NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

MEETING ANNOUNCEMENT

DATE: **February 23, 2011**

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: **Andre Brown, P.E.**
W. L. Gore & Associates

An Innovative Passive Detection Method for Site Screening of VOCs and SVOCs in Soil, Ground Water, and Indoor Air

Preliminary site screening methods are an established means of lowering the overall cost and time required for site investigation and remediation. Conventional soil-gas detection methods work best for simple volatile compounds in dry, permeable soils or shallow water table elevations. This service uses a patented, passive sorbent collection device constructed from GORE-TEX® ePTFE. GORE®Survey Screening Modules contain replicate sensors (duplicate capability), each filled with specially engineered adsorbent materials. These shallow vadoze zone/saturated zone installed sensors have been demonstrated effective in detecting both volatile and semivolatile compounds (VOCs & SVOCs), even in difficult site applications such as saturated clay overburden, deep groundwater, glacial till, fractured bedrock, vertical delineation of dissolved contaminants, PAHs (low vapor pressure compounds). The results are typically used for site assessment, monitoring active remedial systems, evaluating site risk, natural attenuation monitoring, groundwater trend monitoring, remedial design, insurance monitoring, UST compliance, indoor air risk assessment.

When placed in the screened, saturated interval of a monitoring well or piezometer for a 2-day residence, the membrane collector housing allows for water/air partitioning (Henry's Law) of dissolved phase organic compounds(VOC/SVOCs) while preventing the transfer of liquid water and eliminating the impact of suspended solids on the adsorbent. The emphasis placed on reducing time, waste generation, and costs (>50%) associated with groundwater sampling programs has resulted in the application of this technology to reduce the frequency of groundwater purging and sampling and as a more sensitive indicator for sentinel /sentry wells. *…continued on the back…*

NCGS 2010 – 2011 Calendar

Wednesday March 30, 2011
Dr. James Moore
Native American Granite Cisterns in the Sierra Nevada
7:00 pm at Orinda Masonic Lodge

Wednesday April 27, 2011
Greg Croft
Coal and the Peak of World Carbon Emissions
7:00 pm at Orinda Masonic Lodge

Wednesday May 25, 2011
DINNER MEETING! EARLY TIME!
Dr. Eldridge Moores
TBA
6:00 pm at Orinda Masonic Lodge

Wednesday June 29, 2011
Dr. John Wakabayahsi (Tentative)
Franciscan TBA
7:00 pm at Orinda Masonic Lodge

Our Usual Summer Break!

October 9 – 15, 2011
Earth Science Week
TBA

Upcoming NCGS Events

Early 2011	Cantua Creek II; Dr. Mel Erskine
June 25 & 26, 2011	Geology of Lake Tahoe Region, Dr. Richard Schweickert, Emeritus, University of Nevada, Reno

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 Tridib Guha at: **Tridibguha@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.

- March 8, 2011, Mike Sawlan, USGS
- April 12, 2011, open
- May 10, 2011, Jorge Vazquez, USGS
- June 7, 2011, Jon Hagstrum, USGS, Presidential Address

Association of Engineering Geologists San Francisco Section

Upcoming Events

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

- March 9, 2011; Dr. Doris Sloan; CCGO Fundraiser

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

California Council of Geologic Organizations Fundraising Dinner Dr. Doris Sloan March 9, 2011

Retrospective of 40 years as an Accidental Geologist and Environmentalist

Forty years ago, after a decade of tumult and revolution in civil rights, another arena was opening up. Momentous changes were taking place in the earth sciences and in our experience of the environment. It was a most exciting time to return to academia after a two-decade absence. The environmental movement was just beginning; plate tectonics was new and accepted only reluctantly by many in the older generation of earth scientists; women wanting to be geologists were not welcome in a man's field; free speech and free love were the rallying cries at UCB; and good citizens knew that they couldn't fight city hall or big corporations. How different it was 40 years ago when I walked into my first class as a reentry grad student at UC Berkeley. The changes I have experienced in the ways geology is practiced and taught, and some of the marvelous adventures I have had, are the topics of this look back at 40 years as geologist and environmental activist.

BIOGRAPHY: Doris Sloan is an Adjunct Professor in the Department of Earth and Planetary Science at UC Berkeley. Her MS in geology and PhD in paleontology are both from UC Berkeley. Her research focused primarily on microfossils in the

sediments beneath San Francisco Bay and what they can tell us about the Bay's geologic history. She taught for two decades in the Environmental Sciences program at UCB, taught classes on the geology of California and the Bay Area for UC Extension, and led field seminars for Pt. Reyes National Seashore Association, the Yosemite Association and others. Since retiring, she has traveled widely with Cal Alumni groups to the far corners of the Earth. She is the author of a book on the *Geology of the San Francisco Bay Region*, published in 2006 by the University of California Press in the California Natural History Series.

