

FCGS Newsletter



P.O. Box 1501 | Durango | CO 81302 | www.fourcornersgeologicalsociety.org

January 2021



Fountain Formation, Colorado Springs.

- SPEAKER:** Dr. Vince Matthews, Retired Colorado State Geologist and Director of the Colorado Geological Survey
- TITLE:** *Thrust Faults as a Mechanism for Attenuation in the Steep Limbs of Laramide Folds in Colorado*
- DATE:** Thursday, January 28th, 2021
- TIME:** Please login to meeting a little before 5:30. From 5:30 - 6:00 attendees will be randomly assigned to break out rooms for three, ten-minute sessions, 6:00-6:15 back to meeting for society business announcements and introductory remarks, 6:15-7:15 talk & Q&A.
- LOCATION:** Your own home! This is a Zoom meeting hosted by FLC. Link to join meeting on page 3.
- COST:** Free but please renew your membership!
<https://fourcornersgeologicalsociety.org/membership/>

January 2021

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Jon Harvey

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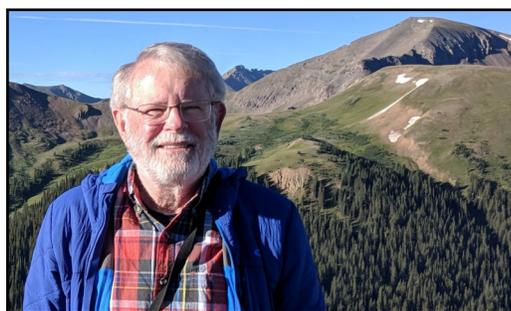
Abstract

Key exposures of several Laramide, basement-cored folds in Colorado provide views of an ordered architecture of faults in their forelimbs. The faults provide an important mechanism for thinning and extending the strata in the steep limbs as displacement on the master, basement fault increases. One location demonstrates thinning and extension of a shale unit entirely by brittle faulting, rather than ductile flow.

A conjugate set of thrust faults may form when the strata have been uplifted and rotated about 60-65 degrees from horizontal—perhaps when the steep limb evolves from compression into extension. One set of thrust faults dip *toward* the uplifted, basement block and displace older strata over younger strata. The other set of thrust faults dip *away* from the uplifted, basement block and displace younger strata over older strata. A thrust fault that displaces younger strata over older strata may appear counter-intuitive—as might a thrust fault in an extensional environment.

The sets of conjugate faults in these forelimbs evolve in an orderly way. As the displacement on the basement fault increases, the dip of the strata in the forelimb steepens (even to overturned) and the conjugate set of faults is rotated within the limb. The thrust faults (<45°) become reverse faults (>45°) as the dip of the limb increases and consequently the dip of the younger-over-older set of faults steepen. With rotation, the younger-over-older set becomes more favorably oriented to slip and experiences greater displacement. This system appears to be scale independent as it is observed operating on the centimeter scale and the hundreds-of-meters scale. Indeed, the steeply dipping limbs of Colorado's range-front monoclines are significantly displaced by these conjugate faults at Golden and Garden of the Gods. Other locales in Colorado contain similar phenomena.

Biography



Dr. Vince Matthews retired as State Geologist and Director of the Colorado Geological Survey at the beginning of 2013. He then served as Interim Executive Director of the National Mining Hall of Fame and Museum and still serves on the Board of Directors.

Vince received Bachelors and Masters degrees in Geology from the University of Georgia and a Ph. D. from the University of California, Santa Cruz and holds Outstanding Alumnus Awards from both institutions. He taught at six institutions of higher education and served as an executive in four natural-resource companies.

Dr. Matthews is a Senior Fellow in the Geological Society of America where he served as General Chair of the 125th Anniversary Meeting in 2013. He is the 2014 recipient of the Pioneer Award from the American Association of Petroleum Geologists. Vince is the author of the multiple, award-winning book *Messages in Stone: Colorado's Colorful Geology* and is currently finishing up a book titled *Land of Ice: Jaunts into Colorado's Glacial Landscape*.

In this Issue:

| | | | |
|---------------------|------|---------------------|------|
| Meeting Information | P. 1 | Foundation News | P. 4 |
| Abstract | P. 2 | Events and Training | P. 5 |
| Biography | P. 2 | Membership Form | P. 6 |
| Prez Sez | P.3 | | |
| Upcoming Meetings | P.3 | | |

January 2021

PREZ SEZ

Greetings FCGS members!

