



# THE GEOLOGICAL SOCIETY OF MINNESOTA

# News

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

### From the President's Desk...

The snow and ice have finally left us, the rivers are receding, and the sun is warming everything up. It's time to strap on the boots and head out to your favorite rock pile and start collecting again. Summer is upon us. If not rocks or fossils, I challenge you to seek out some interesting geology this summer. Plus, Randy Strobel and Joanie Furlong are planning both a local field trip in June and a week-long field trip to the Missouri Ozarks, probably in October. So please look for more information on those trips in your email and read the field trip teasers elsewhere in this newsletter.

The lectures in the second half of our 2022-2023 series were fantastic. Thank you, Steve Erickson, for a job well done! Going forward, Steve is planning on having one to two Zoom lectures each semester. This is great as we get to hear from presenters from around the country who we would not have the chance to host in person. He is planning on having Zoom lectures during the bad weather times when we might not be able to make it in to the University. Broadcasting the lectures by Zoom worked well; it enabled distant members to attend as well as members from other societies we've partnered with, including the Rochester Academy of Science and the State Microscopical Society of Illinois.

Past lectures can be found on the Geological Society of Minnesota's YouTube channel. So if you missed one or want to see it again, now you can. Thank you Patrick Pfundstein.

<https://www.youtube.com/@geologicalsocietyofminneso3363>

I also want to thank Kate Clover, Mark Ryan, Harvey Thorleifson, and Rich Lively for putting together such a great newsletter. Remember, Kate is always looking for stories for the newsletter. So, if you see something interesting, snap a couple of photos, and write a couple of paragraphs.

Don't forget the State Fair is right around the corner, and the GSM booth will need to be staffed. It is a really fun time. Sign-up opportunities will be showing up soon, so please reserve your times before anyone else gets your spot!

I was sorry to hear of Doug Zbikowski's passing in March. He was a strong advocate for promoting the GSM and geology around the state. You can read more about his contributions in this issue of the GSM News.



GSM President, Roger Benepe

Roger Benepe

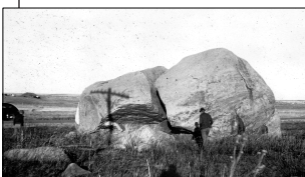
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*Glacial erratic, Hwy 7, East of Odessa, GSM Field Trip Odessa, Minnesota, 1939*



**GSM**

**Board of Directors:**

Roger Benepe, President  
 Patrick Pfundstein, Vice President  
 Dave Kelso, Secretary  
 Dave Kelso, Treasurer

**Board Members:** Dick Bottenberg; Kate Clover; Pete Hesse; Deborah Naffziger; John Westgaard; Steve Willging.

**Field Trip Coordinator:** David Wilhelm; Joe Newberg; Nancy Jannik

**Geological Markers:** Rebecca Galkiewicz

**GSM Outreach:** Joel Renner

**Lecture Recording:** Deborah Naffziger; Dick Bottenberg

**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, Randy Strobel

**Video Library:** David Wilhelm

**Webmaster:** Alan Smith

**Web Site:** [gsmn.org](http://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:**

<b>Student</b> (full time)	\$10
<b>Individual</b>	\$20
<b>Family</b>	\$30
<b>Sustaining</b>	\$50
<b>Supporting</b>	\$100
<b>Guarantor</b>	\$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](mailto: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 meetings are from 7-9 PM at the Minnesota Geological Survey at 2609 W. Territorial Rd, St. Paul, MN 55114.

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 Roger Benepe, [rbtrilobite@gmail.com](mailto:rbtrilobite@gmail.com)

**Welcome New Members!**

Syd Pearson, Savage, Mn.

**Summer Field Trip Teasers**

Randy Strobel and Joanie Furlong

**Missouri Ozarks Field Trip**

Randy Strobel and Joanie Furlong are arranging for a GSM field trip to the Missouri Ozarks; the tentative dates are October 15-22. Sites to be visited include Precambrian igneous rocks in the St. Francois Mountains, historic mining sites in the Old Lead Belt, karst features (caves, springs, sinkholes, etc.) in the Springfield Plateau, and earthquake hazards in the Missouri Bootheel. Randy and Joanie will be scouting the trip this summer. Watch your email for signup information and a detailed agenda sometime mid-summer. This link is a Google Map with several sites being considered for the field trip: <https://goo.gl/maps/N38stwF9nmqimjm66>

