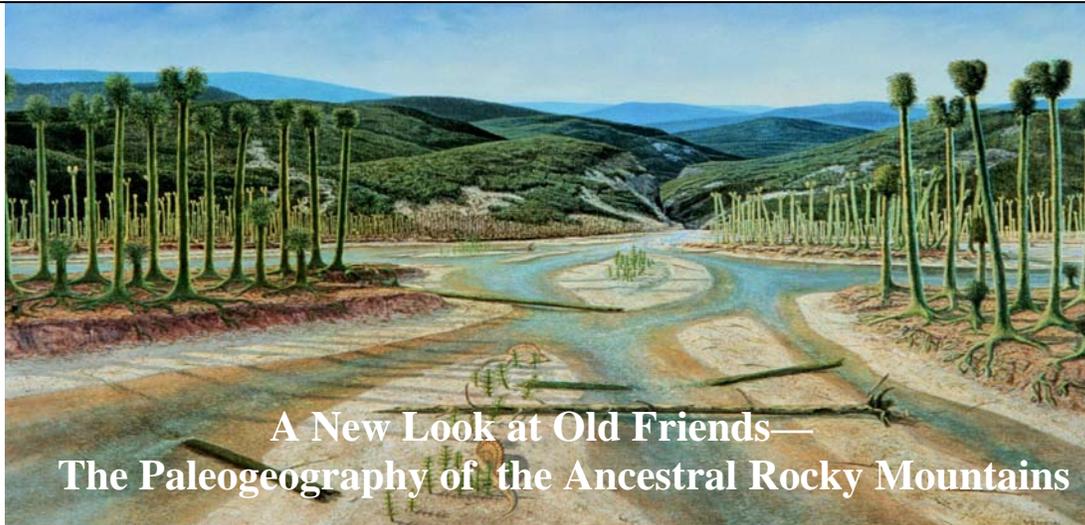




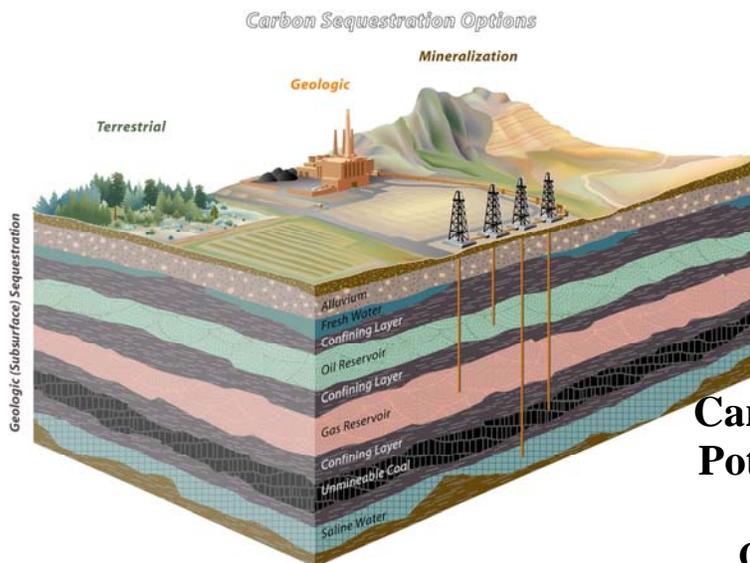
# Colorado Scientific Society

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



**A New Look at Old Friends—  
The Paleogeography of the Ancestral Rocky Mountains**

**Chuck Kluth, Colorado School of Mines**



**Carbon Sequestration  
Potential of Colorado**

**Genevieve Young,  
Colorado Geological Survey**

**Thursday, October 18, 2007**

*American Mountaineering Center*

**710 10<sup>th</sup> St. (NE corner with Washington), Golden  
Social half-hour – 6:30 p.m. Meeting time – 7:00 p.m.**

## **Abstract**

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# **A new look at old friends—The paleogeography of the ancestral Rocky Mountains of Colorado**

By Chuck Kluth, Center of Research Excellence, Colorado School of Mines

New data, combined with earlier data, indicate that previous interpretations of the geometry and timing of the classical Ancestral Rocky Mountains in the Colorado region are in need of revision. N-S stratigraphy of the Fountain Formation along the present Front Range suggests that the Fountain overlapped a broad NW-SE arch that began to develop in early Pennsylvanian time. Interbedded or subjacent marine rocks are preserved as far north as Lyons and as far south as Perry Park, Colorado. The interbedded marine rocks and the preservation of earlier Paleozoic rocks indicate that the Front Range was separated from a narrow, uplifted block in the Colorado Springs area, the Ute Pass Block. The southwestern margin of the Front Range was faulted and had approximately 6 kilometers of structural relief. In contrast, the NE side of the Front Range is now interpreted to have been a NE dip slope with only minor faulting. The presence of Pennsylvanian marine rocks constrains the Front Range to have had its northern plunge end at approximately the Colorado-Wyoming state line.

