

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



FEBRUARY MEETING ANNOUNCEMENT

DATE: Wednesday, February 26, 2003

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

TIME: 6:30 p.m. Social; 7:00 p.m. talk (no dinner)
Cost is \$5.00 per person

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

SPEAKER: Dr. Calvin Stevens, San Jose State University

Paleozoic Stratigraphy of the Eastern Sierra Nevada and Its Relation to Cratonal and Miogeoclinal Rocks to the East

Cambrian through Permian rocks have been identified in the eastern Sierra Nevada roof pendants. The Cambrian through Devonian section represents basal deposition temporally equivalent to shelf and slope deposition to the east in the Inyo-White Mountains. In a major reversal the Pennsylvanian and perhaps the Mississippian rocks in the Sierra Nevada were deposited in shallow water whereas the Inyo Mountains region was converted into a turbidite basin. During the Permian several tectonic events resulted in numerous local basins in which deep-water sediment was deposited.

Direct correlation of the rocks in the eastern Sierra Nevada and the Inyo Mountains has been hindered by the great difference in rock types represented in the two areas and dextral offset in the Owens Valley. Middle to Upper Devonian rocks, however, can be utilized to correlate between the two areas. This part of the section is represented by a submarine fan in the Sierra Nevada composed of calcareous quartz sandstone that was fed through a major channel recognized at McGee Mountain in the Mount Morrison pendant and its offset equivalent in the Inyo Mountains near Big Pine. Upper slope channels are present near Independence. These channels funneled quartz sand which was being carried across the exposed shelf to the east to the developing submarine fan in the Sierra Nevada during a low stand of sealevel. Remnants of this sand sheet is recognized as the Lippincott Member of the Lost Burro Formation throughout the Death Valley region.

Calvin Stevens was born in Sheridan, Wyoming, and received his B.A. and M.A. degrees from the University of Colorado, and his Ph.D. from the University of Southern California in 1963. He worked for Humble Oil Company in Houston, Texas, from 1958 to 1960, then joined the staff of San Jose State University after receiving his Ph.D. degree in 1963. He retired from SJSU in 2002, after nearly 40 years of service on the Geology Department faculty. He now teaches part time and pursues geological problems of interest to him including Permian corals and fusulinids, Paleozoic-Triassic stratigraphy, and the tectonic history of eastern California.

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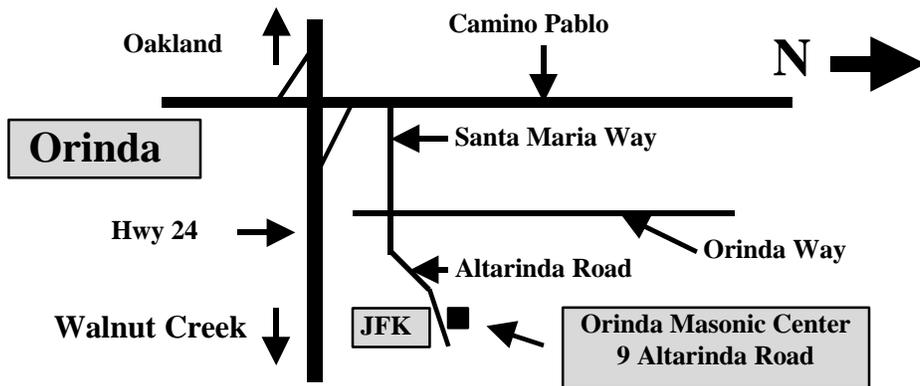
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Bay Area Geophysical Society

SEG 2003 Spring Distinguished Lecture: University of Houston Professor **Art Weglein**, will present *A Perspective on the Evolution of Processing Seismic Primaries and Multiples for a Complex Multidimensional Earth*. A summary of Art's talk can be found at http://sepwww.stanford.edu/bags/Talks/0303weglein_abs.html.

Time: Tuesday, 11 March 2003 Social and Lunch: 11:30 a.m. Talk: 12:30 p.m.

