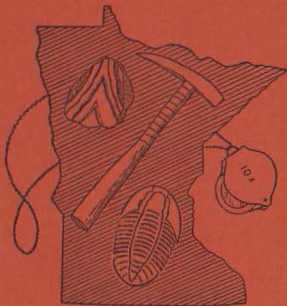


SUMMER 1977



**Geological Society
of Minnesota**

NEWS



Geological Society of Minnesota

Marcia Gunville, Editor
1110 Gardena Ave.
Fridley, Minn. 55432

FIRST CLASS

RETURN REQUESTED

May-June, 1977

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	John Podolinsky	10226 Mildred Terrace, Mtka.	544-1457

From "A Man's Leisure Time", A Sand County Almanac, by Aldo Leopold

The text of this sermon is taken from the gospel according to Aristotle. I do not know the chapter and verse, but this is what he says: "How miserable are the idle hours of the ignorant man!"

There are not many texts that I am able to accept as gospel truths, but this is one of them. I am willing to rise up and declare my belief that this text is literally true; true forward, true backward, true even before breakfast. The man who cannot enjoy his leisure is ignorant, though his degrees exhaust the alphabet, and the man who does enjoy his leisure is to some extent educated, though he has never seen the inside of a school. . . .

What is a hobby anyway? Where is the line of demarcation between hobbies and ordinary normal pursuits? I have been unable to answer this question to my own satisfaction. At first blush I am tempted to conclude that a satisfactory hobby must be in large degree useless, inefficient, laborious, or irrelevant. . . .

It is an axiom that no hobby should either seek or need rational justification. To wish to do it is reason enough. To find reasons why it is useful or beneficial converts it at once from an avocation into an industry--lowers it at once to the ignominious category of an 'exercise' undertaken for health, power, or profit. . . .

When I was a boy, there was an old German merchant who lived in a little cottage in our town. On Sundays he used to go out and knock chips off the limestone ledges along the Mississippi, and he had a great tennage of these chips, all labeled and catalogued. The chips contained little fossil stems of some defunct water creatures called crinoids. The townspeople regarded this gentle old fellow as just a little bit abnormal, but harmless. One day the newspaper reported the arrival of certain titled strangers. It was whispered that these visitors were great scientists. Some of them were from foreign lands, and some among the world's leading paleontologists. They came to visit the harmless old man and to hear his pronouncements on crinoids, and they accepted these pronouncements as law. When the old German died, the town awoke to the fact that he was a world authority on his subject, a creator of knowledge, a maker of scientific history. He was a great man--a man beside whom the local captains of industry were mere bushwhackers. His collection went to a national museum, and his name is known in all nations of the earth.

FIELD TRIPS (continued)

This will be a family type of outing. The park has extensive beach, hiking, biking and playing facilities for young people who tire of science. Picnic grounds are available for lunch. And Dr. Breckenridge's film showing will be an outstanding event for all.

September 17-18 -- A Weekend at Northwoods Audubon Center, Sandstone

Mike Link, Director-Naturalist, again has invited us for a stimulating fall weekend of geology, outdoor activity, and good companionship. This is the fifth year we have participated in this always popular event. This year Mike will talk to us about the effect of the geology of Pine County on man's activities.

Mike and Jane Link are always excellent hosts who also provide us with meals and lodging. This will be a fine learning experience in a lovely wilderness setting. Perhaps we can also persuade Mike to autograph copies of his new book, "Grazing."

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In Memoriam

Mary Mayotte

Mary Mayotte died in early April at the age of 83. She was a long-time member of the G.S.M., an active field tripper and rock collector. Services were held April 12 at the Morris Milson Chapel with interment at Fort Snelling. She is survived by a son, Douglas, of Littleton, Colo., four grandchildren and two great-grandchildren.

Ernest Bukofzer

Mr. Bukofzer was buried at Fort Snelling Monday, June 6, 1977. He was a long-time member of the G.S.M.

Mr. Bukofzer was born in Germany. His family died in the concentration camps during World War II. After the war, he came to the United States, went to college and studied engineering. He was a chemical analyst for the U.S. Bureau of Mines, from which he retired a short time ago. There were no immediate survivors.

