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Promoting public interest and educational support in the geological sciences

The Geological Society of Minnesota News

Volunteer opportunities, field trips, lectures, and public service, since 1938

From the President's Desk…

Greetings! Already this winter, we have survived our coldest temperatures in almost 4 years, and hopefully coldest of this winter, but very little snow. We would need to travel much farther south for that. And no vicious wildfires as in southern California.

I want to welcome **Dan Japuntich** to our Board. He was elected at our Annual Meeting in September, replacing **Pete Hesse**. Dan has served on the Board in the past and we welcome him back. I want to thank Pete for completing two terms (four years) serving on our Board. At the same meeting, **Dick Bottenberg**, **Kate Clover**, and **Steve Willging** were re-elected to second terms on the Board. At the November Board meeting, we elected Society officers. Besides me as President, **Deborah Naffziger** was re-elected as Vice President, **Dave Kelso** as Treasurer, and **Stephen Willging** as Secretary. All terms started January 1. Our full Board membership appears on Page 2, along with many other important roles that do not require Board membership. I look forward to working with all of these persons, and all of you, to advance the mission of GSM, which has now been in existence for 87 years, since 1938.

I want to again thank our Program Director, **Steve Erickson**, for once again putting together a compelling program of in-person and remote speakers. Note that two lectures (Feb. 24 & March 10) are online via Zoom. And a highlight of each winter is our Saturday morning lab at Macalester College, conducted by **Jeff Thole** on Feb. 10. This year's topic is "The Crystallography of Common Rock Forming Minerals." Consider bringing school-age children to this one, as it is very hands-on and there are many museum-quality exhibits in Olin Hall.

Reviewing our lectures from last fall: We presented six lectures with 330 total attendance, thus 55 average attendance. We had an impressive 19 persons identify as new attendees (mostly at the banquet), many of whom became members. This attendance compares to a total attendance of 331 for fall 2023 (essentially flat), with 12 new attendees. The fall 2024 figures do not include the cancelled December lecture, due to family illness. As a substitute, we screened the first three lessons (90 minutes) of Ford Cochran's well-done video "The Great Courses: Wonders of the National Parks: A Geology of North America," which 26 of us attended.

I want to thank all members who brought cookies this past fall or will supply them. Cookie break is a cherished GSM tradition that is only possible through our members' contributions.

A highlight of January was our winter party, generously hosted on the 11th by **Frank & Roxy Janezich**. After the Board at our November meeting decided to move the annual party from December to January, Roxy & Frank realized that hosting would fit into their calendar. The party was potluck and all attendees brought tasty dishes from appetizers to desserts. Roxy reported that about 30 members attended. A few of my photos of the event appear in

GSM President, David Wilhelm

Inside this issue:

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GSM Field Trip to New Ulm, Mn, June 1946.

this issue. Hosting such a party takes considerable effort, and I personally want to thank the Janezichs for stepping up to keep this fun GSM activity alive.

GSM has a large array of geological markers throughout this state. As I reported last quarter, **Becky Galkiewicz** resigned recently as head of the marker project. I am happy to report that **Dick Bottenberg** has stepped up to head this committee. He is joined by **Dan Japuntich**, **Alan Smith**, new GSM member **Patrick Steury**, and Becky herself. Thanks to all of you for your past and future efforts on this project. Everyone else, go to our website for an interactive map with the markers' locations, descriptions, and photos, especially if you will be travelling within our fair state. Should you find any discrepancies, please report them to one of these persons.

And a special shout-out to **Joanie Furlong**, our membership chair, for maintaining our database of members. Each of you should have recently received a copy of our printed 2025 Membership Directory; Joanie has been putting those together for many years so that our members can easily stay in touch. If you see any errors or your information changes, please let Joanie know as soon as possible.

Finally, this Newsletter, ably edited by **Kate Clover**, **Mark Ryan**, **Harvey Thorleifson**, and **Rich Lively**, is by GSM members for GSM members. Consider submitting an article to the editors about a place you visited, a geological experience from your childhood, something you read, or whatever you think might pique the interest of your fellow enthusiasts.

Keep on rocking!

