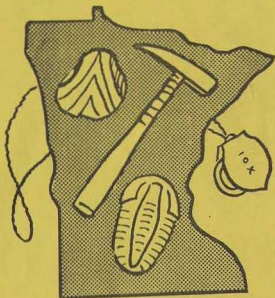


Autumn 1982



NEWS

Geological Society of Minnesota

MINNEAPOLIS, MINNESOTA



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2745 Colfax Ave. South
Minneapolis, MN 55408

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Dr. Matt Walton
Minnesota Geological Survey
1633 Eustis St.
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P2



GEOLOGICAL SOCIETY OF MINNESOTA

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Henry Gangl
Dale Johnson
George Johnson
Conrad Nelson
Elizabeth Ooten

Annual Meeting to be at Viking Village

The Annual Meeting will take place at Viking Village, 27th Ave. S. and East Lake Street on September 27 at 7:00 p.m. Those who wish to join other members for dinner should plan to come around 5:30 so that we may proceed promptly.

The main business will be the election of board members. The following have been nominated: for the first term, Marlys Lowe and Eva Selander; for the second term: Conrad Nelson and Liz Ooten. Further nominations may be made from the floor.

The program will include a review of the year's activities, treasurer's report and announcement of the lecture program for the coming year. In addition, slides from some of our summer field trips will be shown and a film on Surtse, the new volcano near Iceland.

The membership secretary will also be on hand to receive dues for the year. Last year date for payment was changed from January 1 to October 1.

ank & Ernest



In Search of Ancient Crust

P3

Minnesota River Valley Expedition, June 19-20, 1982

Plot! Down came the icicle. Knocking them off our then poorly insulated roof as a kid was great winter sport. I never imagined that such slivers of "rock water" nearly as tall as me or taller could have been consolidated into massive, mobile sheets standing more than a mile in height right where I stood. Yet the message is written all over the State: the ICE was here, sculpting the surface and mostly obscuring but sometimes revealing the underlying bedrock. Rocks in a narrow band along the Minnesota River Valley are particularly revealing or at least revealed thanks to a veritable river monster which drained glacial Lake Agassiz, the Glacial River Warren.

Ancient migmatites radio-dated back to 3.6 billion years ago are good candidates for fossilized remnants of primordial crust. Yet what we see now was the result of even earlier episodes of intense temperature and pressure which metamorphosed earlier granitic (igneous) and sedimentary rock into a grossly interlayered sequence of quartzofeldspathic and amphibolite gneisses. The geologic history and origins of these ancient gneisses is equivocal and largely obliterated by an orogeny occurring about 2.6 b.y. ago. Granitic intrusions at this time reset atomic clocks, produced the Sacred Heart Pluton and many of the current basement rocks of the state and further metamorphosed the earlier gneisses some of which have been eroded away.

Our quarry on this trip was this hodge-podge of inclusions, intrusions and old crustal remnants uniquely exposed in a narrow strip along the Minnesota River Valley from Franklin to Montivideo and appropriately enough the trip began with a puzzle. Namely where was George Johnson?

The answer? On the bus waiting to get started! Once underway, tour leader, Paul Weiblen, U of M petrologist, explained how River Warren did its work some 10,000 years ago. Traveling along Hwy 62 to 169, we began to encounter the old river terraces. From about this point, the earth's crust tilts upward to the west exposing increasingly older rock. From the highest terrace, we began descent through the terrace terrane to the Flying Cloud Airport perched on a river bluff. On rounding the bend, we began our descent into the valley and the enormity of the old river sunk in as we peered through the hazy atmosphere to its opposite bluff some 5 miles distant. Untold tons of sediment were left in its wake to fill in the valley and provide continuing work for its wee sprig, the Minnesota. Land rise was evident in Jordan characterised by the Jordan Sandstone which is covered in the Twin Cities by the St. Peter.

In Belle Plaine, we rode over the point where the old lava rift zone (which includes Lake Superior and extends into northeastern Oklahoma) had been shifted to the southeast. This fracture zone may have guided the path the Minnesota River was eventually to take.

At 9:50 a.m., the second puzzle appeared on board. Putative pickle juice began dripping on George Johnson. Another fracture zone was immediately suspected but none was found and the case was closed when the source apparently ran dry.

