

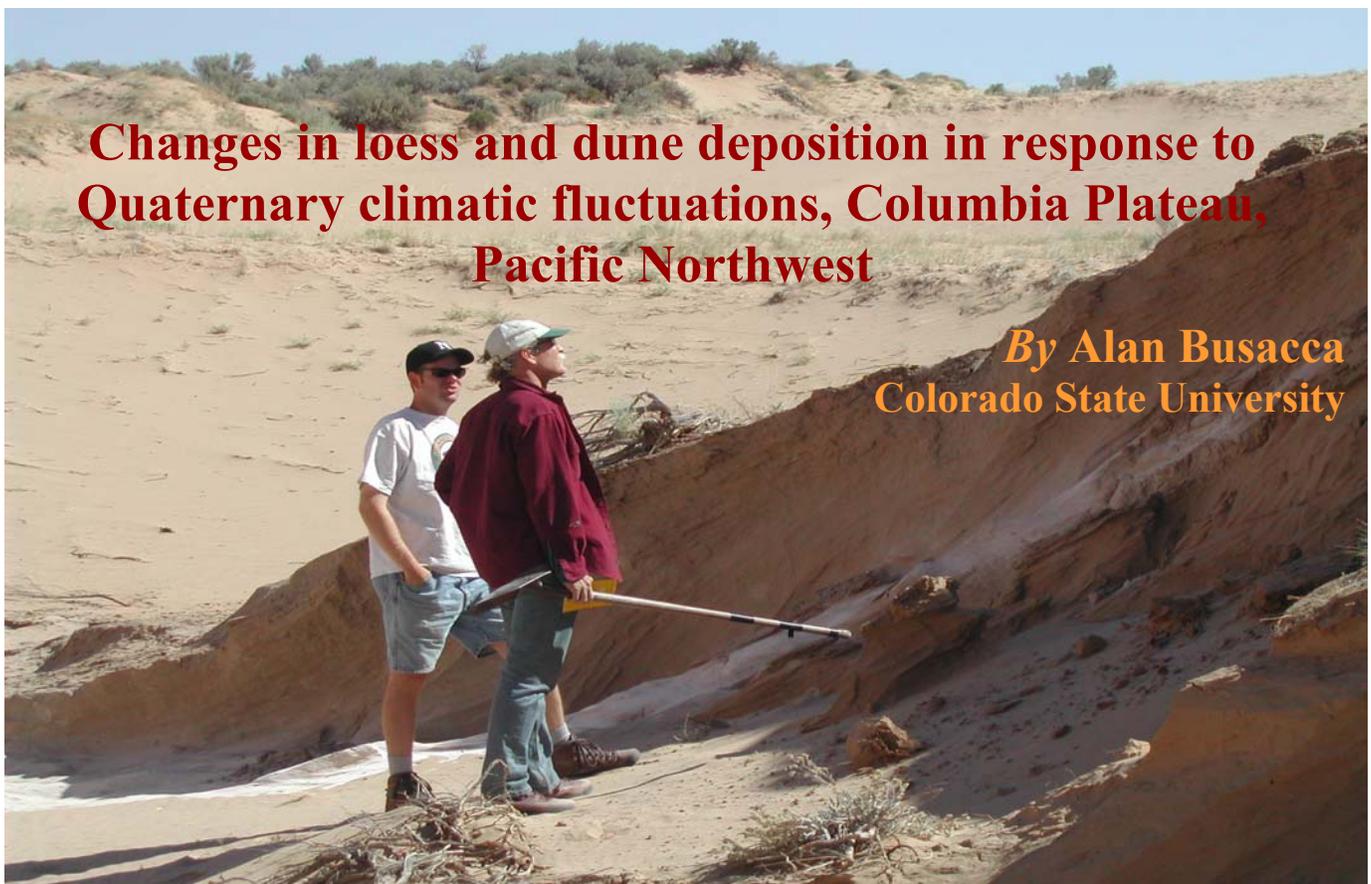


# *Colorado Scientific Society*

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

## **Changes in loess and dune deposition in response to Quaternary climatic fluctuations, Columbia Plateau, Pacific Northwest**