DINNER CHOICES
Spenger's Fresh Fish Grotto
1919 Fourth St, Berkeley, 510.845.7771

Vegetarian - Pasta Primavera with Fresh sautéed Seasonal Vegetables

Meat – Pork Tenderloin with Pepper Jack Daniels Glaze with Fresh Seasonal Vegetables

Fish – Atlantic Salmon with Berry Sauce with Fresh Seasonal Vegetables

Dinner includes mixed greens salad with Balsamic vinaigrette, rolls, butter, coffee or tea.

DINNER COSTS
$50 for professionals
$10 for students with scholarship award (contact John Karachewski at geoscapes1@gmail.com).
Please pay on-line by credit card or at the door either by cash or checks payable to: GROUNDWATER RESOURCES ASSOCIATION (GRA). If you pay on line by credit card, please check in at the door with David Abbott so that we can get an accurate count.

RSVP REQUIRED. Please submit electronic reservation by 12 PM (Noon) Friday, March 4, 2011

SUBMIT RSVP -- http://www.grac.org/reservation

GRA members with an existing account can register in the upper dialogue box on the reservation page.

Non-members of GRA can make a reservation in the middle dialogue box on the reservation page by typing in the requested information (name, company, address, phone number, etc.

CANCELLATION POLICY: GRA will accept cancellations with no charge until 12:00 PM (Noon) on Friday, March 4, 2011. If you cancel after that time, or are a no-show, we will ask you to pay the cost of your meals. Thank you for your cooperation.

If you have any announcements or questions, please contact the Branch President, John Karachewski (Geoscapes1@gmail.com) at 510-540-4121.

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/

- February 24, 2011; ***ARkStorm scenario modeling of southern California coastal impacts***; Patrick Barnard
- March 31, 2011; ***Geomagnetic field influence on avian homing instincts***; Jon Hagstrom
- April 28, 2011; Earthquake Prediction; Susan Hough
- May 26, 2011; Rare Earth Elements; Keith Long
- June 30, 2011; California Seafloor Mapping Program; Sam Johnson
- July 2011; Climate Variability/Change & SF Bay-Delta; Jim Cloern Ecosystem

Bay Area Science

(http://www.bayareascience.org/)

This website came to our attention recently and we wanted to pass the information along to members. The website provides a free weekly emailed newsletter consisting of an extensive listing of local science based activities (evening lectures, classes, field trips, hikes, and etc).

NCGS Maps in Schools Program Update

The NCGS program of giving mounted and laminated wall-size California geologic maps to area teachers is moving ahead well. With $6,000 support from the American Association of Petroleum Geologists Foundation, we board-mount or laminate the two-foot square maps donated by the California Geologic Survey. With the assistance of **Dr. Ellen Metzger** of San Jose State, K-12 Earth science teachers attending her Bay Area Earth Science Institute (BAESI) workshops receive the maps along with ten laminated, page-size copies of the same map, plus a brief lesson outline to help them introduce the maps to their students.

As of January 15, over 110 large maps had been distributed this way, with around 50 more to be given out in February. This program will continue through 2011. In addition, teachers attending the NCGS field trip led by **Ray Sullivan** to downtown San Francisco last October were very pleased to get the map sets.

The program was initiated and run by **Don Lewis**. **Mary Jane Holmes** has done a terrific job laminating over 2,000 page-size maps. **Paul Henshaw** has assisted by participating in BAESI Workshops, and liaising with Chevron Corporation. New NCGS member **Angela Hessler**, a Chevron geophysicist, coordinates Chevron's participation and use of their San Ramon facility for some workshops. **Cynthia Pridmore** of the CGS has been instrumental in getting us the maps for free. NCGS owes a big "Thank You" to these folks for carrying this popular and effective program forward.

Early Announcement

GEOLOGY OF THE LAKE TAHOE REGION, NEVADA and CALIFORNIA

Dr. Richard Schweickert, Professor Emeritus Geology
University of Nevada, Reno

Field Trip Leader's Biography:

Dr. Richard Schweickert received his Ph.D. in geology at Stanford University, and was an Associate Professor at Columbia University and then Professor of Geology at UNR until his retirement in January 2010. He was a Foundation Professor at the University since 1993. He specializes in research on structural geology and tectonics, with special emphasis on the Sierra Nevada and the western U.S. With NSF funding, he has carried out research in Alaska, California, Nevada, Chile, Argentina, Newfoundland, Italy, and Corsica. His ongoing research includes: Active faults, landslides, and tsunamis in the Lake Tahoe basin, involving detailed structural mapping, trenching, drilling, submarine geology, soil gas profiling, and stratigraphic studies; volcanic stratigraphy of the Lake Tahoe basin; stratigraphy, structure, and geologic history of the Tahoe City area; and structure and stratigraphy of the Saddlebag Lake pendant and adjacent areas in the High Sierra.

