FOUR CORNERS GEOLOGICAL SOCIETY

January 2022

JANUARY MEETING

SPEAKER: *Dr. Christian J. Heine*

TITLE: **Wind-blown sands and how to recognize them in modern dunes, outcrops and subsurface**

DATE: *Thursday, January 27th*

TIME & *5:30 - 6:30 pm Social, Drinks and Lots of Various Small Plates!*

LOCATION *Vallecito Room, Student Union Building Fort Lewis College*
6:30 pm - 7:30 pm. Speaker, followed by raffle
ZOOM meeting will start at 6:30 pm.

ZOOM LINK: *Click Here for Zoom Meeting Link or https://fortlewis.zoom.us/j/98215812514*

COVID: *Meeting is at FLC: Per Fort Lewis Policy, VACCINATION IS REQUIRED TO ATTEND IN PERSON. If you are not vaccinated, please use the Zoom option.*

COST: *$20/person. Please RSVP by Tuesday, Jan. 25 at noon if possible. PLEASE go to the website to p ay and register: https://fourcornersgeologicalsociety.org/event Or you can email Jon Harvey at jeharvey@fortlewis.edu*
10 (Wow!) students will be sponsored by our VP, Dr. Jeff Geslin, and by the FCGS. To sign up, contact Dr. Harvey.

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To contact an officer click:
https://fourcornersgeologicalsociety.org

Our Speaker:

Christian J. Heine FTF (First Things First) Geosciences

Chris is a retired Senior Geological advisor with over 40 years industry experience. He began his career with Mobil Oil in Dallas Texas in 1982, and after several U.S. postings including Lafayette, Houston and New Orleans, Chris was seconded to Saudi Aramco in 1991 and in 1996, he joined Saudi Aramco permanently. While in New Orleans with Mobil, Chris was an Associate Professor at Tulane (1990 and 1991) in the Petroleum Engineering Department where he taught Gulf Coast Geology.

Chris made an immediate impact at Saudi Aramco where through core and image log studies he redefined the (Permo-Carboniferous) Unayzah reservoir as eolian rather than the accepted marine interpretation. This discovery changed both the way Aramco explored for the Unayzah as well as the geological modeling and development drilling of the reservoir. He was a strong proponent of using analogs, both outcrop and modern, to guide the geological thinking behind, and ultimately the modeling of, this stratigraphically complex and compartmentalized reservoir.

Chris was very active in the Aramco training program where he taught several courses for both the geology and petroleum engineering programs. He has lead or participated as an instructor for over thirty geological field trips and is a firm believer in the benefits of fieldwork and the use of outcrops in reservoir mapping, modeling and reservoir characterization. While at Aramco, Chris served as the Professional Development Advisor (PDA) for the Exploration Organization, as well as the Subject Matter Expert (SME) for clastic reservoirs and reservoir characterization.

Chris joined QRI in October 2010 and worked in Mexico on the off-shore Jurassic sandstones and Cretaceous carbonate fields of the Cantarell complex. Here he took more of a project management roll coordinating the geological input to the geocellular models. January 2014 to September 2015 Chris worked the Upper & Lower Burgan reservoir development project for QRI/KOC in Kuwait city. The Burgan sandstones are the most prolific producers in Kuwait.

Chris was an active member of the Dhahran Geoscience Society where he held several offices and was an active member of the AAPG where he has served as a delegate representing the Middle East for over 10 years. Chris also served on several AAPG committees including the international regions committee, AAPG Research Committee, Visiting Geologist Program, and Reservoir Geology Committee. He was a session chair in Perth, Cape Town and San Antonio and Cancun, and in Cape Town he was the oral sessions co-chair for the Technical program. Chris served as the AAPG Middle East Region Vice President from June 2005 – 2009.

Education

1978 Bachelor's degree, Penn-State University

1983 Masters Geology, University of Tennessee

1991 Masters Petroleum Engineering, Tulane University

2004 Successfully defended his PhD. in Geology University of Aberdeen

Awards:

- Best poster Geology in Geo 2002.
- Best oral paper in Geology Geo 2004.
- Best oral paper in Geology Geo 2006.
- AAPG International Distinguished lecturer 2009 & 2010.

