



Colorado Scientific Society

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

Using alluvial paleosols to interpret climate change at the Paleocene-Eocene thermal maximum (PETM)

By Mary J. Kraus, University of Colorado, Boulder

Dinovulsion: a new style of avulsion in the Upper Jurassic Morrison Formation

*By Gus Gustason and Larry Jones
EnCana Energy Resources, Inc.*

Thursday, March 18, 2004

American Mountaineering Center

710 10th St. (NE corner of 10th and Washington), Golden

Social half-hour – 6:30 pm. Meeting time – 7:00 pm.

Abstract

Dinovulsion: a new style of avulsion in the Upper Jurassic Morrison Formation

By Gus Gustason and Larry Jones, EnCana Energy Resources, Inc.

The low net-to-gross Salt Wash Member of the Morrison Formation, east-central Utah, contains exceptionally well-exposed, low-sinuosity, ribbon-shaped sand bodies of two distinct sizes enclosed by variegated mudstones and siltstones. These sand bodies were formed during the Jurassic by avulsion, the relatively abrupt shift of a river to a new channel.

Analysis and integration of sedimentology, paleontology, and paleoclimate suggest that river channels, and subsequent ribbon sand bodies, were located by a heretofore unrecognized style of avulsion, termed dinovulsion.

Dinosaurs, well-documented inhabitants of the Salt Wash alluvial plain, trampled channel-like trails into the floodplain, creating conduits that served to focus overbank flow during flooding. During major floods, or over a period of more numerous but less intense flooding, flow coalesced to scour a new primary channel while sand clogged the pre-existing channel and nearby small dinosaur pathways. As time passed and the system aggraded, this process repeated, and the present architecture of isolated, very low-sinuosity sand ribbons of two distinct size populations resulted.

Abstract

Using alluvial paleosols to interpret climate change at the Paleocene-Eocene thermal maximum (PETM)

By Mary J. Kraus, University of Colorado at Boulder

The Paleocene-Eocene thermal maximum (PETM) was a short-lived (~100,000 years) spike in global temperature that occurred approximately 55 m.y. ago. The warming event is identified by distinct excursions in oxygen and carbon isotope records as well as floral and faunal extinctions and migrations. This global warming has been attributed to the release of methane hydrates stored in oceanic sediments, which injected methane into the atmosphere.

Although there is broad agreement that temperatures rose during the PETM, the effects of global warming on precipitation and evaporation patterns are less well understood and more contradictory. Data from continental PETM records are important for establishing a better picture of local and regional climatic conditions during the PETM and for thus testing and refining climate models. The analysis of paleosols provides one approach to clarifying

precipitation and evaporation patterns during this interval.

Paleosols were examined in the Bighorn Basin, Wyoming, one of the few continental areas where the PETM interval has been convincingly documented based upon isotopic analyses of pedogenic carbonate nodules. Paleosols within the PETM interval are dominated by red soil colors and carbonate nodules compared to slightly older paleosols. These features indicate better drained conditions and suggest that climates became drier during the PETM in the Bighorn Basin and possibly in the region. Paleosols in the upper part of the PETM interval show purple paleosols colors and less abundant to absent carbonate nodules, showing a return to more humid climatic conditions. Other features within the PETM interval (absence of organic-rich shales with plant fossils, cut-and-fills with paleosols) are consistent with drier conditions during the PETM.

These conclusions suggest that interpretations of increased precipitation did not occur globally as suggested by other workers. This study also shows the

importance of detailed case studies to test climatic generalizations and models that have been developed for PETM precipitation patterns.

Colorado Scientific Society President's Note—March 2004

By Emmett Evanoff

“...a society whose immediate object (is) to facilitate the interchange of scientific observations and ideas and promote intercourse among the observers themselves.”

Recently I have been giving quite a bit of thought to the role that the Colorado Scientific Society has in the larger scientific community in the state, and what makes up this scientific community. The society was originally founded to promote all aspects of science, as shown by the first quote above, from the first president of the Society, Samuel F. Emmons, at the first meeting in 1882. In the late 1800s and the early 20th century, the society's focus was not only on geology but also on other sciences, technology, and engineering. The society continued to support a wide number of scientific disciplines in the middle of the 20th century, as indicated by the papers that were published in the now defunct *Proceedings of the Colorado Scientific Society*. After World War II, the great influence of members from the U.S. Geological Survey transformed the Society into one that focuses primarily on the earth sciences. Rich Madole (president in 1996) has often pointed out that the Society is essentially the *Colorado Geological Society*, a view that I agree with. However, a number of other geological societies in the Denver metropolitan area, such as RMAG, SEPM, GSA, DREGS, and a slew of others (see the last page of this newsletter), all serve the geological community.