Location: Lunch: ChevronTexaco Cafeteria Talk: ChevronTexaco Park, 6001 Bollinger Canyon Rd., San Ramon, CA

No charge for this program. Buy your own lunch in the ChevronTexaco Cafeteria.

Note: Non-ChevronTexaco employees RSVP to wfki@chevrontexaco.com or phone **Warren King** at **925-842-9964** by noon Monday, March 10th. *This must be done to ensure that you get a visitor's pass.*

Please check the BAGS website <http://sepwww.stanford.edu/bags/> regularly for meeting notices and updates.

Northern California Geological Society
 c/o Dan Day
 9 Bramblewood Court
 Danville, CA. 94506-1130

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 2002-2003 Calendar

Wednesday, February 26, 2003

Calvin Stevens, San Jose State University

Stratigraphy of Eastern Sierra Nevada Roof Pendants and Their Relation to the White-Inyo Range

7 pm at Orinda Masonic Center

Wednesday, March 26, 2003

Dr. Constanze Weyhenmeyer, Lawrence Livermore National Laboratory

Reconstructing Paleoclimates using Groundwater Isotopes, Ice Cores, and Stalagmites

7 pm at Orinda Masonic Center

March 31-April 11, 2003 **AAPG Distinguished Lecture (tentative; exact date to be announced)**

Cindy Yielding, British Petroleum

The History of a New Play: Thunder Horse Discovery, Deepwater Gulf of Mexico

Location and time to be announced

Wednesday, April 30, 2003

Dr. Morgan Sullivan, California State University, Chico

Sequence Stratigraphy of the Ridge Basin, California

7 pm at Orinda Masonic Center

Wednesday, May 28, 2003

Dr. Ian Carmichael, University of California Berkeley

Topic to be announced

7 pm at Orinda Masonic Center

Wednesday, June 25, 2003

Carol Prentice, USGS, Menlo Park, CA.

San Andreas Fault (Exact title to be announced)

7 pm at Orinda Masonic Center

Upcoming Field Trips...

February 22, 2003	<i>Field Trip to Northbrae Rhyolite, Berkeley</i>	Lin Murphy
April 12, 2003	<i>Field Trip to Pacheco Pass</i>	Gary Ernst, Stanford
May 10, 2003	<i>Diablo Antiform-Diablo Range Intersection</i>	Ron Crane, Consultant
June 6-8, 2003	<i>Rodgers Creek-Maacama Step-over Area</i> 2-day overnighiter at Cal Academy Pepperwood Ranch west of Franz Valley	Bob McLaughlin, Dave Wagner, and others, USGS Menlo Park
TBA	<i>Clear Lake Volcanic Field</i>	Rolfe Erickson, Sonoma State
TBA	<i>Northern California Gold Belt, Quincy</i>	Gregg Wilkerson, BLM
Summer 2003 TBA	<i>Devil's Slide / Pebble beach or Pigeon Point</i>	Scott Morgan, Morgan & Jody Castle of Earth Mechanics
Late October, 2003	<i>Point Reyes Area (exact itinerary TBA)</i>	Tom MacKinnon

Assist the NCGS!

The Northern California Geological Society is seeking members who are interested in supporting the society's efforts to arrange and coordinate field trips for our membership. In particular Jean Moran, Field Trip Coordinator, is seeking members who can devote a bit of time in the areas which follow. You can tailor your time commitment according to your interests and time constraints, but please do support your society!! This is your chance!!

(1) **Maps and directions for field trips**

Ideally each field trip announcement will have a map with directions. The directions should be driven and field tested first so that road closures, etc. are not a factor. The Field Trip Coordinator is looking for someone to put together maps with directions for one, or all six, planned field trips this year.

(2) **Annotated pictures for our website**

In support of the new website, the field trip announcements will also have a box to check if you are interested in taking some photos and annotating a few of them for viewing on the website. This is a chance to have your colleagues, friends, and family check out the NCGS website and see what you have been up to. You do not need a digital camera for this, just have the film developed and place on a disk or CD. Talk to the Field Trip Coordinator about how much of the costs are reimbursable.

