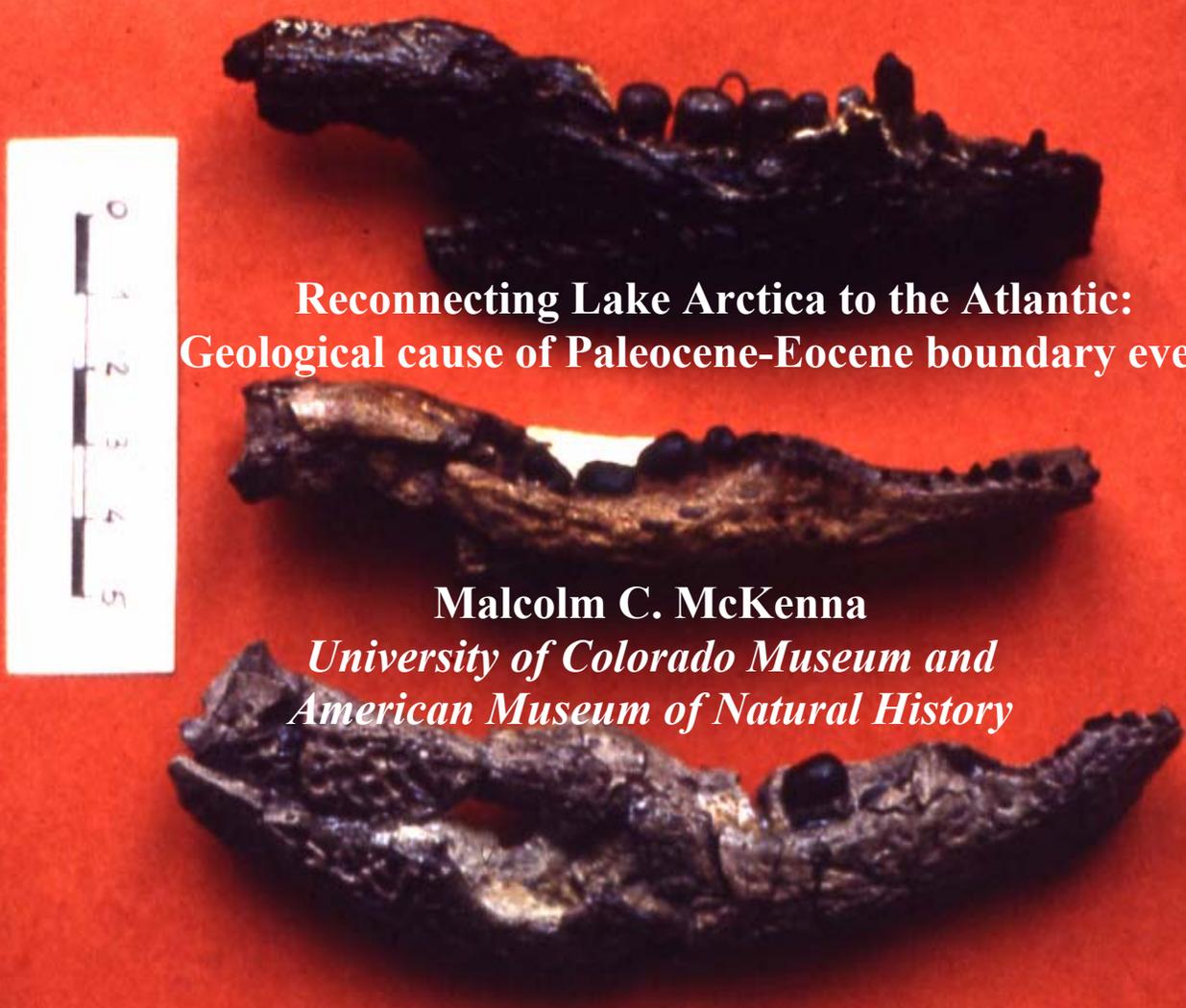




Colorado Scientific Society

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

2004 Emmons Lecture



**Reconnecting Lake Arctica to the Atlantic:
Geological cause of Paleocene-Eocene boundary events**

Malcolm C. McKenna
*University of Colorado Museum and
American Museum of Natural History*

Thursday, January 15, 2004

**Colorado School of Mines, Golden
Metals Hall**

Social half-hour – 7:30 pm Meeting time – 8:00 pm

[NOTE SLIGHTLY LATER SOCIAL AND MEETING TIME!]