So what is our role? The way I see it is that the Colorado Geological Society is the only geological organization that can provide information about this region's geology to the Colorado community. This community includes professional geologists, students, and local informed citizens who are interested in geology and issues concerning geologic phenomena. Unlike RMAG, AAPG, and DREGS, we are not primarily

“(We) need to evaluate trends and start a brainstorming process for change. Otherwise, I'm afraid that the Society may shrink to nothingness....”

interested in economic geology. And unlike GSA and SEPM, which are national organizations, our primary strength is a great understanding of the geology of Colorado and the surrounding areas. This role does not limit us to regional geology topics alone, and indeed our Emmons Lectures and many of the monthly speakers present talks of national and global scope. But through many of our monthly talks, in our field trips, and in the upcoming symposium, we provide information to the citizens of Colorado on the geology of Colorado.

Why must we worry about our role? A basic premise in evolutionary biology is that organisms must find a niche or face extinction. I have been discussing this topic with a number of people in the society, and one of my colleagues who is deeply concerned with the society made the second comment quoted given above. I strongly believe that if we find the role where we act as a source of information for a broad group of people who are interested in Colorado geology, the society will grow.

The symposium on the Geology of the Front Range in April (which is free and open to the public) is one way that we can reach out to the citizens of Colorado who have an interest in the world around them. I am hoping that this symposium will be the first of many, all of which will focus on the geology of Colorado and the surrounding region and issues that geologic phenomena present to the citizens of Colorado. Given this niche, I believe the Society will not go extinct but will in fact grow.

I welcome any discussion these comments may generate.

Colorado Scientific Society Front Range Symposium in Honor of the late William A. Braddock

This symposium focuses on the geologic history of the Colorado Front Range, a region that was the principle study area of the late William A. Braddock of the Department of Geological Sciences, University of Colorado, Boulder. The topics range from the Precambrian features to the glacial record and will be presented by many of the most prominent researchers in the region. The symposium is free and open to the public.

SCHEDULE OF TALKS

Saturday, April 3, 2004

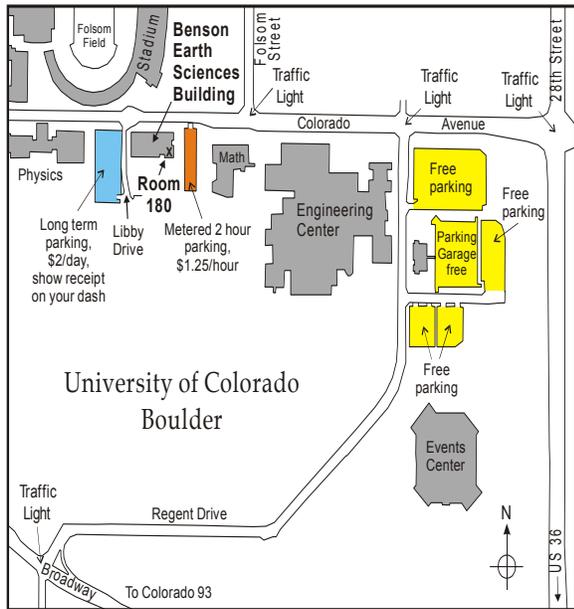
Room 180, Benson Earth Sciences Building, University of Colorado, Boulder

