



Colorado Scientific Society

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



**An Overview
of the
Diamond
Industry,**
*By Karin Hoal,
CSM*

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3D Geologic Modeling and Fracture Interpretation of the Tensleep Sandstone, Alcova Anticline, Wyoming

By Nathaniel J. Gilbertson,
Newfield Exploration Company, Denver, Colorado
and Neil F. Hurley,
Colorado School of Mines, Golden, Colorado

Thursday, May 18 , 2006
American Mountaineering Center
710 10th St. (NE corner with Washington), Golden
Social half-hour – 6:30 pm. Meeting time – 7:00 pm.

Abstract

An Overview of the Diamond Industry,

By Karin Hoal, Research Associate, Colorado School of Mines

In recent years, the diamond industry has gone through a number of significant changes affecting the production, distribution, marketing and retail aspects of the pipeline. De Beers' pivotal role has changed, new players and regions have become increasingly significant, and issues such as conflict diamonds, synthetic diamonds, and diamonds for development now form a large part of

marketing. This talk will review the geological concepts in diamond formation, and discuss exploration and mining methods currently employed. The recent developments in the industry are presented in terms of current and future industry trends, and how they may affect developing regions as well as consumers.

Abstract

3D Geologic Modeling and Fracture Interpretation of the Tensleep Sandstone, Alcova Anticline, Wyoming

By Nathaniel J. Gilbertson, Newfield Exploration Company, Denver, Colorado
and Neil F. Hurley, Colorado School of Mines, Golden, Colorado

Alcova anticline is a Laramide-age structure on the southeast margin of the Wind River basin, central Wyoming. The Tensleep Sandstone is exposed at the core of the anticline. The North Platte River cuts across the axis of the anticline, resulting in two near-vertical walls of Tensleep Sandstone, approximately 500 m (1640 ft) wide, 100 m (330 ft) tall, separated by approximately 140 m (460 ft).

The purpose of this study is to: 1) determine the changes in fracture orientation and intensity across the Alcova anticline, 2) use the emerging technology of LiDAR to aid in the quantification of fracture orientation and intensity in an outcrop setting, 3) characterize fractures at Alcova anticline in a way that will allow the data to be used in a fractured reservoir flow model of analogous structures and, 4) complete a revised geologic map of the Alcova anticline and vicinity.

LiDAR is a laser-scanning technique that provides high-resolution (1-2 cm, 0.4-0.8 in) topography of outcrop surfaces. The LiDAR survey at Alcova anticline contains sufficient data points to resolve fracture planes $\geq 1 \text{ m}^2$ (11 ft²) in area. LiDAR analysis has provided height, strike, and spacing data for 575 fractures with a trace length greater than 5 m (16 ft) for both outcrops. LiDAR

data interpretation of fracture planes at Alcova anticline results in orientation and spacing values consistent with those measured in the field at Alcova anticline. There are 3 major and 1 minor fracture sets. Fracture height and spacing values fit simple power-law distributions.

One result of this study is a new geologic map of the Alcova area, with formation contacts constrained by GPS (global positioning system). A set of 14 balanced serial cross sections, constrained by the field map, were used to construct a 3D geologic model of the Tensleep sandstone. The model was restored using a flexural-slip unfolding algorithm. This model was tested for geometric attributes, such as dip magnitude, dip direction, rate of dip change (simple curvature), and Gaussian curvature. Strain was tracked during the restoration process. Rate of dip change (simple curvature) was found to have the greatest correlation to the location of tectonically produced fractures. Areas of elevated strain correspond directly to field-mapped transverse faults at high angles to the main thrusts.

The Tensleep Sandstone has been identified as a test candidate for carbon dioxide sequestration at the Teapot Dome oil field, 90 km (50 mi) northeast of Alcova anticline. The results of the LiDAR analysis, the 3D geologic model, and field

observations at Alcova anticline provide a set of input parameters for a fractured reservoir model of the Tensleep Sandstone at Teapot Dome field. The input parameters are fracture set orientation,

fracture set height, fracture set aspect ratio, fracture set spacing, and the distribution of the fracture sets over the structure.