David Wilhelm

GSM

2025 Board of Directors:
David Wilhelm, President
Deborah Naffziger, Vice President
Dave Kelso, Treasurer
Stephen Willging, Secretary

Board Members: Roger Benepe; Dick Bottenberg; Kate Clover; Lowell Hill; Dan Japuntich

Field Trip Coordinator: Joe Newberg; David Wilhelm

Geological Markers: Dick Bottenberg (chair); Patrick Steury; Alan Smith; Rebecca Galkiewicz; Dan Japuntich

GSM Outreach: Open

Lecture Recording: Dick Bottenberg; Lowell Hill; Joe Wright

Liaison Officer: Dave Wilhelm

Membership: Joanie Furlong

Newsletter: Kate Clover; Mark Ryan; Harvey Thorleifson; Rich Lively

Programs/Lectures/Labs: Steve Erickson

State Fair: Patrick Pfundstein

YouTube Administrators: Patrick Pfundstein

Video Library: David Wilhelm

Webmaster: Alan Smith

Web Site: gsmn.org

The Geological Society of Minnesota is a 501(c)3 nonprofit organization.

GSM Mail Address: Send all GSM membership dues, change of address cards, and renewals to: Joanie Furlong, GSM Membership Chair, P.O. Box 141065, Minneapolis, MN 55414-6065

Membership categories and dues:

Student (full time)	$10
Individual	$20
Family	$30
Sustaining	$50
Supporting	$100
Guarantor	$250

Individual and Family memberships can be renewed for 1, 2, or 3 years. Members donating at the Sustaining, Supporting or Guarantor levels will have their names highlighted in the GSM membership directory.

GSM News: The purpose of this newsletter is to inform members and friends of activities of interest to the Geological Society of Minnesota. GSM News is published four times a year during the months of February, May, August and November.

Newsletter contributions welcome: GSM enthusiasts: Have you seen interesting geology while traveling? If so, please consider sharing your experiences with others through our GSM Newsletter. Write a short article, add a photo or two and send it in. Deadline for submission is the first of the month before the publication date. Send your story to newsletter editor: Kate Clover, kclover@fastmail.fm Thank you in advance.

GSM Board Membership:

The GSM Board consists of members who have a special interest in advancing the goals of the society, including lectures, field trips, and community outreach. The Board currently has ten members, and our bylaws

limit terms to four years to encourage turnover, and a change of perspectives and ideas.

The Board meets quarterly, on the second Thursdays of February, May, August, and November, or on a different date if conflicts arise. In-person and Zoom meetings are from 7 - 9 pm. Meeting location will be announced close to the meeting date. Board meetings are open to all GSM members. If you are a new or long-time member and Board membership is of interest to you, please consider attending a meeting. If you have a topic you would like the Board to consider, please contact David Wilhelm, dewilhelm53@msn.com

Welcome New Members!

Ken and Paula Justich, St. Paul, MN

GSM currently has 166 members

Notes from the Past

From the Spring and Summer 1966 edition of The Minnesota Geologist, Official Bulletin of the Geological Society of Minnesota:

Geological Society of Minnesota Installs Bronze Tablets

Plans for installation of thirty-two educational bronze tablets throughout the State of Minnesota have now been completed, and the tablets have been installed. This is a project supervised and directed by Mr. Lawrence W. King, a charter member of the Society. The tablets explain the geological significance of the areas in which they are placed. If and when another location is found suitable for an additional tablet, arrangement will be made for its installation.

In Memory of Fran Corcoran

Fran, age 74, passed away peacefully on November 28, 2024. Francine Mary was born on December 15, 1949 in Arcadia, Wisconsin. She graduated from La Crescent High School in 1967. She attended Winona State University and graduated in the spring of 1971 with majors in both Speech and Theatre Arts and a minor in Philosophy.

She was active in many organizations and was a long-time GSM member, board member, and served as president for one year circa 1989.

Read her full obituary: https://www.hastingsmnfuneral.com/obituaries/Francine-M-Corcoran?obId=34213911

This 4-minute audio about Fran aired on NPR in 2005: https://www.npr.org/2005/07/11/4748474/going-on-walkabout-in-minneapolis

GSM's 2025 Winter Party

Frank and Roxy Janezich hosted the GSM's Winter party on January 11th.

