

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



NCGS Newsletter Editor:

Mark Detterman

mdetterman@blymyer.com

Secretary:

Dan Day: danday94@pacbell.net

NCGS Voice Mail: 925-424-3669

Website: www.ncgeolsoc.org

NCGS OFFICERS

President (Interim):

Mark Detterman

mdetterman@blymyer.com

President-Elect:

David Bero

dbsquare@earthlink.net

Field Trip Coordinator:

Tridib Guha: aars@netscape.com

Treasurer:

Phil Reed: philecreed@msn.com

Program Chair:

Bill Perkins

wep Perkins@comcast.net

Scholarship:

Randy Kirby

rkirby.geosci@usa.net

K-12 Programs:

John Stockwell

kugeln@msn.com

Membership:

Barb Matz

barbara.matz@shawgrp.com

COUNSELORS

Programs:

Ron Crane: roncrane@aol.com

Mel Erskine:

mcerskine@comcast.net

Don Lewis: donlewis@comcast.net

Frank Picha: afpicha@comcast.net

Ray Sullivan:

sullivan@lucasvalley.net

MEETING ANNOUNCEMENT

DATE: Wednesday, June 29, 2005

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.

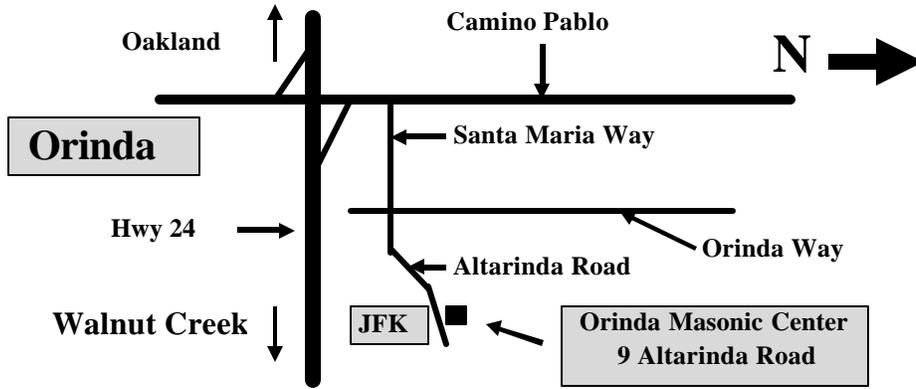
SPEAKER: *Dr. Monty Hampton*, Emeritus,
U. S. Geological Survey

Formation and Evolution of Coastal Cliffs (Or the All-Time Shortest Coastal Cliffs Short Course)

The term "coastal cliff" refers to a steeply sloping surface where elevated land meets the shoreline. Coastal cliffs are a geomorphic feature of first-order significance, occurring along about 80 percent of the world's shorelines, as well as around lakes and estuaries. Like virtually all landforms, modern coastal cliffs are a "work in progress", continually acted upon by a broad assortment of offshore (marine or lacustrine) and terrestrial processes that cause them to change form and location through time. An important consequence is that coastal cliffs retreat (that is, move landward), and the adjacent coastal land is permanently removed as they do so. Retreat can be slow and persistent, but on many occasions it is rapid and episodic. Houses, commercial buildings, roads, and other infrastructure located along a coastal cliff, either on the elevated crest or at the base, have been damaged or destroyed when cliffs collapse. Therefore, coastal-cliff retreat is an important national issue.

Biography: *Dr. Monty Hampton* has had a long interest in the sea. He received a B.S. in Geology in 1966 from Los Angeles State College, and a Ph.D. in Geology in 1970 from Stanford University. His thesis was *Subaqueous Debris Flow and Generation of Turbidity Currents*. From 1970 to 1975 he was an Assistant Professor at the University of Rhode Island; from 1975 to 2003 he was a Geologist working in Coastal and Marine Geology, at the U.S. Geological Survey. Since 2003, he has been an Emeritus Geologist,

Meeting Location



at the USGS. His research interests include debris flows as a sediment transport process in the oceans, sea-floor utilization (environmental geology, geologic hazards, and sediment geotechnical properties). Examples in these areas of interest include studies of geologic hazards and environmental geology in Alaskan Outer continental shelf petroleum lease areas, and acoustic mapping and analysis of contaminated sediment deposits and dredge spoils. Additional interests include nearshore and coastal geology including tonight's topic on coastal cliff retreat, as well as offshore sand resources.