The San Luis Highland is interpreted to have been a west dipping fault block with approximately 8 kilometers of structural relief on its eastern side and a gentle west dip-slope on the western side. It is interpreted to have been a separate uplift from the adjacent Uncompaghre Uplift to the west, during at least its early history, and possibly its entire history. The San Luis Highland was uplifted in early Pennsylvanian time and shed coarse sediments eastward and northward into the Central Colorado Trough, and more fine grained sediments westward into the Paradox Basin.

The Uncompaghre Uplift is interpreted to have been uplifted in late Pennsylvanian and early Permian time, after the deposition of the middle Pennsylvanian evaporites. The data show that the geometry of the Uncompaghre front, SE of the Utah/Colorado state line, contrasts to the single large fault in Utah, and is a stack of SW directed thrust faulted basement blocks. Distribution of

synorogenic sediments derived from the Uncompaghre Uplift was largely by axial river systems. Loading by the sediments caused the underlying salt to move into salt walls that nucleated on basement faults. These basement faults formed between middle-late Mississippian and middle-early Pennsylvanian time. The basement faults are usually interpreted as normal faults, but there is evidence that at least some of them were reverse faults. The development of accommodation space for each minibasin between salt walls ended when the pre-salt and post-salt sections welded together, as the last of the salt moved from beneath the basin. The locus of deposition then moved to the SW, farther away from the Uncompaghre front, and a younger salt wall and minibasin formed. This process was repeated several times, with the result that the salt walls are progressively younger toward the SW. The coarse alluvial fan material was preserved and prograded away from the mountain front only after the locus of deposition moved to the SW and axial rivers no longer redistributed the erosional debris. The new interpretation of the geometry and timing of the Uncompaghre Uplift suggests that the Paradox salts and the Eagle Valley Evaporites were deposited in a continuous basin that existed across the site of the later Uncompaghre Uplift.

The Central Colorado Trough was a NW-SE basin located between the Ancestral Front Range and the San Luis Highland and Uncompaghre Uplift. The Trough appears to have been complexly faulted, and contained crustal slivers that were uplifted in a complicated pattern within the trough. These blocks and slivers included the Ute Pass, Wet Mountain/Hartsel Uplift, possibly the ancestral Sawatch Uplift, and unknown small uplifts known only from lithologies and paleocurrent data from their synorogenic sedimentary packages. Normal block faults and thrust faults are located in the Central Colorado Trough, although the details of their relationships to each other are not yet known.

There appears to have been almost no reactivation of Late Paleozoic Ancestral Rocky Mountain structures during the Late Cretaceous/Early Cenozoic Laramide Orogeny. Most of the younger structures cut across the earlier structures. Structures oriented almost normal to the Laramide regional stress, such as the Uncompaghre and San Luis fronts, the Ute Pass and Gore faults,

were reactivated with movements that appear to be orders of magnitude less than the late Paleozoic movement. The Laramide Front Range formed in a N-S orientation that is oblique to the NW-SE orientation of the Ancestral Front Range, which might have been at almost right angles to the regional Laramide stress fields.

## **Abstract**

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### **CO<sub>2</sub> sequestration potential of Colorado**

By Genevieve Young, Colorado Geological Survey

The Colorado Geological Survey is a participant in the Southwest Regional Partnership on Carbon Sequestration whose primary goal is to determine an optimum strategy for minimizing greenhouse gas intensity in the southwestern United States. The Southwest Partnership is a large, diverse group of expert organizations and individuals specializing in carbon sequestration science and engineering, as well as public policy and outreach.

In 2000, CO<sub>2</sub> emissions were more than 92 million short tons in Colorado; of which 46 percent came from coal-fired power plants. These stationary point sources afford the possibility of capture and separation of CO<sub>2</sub> for transport to, and storage at, nearby “geologic sinks”.