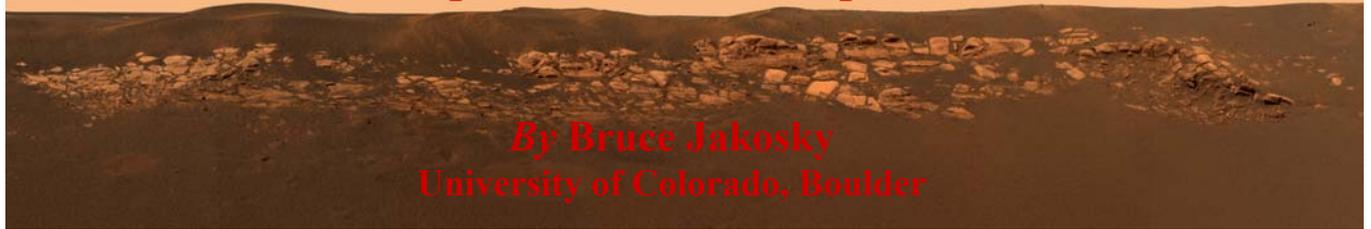
**By Alan Busacca  
Colorado State University**



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## **Mars rover results, liquid water, and the potential for life on Mars**

**By Bruce Jakosky  
University of Colorado, Boulder**



**Thursday, May 20, 2004  
American Mountaineering Center  
710 10<sup>th</sup> St. (NE corner with Washington), Golden  
Social half-hour – 6:30 pm. Meeting time – 7:00 pm.**

## Abstract

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# Changes in loess and dune deposition in response to Quaternary climatic fluctuations, Columbia Plateau, Pacific Northwest

By Alan Busacca, Department of Geology, Colorado State University

The paired dune-loess eolian system of the Colorado Plateau in Washington state allows the study of dynamic interactions of dune and loess systems. Eolian facies of the region lie in the arid to semi-arid rain shadow of the Cascade volcanic range, and prevailing winds that transport sediments move southwest to the northeast. Eolian sediments have been obtained since at least the late Quaternary and perhaps much earlier from fine-grained slackwater deposits (produced by glacial outburst flooding) exposed in upwind basins. Loess deposition appears to span much of the Quaternary.

Eolian dunes and other sandy eolian deposits lie on the upwind perimeter of the Palouse loess. Three mechanisms appear to control the thickness of loess on the plateau. 1) Topographic traps: Deeply incised valleys effectively separate saltation from suspension processes by sequestering sand that allows the deposition of the suspension load as thick loess on the downwind sides of valleys.

2) Shifts in bioclimate: In the absence of topographic traps, the sand-silt boundary freely transgresses and regresses as a function of climate shifts that control soil moisture and vegetation cover density. Over time, the eolian sand has become interstratified at the margins of deflating basins in response to these climate shifts. The mid-

Holocene was dominated by dune activity (lesser vegetative cover and drier surface soils leading to more aggressive saltation processes); the present is dominated by loess deposition. Greater vegetative cover and/or moister soils shift saltation processes to a more arid upwind position, with suspension fall of dust accumulating loess on the flat.

3) Source sediment texture: Source sediment texture controls the balance of dunes versus loess accumulated downwind of specific basins. An "ideal" source sediment is dominated by sand, which limits aggregation and crusting and provides abundant, mobile sand for saltation, while also having significant (20–40%) silt and clay to provide a source of fine dust that is ejected during saltation and forms loess downwind by suspension fall. A source sediment rich in sand but poor in silt results in thin loess.

These three sets of controls appear to have operated separately and in combination to create measured variations in loess thickness. Insight into how saltation and suspension processes interact with each other to control sedimentology and geomorphology of this paired eolian system is key to better understanding the eolian environment of the Columbia Plateau and other eolian systems.

## Abstract

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# Mars rover results, liquid water, and the potential for life on Mars

By Bruce Jakosky, Department of Geological Science & Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder

The Mars Opportunity rover has returned spectacular results suggesting that there was a substantial body of water at the Meridiani landing site. I'll discuss these results in the context of the history of liquid water at the surface and in the subsurface, and then I'll turn to the implications for

climate and for the potential that life might have existed or might still exist on Mars. I'll also discuss the Mars exploration program as it is planned out over the next decade and the implications of President Bush's recently announced new vision for exploration by NASA.