CHECK YOUR CALENDAR

The State Fair Booth will again need many people to man it. More man hours need to be filled to take care of the longer fair schedule. Dr. Alex Lowe, exhibits chairman, would like to hear from anyone willing to work. If you think you could help, call him at 451-2822.

The Annual Meeting is scheduled for Monday, Sept. 26. This is the traditional time to wind up summer field trip events with reminiscences and slides, and to preview the coming lecture season. The very important election of new officers is on the agenda. Put the date on your calendar now.

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FIELD



TRIPS

The field trip season is gearing into full swing. The North Shore trip June 4-5 with Dr. David Southwick was as informative and delightful as expected. A number of interesting events are coming up throughout the rest of the summer. If you are considering any of these events your name should be on the field trip calling list. This is not a commitment. You can decide whether to attend when you are called about arrangements. Contact Bob Gunville (574-1421) or Fred Bradford (454-2611) if your name is not already on the list.

Field trips being planned are:

July 9 -- Twin Cities Building Stones led by Dr. R.K. Hogberg, consulting geologist, formerly with the Minnesota Geological Survey.

Much of the geology of Minnesota is represented in the building stones of the Twin Cities. These beautiful rocks have been quarried from several parts of Minnesota and elsewhere. They were formed under many conditions during many different periods of geological time.

Dr. Hogberg is an expert on these building stones. He is familiar with not only their formation but also the quarrying operations to obtain them. He will take us on a bus-walking tour throughout downtown Minneapolis and outlying locations.

The bus will leave from the Prasca On Main Restaurant, 177 S.E. Main St. at 9:00 a.m. We will visit some 19 sites. For those who wish to stay, we will follow the tour with lunch at this fine restaurant. We will be eating in one of Minneapolis's early buildings on the Mississippi River near St. Anthony Falls.

August 6 -- Rochester-Winona, the Paleozoic Rocks led by Dr. Robert Slean, Dept. of Geology, University of Minnesota.

Dr. Slean has mapped and studied these rocks in detail. He can show us how these sedimentary deposits describe the seas which once covered this part of Minnesota. As a paleontologist he also can help us to recognize fossils of the marine life inhabiting these early seas. This trip will be by bus.

For people who would like to prepare for this trip he recommends the "Geologic Map of Minnesota, St. Paul Sheet", R.E. Slean and G.S. Austin, available at the Minnesota Geological Survey, 1633 Eustis St., St. Paul MN 55108 (\$2.00)

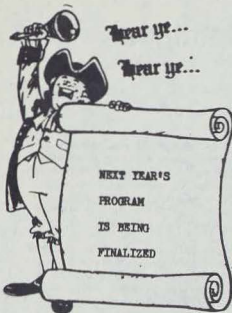
September 10 - Workshop-Picnic at Bunker Hills Park, the Aneka Sand Plain led by Dr. Barbara Gudmundsen and Marcia Gunville, with a special film showing by Dr. Walter Breckenridge, director-emeritus of the Bell Museum of Natural History.

The Aneka Sand Plain is a special legacy of the last glacial invasion of the Twin Cities. Bunker Hills Park, located just north of Minneapolis near Minn. Hwys. 65 and 242, is a good representative area of the Sand Plain. A long chain of sand dunes runs through this park.

Marcia Gunville has worked on this area in connection with a series of articles on Twin Cities geology. Barbara Gudmundsen is an ecologist who has studied dune animal and plant communities. They will join together to present a day of lectures and field investigations.

A special treat has been arranged for the afternoon. Dr. Walter Breckenridge, director-emeritus of the Bell Museum of Natural History at the University of Minnesota, has agreed to show and narrate a film he has produced, "Sand Country Wild Life." Dr. Breckenridge is a well known naturalist whose films and lectures have been enjoyed for many years at the Bell Museum and throughout the area. He made parts of this particular film at Bunker Hills Park.

(continued next page)



NEXT YEAR'S PROGRAM IS BEING FINALIZED

Next year's lectures will be a stimulating series on a variety of subjects.

