

News letter
(don't care)

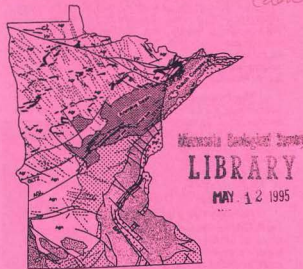
BOARD NEWS

Dick Heglund has been elected as a Director of the Board, replacing member Tom Casey, who recently resigned due to time constraints. We'd like to thank Tom for his service to the Board and GSM and welcome Dick.

The Public Service and Public Information committees have merged into one committee—Public Service. Doug Zbikowski will chair the committee for 1995. Committee Members are Charles Brennecke, Kathryn Clayton, Dick Heglund, Sr. Joan Kain, Paul Lemke, Susan McGuire, Conrad Nelson, Debra Preece and Dick Utke. It was felt that merging the two committees would better serve GSM needs in these areas. Other committees, their chairs and members, can be found in the new roster. Speaking of the roster, copies are now available for pick up at lectures and will be at the Spring Banquet. Stop and see Fran Corcoran, Membership Chair, for your copy. Fran will also be mailing copies out to those members unable to pick one up at a function.

Fran has reported that we have an all time high in membership—228 members as of this month. It's good to see the Society growing.

—Judy Hamilton, Secretary



GEOLOGICAL SOCIETY OF MINNESOTA NEWS

SPRING 1995
VOLUME XLVIII, NO. 4

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FROM THE CAPROCK

In this issue we are launching a new feature: "News from Cyberspace." Rock hounds and geology buffs have hit the information highway. We invite you to share your cyberspace experiences in the GSM News. Look for a cyberspace "starter kit" on page 7. Val Chandler of the Minnesota Geological Survey has more on earthquakes on page 4, and we feature news on two venerable ancestors of bygone days, the newly discovered Wollemi pines and the newly troubled coelacanths. Look for GSM summer field trips and other field opportunities, a profile in geoscience quiz and a video review.

How about another new section, spotlighting a different Minnesota rock each issue?

—Dwight Robinson

EVIDENCE FOR GLACIAL CYCLES IN THE LAST 200,000 YEARS—WHAT DRIVES THE ICE AGES?

By Christina Gallup
Geology Department University of Minnesota
Dinner: 5:00 p.m.
Speaker: 7:00 p.m.
April 24, 1995

Old Country Buffet
Maplewood, Minnesota

MARY R. KIMBALL MEMORIAL BANQUET

Summer Field Trips

Our Field Trip Committee has been busy planning trips for this summer, and we now have dates and locations which are listed below. For those of you who made note of the field trip dates written on the blackboard at the March 27 lecture, one of the dates has been changed. The trip previously scheduled for June 3 has been rescheduled for August 12.

June 24 & 25 - Thunder Bay, Ontario (4 days) Leader: Prof. Manfred Kehlenbeck

This trip will require travel time on Friday, June 23 to Grand Marais, and Monday, June 26 to return home. We will meet in Grand Marais on Saturday morning, June 24, where we will begin the trip by examining volcanic rock which is 1.9 billion years old as well as other volcanic rock about 3 billion years old. We will continue on to Thunder Bay to visit an amethyst mine where you will be able to collect raw amethyst samples. Information is also being gathered for a trip on the excursion boat to Isle Royale.

July 22 & 23 - Mesabi and Cuyuna Ranges (2 day) Leader: This will be a self-guided field trip.

We will tour the LTV Steel Company in Hoyt Lakes, Minnesota, lunch at Virginia, and view an open pit mine. (There is concern that the mines are full of water.) We will visit another Taconite Company in Hibbing, and Chisholm's Iron World Amusement Center which has a mineral museum. We will also see a mining museum in Calumet.

August 12 - Shiely Co. and the Brickyards (1 day) Leader: Jane Clelend of the Minnesota Geological Survey.

On this trip, we will visit two of Shiely's plants on Grey Cloud Island, one sand and one gravel plant. Then we will travel to the brickyards in Lilydale and stop for lunch on Harriet Island in St. Paul.

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.

More information will be mailed to all before each trip. Watch for it—sounds like a fun summer.