Abstract—2004 Emmons Lecture

Reconnecting Lake Arctica to the Atlantic: Geological cause of Paleocene-Eocene boundary events

By **Malcolm C. McKenna**, Adjunct Curator at the University of Colorado Museum and Frick Curator Emeritus at the American Museum of Natural History

When two oceans become separated from each other such that circulation is in one direction only, their sea levels and salinities will become different. Such was the case in the late Paleocene, when increased proto-Icelandic lava outpourings choked the Atlantic marine continuity with the Norwegian/Greenland seas and beyond, and allowed terrestrial interchange directly between Europe and North America. Beringia was simultaneously dry land, blocking Pacific-Arctic circulation.

An isolated Arctic Ocean (about 1% of total oceanic volume) that was fed by rivers of the order of magnitude of those draining into the present Arctic Ocean would soon have exceeded evaporation, freshened, filled the Arctic Basin to its brim, and then would have overflowed southward. Oceanic heat transport to the Arctic Basin would have ceased. At first, overflow would have been through the long Turgai Straits to Tethys in Eurasia.

However, acceleration of sea-floor spreading in the Greenland-Scotland bridge area beginning in geomagnetic chron 24R resulted in a breach in the bridge, allowing rapid release southward of brackish and fresh water. This water would have spread out on top of and into the Atlantic Ocean, severely affecting the marine photic zone and its inhabitants before mixing.

With reconnection and resumption of circulation, oceanic heat transport northward would have resumed, helping to warm the Arctic Basin and its waters and isolating the European terrestrial biota from areas to the west. These changes, in combination with slightly lowered Arctic Basin water level, would have led to extensive methane releases, contributing to what is now thought to have been the root cause of an accelerated episode of global warming that began at 55.5 Ma.

Colorado Scientific Society President's Note—January 2004

By **Emmett Evanoff**

Welcome to 2004! This year the Society will be sponsoring not only excellent talks on every third Thursday of the spring and fall months, but also several field trips and a two-day symposium. The symposium will discuss geology of the Front Range and will consist of one day of talks followed by a one-day field trip.

Many members of the Society will also be participating in the Geological Society of America Annual Meeting on November 7–10 and the annual meeting of Society of Vertebrate Paleontologists in October, both of which will be held in Denver. There will be many opportunities to learn and participate in geology in 2004.

IMPORTANT DATES ON THIS YEAR'S COLORADO SCIENTIFIC SOCIETY CALENDAR

January 15	2004 Emmons Lecture
April 3–4	Front Range Geology Symposium and Field Trip
April 15	Family Night
September 25–26	Fall Field Trip
November 18	Student Night

The 2004 Emmons Lecture will continue the fine tradition of top-of-the-line researchers presenting new and exciting information. This year's lecturer will be Dr. Malcolm McKenna. McKenna is an emeritus curator in vertebrate paleontology at the American Museum of Natural History, New York, and now lives in Boulder, where he is associated with the University of Colorado Museum and is an adjunct professor at the University of Wyoming. McKenna will present the results of more than 30 years of research on the Paleogene faunas and floras in the high Canadian Arctic. These high-latitude fossil biotas provide important information concerning the distribution of land bridges between North America, Europe, and Asia and that reflect the movements of the lithospheric plates in the Northern Hemisphere. These plate movements and the development of marine connections between the Arctic and the southern oceans resulted in major global oceanographic and climatic changes.

A major focus of this talk will be the use of fossils in understanding geologic events and processes. As many of you are aware, paleontology has been downsized in the geology departments of many academic institutions. This reduction in part reflects the shift in paleontology's focus from "biogeology," or the relations of ancient life to geologic events and processes, to "paleobiology," or the use of fossil life to help explain biologic processes. More and more paleontologists are hired by biology, anthropology, and universities medical

departments. This is unfortunate, for the geologic time scale is still based on changes in the fossil record (at least within Phanerozoic rocks), and fossils are the most practical criteria for determining the age of a sedimentary rock. Fossils also provide important information concerning paleoenvironments and paleoclimate. Fossils of subtropical palms and alligators have been found in the lower Eocene rocks of the Canadian Arctic, and interpretations of fossil floras fuel the continuing debate on paleoelevations in Colorado.

