



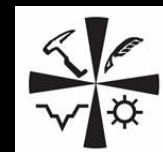
# FOUR CORNERS GEOLOGICAL SOCIETY

## January 2024

**WELCOME TO THE NEW YEAR**  
Kitty Milliken @ FLC on January 18, 2024

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## OFFICERS OF THE SOCIETY

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### Treasurer:

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### Secretary:

Patti Phillips

### Director:

Cindy French

**To contact an officer click:**

<https://fourcornersgeologicalsociety.org>

# FOUR CORNERS GEOLOGICAL SOCIETY



## JANUARY 2024 MEETING

### SPEAKER:

**Dr. Kitty Milliken**

Bureau of Economic Geology

Jackson School of Geosciences, Univ. of Texas, Austin

### SUBJECT:

**Mudrocks (shale, mudstones) at the Scale of Grains and Pores: Current Understanding**

### DATE:

**Thursday January 18, 2024**

### TIMES:

5:30 - 6:30 pm: Dinner and Complementary Drinks  
Appetizers, salads, pizza and dessert. Beer, wine, etc.  
6:30 pm - 7:30 pm: Society Business / Presentations  
7:30 - 7:45 pm: Raffle to raise money for students

**Zoom link is: [LINK to Meeting](#)**

passcode is 840730 Zoom starts at 6:30 pm

### LOCATION

**Sitter Family Hall, Room 710**

Fort Lewis College. Dinner served @ ~ 5:30 - 6:30 pm.

### COST:

\* \$20/person. **MEMBERS: Please RSVP by Tuesday, January 16th if possible.** Otherwise, planning is tough.  
\* **PLEASE go to the website** to pay (preferred) or **RSVP** <https://fourcornersgeologicalsociety.org/event>

\* **STUDENTS & FACULTY ONLY:** You need to RSVP by email to Dr. Gonzales at [gonzales\\_d@fortlewis.edu](mailto:gonzales_d@fortlewis.edu). Most students will be sponsored. Get on the list! All faculty (FCGS members only) will be sponsored.

# Mudrocks (shales, mudstones) at the Scale of Grains and Pores: Current Understanding

## Dr. Kitty Milliken

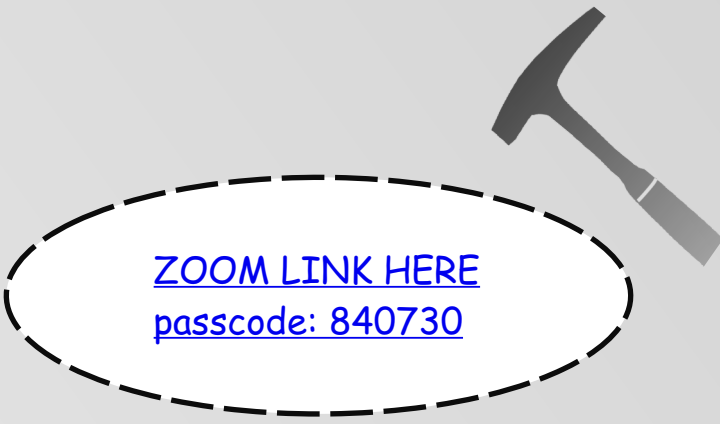
Bureau of Economic Geology  
Jackson School of Geosciences  
University of Texas at Austin

The fine-grained sediments and rocks that constitute most of the sedimentary record have received tremendous research attention in the past decade. This talk reviews some of the technologies that have supported these advances and summarizes current knowledge of the pore-scale processes that drive the evolution of bulk rock properties of mud in the subsurface. Electron microbeam instrumentation has been central to improving our understanding of fine-grained sediment. In particular, improvements in resolution offered by field-emission electron guns and advances in sample preparation by various ion-milling techniques have allowed researchers to see tiny grains and pores in unprecedented detail. Grain assemblages in mudrocks vary across a compositional range greater than the ranges seen in sandstones and limestones. As in these less abundant lithologies, the initial compositions in muds have significant implications for the evolution of mudrock properties in the subsurface. It is now clear that the principal diagenetic processes of sandstones and limestones, compaction and cementation, also operate in mudrocks. Compaction is the most important cause of pore loss and cementation is the key control on the evolution of mechanical properties. Quantification of compaction and cementation is central in the quest to refine a predictive understanding of the evolution of mudrock properties in the subsurface.