# Colorado Scientific Society President's Note—May 2004

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By **Emmett Evanoff**

For those of us in academics, May is the major transition of the year. Classes end, finals are given, and students leave the universities and colleges. For me it is the start of a several-month field season. As a consultant geologist (my other profession), my field projects include short, small projects and the continuation of research projects have taken years to develop. Geology is great because you can look at a small area and learn much (if you only look hard enough) or you can work for years on a project and still learn something new. Sometimes it takes months of work over many years to get an understanding of a geologic system. For example, it took colleagues, students, and me seven years of field work to recognize and map the 26 widespread marker beds in the middle Eocene Bridger Formation of the southern Green River Basin. However, this work provides only the *framework* for much more detailed studies on fluvial architecture, basin analysis, lacustrine sedimentology, biostratigraphy, and paleoenvironmental studies that will require decades of work to complete.

I feel fortunate to work on long-term field projects. Few professional geologists now have this luxury. Long-term field projects are almost impossible to get funded, so professional geologists

typically go into the field for only a week or two—which allows only very rudimentary (at best) or superficial (at worst) analyses. Many-year field projects are still required for much graduate-student research. I have many times heard a colleague say, when an important field problem comes up, “I’ll send a student to work on it.” This is sometimes the worst thing to do since many projects require study by researchers who have a great knowledge of the subject, not someone just developing their ideas and techniques. Besides, I am always amazed at what one learns by studying geology in the field, and even the most experienced geologists will continue to learn if they keep their eyes and mind open. There are no simple solutions to the dearth of long-term geologic research projects, but it is a problem that should be acknowledged.

We had a great family night. More than 50 people showed up at the Fiske Planetarium to hear Joe Romig and Glen Porzak chat about climbing the eight highest peaks in the solar system. Thanks to Joe, Glen, Tito Salas (director of the Planetarium), and all those who came to the talk!

Have a great summer and (I hope) a great field season!

## CSS Memorial Fund awards for 2004

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By **Jim Cappa**, Colorado Geological Survey

The CSS Memorial Fund Committee (Jim Cappa, Eric Nelson, Bruce Bryant, Greg Holden, and Don Sweetkind) met on April 28, 2004 to evaluate proposals for the Tweto, Oriel, Eckel, Snyder, and Pierce Heart Mountain funds. We received 24 proposals (five fewer than last year) from 18 universities throughout the United States.

Twelve awards totaling \$9,425 were made from the five funds. \$2,800 total, which supported three proposals, was awarded from the Tweto Fund for research in the Rocky Mountains. The Oriel Fund for research in the central and northern Rocky Mountains awarded \$2,000 total to three proposals. The Eckel Fund for research in engineering geology awarded \$625 to support one partial proposal. The

Snyder Fund for research on Precambrian geology

of the Rocky Mountains awarded \$1,000 to one proposal. A total of \$3,000 was awarded from the Pierce Heart Mountain Fund, under new guidelines established by the Pierce family last year, for research on the Heart Mountain fault and in areas not covered well by the other funds. This year a proposal for work on the Heart Mountain fault and three other proposals were funded.

During the past 21 years (including this year), the Society has helped support the graduate research of 165 students, awarding a total of \$125,657 (an average of nearly \$750 per grant). This achievement is extraordinary for an

organization of our size and exemplifies the commitment of its members to promote high-quality research in the earth sciences. It was an honor and pleasure to serve as Memorial Fund Chair this year

Matthew Bourke, UCLA, Sedimentary and tectonic analysis of the Kishenehn Basin, northwest Montana – an analogue for Tertiary extensional basins of the western U.S.

Charity Hall, University of Northern Arizona, Post-glacial vegetation and fire history of Hermit Lake, northern Sangre de Cristo Mountains, Colorado.

Michael Meredith, University of Wyoming, Archean crustal development in the Tin Cup Mountain area, Granite Mountains, Wyoming, a product of plate tectonics.

Timothy McIntyre, Colorado School of Mines, Alteration and mineralization of the Wingate sandstone, Paradox Basin, Utah-Colorado.