Although CO<sub>2</sub> sink potential is widely distributed across the state, characterization efforts during Phase I (2003-2005) focused on seven “pilot study regions” defined on the basis of maximum

diversity in potential sequestration options relatively close to large CO<sub>2</sub> sources. Utilizing both geologic and mineralization options, carbon storage capacity within these regions is an estimated 720 billion short tons. With the availability of suitable technology, the pilot areas have the potential of providing a long-term storage solution. The highest CO<sub>2</sub> sequestration capacity potential for Colorado lies within the oil, gas, coalbed, and saline aquifer reservoirs of the Denver, Cañon City Embayment, Piceance, and Sand Wash basins.

The Southwest Partnership is currently conducting three pilots for Phase II (2005-2009) of the U.S. DOE/NETL Carbon Capture and Storage Program. These include one pilot each in the San Juan Basin, the Paradox Basin, and the Permian Basin. The Colorado Geological Survey is taking a key role in the design, implementation, and analysis of the San Juan Basin Fruitland coal pilot because of expertise in coalbed methane development.

## **President’s Note--October 2007**

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By Bill Nesse

The field trip up to Central City and adjacent areas on September 29<sup>th</sup> was another example of what makes me smile when considering the Society. It was organized by Beth Simmons and Karl Kellogg and featured a big dose of history to go with the great geology that we got to see. The 62 page (!) field guide supplemented the copious information provided by Beth and other participants

at the various stops. It didn’t hurt that the weather was great (despite a few drops of rain at the Hidee mine).

This leads me to future activities being discussed by the Council. Matt Morgan, who will be President next year, has suggested some new ideas for us to consider. They include bicycle tours, fossil and mineral collecting for families, raft trips, symposia,

and workshops. All of these are great ideas that can help expand the appeal of the society and help us grow. To make them happen, however, requires people to do the work to get things organized. So if you are a bicycle enthusiast and would like to see a geo-bike-tour (Leadville, Picketwire Canyon, etc.),

or have a good idea for a symposium, or know about a mineral locality that kids would love, or have something else that you think the Society should sponsor, don't be bashful. Do what Beth did and volunteer to help organize the activity.



# *Colorado Scientific Society*

## Call for Papers

- What: Colorado Scientific Society
- When: November 15, 2007
- Where: Mountaineering Center, Golden, Colorado (10<sup>th</sup> and Washington)
- Who: Graduate and Undergraduate Students in the Earth Sciences
- Abstract Deadline: October 28, 2007
- Honorarium: \$250 and free membership for 2008

Each year the Colorado Scientific Society invites students at regional schools to speak at the Society's November meeting. Four papers are selected for oral presentation from those submitted and each speaker will receive a \$250 honorarium to help defray some of the costs of their research and academic study. Papers are invited from all areas of the Earth Sciences and need **not** deal with a Colorado or Rocky Mountain theme. Papers that have been presented at GSA, AAPG, or other similar venues are welcome. Abstracts will be published in the CSS newsletter and in the Colorado Scientific Society web.

Submit your abstract (~300 words, GSA, AAPG, or similar format) as a Microsoft Word attachment to an e-mail to:

Dr. William Nesse [nesse@ctos.com](mailto:nesse@ctos.com)

Please provide your contact information, the name of your research advisor, and whether you are a PhD, Master's, or Bachelor's degree candidate. You will be informed in the first week in November if your presentation has been accepted.

Questions? Contact Dr. William Nesse: 970 330 7183 or [nesse@ctos.com](mailto:nesse@ctos.com)

# Earth Science Meetings and Talks



*Newsletter items must be received by the 25th of each month. Items may include special events, open houses, etc...thanks!*

**Colorado Scientific Society's** regular meetings are held the 3rd Thursday of the month at the American Mountaineering Center in Golden (unless otherwise advertised). Social time begins at 6:30 p.m. and talks start at 7:00 p.m. For more information, contact Bill Nesse, UNC, 970-330-7183 [nesse@ctos.com](mailto:nesse@ctos.com)



**Denver Mining Club** meets every Monday (except when noted) at Country Buffet near Bowles and Wadsworth (at 8100 W. Crestline Ave.) 11:30-1:00. Oct 15, David Carroll, "An update on the Western Museum of Mining and Industry". Oct 22, H. Court Young, "Why I wrote the book, *The Orphan Boy Mine, a love affair with mining*". Oct 29, Allen Bonck, "A silver mining project in Gilpin County, Colorado." <http://china-resources.net>.

**Denver Region Exploration Geologists' Society (DREGS)** Meetings are normally scheduled for the first Monday of each month. Social hour 6:00-7:00 p.m. Technical presentation at 7:00 p.m. Oct 8, Green Center, Colorado School of Mines, Douglas Kirwin, "Discovery History of The Giant Oyu Tolgoi Porphyry Copper-Gold Deposits." For information contact Jim Piper, (303) 932-0137, or the website <http://www.dregs.org>.