## Join by Telephone

For higher quality, dial a number based on your current location.

Dial:+1 719 359 4580 US

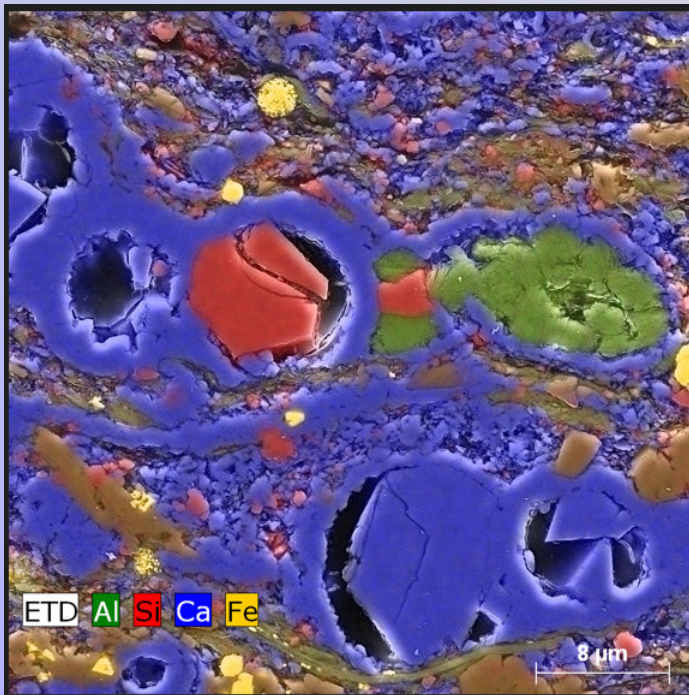


[ZOOM LINK HERE](#)  
[passcode: 840730](#)



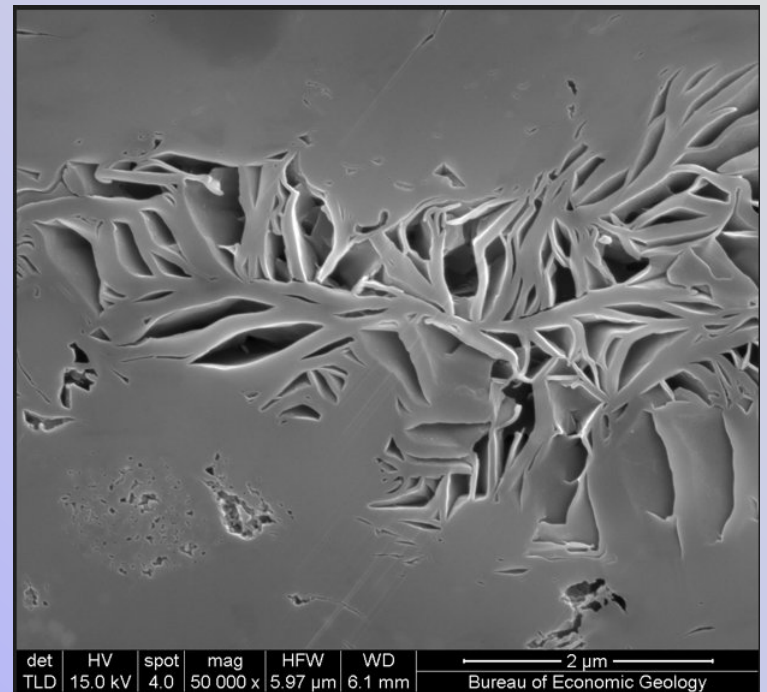
## Speaker Bio

**Kitty L. Milliken** is a Senior Research Scientist at the Bureau of Economic Geology, University of Texas at Austin. She received a B.A. in geology (1975) from Vanderbilt University and M.A. (1977) and Ph.D. (1985) degrees from UT Austin. Her research focuses on diagenesis of siliciclastic sediments and the evolution of rock properties in the subsurface. She has authored and co-authored over 120 peer-reviewed papers and also digital resources for teaching sedimentary petrography. Her current work is focused on the application of electron microbeam imaging and analysis to interpret chemical and mechanical histories of mudrocks.



