

# NORTHERN CALIFORNIA GEOLOGICAL SOCIETY



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## JUNE MEETING ANNOUNCEMENT

- DATE:** Wednesday, June 28, 2000
- 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 on the recorder at 925-294-7530 anytime before the meeting.



**SPEAKER:** Keil Albert, Project Geologist, Geoconsultants Inc., San Jose

### *The Geologic and Tectonic Significance of the Pleistocene Irvington Gravels, East Bay Area Foothills*

The Pleistocene Irvington Gravels exposed in a small outcrop area in the East Bay Area foothills may reveal clues as to the tectonic and sedimentary history of the region during the Pleistocene. The Irvington Gravels were deposited as braided fluvial stream deposits. The coarse-grained portions of the Irvington Gravels bear a striking resemblance to the coarse-grained portions of the Upper Livermore Gravels, which are age correlative and are exposed in the Livermore Valley some 23 kilometers to the east of the Irvington outcrop. Clast compositions were examined in the Irvington Gravels and compared to previous work completed on clast compositions and provenance studies of the Upper Livermore Gravels. Both units are composed primarily of Franciscan Assemblage clasts from the central Diablo Range, with material from Tertiary sedimentary units being subordinate.

The recognition that these deposits may be related has tectonic implications for the region. The two units are now separated by the Diablo Range, which rises to an elevation of at least 400 meters in the area between the outcrop exposures. This would suggest Middle to Late Pleistocene through recent uplift of this region by at least this amount, and probably much more. Uplift was accomplished by movement

*Continued on the back page of the newsletter*

## **NCGS Speaker Program: Year 2000**

Wednesday, January 26, Masonic Auditorium, Orinda, CA

**Paul R. Renne**, University of California, Berkeley, and Director, Berkeley Geochronology Center  
**Continental Flood Basalts and Associated Extraterrestrial Impact and Mass Extinction Phenomena**

Wednesday, February 23, Masonic Auditorium, Orinda, CA

**Warren Nokleberg**, U.S. Geological Survey, Menlo Park, CA  
**Dynamic Computer Model for the Phanerozoic Tectonic and Metallogenic Evolution of the Circum-North Pacific**

Wednesday, March 29, Masonic Auditorium, Orinda, CA

**Heidi Stenner**, U.S. Geological Survey, Menlo Park, CA  
**Tectonics of the Anatolian Fault System and Turkish Earthquakes**

### ***Special Chevron Overseas Petroleum (COPI)-Hosted Event***

**Saturday, April 1, 10:00 a.m.-12:00 noon**, COPI (Chevron) Virtual Reality Visualization Center, San Ramon, CA  
**Geology and 3-D Demonstration of Tengiz Oil Field and Absheron Prospect, Caspian Sea**  
**Robert Kieckhefer**, COPI, San Ramon, CA and **Frank Picha**, Consultant, Walnut Creek, CA

Wednesday, April 26, Masonic Auditorium, Orinda, CA

**Philip B. Duffy**, Group Leader, Climate and Carbon Cycle Modeling Group, Lawrence Livermore National Laboratory  
**The Science of Climate Change: What We Know, What We Don't Know**

Wednesday, May 24, Masonic Auditorium, Orinda, CA

**David Lawler**, Far West Geoscience Foundation, Berkeley, and Bureau of Land Management, Sacramento  
**Paleofluvial Systems and Placer Gold Deposits in the Sierra Nevada Region, California--Sedimentation and Mercury Impacts Associated with Historic Mining Methods**

Wednesday, June 28, Masonic Auditorium, Orinda, CA

**Keil Albert**, Geoconsultants Inc., Sunnyvale  
**Geologic and Tectonic Significance of the Pleistocene Irvington Gravels, East Bay Area Foothills**

Wednesday, September 27, Masonic Auditorium, Orinda, CA

**Dr. Eldridge Moores**, University of California, Davis, and 1996 President, Geological Society of America  
**Geology and Society: A Call for Action**