This is our last meeting until September – Enjoy the summer!!

Start your field season off right – Come join us on John Wakabayashi's two day field trip – June 25 and 26 – Flyer Attached

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 2004-2005 Calendar

Wednesday March 30, 2005

Dr. Barbara Bekins, U. S. Geological Survey
Hydrogeology and the Weak nature of Plate Boundary Faults

7:00 pm at Orinda Masonic Center

Wednesday April 27, 2005

Dr. Michael Manga, University of California, Berkeley
An Explosive Theory about Volcanoes

7:00 pm at Orinda Masonic Center

Wednesday May 25, 2005

Dr. Paul M. (Mitch) Harris, ChevronTexaco, San Ramon
Geologic Framework and Reservoir Distribution, Tengiz Field, Kazakhstan

7:00 pm at Orinda Masonic Center

Wednesday June 29, 2005

Dr. Monty Hampton, Emeritus, U. S. Geological Survey
Formation and Evolution of Coastal Cliffs (or the All-Time Shortest Coastal Cliffs Short Course)

7:00 pm at Orinda Masonic Center

Summer Break

Wednesday September 28, 2005

TBA
7:00 pm at Orinda Masonic Center

Upcoming NCGS Field Trips

June 25 - 26, 2005 *Blueschists and Breweries (Brewschists II)*
John Wakabayashi,
Consultant

Fall 2005 *Fossil Overpressurized Zone on the East Side of the Diablo Range*,
Mel Erskine, Consultant

As many of you are aware, **Dr. Wakabayashi** will be returning from Fresno, where he is the most recent addition to the Department of Earth and Environmental Sciences at Fresno State University, to lead this field trip. Don't miss your chance to wish him well in his

new home and position! Tridib reports that 22 members have reserved a spot on the "Brewschists II" field trip. The field trip can accept a total of 31 participants. Transportation will be by bus, thus eliminating the need for individual driving. For stop by stop details please refer to the February 2005 newsletter (expect some changes).

Please contact Tridib Guha at aars@netscape.com for questions you may have.)

1906 Centennial Events

The *Northern California Geological Society* will be participating in the centennial observance of the San Francisco 1906 Earthquake. We are currently finalizing our contributions to the observance and the events will be posted to the website of the *1906 Earthquake Centennial Alliance* (as well as the NCGS website!). The full set of events range from professional meetings, an SSA professional conference, multiple museum exhibits, as well as commissioned music to be played by the Contra Costa Wind Symphony, (and much more). Please visit the website if you have not done so to see what is planned by the alliance:

<http://www.06centennial.org/>

Preliminary List of NCGS Events

(Dates are still tentative)

April 15, 2006	<i>Hayward Fault Field Trip</i> Multiple leaders
April 29 - 30, 2006	<i>Point Lobos to Point Reyes: Evidence of ~180 km Offset of the San Gregorio & Northern San Andreas Faults</i> (Field Trip) Kathleen Burnham

Several other NCGS events are in the formative stage.

Association of Engineering Geologists, San Francisco Section

Tuesday July 12, 2005

Tsunami Generating Landslides

Location: Sinbad's Restaurant, San Francisco

Once available, more details can be obtained from the San Francisco Section's website: <http://www.aegsf.org/>

Update on AAPG EMD Activities

Peter Warwick, EMD President-elect
pwarwick@usgs.gov

The Energy Minerals Division of the American Association of Petroleum Geologists (EMD, AAPG) continues to be very active to promote research and communication among scientists in the areas of remote sensing and earth materials capable of being used for energy production. The EMD is the primary sponsor for several sessions at regional, national, and international AAPG meetings. The EMD website <<<http://emd.aapg.org>>> has recently been updated to include technical reports on various energy mineral commodities and geospatial information. A Members-Only section has been added to the website to provide EMD membership with the latest committee and officer reports, as well as a searchable membership directory. Links to the Energy Minerals Grant (up to \$2000 USD) for students are provided on the EMD website. The application deadline for the Energy Minerals yearly student grant is January 31. Please see the following web page for student grant application instructions:

<<<http://foundation.aapg.org/gia/howto.cfm>>>

The *Atlas of Coal Geology*, published jointly by EMD and The Society for Organic Petrology (TSOP), continues to be a best seller. This publication along with several others is available for sale via the EMD website. The publications include:

Sequence Stratigraphy, Paleoclimate, and Tectonics of Coal-Bearing Strata

AAPG Studies in Geology, No. 51 (2004), Edited by Jack C. Pashin and Robert A. Gastaldo

Unconventional Energy Resources of North America, AAPG Poster (2003), by John R. Dyni

Atlas of Coal Geology, AAPG Studies in Geology, No. 45 (2000), by Alexander R. Papp, James C. Hower, and Douglas C. Peters

Geology in Coal Resource Utilization (1991), by Douglas C. Peters

The second edition of the *Atlas of Coal Geology* is planned for publication by both EMD and TSOP. The volume addressing the microscopic aspects of coal, edited by Jim Hower, is progressing well. Authors are needed to handle chapters on sequence stratigraphy, CO₂ sequestration, and stress environments (ground control, etc.). Please contact Jim Hower <<hower@caer.uky.edu>> or Alex Papp <<apapp5@comcast.net>> if you are interested in contributing to this effort.

Other EMD-sponsored publications currently underway or in the planning process include a collection of papers from the recent AAPG Hedberg Gas Hydrate Conference, edited by Tim Collett; a collection of papers on CO₂ sequestration edited by Jack Pashin and others; and a geospatial technology applications CD-Rom, edited by Sam Limerick.

Membership in earth-science professional organizations has recently been in decline. The EMD especially needs your help to continue to promote research in the areas of geospatial and the energy minerals. In order to continue to have a seat on the AAPG Advisory Council, EMD needs to maintain and increase its membership. There is much overlap in the goals of EMD and those of many other geological societies, so EMD invites related society members (if they are not already) to become a member of AAPG and EMD. EMD and AAPG membership application material is available on the following website:

http://emd.aapg.org/membership_form.cfm

Experimenting in the Kitchen

Brooks Hanson

The surfaces of basaltic lavas commonly exhibit two kinds of textures: Pahoehoe flows form a ropy and relatively smooth surface, and Aa flows look like jumbled, sharp, angular blocks. It is generally thought that these types reflect an interaction between the viscosity of the lava, which varies as it cools and crystals form, and the shear rate of the flow. Many flows change their morphology from pahoehoe to Aa, and a few change back.

To investigate this transition, Soule and Cashman carried out a series of laboratory experiments using

corn syrup (diluted to the viscosity of hot basaltic magma) and rice (which has the same density as the diluted syrup and represents the lava crystals). They observed four different regimes: With increasing amounts of rice (corresponding to increasing viscosity), flow is laminar; the rice grains aggregate into clumps; shear zones form between the clumps; and finally, a thin film of rice-free syrup appears along the flow boundary, perhaps by cavitation, and the main flow is thus detached. This evolution and the abrupt transitions between these regimes are consistent with field measurements of the pahoehoe-to-Aa transition.

Geology 33, 361 (2005).

AAAS Editors' Choice: Highlights of the recent literature May 27 2005, 308 (5726)

The California Geological Survey (CGS) has recently announced that **John G. Parrish**, Ph.D., has been appointed the new California State Geologist in April 2005. The State Geologist is the chief administrator of CGS within the Department of Conservation.

The Mechanics of Explosive Volcanic Eruptions

Reported by Dan Day

The April 27, 2005 NCGS meeting featured an introduction to fluid mechanical analysis of volcanic eruptions. Speaker **Michael Manga** of the Earth and Planetary Science Department at U.C. Berkeley presented theoretical, experimental, and field data to describe the seemingly unpredictable nature of explosive volcanic eruptions.

Dr. Manga has a multi-faceted academic background in geophysics, fluid mechanics, and earth science that has allowed him to confront some of the complex problems involved with modeling volcanic eruptions. He, his students, and his colleagues utilize mathematical models and ingenious laboratory equipment to simulate the

surprisingly complex behavior of volcanoes. Throughout history, mankind has been exposed to volcanism. But mathematical characterization of eruptions has proven to be a daunting task. However, Michael and his team of dedicated students have successfully confronted this challenge. Their work has melded field observation, laboratory experiment, and mathematical theory to describe important aspects of volcanic activity.

Ironically, both explosive and effusive (lava flow) eruptions often emanate from the same volcano. The question is what specific physical conditions favor each of these processes. Obviously it would be quite beneficial to determine parameters that could be used to signal the onset of explosive events. Defining the conditions necessary for explosive eruptions, particularly magma outgassing mechanics, are the central theme of Dr. Manga's research.

