GEOLOGICAL SOCIETY OF MINNESOTA

NEWS

Summer 1995
VOLUME XLIX, NO. 2

CONTENTS

Newsletter

RENEW YOUR MEMBERSHIP NOW!

Hello, friends!

Avoid annoying long lines. Use valuable resources wisely! Save wear and tear on your car. Support the friendly US Postal Service. Save the Membership Chair from countless hours of worry and sleepless nights.

That's right! It's membership renewal time for almost everyone in the Geological Society of Minnesota. The renewal year begins October 1, 1995.

Individual Memberships are $15. Family memberships are $20. Student memberships are $7.50. Send your check or money order to:

Geological Society of Minnesota
4105 41st Avenue South
Minneapolis, MN 55406

If you have questions about the benefits of membership (this snappy and highly informative quarterly newsletter, guilt-free lecture attendance, working at the State Fair booth, having your own personal copy of the membership roster and Rocky Roots, those invigorating Field Trips, voting at elections) call Membership Chair Fran Corcoran at 612-724-2102.

AND THANKS!

Call to All Members

Share your news, suggestions, ideas, comments and experiences with your GSM family! Send copy, disks, or articles to your Editor for use in the NEWS. Your news is our NEWS!

Volunteers needed!

While you are out and about Minnesota this summer (or any season, for that matter) consider helping to locate, inspect, and report on Geological Markers throughout the state. For each report, you can get two free video rentals from the GSM Video Library. Call Doug Zbikowski, 784-0201, for more information on marker names and locations.

ANNUAL MEETING
MONDAY
SEPTEMBER 25, 1995

OLD COUNTRY BUFFET
3000 White Bear Avenue
Maplewood, Minnesota

Election of 1996 Directors
Slides, Photographs and "Trophies"
of '95 Summer Field Trips

Board News

This has been a very busy year for the GSM Board. At the June meeting, President Doug Zbikowski presented a new State-of-the-Art portable PA system for use during field trips and lectures. The system was used on the Grand Marais/Thunder Bay field trip and was a tremendous success. At last—everyone can hear our leaders! Of course, they still have to listen.

President Zbikowski also purchased two neon orange road cones to mark our tail end on field trips when our caravan of numerous cars must park along a highway. Those too were successful—if lack of crashes is any measure.

Doug also attempted the first video taping of a field trip on the Thunder Bay trip June 24-25. If successful, our videos can be used on Cable TV. We will let you know as this exciting experience progresses.

As if that isn't enough, President Zbikowski and other members of the Society are locating, inspecting and reporting on our 33 GSM markers around Minnesota. Doug still needs volunteers to help with this project. If you would like to help him, call 784-0201 to coordinate your efforts with those already done. Doug has also contacted the Minnesota Highway Department to request placement of "approach signs" along our highways alerting drivers to a Geological Marker ahead. The Highway Department has agreed to do this and will even help in repairing our stonework. These will be similar to the signs that indicate Historical Markers throughout the state.

At the July meeting, Doug proposed an update and edit of the Geological Society By-laws. After vigorous discussion, these were accepted by the Board. These updated By-laws will be ready for approval by the membership at our Annual Meeting in September. The update calls for a GSM Operating Guide, with officer's and committee chair's job descriptions, making for easier transitions when new directors are elected. The revisions will also make GSM a bona fide non-profit corporation eligible to make application for grant monies for public service projects. Along with this, we are making an "action calendar" to prompt timely performance of yearly duties.

The Board also approved an increased in Honorariums for lecturers and field trip leaders from $50 - $75. Whether this is still enough was debated, but it *is* an improvement.

Submitted by *Judy Hamilton*

GSM Events Hot Line! 784-0423

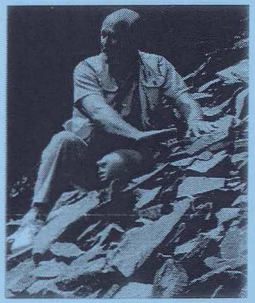
Get the latest on GSM's upcoming events and activities just by dialing the HOTLINE! And you can even leave a message!