Wednesday, October 25, Masonic Auditorium, Orinda, CA

**Frank Picha**, Consultant, Walnut Creek, CA  
**Sedimentary Basins and Petroleum Systems in Terms of Global Tectonic Cycles**

**Wednesday, November 29, Masonic Auditorium, Orinda, CA, or Site TBA . . . . . NCGS FAMILY NIGHT**

**Chris McKay**, NASA Ames Research Center, Mountain View  
**Landscape Geomorphology and the Search for Water on Mars: Implications for the Development of Life**

## **AAPG Distinguished Lecturer Program: Year 2000**

Wednesday, March 8, Masonic Auditorium, Orinda, CA

**Robert C. Balling**, Arizona State University, Tempe, AZ  
**A Climate of Doubt about Global Warming**

Wednesday, April 12, COPI Auditorium, Chevron Overseas Petroleum Inc., San Ramon, CA

**Mark Cooper**, PanCanadian Petroleum, Calgary, Canada  
**Oil and Gas Fields Associated with Inverted Extensional Faults: A Global Review**

Wednesday, May 3, Masonic Auditorium, Orinda, CA

**B. Clark Burchfiel**, Massachusetts Institute of Technology, Schlumberger Professor of Geology  
**Evolution of the Tibetan Plateau Viewed from the Perspective of Eastern Tibet**

## Editorial

Dear fellow members,

I am writing to discuss an incident that I feel needs to be addressed by the **California State Board of Registration for Geologists and Geophysicists**. I bring it to your attention as an example of what I think is a failure of the SBRGG to perform its regulatory duties. I am therefore requesting that the Board reopen my case 01-96-7 for enforcement because I believe it was given a cursory examination and then prematurely closed.

The infraction I refer to involves a very remote Caltrans hazardous waste site in Northern California opened for bid in June 1994. I had just started my firm and was attempting to subcontract a portion of this project. An environmental contractor and I had examined the site together and had discussed the terms of a work agreement between us. The contract that was drafted, however, was not to my satisfaction. A second and third contract were drafted, and neither stipulated that a registered geologist be on site to supervise sampling at this remote site, as had originally been requested by Caltrans and as is explicitly required by SBRGG regulations. I brought this issue to the attention of an SBRGG officer and was advised not to accept the contract. I did as I was instructed, but later discovered from another subcontractor that the investigation had apparently been conducted without a registered geologist on site. The investigating contractor even offered to pay me to review the site report and sign it as a registered geologist, even though I had not been on site to supervise the work, and would be legally liable for any infractions or errors that might have been committed by the investigating team. This practice, or at least parts of it, are clearly unethical and in blatant violation of the SBRGG Code of Regulations; specifically Article 6, section 7872(g).

I have written to two Caltrans managers informing them of this activity and requesting a hearing, and their response was to offer me compensation, but not a hearing. I personally petitioned the SBRGG to consider my case at a public meeting in Sacramento, and the Board subsequently sent an Enforcement Officer to visit me. He spent some time at my office examining the evidence I had on this case and told me that he felt infractions had been committed, but no further work has been done. I have appealed my case to two Executive Officers and two Presidents of the State Board of Registration for Geologists and Geophysicists requesting that I be granted a hearing. Eight qualified state registered geologists have reviewed my case, and all have written to the Executive Officer of the SBRGG requesting that I be granted a hearing. Each of us has received official letters assuring us that the matter will be reviewed, but to date no hearing has been held.

I am only asking that I be given an opportunity to present my complaint to the Board in a sanctioned hearing. An SBRGG officer originally advised me to turn down this contract at a time when I was struggling to establish my business in a very competitive market. Yet this same regulatory agency does not see fit to pursue my case when there is compelling evidence that an SBRGG regulation has been violated.

