



## March 2021



Pseudotachylite-lined shear plane between biotite-rich sandstone of the Bear Valley Formation below and volcanic mudflow deposits of the Mount Dutton Formation above.

**SPEAKER:** Mr. Bob Biek, Utah Geological Survey

**TITLE:** *Utah's Ancient Mega-landslides*

**DATE:** Thursday, March 18<sup>th</sup>, 2021

**TIME:** Please login to meeting a little before 5:30. From 5:30 - 6:00 attendees can socialize, 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/>

*Slumgullian Earthflow, Lake City, CO. Phot Credit: Kim Gerhardt*

# March 2021

## Officers of the Society

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### President

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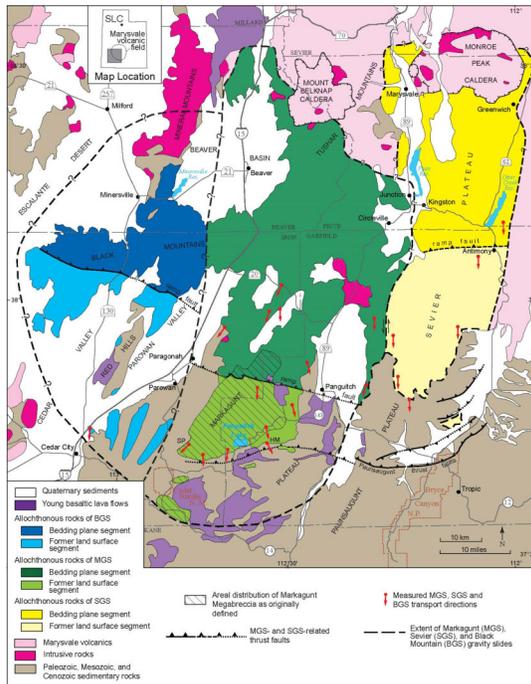
## ABSTRACT

Robert F. Biek<sup>1</sup>, David B. Hacker<sup>2</sup>, and Peter D. Rowley<sup>3</sup>

<sup>1</sup> Utah Geological Survey, P.O. Box 146100, Salt Lake City, UT 84114-6100, [bobbiek@utah.gov](mailto:bobbiek@utah.gov)

<sup>2</sup> Department of Geology, Kent State University Trumbull Campus, Warren, OH 44483-1998

<sup>3</sup> Geologic Mapping Inc., P.O. Box 651, New Harmony, UT 84757



Location of the Sevier (SGS), Markagunt (MGS), and Black Mountains (BGS) gravity slides, each among Earth's largest terrestrial landslides; parts of the mega-slides are inferred to be buried under Quaternary valley sediments. We continue to work to define the northern extent of the slides and the distribution of volcanic rocks that may post-date and thus bury their northern reaches. The Markagunt Megabreccia, formally defined in 1993 as a chaos of volcanic rocks, is where researchers first realized the Markagunt Plateau was covered by something other than a normal sequence of volcanic rocks.

During the late Oligocene to early Miocene, the Marysvale volcanic field of southwestern Utah experienced three consecutive, catastrophic, mega-scale collapse events: the Sevier, Markagunt, and Black Mountains gravity slides, which we refer to collectively as the Marysvale gravity slide complex (MGSC). Each collapse is newly discovered and ranks among Earth's largest terrestrial landslides; collectively they span more than 8000 km<sup>2</sup> with runout distances that exceed 35 km over the < 3° dipping former land surface. The allochthonous stratigraphic sequence, kinematic indicators, and basal structures including clastic dikes, pervasive fragmentation and pseudotachylyte collectively suggest emplacement of each gravity slide occurred at high velocity during a single event.

These gravity slides exhibit the



Close-up of shear and pseudotachylyte dike, with a GPS receiver for scale.

