NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

MEETING ANNOUNCEMENT

DATE: **January 27, 2010**

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

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

SPEAKER: **Dr. Stephen Tobriner, Professor Emeritus of Architectural History,** University of California, Berkeley, CA

The Earthquake of 1868 and the Birth of Seismically Resistant Architecture and Engineering in the San Francisco Bay Area

This lecture presents a revolutionary view of the 1868 earthquake. While popular authors have claimed San Franciscans consistently denied earthquakes and learned nothing from them, this lecture will prove that engineers and architects built earthquake-resistant buildings after the earthquakes of 1868. The earthquake stimulated a wide-ranging discussion of seismically-resistant designs and spawned a series of innovative seismically-resistant patents for insuring the safety of brick buildings in earthquakes. Many of the city's most important buildings, including the United States Mint, the United States Appraiser's Building, the Palace Hotel, the Grand Hotel, and the enlargement of the Occidental Hotel were built to withstand earthquakes, and successfully withstood the earthquake of 1906. The Regents of the new University of California, Berkeley, having experienced the earthquake of 1868, insisted that their buildings be seismically resistant. San Franciscans also saw the effectiveness of wood as a seismically-resistant material and realized how much safer it was to live in wood rather than brick dwellings. Looking back at the history of earthquakes in the Bay Area, it is essential to remember the story of forgotten citizens, engineers, and architects who did not deny earthquakes, but actively intervened to insure a safer San Francisco.

Biography: Dr. Stephen Tobriner is a Professor Emeritus of Architectural History in the Architecture Department at the University of California, Berkeley, where he taught a survey of world architecture and cities for thirty-five years. His philosophy of teaching can be found in an essay he wrote when he received an award for Outstanding Mentorship of GSIs in 2004. He was trained as a scholar of Baroque architecture and Mesoamerican architecture and cities at Harvard, where he wrote a significant paper on the planning of ancient Teotihuacan.

…Continued on the back…

NCGS 2009 – 2010 Calendar

Wednesday January 27, 2010
The Earthquake of 1868 and the Birth of Seismically Resistant Architecture in California
Dr. Stephen Tobriner, Professor Emeritus of Architecture, UC Berkeley
7:00 pm at Orinda Masonic Lodge

Wednesday February 24, 2010
TBA
Dr. C. Page Chamberlain, Professor, Geological & Environmental Sciences, Stanford, CA
7:00 pm at Orinda Masonic Lodge

Wednesday March 31, 2010
TBA
Dr. Mel Erskine, Consulting Geologist
7:00 pm at Orinda Masonic Lodge

Wednesday April 28, 2010
TBA
Dan Leigh, Shaw Group, Inc.
7:00 pm at Orinda Masonic Lodge

Wednesday May 26, 2010
TBA
7:00 pm at Orinda Masonic Lodge

Wednesday June 30, 2010
TBA
7:00 pm at Orinda Masonic Lodge

Our Usual Summer Break: July – August 2010

Upcoming NCGS Field Trips

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 John Christian at: **jmc62@sbcglobal.net**.

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. Please check the website for current details.

- Feb. 9, 2010, Eric L. Geist will present on Tsunami Generation
- March 9, 2010, Robin Stewart, USGS Water Resources; ***Understanding the Influence of Food Web Dynamics on Mercury and Selenium Bioaccumulation in Nature***.
- April 13, 2010, Dave Wagner, California Geological Survey, Recent work on the Oak Creek debris flows east of the Sierras
- May 11, 2010, Julie C. Fosdick, Stanford, Andes research.

Association of Engineering Geologists San Francisco Section

Upcoming meetings

Meeting locations rotate between San Francisco, the East Bay, and the South Bay. Please check the website for current details:

- February 9, 2010; 6:00 pm; JC Isham; ***Reclamation of the Jamestown Gold Mine, Jamestown, CA***
- March 16, 2010; 6:00pm Paul Marnios Jahns Lecturer
- April 13, 2010; 6:00pm Student Night

To download meeting details and registration form go to: http://www.aegsf.org/.

