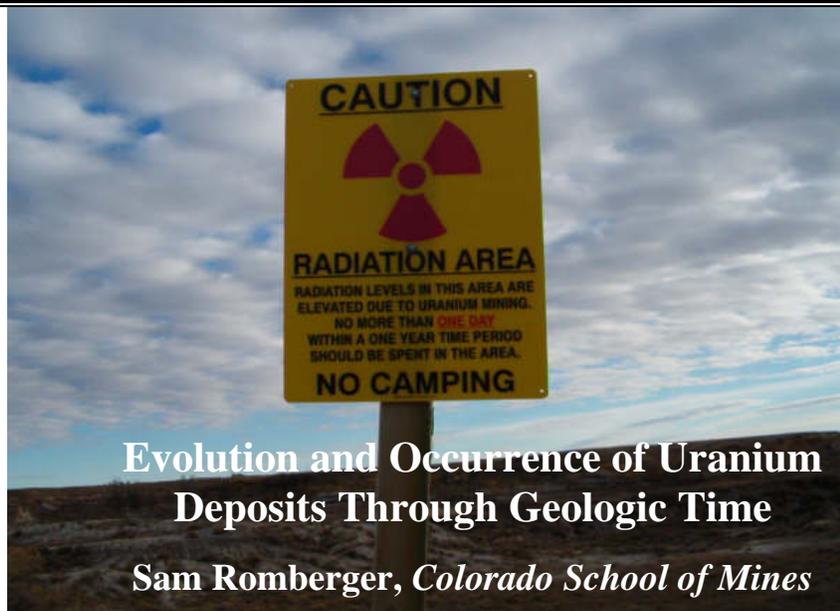




# Colorado Scientific Society

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



## Evolution and Occurrence of Uranium Deposits Through Geologic Time

Sam Romberger, *Colorado School of Mines*



## Geology of the Precambrian Tarkwaian paleoplacer gold deposit, Ghana, West Africa

Thom Fisher, *Colorado School of Mines*

**Thursday, March 15, 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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### **Evolution and Occurrence of Uranium Deposits Through Geologic Time**

By Sam Romberger, Colorado School of Mines

The formation of economic concentrations of uranium is controlled by the contrasting behavior of its two principal oxidation states, the normally immobile reduced uranous  $U^{4+}$  ion, and the generally mobile oxidized  $U^{6+}$  as the uranyl ion  $UO_2^{2+}$ . During primary igneous processes the incompatible behavior of  $U^{4+}$  results in concentration in late alkalic differentiates. Therefore, the mobility and concentration of uranium will be strongly dependent on the redox state of the earth's crust. A major timeline during the evolution of the earth was about 2400 Ma when the crust of the earth changed from reduced to oxidized. Previous to that time, uranium was concentrated in paleoplacer deposits, exemplified by Elliot Lake. Following the oxygenation of the atmosphere and hydrosphere most economical deposits, i.e, unconformity-related, sandstone-hosted, vein-type, and breccia pipe, resulted from fluid transport of uranium as uranyl carbonate complexes and deposition by reduction; similar processes resulted in the subeconomic shale-hosted deposits. Differentiation within these types lies in the, mode of transport, nature of reductant, steepness of the redox gradient and host structure.

Even though some deposit types appear to be concentrated at certain unconformity horizons, i.e.

Middle Proterozoic of northern Canada and Australia, there is not a consistent relationship between deposit type and age. Concentration is more related to the establishment of geologic circumstances that result in contrasting redox states across lithologic boundaries, whether it was oxidized siliciclastic units overlying carbonaceous metamorphic rocks in the Athabasca Basin of Saskatchewan and Pine Creek Geosyncline of Australia, or facies changes within fluvial environments in sandstone-hosted deposits. Age-specific occurrences are a result of geologic processes favorable for the proper combination of source of uranium, redox gradients, and structure to serve as conduits for fluid flow, from crosscutting faults and breccias in unconformity-related deposits, to permeable fluvial channels in sandstone-type deposits. Circumstances that could be particularly favorable for mineralization include the superposition of elevated carbon dioxide levels in the hydrosphere with increased alkalic volcanism and deposition of volcanoclastic debris.

## **Abstract**

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### **Geology of the Precambrian Tarkwaian paleoplacer gold deposit, Ghana, West Africa.**

By Thom Fisher, Colorado School of Mines

(check CSS website for update on abstract).

