



# *FOUR CORNERS GEOLOGICAL SOCIETY*

## *February 2024*

**WELCOME TO THE FCGS**  
**Peter Vrolijk @ FLC on February 22, 2024**

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## OFFICERS OF THE SOCIETY

### Past President:

Jeff Geslin

### President:

Chris Heine

### President-Elect:

David Gonzales

### Secretary:

Jolin Cordalis

### Treasurer:

Tom Staatz

### Newsletter Editors:

Tom Ann Casey  
& Kim Gerhardt

### Fieldtrip Chair:

Jim Corken

### Website:

Jon Harvey

## OFFICERS OF THE FOUNDATION

### President:

Mary Gillam

### Secretary:

Patti Phillips

### Director:

Cindy French

*To contact an officer click:*

<https://fourcornersgeologicalsociety.org>

# FOUR CORNERS GEOLOGICAL SOCIETY

## FEBRUARY 2024 MEETING

### SPEAKER:

**Dr. Peter Vrolijk**  
NEW MEXICO TECH

### SUBJECT:

Massive Earthquakes & Tsunamis: Contributing Factors Revealed by IODP Exp 362

### DATE:

**Thursday February 22, 2024**

### TIMES:

5:30 - 6:30 pm: Dinner and Complementary Drinks  
Chicken, shrimp, pasta, salad, desert. 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: 123536 Zoom starts at 6:30 pm

### LOCATION

**Vallecito Room**, Student Union Building  
Fort Lewis College. 5:30 -- 8 pm

### COST:

\* \$20/person. **PLEASE**, please RSVP by Tuesday, February 20th. WE NEED TO KNOW HOW MANY DINNERS TO ORDER.

\* **Go to the website** to pay 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.



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

## **Abstract**

### **Massive Earthquakes & Tsunamis: Contributing Factors Revealed by IODP Exp 362**

**Dr. Peter Vrolijk**

New Mexico Tech

This lecture is part of the Ocean Discovery Lecture Series (see [link here](#))

On the day after Christmas, 2004, the world awoke to an immense tragedy – one of the largest earthquakes ever recorded ( $M_w$  9.2) struck Sumatra in Indonesia. In the following hours and days, the tragedy grew as a massive tsunami swept around the Indian Ocean and world, inundating coastal communities with tremendous loss of life.

Our appreciation of the variability of subduction zone earthquakes has grown in the past decades and encompasses non-destructive, slow-slip earthquakes, like those along the Hikurangi margin of New Zealand, and massive, destructive tremors, like the Sumatra earthquake (and everything in between). IODP Expedition 362 sailed in summer of 2016 to evaluate whether the thick sedimentary section subducted at the Sumatra margin consists of materials that through burial and diagenetic processes could contribute to one of the largest earthquakes recorded and rupture the seafloor and trigger a devastating tsunami. We discovered a ca. 1300 m turbidite fan section (Nicobar Fan) dominated by detritus eroded from the Himalayas and deposited within 7 m.y. Early, low-temperature diagenetic reactions (opal transformations) were detected, and burial, thermal, and diagenetic modeling suggest that many diagenetic processes, like smectite-illite transformation, may be advanced by the time the sediments start subduction and may no longer contribute to overpressures created under the rapid loading of subduction. Cementation processes, like quartz cement formation, may also have begun in the section prior to subduction initiation, further contributing to an overall stronger section than found at most subduction margins. These results offer one more constraint on the myriad expressions of subduction zone seismicity.