**Fens and Springs in Savage, Minnesota**

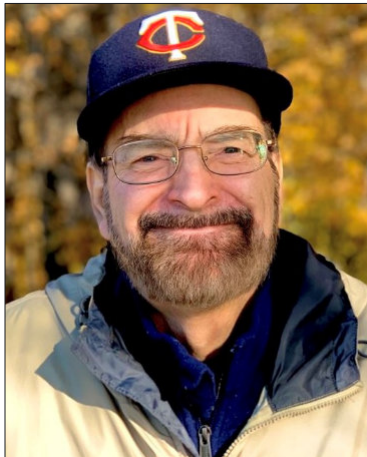
A Sunday afternoon field trip is being planned to visit fens and springs in Savage,

Minnesota. The tentative date is June 4 and as soon as the field sites are no longer flooded, the date will be finalized. Sites to visit include Eagle Creek AMA (Aquatic Management Area), Boiling Springs, and Savage Fen SNA (Scientific and Natural Area). Watch your email for details.

For information on Eagle Creek AMA and Boiling Springs, please see this [file](#).

<https://lowermnrriverwd.org/application/files/7016/5593/4836/EagleCreekWebpageV11.pdf>

### In Memoriam: Doug Zbikowski



Doug Zbikowski

We are sad to report that Doug Zbikowski, past GSM President and leader, passed away 25 March in Phoenix from heart failure. Along with serving as President from 1994 to 1996, Doug served as Vice President, led the Publicity & Public Service Committee for many years and was the driving force behind a major phase of the GSM's showcase Geologic Marker Project (geologic interpretive plaques).

Doug established and led a partnership with various State organizations including, MnDOT, DNR, the Minnesota Historical Society and the Minneapolis Park Board to design,



Doug beside a bronze marker that he led the installation of at Frontenac State Park. Photo by Barb Kordenbrock

manufacture and install new plaques across Minnesota. Doug oversaw installation at places of interest such as Mille Lacs, Winona, the St. Louis River in Duluth, Frontenac State Park and Split Rock Lighthouse State Park. (A complete list of GSM Geologic Markers can be found on the GSM website.) While many of the installations were bronze plaques, Doug introduced the use of acrylic plaques. This innovation added color, the use of graphics and significantly increased the information and appeal of the geologic interpretive plaques.



Doug and Ed Steffner beside an acrylic marker that they led the installation of at Split Rock Lighthouse State Park. Photo by Conrad Zbikowski

Additionally, Doug founded the GSM's Student Outreach program. Considered a win/win program, Macalester College geology graduate students made presentations in Metro area classrooms and to other organizations.

As a result, these educational environments received a top-notch presentation and hands-on experience with rock and mineral samples. In addition, the teachers in these classrooms received rock boxes containing eighteen varieties of Minnesota rock specimens, a tradition also started by Doug Zbikowski. The Macalester geology students received a small honorarium and the chance to experience what it is like to teach elementary and middle school students. Unfortunately, due to COVID-19, the program had to be suspended.

Moreover, the Geological Society has been a standard fixture at the Minnesota Earth Science Teacher Association Conference (MESTA) for many years due to Doug. As a result, the MESTA Conference gave the GSM lectures, field trips, and programs more exposure to educators.

Doug was very generous. He was a lifetime donor and incredibly proud of his work with the Geological Society of Minnesota. Doug was innovative; he worked hard, expected the best, and represented the GSM well. He will be greatly missed.

Dick Bottenberg and Theresa Tweet

### GSM Member Profile: Pete Hesse



**1. How long have you been a GSM member? What got you involved? Why do you stay involved?**

I became a member in 2017 after attending a GSM lecture. I not only enjoyed it, but it sparked an interest that had been dormant in me.

**2. Have you served on the GSM board or held any offices? If yes, what years? Were you involved in any projects, or initiatives?**

I am currently serving on the GSM board. Most of my involvement up to now has been staffing the

GSM booth at the State Fair (2 years). I also staffed the booth at the rock and gem show last fall.