Happy New Year! Here's to 2021 being a year of *openings*, rather than closings.



Jon Harvey on 2019
hike / train fieldtrip

I am excited to welcome you back to FCGS programming, which will, for the time being, remain in *virtual* format. Yes, that means each month we will have a talk that will be broadcast via Zoom. The virtual speaker series will return with a talk on Jan 28 from FCGS member Vince Matthews, formerly of the Colorado Geological Survey. Talk title: *Thrust Faults as a Mechanism for Attenuation in the Steep Limbs of Laramide Folds in Colorado*. Browse the abstract for that talk and see what else we have in store for this spring's speaker series in this newsletter.

Some of you are surely wondering - when will we return to in-person gatherings? and When can we start running field trips again? Those are *great* questions. We are following the guidelines in the Public Health Orders active for La Plata County with respect to re-starting in-person FCGS activities. As it stands, the COVID-19 pandemic has us in Level Orange in La Plata County. Here's what I think that means:

For *indoor activities* like the speaker series, events "...may operate at 25% of the posted occupancy limit, not to exceed 50 people...". For *field trips*, we can have no more than 10 unrelated people together for an 'outdoor guided activity'. Once we drop into Level Blue, that number increases to 25.

So, with those limitations, along with the challenge of getting potential speakers to travel to the area for an in-person talk, we are still in a holding pattern on restarting in-person FCGS meetings. However, what better to do while in a holding pattern than to plan for what to do when you get out of it! We are talking about what kinds of field trips we can line up for when they are safe to resume. If anyone has an idea or request for a field trip topic, let me know with an email (jeharvey@fortlewis.edu)!

We are watching the ever-evolving pandemic closely, with an eye for a light at the end of the tunnel. I am reeeaaally looking forward to seeing you in person again soon. If it doesn't happen this spring, let's hope that we will be close enough to normalcy to resume normal activities in the summer and fall. And - if you are a *remote* member of FCGS, we will try to continue the livestreaming of talks once in-person meetings resume, so you can continue to participate. It has been great to meet many 'new to me' members who were only able to attend thanks to the virtual format.

Thank you all for your continued support and participation in the Four Corners Geological Society! Hope to see you on January 28th.

-Jon

ZOOM MEETING LOGIN INSTRUCTIONS

Topic: Four Corners Geological Society January Meeting

Time: Jan 28, 2021 05:30 PM Mountain Time (US and Canada)

Link to Join Zoom Meeting:

<https://fortlewis.zoom.us/j/99406708153>

Meeting ID: 994 0670 8153

Dial by your location:

+1 669 900 6833 US (San Jose)
+1 253 215 8782 US (Tacoma)
+1 346 248 7799 US (Houston)
+1 646 558 8656 US (New York)
+1 301 715 8592 US (Washington D.C)
+1 312 626 6799 US (Chicago)
888 788 0099 US Toll-free
877 853 5247 US Toll-free

Find your local number:

<https://fortlewis.zoom.us/u/adYmUrBL8L>

UPCOMING FCGS EVENTS

Thursday, Feb 18

Speaker: Jeff Bader (North Dakota Geological Survey)
Topic: Structural inheritance for the Laramide, Central Montana Uplift: A wrench-fault tectonic model related to Proterozoic Orogogenesis in the Foreland of the North American Cordillera

Thursday, Mar 18

Speaker: Bob Biek (Utah Geological Survey),
Topic: Markagunt Gravity Slide in Utah (possibly the largest mass wasting feature recognized in geologic record?)

January 2021

April Date TBA

Speakers: FLC senior research presentations
Topics: a fun variety, depending on each student's thesis topics

May Date TBA

Speaker: TBA

FOUNDATION NEWS

Jim Corken has resigned from the Foundation leaving the position of Director-at-large vacant. If you are interested in applying please contact Mary Gillam, Foundation President (gillam@rmi.net). Among other activities, the Foundation runs an annual grant program for Master's degree students doing their thesis research on some aspect of the geology of the Four Corners region. Applications will be solicited soon and the grant awarded in the spring. Board members are usually needed to evaluate and rank applications.

