



GEOLOGICAL SOCIETY OF MINNESOTA

NEWS

WINTER 1993
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Thoughts of Summer: A Chat With Mother Nature

A month or so ago, while trying to shovel a foot and a half of crusted snow from my back sidewalk (all the while sniffing and sneezing), I decided it was time to have a talk with Mother Nature. "Ms. Nature," I said, "I think we've had enough of this cold white stuff. The birds and squirrels have eaten all the little fruit off my crabapple trees, the snow is much too deep for them to forage, and the sun hasn't shown for weeks. Where's our January thaw? I know we're tough Minnesotans but enough is enough. I'm thinking summer."

With that in mind (my mind at least), the GSM combined Program and Field Trip Committees met at my place on January 18 for discussion and planning.

The **Spring Banquet** is set. Paul Glaser, a liminologist from the School of Earth Science, U of M, will be our speaker. Professor Glaser's topic is "Glacial Climate Changes in the Hudson Bay Lowlands." The banquet will be held April 26 at the Old Country Buffet in Maplewood.

Following up on the December Board meeting, there was further discussion about "Geology of our National Parks" for the 1993-94 Lecture Series. The committee unanimously approved the topic. Dick Uthe volunteered to line up speakers.

Also, there will be three labs next season - "Igneous Rocks and Their Minerals," "Sedimentary and Metamorphic Rocks and Their Minerals," and "Topography Map Reading."

For field trips we considered the following: The Alexandria Moraine and eastern Wisconsin for two-day trips, and the Douglas Fault at Pine City and Mankato Stone Company for one-day trips. Eva Selander and Judy Hamilton are phoning for tour leaders to lead these trips.

The Program and Field Trip committees left the meeting with happy thoughts of

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upcoming summer events. Alas, two days later, Ma Nature (as if to show us who's in control here) sent precipitation. **RAIN!** No matter that it was too cold for rain -- the entire landscape turned into one big ice rink.

Mother Nature, probably trying to make up for all the bad weather, changed her tune recently, and I awoke one day last week to a beautiful adornment of lacy frost on the trees and shrubs. Sparkling ice crystals covered my backyard - undisturbed by a yet unshoveled sidewalk. Still, I'm thinking summer.

Judy Hamilton, President
February 15

Help Wanted: Auditor - Dirt Cheap!

It has been a while (too long) since our books have been audited and we need of someone, possibly a member, who can assume this duty. Our previous auditor is unable to help us at this time. If you, or anyone you know, would be available for this project, call GSM Treasurer, Ed Huppler, to make arrangements. Thanks!

Board News

We've heard that the Geological Survey (University of Minnesota) has been receiving too many calls from folks looking for us (GSM). It was proposed that the Geological Society have their own telephone listing in the Minneapolis Directory.

We now have an "Official GSM Contact." Fran Corcoran volunteered her phone and address for a listing in the Minneapolis telephone directory. Since the directories were recently printed, interested parties will need to call 411.

At the February 22 lecture, the Board voted to try the listing for a year.

We have 188 paid members and 37 are new. The membership roster is about to go to press and will soon be available at the lectures. If you are unable to pick one up at a lecture, call Fran Corcoran and she will send you one. See the new member list enclosed with this issue of the News.

Judy Hamilton, President

S.O.S. From Glacier

Granite Park and Sperry Chalets have been shut down for 1993 because they do not meet "code" on such things as sewage disposal. Compliance will require plans and funds from a park budget already stretched very thin. The chalets were built during the boom years of the railroad (1920's) by James J. Hill's sprig, Louis, for the use of the rich and famous. Hill saw this as his gift to the American people. Now they are open to all hardy enough to trek in for a visit.

Both the Park Service and Belton Chalets, Inc. (the chalet operators) want to keep the chalets open, but they need help. Lanny Luding, Belton Chalet Coordinator, asks that any and all who support and value Glacier and the chalets consider contacting Congress and the President to tell them so.

These mountain treasures offer a truly matchless experience in wilderness adventure. To ignore this bit of our infrastructure would provide a new standard for criminal negligence. Now is the time for all good men and women to come to the aid of "their" chalets. The Ludings can be reached c/o Belton Chalets, P.O. Box 188, West Glacier, MT 59936, (406) 888-5511.

Submitted by Dwight Robinson



Therapsid

Therapsid: * Having the form of a beast.* Extinct order of early mammal-type organisms that gave rise to mammals. Permian/Triassic periods.