**3. What sparked your interest in geology? Was there a particular event? A person? A place? A circumstance? A rock or fossil? What interests around the geosciences do you have today?**

I'm a ranger (born in Hibbing) but spent nearly all of my formative years in other places, mainly Michigan and South Dakota. What kept my connection to the state were the yearly summer visits at my grandparents' cabin on a small lake in southeastern Pope County. I learned about the Alexandria moraine from my mom (a geology enthusiast as well), in the heart of which our lake cabin

was situated. The rolling hills topography and numerous kettle lakes fascinated me. The circumstance that propelled my interest into a hobby was asking my grandfather the age of the lake. He didn't have an answer, but the question stuck with me into adulthood. I've since done a lot of research, mostly from the MGS, as well as obtaining maps and reading several books. I still don't have a definitive answer, but my interests have broadened, and I've found that the area was the subject of a graduate paper written in the 70's. This paper described the unusual features of the area, and has shed a lot of light on the history of the county. My main interest in the geosciences is glacial geomorphology, especially of Minnesota. I've taken road trips around the state to observe some of them, and will be attending the spring 2023 ILSG conference in Eau Claire, which includes a field trip to observe the Quaternary geology of the area.

#### 4. What do you dig about the GSM?

The lectures. I've learned a lot about geology and geosciences from them.

#### 5. What is your favorite geology-related travel destination? And why? What field trips have you taken with GSM?

So far my trips have been in Minnesota and a bit in Ontario. Of those, Inspiration Peak is special. It's the highest point in the Alexandria moraine, from which you get a spectacular view of the Leaf Hills area - rolling hills, dotted with numerous lakes.

#### 6. Favorite geology related book, movies, topics, website?

Roadside Geology of Minnesota, by Richard Ojakangas. I have referred to it a lot on my road trips.

The prehistoric proglacial lakes around the state hold a special interest, especially Lake Agassiz and Lake Benson (south of my cabin).

#### 7. Anything else? Careers? Interests? Hobbies? Sports? Collections?

My profession is software engineering. I also have interests in astronomy, planetary geology, and history. I love hiking, boating, fishing, card games, live music, and theater, to name a few. As for sports, I'm a spectator more than a participant. There's a pickle ball court near my home and the game has become quite popular. I plan to give it a try this spring.

### Discovering Geology

**Editor's Note:** I recently posed a couple of questions to GSM members and asked them to share a story about how they discovered geology. I asked .... what was it that sparked your interest in geology? Was there a particular event or additional circumstance? A person? A place? A rock or fossil?

If you would like to share your story, whether a paragraph or a page, contributions are welcome, and will be printed in future GSM Newsletters. Photos to accompany your story are also welcome. Thank you, Kate Clover [klover@fastmazil.fm](mailto:kclover@fastmazil.fm)

### How I Discovered Geology

#### Cheryl Anderson, Minneapolis MN

Like most of you, I have been a rock collector since I was a child, and I added fossils to that hoard when I learned there were common ones I could find myself. My most memorable find was the first and occurred at a road cut outside Whitewater State Park in southern Minnesota when I found a curled up trilobite, and learned it was 450 million years old. My adventures and study were all self-directed until I passed by the GSM booth at the fair about 10 years ago, and learned there were a lot of people with similar interests.

The lectures and trips organized by GSM have taught me so much more about this amazing planet we live on. In recent years, I have become a nature journalist, recording the environment around me, and noting what I have learned in sketchbooks. The journal page illustrated here was inspired by the GSM lab at Macalester College this past winter.



*Cheryl documented the rocks she learned about at the Macalester lab event.*

#### Gregory A. Beckstrom, Minneapolis MN

I grew up on a farm in Western Wisconsin where we had a former gravel pit. I grew up searching for Lake Superior Agates in the gravel pit and in our plowed fields. So when I went to undergrad in Eau Claire, studying geology seemed like a good path. Not terribly exciting, but I can still look back at significant finds that got me excited about geology, earth history, and related subjects.

#### Sue Engstrom, Alexandria MN

I was hired by St. Paul Public schools back in the 1960s to teach Junior High Life Science.

When school started, and I was presented with my first schedule, there it was: two sections of 8th grade Earth Science, and I didn't know sandstone from granite, because I had never had Earth Science back in Illinois! I panicked, took night school classes at the U, summer school in St. Cloud, joined the GSM, and learned along with the kids!

Remember Jim Miller at the U? After his night school class, and field trips on regional geology, he wrote the nicest letter for me, - to convince the powers that be I would be OK to teach earth science. I had also taken Karlis Kaufmanis' Astronomy class and a summer school Meteorology class at St. Cloud.

Turns out I've loved earth science and had SO much fun teaching it!!

#### Ronald Corradin, St. Paul MN

Understanding geology does not necessarily require the high-level math that chemistry and physics do. The evidence and the examples of geology are everywhere, in road cuts, river valleys, lake shores, and mountains.

Every time I trip over a rock, that's geology. Learning about it requires the ability to see patterns and to grasp how old the earth is. It's something even a child can begin to comprehend and find examples of. You can't say that about organic chemistry or quantum physics.

