

# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



*NCGS Newsletter Editor:*

Mark Detterman

[mdetterman@blymyer.com](mailto:mdetterman@blymyer.com)

*Secretary:*

Dan Day: [danday94@pacbell.net](mailto:danday94@pacbell.net)

NCGS Voice Mail: 925-424-3669

Website: [www.ncgeolsoc.org](http://www.ncgeolsoc.org)

More Field Trip Photos Added!

Future Abstracts Available!

## NCGS OFFICERS

*President:*

Bob Kieckhefer

[rmki@chevrontexaco.com](mailto:rmki@chevrontexaco.com)

*President-Elect:*

*Field Trip Coordinator:*

Tridib Guha: [aars@earthlink.net](mailto:aars@earthlink.net)

*Treasurer:*

Phil Reed: [philecreed@msn.com](mailto:philecreed@msn.com)

*Program Chair:*

Bill Perkins

[wep Perkins@comcast.net](mailto:wep Perkins@comcast.net)

*Scholarship:*

Randy Kirby

[rkirby.geosci@usa.net](mailto:rkirby.geosci@usa.net)

*K-12 Programs:*

John Stockwell

[kugeln@msn.com](mailto:kugeln@msn.com)

*Membership:*

Barb Matz

[Barbara.matz@shawgrp.com](mailto:Barbara.matz@shawgrp.com)

## COUNSELORS

*Programs:*

Ron Crane: [roncrane@aol.com](mailto:roncrane@aol.com)

Don Lewis: [donlewis@comcast.net](mailto:donlewis@comcast.net)

Frank Picha: [afpicha@comcast.net](mailto:afpicha@comcast.net)

Ray Sullivan

[sullivan@lucasvalley.net](mailto:sullivan@lucasvalley.net)

## MEETING ANNOUNCEMENT

**DATE:** Wednesday, May 26, 2004

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

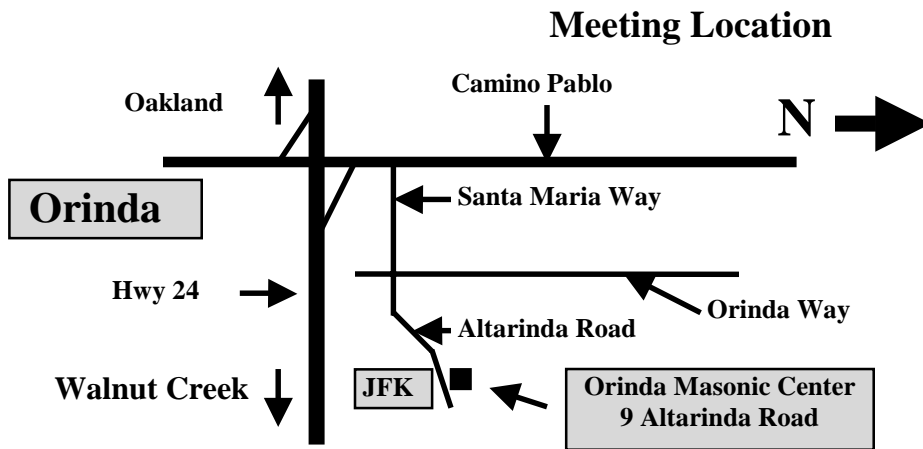
**TIME:** 6:30 p.m. Social; 7:00 p.m. talk (no dinner) Cost:  
\$5 per regular member; \$1 per student member

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

**Speaker:** Jim Ellis, Ph.D. Ellis GeoSpatial, Walnut Creek,  
California

## *Mapping with Remote Sensing & GIS*

Environmental and geologic mapping is being significantly improved with remote sensing & GIS technologies. New airborne and satellite sensors can map different minerals, differentiate vegetation communities, measure vegetation vigor, and detect oil seeps and spills. The scale of mapping can range from regional to highly detailed (6" ground resolution). Using GIS to integrate imagery and derived maps with digital elevation models, published maps, and field observations can enhance understanding of geology and environment. Data access is remarkable for earth scientists working in the USA - you can now download all types of images and GIS maps directly into your PC via the Internet. The application of these technologies for environmental and geologic mapping will be demonstrated through several case histories. Editor note: We understand that 3D glasses may be provided to help visualize some of the images.