"Sue" Suit Settled?

A federal judge has ruled that the Black Hills Institute of Geological Research, a private fossil hunting group, has had illegal possession of "Sue." Unbeknownst to "Sue" (the totally innocent fossil remains of one of the largest and most complete *Tyrannosaurus rex* fossils yet discovered), it turns out "her" final resting place was Indian land held in federal trust for rancher Maurice Williams.

Williams took \$5,000 from the Institute. The Institute thought it bought the fossil. Williams said the money only paid for the right to look for fossils. Since the land was in federal trust, government prosecutors held that federal approval was needed before Sue could be taken.

If Sue could but return to life, she would undoubtedly make quick work of the issue by eating the protagonists one by one as they argued. As it stands, "ownership" remains uncertain. The Institute holds that Williams owns her; the U.S. government says the new administration will have to decide. Stay tuned.

Dwight Robinson

Dinosaurs' Dawning

University of Chicago paleontologist Paul Sereno is one lucky fellow. In 1988, he stumbled onto the remains of one of the earliest dinosaurs while "mining" the badlands of Argentina for bones. This creature dubbed *Herrerasaurus* was a true theropod sporting a double-hinged jaw lined with large sharp teeth (to accommodate prey otherwise too large to swallow). It was a prototype of the line that would end in *Tyrannosaurus rex* some 150 million years later. At 10 to 20 feet in length and 400 pounds, these creatures were probably quite assertive for their day.

Then along came *Eoraptor* or "dawn stealer" less than a mile from *Herrerasaurus*. They were probably contemporaries but *Eoraptor* was only dog-sized and lacked flexible jaws although in tooth and claw it was every bit a carnivore. With such neighbors as *Herrerasaurus* lurking about, it very likely made up with speed and stealth what it lacked in size and flexible jaws. Sereno noted, "We're just a few steps away from the common ancestor of all the dinosaurs." These finds from some 230 million years ago support theories that the earliest true dinosaurs were small, carnivorous bipeds that could outrun, outmaneuver, "outtherapsid" and "outthecodont" most of the competition.

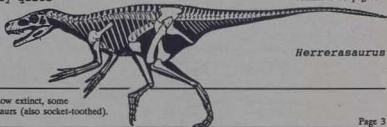
Dwight Robinson

Book Review: A Picture of Early Earth

Have you ever wondered what the earth was like at its birth? The translation of a successful Japanese book, *The Earth: Its Birth and Growth*, (Cambridge University Press, 1981), presents a not-too-technical nearly 100 page presentation of what emerges as scientists delve deeply into understanding the evolution of the earth to its present geological form.

At times becoming technical, author Minoru Ozima, a specialist in isotope geochronology and rock magnetism, explains various radioactive dating procedures. Much remains to be learned about this simple but valid law of radioactive decay. Meteorite study, as other authors continue to point out, not only helps date the age of the earth but helps determine its chemical composition. Research in xenoliths (rocks incorporated in magma as

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Thcodont: "Socket" (thco), "toothed" (dost) reptiles, now extinct, some bipedal, on the path to crocodiles and dinosaurs (also socket-toothed). Permian/Triassic.

The following article, published May, 1992, is reprinted in its entirety by permission of U of M Update.

Bedrock Values

by Richard Broderick

Tucked away in a corner of the Minnesota Geological Survey offices in St. Paul, Val Chandler's desk looks as if it has been partially excavated from a rock slide.

Strewn across the piles of papers and layers of coffee rings are rocks that range from egg-size to chunks big enough to choke a spring pothole. To a geologist's keen eye, though, the disorder is really a handy display of some of the minerals that make up Minnesota's bedrock shield.

"See this?" Chandler asks, running his thumb along the edge of what looks like an ordinary piece of granite, his voice gripped with excitement. "These black particles in here are magnetite. That's one of the leading causes of anomalies."

The anomalies that Chandler, a geophysicist on the Twin Cities campus, refers to are minute variations in the earth's magnetic field caused by mineral deposits in the bedrock. By measuring the difference between the background magnetic field and magnetic readings at the earth's surface, geologists can determine a wealth of information about the bedrock's composition and structure. It's data the state uses to assess its mineral resources and that mining companies need to extract them.