USGS Evening Public Lecture Series

The USGS Evening Public Lecture Series events are free and are intended for a general public audience that may not be familiar with the science being discussed. Monthly lectures are usually scheduled for the last Thursday evening of each month during most of the year but are occasionally presented on the preceding Thursday evening to accommodate the speakers. For more information on the lectures, including a map of the lecture location (Building 3, 2nd floor; Conference Room A) go to:
http://online.wr.usgs.gov/calendar/

- January 28, 2010; 7:00 pm Michael Field, Senior Marine Geologist, ***Coral Reefs, the 6th Extinction, and You***

Predicting the Future of San Francisco Bay: Learning from History

A UC Museum of Paleontology Short Course
Saturday, February 6, 2010

UC Berkeley, 8:00 am to 4:00 pm
Registration information

Sea level fluctuations in the Bay Area? It happened before, but will it happen again? Join the experts to learn about how our knowledge of the history of the San Francisco Bay can inform our understanding of its future.

Deep (or not so deep) history of the San Francisco Bay, Doris Sloan, Adjunct Professor, Earth and Planetary Science, UC Berkeley, and Curatorial Associate, UCMP

The origins and history of San Francisco Bay are dependent on the geologic processes that created it. These processes include plate tectonics, climate, and sea level changes that have shaped the present and past bays. Today's Bay holds many surprises which are not evident to the millions who live on its shores. We will talk about the secrets hidden by its waters, the geologic processes operating on the Bay today and the human impact on its margins.

San Francisco Bay: Interfacing ocean and rivers through time, Jere H. Lipps, Professor of the Graduate School, Integrative Biology, UC Berkeley, and Faculty Curator, UCMP

The Pacific Ocean, San Francisco Bay and the delta are closely interrelated through a system of water levels and precipitation, and they are always changing. For most of the past two million years, sea level was lower, world temperatures were cooler, and San Francisco Bay did not exist. The configuration of the Bay and delta developed only 4000 years ago. Changes are a response to natural variations in the Sun-Earth system that cause overall global climate to cool and warm every so often. Now human activities world-wide are generating climate-warming gases in the atmosphere squarely on top of this time of naturally high sea levels and temperature. Sea level and global temperatures will continue to rise and will impact the Bay and delta significantly.

Historical wetlands of San Francisco Bay Robin M. Grossinger, scientist at the San Francisco Estuary Institute

Before development, the Bay's shoreline was a broad intertidal landscape comprising over 200,000 acres of diverse wetland habitat types. While most were destroyed prior to 1900, their characteristics and spatial patterns are revealed in a remarkable array of historical documents. This talk will explore the historical landscape, its transformation, and how these data are contributing to contemporary restoration efforts.

Does knowing the history of life in the Bay help us with its restoration? Andrew Cohen, Director of the Center for Research on Aquatic Bioinvasions (CRAB)

Life in the Bay today is not as it was in the late 18th century when the first Europeans arrived on the scene. We have limited knowledge of the Bay's biota at that time or of many of the changes it has undergone since then, though we recognize that those changes have been enormous. What do we actually know about the history of Bay species now being targeted for restoration, and how should that knowledge be used to shape restoration efforts? We consider these questions by looking at three species: a mollusk, a plant and a mammal.

San Francisco Bay: Learning from the past, celebrating the present, preparing for the future, Will Travis, Executive Director of the San Francisco Bay Conservation and Development Commission (BCDC)

Between 1850 and 1960, diking, filling, and land reclamation reduced the size of San Francisco Bay by one-third. In 1965, state legislation put a management and regulatory structure in place that has reversed the historic shrinking of the Bay, enhanced the Bay ecosystem, and advanced the economic prosperity of the Bay region. However, sea level rise from global warming could inundate vast low-lying shoreline areas and return the Bay to about the size it was in 1850. Our challenge is to provide a comprehensive regional climate change strategy that will integrate the reduction of greenhouse gas emissions, the protection of critical regional access, the enhancement of natural resources, and adaptation to the impacts of global warming and sea level rise.