Major discoveries by Schweickert and his students since the early 1980's include:

- regional thrust faults in the eastern Sierra Nevada
- a Triassic caldera near Tioga Pass, Yosemite National Park
- a major syn-batholithic dextral strike-slip fault system with over 400 km displacement
- Paleozoic and Mesozoic subduction complexes and island arcs in the Sierra Nevada region
- active faults, megalandslides, and past tsunamis in the Lake Tahoe basin

Lake Tahoe fieldtrip:

The Lake Tahoe basin is an active half-graben at the Sierra Nevada-Great Basin boundary. The basin was dammed near its present outlet by basaltic shield volcanoes about 2 Ma and ~900 ka. Three main active fault zones lie within the basin and are capable of M7 earthquakes. Such earthquakes would likely generate significant tsunamis. A megalandslide along the western edge of the lake removed latest Pleistocene glacial moraines, produced a ~10 km3 debris avalanche, and generated a tsunami at least 30m high. Giant boulder megaripples were produced on shallow shelves north and south of the megalandslide. The age of the megalandslide is uncertain, but likely is between 15 ka and 7 ka. This fieldtrip will feature stops at South Lake Tahoe, Emerald Bay, Meeks Bay, Sugar Pine Point, Eagle Rock, Tahoe City, and Kings Beach. Evidence of active faults, landslides, glaciation, basaltic volcanism, and tsunamis will be emphasized.

California Geological Survey Alquist-Priolo Quake Hazard Maps Now Online

As on December 20, 2010, CGS has posted the Alquist-Priolo Earthquake Fault Zone Maps online so that property owners, consultants, and interested parties can quickly and conveniently find information (as PDFs) with accompanying GIS data, online at:
http://www.quake.ca.gov/gmaps/ap/ap_maps.htm.
The maps are also viewable online.

CGS Tsunami Web Site National Tsunami Awareness and Preparedness Week March 20 – 26, 2010

CGS has also announced the National Tsunami Awareness and Preparedness Week and has created an extensive webpage with downloadable education materials, new tsunami inundation maps, and a new CGS Tsunamis Note at:

http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/Pages/Index.aspx.

World's Biggest Extinction Event: Massive Volcanic Eruption, Burning Coal and Accelerated Greenhouse Gas Choked out Life

ScienceDaily — About 250 million years about 95 per cent of life was wiped out in the sea and 70 per cent on land. Researchers at the University of Calgary believe they have discovered evidence to support massive volcanic eruptions burnt significant volumes of coal, producing ash clouds that had broad impact on global oceans.

"This could literally be the smoking gun that explains the latest Permian extinction," says Dr. Steve Grasby, adjunct professor in the University of Calgary's Department of Geoscience and research scientist at Natural Resources Canada.

Grasby and colleagues discovered layers of coal ash in rocks from the extinction boundary in Canada's High Arctic that give the first direct proof to support this and have published their findings in *Nature Geoscience*.

Unlike end of dinosaurs, 65 million years ago, where there is widespread belief that the impact of a meteorite was at least the partial cause, it is unclear what caused the late Permian extinction. Previous researchers have suggested massive volcanic eruptions through coal beds in Siberia would generate significant greenhouse gases causing run away global warming.

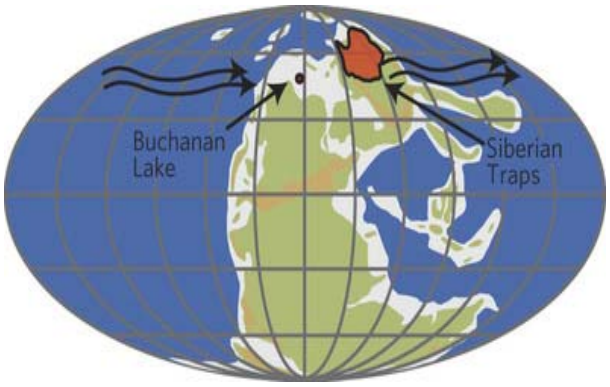


Figure 1: Late Permian paleogeographic map showing location of the Buchanan Lake section and Siberian Traps volcanics. Lava flows combust coal beds through explosive eruption that inject ash into the stratosphere, where prevailing westerly winds transport it to the Sverdrup Basin (base map after R. Scotese).

(Editor's Note – Figure 2 was not provided)

"Our research is the first to show direct evidence that massive volcanic eruptions -- the largest the world has ever witnessed -caused massive coal combustion thus supporting models for significant generation of greenhouse gases at this time," says Grasby.

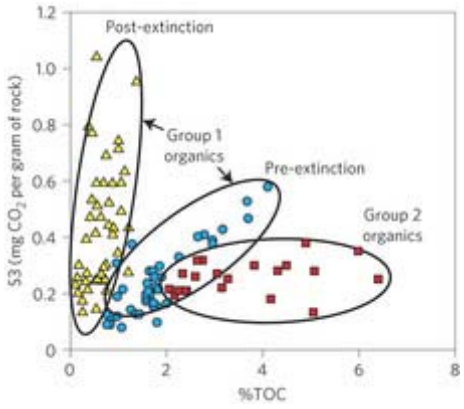


Figure 3: Plot of S3 versus %TOC showing three distinct trends that relate to organic matter type. Group 2 organics (red squares) represent coal-derived combustion chars whereas group 1 represents background marine organics, showing a significant change in character across the LPE event from pre-extinction (blue circles) to postextinction (yellow triangles).