I am aware of other registered professional geoscientists who have had cases of regulatory violations ignored by the SBRGG. I encourage them to continue to appeal their grievances. These infractions are a serious threat to our professional livelihood. Registered geologists, engineering geologists, geophysicists, and hydrogeologists have worked hard to pass the state registration exams and then must pay annual fees to maintain these credentials. Is it asking too much to demand that the Board also uphold its duties to carefully examine incidents where there is evidence that illegalities have been committed? It not only ensures an honest and fair business environment for geoscience professionals; it also protects the public from fraudulent activities by individuals who are not qualified to perform these tasks. ***Regulation without enforcement is worse than no regulation at all!***

Respectfully yours,

Tridib Guha  
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## The Knowns and Unknowns of Climate Change Reviewed at April 26th NCGS Meeting

The April 26th monthly meeting took up the topic of climate change again with "*The Science of Climate Change: What We Know; What We Don't Know.*" This presentation by Dr. Philip B. Duffy, Group Leader, Climate and Carbon Cycle Modeling Group, Atmospheric Science Division, Lawrence Livermore National Laboratory, addressed several topics on global warming and climate change. Paramount among these issues are what the scientific observations that tell us about climate change, are the observed changes (if any) anthropogenic (man-made), what are the potential consequences of global warming, what does the carbon cycle contribute to our knowledge of climate change, how do we predict climate change in the future, and what aspects of climate change researchers know or don't know with confidence.

A pivotal piece of evidence critical to Dr. Duffy's arguments is a graph plotting mean annual global temperature change from 1850 to the present. It shows an apparent warming trend of  $\sim 0.5^{\circ}\text{C}$  over this interval, most clearly evident since World War I. His research also indicates that annual precipitation has increased in the United States and worldwide from 1900 to 1994, that extreme precipitation events are on the rise in recent decades, satellite-monitored sea ice thickness and areal distribution has decreased over the last 20 years, and that Antarctic sea ice has receded. The key issue is whether these phenomena are triggered by man's activities or are merely part of a natural cycle.

The centerpost of global warming theory is the Greenhouse Effect. It is based on the theory that atmospheric increases in the "greenhouse gases" (carbon dioxide, methane, nitrogen oxides, water vapor, and chlorofluorocarbons) will block infrared radiative heat losses from the earth's surface and cause temperatures to rise. The results are melting of the polar ice caps, a rise in sea level, and perturbation of normal weather cycles. The fears of many are that an increase in mean annual temperature will also lead to higher precipitation in some areas, a greater frequency of severe weather events, and smaller day-to-night time temperature fluctuations. Most of the post-1900 data used to plot the mean annual global temperature change curve is based on terrestrial thermometer readings, and in the last two decades, is supplemented with readings from weather balloons and satellite surveillance. The pre-Twentieth Century data set going back a millenium is based on tree ring studies (dendrochronology) and on stable isotope (non-radioactive hydrogen, oxygen, and carbon) analyses of cored ocean sediments and polar ice caps. The stable isotope ratios ( $\text{O}^{18}/\text{O}^{16}$  for example) in water and carbonates varies with temperature and preserve a thermal record at the time the precipitation falls or the carbonate is incorporated into the sediments. This 1000 year record pre-dating the 19th and 20th Century databases, however, has a higher degree of uncertainty than the recent data. The computer climate models must be able to take into account the effects of solar luminosity and latitudinal effects on the mean annual global temperature before anthropogenic effects can be determined. That solar luminosity changes of 2% will measurably warm the upper atmosphere and that the atmospheric carbon dioxide content has risen 30% over the last century are not being contended in the scientific community.

Dr. Duffy listed significant warming comparable to that encountered during glacial Ice Age cycles, higher precipitation, increased extreme weather events, elevated sea level, disruption of ecosystems, sudden changes in large scale ocean circulation, and major regional climate changes as potential consequences of global warming. The effect on ocean circulation would alter near surface current patterns and cause upwelling of deeper cold water. This would directly influence nutrient pathways and would have substantial impact on local fishing industries and weather patterns. Global effects, however, would be small. Changes in ocean currents can be predicted by computer modeling. Regional shifts in weather conditions triggered by global warming could have significant influences on local economies, particularly in agricultural areas. Although water vapor is the most important atmospheric gas regarding global weather conditions, carbon dioxide is more susceptible to human influences. Dr. Duffy's research indicates a coupling between the atmosphere and the ocean via the carbon cycle. The atmosphere carbon dioxide content influences gas fluxes into and out of the terrestrial biosphere as well as the between ocean and atmosphere. The oceans are also the earth's key thermal and carbon reservoirs. Feedback mechanisms between the atmosphere, oceans, and the terrestrial biosphere are complex and central to many of the arguments being debated about greenhouse effects, global warming, climate change, and man's role in this conundrum. A key to deciphering the climatological interplay between oceans and the atmosphere requires that scientists get a much better understanding of atmospheric carbon dioxide and the carbon cycle over the last 150,000 years.