## In this Issue:

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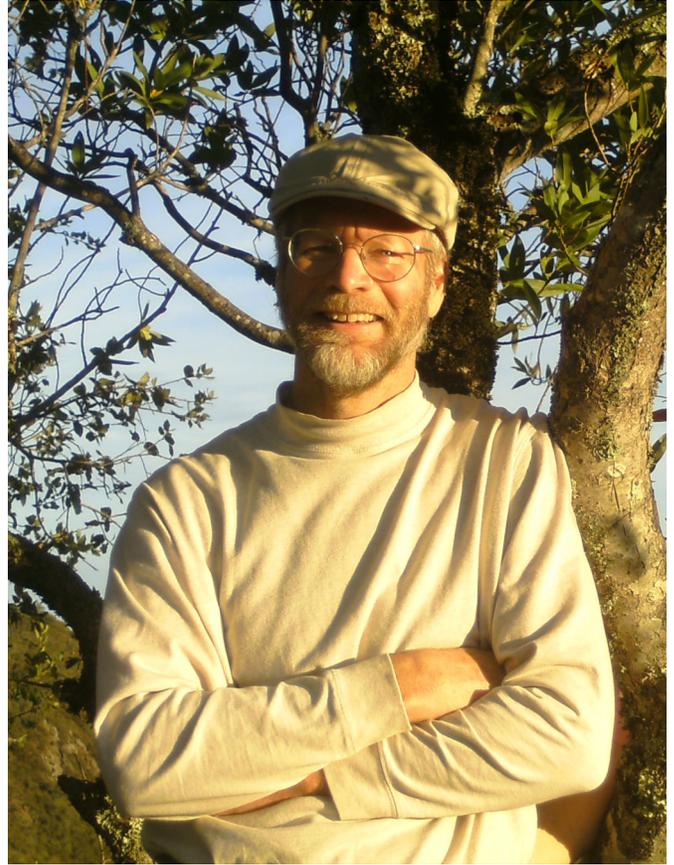
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full range of structural features commonly seen in modern landslides, but on a gigantic scale. Each consists of four distinct structural segments: (1) a high-angle breakaway segment, (2) a bedding-plane segment, (3) a ramp segment, and (4) a former land-surface segment where the upper plate moved over the landscape. The gravity slide complex remained undiscovered for so long precisely because of its gigantic size and an initially confusing mix of extensional, translational, and compressional structures overprinted by post-MGSC basin-range tectonism. Each slide is a large contiguous sheet of andesitic lava flows, mudflow breccias, source intrusions, and intertonguing ash-flow tuffs that record southward, gravitationally induced catastrophic failure of the southern flank of the Marysvale volcanic field. Failure was preceded by slow gravitational spreading on the Paunsaugunt thrust fault system. Triggering mechanisms are poorly understood, but the principal zone of failure was in mechanically weak, clay-rich volcanoclastic strata at the base of the volcanic section.

In September 2017 we convened a 6-day GSA-sponsored Thompson Field Forum on the characteristics and implications of the MGSC. New collaborative research now underway includes geologic mapping, further age control, characterization and implications of pseudotachylytes and injectites, and modelling of mobility mechanisms that allowed extraordinary long runouts.

## BIOGRAPHY

Bob Biek is a Senior Scientist with the Utah Geological Survey's Geologic Mapping Program, having joined the group in 1996 after 4 years (5 winters!) as a mapping geologist with the North Dakota Geological Survey. Most of his geologic mapping is in southwestern Utah and along the Wasatch Front. He is the lead author of nearly 40 7.5' geologic maps and of the St. George, Panguitch, and east half of the Loa 30' x 60' quadrangle maps; he now leads revisions to the Beaver 30' x 60' quadrangle on the southern flank of the Marysvale volcanic field. Geologic mapping is in his blood—he is continually amazed at what one can learn simply by going outdoors and making a geologic map, even of previously mapped areas, and the discovery of the Markagunt, Sevier



and Black Mountains gravity slides are a classic case in point. Bob received his B.A. in Geology from the University of California at Berkeley in 1983 and a M.S. in Geology from Northern Illinois University in 1987.