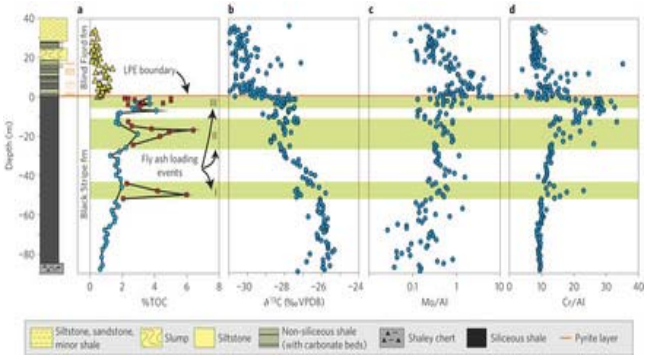


*Figure 4: Plot of vertical trends in key geochemical parameters across the LPE event at Buchanan Lake along with a lithostratigraphic column. Zones with high concentrations of combusted coal (horizontal green bars) are indicated as fly ash loading events. Vertical trends in **a** per cent total organic carbon (TOC%) are distinguished by symbols as defined in Fig. 3.*

At the time of the extinction, the Earth contained one big land mass, a supercontinent known as Pangaea. The environment ranged from desert to lush forest. Four-limbed vertebrates were becoming more diverse and among them were primitive amphibians, early reptiles and synapsids: the group that would, one day, include mammals.

The location of volcanoes, known as the Siberian Traps, are now found in northern Russia, centred around the Siberian city Tura and also encompass Yakutsk, Noril'sk and Irkutsk. They cover an area just under two-million-square kilometers, a size greater than that of Europe. The ash plumes from the volcanoes traveled to regions now in Canada's arctic where coal-ash layers where found.

Researchers walk through sediments deposited shortly after the worst extinction event in earth history, on the shores of Buchanan Lake, Axel Heiberg Island, Nunavut. (Credit: Credit: Steve Grasby, University of Calgary/NRCan)

Grasby studied the formations with Dr. Benoit Beauchamp, a professor in the Department of Geoscience at the University of Calgary. They called upon Dr. Hamed Sanei adjunct professor at the University of Calgary and a researcher at NRCan to look at some of peculiar organic layers they had discovered.

"We saw layers with abundant organic matter and Hamed immediately determined that they were layers of coal-ash, exactly like that produced by modern coal burning power plants," says Beauchamp.

Sanei adds: "Our discovery provides the first direct confirmation for coal ash during this extinction as it may not have been recognized before."

The ash, the authors suggest, may have caused even more trouble for a planet that was already heating up with its oceans starting to suffocate because of decreasing oxygen levels.

"It was a really bad time on Earth. In addition to these volcanoes causing fires through coal, the ash it spewed was highly toxic and was released in the land and water, potentially contributing to the worst extinction event in earth history," says Grasby.

Journal Reference:

1. Stephen E. Grasby, Hamed Sanei, Benoit Beauchamp. **Catastrophic dispersion of coal fly ash into oceans during the latest Permian extinction**. *Nature Geoscience*, 2011

Coal from Mass Extinction Era Linked to Lung Cancer Mystery

ScienceDaily — The volcanic eruptions thought responsible for Earth's largest mass extinction -- which killed more than 70 percent of plants and animals 250 million years ago -- is still taking lives today. That's the conclusion of a new study showing, for the first time, that the high silica content of coal in one region of China may be interacting with volatile substances in the coal to cause unusually high rates of lung cancer. The study, which helps solve this cancer mystery, appears in ACS' *Environmental Science & Technology*.

David Large and colleagues note that parts of China's Xuan Wei County in Yunnan Province have the world's highest incidence of lung cancer in nonsmoking women -- 20 times higher than the rest of China. Women in the region heat their homes and cook on open coal-burning stoves that are not vented to the outside. Scientists believe that indoor emissions from burning coal cause cancer, but are unclear why the lung cancer rates in this region are so much higher than other areas. Earlier studies show a strong link between certain volatile substances, called PAHs, in coal smoke and lung cancer in the region.

The scientists found that coal used in parts of Xuan Wei County had about 10 times more silica, a suspected carcinogen, than U.S. coal. Silica may work in conjunction with PAHs to make the coal more carcinogenic, they indicate. The scientists also found that this high-silica coal was formed 250 million years ago, at a time when massive volcanic eruptions worked to deposit silica in the peat that formed Xuan Wei's coal.

Journal Reference:

1. Large et al. **Silica-Volatile Interaction and the Geological Cause of the Xuan Wei Lung Cancer Epidemic**. *Environmental Science & Technology*, 2009; 43 (23): 9016.

Loss of Reflectivity in the Arctic Doubles Estimate of Climate Models

ScienceDaily — A new analysis of the Northern Hemisphere's "albedo feedback" over a 30-year period concludes that the region's loss of reflectivity due to snow and sea ice decline is more than double what state-of-the-art climate models estimate.

The findings are important, researchers say, because they suggest that Arctic warming amplified by the

loss of reflectivity could be even more significant than previously thought.