When I was a teenager, I lived not far from Thornton quarry, a huge deposit of Silurian Period limestone south of Chicago on I-80 just west of the Illinois-Indiana border. That ancient coral reef is full of fossils and makes the best aggregate for concrete. They pour a lot of concrete in Chicago.

I was glad to join GSM. It gives a layperson the opportunity to learn more about geology without needing a long list of academic prerequisites.

**Notes from the Past – GSM News,  
January 1979**

**Canoe Trip in Sandstone Area**

The final field trip September 9 - 10, was an "exciting experience", according to Pearl Downey. It was a canoe and hiking exploration of the Kettle River. Nine members, the most who could be accommodated, were guided by Steve Olson, staff member of the Audubon Center on Grindstone Lake near Sandstone. Some of the highlights were going through deep rock cuts of the River, exploring the mill dam in Banning State Park, and seeing a beaver dam there. Long-time members, Eva O'Leary, Grace Benz, and Pearl shared one canoe. Six new young members, including Virginia Baker, her son, and Cec MacDonald, made up the rest of the flotilla. The river trip was a relief from the extreme September heat, as well as a chance to see some geology sites from a different point of view. 1978 was the fifth year in which Audubon Center has served as host and organizer of geology and nature studies throughout Pine County. It was a rare opportunity to get a holistic view of an interesting area of our state.

**Ramsey/Washington Recycling  
and Energy Center**

Garbage and recycling are not something people tend to spend a lot of time thinking about. They tie up the bags, and put each into the proper container - garbage or recycling. Then the guys come and take it away. Done. Until next week. But at the Ramsey/Washington Recycling and Energy Center, they care a lot about your



GSMers in hardhats and safety vests

garbage.

On a sunny but cool Wednesday in March, 28 members of GSM and their friends toured the Center. Shannon, our guide said we were a big group. We were enthusiastic about the whole thing.

The first innovative thing is that Ramsey and Washington Counties have consolidated and jointly take care of their garbage (recycling is handled separately). The two counties merged services in the 1980s when Washington County's landfill in Lake Elmo was designated a superfund site (due to PFAS) and closed and clean up was begun. The plant was originally a for-profit company, but in 2016 they went public as a not-for-profit company. In that way, they can be more flexible about where stuff goes – such as paying Xcel to take their burnables (more on that later in the story).

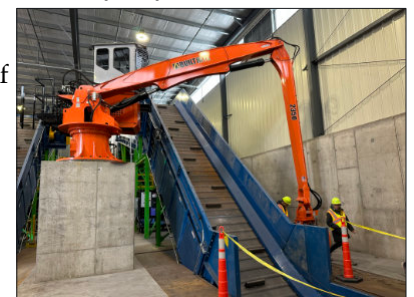
The Center only processes garbage. Everyone, both private homes and businesses in the two counties has to use their garbage collection service. No outside garbage haulers here. The present plant in Newport, near Pig's Eye Lake, just north of Interstate 494 off Highway 61 was constructed in 1988. They serve 14% of the state's population: 810,000 residences and 70,000 businesses, plus the State Fair and Capitol grounds, both of which boost the waste stream.

In contrast, Hennepin County allows various garbage haulers, and most of the county's waste is disposed of at the garbage burner in downtown Minneapolis. But that is also controversial, and not a subject we can address here. Some loads are even sent to Iowa, which is not energy efficient.

With waste, the Ramsey/Washington Recycling and Energy Center wants residents to think about what they throw away. They want people to manage their waste upstream so they don't have to do it all at the site. They encourage fix-it people and cleaners to take things that still have value. They encourage regular household recycling and composting of food scraps. Nonetheless, the plant separates hazardous waste items such as medical waste, propane tanks, and lithium batteries. Likewise, yard waste and industrial waste items are handled separately. Our tour guide noted that old clothing is an issue and shouldn't be tossed in the garbage, as it is not recyclable. But a good solution for old clothing is not currently available.

So that leaves the plain old garbage, and the plant is designed to make the most of the equivalent of 73 school buses of trash that come in every day. Their ultimate hope is that they send as little as possible to a landfill. Yet after lots of sifting and sorting, what cannot be used elsewhere ultimately goes to a landfill in Inver Grove Heights.