#### Join Zoom Meeting

#### One tap mobile:

US: +17193594580,,96007209630# or  
+12532050468,,96007209630#

#### Meeting URL:

[https://fortlewis.zoom.us/j/96007209630?pwd=bkVmSld3S  
UZTRHc1UmloTDdiV3JtUT09](https://fortlewis.zoom.us/j/96007209630?pwd=bkVmSld3S UZTRHc1UmloTDdiV3JtUT09)

#### Meeting ID:

960 0720 9630

#### Passcode: 123536

#### Join by Telephone

+1 719 359 4580 US

**PLEASE RSVP**

**ZOOM LINK HERE**

passcode: 123536



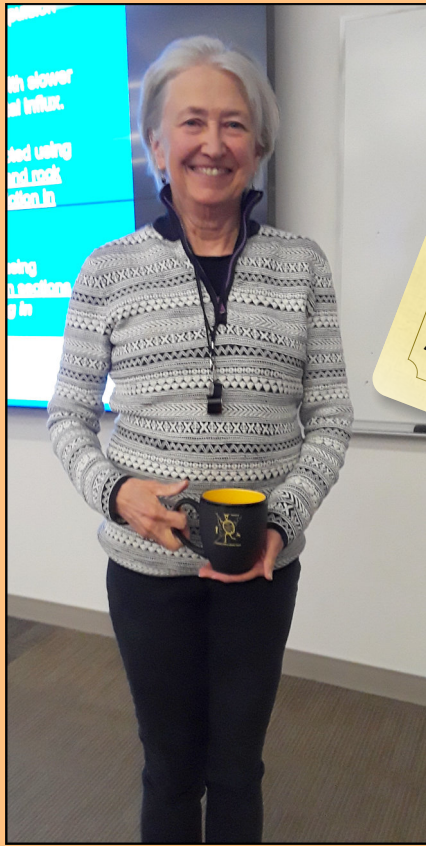


## Speaker Bio

*Peter Vrolijk is an Adjunct Professor at New Mexico Tech and pursues a number of retirement interests, including participation in IODP Expedition 362 and post-expedition research. Following B.S. and M.S. degrees at MIT and a PhD at U. C. Santa Cruz, exploring fluid flow processes in shallow subduction zones, and post-docs at Cambridge University and the Univ. of Michigan, he pursued a research career at Exxon and Exxon-Mobil, retiring in 2016 just in time to join IODP Expedition 362. Throughout his career he has worked on a wide variety of problems, encompassing methods development for fault dating, normal fault processes, and subsurface fluid flow methods, but he has always maintained an interest in subduction zone processes.*



*In retirement Peter has pursued select research projects that have afforded him the opportunity to support developing student scientists, including the Sumatra expedition and the development of autonomous underwater exploration methods on the Costa Rican subduction margin. In addition, volunteer activities in local wilderness areas and MIT undergraduate student recruitment provide opportunities for fruitful use of retirement time.*