A HUGE THANK YOU to Dr. Jeff Geslin for sponsoring 5 Student Dinners this month.

Abstract:

Wind-blown sands and how to recognize them in modern dunes, outcrops and subsurface

In and around the Four Corners, we are blessed with an abundance of well preserved and exposed ancient dune deposits. Most of the spectacular outcrops in the Utah National Parks are ancient dune deposits. At Zion it's the Navajo, at Arches it's the Entrada, at Canyon De Chelle it's the De Chelle Sandstone. The Canyon Lands area of Utah has the Page, Cedar Mesa, Wingate and White Rim sandstones. All the sandstones mentioned above are formed by the same process, they are wind deposited.

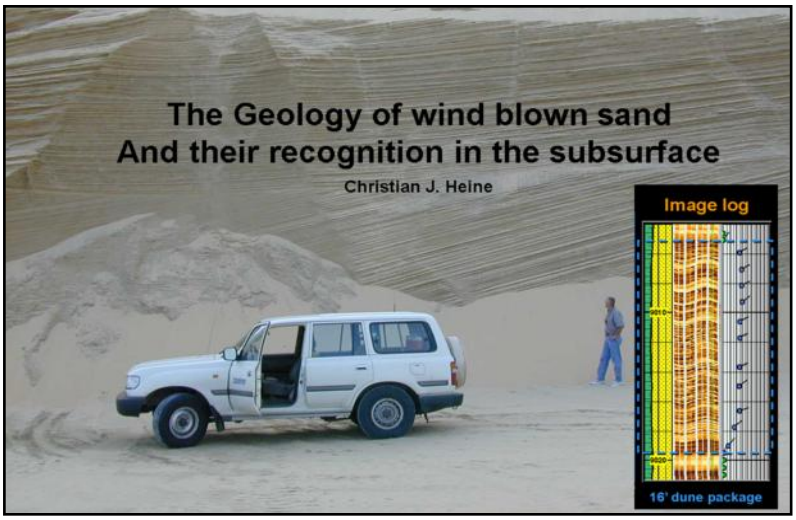
The wind can only move a very narrow distribution of grain sizes. Too small and the particles get carried off as 'dust' to be deposited a long distance away as loess. Too big and the particles are left behind as a lag deposit. What ends up in a dune field are sand grains ranging from .1mm to 1mm. The dune sand mineral composition is the result of the source or provenance for the sand and transportation time. For the most part, dune sands are pure quartz because quartz has the combination of mineral properties necessary to 'weather' the eolian depositional process. Quartz is mechanically very stable. It is hard and does not have a cleavage, which allows quarts to withstand being windblown. Quartz is also chemically very stable. Most naturally occurring solvents (water and acid rain) have no effect on quartz. There are rare examples of other minerals making up dune sands such as garnet, found in dunes along the SW Australian coast but that is another story.

All dunes have the same facies making up the deposit. They are: wind ripples, grain fall or grain flow. These three facies make up all dunes regardless of the dune type. To understand the dune type, or classification, we need more information. Dunes can be classified by morphology based on the shape of the dune (crescentic, linear or star) or classified morphodynamically based on the dune crest line relative to the wind transport direction (Longitudinal, Oblique or Transverse). The dune classification is very important when chasing dune sand bodies in the subsurface for oil and gas exploration.

In the subsurface, the borehole image is king when trying to understand the classification of dune sands and their distribution. The subsurface example used in this talk will be a Permian Unayzah eolian reservoir in Saudi Arabia. The Unayzah had great coverage for both Borehole image logs and conventional core, together I was able to put together a sand distribution map guiding exploration drilling and reservoir development efforts.