Good food. Fine Company. Dave Wilhelm's delicious cheesecake made an appearance too. Here are some photos from the event. Photos by David Wilhelm.

Winter – Spring 2025 GSM Seminar Schedule

Except as noted, in-person lectures are 7 PM CT at U of Minnesota, Keller Hall, Room 3-230.

February 10, 2025: "Soils: The Most Undervalued and Overlooked Geologic Resource" ***Holly Dolliver***, Ph.D., Department Chair of Plant and Earth Science, U of Wisconsin, River Falls.

February 15, 2025: Saturday Lab, 10 am - noon. Macalester College. "The Crystallography of Common Rock Forming Minerals." ***Jeff Thole***, M.Sc., Geology Laboratory Supervisor and Instructor at Macalester College. **NOTE:** If you have rocks or minerals you would like Jeff to analyze, please bring them to the prior lecture. We will pass them on to Jeff. With your specimen, include your name and the location where the specimen came from.

February 24, 2025: Zoom Lecture. 7 pm Central "Greatest Mass Extinctions in Earth's History" ***Rachel Phillips***, Ph.D. (GEO GIRL), Postdoctoral Researcher and Instructor, University of South Carolina.

March 10, 2025: Zoom Lecture, 3 pm Central. "Iron-ore in Minnesota: Geology and the Industry." ***Joyashish Thakurta***, Ph.D., Research Manager, Natural Resources Research Institute. **NOTE:** This talk is at 3pm, not the regular 7pm.

March 24, 2025: "Earthquake Hazards" ***Stephan Delong***, Ph.D., USGS, and Adjunct Prof, University of Minnesota.

April 7, 2025: "Ancient Seas, Modern Thrills! Journey Through Minnesota's Paleozoic Geology" ***Andrew Retzler***, M.Sc., Phanerozoic Geologist, Minnesota Geological Survey.

April 21, 2025: "Stromatolite Morphology and Diversity - How did (mostly) brainless pond scum build large, complex structures?" ***Julie K. Bartley***, Ph.D., Professor, Gustavus Adolphus College.

May 5, 2025: Spring Banquet. U Garden, 2725 University Ave. SE. Minneapolis. Dinner 5 - 7pm. Lecture at 7 pm. "Bemidji and Bemidji West (Pearl Harbor)" ***Jared Trost***, M.Sc., hydrologist with Upper Midwest Water Science Center, USGS.

Carrara Marble
Story and photos by Dave Wilhelm

During Sept/Oct 2024, I had the pleasure of taking the Rick Steves two-week “Village Italy” tour through the northern part of the country. It started in Padua, proceeded south on the east side of Italy to Montefalco, crossed the Apennines to Orvieto, then went north to Lake Orta. It was a wonderful trip during an ideal time of the year; if you are considering a trip there, feel free to contact me for suggestions. This article covers what we did on Day 11, when we visited an open-air museum featuring marble quarried near Carrara.

First, the basics: Marble is a metamorphic rock consisting of carbonate minerals (most commonly calcite ($CaCO_3$) or dolomite ($CaMg(CO_3)_2$) that have recrystallized under the influence of heat and pressure. The resulting marble rock is typically composed of an interlocking mosaic of carbonate crystals. Primary sedimentary textures and structures of the original carbonate rock have typically been modified or destroyed. It has a crystalline texture, and is typically not foliated (layered), although there are exceptions. Marble is commonly used for sculpture and as a building material.

Pure white marble is the result of metamorphism of a very pure (silicate-poor) limestone or dolomite. The characteristic swirls and veins of many-colored marble varieties, sometimes called striations, are usually due to various mineral impurities such as clay, silt, sand, iron oxides, or chert which were originally present as grains or layers in the limestone. These various impurities have been mobilized and recrystallized by the intense pressure and heat of the metamorphism.

Carrara marble (Luna marble to the Romans) is a type of white or blue-gray marble popular for use in sculpture and building decor. It has been quarried since Roman times in the mountains just outside the city of Carrara in Lunigiana, the northernmost tip of modern-day Tuscany. The Apuan Alps above Carrara show evidence of at least 650 quarry sites, with about half of them currently abandoned or worked out. The Carrara quarries have produced more marble than any other place on earth. The pure white statuario grade was used for monumental sculpture, as it has a high tensile strength, can take a high-gloss polish and holds very fine detail. By the late 20th century Carrara's highest-grade marble had run out; the considerable ongoing production is of stone with a greyish tint, or streaks of black or grey on white. This is still attractive as an architectural facing or for tiles.