## PREZ SEZ

### *Greetings FCGS Community,*

Spring is in the air! For a time, anyway.

I am really looking forward to this month's talk from Bob Biek of the Utah Geological Survey. He is going to talk about a gravity slide...which might conjure images of a debris flow, or a landslide, or a rock avalanche – but this is something else entirely, because we are talking



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about not just a small patch of colluvium, bedrock, or snow sliding down a slope. We are talking about a whole *region* of land moving rapidly downslope. I have been wanting to know more about this event for years and am thrilled that Bob is coming to tell us about their work in unraveling the story of this massive disruption to Earth's surface. I hope you all can make it on Mar 18 for his talk!

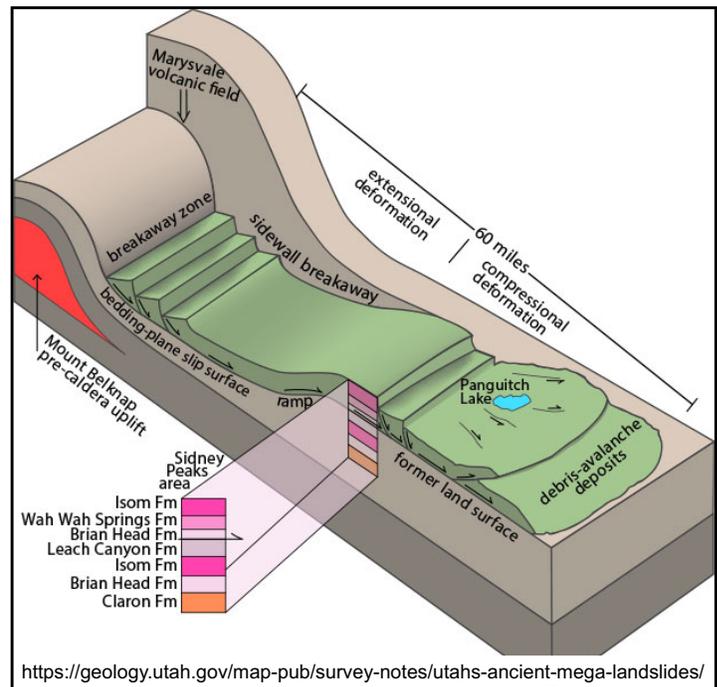
Here is a link to a Salt Lake Tribune article about their research:

<https://www.sltrib.com/news/environment/2020/07/05/ancient-volcanoes/>

In other news, it is that time of year when do some 'spring cleaning' of the individuals that keep this organization running. If you weren't aware, the FCGS has several elected positions in its "Executive Committee": President-Elect, Secretary, Treasurer, and Editor. The current President-Elect (Dave Schiowitz) automatically becomes the new President, and the current President (me) automatically becomes the new Past-President. The Past-President, President and President-Elect are term-limited to one year, but the members serving in the Secretary, Treasurer, and Editor's positions can repeat.

**So, we need to hold elections in May for the positions of President-Elect, Secretary, Treasurer and Editor.** The Nominating Committee (President and two Past-Presidents) does have nominations for most of the positions (including some incumbents), but all active members of the society are welcome to throw their hat in the ring. If anyone is particularly interested in running for a particular position, please contact Jon Harvey by April 15<sup>th</sup> through his email ([jeharvey@fortlewis.edu](mailto:jeharvey@fortlewis.edu)).

**Website Manager:** In addition, we are looking for someone to help us manage our website! Rachael Medina has graciously done so for years, but we want to give her more room as she becomes City Councilmember and then Mayor of the City of Cortez (Go Rachael!). This is not an elected position of the FCGS. Please get in touch with Jon Harvey if you are interested in contributing your website editing skills to the FCGS! Rachael has all the documentation you need to keep the site updated.