Everyone who uses a compass knows the earth acts like a simple bipolar magnet," explains Chandler. "But when you go over the surface of the earth and take detailed readings you discover there are deviations from this simple field."

The high and low readings caused by the anomalies then can be used to create a shaded relief map in which, as he says, "every bump is an anomaly." Chandler's

interest and excitement stem from the work he has directed for the past decade -- magnetic mapping of the bedrock under the entire state of Minnesota, the largest project of its kind in North America.

The massive undertaking took 12 years to complete as, day in and day out, aircraft carrying magnetometers crisscrossed sections of the state at altitudes ranging between 300 feet and 700 feet, finally creating a grid pattern of readings at intervals of about 1,500 feet. Data collections was finally completed in 1991.

"The whole state has been mapped," Chandler says proudly, displaying some of the maps -- all available for use by government, corporations, or private individuals -- based upon magnetic anomalies.



Saurichia: Order of dinosaurs with hips that resemble those of lizards. Two major groups are theropods (flesh eaters) and sauropods (vegetarians).

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The aeromagnetic mapping of Minnesota was inspired, in part, by an upsurge in mineral exploration and discovery in the mid-70's (remember the stories of a potential gold rush in the Boundary Waters), and partly by the example of a similar effort in Finland. In 1978, then survey director Matt Walton organized an international workshop with money provided by the Legislative Commission on Minnesota Resources (LCMR). Its key recommendation: conduct a high-resolution aeromagnetic survey of the entire state.

LCMR funded the survey through six continuous biennia -- something of a feat in itself considering the ups and downs in the state's budget during that time -- for a total appropriation of \$4.5 Million. Some of the data in the final survey came from the federal government and from the Geological Survey of Canada, but most of it was collected, one flight at a time, by pilots on contract with the Geological Survey.

Minnesotans are used to thinking of the state as pretty solid, geologically speaking, a region of little seismic activity. But, the aeromagnetic mapping has revealed, the state's bedrock is not quite as solid as most of us might assume.

"One of the things we are finding," Chandler says, "is correlations between specific geological features and some recent seismic events, like earthquakes. Those are rare in Minnesota but do occur occasionally and happen along major fault lines.

"Minnesota has been the scene of major events like mountain building. These forces left weakness zones, fault lines, that can be jostled into a gentle amount of earthquake activity." With the aeromagnetic map, Chandler says, it is possible to trace some of the faults that may have caused the 16 known earthquakes in Minnesota history.

One dramatic "event" shaping today's geology in Minnesota was the great ice

sheets that advanced and retreated over the million-year period known as the Pleistocene. At one time or another all of Minnesota lay under glaciers whose bulldozing action is the principal reason why mapping the state's bedrock has posed some special challenges. Major outcrops of bedrock occur over about one tenth of Minnesota -- most of them in the rugged northeast region. Elsewhere, it's a different story.

"As you leave the northeast part of the state," says Chandler, "bedrock knobs become few and far between. And there's no way you can map the faults in the bedrock if you can't see them.

"Up north, glaciers were more in the picking-up-and-scouring mode. Farther south, there was more deposition. We ended up with a lot of Canadian topsoil, which is great for agriculture, but not for mapping bedrock. Each time the glaciers advanced and retreated they left a layer of silt that ranges from a few feet thick to many hundreds of feet thick in northwest Minnesota. Even drilling to investigate becomes very expensive."

Meanwhile, the age of the bedrock differs across the state, adding yet another element to the equation. In southeast Minnesota it is relatively young, geologically speaking -- about 500 million years old. Along the Minnesota River Valley, the bedrock is some of the oldest on earth, about 3.5 billion to 3.6 billion years old, while northeast Minnesota is about 2.5 billion years old. The North Shore along Lake Superior has its own sheet of bedrock dated about 1 billion years old -- rock spilled forth from the earth's interior as a result of continental rifting.

"That rift is what makes the North Shore so scenic," Chandler explains. "You're looking at a place where the continent split apart."

Minnesota Geological Survey maps are available in many different forms -- from

contour maps to color-coded maps to a topographic version on a 1:240,000 scale -- and Chandler reports that they are being used increasingly by "a host of people, chiefly those interested in mineral exploration or for other scientific reasons."

One high-tech variation that has added to the survey's value is digital mapping; all the information recorded by the survey airplanes has been recorded digitally on magnetic tape. The magnetic readings, location of the aircraft at the time of the reading, time of day, and elevation are converted into digital readings that can be fed into a computer and retranslated back into words and figures.