## **President's Note--March 2007**

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*By Bill Nesse*

Plans are moving along for the Society's activities for the Spring. Elsewhere in the newsletter is a call for papers for a symposium on volcanics in Colorado to be held in May. Look for the details there. Lisa Fisher has also completed most of the arrangements for **Family Night**, to be held at **NCAR** on **Thursday April 19,**

5:30-8:30. The speaker will be Joan Burkepile, who will present "Space weather for the non-scientist", advances in solar and space physics. Stay tuned for details.

## **2007 CSS June Field Trip**

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*By Karl Kellogg*

This is just a reminder that on June 2-3 the CSS will have its spring field trip, led by Mike Machette, to ancient Lake Alamosa, the Plio-Pleistocene lake that occupied a large part of the San Luis Valley. This promises to be a fascinating trip that will examine various lake features, such as spits, bars and lagoon deposits, discuss the timing and ultimate overflow of the lake, peat and tufa deposits, and visit the Quaternary Mesita Volcano. We will also visit the Sangre de Cristo fault zone and its scarps

near Fort Garland, some of which are as young as early Holocene. Look for sign-up forms in the April Newsletter, and on the CSS website. The estimated cost will be about \$90/person (the exact price to be finalized) and will include transportation from Lakewood, one night lodging in Alamosa (double occupancy), two lunches and one breakfast. Student grants are available to cover some or all expenses. Contact Karl Kellogg ([kkellogg@usgs.gov](mailto:kkellogg@usgs.gov); (303) 236-1305) for additional information.

# Call for Speakers

## Colorado Scientific Society Symposium on the Volcanoes of Colorado, A Symposium in Honor of Thomas A. Steven

When	Saturday, May 19, 2007
Where	University of Northern Colorado Campus in Greeley
Topics	All aspects of the volcanic history of Colorado
Field trip	TBA
Deadlines	Friday, March 30—deadline for submitting a title for a talk Friday, April 27—deadline for submitting abstract
Contact information	Emmett Evanoff Dept. Earth Science, Campus Box 100, Univ. Northern Colorado, Greeley CO 80639 emmett.evanoff@unco.edu

On 19 May 2007, the Colorado Scientific Society will sponsor a one-day symposium on the volcanic geology of Colorado. The symposium is dedicated to Tom Steven, whose work provided the foundation of our understanding of Colorado's volcanic history. About 30 minutes will be allowed for each speaker. If you are interested in presenting a talk, contact Emmett Evanoff (address above) and provide your name, address, phone number, e-mail address, and a title for your presentation. The title of your talk must be received no later than **March 30**. If you are interested in helping to plan a field trip, please say so when you send in your talk title.

### Guidelines for abstracts

The deadline for abstracts will be **Friday, April 27**. The abstract can range from a short

abstract (typical GSA style abstract) to an extended abstract with figures and references. Extended abstracts, including title, text (double spaced, 12 point Times Roman type) and references must be no more than two pages long. You may submit no more than two figures, with captions, along with your abstract.

Submit the abstract either on paper or electronically by email or disk (CD-ROM). Graphics must fit inside a 6.5" H 9" rectangle. Electronically submitted abstracts must be in Windows word processing format (MS Word preferred) or as unformatted text. Please send your graphics as separate files, preferably as TIF or JPEG files.

# Historical Notes

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By Beth Simmons

Recent Earth Movements. An Account of Some Movements in the Rocky Mountains as Shown by Effects on Streams and Mines, by Professor Arthur Lakes, Mines and Minerals, Dec. 1902, V. 23, #5, p. 228 (excerpts)

Most people are aware that great movements of the earth's crust have taken place in past ages. Geologists also know that these movements have progressed up to the present time and, we may add further, are still in progress. The general opinion of geologists nowadays, we believe, is that past movements have been relatively slow and gradual, and rarely paroxysmal, sudden, or sharp, though some movements have undoubtedly been more rapid than others. It is interesting, therefore, to observe what movements in the earth's crust have gone on comparatively recently, and what we have reason to believe are today in progress, and what we can actually see in progress in our own lifetime.

Before approaching the subject of movements in the present time, we may mention briefly one or two orographic movements that we have reason to believe are comparatively recent or at least postquaternary.

