



Colorado Scientific Society

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

DISSOLUTION OF EVAPORITES CAUSES WIDESPREAD ACTIVE COLLAPSE IN WEST-CENTRAL COLORADO

Robert M. Kirkham, Colorado Geological Survey

Geologic mapping of 7.5-minute quadrangles in west-central Colorado in the vicinity of Glenwood Springs has led to the discovery of widespread active collapse that is a result of dissolution and flowage of underlying Pennsylvanian evaporitic rocks. Neogene extrusive rocks preserved in the region provide an excellent datum by which the extent of the collapse areas and style and timing of deformation can be evaluated. A cooperative investigation of the Neogene igneous rocks by the Colorado Geological Survey and U. S. Geological Survey involving large numbers of Ar40/Ar39 dates, major and trace element geochemical analyses, paleomagnetic determinations, and petrographic studies allows for individual lava flows to be correlated across the collapse areas.

The Neogene igneous rocks are downdropped as much as 3,000 to 4,000 feet in the Carbondale collapse center. Laramide structures bound the Carbondale collapse center, but the direction of collapse is generally opposite to movement during the Laramide. For example, the Laramide Grand Hogback Monocline has "unfolded" or collapsed during the Neogene as evaporitic rocks dissolved and/or flowed from beneath it. A variety of unusual geologic features related to salt tectonism occur within the collapse area. They include sets of parallel bedding-plane faults, orthogonal fault patterns, sag structures, sharp monoclines, intrusive contacts between sedimentary formations, valley anticlines, complexly deformed collapse debris, and locally thick accumulations of sediments. Faulted and folded surficial deposits indicate the collapse continued into the Quaternary, while historic sinkholes and the high salinity loads of streams in the area suggest dissolution is ongoing today.

UPHEAVAL IN THE SOUTHERN ROCKIES: CLIMATE VERSUS TECTONICS FOR STREAM INCISION IN THE LATE CENOZOIC

Emmett Evanoff, University of Colorado Museum, Boulder

The late Cenozoic canyon cutting event in the Southern Rockies has traditionally been attributed to regional uplift. Recent models have suggested that the average elevations of the Southern Rockies have remained the same, and that late Cenozoic climate change caused the rivers to cut their canyons. The answer probably lies between these two end member models, based on evidence from paleoclimatic, geomorphic, and structural geologic studies. (see next page for abstract)

Tuesday, April 13, 1999

**City Lights II Room (left at top of stairs) in the Sheraton Hotel
360 Union Boulevard
Lakewood, Colorado**

**Social Half-hour: 7:00 p.m. (bar available downstairs)
Meeting Time: 7:30 p.m.**



Speakers' Abstracts

UPHEAVAL IN THE SOUTHERN ROCKIES: CLIMATE VERSUS TECTONICS FOR STREAM INCISION IN THE LATE CENOZOIC

Emmett Evanoff, University of Colorado Museum, Boulder

The deep canyons cut into the Southern Rocky Mountains have been explained by two scenarios. The first, traditional explanation, is that the region has undergone late Cenozoic uplift. By this model, elevations in the middle Cenozoic were lower than at present and the present elevations result from regional uplift that steepened the gradients of the rivers resulting in the rivers cutting their canyons. The second scenario is that the average elevations of the region were as high as today since the middle Cenozoic, and that climatic change provided the streams with more power to cut their canyons. The apparent uplift of the region resulted from the isostatic adjustment of the mountains to the removal of materials by the rivers and that the mean regional elevation has not changed throughout the Cenozoic.

A wide variety of evidence has been presented for and against both interpretations. The traditional view has been largely supported from evidence of geomorphology, while the second model has been supported by paleobotanical interpretations. Supporters of each explanation have regarded the two scenarios to be mutually exclusive, but both models may be acting in the region. Climatic change has occurred in the late Cenozoic and did affect the drainage systems, primarily by integration of the large river systems. Erosion has been a large factor, but primarily in the basins adjacent to the mountains. Isostatic rebound may have occurred from erosion of the basins. Finally, river drainages have had major readjustments from the middle Cenozoic to the late Cenozoic, that could not have been from climatic change alone. Thus, the models may be the end members of a complex interaction of events that produced the modern topography in the Southern Rockies.