January speaker, Dr. Kitty Milliken,  
Bureau of Economic Geology, U.T. Austin

**Save the Dates!**

**2024**

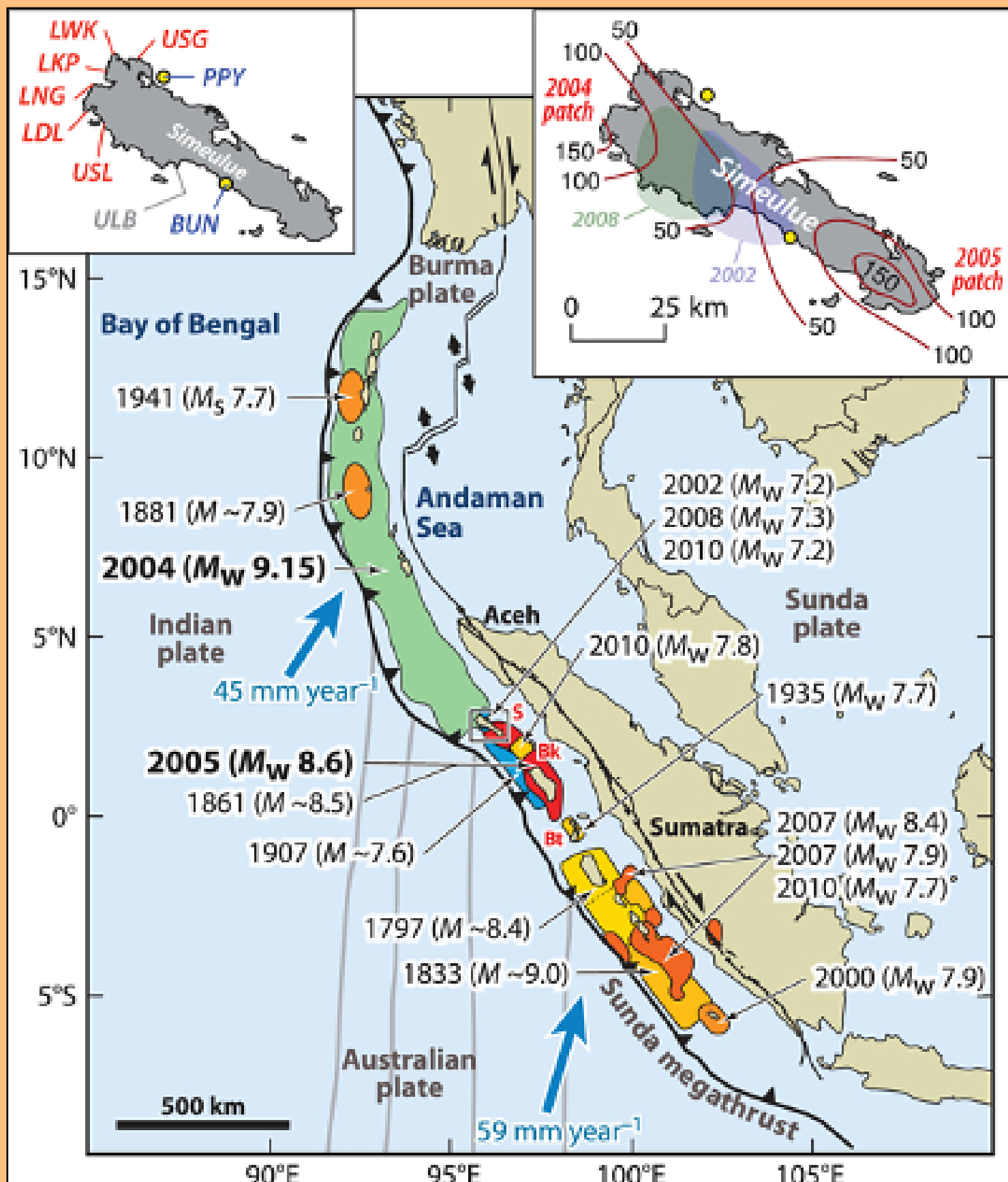
- March 28: Chip Head
- April 15: Bill Chavez
- May 16: (this is a MONDAY!)  
Doug Bartlett
- August 25: Picnic



Corona Arch, Navajo SS, Moab, Utah. Photo by Kim Gerhardt



# Dr. Peter Vrolijk





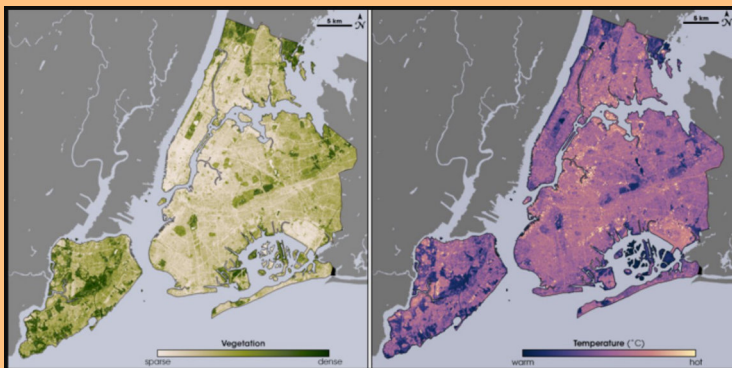
# "PREZ SEZ" by Chris Heine



Hello FCGS Members!