EVENTS AND TRAINING

The following listing are provided by Douglas Peters, CO-AIPG

Grand Junction Geological Society January Meeting

WEDNESDAY, JANUARY 27, 2021; 7:30 PM Joint meeting with the CMU Geology Students

Speaker: Dr. Sally Potter-McIntyre, Department of Geological Sciences, Southern Illinois University, Carbondale, Illinois

Topic: "Concretions: Records of subsurface fluid/rock/biota interactions"

Abstract: Concretions are cemented mineral masses that form during diagenesis and preserve a record of fluid chemistries, cement mineralogies, biotic influence, and timing of precipitation. Important issues of authigenic minerals (leading to fluid composition), diagenetic textures, and age dating are all key to deciphering the complex relationship and diagenetic histories. Models for spheroidal concretion formation are evaluated. Understanding how iron is mobilized and precipitated and how spheroidal concretions form have implications for similar geometries and mineralogies in many terrestrial regions as well as on other planets but will require continued integrated studies across multiple scales.

Join Zoom Meeting:

<https://coloradomesa.zoom.us/j/95869211550?pwd=bmpyMlVvYjJJOVA2dGIJbHZQRTdrUT09> Meeting ID: 958 6921 1550
Passcode: 008252

Focused Remediation Seminar January 28, 2021; 12:30 PM-3:30 PM EST

The Focused Remediation Seminars team is committed to mitigating the spread of COVID-19. With this in mind, we're excited to announce that we will resume our technical seminar series offerings through an alternative virtual webinar platform. The same trusted, professional, industry-leading speakers and

technologies you've grown accustomed to, now with the convenience of being brought to your computer.

The Focused Remediation Seminar series has earned a reputation for its attention to technical exchange merit and not being a "boring" sales pitch! We highly recommend reviewing our speakers, and their cutting edge topics below and decide for yourself. Each webinar is FREE and offers multiple learning credits, units, or hours.

Virtual Seminar Agenda and Schedule:

12:30 – Welcome/Intro 12:45 – Eva Caspary – Carus Corporation: "Carus' Solutions: "Headlining MLO Next Generation ISCO" 1:10 – Will Moody – Provectus Environmental: "Overcoming ISCO Limitations with Ferric Iron Activated Persulfates" 1:35 – George "Bud" Ivey – Ivey International: "Surfactant Enhanced Bioremediation (SEB) of Recalcitrant Soil and Groundwater Contamination (In-Situ and Ex-Situ)" 2:00 – Drew Baird – FRx Inc.: "Using Induced Fractures for Penetrative ISCO Distribution in Low Permeability Formations" 2:25 – Janet Castle – Eagle Synergistic: "Strategic Optimization utilizing HRSC Technologies" 2:50 – Mitchell Brouman – Field Environmental Instruments (FEI): "Remote Monitoring of Environmental Remediation and How It Can Work For You." 3:15 – Q & A

To register, go to

http://focusedremediationseminars.com/?event=virtual-webinar-january-28-2021&event_date=2021-01-28

RMAG February Online Lunch Talk February 3, 2021; 12:00 pm - 1:00 pm Location: Online via RingCentral Meetings

Luncheon Speaker: Dave Runyon, Cimarron Resources, Golden, CO Talk Title: "Salty Things: Shape Shifter Geology"

ABSTRACT: This Global presentation will focus heavily on Surface Geology exposures, expressions, relationships, and the direct interplay of Halokenesis with surrounding geology. Salt is Mother Nature's best reservoir seal and controls many of the World's largest oil fields and this presentation will show examples from multiple seasons of field mapping, with numerous aerial photos from conventional aircraft, Drones, and satellite imagery. It will consider oil field examples, helium gas exploration and the possibility of searching right here in the Rocky Mountains and will view our shared "Blue Marble" from the Utah Arapien Salt Basin, to Iran Zagros Mtns, to coastal Gulf of Mexico, to Canyon Lands National Park, to the Paradox Basin, to the Colorado Eagle Basin.

Free, but open only to RMAG members.