Editor's note: Last month's newsletter shifted from the past format by including short summaries on the first page with the meeting announcement, instead of including longer abstracts on the following page. This month includes examples of both formats. Some flexibility is needed because of the varying length of material that is submitted by speakers, and variable amount of information that needs to be provided with each issue. We welcome your preferences, opinions, and suggestions on this. Send to Scott Lundstrom (sclundst@usgs.gov)

We have a separate inquiry to make. Dave Moore, our Publicity chairman, distributes information about our upcoming meetings to about 20 newspapers in the area, and we would like to know how effective that substantial effort is. If any member has seen an announcement of the CSS meetings in any newspaper other than the Denver Post during the last year, please contact Dave Moore (dwmooore@usgs.gov, 303-236-1271)

U.S. Geological Survey 1999 Open House

U.S. Geological Survey 1999 Open House, Denver Federal Center
Saturday, August 28, 1999, Open to the Public 10:00 am to 6:00 pm

Wanted: volunteers to help put on the Open House. Emeritus, boy scouts, girl scouts, rock hounds, other...We need your help!! For more information, contact Lisa Bader 303-236-5547 lbader@usgs.gov



P x 4 (President Pierce's Purple Prose)

The grand turn-out for our March 9 meeting was a tribute to our scheduled speakers and an outstanding membership drive. Unfortunately, Pete Lipman was unable to travel because of severe back problems, but is doing better now. Thanks to Pat Shanks for giving on short notice a fascinating talk on the geothermal features beneath Yellowstone Lake. The crowd of 160 in attendance was unfortunately unable to spread out into the adjacent room because of a scheduling glitch.

For this month's April 13 meeting, we have reserved a larger space, so there will be room for all. The talk by Emmett Evanoff on upheaval, and the talk by Bob Kirkham on evaporite dissolution both focus on this year's theme of the Cenozoic geologic evolution of Colorado.

The Dinosaur Ridge group has set Saturday, May 8th, to honor Colorado Scientific Society's contribution to their work. Think about going on a tour with their leaders. Bring your family and do dinosaurs in May before it gets really hot this summer. We will meet for coffee and donuts at 11:00 at the Dinosaur Ridge Visitor Center, which is 1/4 mile west of C-470 at 16,832 West Alameda, and has a Stegosaur in the front yard. Other CSS people will be there to mingle with and discuss different aspects of the geology. The tour is free, a bus is provided, and the day is set aside for us. Please come.

I wish to thank Dean Kleinkopf and Mary-Margaret Coates for their leadership on the Membership Drive. In my article in the last newsletter, I forgot to thank Lisa Bader for redoing our CSS brochure and Van Williams for help getting it printed. So far this year, membership has increased by about 50.

About 43 grad students have submitted applications to the Colorado Scientific Society Memorial Funds for about \$10,000 in grants. Past-President Eric Erslev is organizing the committee, with panel members Susan Landon, Jack Reed, Barney Poole, and Robbie Robins.

Members, if you have not sent in your dues, please do so now. Look on in the upper right corner of the newsletter to see the year for which you are paid up. Also, please consider making a tax-deductible donation to our Memorial Funds or Endowment Fund, and help with these noteworthy contributions to Rocky Mountain geology (form available on web site noted below).

Our web site address "evolved" and the current address <http://home.rmi.net/~css/>
The change is that the word "*home*" is in and the word "*rainbow*" is out.

Our meetings in May will feature these speakers:

May 11	Julie Cole	El Niño: Geological evidence for past events
	Dave Crow	Growth of gold nuggets during active mountain building

Don't miss the announcement by Sherm Marsh for our **June 19-20 Arkansas Valley Field Trip**