Before Christmas Dr. Sam Sawkins, University of Minnesota, will give five talks on geology and energy resources. He will discuss energy from the perspectives of history, an overview, and the future. He also will talk on petroleum, coal and nuclear fuels as specific energy resources.

After Christmas Dr. Henry Lepp, Macalester College, will present five lectures on the Planet Earth. He will give us an overview, and go into more detail about its materials and processes, the rock cycle, energy and earth processes, and geochemical elements.

Dr. Peter Huddleston, University of Minnesota, will offer two lectures on tectonics (structure and deformation of the earth's crust, including plate movements) and mountain building.

John Podolinsky, program chairman, is working with these geology professors to finalize arrangements for the talks. The first meeting will be October 10. Watch for a complete announcement of the program. It will be included in the next Newsletter to be published in September.

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welcome

NEW MEMBERS:

We would like to welcome the following people into the membership of the G.S.M.

Mrs. Leo Nash (Helen Marie)
1330 S. Cleveland Ave.
St. Paul, MN 55116

Mr. and Mrs. Tom Ostertag (Fram)
1568 Huron St.
St. Paul, MN 55108

Virginia Baker
5444 Legan Ave. S.
Minneapolis, MN 55419

Mr. and Mrs. Ernest Stalock (Donna)
1519 Deerwood Drive
South St. Paul, MN 55075

Gertrude J. Mattson
1608 Bohlund Ave.
St. Paul, MN 55116

Dr. Jim Rahn
633 N. Lexington Parkway
St. Paul, MN 55104

The following people have changed their addresses:

William Larson
616 10th Ave. S.E. #303
Minneapolis, MN 55414

Edmund Eray
Route 1, Box 172
Hager City, Wis. 54014

People in the Spotlight

TWO G.S.M. MEMBERS AUTHOR NEW BOOKS

Two members of the G.S.M. recently have become authors of new books. Mike Link, Director of the Northwoods Audubon Center, as a naturalist is expert in many fields besides geology. He has just published a book called "Grazing -- The Minnesota Wild Eaters' Book." This book is meant to encourage people to try what may be a new experience for them, learning about plants through their stomachs. His enthusiasm for learning about academic subjects through direct experience is infectious. Biology classes were never this much fun.

Mike tells about how to learn which plants are edible, and how to collect them. He discusses which wild foods might be found in different parts of the state during the various seasons of the year. He devotes several chapters to specific foods--berries, mushrooms, maple sugar, meat, herbs--and includes menu ideas. There is a section on a few very special recipes, including Grandma Link's Wild Rice Casserole.

He warns against hazardous plants and problems of distaste. For those who really want to get into wild foods he tells where to go for information. He has made a reference list of books with a section on favorites from his own library. He even shows ways for teachers to use wild plants as learning devices.

"Grazing" by Mike Link is available at B. Dalton Bookstores, in paperback for \$3.50.

Edmund Bray has just published an enlargement and revision of his earlier book on Minnesota geology. His new book is entitled "Billions of Years in Minnesota -- The Geological Story of the State." It discusses Minnesota geology from four different aspects.

The new volume includes: Part I, The Story of the Rocks - a discussion of the various rock formations throughout the state; Part II, Plate Tectonics - a brief discussion of Minnesota and how it has been affected by continental drift; Part III, The Story of the Ice Age - incorporating current interpretations of glacial data; Part IV, Tour Guide - a brief treatment of the geology of each of eight regions of the state, of each of the 87 counties with locations and descriptions of many important geological features in each county. Information is included on the geology within or adjacent to each of the state parks.

The book is about 100 pages with 110 or more maps and figures. It is available at the St. Paul Science Museum for \$3.50 in soft cover and \$5.00 in hard cover.

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PIPESTONE IS MORE THAN A CALIBRET
WHEN SEEN ON A FIELD TRIP WITH CHARLIE MATSCH

by Marcia Gunville

Southwestern Minnesota was covered with dried-up corn fields last fall when Dr. C.L. Matsch took the G.S.M. on a field trip to the Pipestone area. Obviously there was not much water out there. However, this situation did not always prevail. Water conditions had been much different in this area during several other periods of the earth's history. Dr. Matsch showed us the unmistakable evidence for a number of watery environments.