To register, join, or get more info, go to

<https://www.rmag.org/index.php?src=events&srctype=detail&refno=137&category=RMAG%20Luncheons>

January 2021

Members in Transition Virtual Talk February 4, 2021; 12 pm-1 pm (MST)

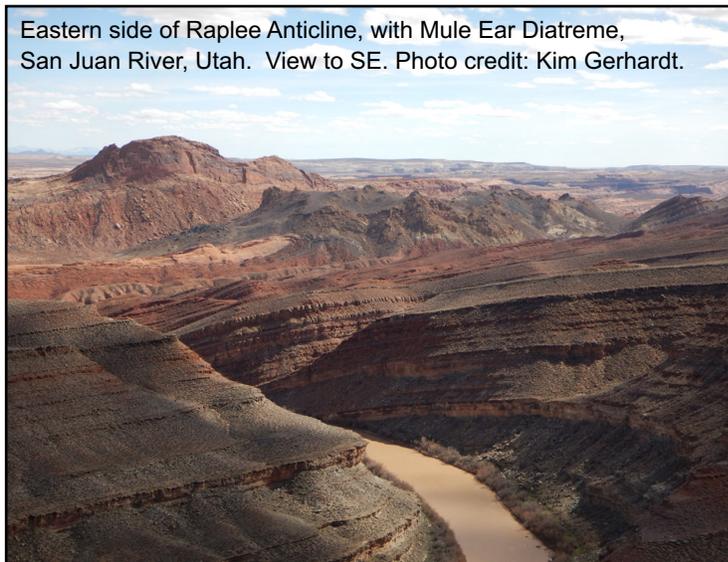
Rocky Mountain Members in Transition (MIT) is a joint effort of members of AAPG, SPE, WOGA, COGA, DWLS, and RMAG in the Rocky Mountain region to help association members in the midst of a career transition. Webinars are free and open to all.

Speaker panel: Dr. Ali Tura; "Climate Change, the Energy Industry, and the Role of Carbon Capture Utilization and Storage"

Want to get your feet wet in hydrology or related disciplines? Join our panel discussion featuring Miori Harms (hydrogeologist), Lyndsay Ball (hydrogeophysicist), and Arianne Godwin (hydrologist/environmental engineer). They will talk about what they do, the education and experience required, and typical projects at consulting companies and government agencies.

Register at <https://www.rmag.org/index.php?src=events&srctype=detail&refno=139&category=Special%20Events>

Eastern side of Raplee Anticline, with Mule Ear Diatreme, San Juan River, Utah. View to SE. Photo credit: Kim Gerhardt.



Mitten Fault, Green River in Dinosaur National Monument. Photo credit: Kim Gerhardt





FOUR CORNERS GEOLOGICAL SOCIETY

P.O. Box 1501, Durango, CO 81302

MEMBERSHIP RENEWAL or APPLICATION: June 1, 2020 to May 31, 2021



*Name: _____

*Address: _____ City: _____ State: _____ Zip: _____

*Email: _____ Phone: _____

*Employer: _____

Please Identify a Membership Category:

***Please check your interests:**

- Sedimentology & stratigraphy
- Structure & tectonics
- Mineralogy, petrology, geochemistry
- Igneous geology, volcanology
- Ore geology and hard rock mining
- Other mineral extraction
- Petroleum geology
- Geophysics
- Geological engineering
- Geomorphology
- Quaternary geology
- Hydrology & water resources
- Environmental geology
- Geography / GIS
- Other interest (see box)

| | | |
|-------------------------|------|--|
| Active Member | \$25 | Any person engaged in the practice or teaching of geology or who holds a Bachelor's Degree in geological science from a college of acceptable academic standards. Degree requirement may be waived if applicant has adequate professional experience. <i>*Highest Degree, Type and Year:</i> _____ <i>*College / University:</i> _____ |
| Associate Member | \$25 | Any person who is a graduate of a college of acceptable academic standards with major studies related to, or associated with, geology. Degree requirement may be waived if applicant has adequate professional experience. <i>*Highest Degree, Type and Year:</i> _____ <i>*College / University:</i> _____ |
| Student Member | Free | Any undergraduate or graduate student majoring in geology at a college of acceptable academic standards. <i>*College / University:</i> _____ <i>*Year expected to graduate:</i> _____ |
| Emeritus Member | Free | An Active Member of 65 years old or older who has been a member for 25 years including time spent in military service. <i>*Year emeritus status was awarded:</i> _____ |
| Honorary Member | Free | An Active Member who has contributed distinguished service to the profession of geology and to the betterment of the FCGS. Determination is made by the FCGS Executive Committee. <i>*Year honorarium was awarded:</i> _____ |

Other Professional Interests:

** Required information for new members. Current Members, please update.*

Please either print, complete and return this form with your check for dues made payable to: "Four Corners Geological Society" and mail to the address above or go online to fourcornersgeologicalsociety.org .