



# Colorado Scientific Society

*The objective of the Society is to promote  
the knowledge and understanding of Earth Science,  
and its application to human needs*

## *April Presentations:*

**“The Sierra Nevada of California: An example of bottom-down mountain building”**

**G. Lang Farmer**

Department of Geological Sciences and CIRES, University of Colorado

*And*

**“Blast from the past: when there were huge volcanoes in Colorado”**

**Peter Lipman**

U.S. Geological Survey, Menlo Park, CA

Thursday, April 20, 2000

American Mountaineering Center

710 10<sup>th</sup> Street (NE corner with Washington)  
Golden, Colorado

Social Half-hour: 7:00 p.m.

Meeting Time: 7:30 p.m.



# The Sierra Nevada of California- an Example of Bottom-Down Mountain Building

## Abstract of presentation by Lang Farmer:

Recent geologic and geochemical studies of the Sierra Nevada in California have resurrected the debate regarding the origin and evolution of the range's high topography. Early (circa 1960's) studies based on geologic and paleontological information suggested that the high topography is relatively young (dating from <10 Ma) and that the high topography is supported by a deep crustal "root". In contrast, recent seismic tomography studies show no evidence of a thick root beneath the Sierra and suggest instead that the modern topography is supported by upwelling asthenosphere (Wernicke et al., Science, 1996). In addition, estimates of ancient topography based on U-Th/He ages (House et al., Nature, 1998) and oxygen isotope data from altered ash-flow tuffs east of the Sierran crest (Chamberlain and Poage, Geology, 2000) suggest that the high topography is significantly older than 10 m.y. and may have been initiated in the Late Cretaceous during subduction-related magmatism and tectonism. To add to the general confusion, trace element and isotopic data from mantle and lower crustal xenoliths entrained in Cenozoic volcanic rocks present in the southern Sierra have been interpreted to indicate that "delamination" of the mafic, eclogitic, root of the Sierra occurred between 8 and 3 Ma (Ducea and Saleeby, JGR, 1996). The removal of the deep lithosphere, perhaps triggered by NW-SE directed lithospheric extension and the opening of a "mantle" window beneath the southwest U.S., may have resulted in asthenospheric upwelling and increased the uplift of portions of the southern Sierra. Such a "bottom-down" mountain building event seems consistent with new and existing age and geochemical data from the Cenozoic volcanic rocks, themselves. While Miocene volcanic rocks are mainly high-K basalts and andesites that span a range of ages from 12-8 Ma, widespread Pliocene volcanic rocks (which lack eclogite xenoliths) are ultrapotassic, include high MgO absarokites, and span a very narrow age range from about 3.2 to 3.5 Ma. The Pliocene rocks also have distinctly lower epsilon Nd values (-6 to -9) than either Miocene or Quaternary volcanics, suggesting that the Pliocene rocks tapped a source unavailable to other Cenozoic volcanic rocks. While the exact magma source is unknown, the fact that the Pliocene volcanism was short-lived and unique in composition supports a model in which deep lithosphere delamination triggers magmatism from a source related to the delaminated lithosphere itself, as suggested for potassic magmatism in the Tibetan plateau. Future work will be centered on reconciling the geologic and chemical evidence outlined above for a Pliocene-Miocene delamination event with the growing evidence that the Sierra Nevada may have existed as a topographic high for as long as 70 m.y.

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# Blasts from the past: when there were huge volcanoes in Colorado

## Abstract of presentation by Peter Lipman:

Since about 20 Ma, mountainous parts of Colorado have been sites of relatively small infrequent basaltic eruptions. In contrast, from 35 to 23 Ma at least 25 gigantic explosive eruptions generated enormous silicic ash flows that avalanched as much as 100 km from large caldera sources, mainly in the Sawatch and San Juan Mountain areas. Because of the size of these eruptions and the erosional dissection of internal structures of caldera volcanoes, the middle Tertiary volcanism in Colorado provides instructive comparisons and contrasts with recent explosive eruptions such as Mount St. Helens in 1980, and Pinatubo in 1991. Especially impressive, in terms of ash-flow volumes, caldera size, and magma-production rates is the 28-26 Ma central San Juan caldera cluster, where recent studies provide new insights into processes of silicic magma generation, pyroclastic eruptions, and caldera formation.

*Peter Lipman, U.S. Geological Survey, Menlo Park, CA*

## May CSS Speakers

Here are the upcoming speakers at the May 18 CSS Meeting:

**Ren Thompson:** “The self-destructive nature of middle-latitude Andean volcanoes.”

**Art Snoke:** “Geologic Evolution of Tobago, West Indies”

## San Luis Valley Regional Science Fair

Bob Kirkham attended the San Luis Valley regional science fair that was held in early March, and presented certificates to the following deserving candidates:

Elementary Earth Science Award: **Tori Chaney**, Bill Metz Elementary, Monte Vista CO- “Does depth affect soil temperature ?”

Junior Science Award: **Samantha Vance**, Centauri Middle School, La Jara CO-“What’s in your water?”