(3) **Short (one paragraph) write-ups of our field trips for our website**

In support of the new website, the field trip announcements will have a box to check if you are interested in writing a one paragraph synopsis of the excursion for the website. This is a chance to acknowledge the field trip leader and have colleagues read your interpretation of the field trip.

(4) **Newsletter write-ups of our field trips**

To maintain and support our outstanding newsletter, the field trip announcements will have a box to check if you are interested writing up the field trip for the monthly newsletter. This task hones your technical writing skills and documents the geologic excursion and knowledge for those members who could not attend.

(5) **Access to carpooling van**

One of the largest expenses for field trips, almost \$20/day/participant, is transportation. For local field trips we try to carpool into fewer vehicles, but sometimes this is just too many cars. It would be greatly appreciated if any of our members had access to a company or school car pool van for our weekend excursions. Oftentimes this requires that the member be the driver of the van. NCGS would reimburse for gas. Please contact the Field Trip Coordinator if you have any solutions or connections regarding inexpensive and reliable transportation.

Please contact NCGS Field Trip Coordinator **Jean Moran** at jeanm@stetsonengineers.com

The NCGS Website is Here!!

The Northern California Geological Society is pleased to announce that thanks to the efforts of member Art Bonwell, the NCGS has an attractive and fast website!! Please visit the site located at www.ncgeolsoc.org The website will be undergoing some additions and changes over time as we incorporate new features and new subsections. We intend to post older newsletters, photos and maps from field trips, a listing of NCGS publications, upcoming meeting and field trip information, links, and a number of other elements to the site as time permits. We are open to suggestions that you think would improve the site - after all it is intended to help our membership and to attract potential new members!

Our website designer, Art Bonwell, is hoping to have some assistance maintaining the website and would like to hear from any interested members who would like learn how to maintain a website and would like to contribute to the society in a small but important way. It is not anticipated to require a great deal of time, so please step forward! Please contact **Mark Detterman** at the email address listed on the newsletter cover and well get you in contact with Art!

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



Northbrae Rhyolite / Silica-Rich Rocks in the Berkeley Hills **Saturday, February 22, 2003** **Trip Leader: Lin Murphy**

In 1914, Andrew Lawson described the Northbrae as a Pliocene volcanic flow. Since then, the Northbrae has been repeatedly reinterpreted and is currently mapped as that part of the Jurassic Coast Range Ophiolite known as the Leona Rhyolite. Though now mapped as one unit, the widespread Leona and the aerially restricted Northbrae are distinguished from each other by their petrology, geochemistry, and morphology. Recent dating indicates that the Northbrae is a Late Miocene flow.

The geochemistry of the Leona Rhyolite shows a flat REE signature, similar to the keratophyres of the Coast Range Ophiolite. The Northbrae exhibits light REE enrichment and a negative Eu anomaly. In discrimination diagrams, the Northbrae plots as an within plate granite, whereas the Leona plots as a volcanic arc. The Northbrae formed as a glass flow or dome: it exhibits flowbanding, autobrecciated clasts, relict spherulites, and a microcrystalline matrix. The Leona contains no flowbanding or autobrecciation. Northbrae (and the related Cragmont Rock) exhibits silicification textures; Leona does not. In outcrop, Northbrae surfaces are frequently rounded, with some extremely polished areas. Leona outcrops, in contrast, are jagged, rough, and fractured. This research suggests that the Leona and the Northbrae Rhyolites have different petrogeneses and that they are distinct rock units.

In 2000, Murphy presented a hypothesis that explained Northbrae's distinct lithology as an exotic block within the Franciscan Complex or the Coast Range Ophiolite. In Spring 2002, zircons collected from the Northbrae gave a Late Miocene age (11.5 Ma) for its formation. This date precludes the Mesozoic exotic-block hypothesis. The Northbrae is thus a newly recognized unit of the Late Cenozoic volcanics that erupted in the wake of the northward-migrating Mendocino Triple Junction. Northbrae's rounded morphology, polished surfaces, and silicification may be explained by travel within the San Andreas fault system. The Northbrae may thus offer a new constraint on displacement within the Hayward-Calaveras fault system.