The marble from Carrara was used for some of the most remarkable buildings in ancient Rome, including the Pantheon, Temple of Proserpina, Trajan's Column, and Column of Marcus Aurelius. Many famous sculptures of the Renaissance were carved from it, including Michelangelo's David, Moses, and Pietà. The Renaissance master was intimately familiar with the marble quarries near Carrara, where he traveled to select raw materials. Among many Renaissance buildings of Carrara marble is the Siena Cathedral (mid-13th century), which I had admired just a few days earlier.

Part of Siena Cathedral facade

We arrived by bus at Fantiscritti, the open-air quarry museum in the heart of the Carrara marble country. It was raining lightly during our visit, but we were dressed for it. On

Open Carrara marble quarry adjacent to the museum

As we listened in the rain, our local guide explained the quarry operation.

our drive to the quarry, we passed towering cliffs of exposed marble, from both working and abandoned quarries. The quarry faces are unnaturally white, resembling snow from a distance.

Oxen drawing a cart of marble

The museum itself focuses on the history of marble quarrying in the area, which has been going on since Roman times. Near the entrance are life-size sculptures of quarry workers from the past, when hand tools and draft animals were the latest technology. Further back are many of the hand tools that were used. These include a large two-person handsaw for forming blocks; it could cut less than a centimeter a day. At that rate, it took months to shape a large block. Our local guide, Stefania, led us through all of it, explaining the labor-intensive processes and the dangers of the work

Il Quadratore - specialized worker who squares blocks with mallet & chisel

Handsaw - could cut less than one cm per day

By the late 19th and into the early 20th century, mechanically powered tools were introduced. Those sped up the labor considerably; we also saw samples of those devices. Just outside the museum, we saw large blocks of marble and machines in current use, including dump trucks, front-end loaders, a large crane on tracks, and water-jet cutting equipment.

Our visit, of course, included the gift shop, which was a delight to explore. There were miniature versions of famous marble sculptures, translucent lamps made of thin marble, and kitchen utensils such as rolling pins and mortars & pestles. Curiously, the shop also sold lard locally produced from wild boars.

Pins to fracture marble

It was quite a treat to visit the site where many famous buildings and sculptures started. As always, I took lots of photos. To see more, go to https://t.ly/p65Mz

Crane on tracks for shifting marble blocks

Large dump truck hauling scrap marble

Miniatures of classic statues for sale in gift shop

Murphy's Law in the Arizona Desert

Patrick Steury

Here in the heartland it seems we have control of the world, crossing the land with roads and bending the soil to our will to grow trillions of calories from just minerals, water, and air. But the west can remind us how unstoppable the Earth is. Vast badlands, mountains, eruptions, seas long gone - all tangible in a breathtaking way. I explore the west whenever I can. So in October 2023, my friend Turner and I joined a twelve-person geology field trip to Nevada and Arizona, having

enjoyed a trip to New Mexico and West Texas the year before.

We arrived in Las Vegas in two groups, and we in the first group visited the Atomic Museum, which was good but not quite up to expectations. Soon, we all were in vans and on our way to Hoover Dam and our first geology stop looking at welded volcanic ash and faults next to the visitor center. The Hoover Dam is an incredible feat of engineering, and I recommend a tour of its inner workings if you go.

We entered Arizona and had the best tacos we ever had at JJ's in Kingman. We then camped at Hualapai Mountain Park Campground, nestled in the cool and dry pines in the sky island of the Hualapai range. The mountains expose granites and gneisses around two billion years old. We navigated the steep roads after dark and pitched tents in the headlight glare.

We got an early start in the morning, three hours down I-40 towards Flagstaff. We stopped in Seligman on Route 66, which claims to be the inspiration for Radiator Springs in the Cars movie, on the way to the campground north of Flagstaff. We were all set to see Meteor Crater and the Petrified Forest after a stop at the volcanic complex to see a little cinder cone – an ambitious agenda from which we returned well after dark – one of several glitches on our trip.