Senior Science Award: **Brandon Hawkins**, Moffat High School, Moffat CO-“Compost World”



## Spring Gem and Mineral Show

Denver's 5th Annual Spring Show in the Rockies--Minerals\* Fossils\* Gems\* Jewelry, will be held April 21-23, 2000 at the Best Western & Holiday Inn, both located at the intersection of I-25 & I-70 (NW corner). It will be open 10AM-7PM Friday and Saturday, and 10AM-5PM Sunday. Interested in the latest riches from specimen mining? Attend the Rocky Mountain's second largest gem and mineral show--more dealers than ever--over 85 dealers. Visit Bryan Lees, of Sweet Home Mine fame, who will be displaying specimen production from his latest mining venture: Twin Creeks Mine, Nevada beautiful orange opiment--the finest in the world. *There is free admission, free parking, door prizes, and it is open to the public.* Among the show activities will be wrapping, silversmithing, and bead-stringing classes, as well as a stone Easter Egg hunt on Sunday at both hotels (located across the street from each other). There will even be gold panning! Show Info: GeoExpositions, (303) 278-1218.

## Arthur P. Butler

Arthur P. Butler, Jr. of Denver, CO, died January 29, 2000. He retired from the U.S. Geological Survey in 1974. During a part of his career he was chief of the Uranium Resource Compilation Section at the Federal Center in Denver. He was a 1930 cum laude graduate of Harvard University where he also received an A.M., MBA, and Ph.D. His published works included "Geological Appraisal of Uranium Resources of the U.S.", Second International Conference on Peaceful Uses of Atomic Energy, Volume 2, and "Uranium and Vanadium Resources of the Maobyl 1°x2° Quadrangle" (with R. P. Fisher), U.S. Geological Survey Professional Paper 988-B. he was a member of the Geological Society of America and the Society of Economic Geologists. He is survived by his wife of 51 years, Josephine, as well as their four children, and eight grandchildren. Gifts in memory may be made to Harvard University, Department of Earth and Planetary Sciences, Attention: Recording Secretary, 124 Mt Auburn St. Cambridge, MA 02138.

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*Obituary respectfully submitted by his eldest son, Emery Butler,  
2618 S. Grant St. Denver, CO, 80215; (303) 715-1539*



# Earth Science Meetings and Talks

**Colorado Scientific Society's** regular meetings are held the third Thursday of the month (unless otherwise advertised). Social time begins at 7:00 p.m. and presentations start at 7:30 p.m. For information, contact Mark Hudson at (303) 236-7446 or [mhudson@usgs.gov](mailto:mhudson@usgs.gov).

**Denver International Petroleum Society (DIPS)** meets the 2<sup>nd</sup> Friday of each month at the Wynkoop Brewing Co., 18<sup>th</sup> and Wynkoop Streets. Reception begins at 11:30 a.m., luncheon at 12 p.m., program at 12:30 p.m. Make reservations (required) by leaving message at (303) 623-5396. Reservations accepted after 8 a.m. on Friday until 10:30 a.m. on Wednesday prior to the meeting. Cancellations accepted until 11:00 am Wednesday prior to the meeting. Cost: \$15 for lunches; talk only is available for \$2 (make checks payable to "D.I.P.S."). Contact Keith Murray at (303) 986-8554 for information.

**Denver Region Exploration Geologists' Society (DREGS)** meets in the Mutual Consolidated Water Building, 12700 West 27th Avenue, Lakewood. Social hour 6:00-7:00 p.m. Technical presentation at 7:00 p.m. Meetings are normally scheduled for the first Monday of each month. For information contact Jim Piper, (303) 932-0134, or the website <http://www.dregs.org>.

**Colorado School of Mines Lectures** - Heiland Lectures are at 4:00 p.m. on Fridays, in the Brown Building, Rm 204A. Contact Michelle Szobody (303) 273-3451 for the information on scheduled Heiland lectures. For information on Van Tuyl Lectures, call the Dept. of Geology at (303) 273-3800.

**Colorado State University Geology Lectures** -Mondays, 4:10 p.m. in room 109 or 316 of the Natural Resources Building. Call the Dept. of Earth Resources at (970) 491-5661 for further details.

## **University of Colorado at Boulder, Geological Sciences Colloquium**

Wednesdays, 4:00-5:30 p.m., Rm. 180. For schedule, contact Kathy Madsen 303-492-8141.

## **U. S. Geological Survey, Geologic Division Colloquium**

Thursday, April 20: **Scott Lundstrom**- "A record of earth surface processes in southern Nevada and along the lower Colorado River from recent geological mapping"

Thursday, April 27: **Robert Smith**- "Hotspots, Earthquakes and Evolution of Yellowstone and Grand Teton National Parks Latest thoughts on the Laramide and Tertiary history of the Gore and Western Front Ranges, Colorado"

Thursday, May 7: **Connie Woodhouse**-" The paleoclimatic record of Drought: Putting 20<sup>th</sup> century droughts in perspective."

Bldg 20, Denver Federal Center, Thursdays, 1:30-2:30 p.m., Foord Conference Room.  
For a more complete schedule, contact Margaret Hiza: (303) 236-0075.



Colorado Scientific Society  
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