***** **REGISTRATION FORM --- PLEASE RSVP by Thursday, February 20, 2003** *****

Name _____

Address (Street/City/Zip) _____ Phone (day) _____

Phone (evening) _____ E-mail or Fax No. _____

Cost: \$15 for adults (18 and over); **\$10 for adolescents** (11 to 17). Cost includes, lunch, refreshments, and field guide.

Indicate if you are a nonmember (cost is \$20) _____ **Regular Lunch** _____ **Vegetarian Lunch** _____ (Please check one)

I am willing to drive my vehicle on this trip _____ (check if YES) My vehicle can carry myself plus _____ people.

I am willing to take pictures on this trip for the web site _____ (check if YES)

I am willing to write up the field trip for the newsletter _____ (check if YES),

or a short paragraph for the website _____ (check if YES)

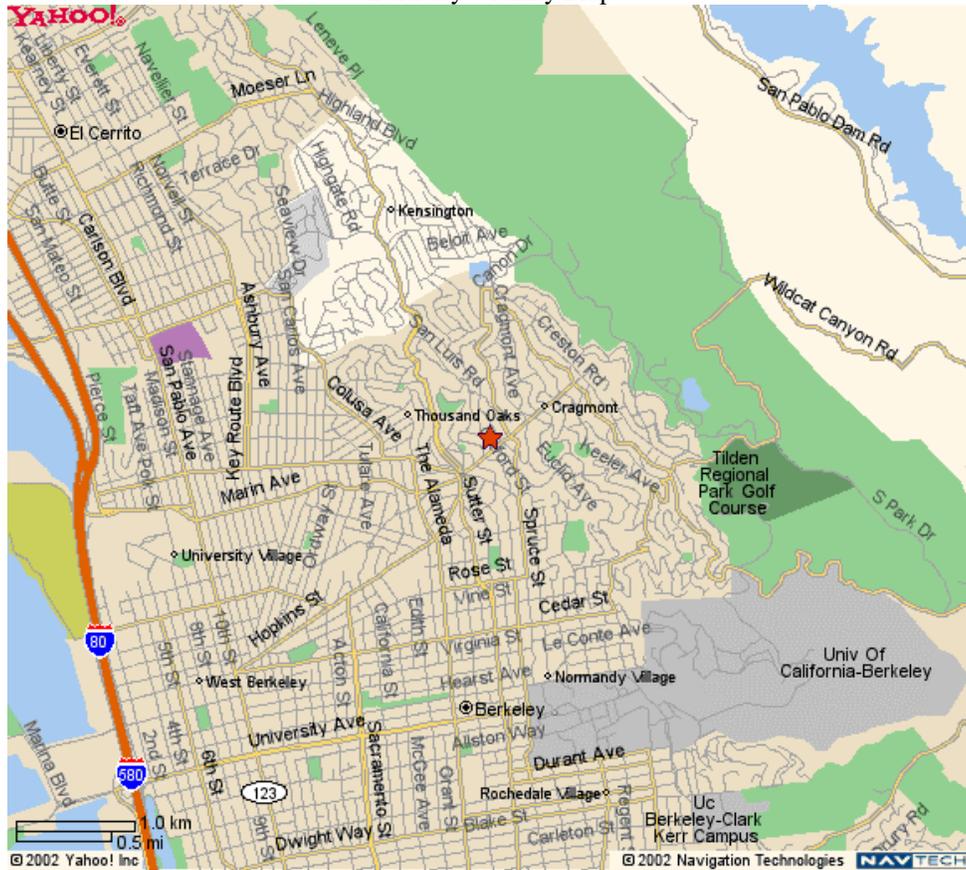
Please mail form and a check made out to NCGS to: **Jean Moran, P.O. Box 1861, Sausalito, CA. 94966**

If you have any questions or need additional information, e-mail Jean at jeanm@stetsonengineers.com or call **415-331-6806** (eve)