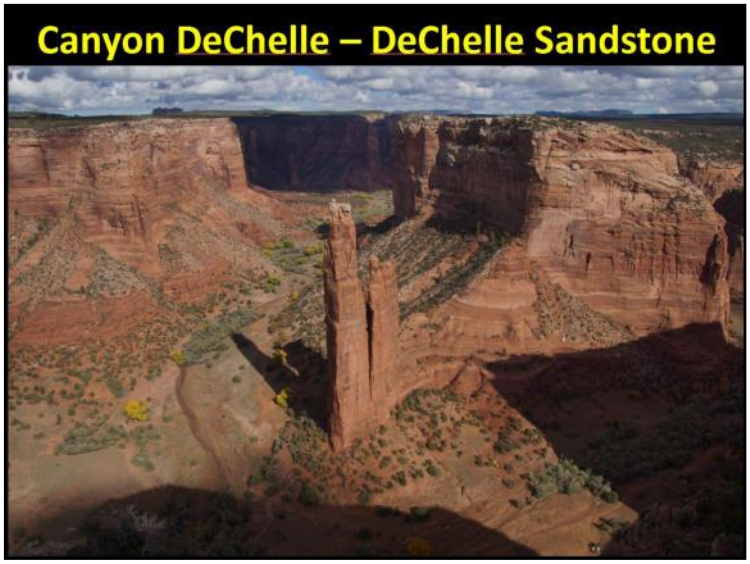
Five distinct facies can be recognized in core and on image log: dune, sand-sheet, paleosol, playa and ephemeral-fluvial deposits. Although the eolian reservoir is not present in outcrop in Saudi Arabia, the Permian Cedar Mesa Formation of Southern Utah serves as an excellent outcrop analog for the Permian 'wet' eolian Unayzah reservoir and will be used to illustrate the nature of the wet eolian system. Barren of consistent datable organic material, the Unayzah eolian reservoir is sandwiched between the Lower Permian glacial deposits of the Unayzah and the Middle Permian tropical deposits of the Khuff carbonates, both of which have very good palynological control for the age of the units. A dominant west-to-east wind direction is identified on image logs for the Unayzah transverse dune system which would place the eolian reservoir in a mid-latitude, southern hemisphere desert setting at the time of deposition around 45 degrees south latitude in the location of the prevailing westerlies (~285Ma).

Zoom Link is: (click)

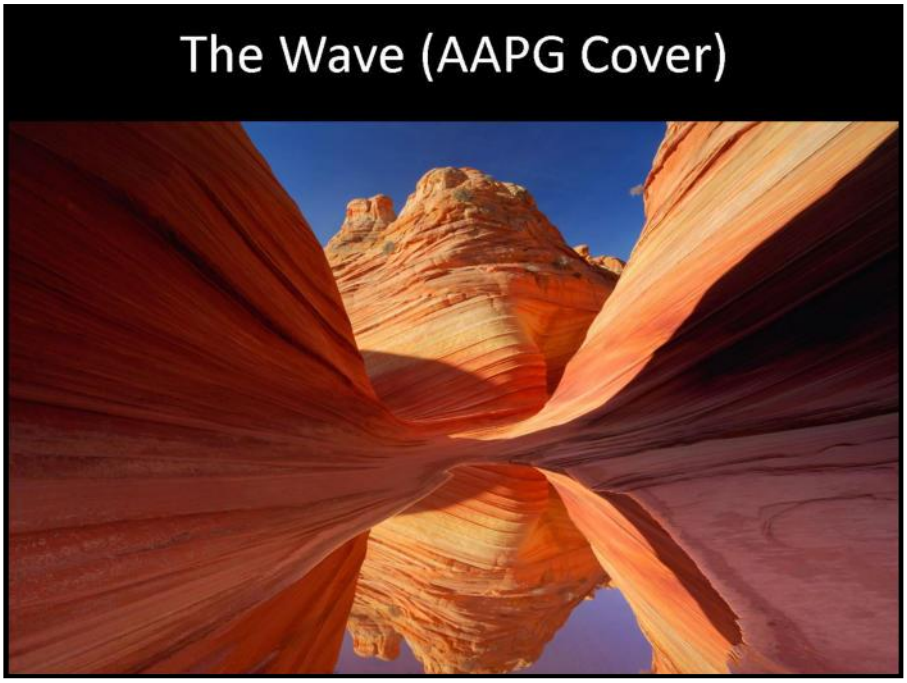


Checkerboard Mesa – Navajo Sandstone

Canyon DeChelle – DeChelle Sandstone



The Wave (AAPG Cover)