Some really neat structure in the basalt on the crater rim. Most of these rocks are bombs that were violently ejected during the eruption.

We hiked to the summit and saw boulders of basalt littering the rim of the crater and red-brown scoria gravel filling every gap. A few plants eke out a feeble existence in the cracks. To the north lies a large lava flow, which erupted from the fissure at the time of the volcano's formation about 6000 years ago. The other peaks of the San Francisco volcanic field lie off to the west, and the rugged BLM dirt tracks we crossed to get there revealed themselves with binoculars. In the east is more lava flows, much older, and the valley of the Little Colorado River.

The summit of SP Crater, looking north towards the lava flow

The plan for the next day was Grand Canyon, which was super exciting. We arrived there in the early afternoon, after replacing a broken-down van. The line to enter took an hour and then we set loose on the place and had a pretty fun time. The stratigraphy of the canyon was fascinating, and we were looking forward to getting to drive down to the bottom, stopping at each layer along the way the next day. One thing in particular stood out to me at the south rim- the almost complete absence of railings. It was explained to me that they sort of adopted a European philosophy- if you put up railings, people will climb over them to get that "perfect shot" and fall off the edge even more frequently.

Van problems. Note the horizontal scrapes on the side. Our ill-advised route took us, in some cases, directly though the foliage.

We walked the rim for a couple of hours, taking notes and making sketches where we had sun.

As sunset came, people flocked to the rim for their once-in-a-lifetime pictures, and we set off before the inevitable congestion. We arrived after dark in Peach Springs, another small town on Route 66 that claims to be the inspiration for Radiator Springs, with all the relevant Cars cutouts and merchandise in the gas stations.

Our lodging was a grass and gravel lot in front of a motel, and we rented one room so we could take turns showering. It was a pretty good system and by midmorning we were all ready to go, having made sandwiches to pack away for our first real field work. Peach Springs is the tribal headquarters of the Hualapai Reservation, an 1100 square mile reservation whose northern border is the western section of the Grand Canyon.

We had permits to camp on their land and proceeded down the fault-formed Hualapai Canyon, from the plateau all the way down to our campsite on the Colorado River. The drive was pleasant and we stopped repeatedly at each layer to look at it close up and search for fossils. We had a small lunch at the Great Unconformity, where the Tapeats Sandstone lies atop the Vishnu Schist. What makes this unconformity so great is the vast gulf of missing geologic history between those two layers due to erosion after the older layer's formation prior to the Tapeats Sandstone sticking around. The unconformity, which you can place one hand on each side of, represents a gap of 1.2 billion years. More than 25% of the entire history of the planet has been wiped away between those two intervals of geologic time. To think that the younger layer, the Tapeats Sandstone, is still half a billion years old is difficult to even comprehend.

With lunch eaten and fossils found, we progressed into the steep lowest part of the valley in the Vishnu Schist. It was considerably hotter down there, and the first thing we did after claiming tent sites was jump in the river. It

A large prickly pear cactus in the Hualapai Valley, descending towards the Grand Canyon floor.

Punta Pozuelo Beach is located on Puerto Rico's south coast between Salinas and Guayama. Photo by Leo Kenney

was a terrific afternoon, and we spent most of it in the river finding eddy currents to float in lazy circles in. When the sun dipped below the canyon walls things cooled off and we assembled for dinner- with nothing left to save for tomorrow except a few granola bars. The crescent moon rose above the canyon rim as the stars emerged and we settled in for our last night. This would have been cozy and peaceful were it not for the winds that swept down the canyon and blew into our tents, coating everything and everyone in a fine layer of static-clinging sand. It was a coarse night's sleep.

Most had early flights back home, except me. I was off to Albuquerque to start another unforgettable trip for the annular solar eclipse in a couple days. The vans were returned and all was generally rosy. It was a trip to remember and not all for good reasons, but I'm confident that lessons about preparedness were learned. Turner indicated it would be his last geology trip, but six months later we had a terrific adventure with erupting volcanoes, glacial tremors, and every kind of basalt under the sun and much more. I think the fun of geology for many people is not even realizing how much you've learned. It has a magnetic power to keep us all grounded and aware that the planet is doing its own thing without us, and it's been grinding along for a very, very long time.