**Fieldtrip Committee:** Finally, the Society is again searching for volunteers to join (or re-join) the Field Trip Committee. Because of the ongoing COVID situation there is no guarantee that we will be able to run a trip this summer or fall, but things are looking up and we'd like to have a plan in place for when the restrictions are lifted. Anyone interested should contact David Schiowitz ([dauids@sgm-inc.com](mailto:dauids@sgm-inc.com)).

Lastly, I want to implore you all to make sure you are ACTIVE members of the FCGS. We have been keeping all pre-COVID members on the mailing list and allowing everyone to join the Zoom meetings at no cost during the pandemic. While that increased access, it also reduced the incentive to sign up to be a member. However, the society thrives on having a broad base of *active* members. If you have let your membership lapse – no problem – just try to make sure you sign up again in time to hear about summer and fall FCGS activities! Okay – that's my spiel.

Thank you all! Hope to see you on Thursday, March 18.

-Jon

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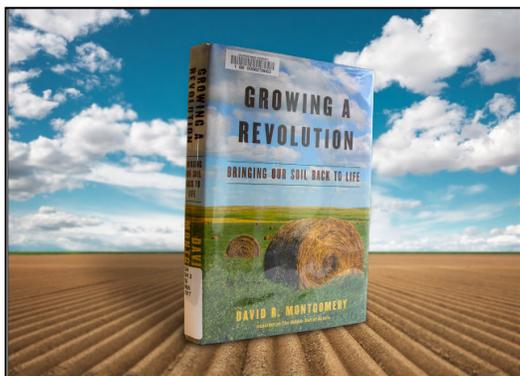
## ZOOM MEETING LOGIN INFO

**Topic:** Four Corners Geological Society February Meeting

**Time:** March 18th, 2021 05:30 PM Mountain Time (US and Canada)

**Link to Join Zoom Meeting:**

<https://fortlewis.zoom.us/j/91738203453>



The Grand Junction Geological Society and Colorado Mesa University present...

**Growing a Revolution:  
Bringing Our Soil Back to Life**

Wednesday, March 17, 2021  
7:30 pm MT, Zoom

RSVP to the event and receive Zoom login information at [coloradomesa.edu/geosciences/growing-revolution](http://coloradomesa.edu/geosciences/growing-revolution).

A Zoom lecture by MacArthur Fellow and University of Washington geology professor, David R. Montgomery, PhD, about the underappreciated importance of soil for the future of civilization.



David R. Montgomery, PhD

COLORADO MESA UNIVERSITY  
DEPARTMENT OF PHYSICAL AND ENVIRONMENTAL SCIENCES  
Information: Andrew Adams  
aadams@coloradomesa.edu  
970.248.1614

## FOUNDATION NEWS

The Four Corners Geological Foundation is pleased to announce that the application for 2021 Master's Thesis Grants has been posted on our website (link below). Usually, two grants for expenses of up to \$1000 are given each year. Applicants may be enrolled at any institution but must be researching a geoscience topic in Colorado, New Mexico, Utah or Arizona. Thesis disciplines may include (but are not limited to) general geology, geophysics, environmental geology, and hydrology. **Applications must be submitted by email by April 1, 2021**, so please share this information quickly with interested students and faculty. Also, we may need volunteers to help evaluate the applicants. If you are interested please contact Jim Fassett at [jimgeology@aol.com](mailto:jimgeology@aol.com). Please download the application form at: <https://fourcornersgeologicalsociety.org/scholarships/>

## UPCOMING FCGS EVENTS

**Thursday, April 29**

Speakers: FLC senior research presentations  
Topics: a fun variety, depending on each students' research area.

**Thursday, May, 13 [Tentative]**

Speaker: Erik Hulm, TeoGeo Consulting  
Topic: Seeing the Forest for the Trees Across North America's Cordilleran Foreland Megasequence.

**Sunday, August, 29**

The board is considering holding our annual Society Picnic if it can be done in compliance with the state health & safety guidelines in effect later this summer. Please stay tuned!