June 1995 Field Trip Explores Lake Superior Geology

By Bill Hoffman

Two Canadian professors described the geologic history and pointed out examples of volcanic rock up to 3 billion years old to the 40 people who caravanned on a four-day Geological Society field trip in June along the north shore of Lake Superior.

At the first site at Grand Marais on Saturday, June 24, the group stood and sat on the concrete seawall or on the dark, angular volcanic igneous formations at Artist's Point, as the professors described the rock history. Columnar fractures developed as the lava cooled and solidified, similar to mud cracks.



Professor Kehlenbeck on a talus slope

Manfred Kehlenbeck and Steve Kissin, professors at Lakehead University in Thunder Bay, Ontario, described the 1.5 billion-year-old mid-continent rift. It can be traced from Isle Royale in Lake Superior south to Kansas and east to Ohio.

The "aborted rift" lasted about 25 million years and started to break up the North American continent. The rift was presumed to be driven by a deep heat source that produced rising plumes of molten rock. The rifting episode produced much of the volcanic rock visible today in the Lake Superior area. The rifting produced faulting and flows of molten rock, rather than volcanoes.

The professors answered questions and talked about how all continents contain ancient (Proterozoic, Archæan, and Precambrian) rocks. They described the geologic drift of continents and how younger rock masses collide and accrete around the edges. For instance, the

Shield: *Continental "core" made up of Precambrian igneous and metamorphic rocks folded and deformed by Precambrian tectonics but since then subject only to uplift and erosion.*

Appalachian mountains were once attached to Scotland. The oldest rocks now known are in the Northwest Territories in Canada dating to 3.9 billion years.

In geologic research, it is important to determine the precise location of a site in order to understand its history, context, and composition in relation to adjacent rock formations. The professors demonstrated the latest hi-tech instrument they use for determining location. It is called a Global Positioning System, or GPS.

The hand-held instrument locates the site by communicating with earth satellites. The instrument is so accurate that its calibration is intentionally misaligned a small percentage by the manufacturer, to reduce the chance that the technology could be used for military purposes. The professors said they used the instrument last summer to determine the location of a meteorite that fell in Quebec.

Prehistoric fossil captured live!

After a stop at Grand Portage, the group went to Pigeon Bay on Lake Superior where the professors talked about the "Pigeon River dike swarm," igneous intrusions, contact metamorphism, and pointed to small faults and veins of lead, zinc, and copper visible in the exposed hillside next to the highway.

The landscape at Grand Portage transforms into the high forested mesas that continue on the trip into Thunder Bay. A large pulp mill spouting steam and fumes sits at the base of a high mesa outside of Thunder Bay. The city of 113,000 residents is about 400 miles from St. Paul. It is in the eastern time zone and the sun set at 10:03 p.m. on the 25th. The sun set an hour earlier in the Twin Cities.

The record heat wave and drought in June threatened jobs at the mill because wood chipping operations had to be limited to night hours to reduce the chance of the operations setting more forest fires. Temperatures in Thunder Bay topped 105° F earlier.

The professors noted that hazards, such as poisonous snakes and plants and deer ticks, are absent from the area. It is, however, prime mosquito and gnat country! They said the Thunder Bay area is near the northern limit of the range of deer and moose. The area has elk and caribou.

On Sunday, June 25, the drought broke and there was thunder and rain in Thunder Bay. Those on the field trip wore bright ponchos and carried umbrellas as they listened to the professors. They lectured under the eave of the visitor's center at the Terry Fox Memorial, situated high above Thunder Bay with a sweeping view of Lake Superior.

Driving 30 miles north through logging country, the damp pine scent was sweet. Quiet areas of marsh water and grasses reflected like a black mirror. A beaver dam looked like a stockade holding back a pond.

Stopping at Quetico and Wawa formation outcrops next to the road, the professors answered many questions. The smooth surface of buried rock broke the surface like a small continent. "Presumably this would keep going until you hit the mantle," Prof. Kehlenbeck said.