Fossils can provide important information concerning the post-burial diagenesis of rocks, such as the color alterations of calcium-phosphate conodonts across the geothermal gradient—an important tool in determining oil and natural gas thermal "windows." Finally, fossils can be used to determine the timing of connections of land and seas, as indicated by the spreading of plants and animals across large regions of the Earth's surface. A good example is the connection of North America with South America in the Pliocene, or the lesser-known late Paleocene-early Eocene connections of the northern continents as presented by Dr. McKenna. Paleontology is one of the few fields that still attract the attention of large number of professionals and amateurs alike—just see how animated the participants of the CSS field trips become when we visit a fossil locality! Let's not forget the great potential that fossils can have in understanding the geologic past.

Treasurer's Report for 2003

By Don Sweetkind, Treasurer

At the December business meeting of the Colorado Scientific Society, I summarized the status of the CSS finances for 2003. We took in about \$3,500 in member dues; this represents our operating budget for the year. In addition to dues payments, in 2003 CSS members contributed \$2,875 to Memorial Funds and \$1,310 to the Endowment Fund. An additional \$4,365 in Memorial Fund contributions was received through Dec. 1, 2003, in memory of Charles Pillmore.

Our society expenses fall into two categories: those activities that are purely expenditures and activities that involve expenses

but also potentially generate revenue. The major items that are purely expenditures are insurance, \$702; rental of meeting space at the American Mountaineering Center and at the Colorado School of Mines, \$700; student night awards, \$650; newsletter expenses, \$451; speaker honorarium for the Emmons Lecture, \$415; donation to the Western Interior Paleontological Society to support their Spring 2003 conference, \$300; Science Fair awards, \$300; and website costs, \$217. Our total expenditures for the year were about \$3,950.

Activities for which we spent money but also received revenue were field trips, \$7,010

income, \$6,082 expenditure; Past President's Dinner, \$627 income, \$660 expenditure; and Family Night, \$416 income; \$481 expenditure.

For 2003, we show about \$500 in excess funds this year (income exceeded expenses) owing

to field trip profits and a smaller than usual Emmons honorarium. In addition, we are holding \$5,080 in monies earmarked for our road sign project.

T.D.A. Cockerell, early investigator of the Florissant fossil beds

By **Pete Modreski**, U.S. Geological Survey, Denver

A book is newly published about the life of Theodore Dru Allison Cockerell, the natural scientist who did many of the early studies at Florissant fossil beds. For more than 50 years, the study of Cockerell and his work has been the passion of another UC-Boulder biology professor, William Weber, who served as the curator of the University of Colorado herbarium and Professor of Natural History for 62 years, the longest continuous career of any Colorado botanist. (Readers may be familiar with Weber's plant identification guides "Rocky Mountain Flora," "Colorado Flora: Eastern Slope," and "Colorado Flora: Western Slope" with

Ronald Wittmann.) He retired in 1990. A decade later, Weber has released a book titled *The American Cockerell: A Naturalist's Life, 1866–1948* about the life and work of T.D.A. Cockerell, of Westcliffe, Colorado. The book fills a major gap in Cockerell's personal history and sets the stage for scientific discoveries that were occurring here in Colorado during the late 1880s. To offer contributions to help defray printing costs, contact the Western Interior Paleontological Society. For more information about Cockerell, see <<http://newmedia.colorado.edu/silverandgold/messages/1881.html>>.

Ground water in Colorado subject of new CGS publication

By **Jim Cappa**, Colorado Geological Survey

With the worst drought on record, water is a topic that gets a bit more attention throughout Colorado these days. From farmers and ranchers to urban dwellers and legislators at the state capitol, information on this subject is more sought after than ever.

The Colorado Geological Survey (CGS) has just produced a large format (11" x 17"), 210 page publication that makes it easy to get both basic and detailed information about Colorado's ground water resources. The *Ground Water Atlas of Colorado* is a comprehensive, map-based look at ground water in our state. The atlas was produced in cooperation with the Colorado Water Conservation Board.

The first three chapters of this eight-chapter volume are a primer on ground water in Colorado. These chapters discuss statewide geologic deposits and aquifers, climatic influences on water supply,

the state's water demands and principal uses, ground-water occurrence and flow, aquifer types, surface-water and ground-water interactions, and the legal administration of ground water. A glossary provides a quick reference to ground water terms.