## EVENTS AND TRAINING

### Wyoming Geological Association Events

**Date:** March 12<sup>th</sup>

**Speaker:** Glen Murrell, Director, WY Energy Authority

**Topic:** Wyoming Energy Updates

**Date:** March 19<sup>th</sup>

**Speaker:** Kristen Alvey-Mudd, Executive Director, Missouri Bat Census

**Topic:** Caves and Karst Management

**Date:** March 26<sup>th</sup>

**Speaker:** John Robitaille, Encore Green Environmental

**Topic:** How ESG, Produced Water and Carbon Capture Work Together

**Date:** June 18<sup>th</sup>, 8 a.m. – 5 p.m.

**Event:** Gene George Golf Tournament

**Location:** Three Crowns Golf Club, Casper, WY.

Please RSVP to Brandy Butler, by Thursday, for the Zoom link at (307) 237-0027 or by email at [wygeology@gmail.com](mailto:wygeology@gmail.com)

### SCA Subsurface Consultants - Free Webinar

**Date:** March 16, 12:00 p.m. CT

**Speaker:** D. Nathan Meehan, Ph.D.

**Topic:** Energy Transition - The Next Step to Net Zero

**Register at:**

[https://register.gotowebinar.com/register/5336679109897199372?source=Email&utm\\_campaign=SpringintoSCA&utm\\_source=Spring-Into-Action-With-SCA-Classes&utm\\_medium=email](https://register.gotowebinar.com/register/5336679109897199372?source=Email&utm_campaign=SpringintoSCA&utm_source=Spring-Into-Action-With-SCA-Classes&utm_medium=email)

### Grand Junction Geological Society Meeting

**Date:** March 17, 7:30 p.m. (can log on beginning at 6:30)

**Speaker:** Dr. David Montgomery, U. Washington.

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**Topic:** Growing a Revolution: Bringing our Soil Back to Life  
**Zoom link** (provided by Dr. Andres Aslan to FCGS):  
<https://coloradomesa.zoom.us/j/91355867800?pwd=MUg0WlVaM2Y1cStuc2cxbFVjS1VRZz09>

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## Colorado State University, Department of Geosciences Seminar Schedule

**Date:** March 18. 12:30 pm.  
**Speaker:** Kerstin Braun, Arizona State University.  
**Topic:** "Mid- to Late- Pleistocene Paleoclimate and Environments in Southern South Africa Reconstructed Using Speleothem Stable Isotopes."  
**Zoom link:** Please email for link: [patti.uman@colostate.edu](mailto:patti.uman@colostate.edu).

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## University of Colorado Benson Earth Sciences Colloquia

**Date:** March 24, Wed. 4:10 pm.  
**Speaker:** Dr. Elizabeth Niespolo, Caltech.  
**Topic:** "Isotope geochemistry and human history"  
**Zoom link** and recordings posted at:  
<https://www.colorado.edu/geologicalsciences/colloquium>

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## SPE-GCS SPRING ONLINE HIRING EVENT

**Date:** April 7, 2021

You are cordially invited to attend the "ENERGY PROFESSIONALS HIRING EVENT" hosted by the Society of Petroleum Engineers – Gulf Coast Section in partnership with Texas Workforce Solutions. This virtual event provides job seekers with opportunities to meet with potential energy industry hiring companies in upstream oil and gas and renewables. The event also features Discipline-driven Networking Suites hosted by Collaborating Organizations and companies.

**Register at:** <https://www.spegcs.org/hiring-event/>

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## RMAG April Online Lunch Talk

**Date:** April 7, 2021. 12:00 - 1:00 p.m.  
**Speaker:** Ali Jaffrey, Ph.D., CEO Applied Stratigraphix  
**Topic:** Putting the Sedimentology back into Sediment-Hosted Uranium-Vanadium Exploration

**Register at:**  
<https://www.rmag.org/index.php?src=events&category=RMAG%20Luncheons>

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## SCA Subsurface Consultants Free Webinar Field Trip