To find out what to wear, what to bring and how to plan for a GSM trip to the field, see "Practical Hints for Field Trips," page 3.

Farther Afield

Just think of the geological booty yet to be mined, excavated or discovered. You can be part of the action. All you need is enough time, stamina, interest and curiosity to sustain yourself "in the field." The field is often in turns hot, dusty, scorching, windy, wet, cold, usually remote and always memorable. Here is a sampler and happy hunting!

The Potomac Museum Group (PMG) aka Earth Museum is a local group of for-profit collectors who conduct small group trips of 4 to 7 days to a Cretaceous bone bed in the Lance Creek Formation, Wyoming. The main quarry is the Cretaceous duckbill dinosaur Edmontosaurus. Conditions are primitive. Contact Hal Halvorson for more information at (612) 521-4434. Also look for the annual PMG Open House in June at their "digs" in the old Robbinsdale High School Building.

The 1995 Field Paleontology sessions through the **South Dakota School of Mines and Technology, Museum of Geology** are set. It is billed as a "two week hands-on experience which may be taken for academic credit or just of the enjoyment of a very rewarding experience." The sessions start in early June and offer session on Jurassic dinosaurs, Cretaceous dinosaurs, Cretaceous marine reptiles and South Dakota Badlands Oligocene mammals. Schedules are available from Dwight Robinson. For more information call 1-800-544-8162, or write directly to:

Dr. Philip R. Bjork
Museum of Geology
501 East St. Joseph Street
Rapid City, SD 57701
(605) 394-2467.

Devonian Fossil Gorge near Iowa City, Iowa, reveals a record of life 375 millions years ago. It was only recently exposed thanks the flood waters of 1993. As water surged over the emergency spillway at Coralville Lake to the northeast, it scoured off the topsoil revealing the ancient sea floor nearly 1,000 feet deep at this location. You can see remnants of corals (bryozoans?), sea lilies, worms and other denizens of the ancient deeps. Keep this one in mind for a handy roadside stop - no special equipment or expense required. For more information call (319) 338-3543.

Dinomation's Dinosaur Discovery Expeditions promise the opportunity to join a research team excavating a Jurassic watering hole at Rabbit Valley near Grand Junction, Colorado. Five days of amateur paleontology for \$775, with other sites in Wyoming, Indonesia, Argentina, England, California and Mexico. For more information call (800) 344-3466.

Adaptive Radiation:

The development of new species that occurs through natural selection when the descendants of a taxon evolve into different species due to new or changing environments.

Chris Paola: A Class Act!

One of GSM's favorites, Chris Paola, Associate Professor of geology and geophysics, was the recent recipient of the Horace T. Morse - Minnesota Alumni Association Award for his excellence in teaching, advising, academic program development and educational leadership in undergraduate teaching. A colleague noted that Chris Paola "symbolizes all that is right with undergraduate instruction at a large research-oriented institution."

Dr. Paola notes that his "most important goal is to demystify things because the growth of the sciences has made them seem remote from everyday experience and inaccessible to the majority of people." As opening lecturer for the GSM 94/95 Program, Chris led us down a rocky slope straight into the dynamics of rock falls posing the question: "How is it that rocks can 'cascade' so far up the side of an opposing slope?" Neurons were fired up all over the room.

While we didn't "solve" this problem it was the perfect demonstration of the "Paolaian" method. "I put a lot of effort into trying to convince my students that they really can understand things based on their own wits...and observation, that they shouldn't take my or anybody else's word for it, and that the final authority in science is not books or experts, but nature itself." Amen, Chris and congratulations!

As a winner of the Horace T Morse award Dr. Paola and 9 other distinguished undergraduate teachers will receive commemorative plaques, and \$2,500 to each winner and his or her department annually over the next three years. Dr. Paola's main area of research interest is physical sedimentary processes especially problems that apply directly to the generation of the sedimentary record.

Dr. Paola's lecture to the Society on October 3, 1994 opened our series on *Catastrophic Events in Geology* and was titled "Catastrophic Events in the Sedimentary Record: History and Observations."

Taxon:

A taxonomic group or unit of biological classification of organisms; for example: genus, family, species, etc.