## BIOGRAPHY

Jim Ellis began his remote sensing career with Gulf Oil in 1982. He joined Chevron in 1985 to implement remote sensing and associated technologies for international environmental and exploration applications. He helped found The MapFactory in 1997 to expand into other applications. In 2002 he established Ellis GeoSpatial ([www.ellis-geospatial.com](http://www.ellis-geospatial.com)) to provide focused remote sensing & GIS solutions to industry and government. Jim has over 25 industry publications and has taught several workshops at conferences. He teaches part-time at Diablo Valley College (Physical Geology and Remote Sensing). He received his Bachelors from the University of Rochester and his Masters and Ph.D. from the State University of New York at Buffalo. He is a State of California Registered Geologist.

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](mailto:danday94@pacbell.net) to sign up for this service.

# *NCGS 2003-2004 Calendar*

**Wednesday May 26, 2004**

Jim Ellis, Ph.D.; Ellis GeoSpatial  
*Mapping with Remote Sensing & GIS*  
7:00 PM at Orinda Masonic Center

**Wednesday June 30, 2004**

David A. Bero, P.G., R.G.  
*Geology of the Tiburon Peninsula, Marin County, CA*  
7:00 PM at Orinda Masonic Center

---

## *Upcoming NCGS Field Trips*

**July 10, 2004**

*Geology and Groundwater Resources of the Merced Formation in the Westside Basin of the Coastal San Mateo and San Francisco Counties*

Ed Clifton, Ralph Hunter (Retired USGS), and Gregg Bartow (Public Utilities Commission)

**Fall 2004**

*Devil's Slide*

Carl Wentworth, U.S.G.S. and others

**Fall 2004**

*East San Jose Landslide - Tectonically Driven?*

Sands Figuers,  
Norfleet Consultants

---

## *Upcoming Meetings of Interest – Bay Area Geophysical Society*

**May 20, 2004** BAGS Luncheon:

**Eli Silver**, University of California, Santa Cruz  
[\*The Tectonic Enigma of the Middle America Trench: Geophysical Studies\*](#)

**Location:** California State University, Hayward,  
25800 Carlos Bee Blvd., Hayward, CA 94542

**Talk:** 12:00 p.m., Science North, Rm. 347

**Lunch:** 13:00 p.m., Bronco Billy's Pizza, 26775  
Hayward Blvd., Suite J, Hayward, CA 94542 ([Map](#))

**Directions:** [CSU Hayward Campus](#)

**Map:** [CSU Hayward Campus](#)

An abstract and biography is at:

<http://sepwww.stanford.edu/bags/Talks>

---

[www.ncgeolsoc.org](http://www.ncgeolsoc.org)

Please check our website for abstracts and biographies for up coming (and previous) talks under the "Meetings" page. We've also recently posted a number of photos and field trip reviews from the following field trips: June 2002 Sierra Buttes and Sixteen-to-One Mine, January 2003 San Francisco Bay Model, February 2003 Northbrae Rhyolite, April 2003 Pacheco Pass - Franciscan Metasedimentary Section, May 2003 Diablo-Antiform - Diablo Range Intersection, June 2003 Geology of the Right Stepover Region - Rogers Creek and Maacama Faults, August 2003 Clear Lake Volcanics, and the September 2003 Geology of the Pt. Reyes Area. See where we've been and what you may have missed! These pages are still a good way to see and learn a bit more about local geology. You'll find these under the "Pictures From Events" page. We will continue to add content to the site in hopes that it becomes more useful to you. Let us know what you like, and what you might find helpful.

---

## *Employment Opportunity*

**Diablo Valley College** in Pleasant Hill, California, is currently seeking qualified individuals for **part-time teaching opportunities in the geology department**, day program, for the fall term, beginning August, 2004. Minimum qualifications include a Master's Degree in geology, geophysics, earth science, meteorology, oceanography or paleontology, OR a Bachelor's Degree in geology AND a Master's in geography, physics or geochemistry, OR the equivalent. A Master's Degree in geology is preferred. Interested individuals should contact Jean Hetherington, 925-685-1230 x2462 or [jheteri@dvc.edu](mailto:jheteri@dvc.edu). Information about the college can be found at [www.dvc.edu](http://www.dvc.edu)

# Association for Woman Geoscientists Presents

## Earth Colors and the 'Art' of Science

by Geologist and Mystery Writer Sarah Andrews

**Date:** Thursday, June 17<sup>th</sup>

**Time:** 6:30 pm social, dinner served at 7:00 pm, presentation begins at 7:30 pm

**Location:** The Bay Model, Sausalito. Though the address is 2100 Bridgeway; Sausalito, the building containing the model and visitor center is not on Bridgeway, but between Marinship Way and the waterfront. The visitor's entrance is located at the front of the building on the waterfront. There is plenty of parking.