Colorado Scientific Society President's Note—May 2006

By Chuck Kluth

Data!! It's the absolute life blood of what we do as scientists. In general, companies have more of it, especially in the subsurface, and academics have more of it on the surface. The work done in universities is in the public domain, but the subsurface data is mostly in private hands. The companies are not too eager to give it up to the public domain because it cost a lot of effort and money to acquire it. It was, in some ways, easier to get a look at data and to get it released for theses when the majors were still in the Rocky Mountains. A request for data can sometimes be harder with smaller companies because they have a relatively bigger investment in it, but sometimes easier, because they are more likely to be more personal.

There are some things that folks can do to help with their requests for data.

1. Think carefully about what you are doing and ask for what you really need. "Show us your data in the Paradox Basin", is not going to work.
2. State your specific problem and why the data would make an important contribution to solving it. "I always wanted to know what it looked like along there", won't work.

3. Do some homework to find the right person to ask. The company exists to make money and having someone in their organization go look for the data and copy it in some form to you requires time and expenses that scrub off of their bottom line. So they aren't usually jumping up to help you. If your request goes to the right person, you have a much better chance of having their support.
4. Use the data only as specified. Because the data costs so much, companies sue for unapproved use of proprietary data. So make sure that you and the company agree on how the data can be used.
5. Give what you can in return. They know that you can't pay them for the data. But offer to give them a short report on your work, especially any new insights. A copy of the thesis. Or acknowledgement in any talks that you give, based on that work. It seems so obvious, but you'd be surprised how many people don't even write a thank you letter. They get some satisfaction for helping, so make sure that they know you appreciate it.

It all seems like common sense. But I have learned that common sense isn't.

June Field Trip

June 17 – Matthews-Winter Park to Deckers, "New ecological model for altitudinally-based life zones – model for biota distribution in the Front Range. This trip will relate botany and ecology to the geology of the local area.
Field trip leader, Dr. John Townrow, PhD botany, co-author with Harald Drewes of the new

Trailwalker's Guide to the Geology and Biology of Red Rocks/Green Mountain Area.
Meeting place for van pool – Cold Springs Park and Ride, 4th & Union Blvd, Lakewood. **Meet at 8 a.m.**
Time – 8:30 a.m.- 5 p.m.
Price - \$12

Register for Matthews-Winters Park to Deckers field trip, June 17

Name: _____

Phone: _____ E-Mail: _____

Bring appropriate clothing, lunch, and water.

Number of Participants: _____ @ \$12 a person

Total for all attending: \$ _____

For registration, send this form and your check made out to **Colorado Scientific Society** to Celia Greenman, Colorado Geological Survey, 1313 Sherman St, Rm 715, Denver, CO 80203

Science News

Chuck Weisenberg and Tom Sutton of CSS judged the **Colorado State Science Fair** April 6, 2006 at the Lory Center at CSU. The following are winners of the Colorado Scientific Society special awards:

Senior division

First prize: Chris Twombly 11th grade, \$100; Conifer High School; *The mystery of the Teepee Buttes*.

In 6 years of judging, this was probably the best real geology project I have seen: Chris visited these supposed methane seep limestone-cored buttes south of Colorado Springs, collected and identified a large number of fossils, determined their ecologic significance, and formulated (and defended) his own counter theory that the limestones were formed as conventional shallow water shell beds.

Second prize: Cody Caver; \$75; 10th grade, Woodlin School, Woodrow, CO; *Hidden*

contamination: an investigation of elevated sulphate levels. Cody measured groundwater compositions from wells in his area and identified the Pierre Shale as the source of high sulphate levels.