"The tapes are a reconstruction of the aircraft flying through the air," Chandler explains. "You can always go back to the tapes and pull out the digital data." Efforts to make the data as "pc-friendly as possible" reflect the degree to which the geological survey wants the mapping to find practical applications. At the moment, Chandler and his team are now working with the National Oceanographic and Atmospheric Agency to transfer all the data on computer tapes to optical disks for ease of storage and movement.

The project, he says, "is the kind of thing mining companies need but don't usually have the resources to do." And the state, he explains, needs the information to regulate and conserve its mineral holdings.

"From the survey's perspective," he says, "we saw it as something that would give us a tremendous assistance in mapping all of the state's bedrock -- the structure and mineral content. Ever since the beginning of the Minnesota Geological Survey in the 1880s, that's been one of our primary missions."

Our thanks to Update and Editor Richard Broderick for sharing this article with GSM.

Book Report
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it rises from mantle to surface) also provides a look at the composition of mantle.

GSM lecturer, Heyo Van Iken, at the October 19, 1992 lecture, presented a theory of precambrian plate tectonics and how the early earth may have looked. Ozima suggests a major geological topic of the future will be whether plate tectonics, which explains geological happenings since the Mesozoic Era, can be applied to precambrian happenings.

How exciting to be a part of these up-to-date visions of what modern technology tells us about the precambrian era.

Submitted by Margret Rodina

Dating Anomalies in the News

Perceptive readers may have noted a discrepancy in GSM newsletter dating. Since the Geological Society was incorporated October 1938, making us 55 years old next October, shouldn't this issue be Volume LV not XLVII?

The answer is "No." Newsletters weren't started immediately and production was curtailed during the WWII years to conserve paper. Also, certain volumes subsumed more than one year. Furthermore, we have certain major "gaps" (i.e. missing issues) in our geological records. GSM archivist, Jan Mitchell, has a list of our "unconformities" and would welcome news of any missing "strata."

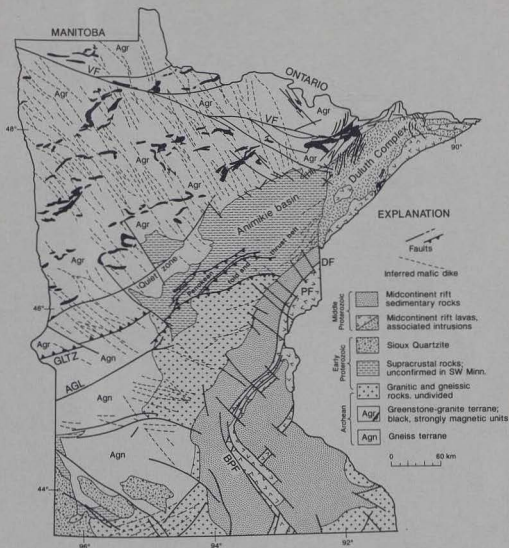
The Editors

News Flash...First GSM Driving Tour Guide almost ready! More to come in next newsletter.

Sauropod: "Lizard" (sauro), "footed" (pod), suborder of herbivorous dinosaurs with long necks and tails and five toes.

MINNEOSTA BEDROCK MAP

Minnesota Geological Survey



Simplified geologic map of Archean and Proterozoic rocks of Minnesota compiled from published and unpublished sources at the Minnesota Geological Survey. AGL, Appleton geophysical lineament; BPF, Belle Plaine fault; DF, Douglas fault; GLTZ, Great Lakes tectonic zone; PF, Pine fault; and VF, Vermillion fault.

Terrane: Area or surface over which a particular rock or rock group is prevalent.

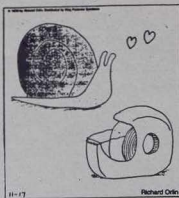
1993 Committee Chairpersons

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Membership participation on committees is always welcome. Contact chairs of interest to join in.

Look for more exciting new features in upcoming issues of your newsletter.

THE NEW BREED



The purpose of this newsletter is to inform members and friends of the activities of the Geological Society of Minnesota. NEWS is published four times a year - Feb. 15, May 15, Aug. 15, Nov. 15. Deadline for article submission is the 1st day of the month of publication.

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First Class

PLEASE FORWARD