“**PREZ SEZ**” by David Schiowitz
January 2022

Happy New Year FCGS members,

I hope everyone had a great holiday and enjoyed the fresh snow. I know that it was a welcome site and our mountains needed all the precipitation. Since our last newsletter the snowpack has increased significantly across the West with snowpack in the Upper Colorado River at 132% of median for this time of year. The Four Corners region appears to be in a typical January thaw with warm (relatively) day and cold nights, but I am hopeful that moisture will return soon.

Thank you to everyone that was able to participate in last month's meeting. We had seven FLC seniors present their research during a poster session and had an excellent talk by Dr. Ron Hall regarding unconventional petroleum systems in the Western US.

For our next meeting, **Thursday, January 27th,** we have a sediment and stratigraphy talk by local guru Chris Heine. He will be discussing the wind-blown sands and how to recognize them in modern dunes, outcrops, and the subsurface. Please RSVP for the talk and note the COVID-19 requirements. We understand that some members may be uncomfortable attending the meeting in-person due to the uptick in COVID-19 cases in the area, so we will continue to have a Zoom option starting around 6:30 pm (link).

On a not so merry note, the FCGS lost a longtime member and advocate of the Society with the passing of Dr. Charlie Burnham last month. Charlie was an active member in FCGS and enriched our geofamily with wonderful, insightful questions at many talks, and a warm and welcoming personality. Charlie also helped the FLC geology program with teaching mineralogy, mentoring, and being a vocal advocate of student research. He often could be heard saying that he thought the research by FLC undergraduates was equal to or better than he saw from undergraduates in his years of teaching Mineralogy at Harvard. Beyond that, he and his wife Mary Sue helped create and run the Host Family program at FLC and genuinely enjoyed being with the students. He will be deeply missed.

All the best,

David

Map of Meeting Location

SAVE THE DATES!

February 17: David Gonzales, Fort Lewis College

March 31: Peter Vrolijk, ExxonMobil retired

April 21: FLC student presentations

May 19: TBD

NEWS FROM THE FOUNDATION

The Four Corners Geological Foundation would like to thank **Ron Brogdon, Jay LeBeau, Patti Phillips and a wonderful, but anonymous, donor** for their recent generous donations. Their support will help us offer more grants to deserving students. Thanks to all of you!

Coming next month: The announcement of our 2022 MS Thesis Grant program!

GEO QUESTION OF THE MONTH!

Courtesy of Dr. Vince Matthews

How many of the 14,000 foot+ peaks in the entire Rocky Mountains from central New Mexico to Northern British Columbia are in Colorado?

(see answer Page 8)

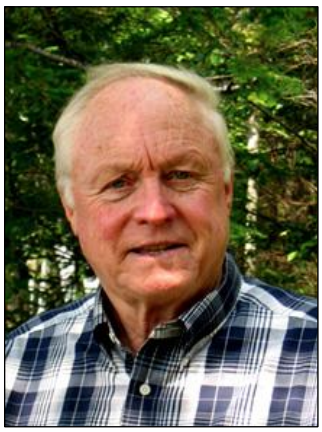
NEWS FROM THE ARIZONA GEOLOGICAL SURVERY AND ARIZONA GEOLOGICAL SOCIETY

Greetngs FCGS Members from the Arizona Geological Survey! We wish to announce that we have revised 20 geologic maps and added new geodatabases. We invite you to check out the latest AGS & Arizona Geology Newsletter, v.43 #2 Winter 2021 at http://repository.azgs.az.gov/uri_gin/azgs/dlio/2007 or click here.