Practical Hints For Field Trips

GSM field trips often involve "seeing" and "doing." Use the check list below to help prepare for your trip.

1. CLOTHING: Dress casual and practical. Layering will help you ease through those daily and seasonal temperature changes for which we're famous. Hats protect against sun and rain.

2. EQUIPMENT: Plastic bags or other specimen containers, labels (masking tape works well), writing tool(s), note book, rock pick.

3. FOOD & DRINK: Plan for lunch in the field. Bring plenty of liquids.

4. OPTIONAL ITEMS: Camera, binoculars, hand lens, rain gear, sun screen, bug repellent, field guides for rocks, fossils, birds, bugs, etc.

5. OVERNIGHT: Depending on the trip instructions, plan to bring canned or dry foods for more meals in the field.

6. SCHEDULE: Plan to make a day or days of it; schedules, meeting sites, stops, restaurants and accommodations are usually suggested for overnights. Schedules tend to be flexible.

7. GETTING INVOLVED: Field trips are planned during the winter months in conjunction with the lecture series. The Field Trip Committee is always open to the new members and ideas. Contact the Chair, Galen O'Connor!

In Memoriam

Kenneth Torstad worked as a tool and die maker for Minneapolis Moline for some 20 years until Moline moved out of town and then finished his career with the State of Minnesota Department of Administration. He retired in 1988 at age 62. That year he joined GSM and became a lecture and field trip regular. He was also a member of the National Guard serving at the Sergeant Major level, as brother-in-law Ed Huppler notes "Three stripes up and three stripes down. That is as high as you can go." Kenneth also worked as a deputy sheriff with Hennepin County after retirement. As an avid ham radio operator, he worked in emergency communications and helped with events such as the Superbowl, security and traffic control for famous visiting dignitaries or natural catastrophes such as storms and tomados. In addition to hunting rocks, he was an avid hunter making annual expeditions out west and on three occasions to Alaska. He died on March 6, 1995 of a heart attack after shoveling snow. His steady and perceptiveness presence and quiet wit will be missed.

Earthquakes in Minnesota

Val W. Chandler, Ph.D.—Minnesota Geological Survey

Few natural phenomena attract as much public attention as earthquakes. Most earthquakes occur in tectonically active areas like the Circum-Pacific "Ring of Fire," where the slowly moving plates that form the outer shell of the earth collide. Much less frequent but much more surprising earthquakes happen in the so-called "stable" parts of continents, far removed from any mountain-building or volcanic activity. Normally these mid-continental events are small to moderate, but not always; the infamous earthquake sequence of 1811-1812 near New Madrid, Missouri, was the most powerful sequence in the history of the United States. Over a period of several months three great shocks and hundreds of powerful aftershocks rocked the middle Mississippi valley; buildings were damaged hundreds of miles away from New Madrid and the shaking was felt as far away as the east coast. The New Madrid earthquake zone has continued to generate smaller earthquakes to the present day and still poses a significant earthquake risk for the south-central and central United States. "Stable" continental areas in other parts of the world have also produced destructive earthquakes; in the last decade, many lives have been tragically lost in such events in Australia and India. Minnesota, which has one of the lowest levels of earthquake activity in the United States, has been spared a tragic earthquake story, but even here earthquakes have made an occasional entry on the pages of Minnesota history.

A total of 19 small to moderate earthquakes have originated in Minnesota since 1860. The earthquake history of the state is summarized in Table 1, and Figure 1 shows the epicenters spots on the surface directly above the shocks on a map of Minnesota. Minnesota earthquakes, like those elsewhere in stable continental areas, may be caused by minor reactivation of ancient faults in the Precambrian bedrock. The great forces that formed these faults have long since ceased, but the faults themselves remain as zones of weakness that, if oriented appropriately to the modern stress field, could be slightly reactivated. Several epicenters of Minnesota earthquakes lie near or along some major Precambrian faults (Figure 1). The modern stress that may be re-activating these faults may be related to the westward drift of the North American plate away from its spreading center, the Mid-Atlantic ridge, toward the subduction and transform zones along the Pacific coast. This westward drift sets up a subtle but pervasive compression that is oriented roughly east-northeast for most of eastern North America. The reason why the reactivated faults in Minnesota and other Midwestern areas produce much less seismic activity than the faults beneath the New Madrid area remains a mystery; some workers believe that it may be related to an unusual crustal structure beneath the New Madrid area that focuses all crustal stress into the shallowest part of the crust.