**Date:** April 8, 12 p.m. CT  
**Speaker:** Eric Carlson  
**Topic:** Big Bend Field Trip - Normal Faulting at Santa Elena Canyon  
**Register at:**  
[https://register.gotowebinar.com/register/8791748165052399115?source=Email&utm\\_campaign=SpringintoSCA&utm\\_source=Spring-Into-Action-With-SCA-Classes&utm\\_medium=email](https://register.gotowebinar.com/register/8791748165052399115?source=Email&utm_campaign=SpringintoSCA&utm_source=Spring-Into-Action-With-SCA-Classes&utm_medium=email)

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## NMGS 2021 Spring Meeting, Call for Abstracts

**Meeting Dates:** Thursday, April 15 - Friday, April 16, 2021  
**Submission Deadline:** April 4, 2021  
**Theme:** "Our Common Future: Reliability, Robustness, and Resiliency for Effective Risk Management" (Virtual Event)

The New Mexico Geological Society (NMGS) invites the submission of abstracts for posters and oral presentations at its 2021 Spring Meeting. This meeting features a variety of technical sessions including geology, hydrology, geophysics, paleontology, and mineral resources of New Mexico (and adjacent areas). In addition, the committee is inviting abstracts on topics related to risk management in the geosciences. These topic areas include:

- Managing Risk through Data and Data Management.
- Asset Management.
- Workforce as a Renewable Energy.
- Where Water and Energy Meet.

**For more information go to:**

<https://nmgs.nmt.edu/meeting/home.cfm>

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## NMGS Fall Field Conference - Call for Papers - Geology of the Mount Taylor Area

**Conference Dates:** September 15-18th.  
**Submission Deadline:** April 1st.

This field conference was originally scheduled for the fall of 2020, and papers for the accompanying guidebook were collected last year as NMGS Special Publication 14. The trip was then postponed due to the Covid pandemic and is now rescheduled for fall 2021. The majority of the 2021 guidebook will draw from SP 14, however, Guidebook 71 will also include road logs and a few new technical papers. If you would like to submit a paper or mini-paper, please contact Bonnie Frey ([bonnie.frey@nmt.edu](mailto:bonnie.frey@nmt.edu)). All papers must be reviewed by two colleagues before submission as described in the Instructions For Authors page.

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**JOB OPENING:** Fluid Minerals Program Manager for the Nevada Division of Minerals, Carson City Office.

For more information go to:

<https://files.constantcontact.com/1d65777d701/575774fb-42f9-400e-8ee9-72ff87042be7.pdf>

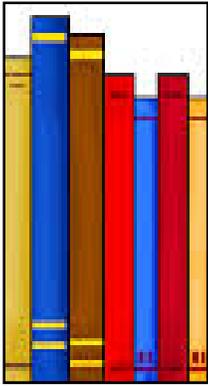
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## JOIN THE FCGS BOARD as the NEWSLETTER EDITOR!!

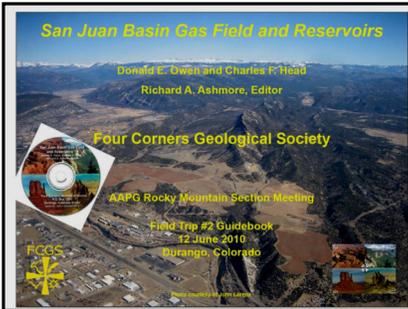
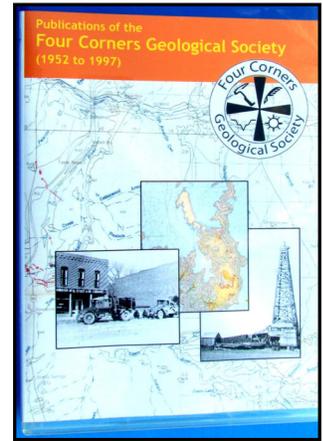
We've enjoyed editing the FCGS Newsletter, but we've been doing it since 2015. It's time for someone to bring a fresh face to the typeface! The new editor will enjoy working closely with the Officers of the Society and the Foundation to keep our members apprised of meetings, fieldtrips and regional events. Contact Kim Gerhardt or Tom Ann Casey for more information.