The remaining chapters discuss specific Colorado aquifers in three general areas: 1) Aquifers associated with the state's major river systems, or *alluvial aquifers*, 2) major *sedimentary rock aquifers*, such as those in the Denver Basin, and 3) *mountainous region aquifers*, such as in crystalline rocks (granite) or intermontane parks and valleys, like South Park. These chapters provide useful and specific information on the population, geography, and geology of each area; descriptions of available hydrogeologic units; water levels and specific aquifer parameters; water use and quantified withdrawals; water quality information;

and a selected list of references for additional research.

The atlas summarizes information from many individual ground water research projects and publications by scientists from federal and state government, and private industry. The CGS used water well permit data (over 192,000 records) from the Colorado Division of Water Resources to produce maps and graphs showing the location, depth, and yield of water supply wells in specific ground water areas.



Happy New Year! Another year has cheetahed by and all we have to show for it at the USGS is an abundance of pretty red tape. The latest decree from the Crystal Palace makes it a felony to hoard your annual leave. The bean counters have decided to skim money off the projects that will cover leave according to the “average amount of leave” taken by the “average” person. This is flawed reasoning right off the bat since I know of no one who could be termed “average” in the entire GD*. Not only that, if you don’t use the average amount of leave, say to stay in your office and get some work done (horrors!), your project OE gets charged! And, if you pretend to use your leave but turn around and

Copies of Special Publication 53, *Ground Water Atlas of Colorado*, by Ralf Topper and others, are available over-the-counter for \$40.00 from the Colorado Geological Survey, 1313 Sherman Street, Room 715, Denver, CO 80203, or by phone at (303) 866-2611, or fax at (303) 866-2461. See the CGS web site <<http://geosurvey.state.co.us/>> for further information and a list of other CGS publications.

A View Through the Brown Cloud by Lisa Ramirez Rukstales

stay in your government office and work, you better not trip and fall on the uneven floors of building 25 or have an allergic reaction to the noxious fumes they pump into our offices because the liability issues will make you wish you were dead, which sort of sums up how many people feel about working here anyway! It’s heartwarming to know they’d rather pay us to not be here. As for the skimmed leave money, guess who gets to keep it when it doesn’t get used by the workaholic employee?? (*That’s *Geologic Discipline*, not *Division*... another inane decree from the Restonian home for the creepers and climbers.)

More minerals named for Coloradoans

By Richard Pearl

Richard M. Pearl recorded the following tidbits of Colorado mineralogical history in an article *Minerals Named for Colorado Men*, March, 1941, Colorado Magazine, V. 18, no. 2, p. 48–53. The information was updated in the new volume, *Minerals of Colorado*, by Eckel et.al. and the Friends of Mineralogy.

Rickardite carries the name of Thomas A. Rickard, for whom it was named in 1903. Rickard was the State Geologist of Colorado, the editor of

many mining journals, and the author of mining monographs on many famous mining regions in the United States. Some say the original proposal was to name it Sanford after the metallurgist who identified the new mineral in 1901. Rickardite, the first known copper telluride, was found only at Vulcan, Gunnison County, in the Good Hope Mine. There it occurred with native tellurium, native sulphur, pyrite, petzite, and berthierite, and with weissite, vulcanite, and cameronite, other copper

tellurium minerals. Later it was found in tellurium deposits in Boulder County, Lake County, and Saguache County.

Weissite came from the same mine. William P. Crawford of Denver named it in 1927 for Dr. Loui Weiss, who owned the Good Hope mine. Another copper telluride, this massive, dark bluish black mineral contains no gold or silver. It, too, occurs in Boulder County and Lake County.

Beegerite comes from the Baltic Lode of the Geneva Mining District near Grant in Park County. George A. Koenig (U. Pennsylvania), described it in

1881. He named it after the donor, Herman Beeger, another charter members of the CSS, "in recognition of his services to metallurgy in Colorado". Unfortunately, his services did not last long, as this mineral proved to be Schirmerite, first found in 1874 and named for J.F.L. Schirmer, former Superintendent of the United States Mint at Denver. This valuable, gray, brilliantly metallic sulphide of lead and bismuth combined with silver can be found in Clear Creek County, Park and Summit County, Hinsdale County, San Juan County and San Miguel County.