Author's note: Patrick Steury graduated from North Carolina State University in 2024 with degrees in Industrial Design and Geology. He's actively looking for work in the geosciences, but is now working at a country bed and breakfast and substitute teaching. Throughout his life, he's loved traveling to weird places and learning about them!

Vicarious Travels: Punta Pozuelo Beach, Puerto Rico

It's the dead of winter in Minnesota, and I'd like to take you to someplace warm. Let's take a vicarious trip to the Punta Pozuelo Beach, on Puerto Rico's south coast. We'll check out the grains found in the beach sand. This is a quiet stretch of shoreline; the water is shallow, and it's not a beach for swimmers (that beach is around the point). As I wade into the shallow water, I register – the water is bathtub warm on April 8. . . .Kind-of scary warm! I park that idea away and scoop up a handful of sand where the gentle waves lap the shore. It's coarse grained sand. With a reef along the shore, I expect an assortment of biogenic grains. But not until I view this sample under the microscope do I see the variety of biogenic species present and the beauty of the sample.

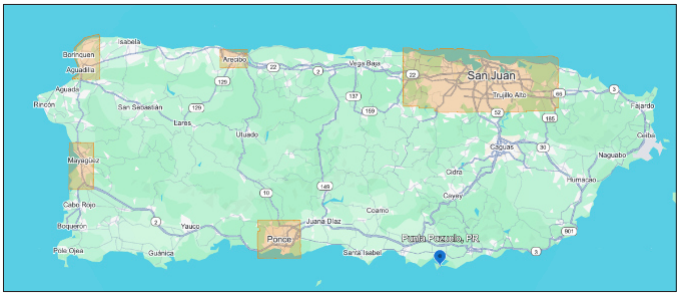
Here's more information: Jobos Bay on Puerto Rico's southern shore is recognized for its habitat diversity: coral reefs; mangroves; seagrass beds and estuaries. The bay is rimmed by a peninsula and a chain of small islands. Tucked between the reef and mangrove cays, this bowl-shaped beach features grains from both the land and sea.

Mermaid's Fan Seaweed. Padina is a genus of brown macroalgae. Inhabits tropical regions. Photo by Kate Clover

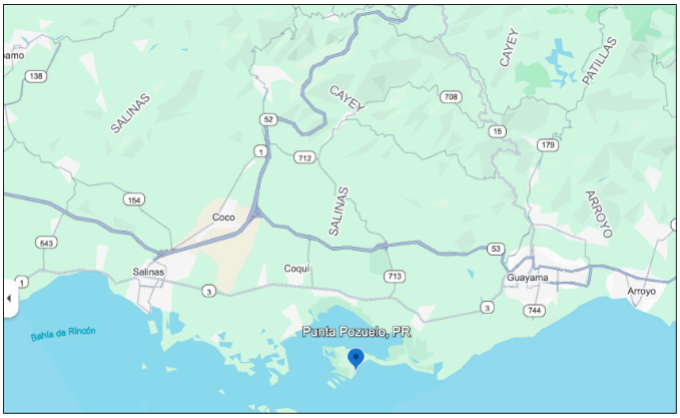
Lithic grains here reflect Puerto Rico's geology where carbonate rocks overlay volcanics. Biogenic grains reflect nearby reef and estuary habitats. The green nerite snail is an algal grazer while the high spired snails feed on detritus. The brownish U-shaped fragment, a vermetid snail, attaches to hard surfaces and feeds using mucus nets. The glassy oval near center and ribbed fan shape, center top, are bivalve remains. Large chalky flakes with porous interiors are blades from coralline alga Halimeda. Swirled discs with tight rows of pores are forams like Heterostegina. Brick-red chunks are Homotrema, an incrusting foram.

Sea urchin parts include the urchin skeleton fragment (bottom left) with the pores and the raised tubercle that once supported a moveable spine. Other fragments of urchin spines are green, purple, and tan and show longitudinal grooves.

Punta Pozuelo Beach. Photo by Kate Clover



Google map of Puerto Rico. Punta Pozuola is pinned on the south shore.



Puerto Pozuola Beach is located between the towns of Salinas and Guayama. Google map.

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