



FOUR CORNERS GEOLOGICAL SOCIETY NEWSLETTER

April 2008

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Next Meeting and Presentation

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Four Corners Geological Society

April Meeting and Presentation

DATE: Friday, April 25, 2008

SPEAKERS: Meghan Marsters, Jonathan Moore, David Schiowitz & Minna Swanson-Theisen

TOPIC: FLC Senior Thesis Presentations

PLACE: Fort Lewis College, 1000 Rim Drive, Durango, Colorado (970) 247-7010

AGENDA:

5:30 PM- Social Hour & POSTERS, “**Sub CUB Pub**”, in the College Union Building

6:30 PM- Dinner – New Mexican Buffet

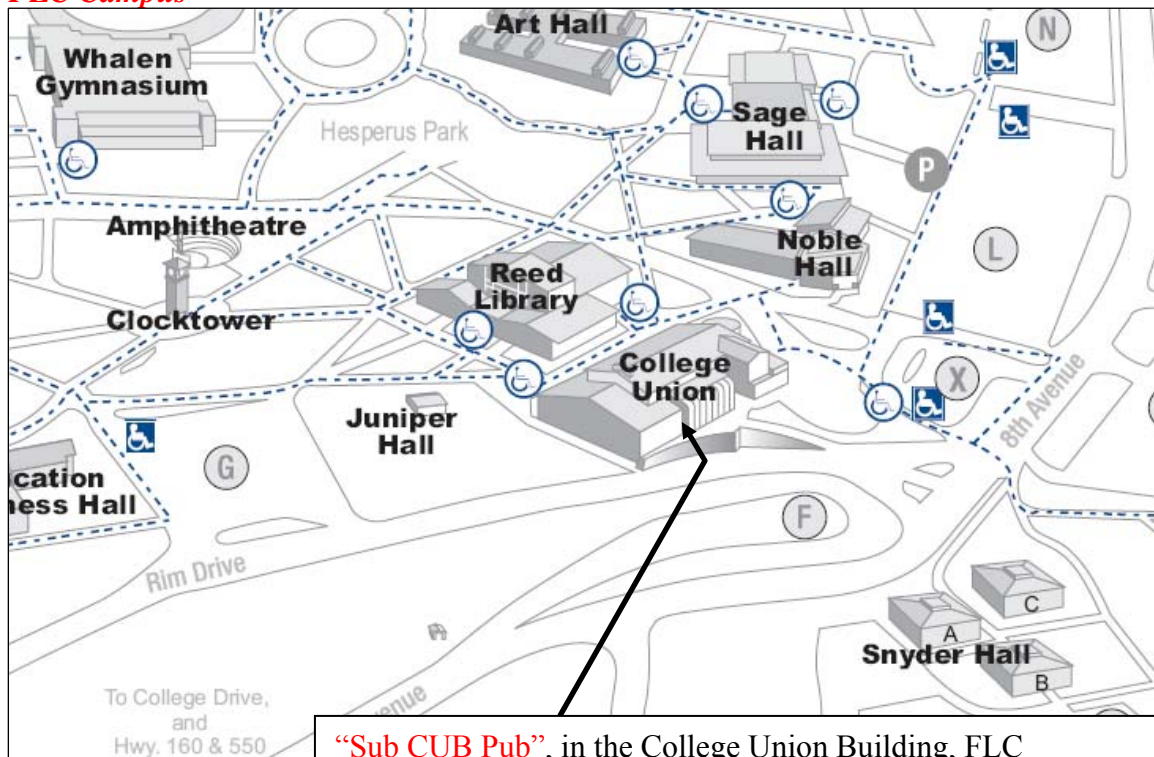
7:30 PM- Presentation

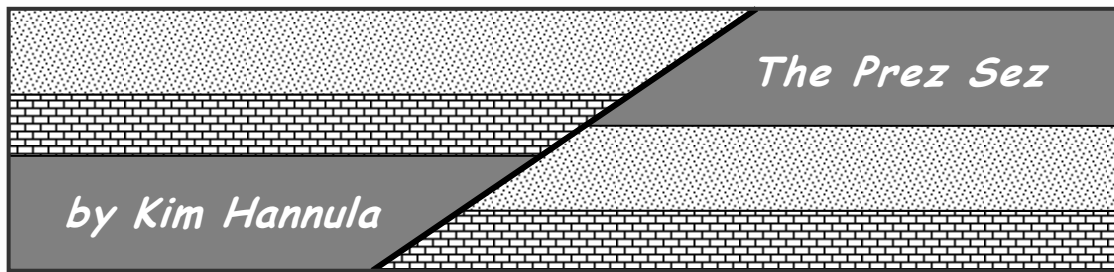
COSTS: \$20.00 per person (dinner and talk), \$2.00 per person (talk only), student’s free (talk only)