The first stop was along the shoreline of a large intracratonic basin formed after a major period of igneous intrusions 1.8 b.y. ago (Penokean Orogeny). Sand and silt from the north (Hibbing area) formed banded iron deposits (Sioux Quartzite) in a shallow basin sea. Folding and compression metamorphosed upper clay layers into pipestone. Granites from the Penokean protruded out of the Sioux Quartzite and probably some, like the rock we examined, could be seen breaking the surface

Con't. next page

P4

Minnesota River Valley, cont.

of the old basin sea.

By 12:30 p.m., the Minnesota River Valley was again in view. We descended into Morton careening off the terraces into the Valley and lunched in the abandoned Morton rock quarry. Several rock types were evident. Gray granite (considered oldest), pink granite and amphibolite rafts with biotite borders. These rafts are characteristic throughout the area. They may be fractured dikes or per continental drift theory, may be original crust thrust up to have its atomic clock reset. Unfortunately recent trace mineral studies do not sufficiently support either theory. On that bit of intellectual indigestion, we left for north Redwood (positively known as the home of Sears and Roebuck).

The next stop was at a farm situated in the Warren "river bottoms." Inspection of the drive way dirt revealed muds and clays which served to explain the sillimanite found in the adjacent rock outcrops. Such clays when subjected to the high heats of convection deep within ocean archs lose water to form aluminum silicates such as the sillimanite at this site. Complex folding, amphibolite rafts, and various metasedimentary gneiss layers were examined for cordierites, garnets, anthophyllite, biotite and plagioclase at this and the next stop.

At 4:20 p.m., campers headed for their overnight rock roasts, motels for the TriCourt Motel in Granite Falls. All met later at the Municipal Park in Granite Falls for Paul Weiblen's special recipe: beer-cured, charbroiled pot roast. (In a word - SUPERIOR!!!). All were up and eating by 7:30 a.m. the next morning. In anticipation of more rock interpretation, everyone ate scrambled eggs.

By 8:40 a.m., we were back at the Municipal Park standing in a road bed situated about central to the Warren River bed. Layering was evident in the rocks. Weiblen explained that there have been 3 major, folding episodes painstakingly studied by comparing the orientations of crystalline minerals for match with preconceived models. Interpretations are very complicated. Indeed, a zig-zag, quartz vein showing obvious compression and situated in a large pothole in the outcrop called into question the apparent order of the garnet-biotite to hornblende-pyroxene gneisses. Per Weiblen, why study rocks? They are like dogs, always there, even pettable, they can be used as you wish and you never need fear they will turn on you.

Next stop was made along a rail bed to see straight banded Montevideo, granitic gneiss cut by 1.8 to 1.2 b.y. old dikes of basaltic (oceanic) hornblende andesite one of which was in contemporaneous contact with adamellite (continental crust). The adamellite probably penetrated the basalt pushing it apart and rounding off the pieces; chemistries were then blended. Later granitic veins cut both basalt and adamellite. Isoclinal folding and budens were also inspected here. Weiblen speculating on reasons for these various deep exposures, drew analogy with the Himalayas. We may be looking at the once deeply buried roots of long gone mountains or perhaps these exposures represent upturned edges of early craters. Proof of meteoritic impact depends on finding remnants of parent materials most or all of which was likely vaporized on impact. Furthermore edges like these provide very poor records. Moon and planetary studies may fill in some of the possibly missing pieces. What is under these ancient surface rocks? More mafic rocks increasing in grade (amphiboles to pyroxenes) with depth. Despite its lack of mountains, Minnesota has a deep mantle, 15 - 20 kilometers deep.

Beach Combing in Wisconsin

p 5

Osceola - on a day in the Cambrian

Wow! It was a hot one. I was trudging along the beach, kicking up sand spouts. The briny surf roared against a cliff of black basalt, far down the beach. Here and there, waves swirled about boulders, tossing the green tresses on them, like wind in a girl's hair.

A rumbling outdid the noisy waves. I looked landward, and there boiling up over barren mountains and dunes was a fluffy thunderhead, reaching toward heaven. Lightning bolts had begun cavorting around, its shady base. Already a cool draught blew from it, smelling like water on hot rocks.

I stood a moment in the equatorial sun. Only a little tight shadow encircled my feet, like a pair of dark pants that had slipped down my legs. The sand was damp and smooth from a retreating wave. I looked for a stick of drift wood to write in the sand.

For a few seconds I scanned the treeless landscape, now all in shadow. Then I remembered-- no wood, no sticks. Yikes, not even a stiff grass stem. No land plants at all. So I squatted and used my finger in the sand. I wasn't good at spelling in those days.