# FCGS PUBLICATIONS

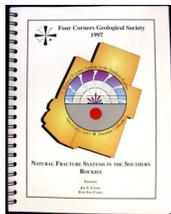
Order online at: <https://fourcornersgeologicalsociety.org/bookstore/>



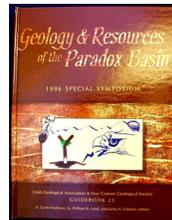
**Publications of the Society: 1952-1997.** This disk contains all publications of the Four Corners Geological Society (FCGS) from 1952-1997. Includes several which are out of print in hardcopy. Many contain classic papers on the geology of the Four Corners region. Much of the emphasis, but not all, is on exploration for oil and gas. Twenty publications in all. **UPDATED** - now includes Owen & Head, 2010, San Juan Basin Gas Fields and reservoirs. **\$105.**



**San Juan Basin Gas Fields and Reservoirs: A Field Guide on CD.** 2010, D.E. Owen and C.F. Head. A (CD) field guide of a 200 mile traverse from Durango and back into the heart of the San Juan Basin. Discussion covers Cretaceous and Tertiary reservoir outcrops, landforms, stratigraphy, history of exploration and development, and the hydrocarbon system of the basin. **\$25.**



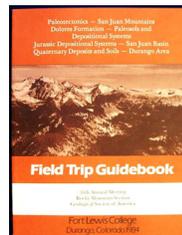
**Natural Fracture Systems in the Southern Rockies.** 1997. Sixteen full-length papers and 12 abstracts covering a variety of topics on natural fracture systems. Soft-spiral bound. 210p. **\$45**



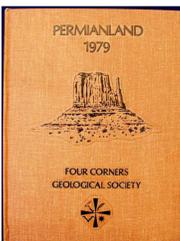
**Geology & Resources of the Paradox Basin.** Special Symposium with Utah Geological Association. 1996. A.C. Huffman, ed. Thirty-three technical papers and road log. Hardbound. 460p. **\$65.**



**Four-Corners Oil & Gas Fields, Vols I, II, and III.** Oil & gas field papers include geologic setting, discovery well drilling and completion practices, and reservoir data for each field. Vol. I&II (1978) includes 242 field papers, 726p. Vol. III (1983) has 95 field papers, 415p. Looseleaf ring binders. **\$60.**



**Field Guide – Durango Vicinity.** 1984, 37<sup>th</sup> Annual Meeting of Rocky Mountain Section GSA. Includes excellent road guide. Softbound. 209p. **\$22.**

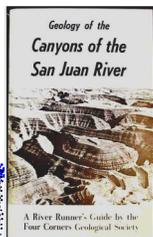


**Permianland.** 1979. Ninth field conference. Hardbound. 186p. **\$22**



**Cataract Canyon and Vicinity,** 1987, John A. Campbell, Editor. FCGS Tenth Field Conference. Twenty eight papers. Hardbound, 199p. **\$25.**

**For River Runners**



**Geology of the Canyons of the San Juan River.** 1974. The classic geologic river guide to the San Juan River from Bluff, Utah to Clay Hills Crossing. Softbound, water-resistant. 94p. **\$15.**



Green River, Gates of Ladore. Photo Credit Kim Gerhardt



# FOUR CORNERS GEOLOGICAL SOCIETY

P.O. Box 1501, Durango, CO 81302

**MEMBERSHIP RENEWAL or APPLICATION: June 1, 2021 to May 31, 2022**



\*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)

<b>Active Member</b>	\$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> _____
<b>Associate Member</b>	\$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> _____
<b>Student Member</b>	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> _____
<b>Emeritus Member</b>	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> _____
<b>Honorary Member</b>	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](http://fourcornersgeologicalsociety.org) .**