Ken concluded by summarizing what he thinks are the knowns and unknowns of recent climate change. Scientists are reasonably certain that the earth's surface has been warming over the last millenium. The twentieth century is the warmest century in the last 1000 years, and the atmospheric carbon dioxide content has been measurably and significantly rising since the early 1900's. Increases in the mean annual temperature since the turn of the century agree better with computer models that take into account anthropogenic inputs into the system than those which do not. Our weaknesses, according to Ken, include man's poor understanding of climate variations on a 100 year time scale, our poor grasp of *how much* influence anthropogenic factors have on global climate change, why atmospheric carbon dioxide levels change during

Ice Ages, our inability to accurately predict El Nino weather anomalies, and the uncertainty experts have determining how future climate changes will affect marine and terrestrial biosphere responses to these perturbations.

The NCGS gratefully acknowledges Dr. Ken Duffy of Lawrence Livermore National Laboratory for taking time from his busy schedule to discuss the current status of evaluating and predicting climate change. Ken has been deeply involved with climate change research and carbon cycle modeling for seven years. We appreciate his comments on the global warming controversy and his willingness to debate these topics with members of the audience. Our thanks to Dr. Duffy, AAPG Distinguished Lecturer Dr. Robert Balling of Arizona State University at Tempe, and Dr. Benjamin Santer of LLNL who have provided the NCGS with an excellent synopsis of global warming concepts from both camps over the last eight months.

## **Altamont Hills Excursion Opens Year 2000 Field Trip Season**

Consultant **Ron Crane** helped NCGS open this year's field season with a one-day jaunt through the Altamont Hills east of Livermore. This trip complements the Brushy Peak, Sunol Wilderness, and Mt. Hamilton-Del Puerto Canyon trips that Ron and Sandy Figuers led last year to introduce attendees to the structural complexity of the northern Diablo Range. This trip was fortunately blessed by unusually calm, sunny weather for this part of the Coast Range.

The first field trip group assembled at the Patterson Pass Water Treatment Plant and proceeded past the Livermore Oil Field, which is situated on a plunging anticlinal nose extending westward from the Greenville fault zone. Here the Mt. Diablo antiform plunges south and two westward-vergent subsurface thrust faults occur just before the South Bay aqueduct. The nose of the anticline was drilled to tap the oil reservoir, but the source rocks are speculative; probably Eocene Kreyenhagen Formation ten miles to the south or Miocene Monterey-type rocks in the subsurface of the Diablo antiform. The trip caravan ascended into the Altamont Hills on Patterson Pass Road, following another trace of the Greenville fault system. Near the top of the ridge, the vehicles stopped to view a tightly folded syncline with 60 to 65° dipping flanks oriented parallel to the fault. Ron believes the Greenville fault, locally referred to as a strike-slip fault, is actually a compressive feature. The Diablo anticlinal structure has overridden the syncline, which extends beneath the antiform to the east in a thrust motion with a possible slight horizontal component.

The view from Patterson Pass was breathtaking. The Central valley loomed in the distance and the hills in the foreground were dotted with cattle and---windmills! The Cierbo (lower upper Miocene Briones equivalent) was exposed in the outcrop and is overlain by the blue-gray Neroly Formation. The latter's distinctive color is derived from altered Sierran andesitic volcanic debris air-fall deposited into the sediment. The Stockton Arch affected this area in the late Cretaceous and resulted in anticlines and synclines that were subsequently refolded by the northward-moving Diablo Range. The area has been influenced by deformation events in the late Cretaceous, Paleocene-Eocene, Mio-Pliocene, early to middle Pleistocene, and by current orogenic activity. The Cierbo in this area is a shallow fluvial and estuarine unit disconformable on the Cretaceous that contains pebbles of Sierran origin. At this time Mt. Diablo and the Diablo Range were high and the Cierbo terranes were topographic lows.