← Pores in the Mowry Formation,

Slide shows (in false colors) pores and authigenic minerals in the Eagle Ford Formation,



"My talk will explore how cementation and compaction affect porosity evolution in muddy sediments."



Four Corners Geological Society, P.O. Box 1501, Durango, CO 81302  
[www.fourcornersgeologicalsociety.org](http://www.fourcornersgeologicalsociety.org)

## “PREZ SEZ” by Chris Heine



Hello FCGS Members!

Welcome to 2024, I hope you all had a great holiday season. We are

looking forward to the 2024 speaker schedule and the upcoming fieldtrips which have yet to be finalized. We are hoping to have an update by the January 18<sup>th</sup> meeting next week.

A little change of pace. I came across a really cool article dealing with subsidence.

<https://www.sciencedaily.com/releases/2024/01/240102151937.htm>

Every time there is a tropical storm or flooding due to heavy rains, Gulf coast deltas and coastal areas, east coast cities and low lying areas around the world make headlines often followed by a piece on climate change. In the above article, cities like New York City, Long Island, Baltimore, Virginia Beach and Norfolk

are seeing up to 5mm of subsidence each year. For comparison, Venice Italy, now that they no longer pump groundwater, is still subsiding at 3+mm/year. That's significant compared to the 1.5mm/year sea-level rise attributed to all the effects of global warming.

The greater Mississippi delta area including New Orleans, has high rates of subsidence due to the dewatering of soupy sands and silts. When deposited, river deposits have as much as 40% or more water filled pore space. Over time through compaction, that pore space is reduced to <20%. For over 150 years, the Army Corps of Engineers have been working hard to ensure the Mississippi stays the course by building levees, preventing the natural embankment breaching that fills adjacent lowlands with sediment. These levees also prevent the every ~2000 years or so abandonment of the main river channel. Instead, the river sediments are forced down the main channel into thousands of feet of water. Without the occasional levee breaches

where river sediment replenish the bays and wetlands, all we see is exaggerated subsidence and the landward movement of the coastline. “Worldwide, coastal river deltas are home to more than half a billion people.” Globally, deltas and cities on the deltas suffer greatly from seasonal flood events and more long term, subsidence.



# "PREZ SEZ" by Chris Heine

See:

<https://phys.org/news/2023-11-coastal-river-deltas-threatened-climate.html>

From the above article. "We can clearly show that many risks are not linked to climate. While climate change is a global problem, other important risk factors like land subsidence, population density and ineffective governance are local problems. Risks to deltas will only increase over time."

Best regards,

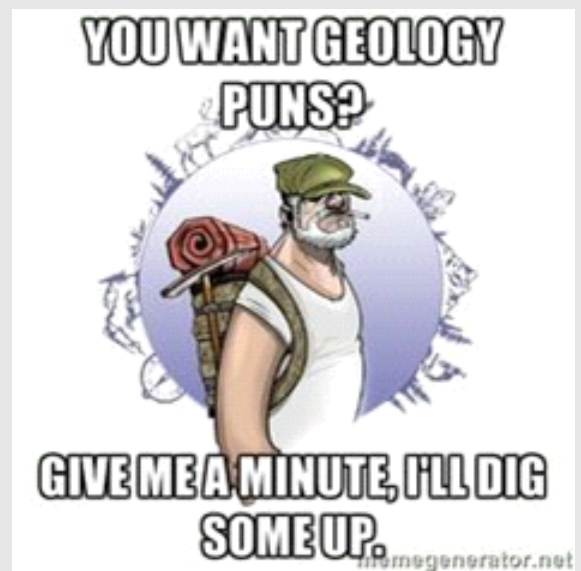
*Chris*



## Save the Dates!

2024

- February 22: Peter Vrolijk
- March 28: Chip Head
- April 18: FLC Students
- May 16: Doug Bartlett





# FCGS NEWS YOU CAN USE! A Message from the Foundation

Cindy French

## FCG Foundation News & Update



Dear Fellow Four Corners Geological Society Members,

Your Four Corners Geological Foundation is again offering grants to Master's degree students who are doing geological field work in Colorado, New Mexico, Arizona or Utah. The application deadline is March 1.