1999 SPRING-SUMMER FIELD TRIP, 19-20 JUNE

Get hold of your hat and your shoes and socks; we're going RAFTING!! The spring-summer Colorado Scientific Society field trip on June 19-20 this year will be an over-nite to the Arkansas River Valley. We will be focusing on the geologic history of the valley and the faulting. Our leader for this expedition will be Glen Scott, who has mapped the entire area and is undeniably the most knowledgeable person on the geology of the Arkansas River Valley. As part of the trip we will be rafting down the Brown's Canyon on the Arkansas River in the Buena Vista area. This will be an exciting full day whitewater trip running fun rapids (Class III-IV) with spectacular views of the Sawatch Range and a stop for a provided lunch. Bring your shorts or bathing suits cause you're gonna get wet! For those that would prefer to see more geology on their feet than from the river, Glen will lead a simultaneous excursion along the Arkansas valley via vans with several interesting stops and lunch (cost will be about \$50 less than river trip). Both groups will meet up in the afternoon at the end of the raft trip for our ride to Salida, where we will spend the night. We are planning a Bar-B-Que dinner at the city park so bring your appetites. On Sunday (breakfast on your own) we will travel down the Arkansas River to Canon City and then back to Denver along the Front Range. There will be several stops and a lunch break along the way.

Costs for the trip haven't been firmed up yet but the day raft trip, including lunch, will be \$55-60 per person depending on the number of participants. An estimate on the rest of the trip would be in the \$80-100 range per person. For those not going on the raft trip add \$10 for lunch on Saturday. Costs will include transportation, 2 lunches, dinner on Saturday night, motel on Saturday night, and coffee breaks. Room cost will be based on double occupancy. These are NOT firm numbers, just ball-park estimates. The Colorado Scientific Society will provide financial support for students who apply to go on the trip.

Please fill out the form below and mail or email so we can begin to get an estimate on how many will be going. Circle where appropriate.

NAME _____

YES!! I'll be going on the field trip with _____ persons

YES!! I want to go on the raft trip on the Arkansas River (\$55-60)

YES!! I am a student and would like financial support

No I don't want to go on the raft trip, but include me on the field trip

I prefer Smoking Non-smoking Room (circle one)

I prefer a private room (may cost a little more)

Special diet needs (we will try to accommodate as best we can)

Please send or email your response to: Sherman P. Marsh, 8384 W. Iliff Ave., Lakewood, CO 80227
spmarsh@earthlink.net



Colorado Scientific Society Day at Dinosaur Ridge

The Dinosaur Ridge group has set **Saturday, May 8th**, to honor Colorado Scientific Society's contribution to their work. Think about going on a tour with their leaders. Bring your family and do dinosaurs in May before it gets really hot this summer. We will meet for coffee and donuts at 11:00 at the Dinosaur Ridge Visitor Center, which is 1/4 mile west of C-470 at 16,832 West Alameda, and has a Stegosaur in the front yard. Other CSS people will be there to discuss different aspects of the geology. The tour is free, a bus is provided, and the day is set aside for us.

Joint Petroleum Society Meeting

The RMAG, DGS, DIPS and SEPM organizations in the Denver area will co-host a luncheon reception at the Denver Petroleum Club on May 28, 1999. The purpose of the meeting will be to facilitate and expand opportunities for business in all phases of oil and gas exploration and development, both domestic and international. Individuals and companies active in all aspects of the industry are encouraged to attend. Lunch will be buffet style with no lecture apart from introductory comments. Tables will be marked with areas of interest or expertise to make it easy to find what and who you need to contact. Go there, get fed, and CONNECT! Reservations may be made by phone to the DGS office at (303) 820-0501, or by email to: dgs@denvergeo.org before Friday, May 21.

New Members

The Colorado Scientific Society would like to welcome the following new members!!!!

*Kenneth W. Andresen
Kathleen A. Arford
Sheri L. Atencio-Church
Dan W. Bench
Lydia V. Bennett
Nicole V. Bolay
Robert G. Blair
Frederick C. Brunstein
Parker E. Calkin
Louis J. Conti
James L. Courdin
Steven N. Daviess
Dwight Deal
Mark Emerson*

*Jim E. Fleming
David L. Gaskill
Joe D. Gregson
John K. Hardie
Eric J. Harmon
David C. Hedlund
Michael Holmes
Ernest W. Kozak
Aaron J. Kullman
Russell J. Lehmann
Michael D. Lewan
Mark W. Longman
Richard F. Marvin
John F. Murphy*

*Carl E. Nelson
Douglas J. Nichols
Mark A. Petersen
Jack Redmond
William E. Sanford
Mark A. Scanniello
Russ Shepherd
Harry L. Siebert
Richard A. Snyder
Sarah M. Stevens
Richard N. Walker
Rob Wesson
William E. Wilson
William P. Rogers*



Museums

Friends of Dinosaur Ridge For information call 697-DINO. Visitors' Center is located at 16831 West Alameda Parkway (north side of Alameda, just west of the C-470 overpass). Open 9 a.m. to 4 p.m. weekdays and weekends. Fireside chats are held at the Red Rocks Elementary School Cafe, in Morrison starting at 7 p.m.