*Have you Hugged your
Trail bite today?*

J. H. G. July 10



I'd hardly finished when the storm hit; solid sheets of rain, and wind enough to blow the waves flat. A little stream mouth emptying into the surf began vomiting sand and gravel. Then suddenly, egg-sized rocks came spewing out in muddy gushes. The stream got wider and wider. The whole countryside seemed to be washing down. But in half an hour it was over.

I sat down by a tide pool on a boulder half buried in sand. My shirt steamed as the sun came back out. It felt good after the cold rain, and I started to doze. Suddenly, I felt someone pounding on my back and shouting;

I opened my eyes. It was Dr. Southwick.

He pointed. "Look, there in the tide pool. They're linguloid brachiopods, hundreds of the little devils." They were shiny and brown in their chitin covered shells. I wished I'd seen them first.

I looked at my watch. Thank God, he'd awakened me in time. It was exactly 5:15 p.m., July 10, 487,633,020 Years Before Present. Surf thundered on the distant rocks. The Ordovician had begun.

RS

Editorial

Congratulations to all the good people who have given their time and energy to make possible our fine lecture programs and field trips. All committee people volunteer, only professionals are paid.

It's all come about as a result of teamwork-- every one doing his bit. And it's great! However, the work must continue.

There are always opportunities for willing hands and minds to help the committees. For further information, call the president (227-3394), or a committee chairman.

Presently the Publicity Committee needs two people to send lecture notices to the media, preferably one from Minneapolis and one from St. Paul.

Also, the Hospitality Committee needs two people to prepare and serve coffee and at lectures.

* * * * *

Welcome New Members

Dr. Clement G. Chase
2279 Gordon Ave.
St. Paul 55108
phone 546 6963

Marlene Daws
806 Mt Curve Ave.
Minneapolis 55403
Phone 332 3421 work
377 0067 home

The Minnesota Geological Survey has the following publications available.

GUIDE TO FOSSIL COLLECTING IN MINNESOTA
#ES-1 30 pp. \$1.00

GUIDE TO MINERAL COLLECTING IN MINNESOTA
#ES-2 42 pp. #1.00

GEOLOGIC SKETCH OF THE TOWER-SUDAN STATE
PARK #-3 29 pp. #1.00

#

Minnesota River Expedition, cont.

After lunch, the Sacred Heart Pluton of pink, medium-grained, quartz monzonite (2.7 b.y.), then on to a look at a mass of amphibolite structures, resembling pillow basalts. These may be oceanic crust incorporated in crustal, quartzofeldspathic gneisses. They resembled the komatite (high magnesium, high melting point, 1,800°C) basalts of S. Africa. Some hold these to be the oldest crustal components. Others claim they are granitic materials and the inevitable others say such combinations are characteristic of earliest crust. Weiblen wryly noted that there are again others who really don't care.

Last stop, weathered Morton Gneiss, North Redwood. Cretaceous clays were deposited to perhaps hundreds of feet at this site during the transgression of a western sea over the quartzofeldspathic gneiss. Warm percolating ground waters converted amphiboles/biotites to shale/clay and quartz back to sandstone. Ghosts of the old rock were visible in the face of the roadcut and decaying quartz crystals could be and were chipped out of the bank. With this booty for the final ballast and with the rock cycle having come full circle, we did likewise and headed for home.

-- Dwight Robinson

GEOLOGICAL SOCIETY OF MINNESOTA

Background Information

THE GEOLOGICAL SOCIETY OF MINNESOTA is an organization interested in the study of the earth, what it is made of and how it is put together. The study of geology, the learning about the earth's past and present history involving billions of years constant change, is fascinating to a large number of people. Members of the Geological Society of Minnesota are such people who want to further their understanding of the processes creating these changes.

LECTURES AND LABORATORY SESSIONS are held on a regular basis during the fall, winter and spring seasons. Generally, an area of study is pursued in depth over several meetings, with presentations being given by professional geologists who either teach on local college campuses or who practice in some other capacity. All lectures are presented on the second and fourth Mondays, October - April at 7:30 p.m. in a room reserved on the University of Minnesota Campus. A discussion period with coffee and refreshments is held during lecture presentation. Also, from time to time selected films are announced and shown. Specimens may be brought to the lectures for examination and identification. Whenever possible, informal laboratory sessions are held on alternate Mondays throughout the lecture series. Announcements concerning them are given at the regular meetings.