More information and the application form may be found at <https://fourcornersgeologicalsociety.org/scholarships>.

This year's Grants Program is being administered by Foundation Director and 2024 Committee Chair Cindy French.

Geological Society Members, please support this program by donating to the Foundation at <https://fourcornersgeologicalsociety.org/foundation>.

Donations may also be made by check (preferred) payable to 'Four Corners Geological Foundation' and mailed to:

Mary Gillam  
FCG Foundation President  
115 Meadow Road East  
Durango, CO 81301

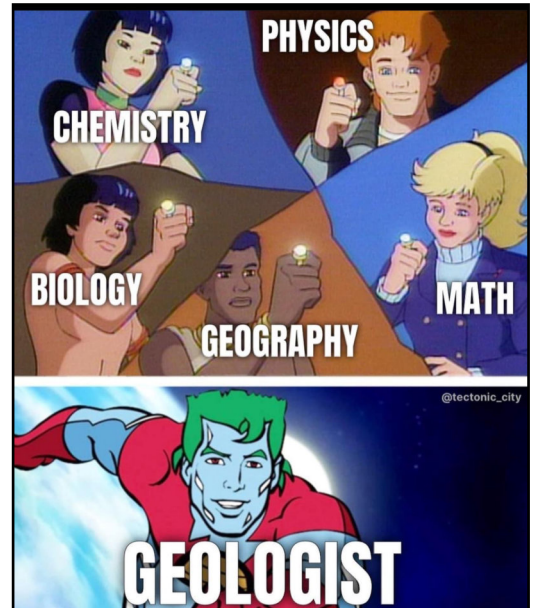
If you have questions or want more information, please contact Mary at 970-259-0966 or Cindy at 281-202-3644.

If you know of anyone who might meet the qualifications for a Foundation Grant, please share this information with them.

Thank you in advance for your support!

*Cindy French*

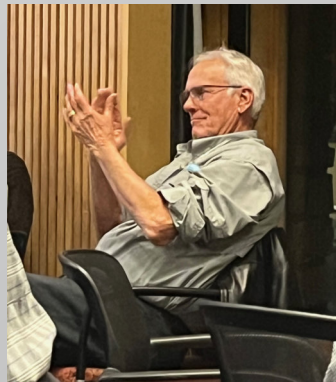
Foundation Director and 2024 Grants Program Committee Chair



Four Corners Geological Foundation Directors  
President: Mary Gillam - independent geomorphologist  
Vice President and Treasurer: Gordon Greve - geophysicist  
Secretary: Patti Phillips - petroleum geologist (retired)  
Director: Cindy French - geologist (retired)



# DECEMBER MEETING







## REMEMBERING OUR FRIENDS

### Connie Mack Krivanek 1936-2023

Connie Mack Krivanek was born to Millard Frank Krivanek and Emma Elizabeth Svoboda Krivanek on Aug. 14, 1936, in Oklahoma City, Oklahoma. He was named after the famed baseball manager Connie Mack, as his father was a baseball player (this was long before the Farmington tournament would also be named in the manager's honor).



Connie grew up in Oklahoma City and went on to attend Oklahoma University for both a BS and MS degree in Geology. After graduation he served on active duty in the US Navy on the USS Reboth Survey ship along the North Pacific rim.

In 1963 Connie began his career as an oil and gas exploration geologist. He was a long-time member of the local Four Corners Geological Society, starting in 1967 and served as president in 1974. His work brought him to live in eight states including Alaska where in Anchorage he lived through the Great Alaskan Earthquake of 1964 which is among the largest ever recorded.

During his nine years living in Durango, CO, a fellow geologist Dennis Belnap introduced Connie to high country backpacking, which changed him from a former "flatlander" to a mountain man. His favorite experience was to walk out of the stunted spruce tree forest at timberline onto the grassy alpine tundra at 12,000 feet. The view would be like looking down on the world.

Over the years he would go on many trips with his son Alan and friends into remote high mountain lakes to trout fish around the Weminuche Wilderness of Southwest Colorado. Along the way he also managed to climb a few "14ers" with his son.

Every summer Connie Mack planted a large garden and he not only enjoyed eating the produce himself but also giving away much of what he grew to friends and neighbors.