The third stop downhill from Patterson Pass looked up at the Neroly Formation capping hilltops to the north. Bedding was revealed by color changes in grasses that were caused by fault barriers that locally disrupted groundwater flow. The fourth stop was at Stone Corral, a local landmark thought to have been made by early settlers. A thrust cuts up a north-trending valley west of the corral. Members were standing on the thrust of the Mt. Diablo antiform, which has only minor throws on the associated faults. Consultant Mel Erskine mentioned that the Coast Ranges are full of warm springs that reach the surface at elevations of 500 to 1000 feet, and represent pore fluids squeezed out of the Great Valley sedimentary sequence at depth by tectonic forces. The fluid overpressure this causes actually lubricates the fault planes.

The group took a short rest break at a truck stop on I-5 near Tracy. Ron used a 1998 Landsat 5 satellite photo of the greater Bay Area to illustrate his conceptions of the general geology and tectonics of the East Bay and Diablo Range. If these structures were unfolded, some of these units would 50 km. west of their present locations. He also discussed the southward ENE-WSW passive thrusting of the Mt. Diablo block, which creates mildly seismic activity at depths below 3 km., and aseismic flow of the sedimentary veneer above that level. Ron also mentioned that refined dating of ophiolitic rock, Franciscan assemblages, and Great Valley Sequence sediments show different ages for these rocks from different areas. These findings indicate some plate tectonics models for west coast subduction complexes are grossly oversimplified. The vehicles filled and headed south towards Corral Hollow. A few miles west of the I-5 exit on Corral Hollow Road, the group stopped to view the Black Butte anticline and thrust fault, and uplifted Pleistocene Tulare Formation lake bed pediment unconformably overlain by middle(?) Pleistocene gravels. The pediment surface slopes to the northeast. Uplift of this terrace is post-middle/pre-late Pleistocene in age. The Black Butte fault in this area thrusts Cretaceous over Quaternary gravels and Tulare Formation, and to the north, Cierbo and Neroly over these Pleistocene units. The following

stop 2 miles up the hollow gave an excellent view of Castle Rock, a Neroly outcrop dipping 18° to the west. To the north, the Neroly dips southward on the flank of the Patterson anticline. Its strike changes from NW to EW as the Neroly dips into the Callahan syncline. The vehicles passed Lawrence Livermore National Lab Site 300 before stopping at Carnegie Cycle park for lunch. The hills to the north of Carnegie Park dip gently and are the southernmost plunge of the Mt. Diablo antiform. This area also contains older structures on the extension of the Stockton Arch. The Stockton fault here was originally a down-to-the-south listric normal fault in Cretaceous times that was reactivated in the mid-Miocene as a thrust to the north.

Three miles uphill is the old Tesla pottery site. Units here are on the south limb of the Callahan syncline and dip steeply northward. The Cierbo rests on coal-bearing Tesla (Domengine equivalent) Formation which overlies Maastrichtian sediments. Another 1½ miles west, the group pulled off the road to examine a roadcut through Tulare equivalent lake beds in a landslide slumping toward the road. Another mile west the vehicles stopped to look at fault patterns on the north flank of the Callahan syncline visible across the valley as intersecting green "X's" where escaping groundwater has kept the grass alive. As the caravan re-entered the Livermore Valley it crossed the trace of the Greenville fault. At Greenville Road the group headed north and over a small ridge marking the Las Positas fault zone. Trenching of this fault at LLNL recently verified cross faults on the Las Positas structure, and other studies on the northwest corner of the Lab revealed the extension of an anticline that crosses I-580 to the northwest. Faulting associated with an anticline-syncline structure off the Tassajara Hills bordering the north end of the Livermore Valley implies that a shallow thrust fault exists under the anticlinal structures, suggesting that the Mt. Diablo thrust may extend to the Las Positas fault zone. Food for thought as more data keeps coming in! This completed the trip.