Reservations for this months meeting and presentation should be made by Wednesday, April 23.

Durango Contact: Kim Hannula – email: hannula_k@fortlewis.edu phone: (970) 247-7463

FLC Campus





It's the end of the year at Fort Lewis College, and this month, FLC seniors will be presenting the results of their thesis research. This month, in addition to hearing the four talks, you will be able to see six posters presented at the recent Rocky Mountain GSA meeting in Las Vegas. At the meeting, the students fended off difficult questions from Warren Hamilton and were asked whether their posters were related to their PhD research, so I think the meeting was an overall success. Four Corners Geological Society members helped fund this research, through participation in the annual horseshoe contest, donations to the FCGS Foundation, and other generous support to the department. I think you will be proud of the work that your donations have made possible.

Next month, Ron Blakey of NAU will be speaking in Durango about paleogeography of the Southwestern US.

Finally, the Society needs some new officers. We're especially looking for volunteers to be Treasurer next year. The Foundation is also looking for a new member, to join Jim Hornbeck and Gary Gianniny, and the Scholarships Committee needs a new chair. If you are interested in any of these positions, please contact me at Hannula_k@fortlewis.edu, and I can give you more information about the responsibilities involved.

Kim



Proterozoic metamorphism of the Vallecito Conglomerate, Needle Mountains, southwest Colorado

Meghan Marsters, FLC Senior Geology Major

The Vallecito Conglomerate is a member of a suite of Proterozoic basement rocks that have been exposed in the Needle Mountains Complex, southwestern Colorado. This metasedimentary unit lies within the transition zone between the Proterozoic Mazatzal and Yavapai provinces, and is part of the regional 1.8-1.4 Ga quartzite phenomenon that is recorded in basement rocks throughout the southwestern United States. Recent identification of metapelite layers at the top of the Vallecito Conglomerate provides information that allows for determination of the conditions at which the rocks in the Needle Mountains were metamorphosed. Mineral assemblages in the contact aureole of the 1.4 Ga Eolus Granite range from andalusite + biotite + muscovite + garnet at approximately 2.5 km from the contact to sillimanite + k-spar at about 1 km. This petrographic data also provides evidence for two phases of deformation because included foliations within k-feldspar are at an angle to matrix foliations. Metamorphic conditions at ~2.5 km from the pluton were approximately 500°C -550°C and 3-4 kb based on garnet-biotite thermometry and GASP barometry. At ~1 km from the Eolus Granite, TSCH exchange plotted temperatures ranging from 600-650°C. This is consistent with contact metamorphism at mid-crustal depths and is another example of regionally pluton-enhanced deformation at 1.4 Ga.

Speaker Bio:

Meghan Marsters is a senior geology major from Palmer Lake, Colorado. She is planning to begin graduate work on rare-earth element ore deposits in January, 2009.





IN SEARCH OF ELUSIVE GOLD: AN INVESTIGATION OF A TERTIARY HYDROTHERMAL SYSTEM IN UPPER LIME CREEK BASIN, SAN JUAN COUNTY, COLORADO