Driving up a long, steep dirt road on Sunday lead the group to an open-pit amethyst mine, the final stop on the trip. Spaces in the faulted rock allows the passage of liquids which crystallize into quartz. Amethyst contains iron and is a form of quartz. At the mine site, which overlooks a small dark lake which is part of the same fault zone, some individual amethyst crystals sticking out of the ground are as large as your fist. The purple amethyst has been known since Roman times as a gem stone.

Both professors waived their honoraria. They said the group asked good questions. The professors could be heard easily at each stop because they used the head set and portable loud speakers provided by the Geological Society.

Each stop was video taped by Doug Zbikowski. He used equipment borrowed from the public access cable TV station. The station may be interested in broadcasting a program on the field trip.

For an excellent and very readable account see *Geology of the Lake Superior Region,* by Gene LaBerge, Geoscience Press, Inc., Phoenix, AZ 1994. Cost is about $20, and volume discounts of up to 40% are available through Mountain Press. LaBerge is Professor of Earth Sciences in the Geology Dpt. of the University of Wisconsin, Oshkosh.

Final Field Trip for 1995!

September 9 - River Valleys (1 day) Leader: Carrie Patterson of the Minnesota Geological Survey

Carrie will lead this expedition while explaining how the glacier affected three rivers—the Mississippi, Minnesota and St. Croix.

Joint: *A fracture or break in a rock along which no movement has taken place.*

Profiles in Geoscience
CHARLES LYELL

Part I: 1797 to 1832

Grand Portage was a bustling outpost to adventure. David Thompson, astronomer and surveyor of the northern territories and the Pacific Northwest was employed by the British Northwest Company to locate the source of the Mississippi. He declared it to be Turtle Lake (about 10 miles north of what is now Bemidji).

The "Magician of the Charnel House," (Georges Cuvier) had just declared for the first time that species go extinct based on fossil elephant bones unearthed in Paris and James Hutton, physician, gentleman farmer and geologist, who looked at unconformities and discovered a bottomless abyss of time, died. The year was 1797.

On November 14th that year Charles Lyell Jr., first child of Charles Sr., was born into wealth in a rambling manor named Kinnordy nestled between mountains on the east coast of Scotland. Before young Charles could say "Kinnordy," Charles Sr. moved his family to southern England in the pursuit of better weather. In the course of a sometimes rough and tumble schooling, Charles Jr. honed his observational skills by hunting and accurately identifying "bugs" and bird eggs and mining books in the family library.

In one of these books (*An Introduction to Geology* by Robert Bakewell) he read, "Compared with the ephemeral existence of man the epochs of these [geological] changes appear of almost inconceivable duration." Lyell was about 15 years old at the time. In looking back at his school days he observed, "I was always most exceedingly miserable if unemployed, though I had an excessive aversion to work unless forced to it."[1]

Great Britain and the United States were nearing agreement on the forty-ninth parallel as the northern boundary of the Louisiana Purchase (and the state to be named Minnesota.) Such surficial boundary disputes were literally scratching the surface. The real, more interesting challenges of the day were surfacing from what was below ground.

At Oxford, Lyell's future in geology took another notch forward when he took a course in geology from the eccentric and eloquent William Buckland (1784 - 1856). Buckland of the blue bone bag, bat urine taste test, exotic hair bugs and numerous other stories, hauled his bone bag to even the most fashionable of parties where he would extract a bone only to "describe with infinite drollery...the latest find from a bone cave." On one occasion he gave his dinner guests a good start toward indigestion when he announced they had just finished a meal of Siberian mammoth! (His special interest was the large mammals such as hyenas and elephants interred in British caves during the "Deluge." He was a Neptunist, later to be called a Catastrophist and a consummate showman.) Buckland's class often rode to outcrops on horseback and field geologists, like cricketeers and hunters of the day, regularly performed in top hats!