**Directions:** See-attached map (next page).

**RSVP:** by June 15th to Christi Nelson, christin@stetsonengineers.com (so we can order enough pizza!)

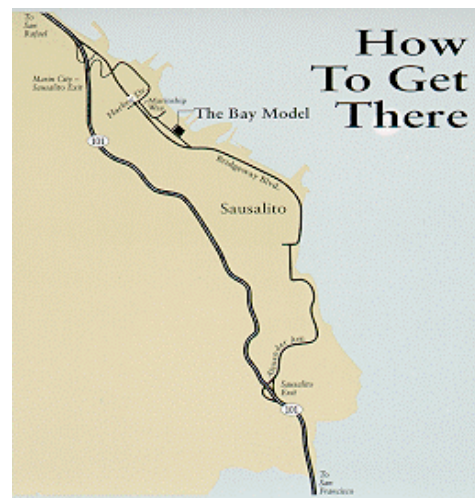
**Cost:** \$15 for professionals/members; \$8 for students (includes pizza dinner and donation to the Bay Model and to AWG)

Please join us on Thursday, June 17th for a presentation by **Sarah Andrews** showcasing her newest book, *Earth Colors*. Sarah will discuss her career and the 'art' of science: how science involves not just the collection of facts but also a variety of logics and reasonings, how all geologists are in fact science detectives....and how geology can unravel the crime of art forgery.

### Earth Colors: Book Description

Em Hansen, the popular heroine at the center of Sarah Andrews's unique geology mystery series, has landed a new job, although an unusual one: a client affiliated with a museum wants Em to investigate a painting by the famed western painter Frederick Remington. The client believes it's a fake, but Em must explore the painting's provenance to find out. The project takes her through Wyoming, Utah, Washington DC and Pennsylvania, and halfway through the trip Em finds she's also chasing a murderer: someone seems to be slowly poisoning her client's family. Before long, her innocent research project has taken a sinister twist, and it's up to Em to find out what's going on in time to save her own skin.

**Sarah Andrews** is the author of nine forensic geology mystery novels ([www.sarahandrews.net](http://www.sarahandrews.net)) and is an occasional lecturer in Geology at Sonoma State University, [www.sonoma.edu/andrews.htm](http://www.sonoma.edu/andrews.htm). She holds a B.A. from Colorado College and an M.S. from Colorado State University and is the recipient of numerous awards including the AAPG Journalism Award, the NAGT Shea Award, and the RMAG Journalism Award. Her basic training in geology was in eolian sedimentology under Edwin D. McKee at the U.S. Geological Survey in Denver, and her subsequent experience applied that expertise through extensive tours of duty in oil and gas development and environmental services, including well site duty for Amoco in Wyoming (the genesis of her early novels) and management of soil and groundwater contamination at a Superfund site on an Air Force base (yet to be addressed).



See attached flyer

# The Origin of Thundereggs

Our monthly speaker for April 28, 2004, was NCGS K-12 Programs Chair, retired earth science and chemistry teacher, and gemologist/mineralogist **John Stockwell**. John is a former exploration geologist with British Petroleum and Sohio, educated at Yale University, who abandoned field geology to teach high school in northern Contra Costa County until his retirement in 2002. Intermingled with his teaching career is an obviously deep fascination for gemstones and minerals. Gemology often does not receive the respect it deserves as an earth science discipline. John's talk "**The Formation of Thundereggs**" was a timely reminder that gemstones are also geological phenomena, and that their origin is closely tied to, and diagnostic of, many common geological processes.

Thundereggs have been a mineralogical and gemological curiosity for hundreds of years. Casual observers tend to categorize these nodules with other seemingly similar geological features in sedimentary and igneous rocks (septarian nodules, concretions, and hollow geodes), usually ignoring their formation. However, source rocks and internal structures can be used to construct a paragenetic sequence for these nodule types and differentiate the processes that formed them.