February 2004 CSS speakers

By **Vince Matthews**, Colorado Geological Survey

Coming in February: Rich Madole, USGS, who will talk about his research on the Great Sand Dunes, and Jon White, CGS, talking about the

characteristics and monitoring of the Debeque landslide, which threatens I-70, the Colorado River, and the railroad. See you then!

1869 Hayden Expedition—Previously Unpublished Sketches

By **Kevin C. McKinney**, USGS

The first formal geological expedition directly funded by the Secretary of the Department of the Interior took place in 1869. Led by United States Geologist Ferdinand V. Hayden, expedition members started out in Cheyenne, Wyoming, traveled south along the eastern flank of the Rocky Mountains to Santa Fe, New Mexico, and returned north via Fort Garland, Colorado.

Elliott worked for Hayden sketching canyons, landscapes, and geological features along expedition routes. Hayden indicated in the 1869 field report that Elliott "made more than four hundred outlines of sketches, and about seventy finished ones for the final reports. Each one of these sketches illustrates some thought or principle in geology, and if properly engraved, will be invaluable."

Because of the duration of fieldwork and the coincident timing of fiscal project reviews and proposals, Hayden's report of the expedition was hastily issued as the Preliminary Field Report of the United States Geological Survey of Colorado and

New Mexico. The field report contains identifiable contributions by all participants with the exception of those by expedition artist Henry Elliott. Hayden had been under pressure to release the report immediately, to assure consideration for expedition funding the following year, and so he could not wait for woodcuts or engravings of Elliott's sketches to be added to the 1869 expedition report.

A new USGS Open-File CDROM (OFR-03-384) unifies Elliott's unpublished sketches with the 1869 Hayden report. This disk is one of a series of archival CDs on mid-nineteenth century explorations of the southwest; other presentations include: Macomb/Newberry Reports for the 1859 Santa Fe-Green/Grand River Expedition (OFR-00-368), Ives Report of the 1857-58 Lower Colorado R. Expedition (OFR-02-25), and Cope's New Mexico vertebrate paleontology monograph for the 1874 Wheeler Survey (OFR-02-270). A limited number of copies are available from "author" Kevin McKinney (kcmckinney@usgs.gov). Otherwise, the CD's may be procured from USGS Map Sales.



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 Emmett Evanoff at (303) 492-8069, evanoff@colorado.edu

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. **Closing the Oldest Continuously Operating Clay Mine in Colorado (1877-2003)**, January 5—Chip Parfet, President, The Geo.W. Parfet Estate, Inc. **Guided Tour of the New Colorado School of Mines Geology Museum**, January 12.—Paul Bartos, Curator. (We'll meet at 11:45 a.m. in the museum lobby, 13th and Maple St., Golden, west of the CSM gym; park in the large lot north of museum. Tour starts at 12 noon; no DMC lunch is planned.) **Holiday Story Time**, January 19—**No meeting**. Martin Luther King, Jr., Holiday. **Overview of Operations, Permitting, and Exploration Activities**, January 26—Jim Chavis, Vice President, Placer Dome America.

Denver International Petroleum Society 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 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) 932-0137, 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. **Time-Lapse Logging in Vertical and Horizontal Wells**, January 20.—Neil Hurley, Colorado School of Mines. 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. **Petroleum Industry Perspective 2004**, January 16, 2004—Pete Stark, IHS Energy. **MMF Activity Report**, February 6—Jim Cappa. 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. **TBA**, January 14—Don Helmberger, California Institute of Technology. **Oxygen Isotope Paleoaltimetry: Applications in the Tibetan Plateau and Bolivian Altiplano**, January 21—Carmala Garziona, University of Rochester & University of Colorado. **Types of Carbonate Platforms, A Genetic Approach**, January 28—Luis Pomar, Universitat de les Illes Balears. 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, CO. Join now. 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. **Effect of Physical Geology, Mineralogy, Topography, and Vegetation Cover on Stream Chemical Fluxes in Alpine and Subalpine Basins, Rocky Mountain National Park**, January 17—Julie Sueker, Blasland, Bouck & Lee, Inc., Denver. **Geophysical Logging in Groundwater Studies**, January 24—Rodger Morin, USGS, **Regional Application of a Transient Hazard Model for Predicting Initiation of Shallow Debris Flows in Madison County, Virginia**, January 31—Meghen Morrissey, CSM. Denver. For further information, check the web page: <http://www.mines.edu/academic/geology/calendar/vantuyl.html>

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

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