Khitam Alzughoul, Colorado School of Mines, Mineralization in the Whitehorn Stock area, NE Salida, Colorado.

Jessica Moore Ali-Adeeb, University of Utah, Three-dimensional fluvial architecture and reservoir modeling of the Green River Formation, Eocene.

Peter J. Schmitz, University of Wyoming, Emplacement style of Late Archean Louis Lake

and I want to extend a “thank you” to all the Memorial Fund donors that have made these grants possible. The 2004 recipients of CSS memorial funds awards are as follows:

batholith, southern Wyoming Province.

Daniel Hembre, University of Kansas, Using modern burrowing organisms to determine paleoenvironmental, paleoclimatic, and paleoecological significance of continental ichnofossils in the Eocene-Oligocene White River Formation, Logan County, Colorado.

Joseph J. Beer, University of Minnesota at Duluth, Sequence stratigraphy of fluvial and lacustrine deposits in the lower part of the Chinle Formation, central Utah: Paleoclimatic and paleoecologic implications.

Nathaniel Gilbertson, Colorado School of Mines, 3-D geologic modeling and fracture interpretation of the Tensleep Sandstone, Alcova Anticline, Wyoming.

Scott Salamoff, Colorado State University, Integration of fold modes with fracture history in Laramide anticlinal oil traps: an example from the Elk Basin and surrounding areas, Wyoming.

Joshua DeFrates, Illinois State University, Paleomagnetic analysis of basaltic dikes at Cathedral Cliffs: a test of the continuous allochthon model for Heart Mountain faulting.

## Colorado Scientific Society awards at Colorado State Science Fair

By **Chuck Weisenberg**, Front Range Community College

The Colorado Scientific Society awards first and second place prizes in the junior and senior divisions for earth science-related projects at the finals of the Colorado State Science Fair. At the judging on April 8 at Colorado State University, Tom Sutton and Chuck Weisenberg determined the following winners:

### Senior Division

1st place—\$100 award. Jade Brooks, 12th grade, Sierra Grande High School, Blanca, Colorado. “Hydrophobicity II: The effects of forest fires on debris flows.” Jade applied a mathematical model of debris flow formation to the Million burn. She has an excellent understanding of the issues involved.

2nd place—\$75 award. Tyler Benton, 11th grade, Stratton High School, Stratton, Colorado. “Reconstructing soil moisture of the Platte climate

division using moisture-sensitive tree ring chronologies.” Tyler cored and measured tree rings along the South Platte River and then compared them with historical rainfall records, getting an excellent match. He is a repeat winner of CSS awards.

### Junior Division

1st place—\$75 award. Daniel Neligh, 8th grade, Ricks Center For Gifted Children, Denver. “Erosional investigations.” Daniel was fascinated by regularly spaced ravines he saw on vacation and constructed an experiment to study the spacing of channels in soil given different rates of precipitation.

2nd place—\$50 award. Elizabeth Garcia, 7th grade, Sargent Jr. and Sr. High School, Monte Vista, Colorado. Elizabeth loves rocks, so she collected volcanic rocks around Monte Vista and interpreted their origin.

# May, June, and August 2004 CSS field trips

By Emmett Evanoff

Three one-day field trips are currently scheduled for this summer: geology of I-70 across the Front Range on May 30, geology of the Pawnee Buttes area on June 19, and Precambrian geology of the east-central Front Range on August 14. Each will be a preview trip for the GSA Annual Meeting in November; the previews will be during (presumed) excellent weather and will be much less expensive (participants will provide their own lunches).

**Sunday, May 30—Colorado Front Range—Anatomy of a Laramide uplift.** Leaders: Karl Kellogg, Bruce Bryant, and Jack Reed. Registration deadline: May 21. Cost: \$25. Transportation: Vans only. Departure: 8:00 am, Cold Spring Park and Ride (6<sup>th</sup> Avenue and Union). The trip will travel along I-70 to the Silverthorne area to examine the geology along a cross section through the Front Range. Karl, Bruce, and Jack have decades of experience working on geology of the Front Range, so this trip is a must for those who are interested in our local geology. Since the trip will be stopping at narrow exits along I-70, we will travel in vans and personal cars are discouraged. Please note: *the date of this trip differs from the date given in previous announcements.*

**Saturday, June 19—Cenozoic geology and fossils of the Pawnee Buttes area, northeast Colorado.** Leader: Emmett Evanoff. Registration deadline: June 11. Cost: \$8. Transportation: Car pools. Departure: 8:00 am, RTD Park and Ride at

1<sup>st</sup> Avenue and Strong Streets in Brighton, Colorado. We will visit many of the fossil vertebrate sites that paleontologists have studied for the past 130 years. The geology of northeast Colorado is subtle but fascinating.