FYI

NCGS was recently contacted as the result of **Dan Day's** Panoche Cold Seep article of **Mel Erskine's** field trip on our website. The article was found by someone researching the Panoche Valley due to a large scale solar farm that is proposed for Panoche Valley and some of the Panoche Hills. A website has been set up to disseminate information about the plans at http://savepanochevalley.com. The scale of the planned development is indeed large.

Geologists to Map New Fault Near Truckee

By Barbara Barte Osborn,
Sacramento Bee Correspondent
November 19, 2009

Geologists from two national engineering firms will begin mapping the recently identified Polaris earthquake fault near Truckee. Kleinfelder and AMEC-Geomatrix will be paid $250,000 for their part of the continuing study of the dam in Martis Valley, which lies between Truckee and North Lake Tahoe. The Martis Creek Dam is plagued by seepage as well as the fault, has been deemed one of the riskiest of the U.S. Army Corps of Engineers' 610 dams nationwide and is the subject of a long-term study and remedial efforts.

"Seismically, it's very active up there," said Ronn Rose, a corps geologist and dam safety program manager for the corps' Sacramento district. Discovery of the fault, in which Rose had a part, is "exciting for the geology community," he said. "It's not common that you find a brand-new fault."

The fault is about 21 miles long, extending from a few miles south of the Northstar-at-Tahoe ski resort northward into the Sierra Valley near Loyalton, Rose said. It has been recently active – geologically speaking – "probably within the last 11,000 years," he added. In a conference this summer, a corps presentation included a 2008 U.S. Geological Survey calculation that the Polaris fault "may be capable of a 6.9 event."

More mapping and trenching are needed to determine the exact length of the fault and whether it is linked to other known faults, Rose said. "The longer the fault, the larger the earthquake that could occur," he said.

Maps are expected to be ready by next spring or summer and will help determine sites for future trenching and information-gathering. Seepage at the dam is less of a concern, he said, as "it's for flood protection and we don't store a lot of water behind it."

By 2014 the corps expects to determine what should be done about the dam – "from leaving it as is, to removing it, to new construction," said Adam Riley of the corps' Civil Works Project Management office. Construction could begin in 2019 if that option is chosen.

Extinction of Giant Mammals Altered Landscape

Different Plant Communities Popped up, Wildfires Increased, Study Suggests

By Jeanna Bryner, LiveScience
November 19, 2009

The last breaths of mammoths and mastodons some 13,000 years ago have garnered plenty of research and just as much debate. What killed these large beasts in a relative instant of geologic time? A question asked less often: What happened when they disappeared?

A new study, based partly on dung fungus, provides some answers to both questions. The upshot: The landscape changed dramatically. "As soon as herbivores drop off the landscape, we see different plant communities," said lead researcher Jacquelyn Gill of the University of Wisconsin, Madison, adding the result was an "ecosystem upheaval"

Gill and her colleagues found that once emptied of a diversity of large animals equaling or surpassing that of Africa's Serengeti, the landscape completely changed. Trees once kept in check by the mammoth gang popped up and so did wildfires sparked by the woody debris. The results, which are detailed in the Nov. 20 issue of the journal Science, could paint a picture of what's to come if today's giant plant-eaters, such as elephants, disappear.

"We know some of these large animals are among the most threatened that we have on the landscape today and they have a lot of large habitat requirements and they eat a lot of food," Gill told

LiveScience. "If these animals go extinct we can expect the landscape will respond."

Dung fungus

Gill and her colleagues analyzed sediment samples collected from Appleman Lake in Indiana as well as data from sites in New York. They focused on a dung fungus called Sporormiella that must pass through a mammal's gut to complete its life cycle and reproduce via spores. More of such spores indicate more dung and more megafauna around to contribute to the fecal contents. Within that same sediment, the team looked at pollen and charcoal as proxies for vegetation and fires, respectively.

Sediment layers accumulate over time and can indicate when the stuff embedded in it was around. By matching up the dung spores along with vegetation and fire indicators in certain layers, the researchers figured the large herbivores were already declining before the vegetation started changing or wildfires took off.