The study was published online in early January 2011 in *Nature Geoscience*. It was funded primarily by the National Science Foundation, with data also culled from projects funded by NASA, the Department of Energy and others.

"The cryosphere isn't cooling the Earth as much as it did 30 years ago, and climate model simulations do not reproduce this recent effect," said Karen Shell, an Oregon State University atmospheric scientist and one of the authors of the study. "Though we don't necessarily attribute this to global warming, it is interesting to note that none of the climate models used for the 2007 International Panel on Climate Change report showed a decrease of this magnitude."

Islands frozen in Frobisher Bay with mountains in the distance. Nunavut Canada. The cryosphere is the collective portion of the Earth's surface where water is in solid form and includes sea ice, snow, lake and river ice, glaciers, ice sheets and frozen ground. Most of these frozen areas are highly reflective, and "bounce" sunlight back into the atmosphere, keeping the Earth cooler than it would be without the cryosphere. (Credit: iStockphoto/Ryerson Clark)

The cryosphere is the collective portion of the Earth's surface where water is in solid form and includes sea ice, snow, lake and river ice, glaciers, ice sheets and frozen ground. Most of these frozen areas are highly reflective, and "bounce" sunlight back into the atmosphere, keeping the Earth cooler than it would be without the cryosphere.

But as temperatures warm, ice and snow melts and reflectivity decreases, noted Shell, an assistant professor in OSU's College of Oceanic and Atmospheric Sciences.

"Instead of being reflected back into the atmosphere, the energy of the sun is absorbed by the Earth, which amplifies the warming," Shell said. "Scientists have known for some time that there is this amplification effect, but almost all of the climate models we examined underestimated the impact -- and they contained a pretty broad range of scenarios."

As part of the study, Shell, lead author Mark Flanner of the University of Michigan, and their colleagues compared Northern Hemisphere cryosphere changes between 1979 and 2008 in 18 different climate models to changes in actual snow, ice and reflectivity measurements of the same period. They determined that mean radiative forcing -- or the amount of energy reflected into the atmosphere -- ranged from 4.6 to 2.2 watts per meter squared.

During the 30-year study period, cryosphere cooling declined by 0.45 watts per meter squared. The authors attribute that decline equally to loss of snow and sea ice.

"Some of the decline may be natural climate variability," Shell said. "Thirty years isn't a long enough time period to attribute this entirely to 'forcing,' or anthropogenic influence. But the loss of cooling is significant. The rate of energy being absorbed by the Earth through cryosphere decline -- instead of being reflected back to the atmosphere -- is almost 30 percent of the rate of extra energy absorption due to carbon dioxide increase between pre-industrial values and today."

The "albedo" or reflectivity process is simple, scientists say, but difficult to measure on a broad scale. The reflectivity of ice and snow is obviously much greater than that of darker, unfrozen ground, or open sea water. But researchers also have discovered that variations in the snow and ice result in different albedo impacts.

For example, pools of melted water on top of sea ice can have significantly less reflectivity, which in essence may speed up the warming and possibly melting of that sea ice.

"While the current group of models underestimates these Northern Hemisphere cryosphere changes, new models will be released this year that will have better representations of snow and ice," Shell said. "This study will help climate modelers improve the new generation of models to better predict the rate of cryosphere and albedo decline in the future."

Journal Reference:

1. M. G. Flanner, K. M. Shell, M. Barlage, D. K. Perovich, M. A. Tschudi. **Radiative forcing and albedo feedback from the Northern Hemisphere cryosphere between 1979 and 2008**. *Nature Geoscience*, 2011.

Secrets of Dinosaur Footprints Revealed, Thanks to 'Goldilocks'

ScienceDaily — Terrain thought to be ruled by only the largest dinosaurs to inhabit Earth could have in fact been home to dozens of other creatures, ground-breaking research from The University of Manchester has found.

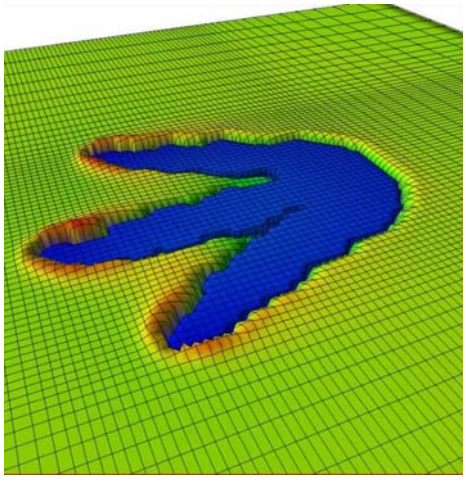
Writing in the journal of the Royal Society *Interface*, Dr. Peter Falkingham has discovered that dinosaurs only created lasting footprints if the soil conditions were perfect to do so -- and entirely depending on the animal's weight.

Dubbed the 'Goldilocks Effect' -- as all conditions have to be 'just right' for a print to be created -- this work could help to bring ancient environments to life, by showing how a great number of animals can walk over an area, but only a few leave behind tracks.