Denver Museum of Natural History Check out the artistry, paleontologic perspective, and sense of humor of Ray Troll in **Cruisin' the Fossil Freeway**, on exhibit at DMNH through July 5. This exhibit features original art inspired by and juxtaposed with fossil exhibits of eurypterids, trilobites, Ichthyosaurs, saber-toothed salmon, Paleozoic sharks, ammonites and more.

Earth Science Meetings and Talks

Colorado Scientific Society's regular meetings are held the 2nd Tuesday 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 Ken Pierce at (303) 236-1244 or kpierce@usgs.gov

Denver International Petroleum Society (DIPS) meets the 2nd Friday of each month at the Wynkoop Brewing Co., 18th 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 calling or leaving message with Dan Spancers (303) 446-5701. 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 Don Bryant, (303) 733-2358, or the website <http://www.qadas.com/dregs>

Colorado School of Mines Lectures For Heiland Lectures at 4:00 p.m. on Fridays, contact Michelle Szobody (303) 273-3451. 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

USGS Geologic Division Colloquium

Thursdays, 1:30 p.m., Foord Room, Building 20, Federal Center. For information, contact Pat Poole at ppoole@usgs.gov.



Invitation to Join the Colorado Scientific Society

The Society is dedicated to the advancement of science through open forums and activities. We sponsor lectures, field trips, student scholarship grants, and discussions of scientific matters of public concern. Please help us enlist new members.

I hereby apply for _____ membership in the Colorado Scientific Society.
 (Regular, Corresponding, Student)

 (Last Name) (First Name) (Middle)

 (Address) (Telephone, with area code) (e-mail)

 (City) (State) (Zip)

 (Company/Agency/University)

 (Mailing address if different than above)

 School Degree Year Major

Main Scientific Interests

DUES—Your dues are for the calendar year and help support the newsletter, monthly meetings, two field trips each year, family night, and the Emmons Lecture.

Regular Member (\$15) _____
 Corresponding (outside Denver metro area) Member (\$10) _____
 Student Member (\$5) _____

Please make your dues payable to Colorado Scientific Society. Thank you!!

The success of certain Colorado Scientific activities depend on your volunteer help. Please circle those activities for which you can provide assistance. We will pass your name on to the appropriate Committee Chairperson.

- | | | | |
|-------------------------|---------------------|-------------------|----------------------|
| <i>Arrangements</i> | <i>Fund Raising</i> | <i>Newsletter</i> | <i>Publicity</i> |
| <i>Best Paper Award</i> | <i>History</i> | <i>Outreach</i> | <i>Science Fairs</i> |
| <i>Field Trips</i> | <i>Membership</i> | <i>Program</i> | <i>Web Site</i> |

I certify that all statements in this application are correct and, I agree to promote the objectives of the Society and to abide by its Constitution, Bylaws, and Rules.

Applicant's signature

Date

Colorado Scientific Society, P.O. Box 150495, Lakewood, CO 80215-0495



Visit CSS at <http://home.rmi.net/~css/>

Colorado Scientific Society Officers, Councilors, and Chairpersons

OFFICERS

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President-Elect: Mark Hudson, USGS, 236-7446
Treasurer: Michael N. Machette, USGS, 273-8612
Secretary: Stephen F. Personius, USGS, 273-8611
Past President: Eric Erslev, CSU, (970) 491-6375

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1997-1999: William D. Nesse, UNC, (970) 351-2830
1998-2000: Eric Nelson, CSM, 273-3811
1998-2000: Ted Ball, Consultant
1999-2001: Emmett Evanoff, CU, 492-8069
1991-2001: Bob Jarrett, USGS,, 236-6447

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**** NOTE: Please help us with publicity by posting copies of the Newsletter on bulletin boards.**