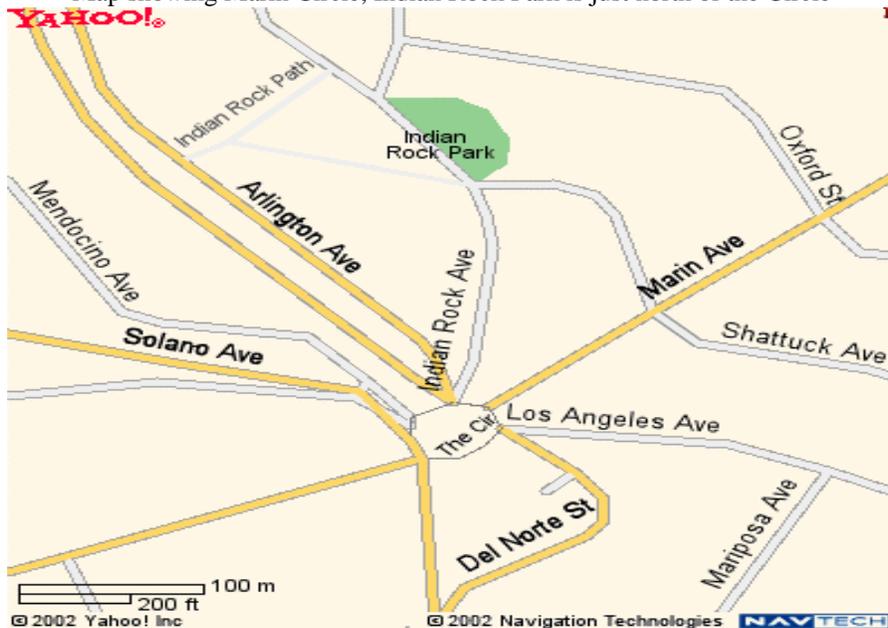
Departure & Logistics: Meet at **10 am** at Indian Rock Park off Marin Circle in north Berkeley. From there we will walk about the neighborhood looking at outcrops and visit Hinkle Park and Grest Stone Face Park. One of our NCGS members, **John Stockwell**, has invited everyone to his place for refreshments and to see his thunder egg collection. We will also have lunch there and Lyn will pass around and explain the geochem plots and photomicrographs that have been developed. We will then carpool up to Cragmont Park off Euclid, south of Marin St. We will also go to Remillard Park to look at an entirely different rock, but an interesting one--a silica carbonate.

These parks are located in small neighborhoods with limited on-street parking. Carpooling to the first stop is strongly encouraged. Please indicate on the rsvp form if you are able to drive, and how many people you can fit in your car. We will try to condense the number of cars prior to the trip.

Berkeley Vicinity Map



Map showing Marin Circle, Indian Rock Park is just north of the Circle



NCGS Visits Army Corps of Engineers San Francisco Bay Model

The NCGS opened its 2003 field trip season with a visit to the Army Corps of Engineers Bay Model in Sausalito on January 11th. The Model is a landmark in Sausalito, harkening back to World War II, when it was a warehouse in the Marinship Shipyard where Liberty Ships were built.

The guide for this exciting tour of the Bay Model was ranger **Bob Stevenson**. Bob is a native of Ohio who has a love of nature and the great outdoors. After receiving a degree in geology, he spent several years as a park ranger in the Rocky Mountains, Alaska, and the Hawaii Volcano Observatory before assuming his current role at the Bay Model Visitor Center.

Bob began the tour by taking the group to the dock in front of the Center where everyone could view Richardson Bay. He then explained the role of the Army Corps of Engineers in maintaining San Francisco Bay and its waterways. The ACE is responsible for shipping channels, docks, airport runways, and any structures that affect the Bay. It also removes debris from Bay waters using two scavenging vessels docked at the site. Shortly after the attack on Pearl Harbor in December, 1941, the U.S. Maritime Commission urged the W.A. Bechtel Company of San Francisco to build a shipyard in San Francisco Bay. The site that was chosen was on the shore of Richardson Bay in Sausalito and was named the Marinship Shipyard. Recruiters searched for people from around the country willing to come serve the nation in its hour of need by constructing desperately needed warships. The resulting influx of 75,000 Americans into southern Marin County had an impact on the area every bit as great as the 49er Gold Rush a century earlier. In all, 93 ships, including 78 tankers and 15 Liberty cargo ships were built over a 3½-year period. By the end of World War II the shipyard had only 600 employees left out of 20,000 at its peak. In 1946, Marinship was turned over to the U.S. Army Corps of Engineers. The Corps only needed a few of the shipyard buildings, including the warehouse that now houses the Bay Model. The remainder were eventually developed for commercial and public use.