Urban heat islands are larger than you think... an 'urban heat island' is identified when a city

shows much warmer temperatures than rural or less developed areas. It's all about the surfaces and their ability to hold heat. Dark colors absorb heat, light colors reflect heat. In the urban setting, roofs, asphalt roads, parking lots or any dark surface holds heat. While in the rural setting, grassland, forests and farmland do not retain the sun's energy in the form of heat. All plants through transpiration act as nature's air-conditioner. New York City during the summer months, is 7°F hotter than the surrounding vegetated rural areas. 'Hot' cities require measurably more energy to 'cool' businesses and residents. Most, if not all, deaths due to overheating and dehydration are in cities. In the case of New York, 7 degrees makes a big difference.

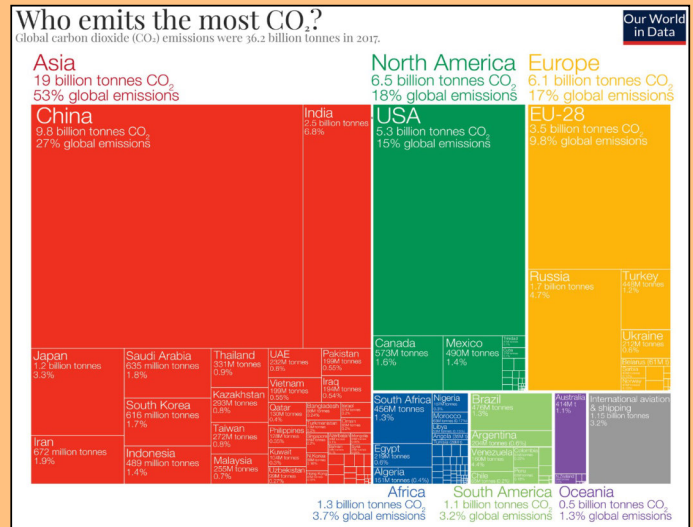
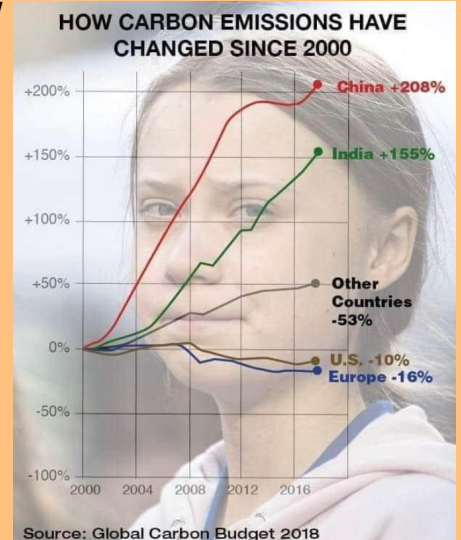


Caption: These images from the NASA/USGS satellite Landsat show the cooling effects of plants on New York City's heat. On the left, areas of the map that are dark green have dense vegetation. Notice how these regions match up with the dark purple regions – those with the coolest temperatures – on the right. Image credit: Maps by Robert Simmon, using data from the Landsat Program.

Urban areas make up less than 2% of the total global land area. Pavement and roofs make up 60% of urban areas. A study out of Greece showed by replacing roof and pavement

materials with low absorption, high reflectivity material, surface temperatures can be reduced by as much as 12°F. Of all the sun's rays hitting the earth, half is absorbed by the earth's surface as heat, the rest is

reflected or absorbed by the atmosphere. The increase in CO<sup>2</sup> along with other greenhouse gasses in the atmosphere are partially responsible for the overall global warming trend.