Two numbers are used to describe an earthquake, intensity and magnitude (Table 1). Intensity, also referred to as the "Mercalli scale," is a number based on people's observations (or "felt reports") and the scale ranges from I, which is noticed by almost nobody, up to XII, which includes virtually total destruction of all structures. Significant damage to buildings occurs at Mercalli intensities of VII or greater. Intensity generally decreases with distance from the epicenter, but local soil conditions can cause higher values at distant sites. Magnitude, commonly referred to as the "Richter scale," quantitatively describes the strength of an earthquake, and is usually based on the maximum amplitude of certain types of seismic waves recorded on a seismograph.

Since the development of the original scale in the 1930s by seismologist Charles Richter, several new ways of computing magnitude have been developed. For earthquakes that were not recorded on seismographs, methods have been developed to estimate magnitude from intensity data. Regardless of how it is calculated, magnitude is expressed on a logarithmic scale, meaning that an increase in value of one digit equates to a 10-fold increase that may in turn equate to approximately 30 times more energy. Thus, the magnitude 7.1 Loma Prieta earthquake, which occurred on 10/17/89 near San Francisco, had over 900 times more energy than the largest earthquake in Minnesota history! Although there have been notable exceptions, earthquakes with magnitudes less than 5.5 usually do not cause major damage or injuries.

Although the two earliest Minnesota earthquakes may have had magnitudes of 4.7 to 5.0, the 1917 Staples and 1975 Morris earthquakes with magnitudes of 4.3 and 4.6, respectively, are the largest that are well documented (Table 1). Both earthquakes caused objects to fall, cracked masonry, and damaged chimneys, equating to intensities of VI to VII. In the Staples earthquake, many windows were broken. Near their epicenters these events caused considerable alarm, but the only known earthquake-related injuries were minor and in a way self-inflicted (one man fell out of a hayrack in his excitement).

Although less dramatic than the Staples or Morris events, the 1993 Dumont (reported at the time as at Graceville or Wheaton) earthquake and the 1994 Granite Falls earthquake are in some ways more typical of those that occur in Minnesota. The magnitude 4.1 Dumont earthquake was felt over 69,500 square kilometers (about 27,000 square miles), and was associated with intensity V near the epicenter. The shaking near the epicenter was accompanied by a loud, explosive noise that alarmed many people, but no injuries or serious damage occurred. In contrast to the Dumont event, the much weaker Granite Falls earthquake (magnitude 3.1) was

Earthquake!

Tektite:

A round or flat glassy meteorite, believed to be either extraterrestrial or the product of large, high-velocity meteorite impacts on terrestrial rocks.

felt over only about 11,600 square kilometers (about 4,400 square miles), and although intensity V may have occurred locally near the epicenter, most reported intensities were III to IV.

In summary, our current knowledge indicates that, although weak to moderate earthquakes do occur occasionally in Minnesota, a severe earthquake is very unlikely. Although we cannot assign a zero probability of a damaging earthquake occurring in the time span of a human life, the threat is very small compared to other natural hazards such as blizzards, tornadoes, and flooding. The late Harold Mooney of the University of Minnesota estimated average recurrence rates for Minnesota earthquakes as follows:

Magnitude 4	10 years
Magnitude 4.5	30 years
Magnitude 5	89 years
Magnitude 5.5	266 years

If earthquakes larger than magnitude 5.5 can occur in Minnesota, it is likely that their rate of recurrence would be many hundreds or perhaps thousands of years.

Minnesota earthquakes are of scientific interest because they provide information on crustal structure and the regional stress field. If you think that you have

ever felt an earthquake in Minnesota, we would like to hear from you.

The most useful reports include the place, date and time of day, where you were (in a parked car, upper floor of a building, outdoors, at rest, walking, etc.), together with what you observed.