After the garbage comes in and is dumped, an operator

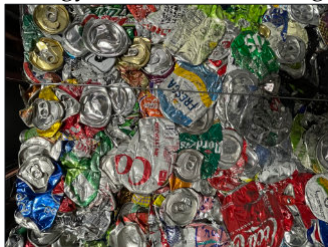


A new crane and conveyor belt at the plant



*Bales of aluminum cans*

recycling. The rest is chopped up and sent for fuel to Xcel Energy. The weirdest thing the guy in the Control Room

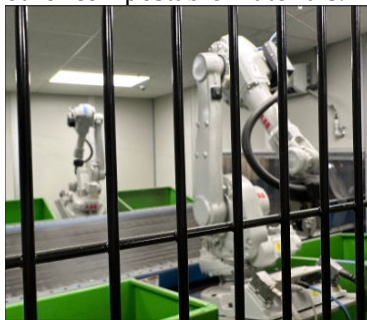


*A bale of crushed aluminum cans. Photo by Kate Clover*

has seen was a whole cow (dead). Obviously, that had to be sorted out; it was sent to food recycling. So far, they haven't seen any dead bodies (we asked). After the initial sort, the garbage is sent on a conveyor belt to a hammer mill which breaks it up. Then it goes through a magnetic separator which removes the ferrous metals. Next, the disc screens and air separators remove the small lightweight stuff including plastics. Then it goes through an eddy current where the non-ferrous metals (including aluminum cans) are blown from the conveyor. (They end up with 28 bales a week.) Then what is left is classified as RDF – refuse-derived fuel. That goes through another shredder/compactor and is baled and sent to Xcel Energy in either Red Wing or Mankato to be burnt to generate electricity. The facility also ends up with recyclables that are sent to other recycling facilities across the two counties.

This spring, the Ramsey/Washington Recycling and Energy Center is rolling out a food-scrap recycling program. Why? Because 20% of trash is food scraps. They hope to get 75% of households to recycle compostable materials.

Engineers and managers at the plant researched food recycling and determined that putting food scrap bags in with regular garbage was more economical than using separate carts with separate collections (as Minneapolis does), and they found that a separate collection would cost 10 times as much. Their plan is to give households and business free green trash bags for food scraps and other compostable materials. Then, at a new area of the plant, optical scanners and robotic arms will remove the green bags from a conveyor belt. From there, they will go to an industrial compost site.



*Robotic arms wait to pluck food scrap bags from the line*

The food scrap bags are green and compostable, plus thicker than a regular plastic bag. At the plant, which is monitored

in a crane with a giant claw spreads it and pulls out the big stuff including propane tanks, rolls of plastic, furniture and carpet that should go elsewhere. Mattresses are diverted to a separate pile and deconstructed, and their metal parts (springs etc.) are sorted and sent to recycling.

After the initial sort, the garbage is sent on a conveyor belt to a hammer mill which breaks it up. Then

from Michigan (yes, Michigan), the food trash bags arrive 90+% unbroken, which they consider a good number. And the plan is not just for collecting food scraps but for anything certified compostable. Right now, they plan to send the food scraps to an industrial compost site. In the future, they hope to have an anaerobic digestion facility to process the organic scraps. One participant's grandson didn't want to tour the plant because he thought it would be too stinky. But it was not stinky at all. In summer, we were told, things can get quite ripe, but in spring the odors are minimal for the amount of garbage they process. And they have an aggressive odor mitigation system. The doors open and close quickly for less odor leakage. They have negative air pressure in place, and the air is passed through a system which removes odors before being released to the outside.



*The control room*

The control room was big and complex with many machines with lights and switches, but that was not what ran the plant. An operator there oversaw the operation, monitoring numerous computer screens. All over the plant there were cameras; some inside the machines and others aimed at the various machines and conveyor belts. The control room operator watched the monitors for plugs and problems in the process.

Jobs there are union jobs, IBEW 23. New employees start on the floor sorting and work up to being an operator/overseer in various positions. You do not need any special education to get one of these jobs; they train you on the job, and you rotate from position to position over time. There is a two-year apprenticeship after you have worked as a picker on the floor.



*The control room operator monitors the video feeds from the cameras in and around machinery in the facility*

For safety, they just installed a new dust collector. And there is an automatic monitoring system to detect heat and catch hot spots before any fires ignite. Lithium batteries are the main culprit for those. Occasionally, explosions do happen at the plant.