The changes in spore abundance suggest the megafauna began to decline some time between 14,800 and 13,700 years ago. By 13,500 years ago, the decline was in full force, Gill said. Rather than getting vaporized in an instant, the results suggest the animals gradually dwindled for about 1,000 years.

Here's how it may have gone down: The large herbivores started to decline. Without such leafy eaters to keep broad-leaved species in check, trees such as black ash and elm took over a landscape once dominated by conifers. Soon after, the accumulation of woody debris sparked an increase in wildfires, another key shaper of landscapes, the researchers say.

What killed the mammoths?

As for what drove the beasts into their graves, Gill says the findings don't put the nail in the coffin, but do rule out some ideas. To explain the extinction, scientists have put forth climate change, hunting by humans such as the Clovis people (known for using advanced spear tips), and even impact by a comet. The answer could be a combination of several factors, scientists say.

Gill says this new study is a strong one because all of the evidence comes from one place, and so the researchers aren't making comparisons across different regions whose sediments may be off in terms of timing. If the timing is accurate, as Gill says it should be, the findings can rule out the idea of a meteor or comet killing off the creatures some 13,000 years ago.

And since the plant community didn't change until after the big guys began to decline, that's a mark against climate change. (A warming climate was considered the cause of a revamping of vegetation, and thus animal habitat.)

"At this site, we can say that habitat loss didn't cause the decline, because the major habitat shift happens after the collapse [of the megafauna]," Gill said. "And habitat change is a big line of argument in the climate camp. If climate change is causing these extinctions, you'll have to evoke another process than habitat loss."

Hunting, at least that by the Clovis people, can also be ruled out at the site. "It seems as though the animals were already in decline by the time [Clovis] people adopted this tool kit," Gill said, referring to the advanced spear tips thought to be more efficient at taking down large prey than hunting instruments used by humans prior to the Clovis.

The new study was funded by the Wisconsin Alumni Research Foundation, the UW-Madison Center for Climatic Research in the Nelson Institute for Environmental Studies, and the National Science Foundation.

Fault Weaknesses, the Center Cannot Hold for Some Geologic Faults

ScienceDaily (Jan. 4, 2010)

Some geologic faults that appear strong and stable, slip and slide like weak faults. Now an international team of researchers has laboratory evidence showing why some faults that "should not" slip are weaker than previously thought.

"Low-angle normal faults, faults that dip less than 45 degrees, are a problem," said Chris Marone, professor of geosciences, Penn State. "Standard analysis shows that these faults should not slip because it is easier to form a new fault than to slip on this orientation."

However, field evidence shows that low-angle normal faults do slip. One explanation is that they act more like weak faults, slipping and sliding. Previous laboratory experiments indicated that the fabric of the rocks in the fault had too much friction for the faults to slide easily. The researchers wanted to test the material in the fault in a form closer to what occurs naturally.

"The standard way to test the friction of the rocks in a fault is to take some of the rock and grind it up into a powder," said Marone. "The powder is then tested in an apparatus that applies shear forces to the materials measuring the amount of force it would take to move sides of the fault."

These conventional measurements indicated that low-angle normal faults have too much friction to move, but the reality is that they do move.

" Cristiano was insistent on checking the shear forces under conditions as close to the natural situation as possible," said Marone. "I thought what he wanted to do was impossible because the rocks cannot easily be cut into a shape that we can work with. We need a prismatic wafer of the material."

Cristiano Collettini, researcher at Geologia Strutturale e Geofisica, Universita degli Studi di Perugia, Italy, got his way because of an unusual low-angle normal fault on the Isle of Elba. The Zuccale fault sits exposed on the beach so it is easy to gather large amounts of rock.

The researchers first ground the material and tested the powder in the conventional way. The ground powder did produce sufficient frictional forces to prevent slipping. This is what they expected.

"Normally the rock we use from fault zones comes from below the surface and we only get small amounts to work with," said Marone. "With the samples from Elba we could use a rotary cutter and carve a wafer from the rock with the same orientation that would slip in the ground."