He took us for a very fast ride through the earth's time machine. In Southwestern Minnesota we could visit at Morton the oldest materials known in North America, perhaps the world (Morton Gneiss, 3.6-3.8 B.Y.). We also visited displays of Indian-painted petroglyphs, hardly considered yesterday in geological terms. We saw the Late Precambrian Sioux Quartzite (1.5-1.6 B.Y.) and the deeply weathered remains of Cretaceous sea sediments (about 60 M.Y.). Evidence of the glaciers (500,000-10,000 years) was almost everywhere.

Water had been an important part of the geological development of this region. During the Late Precambrian Period water was the agent that eroded some ancient highland, depositing quartz sand here in the beds which later became the very hard, pink Sioux Quartzite. As we looked at the Sioux Quartzite Dr. Matsch showed us how the stratification in the rocks indicated this deposition. He carefully explained how geologists could determine from such rock exposures the environment that probably existed at that time.

It was unlikely to have been an ocean. Ocean currents would not have enough energy to move sand grains in these crossbedded designs. It was not apt to have been a glacier. Glaciers do not sort materials into this type of layering. Moving currents of river water can size and distribute particles in these kinds of orderly patterns. We could try out the hypothesis of a continental river deposit, perhaps a delta, being supplied from some highland located in the opposite direction from the apparent movement of the stream water, in this case to the north. The picture seemed to fit.

How old is the Sioux Quartzite? We could not tell from the exposures we saw, though we wondered about it. The quartzite contains no minerals which can be radioactively dated. We saw beds of granite situated in the same farm fields with the quartzite, but did not find a contact. We saw sections of conglomerate within the Sioux Quartzite, but none of the pebbles were of granite. Was the granite already here when the quartz sand was laid down? Geologists think so, but they cannot determine it positively.

Dr. Matsch told us that the best means of dating the Sioux Quartzite is through well borings taken in Northern Iowa. In these borings the Sioux Quartzite has been found to interlayer with rhyolite. The rhyolite can be radioactively dated. It yields an age of about 1.4 B.Y. It probably was deposited within the beds of the quartzite during some period of volcanism. Therefore, it probably is younger, making the Sioux Quartzite older than 1.4 B.Y. Current thinking determines the quartzite's age to be 1.5-1.6 B.Y. If so, this place probably was a great river delta with barren eroding highlands to the north 1500 million years ago.

At a much younger time water prevailed all over this landscape. The Cretaceous seas (60-70 M.Y.) crept over this part of the continent from the west. Their easternmost shorelines are now parts of Minnesota. The sediments on their sea bottoms blanketed the earlier rocks. Shark's teeth have been found in these sediments.

After the seas retreated Minnesota's climate became tropical. The old sea sediments, then exposed as land, withstood the torrential rains and punishing sun of the tropics, and were weathered deeply. Rain water reduced these sea sediments largely to clay. Today the clay is used for making bricks.

We visited a clay quarry near Springfield where we could see the layers of these weathered sediments in the quarry walls. We also saw within them dark beds of lignite coal. This coal had to have been formed from Cretaceous plant life once growing near a Cretaceous seashore, and later covered with sediments. We saw rocks displaying mud cracks, and we knew that they, too, were formed on some ancient shore.

When we looked at the highest parts of the quarry walls we saw another type of material. Overlying the clay deposits we found glacial till. Obviously the tropical environment was long past when ice occupied this place. Another sort of watery situation had left its mark here in the more recent geological past.

We stopped at the Pipestone National Monument where we saw thick layers of the Sioux Quartzite with lenses of Pipestone interbedded within them. This is the stone which has been quarried by Indians for their peace pipes since prehistoric times. The quarries are still in operation. We met Indian women at the Exhibit Center working on various carvings. It is a very soft stone.