In conclusion, the use of low absorption, high reflection materials in all urban areas will directly reduce 'urban island' temperatures. Indirectly, the reduction of urban island temperatures will reduce the demand on electricity and reduce CO<sup>2</sup> emissions. So my question is, why do we give China and India a free pass when it comes to CO<sup>2</sup> emissions? The math just doesn't make sense.

Best regards, *Chris*





## 2024 SPRING FIELD TRIPS by Kim Gerhardt



Jim Corken, Field Trip  
Committee Chair

The FCGS Field Trip Committee are planning three trips this spring for Society members. The first is an overnight trip in April to the Harding Pegmatite Mine near Taos, NM with Dr. David Gonzales and his petrology class. The second is an afternoon in May with Dr. Gary Gianniny examining the Chinle Formation in the Animas Valley. Finally, in July it's.... *Back to the Chama!* More information below and in future newsletters and email announcements. Remember, only members of the Society can participate in fieldtrips, so please renew your membership by May 31<sup>st</sup> to stay current.

### **APRIL 20-21<sup>st</sup> – HARDING PEGMATITE MINE, TAOS, NEW MEXICO**

**DESCRIPTION:** This is a two-day trip with an overnight in Taos, NM. FCGS members will be accompanying Professor David Gonzales and his Petrology Class. The mine site, which is 34 miles south of Taos, is in a Precambrian pegmatite sill that was worked intermittently from 1918 to 1958, producing lithium, tantalum and beryllium. The owner donated the mine to UNM in 1958, and now groups are allowed to visit and collect small hand samples. Lithium from spodumene

and lepidolite has become increasingly important as it is used in rechargeable batteries for cell phones, laptops, digital cameras and electric vehicles. Other collectible minerals here include tantalite, beryl, quartz, albite and muscovite.

**DATES:** April 20-21<sup>st</sup>.

**LEADER:** Dr. David Gonzales

**LIMIT:** 20 FCGS members / 17 FLC students (the petrology class).

**TRANSPORTATION:** Carpooling for FCGS members / vans for FLC.

**LODGING & MEALS:** Being planned now.

**FEE:** TBA.

**REGISTRATION:** Will open in early March.



### **SATURDAY, MAY 18<sup>th</sup> – THE CHINLE CONGLOMERATE IN THE ANIMAS VALLEY**

**DESCRIPTION:** Participants of the *Mesozoic of Durango* trip last spring will remember looking at a caliche clast conglomerate in the lower Chinle (Dolores) Formation in Hidden Valley. This trip is a visit to the same unit, but on the west side of the Animas Valley. Participants will spend an afternoon with Dr. Gianniny measuring a section and defining a Triassic paleo-valley system through Durango that was first recognized by Dr. Bill Dickinson. Rumors are that the outing may end up at a local brewery!

**DATE:** May 18<sup>th</sup>.

**LEADER:** Dr. Gary Gianniny.

**LIMIT:** 20 participants.

**TRANSPORTATION:** Carpool.

**REGISTRATION:** Date / fee TBA.

### **FRIDAY-SUNDAY, JULY 26-28<sup>th</sup> – BACK TO THE CHAMA RIVER!**

**DESCRIPTION:** Our Chama float trip with F.L.O.W. was cancelled last summer when dam repairs diminished the water flow. We're back again this year with NMBGMR geologists Drs. Paul Bauer and Matt Zimmerer, who recently published a new geologic guidebook of the Chama, as trip leaders. We'll run the river from below the El Vado dam through the designated Wild and Scenic River section to the Big Eddy take-out above Abiquiu Reservoir.

**DATES:** July 26-28<sup>th</sup>.

**LEADERS:** Dr. Paul Bauer and Dr. Matt Zimmerer, NMBGMR.

**LIMIT:** 15 total. Planning on 2 trip leaders, 13 participants.

**TRANSPORTATION, LODGING & MEALS:** Included in FLOW package. Participants will travel in FLC vans from Durango and back. Participants bring some of their own personal camping gear.