As the group entered the Visitor Center, Bob led them past the Marinship Museum, which relates the history of the shipyard, and noted that the Center also hosts a variety of educational workshops covering Bay ecology, environmental issues, and the history and culture of San Francisco Bay. As everyone entered the large open warehouse area housing the model, Bob assembled the group near its center and briefly described the Bay Model. It was built in the mid 1950's to simulate the

effects of several bold ideas put forth during the early days of the Cold War to dramatically transform San Francisco Bay. Similar scale models were constructed by the Army Corps of Engineers to model Chesapeake Bay and the Mississippi Delta.

The main driving force behind the Bay Model was the Reber Plan. This and other plans evolved because of concern over sufficient fresh water and increasing traffic congestion as the Bay Area's population continued to grow after the Second World War. The proponent of the Reber Plan (originally dubbed the San Francisco Bay Project) was John Reber, a former school teacher and theatrical producer. His idea would have dammed the Bay at two points, between Richmond and the Marin Peninsula, and between Oakland and San Francisco. Two freshwater lakes would have been formed in what is now San Pablo Bay and in the South Bay. The plan also called for a torpedo boat base at the Marinship site, a submarine base north of Tiburon near San Rafael, adding 20,000 acres of landfill to the East Bay and enlarging the deepwater harbor by 50 miles, and providing high-speed highways and railways linking portions of the Bay over the dams. Critics pointed out the destruction of commercial fisheries, increased sewage disposal problems, potential flooding, and undesirable effects on the ports of Oakland, Stockton, and Sacramento. Although the State of California, the Bureau of Reclamation, and the Army Corps of Engineers opposed the plan, it was proposed that a scale model of the Bay be designed and used to test the effects of the Reber Plan. The model was finished in 1957. Subsequent tests showed that Reber's plan would not conserve 2.4 million acre feet of fresh water as claimed, and that it would otherwise have had disastrous effects, including 15 foot tides! The Reber Plan was not the first, nor the last, plan calling for major damming and landfill in San Francisco Bay. The 1929 Walker Plan proposed a dam across the Golden Gate to transform the Bay into a large freshwater lake. The Cal-Water Project of 1952 proposed a barrier between Point Richmond and California Point that would create a huge freshwater lake in San Pablo Bay, and include an 8-lane freeway with 2 railways across its top. Other proposals for major alterations to the Bay include the Swanson Plan (1959), which would have created a dam across the Carquinez Straits and fill in the Bay with rock from San Bruno Mountain and other sites around the Bay Area; and the Savage and Weber Plans of 1962.

As the group toured the model, members were impressed with the size and detail of the 1.5 acre structure. The model is constructed of 286 carefully-sculpted 12 foot-by-12 foot concrete slabs covering San Francisco, San Pablo, and Suisun Bays, and the Sacramento-San Joaquin Delta from Verona on the north to Vernalis on

Archaeological Studies of Bay Area Native American Shellmounds Discussed at the January NCGS Meeting

University of California, Berkeley, Archaeological Professor **Kent Lightfoot** thrilled a mixed audience of archaeologists and earth scientists at the January 29th NCGS meeting with a fascinating discussion of native American shellmound excavations in Bay Area wetlands. His talk "*Archaeology of the San Francisco Bay Region*" chronicled turn-of-the Century to recent shellmound studies in the Bayshore wetlands and what archaeologists have learned from them.