To model eruptions, Michael and his graduate students designed and assembled specialized equipment to mimic volcanic processes. The research team simulated an eruption using a vacuum chamber constructed by graduate student Atsuko Namiki. Functioning as a decompression chamber, the apparatus can simulate various eruptive scenarios using a xanthum gum mixture as a surrogate magma. By controlling the evacuation rate and the pressure inside the chamber, the researchers were able to examine various fluid responses and record them using a high-speed camera. The vacuum controls "magma" ascent velocity, and the outgassing rate or exsolution of dissolved volatiles (H₂O) controls the transition from effusive to violent explosive behavior. Fluid mechanics equations were used to mathematically model a variety of physical properties including the strain versus temperature response of the liquid phase, viscous drag near the conduit wall, the effects of magma water content on its rheological (flow) properties, and bubble growth rates. The results indicate the magma velocity profile across a cylindrical conduit becomes more blunt (less parabolic in cross sectional shape) as the magma outgasses and its viscosity increases. The team's calculations indicate explosive activity begins when

the depth (pressure) dependent shear rate and brittle failure shear rate curves for the magma intersect. At pressures below this critical value catastrophic magma fragmentation occurs.

The Berkeley research group validated its theoretical models using these controlled laboratory experiments. The xanthum gum vacuum chamber studies revealed five fluid response styles based on pressure change (ascent rate), liquid viscosity, and bubble content. The sudden pressure drop when the chamber valve was opened created an expansive pulse or wavefront that swept through the gum charge in the sample cartridge beneath the vacuum chamber. With progressively decreasing pressure (increasing vacuum/ascent velocity) the gum response regimes were ranked as “no response”, mild expansion, detachment, partial rupture, and violent fragmentation (explosive response). These events were clearly recorded by the high-speed camera. Controlled testing showed that the five flow regimes were encountered at higher chamber pressures (lower vacuum) as the gum bubble concentration (volatile content) was increased. The sudden pressure drop promoted bubble evolution. Breaking the walls between neighboring bubbles caused fragmentation. A very delicate balance was seen to exist between the degassing mechanics and effusive versus explosive eruptive behavior. Partial bubble rupture favors benign degassing. The magma viscosity and its shear rate at the conduit walls (ascent velocity) during degassing determine if fragmentation is associated with effusion (surface flows) or explosive eruption. As magma viscosity decreases and the conduit wall shear rate increases, eruptions tend to exhibit explosive behavior.

The theoretical calculations and laboratory experiments were supplemented by careful fieldwork and microscopic examination of rock specimens from Little Glass Mountain in northern California’s Medicine Lake volcanic field. Rhyolite flow bands revealed a progression of events beginning with magma fragmentation, followed by fragment reorientation, particle welding, and viscous stretching into parallel streaks. This

fragmentation-to-flow banding process is typically repeated several times over the course of a single eruption. Fragmentation facilitates magma degassing, hence permeability must control the transition from effusive to explosive eruptions. The more permeable the magma becomes, the easier it degasses. Less permeable magmas tend to fragment violently when the bubble pressure exceeds their shear strength.

Dr. Manga’s conclusions gain additional support from field observations at the Philippines’ Mount Pinatubo, the Mule Creek vent in New Mexico, Oregon’s Newberry volcano, and the Torfajokull rhyolite vent in Iceland. Some relationships suggest volatile loss may be into the conduit wall through pervasive country rock fracture systems. Future work by Michael and his graduate students will include modeling the viscosity effects of crystals suspended in the magma.

The April 27th presentation underscored the complexity of volcanic activity and highlighted several factors that produce explosive and effusive eruptions from the same vent. Magma viscosity is a key fluid property that is determined by liquid composition, melt crystallinity, and volatile content. Ascent rate and magma temperature also influence eruption behavior. These properties play major roles in how volcanoes erupt—either as relatively benign flows or as violent explosive events that destroy everything in their path. Combined theoretical, experimental, and field studies are systematically filling the gaps in our understanding of volcanism.

The NCGS expresses its thanks to Dr. Michael Manga of U.C. Berkeley for explaining his sophisticated approach to modeling volcanic eruptions. His talk brought together theory, experiment, and field observations to show his audience the complexity of volcanic processes. More detailed discussions of Dr. Manga’s diverse research interests can be found at <http://seismo.berkeley.edu/~manga>.