Earth circa 1800

By this time, it was clear that the Earth and its history was a many layered thing and these layers bore mute witness to a welter of earlier times and events. The seekers after earth history (naturalists) were caught between "the rocks and a hard Faith." On the one side there was Sir Isaac Newton's recent and tidy discovery of the "clockwork universe" and that scriptural timetable set out in the Book of Genesis. On the other were the messy rocks stacked in multiple layers or twisted and bent into complex folds and contortions often seeming to defy both. Through the common themes of heat and water, compromises were struck and "schools of thought" were developed. Those who studied volcanoes not surprisingly found heat to be the best explanation for what was seen at the surface and were labeled "Vulcanists." Those who studied the usually more orderly sedimentary strata invoked floods and hence were of the "Neptunist" school. The two approaches were not mutually exclusive and "hybrid species" were common. All were united in their belief that violent and cataclysmic events provided the best (and religiously safest) explanation for what they saw in the rocks. Yet accounting for these violent, worldwide paroxysms in terms of natural, observable processes was a constant challenge. Skeptics began to speak.

While Lyell was not inclined by constitution or temperament to emulate his great teacher, he noted during his days at Oxford, "It is seeing the superiority of others that convinces me how much is to be, and must be, done to get any fame, and it is this which spurs the emulation." In Buckland's case, the normally genial Charles Darwin found him "though very good humored and good natured...a vulgar and almost coarse man...incited more by a craving for notoriety, which sometimes made him act like a buffoon, than by a love of science." And his obvious problems in proving that the remains of animals he was finding in caves were those of animals existing before the flood, as proposed in his book *Reliquiae Deluviae* (1823) or *Relicts of the Flood* prompted the following critique:

> Some doubts were once expressed about the Flood:
> Buckland arose and all was clear as mud.

Despite his personal quirks and quibbles, William Buckland encouraged Lyell in his studies and remained a life long friend, sounding board...and eventual "convert."

Lyell finished his degree in 1819 and at his father's prompting, took up the study of law which his father advised required confidence and quickness as chief virtues. Charles responded, "I know I have little enough of them now" and wondered whether intercourse with the world would supply them. Troubled throughout life by weak eyes, he had to take breaks from his law studies to relieve

Zeolite: One of a group of hydrous (water-containing) aluminum silicate minerals found in basalts (e.g., thompsonite) that bubble when heated. "Zeolite" is derived from two Greek words meaning "boiling stone."

the eye strain. He did this by doing geology, in this case, on the Continent. In fact, travel was a way of life for Lyell. He would later declare the first three prerequites for the student of geology to be travel, travel and travel; and if indeed that is the secret, it certainly worked for him. He showed neither lack of confidence or quickness once he decided what he needed to be done about the world he was seeing on these travels: uniform processes which must have acted over countless æons of time just as they do today.

In 1819, he was also elected Fellow of the Geological and Linnean Societies in London, and in 1823 in his role as secretary of the Geological Society (at the extraordinarily young age of 25), "fortified with most excellent letters of introduction" and copies of Buckland's Reliquiae Diluviae, he crossed the channel to France where he mingled with some of the best and brightest of the French savants (scholars) at the time including Georges Cuvier and others living in Paris such as Alexander von Humboldt (renowned geographer and explorer and Cuvier's chief rival in science.) At this time, Paris was the science center of the world.

By Lyell's own accounts, he was warmly received at Cuvier's weekly soirees—social gatherings for conversation on topics of mutual interest—and got a good taste of French politics, as was inevitable with Cuvier, who was both a brilliant scientist and an often disliked politician. Lyell paid close attention to the French methods of education. He also visited the Tertiary strata of the Paris basin with Professor of Mineralogy Alexandre Brongniart, who had mapped the basin with Cuvier in 1806. In fact, Lyell's list of friends and acquaintenances was beginning to read like a Who's Who of earth science at the time.

Fort Snelling had just recently been built (1819) of limestone quarried from nearby bluffs at the junction of the Minnesota and Mississippi Rivers—"artfully designed to repel attack from any direction."

In the summer of 1825, Lyell's eyes had improved enough to finish his law studies and his training as a barrister proved to be the best possible preparation for what was to be the greatest brief in the history of geology: *Principles of Geology: Being an Attempt to Explain the Former Changes of the Earth's Surface by Reference to Causes now in Operation.* Volume One appeared in 1830. Volumes Two and Three were finished by 1832. Of affable character and unassuming demeanor, he seemed to avoid direct offence although he knew his books were going to "create waves," particularly among the Catastrophists. Which brings us to the great exposé.