- 8:30 AM – Introductory remarks – Emmett Evanoff, University of Colorado at Boulder
- 8:40 AM - Precambrian of the Front Range—What have we learned since Hayden? Jack Reed, U.S. Geological Survey emeritus
- 9:00 AM - Proterozoic of the central Front Range—How Colorado began. Lisa Lytle, Colorado School of Mines
- 9:20 AM - Front Range kimberlites: New dates, crustal xenoliths, and a view into mountain roots. Alan Lester, University of Colorado at Boulder
- 9:40 AM - A new look at an old friend: The Late Paleozoic Frontrange Uplift and the Ancestral Rocky Mountains. Chuck Kluth, Colorado School of Mines
- 10:00 AM – **Break**
- 10:20 AM - Precambrian through Miocene deformations along the west flank of the Front Range around Granby, Colorado. David A. Schroeder, University of Colorado, Denver
- 10:40 AM - Laramide Front Range uplift and the Golden Fault. Robert J. Weimer, Colorado School of Mines emeritus
- 11:00 AM - A tectonic model for the differing styles of deformation along the northeastern flank of the Front Range and adjacent Denver Basin. Vincent Matthews, Colorado Geological Survey
- 11:20 AM - Limits on Laramide tectonic models of the Front Range based on detailed sequential cross sections of the range. Bill Nesse, University of Northern Colorado
- 11:40 AM - The Colorado Front Range: A wellspring of change in Laramide concepts: Eric Erslev, Colorado State University
- Noon – **Break for Lunch**
- 1:15 PM – Afternoon introductory remarks – Emmett Evanoff
- 1:20 PM - Timing of the uplift of the Front Range in Colorado as deduced from adjacent debris. Bob Reynolds, Denver Museum of Nature and Science
- 1:40 PM - Kinematics of the Colorado mineral belt. Eric Nelson, Colorado School of Mines
- 2:00 PM - Late Cretaceous and Paleogene magmatism in the Front Range. Edwin E. Larson, University of Colorado at Boulder emeritus.
- 2:20 PM - Laramide exhumation history of the Southern Rocky Mountains based on apatite fission-track thermochronology. Shari Kelley, New Mexico Bureau of Mines
- 2:40 PM - **Break**
- 3:00 PM - The western Front Range margin near Dillon, Colorado—The interrelationship of thrusts, extensional faults, and large landslides. Karl Kellogg, U.S. Geological Survey
- 3:20 PM - Incised meanders, geomorphic clues to neotectonism in the Colorado Front Range. Tom Steven, U.S. Geological Survey emeritus
- 3:40 PM - Latest Cenozoic history of the Front Range—from Neogene diamictites to cosmogenic nuclide dates of late Quaternary glacier advances. Rich Madole, U.S. Geological Survey emeritus
- 4:00 PM – End of symposium.

LOCATION OF BENSON EARTH SCIENCE BUILDING AND PARKING

The Front Range Symposium of the Colorado Scientific Society will meet in Room 180, Benson Earth Science Building, University of Colorado. Room 180 is on the first floor across from the earth sciences library. The closest long-term parking is Parking Lot 360, west of the Benson Building. Enter the lot from Libby Drive. Fee: \$2 per day; pay

at the central kiosk; show your receipt on your dash. Parking meters (2 h maximum) are just east of the Benson Building. Free long-term parking is available east of the Engineering Center in Regent Drive Autopark Garage and Parking Lots 436 and 440. Walk north on Regent Drive and then west on Colorado Avenue to get to the Benson Building.



Symposium Field Trip: The Tectonics and Precambrian Geology of the Front Range between Golden and Marshall

Led by **Robert J. Weimer** and **Lisa A. Lytle**, Colorado School of Mines

Sunday, 4 April 2004

The Colorado Scientific Society is presenting a field trip in conjunction with the Symposium of the Geology of the Front Range. The field trip will examine the tectonic features along the margin and some of the Precambrian features of within the Front Range between Golden and Marshall. Bob Weimer and Lisa Lytle are the

Bus departure Saturday, April 4: Those who live in Longmont, Loveland, and Boulder can meet the bus at **7:30 AM** at the **Foothills Park and Ride** at the SE corner of the Foothills Parkway and Pearl Street intersection in Boulder.

Meet at **8:15 AM** for an 8:30 AM departure from the **Cold Spring Park and Ride** at the corner of 6th Avenue and Simms, on the northwest corner of the Federal Center. Meet on the east side of the parking lot.

primary field trip leaders, and speakers from the symposium are encouraged to provide additional commentary. The cost of the trip is \$30, which includes transportation, handouts, lunch, and snacks. Since the available space is limited, only members of the Colorado Scientific Society will be able to register for the trip.

Bus return: We hope to return to the Cold Springs Park and Ride no later than 5 PM, and the Foothills Park and Ride no later than 6 PM. In case of bad weather, the status of the field trip will be announced at the symposium.