**Denver Well Logging Society (DWLS)** meets on the third Tuesday of each month, Sept. through May. Lunch and a technical talk at the Wynkoop Brewery begins at 11:30 a.m., 18th and Wynkoop Sts. in Denver, \$15. Subject matter usually deals with the application of well logs to oil and gas exploration. Oct 16, Steve Cumella, Bill Barrett Corp, "Open-Hole or Cased-Hole Logs in Tight Gas Sands?" Call Eleice Wickham at 303-573-2781 for reservations. Web page: <http://dwls.spwla.org>.

**Rocky Mountain Association of Geologists (RMAG)** Reception at 11:30, lunch at noon, talk at 12:30. Reservations by recording at 303-623-5396 until 10:30 a.m., Wed. before the luncheon. Cancellations until 11:00 a.m. on Wed. at 303-573-8621. Luncheon is \$20 payable to RMAG at the door. Talk only (no res)—cost is \$3. Location: Denver Marriott, 17<sup>th</sup> & California. Oct 5, Vince Matthews, "Science and Service for the People of Colorado, or what has YOUR Geological Survey done for you lately?" Web page: <http://www.rmag.org>.

**Rocky Mountain SEPM** Reception at 11:30, lunch at noon, speaker at 12:30. Reservations, Dave Uhl:303-389-5092 before noon of preceding Friday. \$15.00 lunch, \$3 talk only. Wynkoop Brewing Company, 1634 18<sup>th</sup> St., Denver. [David.uhl@EnCana.com](mailto:David.uhl@EnCana.com).

**University of Colorado at Boulder**, Geological Sciences Colloquium Wednesdays, 4:00-5:30, Rm. Benson Earth Sciences Conference Rm 380. Refreshments at 3:30 on the 3rd floor. Oct 10, Brian Hynek, CU, "The history of water on Mars, the implications for biology". Oct 17, Craig Lundstrom, "Magma differentiation in a temperature gradient: a potentially important process with an isotopic fingerprint". 303-492-8141. Web page: <http://www.colorado.edu/GeolSci>.

**Colorado State University, Dept of Geosciences**, Rm 320 Natural Resources Bldg, Mondays, 4:10 pm. Nov 2, John Marsh, Johns Hopkins, "Magmas in the McMurdo dry volcanoes of Antarctica". 970-491-5661. <http://www.cnr.colostate.edu/geo/seminars>

**Friends of Dinosaur Ridge**. Dinosaur Ridge Visitor Center. Admission is free, but donations are welcome. Oct 14, 9 a.m. "Hike with Harald, up North Table Mountain". Meet at visitor center. Oct 24, 7 p.m. "Arthur Lakes and oil in Jefferson County". Call for location. (303) 697-3466. Web page: <http://www.dinoridge.org>.

**Colorado School of Mines, Van Tuyl Lectures** Thursdays from 4-5 p.m. in Berthoud Hall room 108. Oct 11, Cathy Farmer, BP, "Structural and Sedimentological Evolution of the Ultra-Deep Gas Play Fairway-Gulf of Mexico Shelf, Texas and Louisiana". Oct 18, James Butler, Jr., Kansas Geo Survey, "What the heck is a phreatophyte? A field investigation of ecohydrologic processes in stream-aquifer systems." <http://www.mines.edu/academic/geology.html>

**USGS Geologic Division Colloquium**. Thursdays, 1:30, Foord Room, Building 20, Denver Federal Center. For more information contact: Peter J. Modreski, U.S. Geological Survey, Denver, Colorado tel. 303-202-4766, fax 303-202-4767 email [pmodreski@usgs.gov](mailto:pmodreski@usgs.gov).

**Café Scientifique**. Wynkoop Brewery, 18th & Wynkoop, 6:30 p.m. Oct 23, Gwen Huitt, MD, National Jewish Hospital, "Drug-Resistant TB. No charge except for beer. <http://cafescicolorado.org/Upcoming>

**Co AIPG**. University Club, 1673 Sherman Street, Denver. Advance reservations, \$23, \$26 at the door. Paid parking is available along the street (metered) or in the adjacent parking lot. 11:30 social gathering, noon, luncheon and talk. Oct 16, Jon Altenhofen, Northern Water, "South Platte Alluvial Aquifer History and Controversy".

**For a constantly updated, online geo-calendar, visit the Colorado Geological Survey at**  
<http://geosurvey.state.co.us>

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