Junior division

First prize: Hannah Peckenbrock; \$75; 6th grade, West Jefferson Middle School, Conifer, *Erosion in the West Denver area*. Hannah had the idea to compare erosion rates of the different formations and rock types along the I-70 road cut, knowing that the outcrops were even at the time of excavation.

Second prize: Christopher Krause; \$50; 8th grade, The Classical Academy, Colorado Springs, *Caution, leaky levees*. Christopher made models of different Louisiana levee types and tested them against various waves in a tank. He showed impressive knowledge of the subject.

The Colorado Mining Association Education Foundation,

in conjunction with the **Colorado School of Mines**, is offering a four-week course for K-12 teachers, counselors and administrators beginning June 12, 2006.

“A Total Concept of the Mining Industry,” provides a comprehensive overview of all phases of

the metals, energy, industrial minerals, and aggregates industries. The Colorado School of Mines grants six semester hours of graduate-level, recertification credit to those who complete the course.

Research Grants Awarded for 2006

The CSS Memorial Fund Committee (Vince Matthews, Jim Cappa, and Don Sweetkind) met on May 3, 2006 to evaluate proposals for the Tweto, Oriel, Eckel, Snyder, and Pierce funds. We received 22 proposals from 17 universities throughout the United States.

Eight awards totaling \$10,100 were made from the five funds. The Tweto Fund for research in the Rocky Mountains supported three proposals for \$2,900 total. The Oriel Fund for research in the

central and northern Rocky Mountains awarded \$2,000 total to a single proposal. The Eckel Fund for research in engineering geology awarded \$1400 to support one proposal. The Snyder Fund for research on Precambrian geology of the Rocky Mountains awarded \$3,000 to two proposals. A total of \$1,000 for one proposal for research on Quaternary geologic problems was awarded from the Pierce Fund, under new guidelines established by the Pierce family last year.

During the past 23 years (including this year), the Society has helped support the graduate research of 186 students, awarding a total of \$145,700 (an average of over \$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 and I want to extend a “thank you” to all the Memorial Fund donors that have made these grants possible. The 2006 recipients of CSS memorial funds awards are as follows:

Riyad Ali-Adeeb, University of Minnesota-Duluth, Stratal architecture of the upper Morrison Formation: Tectonic and climatic implications

Benjamin Burger, University of Colorado, Boulder, Age and correlation of fossiliferous Late Paleocene-Early Eocene strata in the Piceance Creek basin, western Colorado

Siobhan Fackelman, University of Northern Colorado, Potential Impact Structure: Santa Fe, NM

Debra S. Jennings, Baylor University, Differentiating Paleoclimate and Paleoenvironments in the Morrison Formation, central Wyoming using detailed paleopedological analyses

Adam Majeski, Utah State University, Distinctly different fluvial systems tied together through a common base level: Geologic and Geomorphic Response of the Dirty Devil River, North Wash Creek, and the Colorado River to rapid base level drop of Lake Powell

Sara Lynn Peyton, University of Arizona, Temporal evolution of the Laramide orogeny from (U-Th)/He thermochronology

Kurt Refsnider, University of Wisconsin-Madison, Quaternary Glacial and Climate History of the Sangre de Cristo Range, Colorado

Justin Tully, Montana State University, Structural Investigation of the Elk Range thrust system in the Pearl Pass quadrangle, west-central Colorado.

WANTED

On Sat May 6th, the Friends of Dinosaur Ridge is hosting 500 boy scouts at the Ridge to get the geology merit badge. They are still in need of volunteers, either from 9-12 or 12-3. Geologists are needed for:

- Careers in geology: tools a geologists uses (which they need to bring) to do their work
- Rock and mineral identification
- Rock and mineral uses (homes, streets, whatever - but things kids can identify with) earthquakes, volcanoes and mountain building

People without a geology background could help with dig pit helpers (mostly interacting with kids and brushing gravel back onto the bones), and fossil casting (mostly helping kids paint plaster casts, but some cast construction)

If you can help out, please contact Chris Carroll at 303-866-3501 or Clair Marshall, Discovery Day Liaison, FODR, 303-989-7269, www.dinoridge.org.