The wafers were about two by two inches square and an eighth of an inch thick. The researchers found that material prepared in this way was very weak when sheared in one direction moving almost like a deck of cards pushed in opposing directions.

The reason for the low friction is small patches of talc and clays like montmorillonite that allow the material to slide.

The researchers, who also include Andre Niemeijer, former Penn State postdoctoral fellow now at Instituto Nazionale Di Geofisica Vulcanologia, Rome, and Cecilia Viti, Universita degli Studi di Siena, Italy, note in the December. 17th issue of *Nature* that "fault weakness can occur in cases where weak mineral phases constitute only a small percentage of the total fault rock and that low friction results from slip on a network of weak phyllosilicate-rich surfaces that define the rock fabric."

Talc and these clays are often found in fault materials. In areas where connected layers of these materials occur, geologists understood that the connections created weak fabric and slipped easily. But when clays or talc create intermittent flake-like surface coatings, they provide far more slip than when they are simply powdered. The discontinuous flakes and coatings that the researchers found were previously considered insufficiently complete to weaken the fault.

"These low-angle normal faults do not look like they will do anything but creep along, but they could have earthquakes," said Marone. "There are places in central Italy, for example, where faults like this have had small earthquakes."

The National Science Foundation supported this work.

Geosciences: Melt Rises to Earth's Surface Up to 25 Times Faster Than Previously Assumed

ScienceDaily (Jan. 4, 2010)

Scientists have successfully determined the permeability of the asthenosphere in the Earth's upper mantle and thus the rate at which melt rises to the Earth's surface: it flows up to 25 times faster than previously assumed. Thermo-mechanical and geochemical models on melt flows in volcanoes now have to be reconsidered.

A colossal centrifuge measuring about two meters in diameter is embedded in the floor in the cellar of the Department of Geosciences. It spins samples at 2800 rpm creating a radial acceleration of 3000 times the Earth's gravity. In full operation this centrifuge makes an infernal noise of 120 decibels. "That's about as loud as if you were standing underneath an airplane," says Max Schmidt, a professor from the Institute for Mineralogy and Petrology at ETH Zurich. The rim of the centrifuge reaches a speed of 850 km/h; if the machine is stopped by switching off the drive motor, it takes an hour to come to a standstill.

Globally unique

Schmidt joined ETH Zurich in 2001 with the idea of building a centrifuge in which, apart from increased acceleration, the temperature and pressure conditions characteristic of the Earth's interior could be used to influence a sample. He was aided by a mechanic, an electronics technician and a company that specializes in producing centrifuges for sugar production or launderettes. After about one and a half years, the first "rough version" of this globally unique centrifuge was put into operation and improved continually. Now Schmidt's research team has successfully used the centrifuge to determine the permeability of the asthenosphere -- the area in the Earth's upper mantle where the molten rock that feeds the volcanoes forms. The results were published in the science journal Nature.

The researchers simulated the asthenosphere's melt transport conditions using basaltic glass from the mid-ocean ridge to represent the molten rock. In the experiment, the mineral olivine, which makes up two thirds of the Earth's upper mantle, served as a matrix for the molten mass to flow through. They heated both to about 1300 degrees and exposed the mixture to a pressure of one gigapascal. The basaltic glass melted; based on the distance the molten mass covered through the olivine matrix when centrifuged at accelerations of 400 to 700g, the scientists were able to calculate the permeability directly by microscopically analyzing the samples prepared. This therefore enabled them to record specifically the constant which relates porosity (or melt volume) to permeability and that is important for thermo-mechanical models of melt transport.