Thundereggs occur only in acid volcanic rocks. Their occurrence in the San Francisco Bay Area is limited to the Northbrae Rhyolite that crops out in several public parks in north Berkeley, and at Lone Hill, San Jose, which is now closed to the public. These nodules are characterized by a "warty" or lumpy outer rind, a star-shaped core or central kernel, quartz or amorphous silica fillings, an often banded or layered interior texture, a faint to obvious radiating pattern sometimes overprinted by the late-stage siliceous infillings, and an association with spherulite or lithophysae (lith-oh-fye-zee) precursors. The host rocks are generally rhyolite and dacite flows or welded tuffs associated with

ignimbrite eruptions. In igneous terminology, the dacite-rhyolite associations are the extrusive equivalents of the granodiorite and granite intrusives exposed in batholith complexes like the Sierra Nevada range. The welded tuffs are generated by explosive eruptions of caldera complexes such as those exposed in southern Nevada. The source rocks are also siliceous dacite-rhyolite compositions and the dense ash clouds generated by these events are so hot that the glassy particles fuse together as they settle to earth. This process forms a dense bedded pyroclastic deposit composed predominantly of silica glass, that under certain conditions spawns secondary post-eruptive structures called lithophysae. Unlike spherulites, these structures are concentrically zoned and often have hollow central void cavities. They are thought to originate from a secondary post-depositional vapor phase expansion of the welded tuff at scattered nucleation sites. These small cavities are lined with vapor phase deposits of silica (tridymite-cristobalite-quartz), and sometimes feldspar and other accessory minerals. They are surrounded by concentric layers of partially devitrified, fine crystalline glass, and may have subsequently infilled with amorphous or crystalline siliceous material. In rhyolitic flows, the thundereggs and spherulite precursors occur in a vitrophyric (glassy) interior layer that parallels the upper and lower flow surfaces. The thundereggs are confined to the basal section (nearest the ground surface) of this continuous vitreous sheet, where the cooling rate is slower. Occasionally thundereggs occur in andesitic rocks, but they are **never** found in basalts. The lumpy inclusions in the latter are mineralized gas bubbles called amygdules.

John interspersed photographs of his personal thunderegg collection with more technical discussions and literature relating to their formation. The nodules frequently have external ridges that follow the internal pentagonal pattern created by the uniform expansion of the spherulites during gas phase evolution. John noted that if the nodules are cut along the ridges, the halves should reveal the desired five-point star-shaped cross section. His photo series took the audience to all corners of the globe where thundereggs have been collected: Brazil, Turkey, Australia, Iran, British Columbia,

Germany, France, and Mexico. These nodules have also been discovered in Russia, central Europe (Poland and Hungary), Ethiopia, and Patagonia (South America). The wide variety of colors and textures—from banded individuals to amorphous, opaline-filled cavities—is an aesthetic delight as well as a scientific curiosity.

Although thundereggs have been recognized for several centuries, serious renewed interest in them by the scientific community began in the 1940's. Some key geologists and mineralogists have commented on their origin, including Wahlstrom. Theories ranged from an absurd “man-made” hypothesis to differing types of igneous origin. The spherulite concept is the most favored, but there is also a syngenetic school of thought that proposes silica magma immiscibility as the source of the thundereggs. This is analogous to an oil-in-water dispersion, and has been invoked to explain other igneous phenomena like the orbicular granite structure. Its plausibility is a subject of debate. Major contributions to thunderegg theory have been made by the German school of mineralogists led by Holzhey, who devised a schematic sequence of pre- and post-eruptive events that generate thundereggs. One factor is evident—that the process occurs while the host rock is still relatively fluid, as indicated by disruption and distortion of some specimens that have all the features associated with fully developed nodules. The solidified outer rind on the spherulite precursor is thought by some to develop early in its formation. The gas phase evolution that ruptures the spherulite allows post-eruptive fluids to percolate into the open central cavity and fill it, first

with amorphous silica, and occasionally with a crystalline silica core. The often spectacular structural features of these fascinating nodules, however, have captured the interest of scientists and rock collectors alike!

The NCGS is deeply thankful to John Stockwell for sharing his views on a subject that spans the fields of igneous petrology and gemology/mineralogy. John has applied both his formal geological training and his gemological expertise to thunderegg research. There is a wealth of literature at both the technical and non-technical levels, including treatises on thunderegg formation, that he has assembled. The NCGS is extremely fortunate to have John as a board member and an expert on this topic. He maintains an extensive, and extraordinarily well-documented, collection of thundereggs and literature on their origin and global distribution. John can be reached by e-mail at **[kugeln@msn.com](mailto:kugeln@msn.com)**.

It should be noted that amateur rock collectors and gemologists have contributed considerably to our understanding of geological phenomena like thundereggs. They have discovered numerous sampling locations for the scientific community and have made many astute field observations. Their benefit to the geological sciences should not be underestimated.