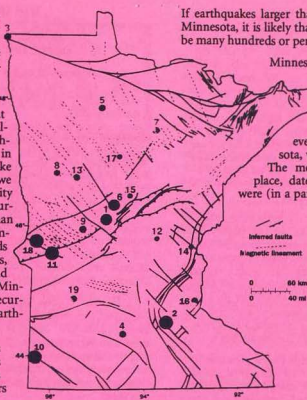


Figure 1. Epicenter locations.

The numbers are keyed to the Table below. Information on the 1881 New Ulm earthquake was only recently provided by the Mankato Free Press and the Brown County Historical Society.

Table 1. Historical seismicity of Minnesota

[Asterisks denote earthquakes that were recorded instrumentally.

All others and associated magnitudes based solely on intensity data from felt reports]

Epicenter (nearest town)	Mo/day/yr	Lat. (N)	Long. (W)	Felt area (km ²)	Max. intensity	Magnitude
1 Long Prairie	1860-61	46.1	94.9	---	VI-VII	5.0
2 New Prague	12/16/1860	44.6	93.5	---	VI	4.7
3 St. Vincent	12/28/1880	49.0	97.2	---	II-IV	3.6
4 New Ulm	2/5-2/12/1881	44.3	94.5	v. local	VI	3.0-4.0?
5 Red Lake	2/6/1917	47.9	95.0	---	IV	3.8
6 Staples	9/3/1917	46.34	94.63	48000	VI-VII	4.3
7 Bowstring	12/23/1928	47.5	93.8	---	IV	3.8
8 Detroit Lakes	1/28/1939	46.9	96.0	8000	IV	3.9-3
9 Alexandria	2/15/1950	46.1	95.2	3000	V	3.6
10 Pipestone*	9/28/1964	44.0	96.4	3.4		
11 Morris*	7/9/1975	45.50	96.10	82000	VI	4.8-4.6
12 Milaca*	3/5/1979	45.85	93.75	1.0		
13 Evergreen*	4/16/1979	46.78	95.55	3.1		
14 Rush City*	5/14/1979	45.72	92.99	0.1		
15 Nisswa*	7/26/1979	46.50	94.33	v. local	III	1.0
16 Cottage Grove	4/24/1981	44.84	92.93	v. local	III-IV	3.6
17 Walker	9/27/1982	47.10	97.6	v. local	II	2.0
18 Dumont*	6/4/1993	45.67	96.29	69500	V-VI	4.1
19 Granite Falls*	2/9/1994	44.86	95.56	11600	V	3.1

Chondrite: A stony meteorite containing chondrules (small rounded masses of various minerals, i.e., pyroxene or olivine) pea-sized or smaller.

Lake Baikal Gets Some Deep Water Plumbing

Lake Baikal - the oldest, deepest and, by volume, the largest lake in the world may be able to tell tales of climates past. According to an article in ARC News Vol. 16 No.3 published by the Environmental Systems Research Institute, Inc., the U.S., Russia and Japan have collected 400,000 years worth of sedimentary records from the lake bottom, the longest record of its kind. In view of rising sea waters (see News from Cyberspace) and the recent launch of a gigantic iceberg from Antarctica, Lake Baikal's records may shed a critical light on past variations in global climate and what we might expect if present trends continue.

Meanwhile, many miles away on a rain soaked mountain in Tasmania...there lives an *old* pine. This Mathuseloh of trees (a Huon pine estimated to be over 10,000 years old!) exists as a tangled mass of moss covered limbs and roots spread out over 2.4 acres. Pollen from the tree extracted from nearby lake sediments dates back 10,500. Tree ring samples bored out of the pine revealed that the last 30 years have been the warmest recorded over the past 2,000 years. However, Ed Cook, tree dating specialist from Columbia University adds,

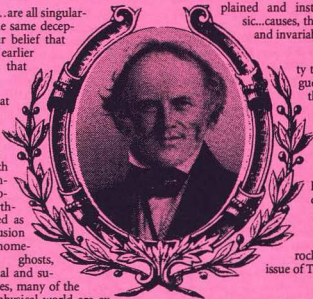
"In the past 3,800 years there has only been one 30 year period...warmer than the current episode of global warming." The verdict may still be out on global warming but such venerable witnesses as Lake Baikal and the Huon pine may have much to tell us. Will we listen?