The findings mean that hugely-significant prehistoric dinosaur track sites, such as Paluxy River in Texas, USA, or Fumanya, Spain could have been host to a much larger number of dinosaurs and other animals than the tracks themselves show.

Dr. Falkingham, from the University's School of Earth, Atmospheric and Environmental Sciences, led a team using detailed computer modeling to recreate the process of large dinosaurs making footprints in different types of mud.

The team incorporated scientists from a range of disciplines, including vertebrate palaeontologist Dr. Phil Manning and Geotechnical engineer Dr. Lee Margetts, both from The University of Manchester, and biomechanicist Dr. Karl Bates (University of Liverpool).



A computer model of a three-toed dinosaur track. (Credit: Image courtesy of Dr. Peter L. Falkingham, University of Manchester)

By using computer modeling to simulate dinosaurs making tracks, the scientists were able for the first time to run dozens of simulations in order to systematically change the conditions of the mud.

As dinosaurs ranged vastly in weight, from Brachiosaurus, weighing around 30 tonnes, to Compsognathus, which was the size and weight of a chicken, Dr. Falkingham worked out that only the heaviest creatures would leave prints in certain mud conditions.

Equally, in other areas where the mud was deep and soft, only lighter, nimbler dinosaurs would be able to walk over it and therefore leave prints; larger animals would become stuck and die.

These insights give palaeontologists the chance to re-evaluate the ecosystems which existed more than 100 million years ago.

Dr. Falkingham said: "By using computer modeling, we were able to recreate the conditions involved when a 30-tonne animal makes a track.

"That's very hard to do with physical modeling, more so when you need to do it 20 times in 20 different types of mud.

"But the real advantage of computer modeling is that everything is controllable. We were able to ensure that in every simulation we could look at the effects of each variable (for instance, the shape of the foot, or the weight of the animal) independently.

"As with most scientific papers, this isn't the end of research, this is the beginning.

"Now we can use this "Goldilocks" effect as a baseline for exploring more complicated factors such as the way dinosaurs moved their legs, or what happens to tracks when a mud is drying out."

In Paluxy River, site of one of the most famous sets of dinosaur footprints which seem to show a sauropod being chased by a carnivorous theropod, there are only footprints recording large dinosaurs.

But Dr. Falkingham's findings suggest that many more species probably lived there, walking over the same mud, but their footprints either made no impression or have disappeared over time.

The computer method was based on a technique common in engineering, known as finite element analysis.

This method lets scientists simulate the deformation of a material under load. While in engineering this may be an airplane wing supporting the aircraft, Dr. Falkingham and his co-authors applied the method to mud supporting a dinosaur.

Journal Reference:

1 P. L. Falkingham, K. T. Bates, L. Margetts, P. L. Manning. **The 'Goldilocks' effect: preservation bias in vertebrate track assemblages**. *Journal of The Royal Society Interface*, 2011.

Dinosaurs Survived Mass Extinction by 700,000 Years, Fossil Find Suggests

ScienceDaily — University of Alberta researchers determined that a fossilized dinosaur bone found in New Mexico confounds the long established paradigm that the age of dinosaurs ended between 65.5 and 66 million years ago.

The U of A team, led by Larry Heaman from the Department of Earth and Atmospheric Sciences, determined the femur bone of a hadrosaur as being only 64.8 million years old. That means this particular plant eater was alive about 700,000 years after the mass extinction event many paleontologists believe wiped all non-avian dinosaurs off the face of earth, forever.

Heaman and colleagues used a new direct-dating method called U-Pb (uranium-lead) dating. A laser beam unseats minute particles of the fossil, which then undergo isotopic analysis. This new technique not only allows the age of fossil bone to be determined but potentially can distinguish the type of food a dinosaur eats. Living bone contains very low levels of uranium but during fossilization (typically less than 1000 years after death) bone is enriched in elements like uranium. The uranium atoms in bone decay spontaneously to lead over time and once fossilization is complete the uranium-lead clock starts ticking. The isotopic composition of lead determined in the hadrosaur's femur bone is therefore a measure of its absolute age.

U of A researcher Larry Heaman with the actual fossil that now throws into questions the KT paradigm. He is sitting in front the laser ablation machine. (Credit: Image courtesy of University of Alberta)

Currently, paleontologists date dinosaur fossils using a technique called relative chronology. Where possible, a fossil's age is estimated relative to the known depositional age of a layer of sediment in which it was found or constrained by the known depositional ages of layers above and below the fossil-bearing horizon. However, obtaining accurate depositional ages for sedimentary rocks is very difficult and as a consequence the depositional age of most fossil horizons is poorly constrained. A potential weakness for the relative chronology approach is that over millions of years geologic and environmental forces may cause erosion of a fossil-bearing horizon and therefore a fossil can drift or migrate from its original layer in the strata. The researchers say their direct-dating method precludes the reworking process.

It's widely believed that a mass extinction of the dinosaurs happened between 65.5 and 66 million years ago. It's commonly believed debris from a giant meteorite impact blocked out the Sun, causing extreme climate conditions and killing vegetation worldwide.