---

---



# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



## NCGS FIELD TRIP

### *Geology and Groundwater Resources of the Merced Formation in the Westside Basin of the Coastal San Mateo and San Francisco Counties*

**Saturday July 10, 2004**

#### **Field Trip Leaders:**

**Ed Clifton, (Retired) United States Geological Survey**  
**Ralph Hunter, (Retired) United States Geological Survey**  
**Greg Bartow, San Francisco Public Utility Commission**

The Merced Formation, in its sea cliff exposures between Lake Merced and Mussel Rock, displays a nearly continuous section of more than 1700 m of late Pliocene and Pleistocene strata. The section offers a unique opportunity to explore the late Neogene and quaternary history of coastal California in the San Francisco Bay Area. Focus will be on depositional facies that range from shelf depth to eolian dune and their implications relative to sea level history and tectonism in this area over the past 2+ million years. Discussions will include the applicability of sequence stratigraphic concepts in a rapidly subsiding basin. One stop along the way will be devoted to a discussion of Lake Merced and the Westside Groundwater Basin.

Exposure of the Merced Formation differs from year to year. Past trips have encountered a variety of fossil remains, including that of a mammoth or mastodon, fossil foot prints of diverse Pleistocene mammals, sedimentary structures produced by ancient earthquakes, and an ash fall that, today, would devastate the Bay Area. Part of the walk will be along the base of a giant landslide that is activated by contemporary earthquakes and El Niño winters.

**THIS FIELD TRIP WILL BE LIMITED TO 50 PEOPLE. CARPOOL/VANPOOL IS A MUST**

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

**Time: Saturday July 10, 2004, 7:30 am**

**Departure:** Gathering place will be announced in the next issue and notified to the registrants by e-mail. Gather (?) at 7:30 am for distribution of guidebook, coffee and doughnuts, and leave by 8:00 a.m.

**Cost:** \$30 for members; \$40 for non-members and \$20 for students. Cost includes refreshments, lunch, and field guides.

\*\*\*\*\* **REGISTRATION FORM (Merced Formation Field Trip)** \*\*\*\*\*

Name: \_\_\_\_\_ E-mail: \_\_\_\_\_

Address: \_\_\_\_\_

Phone (day): \_\_\_\_\_ Phone (evening) \_\_\_\_\_ Please indicate check amount:

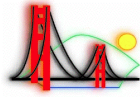
Lunch (Sandwich) Regular \_\_\_\_\_ Vegetarian \_\_\_\_\_ (Please check one)

Please mail form and check made out to **NCGS to: Tridib Guha, 5016 Gloucester Lane, Martinez, CA 94553**

Questions: e-mail: [aars@earthlink.net](mailto:aars@earthlink.net); Phone: (925) 370-0685 ( evening - PREFERRED) (925) 363-1999 (day – emergency )

People who are willing to drive their car or SUV please indicate (NCGS will pay for the fuel cost)

The SF Bay Chapter of the Association for Women



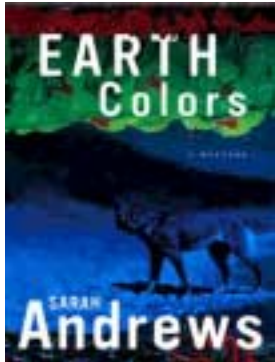
Geoscientists Presents:

# Earth Colors and the 'Art' of Science

by Geologist and Mystery Writer

Sarah Andrews

Thursday, June 17<sup>th</sup>



- *All geologists are in fact science detectives—what special tools does a forensic geologist use to investigate crimes?*
- *Learn how forensic geology can unravel the crime of art forgery*
- *Can mineral pigments be “fingerprinted” to reveal where and when they were mined and how they were processed into paints?*
- *Although available earth resources have influenced the artist's palette throughout history, the most beautiful ancient pigments were derived from toxic metals*

6:30 pm social

Dinner served at 7:00 pm

**Presentation begins at 7:30 pm**

**at The Bay Model Visitor's Center in Sausalito, California**

*\$15 for professionals/members*

*\$8 for students (includes pizza dinner and donation to the Bay Model and to AWG)*

RSVP by June 15th to Christi Nelson,

[christin@stetsonengineers.com](mailto:christin@stetsonengineers.com)



For venue information and directions please  
Visit the Bay Model web site at

<http://www.spn.usace.army.mil/bmvc/bmvcinfo.htm>