Contents:

- Recent Earthquake Activity & Seismic Hazards in SE Arizona
- Monsoon Rains & Earth Fissures in Cochise County
- Arizona Mining Production & Employment 2020 Infographic
- New, Pending, and Revised Publications
- PLUS Smiling faces of the AZGS Staff

IN MEMORY OF DR. CHARLES BURNHAM - we will miss you, Charlie….



With great sadness we mark the passing of our friend and colleague, Dr. Charles Burnham on December 13, 2021.

Charlie was a member of the FCGS for over 20 years and was always interested in helping the FLC geology students with their studies. At meetings you could count on finding him enthusiastically engaging the students and challenging them to think creatively.

He had a long and distinguished career. A graduate of MIT, in 1966 he joined the Department of Geological Sciences at Harvard University as Professor of Mineralogy. During his 30 years at Harvard he taught courses in mineralogy, crystallography, environmental geology, and field geology; and led first-year seminars on glaciers and ice ages. His research focused primarily on structural mineralogy. He was departmental adviser to numerous undergraduate students, many of whom went on to hold significant positions in major American universities and published numerous papers.

In 1996 Charlie retired from Harvard, and moved from New England to Durango. He and his wife then traveled extensively, lecturing to Harvard alumni and Museum of Natural History groups on plate tectonics, glaciers and ice ages, volcanology, paleoclimate and global warming. These travels took them to Alaska, Arctic Canada, Greenland, Svalbard, Patagonia, Antarctica, Japan, the Sea of Okhotsk, Kamchatka, and New Zealand.

Charlie had been a member of the Appalachian Mountain Club since 1953. He served on its board of directors, and as its president. In the 1980's he represented AMC's interests with the US Forest Service, and worked to pass a wilderness bill for lands in the White Mountain National Forest of New Hampshire.

An avid skier, Charlie has been an alpine ski racing official since the early 1980's. He served as a timing official at the FIS World Championships at Vail/Beaver Creek in 1999, as a gate judge at the Calgary Olympic Winter Games in 1988, and as head gate judge at the Snowbasin venue during the Salt Lake Olympic Winter Games in 2002. He served in several leadership positions with Rocky Mountain Ski Race Officials, Inc., and the United States Ski and Snowboard Association.

Link to his obituary https://obituaries.durangoherald.com/us/obituaries/durangoherald/name/charles-burnham-obituary?id=31903272

Charlie submitted these photos from his travels for the FCGS Photo Contest. He won First Place for the image of an unnamed glacier on the southwest coast of Coburg Island, Nunavut, Canada. "The Inuit name for this small island is Nirjutiqavvik. The island contains 20+ glaciers, all unnamed. The island is located in Baffin Bay between Ellesmere Island to the North and Devon Island to the South, latitude 75°57' North."