In the Arkansas cañon, near Leadville, a series of lake deposits forms prominent table lands for some miles between the towns of Granite and Leadville. These lake beds were deposited after the glacial epoch. The sediments composing them have locally been consolidated by iron oxide into a conglomerate rock, and these strata have been tilted from 10 to 25 degrees by the subsequent rising of the mountains around them either by the Mosquito or Sawatch Range since the last Glacial epoch.

Along the foothills of our mountains on the eastern slope, near Boulder, especially, the lake terraces show a decided dip to the east away from the mountains; these lake beds are certainly postglacial.

Of more recent local movements we have ample evidence in landslides. The base of Aspen Mountain is formed by a series of landslides, which have evidently slipped off from the concave shell of granite that forms the backbone of that thin "knife-edge" mountain. The direct cause of this slipping is

doubtless an underlying bed of tilted slipping shale, overlain by a water- sponge of porous diorite porphyry. That these landslide movements of the past are still continued is shown by the fact that shafts put down in Vallejo Gulch to reach the so-called "contact" could not be kept in line, but were perpetually closing in and moving down hill. It may be of some significance that Aspen Mountain is the theater of the greatest and most intricate faulting movements of any mining region known to us in the State.

"Earthquakes have doubtless had indirectly much influence in bringing about landslides, by the jar of the shock and liberation or direction into new channels of subterranean waters.

"On January 1, 1894, an earthquake occurred with the usual vibratory and other accompaniments. In the volcanic 'stocks' the earthquake was not perceived, but in the bedded volcanics it was generally observed on the surface near Telluride which is located on gravel and at Red Mountain, six miles east in the direction from which the wave is said to have come. Red Mountain, be it observed, is nearer the supposed former focus of volcanic activity and has been the scene of much solfataric action.

"In the succeeding summer and thereafter, the flow of streams, both surface and subterranean, was much smaller than before and the miens were in consequence much inconvenienced. This diminution, while due in part to the disturbance, is also in part due to the deep draining of the talus mounds. It is likely that slight earthquakes are more common than generally believed in this region. "An important part played in the production of landslides is by the percolation of surface waters through the porous volcanic complex and San Miguel conglomerate to the sandy Mancos shale, and by the partial plasticity of the last named thus brought about with each returning spring."

# 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. Mar 5, Paul Morgan, curator, "The new aquamarine exhibit at the Museum of Nature and Science". Mar 12, Paul Bailly, "Old mines under Paris, France". Mar 19, Doug Peters, Peters Geosciences, "Remote sensing of natural and man-induced acid drainage in central Colorado." <http://china-resources.net>.

**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. Mar 12, Warren Day, USGS, "Structural evolution of the central Yukon-Tanana upland-how structural deformation nourishes the ore body." 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. 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. 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. Mar 7, Janok Bhattacharya, "Hyperpycnal vs hypopycnal river plumes and the origin of shelf mud." Mar 14, David Furbish, "Biomechanically driven soil transport and hillside evolution." 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. 970-491-5661. <http://www.cnr.colostate.edu/geo/seminars>

**Friends of Dinosaur Ridge.** Dinosaur Ridge Visitor Center Mar 28, 7:00 p.m., a celebration of the 130<sup>th</sup> anniversary of the discovery of dinosaur bones on Dinosaur Ridge by Arthur Lakes.. Web page: Admission is free, but donations are welcome. FODR Visitor Center at (303) 697-3466, <http://www.dinoridge.org>.

**Denver Museum Nature and Science**, paleobotany course by Ian Miller, Tuesdays, Mar 6-27, 6:30-8:30, Mar 31, 8:30-1 p.m. \$130 members, \$155 non-members. 303-322-7009, paleocert@dmns.org

**Colorado School of Mines, Van Tuyl Lectures** Thursdays from 4-5 p.m. in Berthoud Hall room 108. Mar 8, Phil Nelson, USGS, "Basin-centered gas, claims and counter claims". Mar 22, Jerry Higgins, Rock fall analysis and mitigation." <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, 18<sup>th</sup> & Wynkoop, 6:30 p.m. Mar 27, Curt Freed, division head and director CU medical school, "Stem cells-hype or hope? Clearing away the confusion." No charge, except for beer. <http://cafescicolorado.org/Upcoming>

**Colorado School of Mines**, short course on ore microscopy, Mar 20-22, \$500 students, \$995 others, contact John Lufkin, instructor, 303-284-2646 or 303-273-3321, luk3comcast.net, [space@mines.edu](mailto:space@mines.edu)

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

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