Dr. Matsch explained to us how these concentrations of Pipestone once were layers of clay muds that were deposited as lenses within the sands of the Sioux Quartzite. Pipestone's chemical composition indicated that it is formed from weathered materials. At the Monument we also saw cliffs of quartzite with crossbedded layers beautifully displayed. We could almost imagine the torrents of sand that must have been dropped at the bottom of some ancient stream, abandoned there as the water carrying it along lost its power.

We stopped to see prehistoric Indian paintings on rocks near Springfield. We also saw these petroglyphs on the rocks at the Pipestone National Monument. These paintings record recent events occurring here. At Morton we saw rocks which record the oldest known events in North America, and perhaps the world. The Morton Gneiss contains minerals dating at 3.6-3.8 B.Y., and may have been part of the earth's original crust. These rocks have been deeply buried, superheated, bent, warped and stretched by metamorphic activity, become unroofed by later uplifting, been weathered, eroded, and glaciated. They have undergone unknown amounts of punishments throughout the long eons of the earth's history. The radioactive clocks in their zircon minerals have gone on unchanged throughout time, telling us of their formation almost at the origin of the earth itself.

Any field trip with Charlie Matsch is certain to be filled with numerous lessons in glacial geology. This trip into an area he knows so well was punctuated with them. He described the glacial events forming the scenery we were viewing, picturing these events as great forces working to sculpture the land. With his vivid explanations this ordinary Minnesota farm land becomes an exciting place to be, the stage of a great continuing drama.

Ice was the agent to mold today's landscape, and its actions were easy to visualize with Dr. Matsch's careful teaching. He described how the catastrophic outletting of Glacial Lake Agassiz left the large boulders we saw in the erosional terrace of the River Warren. He told us of three different tills superimposed on one another in the banks of the River Warren, representing three successive glacial episodes.

We climbed over the Altamont (recessional) Moraine with its knob and kettle topography and to the top of the Coteau des Prairies covered by the Bemis (terminal) Moraine. Both moraines were formed during the last (Des Moines) ice invasions here. Still farther west, outside the area of the Des Moines Lobe, was an older till which was covered with windblown loess. It is thought to be of Kansan age.

Dr. Matsch talked to us about how older tills had been recognized by their deep weathering profiles. Known as gumbottles, these clay tills are dated by the depth and intensity of weathering they have undergone.

We saw a number of abrasional features on the bedrock caused by glacial movement. Striations, chattermarks and polish are common. Less common is the wind-blown abrasional feature of sandpapering a rock to mirrorlike smoothness. We saw such a rock at Pipestone National Monument.

Just outside Pipestone National Monument we saw three very large boulders of granite. They were erratics brought here by the glaciers. Their size was remarkable. Even the Indians recognized them as strange. Glacial ice is able to quarry and move all kinds of materials, Dr. Matsch explained. Continental glaciers normally do this by quarrying from the base of their ice.

Glaciers move by two different actions. Ice warm enough at its base slides on a film of water. Ice colder than freezing temperature moves by failure of the ice crystals themselves, a shearing type of movement. If the base of the ice is at a temperature near the melting point it can trickle water into cracks of the bedrock and refreeze, gluing rock chunks to the base of the glacier. As the ice moves forward the rocks will move along with it. Farther down its route the glacier will dump them off. This is the story of the erratics known as the Three Sisters. They come from an area about 60 miles to the north.

Some of the hilly landforms we saw were developed along the margin of the Bemis Moraine when glacial ice was melting away from it. Ice formed one shoreline of a glacial lake. The Bemis Moraine formed the other shoreline. Meltwater was then in plentiful supply, and when the lake became high enough it spilled over a low spot in the moraine, quickly eroding a channel. These old channels are now farmers' fields, but their shape is easily recognizable. Sometimes alluvial fans later formed along such channel margins, damming up drainage waters and forming present day lakes. Lake Benton and Lake Hendricks had such an origin.

The land here within the Des Moines Lobe has not been free of ice very long. Its landforms are still actively developing. Hummocks and lake-filled depressions are still important features of the Altamont Moraine. Examples of stream piracy are common.

We were glad to have the chance to see this part of Minnesota with Dr. Matsch. Besides giving us the fun of sharing his good nature, he let us see a portion of our state in a very special way.