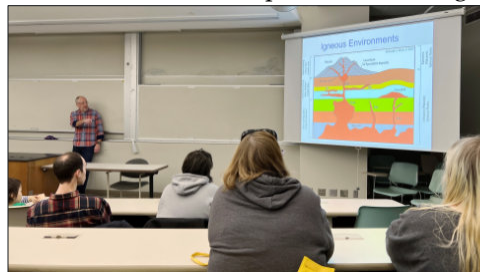
As a group, we were curious, so the tour lasted longer than the 60-90 minutes promised. I was impressed and felt good about the aggressive sorting and recycling. And burning the residue seems a good use. The incoming trucks pay to dump their loads, and they pay Xcel to accept the waste; it is an economical system as a whole.

Deborah Naffziger; Photos by Larry Kalina and Marilyn Nelson

### February 2023 Lab at Macalester

Attending a lab session at Macalester College with Jeff Thole is always a treat. As the Geology department's longtime lab supervisor and geology instructor at the college Jeff has offered this lab to GSM for many years except during the COVID pandemic when we paused in-person gatherings out of health concerns. This past February, however, we were happy to return to campus. Forty participants attended the lab including eight new attendees and seven school-age kids.

Jeff spent the first 30 minutes presenting an enthusiastic overview of the rock cycle accompanied by several informative slides. We then headed into his labs to examine an array of sedimentary, igneous and metamorphic hand specimens laid out across several tables. Attendees accepted the challenge and were



Jeff discussing igneous rock formation. Photo by Mark Ryan

engaged in considering textures and composition when trying to identify the rocks. Many specimens were semi-familiar but Jeff tossed in a few

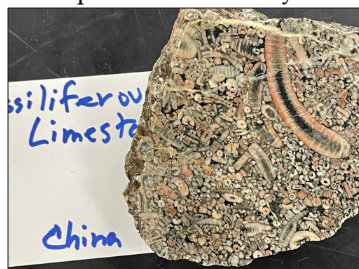
examples that prompted deeper discussions. Four of Jeff's current students were on hand to assist us in the lab.



We tested our rock ID skills with a variety of hand specimens. Photo by Kate Clover

My favorite specimen? The fossiliferous limestone, a crinoid hash from an unknown location in China. That was a "new" specimen for me and a very intriguing one. I'll admit, I don't know much about geology in China; it's a giant country,

but this specimen confirms that an ancient sea covered some part of that county in the geologic past. There is always more to learn.



Among the specimens we examined was this crinoid rich, fossiliferous limestone specimen from China. Photo by Kate Clover

Jeff also had three polarizing microscopes set up with sedimentary, igneous and metamorphic thin sections to examine. People enjoyed switching between the polarized and non-polarized views. They liked the colorful perspective visible under polarized light and had fun rotating the

microscope stage to watch the mineral view change. Despite the arrival of more high tech instruments today, optical mineralogy is still an important technique, and it sure is fun to use these basic tools. And using these

scopes reminded me of my own optical mineralogy classes in the way-back years.

Thank you, Jeff for another fun and informative morning.

Kate Clover



Examining rocks in the lab. Photo by Mark Ryan



Cheryl Anderson works to identify one of the rock specimens. Photo by Mark Ryan



Jeff had polarizing microscopes for us to examine thin sections. Photo by Mark Ryan



Jeff discusses a rock specimen. Photo by Mark Ryan



Becky Galkiewicz examines a rock with Macalester geology major Lily Zugswert, one of the lab assistants for the day. Photo by Mark Ryan

### Geo-tagging from 32,000 feet and My Window Seat Field Trip

When you fly, is your preference a window or aisle seat? For me, I always choose a window seat and either fore or aft of the wing, never a mid-wing seat. I love looking at the landscape from ~32,000 ft. up. Flying over lands with meandering rivers, glacial rivers and lakes, mountain chains, volcanoes, and coastlines – is often like being on a structural geology field trip. But missing is the field trip leader explaining where you are and what you are seeing. Kind of a bummer! Regardless, I typically shoot a few photos.

My camera? I've accepted that I'll never be a National Geographic photographer; and I just use my iPhone 13 these days. It shoots remarkably good photos, and I