GEO FUN FACTS for JANUARY '22

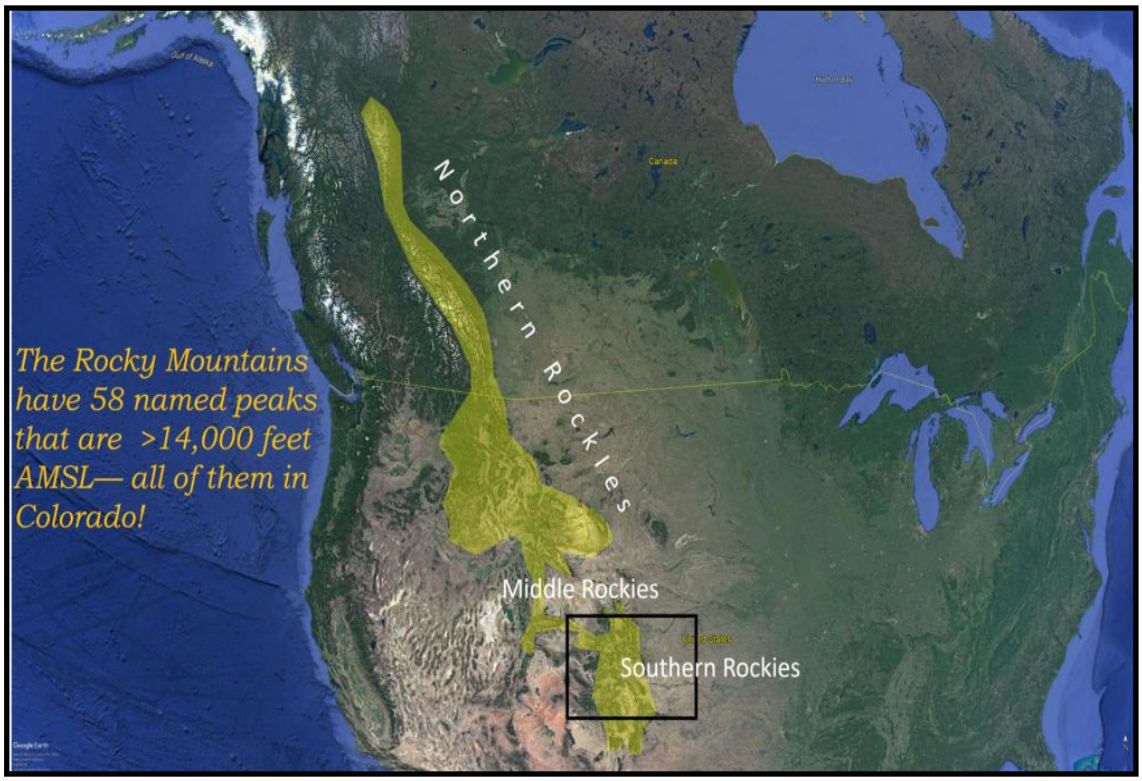
How many of the 14,000 foot+ peaks in the entire Rocky Mountains from central New Mexico to Northern British Columbia are in Colorado?

Answer:
ALL 58 OF THEM!

- Vince Matthews

Thank you to Dr. Vince Matthews, retired Colorado State Geologist and Director, Colorado Geological Survey, for sending us this fun fact.

Send in Your GEO FUN FACT to Tom Ann at talcgeo@gmail.com



Mount Elbert, highest of all.

NEWS FROM AROUND THE REGION

Exploration Geologist Opening

Our Client is seeking an Exploration/Mine Geologist for America's premier producer and supplier of high quality battery-grade graphite products in the rapidly expanding and evolving electrical storage industry.

Our Client is in the process of constructing a new, environmentally sensitive and technologically innovative graphite processing and manufacturing facility in central Alabama, and is advancing the evaluation of a flake graphite mineral deposit in the Alabama graphite belt.

Here is the job posting URL: https://jobs.miningsearch.com/Exploration-Geologist-

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RMS SEPM January Webinar
January 25, 2022; 12 PM MT

Happy New Year! It's already time for our first webinar of 2022.

TALES FROM TWO SHELL BEDS: THE ROLE OF SEDIMENTATION REGIME IN THE PRESERVATION OF HIGH-PRODUCTIVITY SKELETAL CONCENTRATIONS
Madeline S. Marshall, Albion College

ABSTRACT:
High-productivity systems are known to host a diversity of life, along with distinctive sediments such as phosphorites, organic-rich muds, and glauconitic sands. Additionally, elevated productivity has the potential to influence concentrations of skeletal material through multiple interacting ecological, taphonomic, and diagenetic effects in the seabed. Previous study of the Permian Phosphoria Rock Complex (PRC) of the Intermountain West has focused on these variables, finding preservation of skeletal concentrations to be dictated largely by the sequence stratigraphic context and duration of hiatuses in sedimentation.

The current study considers another key component to more fully understanding the problem of preservation in high-productivity systems: sedimentation regime and input of clastics. Variation in the amount of dilution by clastics that high-productivity systems experience can have profound impacts on the subsequent preservation of fossil material: sediment starvation often occurs in tandem with low-energy and dysoxic conditions, while systems rich in clastic input are typically higher energy and better oxygenated. A comparative analysis of the sediment-starved Permian PRC and the sediment-rich late Jurassic record of the southern Morondava Basin, Madagascar, is a first step in tackling this problem.