Connie often took morning jogs with his beloved dogs. He said the dogs liked it more than he did... but it helped him stay in shape for summer backpacking. His running was actually a second-half of life pastime that he used to stay healthy into older age. His first goal was to complete a marathon by age 50 which he achieved when he finished the Shiprock Marathon in 1986. He went on to win dozens of medals for 10k and 5k races in his age categories over 60, then over 70, then over 80!

He said he was privileged to have lived, worked and raised a family in the mountain west and specifically the Four Corners Area for over 50 years.



# REMEMBERING OUR FRIENDS

Connie Mack was preceded in death by his parents Millard and Emma and by Lynda Krivanek his wife of 56 years. He is survived by his sister Wanda Roach; daughter Alecia Pittman and husband Randy Pittman and twin granddaughters Rachael Newman and Sarah Walker; son Alan Krivanek and wife Debra Skinner, granddaughter Lily Krivanek and grandson Leo Krivanek.



## MEMORIES FROM OUR MEMBERS...

That is very sad news. I only interacted with Connie 12 or 15 times in the last 8 or so years since we've been back. Always looked forward to hanging out with him at picnics and talking to him on field trips. I remember that he was FCGS president the year I graduated from FLC, 1974!

~ Jim Corken

It was a pleasure to know Connie. A funny story is that long ago, we both hoped to buy the same used travel trailer. He got it, to my disappointment, but later told me he'd paid too much because he knew I'd buy it if he didn't. How kind of him and Lynda to share the bounty of their vegetable garden at so many of our picnics! It's people like these who've made FCGS so valuable for our geoscience community.

~ Mary Gillam

I really miss Conne, our friend and colleague. He was a member of the FCGS for many, many decades from 1967 to 2023. I first met him in 1980 when I moved to Durango and he was always willing to help me learn the San Juan Basin geology. He was a great geologist. He was a kind, courteous, under-stated and a truly remarkable person. We will especially remember him from attending the FCGS picnics every year and bringing delicious fruits and vegetables from his garden. Our picnics will never be the same without him.

~ Tom Ann Casey

McElmo Field (CO<sub>2</sub>, Oil, Gas), T. 35-37 N., R. 17-18 W., NMPM, Montezuma County, Colorado, Connie M. Krivanek  
Four Corners Geological Society, 1978

Montrose Dome (Gas), T. 45 N., R. 16 W., NMPM, Montrose County, Colorado, Connie M. Krivanek  
Four Corners Geological Society, 1978

Patterson (Oil), T. 38 S., R. 25 E., SLPM, San Juan County, Utah, Connie M. Krivanek  
Four Corners Geological Society, 1978

Lightning Draw: Sec. 35, T. 30 S., R. 23 E., SLPM: San Juan County, Utah, Connie M. Krivanek  
Utah Geological Association, 1993

Little Nancy: Secs. 3 & 11, T. 38 S., R. 25 E., SLPM: San Juan County, Utah, Connie M. Krivanek  
Utah Geological Association, 1993

Turner Bluff: Secs. 24, 25 & 26, T. 40 S., R. 22 E., SLPM: San Juan County, Utah, Connie M. Krivanek  
Utah Geological Association, 1993

Bug Field, T.36 S., R.25 & 26 E., San Juan County, Utah  
Connie M. Krivanek  
Rocky Mountain Association of Geologists, 1981

New Fields and Exploration Drilling Paradox Basin, Utah and Colorado, Connie M. Krivanek,  
Rocky Mountain Association of Geologists, 1981

Aerial Geology of Lane NE Quadrangle, Pushmataha and Atoka Counties, Oklahoma, Connie Mac Krivanek  
Oklahoma City Geological Society, 1964



# REMEMBERING OUR FRIENDS

## Donald E Owen 1936-2023

Don passed away in Beaumont, Texas on December 30, 2023. He was born in Galveston on November 27, 1936, where he first became acquainted with hurricanes and coastal geologic processes, which provided early inspiration for his interest in geoscience. After graduating the top of his class at Lamar University in Beaumont, Don earned his MS and PhD degrees at Kansas University. A self-described “fanatical geologist,” his passion for the science was reflected in his research, teaching, and consulting accomplishments.