Kent has spent his academic career studying the archaeology of native American sites in the Pacific Northwest and Alaska. His main interest is the cultural evolution of these people reflected by lifestyle changes such as diet and burial traditions. Shellmounds produced by prehistoric hunter-gatherer tribes contain a diverse array of artifacts that can be used to infer the social characteristics of their inhabitants. These mounds, many up to 30 feet high, appeared 4000 to 5000 years ago when the rising pluvial (interglacial) sea level had stabilized. The previous low stand sea level was at the Farallon Islands, and subsequently rose to fill the Bay, creating the largest estuary on the west coast of North America. This benign setting was inhabited by numerous tribal groups who left subtle clues to their cultural traits in the abandoned mound complexes.

A proper discussion of recent native American shellmound activity in the immediate Bay Area requires an historical recap of excavation and archaeological research beginning at the turn of the Century. This saga began in 1901-1902 when Frederick Putnam headed the U.C. Berkeley Archaeology Department. Putnam was interested in glacial archaeology, taught at Harvard and the American Museum of Natural History, and actually did not spend much time teaching at Berkeley. During his short tenure as department head, however, he did manage to interest newspaper heiress Phoebe Hearst in Bay Area archaeology. From 1901 to 1911, Hearst gave \$50,000 a year to this effort, a tidy sum in those days. Her donations funded the first shellmound excavation in Emeryville in 1902 by U.C. Berkeley faculty member Max Uhle. Uhle had received his training in Germany, which emphasized a stratigraphic approach to excavating sites. He applied these principles at Emeryville, trenching the huge mound and meticulously noting the stratigraphy of the mound layers and their contents. Uhle also pondered the cultural changes that he perceived were revealed by changes in artifact content of the various layers over time. Unfortunately, this concept of cultural evolution of American Indian society was not accepted by his current department head. Most

the south. The bulk of the Bay was completed in 1957, and the Delta section was added ten years later. It has a horizontal scale of 1 foot = 1000 feet and a vertical scale of 1 foot = 100 feet, for a vertical exaggeration of 10:1. The 4 to 4½-foot tidal action of the Bay is simulated by computer-controlled pumps that operate at 100 times the natural diurnal cycle. This feature allowed the engineers to acquire accurate data over a much shorter time frame than if the model actually functioned in accordance with the natural tidal cycle. In this scaled up mode, 30 days worth of data can be simulated in just 7.2 hours. The model can accurately reproduce Bay flow regimes, but allowance must be made for the additional frictional resistance caused by the vertical exaggeration. The designers cleverly embedded adjustable copper metal strips in the concrete bottom to better simulate tidal action and water salinities. Bob demonstrated the dynamic action of the model using a squirt bottle of purple dye to color the water and show the flow direction at a given location. The model has been used to track the dispersion of oil spills in the Bay, but Bob noted that it cannot take into account the effects of wind. Where graduate students once kept vigil recording data for engineers to process by slide rule, now a computer carefully controls the pumps that regulate the model's water level to accurately simulate the ebb and flow of the tides.

After several decades of modeling a variety of engineering projects, the Bay Model has been replaced by computer programs that simulate its hydrodynamics. Now it is no longer used for research, but as an instructional tool to show the public what innovation and sound engineering principles can create. The Bay Model is a wonderful instructional tool and an inspiration to a future generation of scientists. It is a focal point of military and maritime history, culture, technology, and ecology. Open to the public Tuesday through Saturday, admission is free. For more information, call the Bay Model in Sausalito at **415-332-3871** or visit their website at **www.baymodel.org**.

The NCGS sincerely thanks ranger **Bob Stevenson** for an excellent tour and lecture on the Army Corps of Engineers Bay Model. He entertained and educated the NCGS audience on this fascinating facet of San Francisco Bay Area history. Our many thanks to NCGS Field Trip Coordinator **Jean Moran** and her husband **Bill Martin** for arranging this personal tour for our members, and for providing the refreshments afterwards. This was an afternoon well spent at the dock on Richardson Bay where a former military shipyard is quietly remembered in a unique museum display.

archaeologists considered these cultures static and the period of mound habitation relatively short. Uhle felt that the mound represented several thousand years of habitation, a novel concept in the days before radiocarbon dating techniques had been developed.