To find the Brighton Park and Ride from Denver, go north on I-76 to US 85. Go north on US 85 toward Brighton, and turn to the east (right) onto Bridge Street (Colo 7). If you are coming from the north, come down US 85 (the Greeley Highway) to Bridge Street, and turn east (left) and cross the highway bridge. Follow the signs to the RTD Park and Ride, that will be on the left side of Bridge Street between 1<sup>st</sup> Avenue and Main Street, north of the Brighton Chamber of Commerce. Because of the driving distance, we will probably not return to Brighton until about 6 PM.

**Saturday, August 14—Continental accretion—Colorado style: Proterozoic island arcs and back arcs of the central Front Range.** Leaders: Lisa Lytle and Thomas Fisher. Registration deadline: August 6. Cost: \$8. Transportation: high-clearance 4-wheel-drive vehicles are needed for car-pools (please volunteer yours!). Departure: 8:00 am, Cold Spring Park and Ride, 6<sup>th</sup> Avenue and Union. We will examine the Precambrian features of the Front Range northwest of Golden. We received a preview of this trip during the April field trip, but Lisa and Thom will take us to many additional sites.

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## Registration Form—Summer 2004 Colorado Scientific Society Field Trips

Send registration to Emmett Evanoff, Department of Geological Sciences, 399 UCB, University of Colorado, Boulder, CO 80309-0399

Name: \_\_\_\_\_ Address: \_\_\_\_\_  
 Phone: \_\_\_\_\_ E-Mail : \_\_\_\_\_

<i>Summer field trips</i>	<i>Registration deadline</i>	<i>Number of registrants</i>	<i>Total cost</i>
<b>Colorado Front Range-Anatomy of a Laramide uplift</b>	May 21	@ \$25	
<b>Cenozoic geology of the Pawnee Buttes area</b>	June 11	@ \$8	
<b>Proterozoic island &amp; back arcs, central Front Range*;</b>	August 6	@ \$8	
*I will bring my 4-wheel-drive, high-clearance vehicle for car-pools _____			
(make check to Colorado Scientific Society) <b>TOTAL AMOUNT ENCLOSED</b>			

# 2004 Colorado Scientific Society fall field trip Geology of the Black Hills and Badlands National Park

By Emmett Evanoff

The 2004 Fall Field Trip will take us to the Black Hills and Badlands National Park in South Dakota. Leaders: Jack Redden, John Lufkin, Lee Shropshire, and Emmett Evanoff. Dates: Thursday through Sunday, September 23–26. Cost: \$300 (includes transportation, lodging, and lunches).

DAY 1: Drive to Custer; stop at the Hot Springs Mammoth Site. This excellent local museum displays bones of dozens of mammoths in an ancient sinkhole deposit that acted as a natural trap. DAY 2: Examine the Precambrian and Paleozoic rocks of the Black Hills under the guidance of Jack Redden, a retired USGS geologist

who mapped and subdivided the Precambrian rocks of the Black Hills. We hope to visit some of the famous pegmatite mines and end up in Rapid City in the evening. DAY 3: We will examine the geology and fossils of Badlands National Park; Emmett will discuss the stratigraphy and origin of the most fossiliferous parts of the White River Group. DAY 4: Drive to Devils Tower and then return to Denver. Lee Shropshire, UNC, will lead this last day. Buy dinners and breakfasts in Custer and Rapid City throughout the trip.

You will receive additional information concerning the trip in September.