**FEE:** TBA

**REGISTRATION:** TBA, but last year's cancelled participants will be offered a brief early registration period before it opens up to the rest of the FCGS membership.





# FCGS NEWS YOU CAN USE!

## A Message from the Foundation

### Four Corners Geological Foundation News, by Mary Gillam

It's been a busy month for the Foundation board. We're excited to update you on our activities and also to thank several members for their recent donations.

- ▶ **UPDATE TO FOUNDING DOCUMENTS:** We've been collaborating with the Society on changes that need to be made to the FCGS Constitution and Bylaws to make it compliant with the structure of the new Foundation. We're planning on publishing these revisions in the March Newsletter and asking members to approve them by vote at the March meeting.
- ▶ **GRANT TO FLC GEOLOGY CLUB:** We gave \$350 to Fort Lewis' Geology Club for its recent field trip to the Tucson Gem and Mineral Show. Ask the students about this adventure!
- ▶ **MS THESIS GRANT PROGRAM:** We're continuing to accept applications for MS thesis grants until March 1. More information is available at <https://fourcornersgeologicalsociety.org/scholarships/>.

If you know a Master's candidate who's doing geological research in Colorado, New Mexico, Utah or Arizona, please pass the word.

- ▶ **DONATIONS:** **Thank you donors!!** We gratefully thank several recent donors for helping to support these programs (remember, no donation is too small). To make a donation please see our page on the FCGS website: <https://fourcornersgeologicalsociety.org/foundation/>.

- ▶ **TREASURER OPENING:** Finally, we say goodbye to our former Treasurer and Vice President, Gordon Greve. We're still looking for a replacement so please let us know if you'd consider joining our board. Meanwhile, Mary Gillam is serving as President and Acting Treasurer, Cindy French is Acting Vice President, and Patti Phillips continues as Secretary.



## New Mexico Geological Society Student Scholarships

Scholarship applications for 2024 Grants-in-Aid, Research Awards, Geochronology Awards, and Graduate Mentorship will be accepted until midnight on Friday, March 8, 2024 via the on-line [NMGS scholarship application portal](#).

NMGS grant, research, and mentorship awards are awarded to undergraduate and graduate students enrolled in New Mexico institutions whose proposed projects are located in New Mexico (or the surrounding region for the Cearley Geochronology Award). Project areas and students enrolled in colleges outside of New Mexico are not eligible for funding. Details of the award amounts, including proposal requirements and evaluation criteria, can be found at <https://nmgs.nmt.edu/scholarships/awards/competitive.html>.

Graduate students may apply for the Graduate Grants-in-Aid (maximum award of \$2000 per student), the Cearley Geochronology Award (maximum award of \$2,000 per student) and the Graduate Mentorship Award (maximum award of \$1,500 per student). The top-ranked graduate proposal will be awarded the Frank E. Kottlowski Research Award (\$5,000 award); the second-ranked

graduate proposal will receive the Cearley Graduate Grant-In-Aid (\$5,000 award). Please note the Cearley Grant-In-Aid and Cearley Geochronology Award are different awards with different values.

Undergraduate students may apply for both the Lucille H. Pipkin Undergraduate Research Award (maximum award of \$1,500 per student) and the Cearley Geochronology Award (maximum award of \$2,000 per student). The top-ranked undergraduate proposal will be awarded the Cearley Undergraduate Grant-In-Aid (\$2,500 award). In the absence of a highly-qualified undergraduate proposal, the Cearley Undergraduate Grant-in-Aid (\$2,500) will be awarded to third-ranked graduate students.

Students who have received funding in the past should make sure to include a progress report in their 2024 application detailing work completed to date and a summary of any results.

If students or their advisors have questions concerning the 2024 Grant-In-Aid and Research Award application process, please do not hesitate to contact the NMGS Scholarship Chair at [susan.lucaskamat@env.nm.gov](mailto:susan.lucaskamat@env.nm.gov).







# 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) .**