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 Chuck Kluth, CSM, 303- 904-2939, kluths@comcast.net



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. May 8, Chris Thompson, "Some tips on financing and developing your own mining property". May 22. Todd Hennis, Salelm Minerals, "The recent upturn in metal prices: a short-term boom or long-term cycle?". <http://china-resources.net>

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, luncheon at noon, program at 12:30. For reservations, leave message at (303) 623-5396. Reservations accepted after 8 am on Fri until 10:30 am on Wed prior to the meeting. Cancellations accepted until 11 am Wed prior to the meeting. Cost: \$15 for lunches; talk only--\$2. 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. Technical presentation at 7:00 p.m. Meetings are normally scheduled 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. Call Eleice Wickham at 303-573-2781 for res. <http://dwls.spwla.org>.

Rocky Mountain Association of Geologists (RMAG) Social at 11:30, lunch at noon, talk at 12:30. Reservations are taken at 303-623-5396 until 10:30 am, Wed. before the lunch. Cancellations are taken until 11 am on Wed. at 303-573-8621. Lunch--\$20 at the door. Talk only (no res)—\$3. Location: Denver Petroleum Club, Anaconda Tower, 555-17th St, 37th floor. May 19, Tanya Inks, "Prospecting for gas hydrate with 2D and 3D seismic, North Slope Alaska". <http://www.rmag.org>

Colorado Mineral Society, May 6, Silent Auction, held by the, 11 a.m.-3 p.m., at Holy Shepherd Lutheran Church, 920 Kipling St., see <http://www.coloradomineralsociety.org/upcomingevents.html> or call 303-237-2947. No charge, all welcome.

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 18th St., Denver. David.uhl@EnCana.com

Co-AIPG 11:30-social, noon-1:30-lunch and speaker. Cost-\$25. University Club, 1673 Sherman St, Denver. Reservations: Tom Cavanaugh, 303-458-5550, tcavanaugh@ascg.com.

University of Colorado at Boulder, Geological Sciences Colloquium Wednesdays, 4:00-5:30, Rm. 180. Refreshments at 3:30 on the 3rd floor. 303-492-8141. Web page: <http://www.colorado.edu/GeolSci>.

Denver Museum Nature Science. 7 pm, Ricketson auditorium, \$12 members, \$15 non-members. May 18, Frank Clifford, LA Times, "The backbone of America, exploring the Continental Divide." May 24, John Bally, CU, "Birth of Stars and Planets", Planetarium.

Friends of Dinosaur Ridge. Fireside chats at Morrison Town Hall, 7 p.m. May 10, Bob Reynolds, "Front-Range Water is not where the people are". Web page: <http://www.dinoridge.org>. Admission is free, but donations are welcome. For more information contact the FODR Visitor Center at (303) 697-3466.

Colorado School of Mines Van Tuyl lectures, Wednesdays, 4-5 pm, Berthoud Hall, rm 108. <http://www.mines.edu/academic/geology>.

USGS Geologic Division Colloquium. Thursdays, 1:30, Foord Room, Building 20, Denver Federal Center. May 11, Eileen Poeter, CSM, "All models are wrong. Which ones are useful?" May 25, Suzanne Wuerthele, EPA, "Effects of genetic modification on crops, wildlife, and human health". Contact: Pete Modreski, USGS, 303-202-4766, email pmodreski@usgs.gov.

Café Scientifique, features a talk and discussion on some current science topic; 6:30-8:00 p.m. Tuesday evening once a month (approximately the 3rd Tuesday), at the Wynkoop Brewery (Mercantile Room), corner of 18th & Wynkoop Streets, Denver. No charge, all welcome. <http://cafescicolorado.org>

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

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