## Registration Form—Fall 2004 CSS Field Trip to the Black Hills and Badlands

Send registration to Emmett Evanoff, Department of Geological Sciences, 399 UCB, University of Colorado, Boulder, CO 80309-0399

Name: \_\_\_\_\_ Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ E-Mail : \_\_\_\_\_

<i>Fall field trip</i>	<i>Registration deadline</i>	<i>Number of registrants</i>	<i>Total cost</i>
<b>Black Hills—Badlands field trip</b>	August 27	@ \$300	

(make check to Colorado Scientific Society) **TOTAL AMOUNT ENCLOSED**



## A View Through the Brown Cloud

By Lisa Ramirez Rukstales, USGS

Wow! Check out those gasoline prices! Fuel is still cheaper than a gallon of milk, but it just seems un-American to pay more than a buck-eighty for Texas Tea. You oil patchers must be jumping for joy, or do higher prices only translate to bigger bonuses for the CEOs? The other day I read we (pessimistically) have 35 years of oil left. My first question is, “Who’s ‘we,’ tar man?” When the supply gets low I don’t imagine the great unwashed will be receiving

its share. Git thee to a hybrid car! Anyone know of an alternative fuel that will run our jumbo jets and spy planes? Do we have tanks and humvees that run on Everclear? According to the History Channel, even nuclear-powered aircraft carriers use gazillions of gallons of fuel. I wonder if the Hawks flitting around Washington know that. Hey, I’ve got an idea: maybe if we explain to them that without petroleum products they won’t be able to put on a decent war, they’ll start backing alternative energy! Woo-hoo!



# 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 Emmett Evanoff at (303) 444-2644 or [emmettevanoff@earthlink.net](mailto:emmettevanoff@earthlink.net)

**Denver Mining Club** meets every Monday (except when noted) at Country Buffet near Bowles and Wadsworth (at 8100 W. Crestline Ave.) 11:30 a.m.-1:00 p.m. **How small mines become big mines**, May 3—William Tanaka, SRK Consulting Co. **Recent developments at the Cotter Corp. uranium and aggregate properties**, May 10— Susan Judy, President, Stone Catalyst Consulting Co. **The Prospectors & Developers Association of Canada (PDAC) Convention, Toronto, March 7-10, 2004**, May 17— Bruce Geller, Consulting Mineralogist, Advanced Geologic Services. **Apollo Gold, a new gold mining company**, May 24— David Young, Vice-President of Business Development, Apollo Gold Co. No meeting May 31.

**Denver International Petroleum Society** meets the second 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 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. **Geophysics in 2030: A snapshot of fifth-generation exploration**. May 3—Ken Witherly, Condor Consulting. 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. Subject matter usually deals with the application of well logs to oil and gas exploration. **TBA**—May. Call Elice Wickham at 303-573-2781 for reservations. Web page: <http://dwls.spwla.org>.

**Rocky Mountain Association of Geologists (RMAG)** Reception at 11:30 a.m., lunch at 12:00 p.m., talk at 12:30 p.m. Reservations are taken by recording at 303-623-5396 until 10:30 a.m., Wed. before the luncheon. Cancellations are taken until 11:00 a.m. on Wed. at 303-573-8621. Luncheon cost is \$20 payable to RMAG at the door. Reservations are not required for talk only—cost is \$3. Meeting location: Denver Petroleum Club, Anaconda Tower, 555-17th St, 37th floor. Web page: <http://www.rmag.org>.

**University of Colorado at Boulder, Geological Sciences Colloquium** Wednesdays, 4:00-5:30 p.m., Rm. 180. Refreshments at 3:30 pm on the 3rd floor. **Not scheduled in May**. For more information, call 303-492-8141. Web page: <http://www.colorado.edu/GeolSci>.

**Friends of Dinosaur Ridge** meets at 7:00 pm at Red Rocks Elementary School in Morrison, Colorado. Join now. Web page: <http://www.dinoridge.org>. **Geology of Eldorado Canyon**, May 11— Lin Murphy, geologist and rock climber. Admission is free, but donations are welcome. For more information please contact the FODR Visitor Center at (303) 697-3466.

**Colorado School of Mines, Van Tuyl Lectures** Fridays from 3:00PM to 4:00PM in Berthoud Hall room 108. **Not scheduled in May**. For further information, check <http://www.mines.edu/academic/geology.html>

**USGS Geologic Division Colloquium**. Thursdays, 1:30 p.m., 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)

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

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