Jonathan Moore, FLC Senior Geology Major

The upper basin of Lime Creek located in San Juan County, Colorado, is host to a poorly understood hydrothermal gold deposit. The area has been prospected and explored for over 100 years, mostly due to the spectacular occurrence of coarse, crystalline placer gold in West Lime Creek. The goals of this study were to locate the source of the placer gold by determining the characteristics of the mineralizing system, and using those attributes to suggest the dominate control on gold deposition. A prominent regional structure, known as the Lime Creek fault, trends N-NE through the study area and provided the structural fabric for the mineralization. The veins are hosted by the diverse stratigraphy of the Pennsylvanian Hermosa Group and exhibit open-space textures of coarse-grained euhedral quartz gangue. The system has a simple mineralogy dominated by pyrite with the total sulfide content being <3 wt %. The geochemistry of the system shows anomalous Au, Ag, As, minor Sb, with low Pb, Zn, Cu values. The stability ranges for alteration minerals indicate the hydrothermal fluids were evolving from slightly acidic (pH <4), towards neutral (pH ~6). These stability ranges are consistent with fluid temperatures of 250°C. The bulk of the gold values within the mineralized veins are geochemically anomalous (<1.4 ppm) demonstrating the ubiquitous presence of gold in the system. The exceptional occurrence of high-grade gold values (6.6 to 24.8 ppm) from veins within a carbonaceous shale of the upper Hermosa Group are the likely source of the gold grains found in the placer. The characteristics of the mineralization are consistent with a class of hydrothermal deposits known as low-sulfidation (LS) epithermal systems, and specifically the deeper portions of such a system. The solubility of gold in a hydrothermal solution with the characteristics of the mineralization in the study area indicates that approximately 1000 ppb Au could be transported in the solution. The localized effects of the carbonaceous shale, which hosts the high-grade assays, created a reducing litho-chemical environment within the hydrothermal system. The reducing environment very effectively decreased the solubility of gold to ~10 ppb forcing native gold to precipitate from the solution resulting in the coarse, crystalline gold occurrence that has eroded into West Lime Creek.

Speaker Bio:

Jon Moore is a senior geology major from Fayette, Alabama. After graduation, he is going to marry Meghan and work in the gold mining industry.





Gold Potential Mapping Using Fuzzy Logic, La Plata Mountains, CO

David Schiowitz, FLC Senior Geology Major

The La Plata mining district is located in southwestern Colorado and contains numerous gold, silver, and copper deposits. Geologic and structural data for the district was obtained from digitizing a historic geologic map. Stream sediment samples were collected approximately every 5 km in a 220 km² area, and analyzed using an ICP-OES and fire assay for metal concentrations. GIS-based hydrologic modeling tools were used to delineate upstream watersheds for each sediment sample location. A geodatabase has been created consisting of geologic formations, structures, veins, mines, and geochemical data associated with 41 watersheds within the La Plata mining district. Spatial and geostatistical analysis tools in the GIS software were used to analyze the data to aid in visualization and quantification of the relationships among geology, structure, and geochemistry. These datasets were integrated using fuzzy logic to generate a raster grid of favorable areas for gold deposition.

Geochemical analysis of active stream sediment samples indicates that there is a distinctive epithermal signature (Au-522 ppb high, As-171 ppm high) developed in the Upper Junction Creek and East Mancos River basin. Using fuzzy logic, three known gold deposits (Bessie G., Red Arrow, and May Day) were correlated to high fuzzy membership values. Vein density within each basin appears to have spatial correlation with known mines and to anomalous metal concentrations.

Using fuzzy membership functions and fuzzy combinational operators, a raster grid was generated to model areas that are favorable for gold deposition. These areas have fuzzy membership values ≥ 0.9 and are based on favorable formations, vein distance, vein density and geochemical data (Au, Ag, As). This raster was compared to known producing gold mines to locate potential areas for detailed gold exploration. Based on the results of the model, areas in the upper East Mancos River basin, the South Fork of the West Mancos River basin, and east of Diorite Peak would be good candidates for further gold exploration.

Speaker Bio:

David Schiowitz is a senior geology major from Silver City, New Mexico. After graduation, he will be putting his GIS certificate to work in his job with Bikis Water Consultants. In the near future, he plans to attend graduate school someplace in the western US.





Soil, Climate & Viticulture: a study of *terroir* in Mesa County, CO

Minna Swanson-Theisen, FLC Senior Geology Major

Mesa and Delta counties are responsible for 90% of Colorado's wine production, with the majority of vineyards scattered throughout Grand Junction and Palisade. This region of Colorado has the climate and geology necessary to sustain vineyards. Specific climate aspects are a semi-arid climate, intense sunlight, and large daily temperature fluctuations. Important geologic aspects present are organically (nutrient) poor soils with good drainage capabilities, particularly glacially derived soils. This study compares a 5 acre plot of land (in question to be a vineyard) to four specific vineyards in/near Palisade. The study plot is four miles east of Palisade, adjacent to the Colorado River and I-70. Trace element analyses, coupled with physical and chemical soil property comparisons, and a weather data comparison in Mesa County, support the potential for the study plot to sustain a vineyard. Currently in Mesa County, however, the grape varieties planted need to be selected for their climate affinity rather than soil affinity. In addition, no apparent direct correlation between soil and wine could be established based on cation signatures.