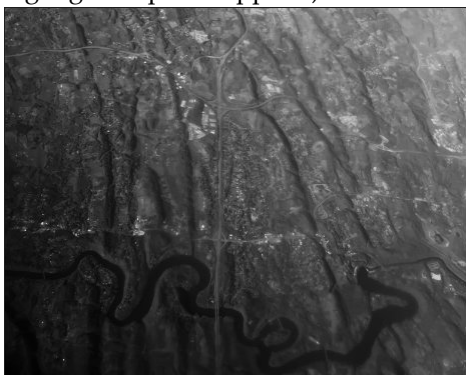
recently learned – if you have "location" turned on, the photos are linked – or geo-tagged – to the precise location. I knew this worked for land-based photos, but I've learned it also works with photos shot from 32,000 ft. (or more?). Wow! Knowing the actual location, I could then later research more about what I was seeing on the ground. (Geo-tagging also works on Android phones.) On a recent flight from Fort Lauderdale to Minneapolis via Chicago (a route I have flown dozens of times), the sky was cloud free, and I was ready to be wowed by the vista from my window seat. I knew to watch for the buckled ridge and valley topography I had seen a few times before, somewhere, I guessed, in the Appalachians. But I was at the mercy of the pilot and FAA to plot the route and what I would see. I was rewarded when the ridge and valley landscape came into view; however, I still wondered – where specifically was this fascinating landscape back on earth? I shot a few pictures.



*The Ridge and Valley Appalachians between the Blue Ridge Mountains and the Appalachians, ENE of Knoxville, Gate City, Virginia. Photo by Kate Clover*

Once home, I looked at the photos, plus the info linked to the photos, and found a city name. Then I "scrolled up" on the photo and saw a tag or pin on the Google Map. Bingo! I'd pinpointed the location. What an "Aha!" moment that was. (If you

are looking at photos on your Mac, click the "i" icon, and a google map will appear.)



*Blountville, Tennessee Photo by Kate Clover*

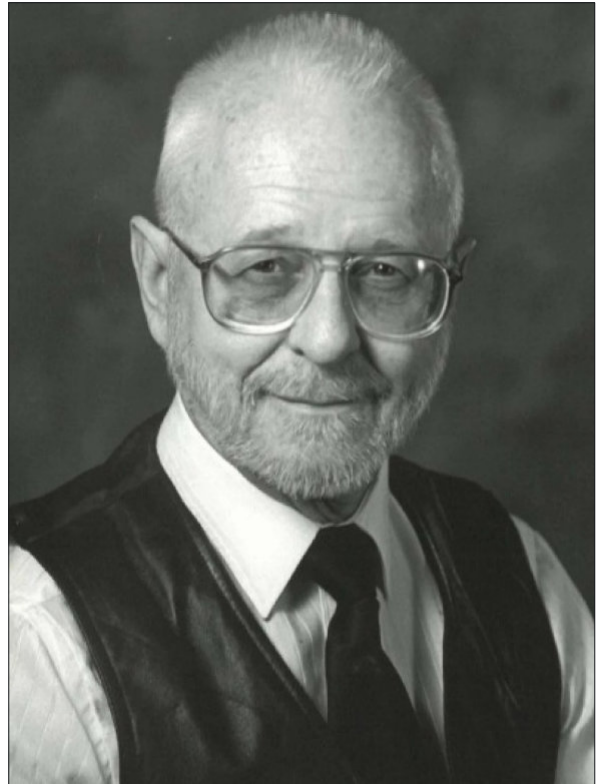
Knowing the location, I was able to research the geology of Gate City and Blountville, Tennessee, both located ENE of Knoxville. I learned this series of ridges and valleys are the Clinch

Mountains. They are a mountain belt sandwiched between the Blue Ridge Mountains and the Appalachians. The ridges and valleys I was seeing are the remnants of an ancient fold and thrust belt that formed in the Alleghenian orogeny. The ridges represent erosion resistant strata in contrast to the valleys with more erodible strata. Geologists had long pondered the formation of this buckled land and with acceptance of the theory of plate tectonics, the formation of these mountains was finally explained.

This geo-tagging technology is amazing, and I find it

very useful in helping me match location information to particular photos. Of course, time and date stamps are also linked to the photos so we can get really specific data about our navigation around the planet.

Kate Clover



### Rip Rapp

George "Rip" Robert Rapp Jr died on March 20, 2023 at age 92. He was born in Toledo, Ohio on September 19, 1930. His father was a ship captain on the Great Lakes and his mother was a schoolteacher. Rip grew up in Duluth. He got his nickname playing hockey. He graduated from the U in 1952 with a B.A. in geology and mineralogy, and got his PhD at Penn State in 1960. He was a professor at South Dakota School of Mines and Technology in 1957 and later a Dean at UMD. He was best known for his archaeological research in the Mediterranean, China, and North America. From 1975 until 2003 he was Director of the Archaeometry Lab and a Professor of Interdisciplinary Archaeology at UMD and UMN. Rip was an accomplished marathon runner. Most time after 2003 was spent in Tucson, in the outdoors and writing. He moved back to Park Point in Duluth in 2014. He was well known, highly regarded, and influential. He will be missed.