Nels Nelson, a Stanford graduate and U.C. Berkeley graduate student succeeded Uhle as resident shellmound expert. Between 1906 and 1911 Nelson discovered over 425 mounds in the Bay Area, and went on to work at the American Museum and a stellar archaeological career. He learned stratigraphy from his mentor John Marion, a paleontologist, and applied these concepts to his excavations. Nelson also took meticulous field notes. His most notable excavations were at Ellis Island, Bay View, and Hunters Point. His sketches also noted the location of burial sites. Over the years other mounds were excavated by graduate students from the U.C. Berkeley Archaeology Department. These sites include Ryan Mound in the Coyote Hills (1930's), the West Berkeley Shell Mound (1950's), and Patterson Mound in the Coyote Hills. The latter is protected by the regional park district.

Over the years these extensive surveys have provided invaluable information about the mounds. The Emeryville Shell Mound is particularly large. It is 30 to 35 feet high and covers an area the size of two football fields. The mounds usually occur in clusters of 4, 5, or 6 near fresh water entering the Bay. They consist of earth, clay, shell material (oysters, clams, and mussels), artifacts such as obsidian blades and tools, fish and mammal remains, architectural features (fire hearths, clay pits, and ovens), and human burial remains suggesting funeral or cemetery plots. The latter number several thousand. Radiocarbon dates indicate some mounds are up to 5000 years old.

The obvious question, then, is what were these mounds used for? Uhle and Nelson originally thought they were garbage dumps. However, Nelson's 1943 exhibit at the American Museum of Natural History suggested that villages were established on these sites. Their usage brings to mind the mound structures of the American Midwest. Mounds seem to be a traditional concept in the Western Hemisphere. Evidence suggests they functioned as temple sites, religious structures, exclusive home sites, mortuaries, and burial sites. They were surrounded by villages and were integral to the community, but their basic function is still debated.

Another intriguing question that has archaeologists baffled is why these sites were suddenly abandoned after 900 A.D. Excavations indicate the shellmounds were

most abundant in the 1400 years preceding this date. Questions one asks are were the mounds abandoned because of drought or food shortages, or did another culture drive out the mound builders? Environmental implications of mound building may help to answer this question. The first approach assumes that the mound builders nurtured and cared for the environment, and modified it to make it more productive as their population grew. A second approach, based largely on careful examination of mound faunal remains, notes a change in animal food sources over time. The trend is from larger game earlier in time to smaller game in more recent times. This suggests the flourishing populations were depleting important food sources and perhaps mismanaging their environment to the point of forcing them to relocate as the climate became drier early in the last millennium. An unfortunate consequence of abandoning the mounds is that their upper layers have often been modified by subsequent cultures or removed when western civilization began to inhabit the Bay Area.

The challenges faced by this generation of archaeologists is to fill in the information lost by urbanization. This can be achieved by protecting relatively intact sites like those in the Coyote Hills regional preserve, and by scavenging the detailed records and photographs left behind by earlier researchers like Nelson and Uhle. There has admittedly not been much synthesis of the data acquired during these early excavations. And there also needs to be cross-correlation of academic versus consulting project archaeological data to fill in some of the gaps. There is a wealth of stratigraphic and artifactual information catalogued by the academicians and consulting firms who have examined these mounds. The challenge is to sort through this database to get a clearer picture of these structures and the role they played in native American cultural development before the arrival of western civilizations.

Our sincerest thanks to Dr. Lightfoot for providing a detailed historical account of shellmound excavation in the proximal Bay Area, and his thoughts on what these features mean in the cultural evolution of its prehistoric native American inhabitants. This is truly a fascinating chapter in the post-glacial cultural history of San Francisco Bay. Special appreciation also goes out to member **Phil Garbutt** of California State University, Hayward, who helped avert disaster by replacing the projector bulb that burned out midway through Kent's talk! Phil has been a technical staff member of the CSUH Geological Department for over 30 years, and his expertise proved invaluable in rescuing our guest speaker's superb presentation.