FIELD TRIPS fill out the schedule during the summer months. These may be one day tours or more lengthy and elaborate trips. They are led by geology professors or others knowledgeable about the areas being visited. These field trips offer an opportunity to observe first-hand the earth processes forming the landscape and to gain experience at evaluating them.

THE SOCIETY is interested in furthering the understanding of geology by the public with particular emphasis on the geology of Minnesota. It has worked on a number of projects with this aim in mind. Roadside plaques at 33 geologically interesting locations throughout the State of Minnesota have been written and installed under its sponsorship. Exhibits on the State's geology are regularly set up and maintained at the Minnesota State Fair and at Mineral Club shows. Club members have served as speakers to school classrooms and at meetings of local organizations. The efforts of the Society concerning educational projects are ongoing.

MEMBERS OF THE SOCIETY come from all walks of life, and represent all age groups. They need have no particular scientific background, or professional interest to belong to the organization. They are united mainly in their enthusiasm for geology as an absorbing intellectual activity and a stimulating hobby.

THE GEOLOGICAL SOCIETY OF MINNESOTA MEMBERSHIP YEAR begins January 1, with yearly dues payable any time beginning with the Fall Annual Meeting. Membership includes subscription to the organization newsletter covering the Society's activities. We invite you to participate.

Membership Chairperson

Marjorie McGladrey (612) 461-2676
Route 1, Box 17F
Elko, MN 55020

Official Address

Mary Kimball (612) 644-6429
1711 Marshall Avenue
St. Paul, MN 55104

Memberships:

REGULAR		OTHER	
Husband/Wife	\$ 15.00	Sustaining	\$ 25.00
Single	\$ 10.00	Supporting	\$ 50.00
Student, full time	\$ 3.00	Guarantor	\$100.00

*ASSOCIATE	
Husband/Wife	\$ 10.00
Single	\$ 7.00

*Associate membership is made available to those who due to health, location or financial status are unable to participate fully or sustain a regular membership.



GEOLOGICAL SOCIETY OF MINNESOTA

1982 - 1983 Public Lecture Series

133 Physics Building, University of Minnesota

7:30P.M., Monday Evenings

September 27

ANNUAL MEETING 7:00 p.m. Smorgasbord Dinner 5:30-6:45
Viking Village, 27th and Lake Street, Minneapolis

EARTH'S SURFACE COVERED BY WATER

Dr. Henry Lepp, Dept. of Geology, Macalester College

October 11 PHYSICAL ASPECTS OF THE OCEANS

October 25 BIOLOGICAL ASPECTS OF THE OCEANS

EARTH'S SURFACE COVERED BY ICE

Dr. Herb Wright, Dept. of Geology and Geophysics, Univ. of Minnesota

November 8 ORIGIN OF GLACIAL FEATURES IN MINNESOTA

November 22 HISTORY OF GLACIATION IN NORTH AMERICA

EARTH'S SURFACE, PHANEROZOIC EON: PHYSICAL AND BIOLOGICAL EVOLUTION

Dr. Gerald Webers, Dept. of Geology, Macalester College

December 6 THE PALEOZOIC ERA -- 560 to 230 Million Years B.P. (Before Present)

January 17 THE MESOZOIC ERA -- 230 to 65 Million Years B.P.

**January 24 **Rock Lab: Mineral Identification I (Dr. Webers)

January 31 THE CENOZOIC ERA -- 65 Million Years B.P. to Present

ROCK MOVEMENT IN THE EARTH'S CRUST: PRINCIPLES OF STRUCTURAL GEOLOGY

Dr. Peter Huddleston, Dept. of Geology and Geophysics, Univ. of Minnesota

February 14 MECHANISMS OF STRESS, STRAIN AND DEFORMATION

**February 21 **Rock Lab: Mineral Identification II (Dr. Webers)

February 28 BRITTLE PROCESSES -- Faulting, Jointing

**March 14 **Rock Lab: Rock Identification I (Dr. Webers)

March 21 DUCTILE PROCESSES -- Folding, Foliation

March 28 STRUCTURES ACROSS THE ALPS -- A Young Mountain Chain

**April 4 **Rock Lab: Rock Identification II (Dr. Webers)

April 11 STRUCTURES ACROSS THE APPALACHIANS -- An Old Mountain Chain

April 25 SPRING BANQUET

**Labs will be held at Rice Hall, Macalester College.