Heaman and his research colleagues say there could be several reasons why the New Mexico hadrosaur came from a line of dinosaurs that survived the great mass extinction events of the late Cretaceous period (KT extinction event). Heaman says it's possible that in some areas the vegetation wasn't wiped out and a number of the hadrosaur species survived. The researchers also say the potential survival of dinosaur eggs during extreme climatic conditions needs to be explored.

Heaman and his colleagues believe if their new uranium-lead dating technique bears out on more fossil samples then the KT extinction paradigm and the end of the dinosaurs will have to be revised.

The research was published online, January 26, in the journal, *Geology*.

Journal Reference:

1. J. E. Fassett, L. M. Heaman, A. Simonetti. **Direct U-Pb dating of Cretaceous and Paleocene dinosaur bones, San Juan Basin, New Mexico**. *Geology*, 2011; 39 (2): 159.

NORTHERN CALIFORNIA GEOLOGICAL SOCIETY

NCGS DINNER MEETING

"Assembling California: an Update"

Also

"The initiative on recognition of Earth Science for entrance into the University: an Update"

Wednesday May 25, 2011

Speaker: Dr. Elridge M. Moores, Distinguished Professor Emeritus
University of California, Davis
6:00 PM at Orinda Masonic Center
(Reservations are required by May 21, 2011, Limit 100 persons)
We are sorry but we will not be able to accommodate "walk-ins"

Stepping out of our normal routine, the **Northern California Geological Society** is pleased to announce this *special dinner and evening* with **Dr. Elridge Moores**. For this unique event, planned for our normal monthly meeting date, but starting one-half hour early, we are planning in typical NCGS style, a **Back Forty Texas BBQ dinner consisting of Pork Ribs and BBQ Chicken, Tossed Green Salad, BBQ Beans, Fresh Corn Cobettes. For vegetarian dinners a deluxe veggie burger will be served in place of BBQ. Desert will include assorted cookies and brownies. We may be again serving wines from California specials (90 pts +).** Please also note that a vegetarian option is available if notified ahead (please see the registration form below).

Abstract: Assembling California: an Update

During the plate tectonic revolution in the 1960's, at first California geology played a small role. That changed with the December, 1969 Asilomar Penrose Conference, in which the Franciscan complex became the type example of a subduction complex, and the Sierra Nevada became a prime example of an Andean-style continental margin. Ophiolite emplacement and collisions between oceanic island arcs and the continent also were invoked in 1970 to explain western U.S. tectonic development, but acceptance of these ideas proceeded more slowly.

In the past two decades, however, many new data and concepts have enriched the picture of northern California's tectonic development, especially since publication of John McPhee's *Assembling California (1993)*. North America probably rifted away some 650-750 million years ago from its former continuation currently present in eastern Australia-East Antarctica. The oldest rocks in northern California--Shoo Fly-Antelope sediments, and the Trinity ophiolite--may have originated from the Appalachians/west Africa and Iapetus Ocean, respectively. Plate tectonic activity in the past 200 million years included collision of Pacific-derived island archipelagoes with North America, as well as subduction of several plates beneath the continental margin. An ophiolitic slab beneath the Great Valley tectonically overlies the continental edge of North America, resulting in a "double Moho" beneath the Valley. This feature has probably kept the Valley low as the Sierra and Coast Ranges rose around it.

Folds and thrusts in the northern Sierra Nevada may be as young as Cretaceous in age (Christe, 2010). At least one archipelago collision (Wrangellia) may be as young as 100 million years. The "Sevier-Laramide" orogeny may have resulted from mid-Cretaceous collision of a "ribbon continent" with North America (Johnston, 2008, Hildebrand, 2009) About 50 million years ago a Tibet-like highland (also called the "Nevadoplano": DeCelles, 2004) had developed in central-eastern Nevada, with a drainage divide in eastern Nevada (Henry et al, 2008). Major streams drained westward from this highland over deformed and eroded older Sierra rocks to the ocean in the present-day Sierra foothills. Deposits

include the Auriferous Gravels of the northern Sierra and younger silicic tuffs (Valley Spring formation) derived from large calderas in central Nevada. The San Andreas Fault system began some 29 million years ago. At present, the Sierra Nevada and Great Valley constitute the ***Sierra Microplate***, located between the Pacific and North American plates.

The long-term evolution of the North American Pacific margin encompasses complex processes of rifting, subduction, collision, igneous and metamorphic activity, and large-scale faulting of all types over some 650 million years. The western Pacific and Alpine orogens provide many insights into the nature of the tectonic development of the complex North American Pacific margin.

Speaker Biography:

Eldridge M. Moores is Distinguished Professor of Geology at the University of California, Davis. He was born and raised in the remote Arizona mining town of Crown King, where his father and grandfather operated small lead-zinc-gold mines. The Moores family was musically inclined, and Eldridge began to play the cello when he was thirteen, a passion he has enthusiastically pursued his entire life. He attended high school in Phoenix where he excelled in music and history. He majored in Geology at the California Institute of Technology and received his Bachelor's Degree in 1959. In 1963 he received a Ph.D. in Geology from Princeton University as a student of Professor Harry Hess. His post doctoral work at Princeton recognized the Troodos ophiolite complex on the Mediterranean island of Cyprus as ancient oceanic crust.