Henry Rowe Schoolcraft traces the Mississippi to its true source in Lake Itasca.

Of Straw Men and Cardboard History

Since Cuvier had so brilliantly articulated the Catastrophist view in his Theory of the Earth (1812), he has poshumously assumed the dubious mantle of chief spokesman for this view; there can be little doubt that he believed in his interpretation of earth history. His careful stratigraphic work in the Tertiary of the Paris Basin clearly showed the strata to be abruptly discontinuous in fossils and sediments from one layer to the other. Hence in his empirically literal reading of the record, something intervened (a catastrophe) that swept the slate clean only to start all over again in the next layer.

Cuvier's predecessor and idol in Paris, Comte de Buffon (1707 - 1788), had already cracked the strictures of biblical time by estimating the earth's age at 74,832 years. It was shocking and condemnable stuff at the time. The idea was considerably refined by the time of Cuvier and Buckland. If the latest catastrophe say 6,000 years ago was taken as the Biblical Deluge and "Man" a distinct and separate creation of these last few thousands of years, then geologists could claim as much time as they pleased for the preceeding "Days of Creation."

Buffon's contemporary across the channel, James Hutton (1726-1797), did just that. But in doing so, he found no need for deluges or "days" of creation. In Hutton's view, the earth's surface could be seen as the product of slow and steady processes such as erosion by rains and rivers. As the sediments settled into the sea, they were layered and lithified by the earth's heat and as the present suite of continents wears down, the new rocks are elevated to maintain the continuity of human habitat. In this scheme, Hutton maintained he had discovered the geological equivalent of Newton's clockwork universe: "We have now got to the end of our reasoning...For having, in the natural history of this earth, seen a succession of worlds, we may from this conclude that there is a system in nature; in like manner as, from seeing revolutions of the planets...(and) if the succession of worlds is established in the system of nature, it is in vain to look for any things higher in the origin of the earth.

James Hutton—astonished at the forms his rocks have taken! (Look for the profiles)

Diagenesis: The physical and chemical processes (changes in mineral composition and texture, excluding metamorphism) that affect deposited sediments causing and subsequent to the formation of solid rock, i.e. lithification

The result, therefore, of our present inquiry is, that we find no vestige of a beginning, no prospect of an end." In latter day assessment, Hutton has been ranked as the "Founder of Modern Day Geology."

Hutton claimed a uniformity of process both in kind and degree acting over infinite stretches of time. Cuvier granted him a tightly crafted paragraph in his work of 1812, ranking him second among six other recent system builders better than their predecessors but still of the "armchair tradition." You don't build scientific consensus from an armchair and Cuvier had little time for theories. Taking the flip side, Lyell observed, "They (the Catastrophists) felt themselves at liberty to indulge their imaginations in guessing at what might be, rather than inquiring what is." In a letter to his sister he charged Cuvier with "trucking in humbug," and found little excuse for it given Cuvier's otherwise splendid powers of reason and observation.

By 1827 Lyell's intent was clear: "I am going to write in confirmation of ancient courses having been the same as modern, and to show that those plants and animals which we know are becoming preserved are the same as were formerly."

Did Lyell also indulge in humbug? Why did he resist Darwin's theory of evolution for so long? What can we learn from Professor Ichthyosaurus? Next time: Catastrophism gets taken to court. For the prosecution: Charles Lyell. For the defense: Georges Cuvier.

Bering Glacier Takes 5

Alaska's huge Bering Glacier, which had been surging southward toward the Pacific Ocean as fast as 300 feet a day, has finally stopped its rush to the sea. "It's now about five miles from the ocean," said Bruce Molnia, deputy chief of the office of international geology at the U.S. Geological Survey in Reston, Va. "It's remarkable."

The world's largest surging glacier advanced more than six miles south between October 1993 and July 1994, reversing 25 years of northward retreat. It has surged at least five times this century pushed forward by water pressure building underneath the ice.