—Submitted by Dwight Robinson

A Profile in Geoscience Who is it?

"The sources of prejudice ...are all singularly calculated to produce the same deception, and to strengthen our belief that the course of nature in the earlier ages differed widely from that now established."

"We must admit that the gradual progress of opinion concerning the succession of phenomena in remote eras, resembles in a singular manner that which accompanies the growing intelligence of every people...when an eclipse, an earthquake, a flood...are regarded as prodigies. The same delusion prevails as to moral phenomena...ascribed to...demons, ghosts, witches and other immaterial and supernatural agents. By degrees, many of the enigmas of the moral and physical world are ex-



plained and instead of being due to extrinsic...causes, they are found to depend on fixed and invariable laws."

"They felt themselves at liberty to indulge their imaginations, in guessing at what might be, rather than in inquiring what is."

"I feel as if my books came half out of 'his' brain."

Charles Darwin

"...the skull before us belonged to some of the lower order of animals."

PROFESSOR ICHTHYOSAURUS

Look for more on this bedrock figure in geoscience in the next issue of The News! Who is it?

Charles Lyell

Vid Watch

STUNNED, JAPAN DIGS OUT Death Toll passes 2,000

Thousands of people were killed or injured in Kobe, Japan when a 7.2 magnitude earthquake, which lasted only 20 seconds, hit this port city of 1.4 million people.

(Star Tribune headline, January 18, 1995)

This video tells the truth about the world's most violent disasters. The one hour tape contains intense and dramatic footage of quakes around the world, including Japan, the world's most dangerous earthquake zone—50 quakes a year! The film explores what Tokyo is attempting to do in predicting earthquakes and disaster prevention, since this city, sitting atop four separate plates, could burn to the ground at any minute. Earthquake survival skills, taught daily to Tokyo citizens, are examined. You will hear what some of the citizens have to say about "the big one."

The video also asks U.S. citizens the question, "Are you safe from earthquakes just because you don't live in California?" See how earthquakes affect your life no matter where you live. You'll learn, perhaps to your surprise, that New Yorkers and Bostonians should fear earthquakes just as much as Californians. Footage includes recent, as well as past, U.S. quakes. I found this video "scary."

—by Judy Hamilton

Key: A conical hill, or short irregular ridge of stratified gravel or sand, formed at the edge of an ice sheet by water flowing from the ice

Extinct Pine Trees Found

The discovery is "the equivalent of finding a small dinosaur still alive on earth."

Carrick Chambers, Director of the Royal Botanic Gardens, Sydney, Australia; quoted on the discovery of the Wollemi pines.

There may be millions of new species of organisms still to be discovered in the world today, and not all of them are little things. Thirty-nine trees of a type that was thought to be extinct were discovered in Wollemi National Park in Australia, 125 miles west of Sidney in the Blue Mountains. Named after the park where they were discovered, the trees were thought to have died out during the Jurassic Period, though some relatives lasted until the end of the Cretaceous. The trees are up to 130 feet tall with a ten-foot girth, and may be 150 years old. They have a dense, waxy foliage and knobby bark.

The discovery was hailed in Australia last week as one of the most important finds of the century, equivalent, according to Carrick Chambers, the director of the gardens, to "finding a small dinosaur still alive on Earth."

The pine was discovered by a project officer with Australia's National Parks and Wildlife Service when he absented into a 1,800-foot deep gorge during a weekend bush walk. In all, 42 trees were discovered at a location that is not being revealed.

The trees may have survived climate changes in a rain forest within a protective gorge, but they may not survive "plant rustling". Plant rustling is the uprooting of vast numbers of exotic plants by poachers, usually to sell as house plants, to the point where the plants become rare. The saguaro cactus and Venus flytrap are two examples. With the hoopla over anything prehistoric because of "Jurassic Park", the Wollemi pines would be especially vulnerable, and their exact location within the park is being kept a secret.

Just to be on the safe side, however, park officials have collected seeds and are studying them for propagation purposes at the Mount Annan Botanic Gardens. Forty seedlings have germinated, so far. Tissue cultures from buds could grow thousands of new seedlings for sale at greenhouses, probably at a cheaper price than seedlings collected in the wild.