Eldridge came to U.C. Davis in 1966, and was Department Chair during the early 1970's. He continued his plate tectonic research, focusing on the tectonic evolution of Northern California and the Western U.S., and on the tectonics of the Alps, the Himalayas, Pakistan, Greece, and Cyprus. Eldridge has also made significant contributions to the plate tectonic evolution of Precambrian continental terranes and the associated bio-evolutionary effects. Dr. Moores has published extensively on Northern California tectonics, orogenies in the western United States, the evolution of the California Coast Range, processes of ophiolite emplacement, and on spreading center tectonics and ocean ridge ore deposition. He was President of the Geological Society of America in 1996, and editor of Geology magazine from 1981 to 1987. Eldridge received the GSA Distinguished Services Award in 1988 and the GSA Distinguished Career Award in 2006. He is a Fellow of the Geological Society of America, the California Academy of Sciences, and the American Association for the Advancement of Science, and an Honorary Fellow of the Geological Society of London. He received the Geological Association of Canada Medal in 1994 and was presented an Honorary D.Sc. from the College of Wooster in 1997. In 2003 the U.C. Davis Academic Senate awarded him its Distinguished Scholarly Public Service Award.

Dr. Moores is also actively involved in promoting Earth Science education at the K-12, undergraduate, and graduate levels locally, in Yolo County, and in Sacramento. He is a member of the National Science Foundation and has served on several other academic advisory committees in the Federal government. Eldridge collaborated closely with author John McPhee on the book "Assembling California," one of five books on geology in the 1998 Pulitzer Prize winning series "Annals of the Former World." He has also co-authored two geology textbooks with U.C. Davis colleague Dr. Robert J. Twiss, ***Tectonics*** and ***Structural Geology***.

********** **Dinner Logistics** **********

Meeting Details: Social Hour: 6:00 – 7:00 pm; Dinner: 7:00 – 8:00 pm **Presentation**: 8:00 – open
Time: May 25, 2011, 6:00 pm, Orinda Masonic Center 9 Altarinda Road, Orinda, CA. **Cost**: **$20/person**

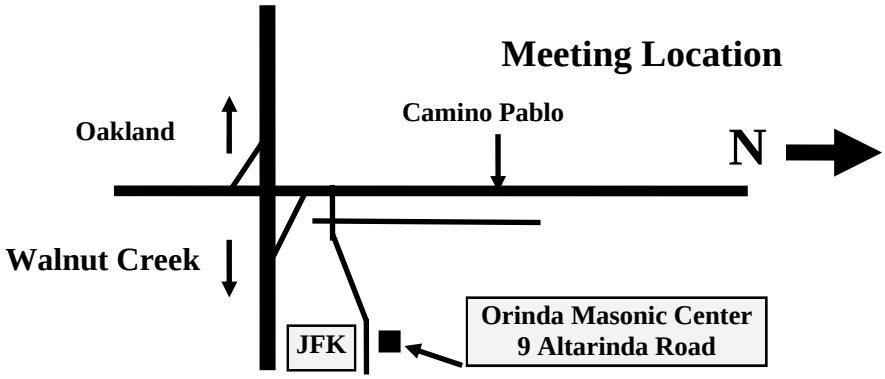
**********REGISTRATION FORM (Dr. Elridge Moores Dinner) **********

Name:_____ E-mail:_____

Phone (day):_____ Phone (cell) _____

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: tridibguha@sbcglobal.net Phone: (925) 370-0685 (evening) (925) 451-1999 (day)



Case studies demonstrating the cost-effective detection and areal-extent mapping of chlorinated solvents, hydrocarbon fuels, explosives, CW breakdown products, PAHs, pesticides, PCBs, and more will be discussed during the presentation. Experience at DOD sites, bulk storage terminals and pipelines, manufactured gas plants, and chemical facilities, drycleaners, brownfield sites, and indoor air assessment will be presented. Comparison of results will be made to both conventional soil and ground water quality data as well as active soil-gas survey data. EPA(SITE) ETV evaluation results will be presented.

Biography: Andre Brown, P.E. is currently the Director of Western Operations, Survey Products Group for W.L. Gore & Associates, Inc. Andre holds a B.S. in Mechanical Engineering from the University of South Carolina, a M.S. in Ocean Engineering from the University of Hawaii, and a M.B.A. in Operations Management from California State University. His experience includes 25 years in petroleum exploration and environmental project management in the Western U.S., Mexico, Canada and the Pacific Rim. He manages this business from the San Francisco offices of W.L Gore and Associates.

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Would you like to receive the NCGS newsletter by e-mail? If you are not already doing so, and would like to, please contact **Rob Nelson** at **rlngeology@sbcglobal.net** to sign up for this free service.