"It's the largest, its the most aggressive surge that's occurred since 1960," said Dennis Trabant, a USGS glacier scientist in Fairbanks. "What has happened at Bering is world-class speed. Very few people will live to see the next one." At 125 miles long and more than 2,300 square miles in area, the Bering Glacier is bigger than Rhode Island. Its ice is up to a half-mile thick in places.

Quaking on the Inside

"With the largest thermonuclear device we have, we can only make small craters in the ground," said Doug Morton, research geologist with the U.S. Geological Survey. "An earthquake can be miles of earth moving. If somehow you could have been down there, the sound alone would have pulverized you. There'd have been this flinty, rock-quarry smell, but a million times over, from all the blasting and grinding of tons of rock into powder. Plus, there would have been these tremendous rushes of water through the rock. People think of rock as being solid, but it isn't. There are all these pores and cracks that are filled with water, and the movement of the rock during the quake would have been like water being squeezed out of a sponge." The earth is quaking constantly at this very moment, all along the broken edges of its crustal plates. Most of the trembling can't be felt, barely registering on the world's seismographs. Still there have been 7,027 significant earthquakes since the beginning of this decade alone, resulting in 65,000 deaths.

Morton is working on the 1992 quake that rocked Landers, California sending an unusual volley of aftershocks out over much of the western United States. Was this due to the interaction of the quakes shock waves with a deep magma chamber underlying these regions? Morton is entering seismographic data into an ARC/INFO geographical information systems (GIS) database. Morton says, "We really don't understand a lot of the forces involved in...quakes. This is one of the reasons for...GIS. Using ARC/INFO we will be able to unravel the complicated geophysical, geological and seismic history of the this area."

GIS will allow researchers to record three dimensions—two dimensions for the map coordinates and the third representing time. Studying these systems through time may not just provide a better picture of how they work they should also help more closely "predict" when and where the next quake is due.

Excerpted by *Dwight Robinson*
(from *ERSI/ARC News*, Summer 1995 and *Geocurrents in Rocks and Minerals*, Vol. 70, May/June 1995)

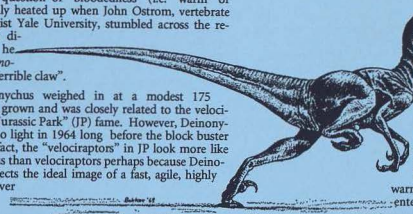
Geology in Cyberspace

For GSM members with access to—or interest in—the Internet, there is a wealth of resources on topics of geological interest. A very thorough listing of Internet geological sites has been compiled by Dr. Phil Ingram, Professor of Earth Sciences at Macquarie University, New South Wales, Australia. He has very graciously allowed us to publish it as a GSM document, and anyone interested can get a copy by calling the GSM Hotline. It's sixteen pages of 9-point type, so be prepared!

Lithification: *The formation of solid rock from unconsolidated sediments by such processes as compaction, cementation and diagenesis.*

Dinosaurs: Lost by a Nose?

Imagine taking the temperature of a living dinosaur. Despite where you and the thermometer would likely end up, it still beats conjuring up metabolic rates from systems that shut down 70 to 225 million years ago. The whole question of "bloodedness" (i.e. "warm" or "cold") really heated up when John Ostrom, vertebrate paleontologist Yale University, stumbled across the remains of a dinosaur he named *Deinonychus* or "terrible claw".



Deinonychus weighed in at a modest 175 pounds full grown and was closely related to the velociraptors of "Jurassic Park" (JP) fame. However, Deinonychus came to light in 1964 long before the block buster movie. In fact, the "velociraptors" in JP look more like Deinonychus than velociraptors perhaps because Deinonychus projects the ideal image of a fast, agile, highly "tuned" ever voracious looking predator.

(Also like "Jurassic" versus the more accurate "Cretaceous" Park, Velociraptor is more euphonious and evocative than Deinonychus). All such artistic license aside, the true nature of this beast was not lost on Ostrom who concluded that these traits, "indicate an unusual level of activity for a reptile and suggest an unusually high metabolic rate. The evidence for these lies chiefly, but not entirely, in the foot."