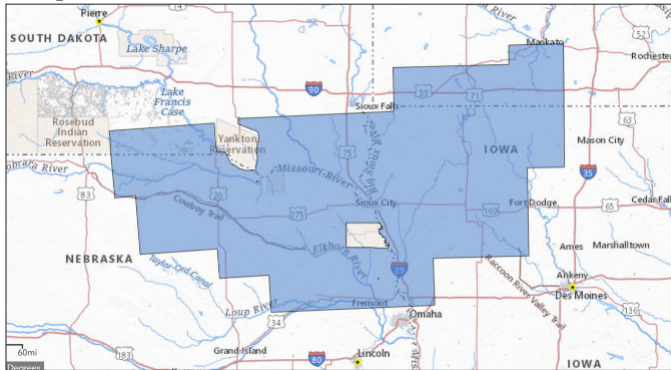
### Media Alert: The USGS and agencies from four states announce low-level airplane flights in the Central Great Plains

May 10, 2023: In the public interest and in accordance with the Federal Aviation Administration regulations, the USGS is announcing this low-level airborne project.



Your assistance in informing the local communities is appreciated.

The new airborne geophysical survey data will be collected using an airplane and will fly over parts of northwest Iowa, northeast Nebraska, southwest Minnesota, and southeast South Dakota, weather permitting. The survey will begin in mid-May and be completed in about four to six months.



*The Spirit Lake tectonic zone survey will cover a broad swath of land, including parts of Iowa, Minnesota, Nebraska and South Dakota.*

The geophysical survey will focus on the buried Spirit Lake tectonic zone that is centered in the area between Sioux Falls, South Dakota, and Omaha, Nebraska. The region is thought to have potential for critical mineral deposits buried in the ancient Precambrian rocks deep beneath the glacial deposits and sedimentary rocks exposed near the surface. The purpose of the geophysical survey is to better map the ancient Precambrian rocks at depth. The region was chosen in collaboration with the Iowa Geological Survey, the Minnesota Geological Survey, the Minnesota Department of Natural Resources, the Minnesota Natural Resources Research Institute, the Nebraska Conservation and Survey Division and the South Dakota Geological Survey.

Covering more than 105,000 square miles, the new geophysical survey will use the latest technological developments that will allow scientists to develop high-resolution three-dimensional representations of geology to depths over 3200 feet (1 kilometer) below the surface.

The 3D models and maps produced from the survey will help understand the distribution of mineral and energy resources, as well as the potential for natural hazards. Data collected as part of this effort will be made public and used by the state agencies and the USGS to guide more detailed geologic mapping at local scales.

The airplane will fly along pre-planned flight paths relatively low to the ground at more than 300 feet (100 meters) above the surface. The ground clearance will be increased to about 1,000 feet (300+ meters) over populated areas in order to comply with FAA regulations. Flight line separation will be more than 600 feet (200 meters) throughout the survey area.



*Photo of one the airplanes that will be used. The "boom" that extends behind the aircraft contains a magnetic sensor. Photo by Sander Geophysical Laboratories, used with permission.*

Instruments on the airplane will measure variations in the Earth's magnetic field and natural low-level radiation created by different rock types. This information will help researchers develop geologic maps in three dimensions.

The USGS is contracting with Sander Geophysics Ltd. and Dewberry to collect the geophysical data.

The scientific instruments on the airplane are completely passive with no emissions that pose a risk to humans, animals, or plant life. No photography or video data will be collected. The data collected will be made freely available to the public once complete. The aircraft will be flown by experienced pilots that are specially trained and approved for low-level flying. The companies work with the FAA to ensure flights are safe and in accordance with U.S. law. The surveys will be conducted during daylight hours only.

This survey fits into a broader effort by the USGS and many other state geological surveys, and other partners, including private companies, academics and State and Federal agencies to modernize our understanding of the Nation's fundamental geologic framework and knowledge of mineral resources. This effort is known as the Earth Mapping Resources Initiative, and it includes airborne geophysical surveys like this one, geochemical reconnaissance surveys and geologic mapping projects.

For more information related to this survey see the [project announcement](https://www.usgs.gov/news/state-news-release/bipartisan-infrastructure-law-supports-critical-minerals-research-central) (<https://www.usgs.gov/news/state-news-release/bipartisan-infrastructure-law-supports-critical-minerals-research-central>).



*GSM Field Trip to  
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Park, 1939*

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