Speaker Bio:

Minna Swanson-Theisen is originally from northern Minnesota. She will be finishing her work at FLC in the summer and fall, taking Calculus II and Physics III in preparation for starting graduate school in 2009.



General Announcements/News from other Geo-Societies

The **AAPG Annual Convention and Exhibition** will be held in San Antonio, Texas April 20-23, 2008. This will include oral and poster presentations, exhibiting companies, daily networking events, and focused pre- and post-conference workshops, courses, and field trips. For information go to: www.aapg.org/sanantonio

AAPG and the Colorado Oil and Gas Association will present the “*Rocky Mountain Energy Epicenter*” at the Colorado Convention Center, July 9-11, 2008. The Energy Epicenter theme recognizes the fact that the Rocky Mountains combine all critical aspects of unconventional oil and gas plays in the context of intense land-use and marketing issues that influence the economy of this country. For more information visit: www.rms-aapg.org

The **AAPG** will be offering over *50 short courses* and field seminars from May 1, 2008 to June 20, 2008, designed with the goal of helping you explore and better understand the petroleum industry. For complete details on any of the field seminars and short courses offered by the AAPG, call +1 918 560-2650, or visit <http://www.aapg.org/education/>

The **GSN Symposium** on the *Great Basin Evolution and Metallogeny* will be held May 14-22, 2010. Details to follow.



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THE GEOLOGICAL SOCIETY OF AMERICA will hold a joint annual meeting and exposition October 5-9, 2008 in Houston, Texas. The meeting will be celebrating the *International Year of the Planet Earth*. The GSA will be joined by the Soil Science Society of America, the American Society of Agronomy, the Crop Science Society of America, The Gulf Coast Association of Geological Societies with the Gulf Coast Section SEPM, and will be hosted by the Houston Geological Society. The meeting will highlight and stimulate discussion in areas of the participating Societies' shared involvement including: energy, water resources, education, earth systems, and more. For additional information, contact: GSA: Darline Daley, 303-914-0695; ASA-CSSA-SSSA: Alexander Barton, 608-268-4947; GCAGS; Bruce Lemmon, 918-585-1004. For rates and on-line reservations go to: www.geosociety.org/JointExhibits08.asp

The **NEVADA PETROLEUM SOCIETY** announces the annual field trip for 2008. *"The Sheep Pass Formation: Sedimentation and Tectonics Within the Late Cretaceous to Eocene Sevier Hinterland"* led by Peter Druschke, University of Nevada, Las Vegas. Field Trip dates are May 31 through June 2, 2008. The NPS homepage is: <http://www.nbmng.unr.edu/nps/>

The **NEW MEXICO GEOLOGICAL SOCIETY** announces its *2008 Fall Field Conference*, mid-October in Silver City, New Mexico. The trip will focus on Eocene-Oligocene volcanism, Paleozoic and Precambrian stratigraphy, and ore deposits of the Gila Wilderness and in southwestern New Mexico. Greg Mack and Jim Witcher are the principal conveners of the 2008 conference. For information, go to the NMGS web site: <http://nmgs.nmt.edu/ffc/home.html>

David V. Grey Geologist/Geophysicist	
UPSTREAM ENERGY CONSULTANTS, LLC Geology, Geophysics, Reservoir & Economic Analysis 970-731-2908	
60 JJ Junction Pagosa Springs, CO 81147	Cell: 970-946-5787 dgrey1129centurytel.net

PTTC Technology Connections of the Rocky Mountain Region presents the following upcoming workshops at the Colorado School of Mines:

GeoGraphix Training: An Overview and Refresher Course, April 11, 2008.

Applied Hydrodynamics, May 1 and 2, 2008

Petra Basics, May 15, 2008.