In a presentation to the first North American Paleontological Conference in Chicago in 1969, Ostrom argued there is considerable evidence that many of the "ancient reptiles" could not be used as indicators of paleoclimates due to their avian and mammalian style metabolism. Controversies over the "hot-blooded" dinosaur have raged ever since. Now it appears scientists may have been studying the wrong end of the beast. According to the March 15, 1995 issue of the *New Scientist*, researchers John Ruben, Oregon State University in Corvalis and a former student John Hellenius, have begun taking a hard look at dinosaur noses.

In mammals and birds, a scroll-like set of turbinate bones or cartilage in the nose provide an expanded surface area over which warm air being exhaled is cooled condensing water vapor out and thus retarding dehydration. Likewise cool, dry air is warmed and moistened before entering the lungs.

With the help of CAT scans two major groups of dinosaurs have been examined so far, including the Velociraptor, and all have flunked the turbinate test. The turbinate system apparently evolved separately in birds and mammals but all warm-blooded animals have turbinates.

During the long, humid summer of Mesozoic times perhaps most dinosaurs had no need of such refined heat or water conserving mechanisms. The great mass of the larger varieties would be enough to stabilize body temperature. The smaller ones are the best candidates for warm-bloodedness as we know it. The researchers plan to examine all the other major groups of dinosaurs before declaring the dinosaurs lost by a nose at the close of the Mesozoic summer.

Submitted by *Dwight Robinson*

To join the GSM Video Library, fill out the enclosed form and mail it to GSM Library, c/o Doug Zbikowski, 7833 Able Street NE, Spring Lake Park. MN 55432. Be sure to enclose your check to activate your membership.

GSM VIDEO LIBRARY MEMBERSHIP APPLICATION

Name _____
Address _____
_____
_____
Phone (H) _____
(W) _____

Occupational background _____
Special geologic interests _____
I would like to do volunteer work for the GSM Video Library _____

Current GSM member _____
MEMBERSHIP LEVEL DESIRED
Regular $15 ____
Friend of the Library $50 ____
Sponsor $100 ____
Patron $200 ____
*Videos purchased with gifts will bear recipient's acknowledgment unless checked here _____

Schistosity: ***The arrangement of minerals in a coarse-grained metamorphic rock in layers that are (as in schists) parallel to each other and may be split along these schistocity planes.***

1995 Minnesota State Fair
August 24—September 2, 1995

Have you volunteered yet (or been called) to work a shift (4 Hours) at our 1995 GSM State Fair Booth in the Education Building? If "No," please do so now. Our GSM booth is one of best vehicles to tell folks about GSM and is our primary source of new members. Be involved in helping to increase our membership!

It's fun to tell people about the upcoming 1995 Lecture Series "Geological Resources and Life: Bounties in the Balance" or showing and explaining to the children the rocks and fossils on display. The Fair Committee has new ideas to display this year including new fossil (life) and mineral (resources) charts and photographs of some recent field trips.

Each shift is only four hours, so you can make a day of it at the Fair. We need your help! Call Judy Hamilton, 699-9812, right away to reserve a spot in the booth.

Vid Watch

Sylvia and Ed Huppler have donated two videos to the GSM Video Library in memory of Sylvia's brother Ken Torstad. The titles are *Geological Time* and *Continental Drift, the Theory of Plate Tectonics.* Our Vid Reporter tells me *Geological Time* superbly illustrates the application of dating techniques, and *Continental Drift...* is the most comprehensive video on plate tectonics he's seen.Take some time out to rent and view these videos. You'll enjoy! *If you're not already a member of the library, complete the form on Page 7 and send it in today!*

The purpose of this newsletter is to inform the members and friends of the activities of the Geological Society of Minnesota. *NEWS* is published four times a year—February 15, May 15, August 15, and November 15. Deadline for article submission is the first day of the month of publication.

SUPPORTING AND PROMOTING PUBLIC INTEREST IN THE GEOLOGICAL SCIENCES SINCE 1938.

Geological Society of Minnesota

ST PAUL, MN PM APR 17 1995

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FIRST CLASS

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PLEASE FORWARD

This Season's Color: Lunar Blue