Webinars are free to attend. Please submit reservations by 10:00 a.m (MT) on January 24.
Email questions to information@rmssepm.org

To register or get more info, go to https://www.rmssepm.org/calendar-feed/2022/251mm?ss_source=sscampaigns&ss_campaign_id=61aee34385c6dd5dbc3ceace&ss_email_id=61e04838b3bd9f7282e609d6&ss_campaign_name=January+25th+Webinar+Announcement&ss_campaign_sent_date=2022-01-13T15%3A44%3A02Z

GJGS January Meeting
WEDNESDAY, JANUARY 26, 2022; 7:30 PM (MT)
Joint meeting with the CMU Geology Students
Saccomanno Lecture Hall (Room 131 in the Wubben-Science Building)

Dr. Javier Tellez, Dept. of Physical and Environmental Sciences, Colorado Mesa University
"UAS-Based Photogrammetry for Facies Architecture and Fluvial Sequence Stratigraphic Definition of the Burro Canyon Formation, Piceance Basin, Colorado"

ABSTRACT:
The Lower Cretaceous Burro Canyon Formation in the southwestern Piceance Basin, Colorado, is composed of deposits that represent a braided fluvial system with high net-to-gross that transitions stratigraphically upward into a low net-to-gross, low-sinuosity meandering fluvial system. I used well-exposed outcrops, detailed measured sections, and UAS-based imagery to describe the fluvial architecture of the late Cretaceous formation using a hierarchical approach. We described the Burro Canyon Formation as comprised of sandstone-rich amalgamated channel complexes overlain by non- to semi-amalgamated channel complexes. The characteristics and spatial distribution of architectural elements of the Burro Canyon Formation correspond to one depositional sequence. The erosional basal surface of the formation, as well as lateral changes in thickness and net-to-gross, suggest that the Burro Canyon Formation within this study area was deposited within multiple incised-valley fills. The study of fluvial deposits such as the Burro Canyon Formation serves as outcrop analogs for subsurface interpretation, modeling, and prospection of similar reservoirs.

Join Zoom Meeting
https://coloradomesa.zoom.us/j/92178149725?pwd=TVpCeG8xMnk4bGVBUlNwb0VkeEJrQT09
Meeting ID: 921 7814 9725; Passcode: 056246

One tap mobile
+16699006833,,92178149725#,,,,*056246# US (San Jose)
+12532158782,,92178149725#,,,,*056246# US (Tacoma)
Find your local number: https://coloradomesa.zoom.us/u/amSYNHdI7

Colorado State University Department of Geosciences Seminar Schedule
Schedule posted at: https://warnercnr.colostate.edu/geosciences/geosciences-seminar-series/ . Please call 970-491-5661.

January 27. Victoria Fernandez, Imperial College London. ***Presentation Title: TBD.***
All are Welcome!!
This seminar will be virtual. If you wish to attend, please email - patti.uman@colostate.edu for Zoom.

Be of Good Cheer
and
Toast to Snow and Field Trips in 2022!

FOUR CORNERS GEOLOGICAL SOCIETY

P.O. Box 1501, Durango, CO 81302

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

NEWSLETTERS SENT BY EMAIL ONLY

*Name: _____

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

*Email: _____ Phone: _____

*Employer: _____

***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)

Please Identify a Membership Category:

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. **Highest Degree, Type and Year:* _____ **College / University:* _____
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. **Highest Degree, Type and Year:* _____ **College / University:* _____
Student Member	Free	Any undergraduate or graduate student majoring in geology at a college of acceptable academic standards. **College / University:* _____ **Year expected to graduate:* _____
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. **Year emeritus status was awarded*: _____
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. **Year honorarium was awarded:* _____.

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 .**

Please donate to the Foundation to support student research. Make out your check to: "Four Corners Geological Foundation" and include it in the envelope with your dues.