Successfully Awakening Mature Oil Fields: The Process for Reversing Field Production Decline, May 20, 2008

Core Workshop: Depositional Environments, Diagenesis, and Hydrothermal Alteration of the Mississippian Leadville Reservoir, Paradox Basin, Utah, May 23, 2008. To register online, go to www.pttrockies.org. For more information, contact Mary Carr, 303-273-3107, mcarr@mines.edu

The **RMAG/PTTC Symposium and Short Course** will take place September 23-24, 2008. **Rocky Mountain “Dusters,” Lessons learned and Opportunities created** will include stories of “near misses” that are the key to our future success. The one day symposium will consist of oral presentations and posters focused on learning’s from significant dry holes and disappointing or economically challenged plays in the Rocky Mountain area. The second day will offer an optional Rick Management short Course. Abstracts will be due May 1, 2008. For ideas or questions, please contact Jim Emme at jemme@elkresources.net (303-339-1949) or Mary Carr with PTTC at mcarr@mines.edu (303-273-3107).

The **RMAG’s On the Rocks Field Trip** will take place April 19, 2008 for the Centennial Uranium Project. Join RMAG for an inside tour of **Powertech Uranium’s exploration activities** in Weld County in the Upper Cretaceous Fox Hills Formation of Northern Colorado. To sign up, email Jeff Glossa at Jeff.Glossa@state.co.us

The **WYOMING GEOLOGICAL ASSOCIATION** invites you to meet in the Gem City of Laramie, Wyoming for the **2008 Annual Field Conference**, September 3-7, 2008, **“Black Gold, Diamonds in the Rough, and Other Gems.”** The WGA is soliciting presentations on topics relevant to the conference for presentation September 4 and 5, 2008. Deadline for abstracts is April 15, 2008. The range of subjects includes economic and general geology of southeastern Wyoming. Abstracts should be e-mailed to Alan Thompson at alan@goolsbyfinley.com. Phone 307-266-3199. The WGA website is www.wyogeo.org

Helen Thompson
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GRAND
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ROCKY MOUNTAIN **Energy Epicenter** 2008

**ENERGY SUMMIT
EVENTS**

**JULY 9-11
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- * Shale Gas Plays

Contact:

Speakers: Mark Sonnenfeld sonnenfeld@whiting.com
Sponsors: Jim Emme jim_emme@yahoo.com
Exhibitors: Brian Richter berichter@aol.com



www.coga.org

FOR MORE INFORMATION

Colorado Oil & Gas Association: www.coga.org



ROCKY MOUNTAIN SECTION
www.rms-aapg.org

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Four Corners Geological Society

MEMBERSHIP RENEWAL or APPLICATION for 2008

PAGE 1

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Please Identify a Membership Category:

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| <input type="checkbox"/> | ACTIVE MEMBER 1 | \$20.00 | Person holding a degree in geology or an allied science and receiving the FCGS Newsletter via <u>email</u> |
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Year you expect to graduate: _____ |

Four Corners Geological Society

MEMBERSHIP RENEWAL or APPLICATION for 2008 PAGE 2

My professional interests are:

I would like to include a Tax Deductible Contribution to the Four Corners Geological Society Foundation.

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In Memory of (optional): _____

To be used for (optional): _____

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The dues year begins on January 1.
For dues paid after March 1, add a \$5 late fee (does not apply to new members).

Please print, complete and return **both pages** of this form with your check for dues made payable to:

**Four Corners Geological Society
P.O. Box 1501,
Durango, CO 81302**

Advertising rates for the Four Corners Geological Society newsletter:

Full Page Ad (7½" x 9½") \$100/mo. or \$1000/yr. Half Page Ad (7½" x 4½") \$50/mo. or \$500/yr.
¼ Page Ad (3½" x 4½") \$25/mo. or \$250/yr. Business Card (3½" x 2") \$10/mo. or 100/yr.

Odd sizes are \$3.50 per column inch per month, minimum \$10.00

For more information, please contact the FCGS Treasurer. Proceeds will go toward the further development of the Society (i.e., offset meeting costs, publications, etc.).

Four Corners Geological Society

P.O. Box 1501, Durango, CO 81302

www.fourcornersgeologicalsociety.org

2007-08 Officers

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