carries approximately one third of the city's sewage out to the sea. A multibeam survey conducted by the USGS in the fall of 2004 indicated that the San Francisco Bar has been contracting since the 1950s. Retreat of the laterally extensive San Francisco Bar has resulted in erosion of shoals that once protected the Sloat region from direct wave attack. In June 2005, the U. S. Army Corps of Engineers implemented a new dredge disposal program to address this problem. About 300,000 yd.^{3} of sediment was dredged from the main ship channel and disposed of in a target area immediately offshore of the erosion hotspot at Ocean Beach. California State University at Monterey Bay and the USGS are currently monitoring and modeling the fate of the dredge sediments to determine if this new practice should be permanently implemented. This very progressive, low-impact form of shore line protection and beach nourishment has been successfully conducted in Holland for many years. For more information about the USGS studies at the mouth of San Francisco Bay, see:
http://walrus.wr.usgs.gov/coastal_processes/intro.html

Ray Sullivan led the presentation about the tectonic setting, San Andreas Fault, sedimentary geology, and geologic hazards at Mussel Rock in Daly City. The coastal zone south of San Francisco is an example of an area where rapid urban development took place in the post-World War II years without an adequate understanding of geologic hazards. Housing developments expanded rapidly into this area between the late 1950s and early 1970s. Many of the homes with spectacular ocean vistas are perched precariously above cliffs adjacent to the San Andreas Fault and were constructed on poorly consolidated sediments. Landslides, slumping, and erosion have caused rapid retreat of the cliff line, which has caused numerous perimeter homes to be condemned and abandoned. Ray also provided insights into a little known report about damage assessments to new homes following the local 1957 M5.3 earthquake. About half of the 580 homes of the Westlake Palisades development needed repair from this moderate tremor. Surprisingly, Bonilla (1959) showed that homes on artificial fill were generally less damaged than those built on nearby natural sediments. The explanation for this unusual observation was that the fill material was well engineered and compacted.

At the fourth stop in Pacifica, Monty Hampton provided an overview of erosion rates in coastal bluffs composed of unconsolidated aeolian and alluvial sediments. Although the long-term average erosion rate for the cliffs at North Esplanade Beach is roughly 0.2 m per year, during the severe 1997-98 El Niño storms, these cliffs receded up to 14 m. One homeowner is quoted as saying than when he bought his new house in the late 1950s it had 150 ft. of backyard, now there is none! Fortuitously, the USGS obtained data from two airborne LIDAR (LIght Detection And Ranging using the same principles as RADAR) surveys over this area, once before the 1997-98 storm season and once afterward. An example of a USGS project that mapped coastal changes and hazards in Pacifica is illustrated at the following web site:
http://coastal.er.usgs.gov/hurricanes/mappingchange/pacifica.html

Robert McLaughlin summarized the structural and sedimentary geology at Moss Beach and James Fitzgerald Marine Reserve. The Pliocene Purisima Formation is interpreted to have been deposited in a strike-slip basin within the San Gregorio-Seal Cove fault system. At the most spectacular outcrop of the day, the participants examined a nonconformity between the Mesozoic granitic rocks and overlying lag deposit of granite boulders in the Purisima Formation, that ranged up to three or four meters in diameter. In the same Cove, the Purisima strata are folded into a plunging syncline on the southwest side of the fault. As an aside, the James Fitzgerald Marine Reserve is also one of the most accessible and best places to introduce children to tide pools in the Bay Area.

At the sixth stop, Monty Hampton provided a brief overview to the colorful history of the Moss Beach Distillery and restaurant, which occupies a romantic location on a high bluff overlooking the Pacific. In the nearby residential area, the discussion focused on the arcuate, steep, and highly irregular patched road surfaces that represent the scarps of deep-seated landslides in the Purisima Formation. Pampas grass was also present in numerous locations on the hummocky topography. Interestingly, one of the homes was for sale and the visiting real estate agent undoubtedly wished that our group would move along quickly to the final stop. At the final stop in Princeton, Julian McCurrach provided a citizen and business owner's perspective on erosion of the local beach and policy issues that are important to the community.

In summary, the NCGS members were fortunate to hear about coastal geology, processes, and policy issues from a diverse group of field trip leaders. From a personal perspective, it was interesting to learn about the rapid rates of geologic change and the intersection with the human time-scale. I've incorporated the example of the Pacifica homeowner's experience into one of the questions in my final exam at DVC, to provide students with a realistic case history illustrating why an understanding of geology is important to their lives.

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

NCGS FIELD TRIP

"FIELD GEOLOGIC MAPPING USING MODERN TECHNOLOGY"

Saturday September 16, 2006

Leader: Dr. George Brimhall, Professor, University of California, Berkeley

Professor Brimhall will review digital mapping methods introduced at the NCGS meeting on May 31, 2006. The group will then be assigned pen tablet PC computers for each group of 2 attendees to use during the excursion. GeoMapping/Pen Mapper software will be demonstrated for mapping geology including outcrops, contacts, faults, strike and dip, field notes, and color infill formations. Base maps covered will include vectorized topography and ortho-images. Use of real-time on-line GPS and Linder lasers will be demonstrated.

THIS FIELD TRIP WILL BE LIMITED TO 20 PEOPLE GIVEN THE AVAILABILITY OF COMPUTERS.

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

Time & Place: September 16, 2006, 10:00 am (sharp), Sibley Volcano Park

(Please bring a hat, field boots, sunscreen, and a light sandwich/snack as the **BBQ will be at the end of the field trip!**)

Cost: $30/person

**********REGISTRATION FORM (Field Geologic Mapping Trip) **********

Name:_____ E-mail:_____

Address:_____ Phone (day):_____ Phone (evening):_____

BBQ: Regular:_____ Vegetarian: _____ (Please check one) Check Amount: _____

Please mail a check made out to **NCGS** to: **Robert Nelson**
269 College View Drive,
Rohnert Park, CA 94928-3775

Questions: e-mail: rlngeology@sbcglobal.net Phone: (707) 795-8090 (evening) (510) 307-9943 ext 237 (day)