Don at a Dakota Fm. outcrop in 2006



Don’s primary interest was field geology, particularly classical stratigraphy. Those of us who went to the field with him could count on long days spent measuring sections, digging up bentonites, characterizing sediments, and describing depositional environments. He did not have time for anything else. Don’s outdoor kitchen consisted of a cooler full of diet cokes, a can opener, and a fork.

Don spent the majority of his career as a professor, first with Bowling Green University (14 years), followed by a 37-year tenure at Lamar University, where he retired as Emeritus Professor of Geoscience in 2012. He was a prolific author and editor of over 100 technical papers and guidebooks, many of which focussed on the San Juan Basin of northern New Mexico.

When he wasn’t teaching field camp, Don spent his summers doing field research, and consulting for petroleum companies in New Mexico. He was known as “Doctor Dakota” for his work in the complex Cretaceous Dakota Formation. His collaboration with petroleum geologists resulted in the first basin-wide resource assessment of the Dakota Formation. That work remains an industry standard for integrating enormous outcrop and subsurface datasets over an entire petroleum system.

Don was active in many professional organizations, including AAPG, SEPM, HGS, NMGS, FCGS, NMBEG, and he was a commissioner with the North American Commission of Stratigraphic Nomenclature. Highly respected by peers and students, Don was a positive influence on multiple generations of students and colleagues, and his enormous contributions to academia, teaching, and the petroleum industry are lasting legacies.

— Charles Head  
January 8, 2024



# REGIONAL NEWS

## **Denver Museum of Nature and Science January 2024 Earth Sciences Colloquia**

In-person only; VIP Room

VIP Room is on the 1st floor, next to the T-rex Cafe. (Museum admission not required to attend. Enter through Staff/Volunteer entrance, 50' east of main visitor entrance, and let Security know you're attending the talk).

Jan 22nd

"Testing evolutionary theories of predator-prey interactions in deep time"

Lydia Tackett, Univ. of Missouri

Jan 30th

"How to take over the world: Climate change, development, and the origin of major vertebrate group"

Chris Griffin, Yale

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## **10th Annual International Course on Geotechnical and Structural Monitoring (IcGSM) Colorado School of Mines, Golden, June 11-14, 2024**

AEG Mile High Chapter and the Colorado Geological Survey are partnering with NHAZCA to host the 10th annual IcGSM in Friedhoff Hall, Green Center, at the Colorado School of Mines in June. Past iterations of this course have been held in Italy (usually Rome), so it's exciting to have this in Colorado in 2024. Sponsorships with exhibitor booths are available, and Early Bird registration is open.

To learn more or to register, go to <https://www.geotechnicalmonitoring.com/>

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## **Denver Mining Club January Schedule**

**Golden Corral Buffet & Grill 3677 South Santa Fe Drive, Sheridan, CO 80110 – Southwest side at Santa Fe Dr. & Hampden Ave.**

Purchase of buffet lunch required (Teachers eat for FREE)

Every Monday, except when noted, 11:30 a.m. - 1:00 p.m. (+/-).

Visitors always welcome!

January 8. Bob Lowdermilk, President (Ret.), Hoyle Lowdermilk, Inc. "Mechanical Advantage: A Gift from the Gods."

January 15. Marc LeVier, K. Marc LeVier & Associates, Inc., SME 2023 President. Title to come.

January 22. Dan Carr, Owner/operator, Moonlight Mint, Loveland, Colo. "The Gold Confiscation of 1933."

January 29. Joel Bolduc, Land & Environment Manager, Albert Frei & Sons, Inc. "Mine Permitting in Today's World."

For more information contact Dick Beach. Tel: 303-986- 6535; E-mail: [dickbeach@alumni.mines.edu](mailto:dickbeach@alumni.mines.edu) ; Website: [www.denverminingclub.org](http://www.denverminingclub.org)





# FOUR CORNERS GEOLOGICAL SOCIETY

P.O. Box 1501, Durango, CO 81302

**MEMBERSHIP RENEWAL or APPLICATION: June 1, 2023 to May 31, 2024**



\*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>	\$30	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>	\$30	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 or Comments and Concerns.**

**Are you interested in Volunteering? If so, what is your area of interest?**

*\* 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) .**