CSS members who want to attend the field trip should fill in the following form and mail it no later than **March 26** to Emmett Evanoff, Department of Geological Sciences, 399 UCB, University of Colorado, Boulder, CO 80309-0399.

Field Trip Registration Form

Geology of the Front Range from Golden to Marshall

Name: _____ Address: _____

Phone: _____

E-Mail : _____

Number of Participants: _____ H \$30/participants = \$ _____

Any food preferences or restrictions (vegetarian, allergies, diabetic diet, etc.): _____

Make your check out to **Colorado Scientific Society**. Send it no later than **March 26** to: Emmett Evanoff, Dept. of Geological Sciences, 399 UCB, University of Colorado, Boulder, CO 80309-0399.

Current investigations...Colorado Geological Survey

By **Vince Matthews**, Colorado Geological Survey, Denver

Historically, surface-water reservoirs have been the primary means of storing water to meet Colorado's needs. CGS is currently studying an alternative means of increasing water-storage capacity by storing water underground through *artificial recharge*. Artificial recharge is defined as any engineered system designed to introduce water to, and store water in, underlying aquifers.

The CGS study's focus is a statewide assessment of the location, geology, and physical ability of various aquifers within Colorado to store water through artificial recharge. Although the

study focuses on Colorado, the use of artificial recharge in the U.S. and internationally is also being researched to investigate best-practices that might be applicable to Colorado. Artificial recharge projects have been documented in at least 32 states in the U.S. and at least 26 countries worldwide.

Artificial recharge of ground water is one strategy among several that can help meet current and future water demands. Other ways to help our water situation include conservation, surface water reservoir enhancement, and inducing or enhancing natural ground water recharge.

Tell us about your organization's current investigations

By **Mary-Margaret Coates**, CSS newsletter editor

Are you as an individual or your organization in the middle of an interesting investigation? Tell other Colorado Scientific Society members about it. "Current Investigations" will be an occasional column that highlights ongoing work

that is bringing to light new information and new perspectives on geologic phenomena.



Earth Science Meetings and Talks



Newsletter items must be received by the 4th 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 7:00 p.m. and talks start at 7:30 p.m. For more information, contact Jim Cappa at (303) 866-3393, jim.cappa@state.co.us

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. **Mining in Greenland**, March 8—Lou Cope, Process/Placer Consultant. **An Overview of U.S. Gold: 27 Years and Still Going**, March 15—Bill Reid, President, U.S. Gold Corp. **Mining motifs in pictures and art objects of the last five centuries**, March 22—W. Tony Seiler, Mining Engineer. **I left gold (Addwest Minerals) during the price downturn. Do I go back?** March 29—Charlie Williams, President, Water Remediation Technology (zeolites).

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 a.m. 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. **TBA**, April. 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**, March. 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. **TBA**, March 19. **The Real Father of Geology**, April 2—Ray Thomasson, Thomasson Partner Associates. 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 p.m. on the 3rd floor. **H2 and HD in Earth's atmosphere: A little something for everyone**, March 10—Thomas Rahn, Los Alamos National Laboratory. **Fossil mammals, stable isotopes, and C3/C4 communities in deep time**, March 17—Bruce McFadden, Florida Museum of Natural History. **TBA**, March 31—Kevin McKeegan, UCLA. **Core Complex: Insights from both the continents and oceans**, April 7—Barbara John, University of Wyoming. For more information, call 303-492-8141. Web page: <http://www.colorado.edu/GeolSci>.

Friends of Dinosaur Ridge; 7:00 pm at Red Rocks Elementary School in Morrison, Colorado. Join now. **Tracking Pterosaurs**, March 31—Martin Lockley, University of Colorado at Denver. Web page: <http://www.dinoridge.org>.

Colorado School of Mines, Van Tuyl Lectures Fridays from 3:00PM to 4:00PM in Berthoud Hall room 108. **TBA**, March 12. Warren Hamilton, CSM. **The Hugo Dummett Cu-Au Porphyry Deposit, Oyu Tolgoi, Mongolia: Thrill in the Gobi Desert**, March 26—Elisabeth Ronacher, CSM. **TBA**, April 2, Robert S. Anderson, University of Colorado, Boulder. 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

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

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