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



TEACHER'S WORKSHOP

SATURDAY OCTOBER 22, 2005; 9 a.m-5 p.m.

BLACK DIAMOND MINES REGIONAL PRESERVE

SPONSORED BY

EAST BAY REGIONAL PARK DISTRICT AND NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

To celebrate National Earth Science Week 2005, NCGS and the Educators Academy of the East Bay Regional Park District, are co hosting a very special day for teachers at Black Diamond Mines near Antioch. From the early 1860s to about 1904, the Mount Diablo coalfield was the site of a flourishing coal mining operation. Five major towns emerged in the coalfield and for a time formed the major population center of Contra Costa County. Over 4 million tons of coal were mined in this area and provided a major source of fuel to the emerging industrial facilities of Bay region and beyond. The increasing costs of mining and the importation of coal from other places led to a rapid decline of the mining operations. Although the towns were abandoned, the records of life in the mining towns are preserved in the historic Rose Hill Cemetery overlooking the town site of Somersville. Exotic trees mark the former home sites and waste piles and tunnels indicate the site of the old mines. Later, from the 1920s to the 1940s, the area was mined again, this time for silica sand for glass making by the Hazel Atlas Glass Company of Oakland. The Black Diamond Mines Regional Preserve was set aside to protect this area rich in Geology and mining history and it is a popular place for school field trips.

The day will begin at 9 a.m. with an orientation and slide presentation in the underground theatre in order to introduce the teachers to the Geology and cultural history. This will be followed by an underground mine tour through a portion of the Hazel Atlas Mine led by geologists from NCGS and naturalists of the East Bay Regional parks. A barbecue lunch will be provided to participants by the NCGS. The lunch will be followed by a walk through the Somersville townsite and a visit to the Rose Hill Cemetery where teachers will learn about the way of life for the families who lived in the mining towns. Participants will receive a teacher's guide and other materials that will be useful in bringing class groups to the park.

The cost of the field course (Course 9369) is \$49 (Alameda/Contra Costa County residents, \$51 non-resident. 1 academic unit is available (add \$49). ***The NCGS will provide a \$15 subsidy to each teacher the morning of October 22, 2005.***

***Call** (510) 636-1684 between 8:30a.m. And 4p.m., Monday through Friday. Have the course numbers and your credit card ready.

***Download, complete, and mail or fax** the [enrollment form](#) (31k Adobe Acrobat PDF, 1 page, 8.5 x 11 inches). Fax to (510) 635-5502.

Mail to:

Educators Academy
Reservations Department
East Bay Regional Park District
P.O. Box 5381
Oakland, CA 94605-0381

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



NCGS FIELD TRIP

BLUESCHISTS AND BREWERIES (*BREWSCHISTS II*)

Saturday & Sunday June 25 -26, 2005

Leader: Dr. John Wakabayashi, Consultant

Many field trips celebrate wine and geology. The Coast Ranges, whose geology is world famous because of the Franciscan Complex, is world famous for another fermented beverage besides wine---beer. Just as Franciscan blueschists have attracted the interest of geologists from around the world, the ales of US West Coast have won international acclaim as a regionally distinct style. One can make a good case that the small breweries of this region are as renowned among international beer enthusiasts as the wineries of the region are among wine lovers. This two-day field trip is a celebration of two things for which California is famous, blueschists of the Franciscan Complex, and wonderfully aromatic hoppy ales. There will be no private vehicles on this trip as participants will be transported by bus. All of the pubs on the schedule feature good food, so there is plenty to enjoy for individuals or families that do not wish to have beer. This trip reprises a trip that was run in 2001, but features a different camping spot (Lake Sonoma), and a different Sunday lunch stop.

THIS FIELD TRIP WILL BE LIMITED TO 31 PEOPLE

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

Time & Departure: Saturday June 25, 2005, 8:00 am (sharp), gathering place TBA.

Cost: \$75/person for both members & non-members; includes guidebook, campground, chartered bus, Saturday night BBQ, beer & wine, Sunday morning breakfast (pastries & fruits) and coffee

*******REGISTRATION FORM (Brewschists II Field Trip)*******

Name: _____ E-mail: _____

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

Lunch / 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: aars@netscape.com Phone: (925) 370-0685 (evening - PREFERRED) (925) 363-1999 (day – emergency)