The NCGS sincerely thanks **Ron Crane** for leading another superb trip through part of the northern Diablo Range. His detailed mapping is helping to unravel the structural complexity of the East Bay Hills, the greater Mt. Diablo region, and the north end of the Diablo Range.

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## **State Senate Bill Passed to Extend Life of State Board of Registration for Geologists and Geophysicists**

On May 24 the California Senate passed Senate Bill 2028, which would extend the life of the Board of Geology, on a 38-0 vote. The bill is now being considered by the State Assembly. The California Council of Geoscience Organizations has supported this legislative action through letters, visits to legislators and their aides, and testimony at public hearings. The full text of the bill is available at <http://www.leginfo.ca.gov>. The following background information is from the Senate Floor Analysis of SB 2028:

### **JLSRC (Joint Legislative Sunset Review Committee) and DCA (Department of Consumer Affairs) Review of the Board for Geologists and Geophysicists:**

The Board of Registration for Geologists and Geophysicists (BRGG) was first reviewed by the JLSRC four years ago (1995-96). The JLSRC and DCA identified a number of issues and problem areas concerning this board. For example, the JLSRC noted that BRGG had never adopted any code of ethics for the profession, had a very low pass rate on its state-only examination for geologists, and because it is a state required examination, there was no comity or reciprocity for out-of-state geologists or geophysicists. In addition, the JLSRC made several findings with regard to the operation of the board, and found it deficient in a number of areas.

The JLSRC and the DCA reached the conclusion that components of the current regulatory program did not appear to provide protections to the consumer and preclude consumer harm. Because of these findings, the JLSRC and the DCA recommended to reconstitute the BRGG with new board members and change its composition, and recommended a number of other changes the BRGG should make to its licensing and enforcement programs.

In November 1999, the BRGG was reviewed once again. It was found that the board had made vast improvements since its last review, and addressed and implemented almost all of the prior issues and recommendations raised by the JLSRC and the DCA. Because of these actions taken by the board, both the DCA and the JLSRC recommended continuation of the BRGG. There are still some minor issues and problem areas for the BRGG to deal with prior to their next review. They are reflected in the current recommendations of the JLSRC and the DCA (including a request

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along the Hayward and Calaveras fault systems, and associated contractional stepover faults.

**Keil A. Albert** is Project Geologist with Geoconsultants, Inc. in San Jose, California. He received his B.S. degree (1995) in Geology from Sonoma State University, and is currently completing an M.S. degree in Geology at San Jose State University. He is working with Dr. David Andersen on Bay Area geology, fluvial sedimentology, and provenance studies of several Pliocene and Pleistocene gravel deposits located in the south and east Bay. At Geoconsultants, Inc., Mr. Albert conducts hydrogeologic studies utilizing surface geophysical survey methods as a basis for water well location. He is a member of SEPM, AAPG, NCGS, AEG, GRA, and CGA. Besides Bay Area geology and hydrogeology, Mr. Albert's other geologic interests include Death Valley geology and Laramide syntectonic sedimentation.

### **New Member Directories Available**

You may have already received your copy, but for those who have not, the 2000 Member Directory has been completed and mailed to NCGS members. We owe Membership Secretary **Judy Hayes** our thanks for the outstanding job she did on this project. In addition to keeping our dues and membership listings straight, she tackled this job with her usual enthusiasm and expertise. The result is our first directory in several years, with members sorted by employer as well as by alphabet. We also need to acknowledge member **Mary Rose Cassa**, who compiled the original directories. Her work acted as a template for Judy, and we owe her our thanks for starting this precedent. The directory has been quite useful to many NCGS members as a networking tool, but it does need to be updated on a regular basis!

Last but certainly not least, the NCGS wishes to thank **Lydia and Louis Leveriza** and their staff at **Diablo Printing** in Danville for the excellent work they did on the directories. **Diablo Printing** also does our newsletter hardcopy printing and mailing. We thank them for their superb work and reliability, often on short notice!

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