Lava from the days of the Pharaohs

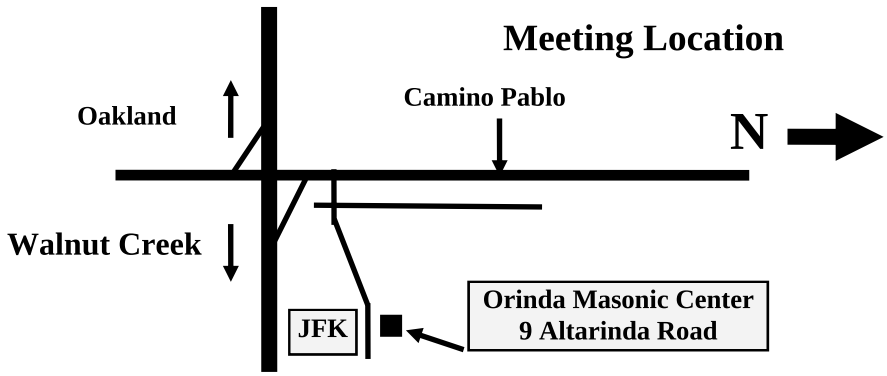
With a value of around ten, this constant is smaller by one and a half orders of magnitude than the value previously assumed for thermo-mechanical models. "Consequently, this also means that the magma speed in the mantle is one and a half orders of magnitude faster," says Schmidt, "as the models calculated by James Connolly, an assistant professor at the institute, reveal."

With such models, the flow behavior of magma melt in the basic tectonic areas of the Earth, such as on mid-ocean ridges upon which new oceanic crust forms, or on volcanically active tectonic plate margins -- so-called subduction zones. For Schmidt, it is therefore clear that the existing models need to be revised in light of the constants now established. The melt that forms at a depth of about 120 kilometers does not need tens to hundreds of thousands of years to reach the Earth's surface as was previously presumed; it only takes a few thousand years. "If a volcano erupts today, its magma did not form during the last ice age, but during the reign of the Pharaohs and around the birth of Christ," states Schmidt.

Balanced picture

This casts magmatism in a whole new light. Due to the rapid ascent, the melt interacts much less with the rock it penetrates. This means that the geochemical signals that bring the magma to the surface come from far greater depths: "We are looking deeper than previously assumed," says the mineralogist. For the scientist, the rapid ascent also fits better with the fact that volcanoes are only active for a few thousand years and the observation that geochemical signals in the magma suggested a much faster rise until now.

The editor thanks John Christian for suggesting many of these articles.



He wrote his Ph.D. dissertation on the planning and architecture of the city of Noto, a small Sicilian city rebuilt after an earthquake in 1693. His book *The Genesis of Noto, an 18th Century Sicilian City*, appeared in 1982 and was republished in Italian as *La genesi di Noto, una città italiana del Settecento* in 1989. Tobriner became fascinated by the politics, sociology, and technology of earthquake-resistant engineering. He has written extensively on architecture and cities in Sicily and the history of reconstruction after earthquakes in Europe, the Americas, and Asia. He has lectured throughout the United States and in Italy and was a Visiting Professor at the University of Palermo. He has investigated damage in contemporary earthquakes around the world as a member of teams sponsored by the United Nations, the National Science Foundation, the Earthquake Engineering Research Center, and the Earthquake Engineering Research Institute. His book, *Bracing for Disaster: Earthquake-Resistant Architecture and Engineering in San Francisco, 1838-1933,* along with a guidebook to seismic retrofits on the University of California Berkeley campus entitled *Bracing Berkeley*[PDF, 21.3 MB], co-authored with Mary C. Comerio and Ariane Fehrenkamp and published by the Pacific Earthquake Engineering Research Center, appeared in 2006, the year he retired from University teaching. He was a keynote speaker for the joint Earthquake Engineering Research Institute, Seismological Society of America, and Office of Emergency Services meeting marking the centennial of the San Francisco earthquake of 1906 on April 18, 2006. In 2008 he was a keynote speaker at the MERCEA convention commemorating the Messina-Calabria earthquake of 1908. In recognition for his contributions to its history, the city of Noto, Sicily, made Tobriner an honorary citizen. In 2008 Tobriner lectured on earthquakes and mythology in the ancient Aegean at a conference on the island of Santorini, Greece. Tobriner, who lives with his wife in Berkeley, California, and Orcas Island, Washington, continues to write papers and give public lectures while also pursuing his passion for sculpting in terracotta.

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