A research officer at the Mount Annan Botanic Gardens in Sydney, Australia, holds the first seedling (right) raised from the new species.



Win One; Lose One?

While the pines flourish are the coelacanths flourishing? Scientists monitoring a population of these grand relics of the ancient lobe-finned fishes have detected a disturbing drop in numbers. Coelacanths dwell in deep water caves just off the coastline of Grand Comoro Island. They were discovered by Comorian fisherman and these same fisherman might be their current undoing. To reduce losses due to the occasional snagging of a coelacanth in the course of regular fishing, fish attracting devices were installed farther off shore and out of the range of the coelacanth caves.

Fisherman were given motorized canoes to get out to these new sites. But as motors broke down, the fishermen, unable to make repairs, were forced back into the coelacanth zone.

Remedies proposed according to an article in the March 23, 1995, *Nature*, Vol 374 are moving the fish attractors in closer to shore well within the range of the Comorians paddle canoes but well above the coelacanth caves and turning the coelacanths into local TV stars. An underwater TV system permanently installed in front of one of their caves would send live action shots to an information center in a nearby village. The new tourist dollars would bolster the local economy and be a shot in the lobe for the beleaguered coelacanths.

—Submitted by Dwight Robinson

News From Cyberspace

Looking for a better way to start your day? Try "Earth and Sky" with Block and Byrd every weekday at 5:58 a.m. and 5:58 p.m. on WCAL (FM 89.3). Anything "under" the Sun or beyond is fair game for a 2 minute expose. For example: a recent eye opener was an alarmingly consistent trend toward rising ocean levels. Listeners whose questions are used on the air qualify for a year's subscription to either "Astronomy" or "Earth" magazines. Block and Byrd may be reached by writing to: Earth and Sky, P.O. Box 2203, Austin, TX 28760. Or you can call them at (512) 480-8773 or E-mail ADDRESS: SKY@TPOINT.NET

Just ask a friendly federal geologist! GSM member Dave Peters reports on another geological resource which can be yours via the Internet. The folks at the U.S. Geological Survey say they will be sitting by their computers waiting for e-mail with probing rock head questions. E-mail ADDRESS: ASK-A-GEOLOGIST@OCTOPUS.WR.USGS.GOV

There is also a Newswatch group called "ca.earthquakes" with reports and discussions of various seismic events, not all of them in California.

Eutectic: pertaining to a mixture of substances that do not form solid solutions with components in such proportions that its melting point is the lowest possible with those components.

The Compleat & Practical Scholar

Extension Classes University of Minnesota

MINNESOTA GEOLOGY: 3.6 BILLION YEARS AND COUNTING

Discover where volcanoes erupted onto a lifeless landscape, where an inland sea teemed thick with algae, where a mountain chain rose to unrivaled heights, where a great valley was filled with lakes of lava, where oceans lapped against white sand beaches, and where mile-thick ice caps slowly carved a new landscape. Discover the long, diverse, and often calamitous geological history of Minnesota. Includes two full-day field trips, one to the Minnesota River Valley (Saturday, Apr. 29) and another to local areas (Saturday, May 20), plus a weekend trip to northeastern Minnesota (May 5-7) that involves one to

two nights camping in state parks (additional cost of about \$15 for group meals and camping fees for weekend trip; participants provide own camping equipment and transportation and may choose to carpool). (Limit 25)

CSch 0551, \$172 (age 62, \$154.80).

Sec 1, Th, 6:30 - 8:30 p.m., Apr. 20 - May 18

(4 meetings plus 3 field trips—no class May 11),

Minnesota Geological Survey,

2642 University Ave., St. Paul.

Jim Miller, Ph.D., geology.

Telephone (612) 624-8880 to register.

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.

Officers: Doug Zbikowski, *President*; Charles Brennecke, *Vice President*; Ed Huppeler, *Treasurer*; Judy Hamilton, *Secretary*.

Directors: Charles Brennecke, Judy Hamilton, Dick Heyland, Rick Hosterman, Ed Huppeler, Susan McGuire, Conrad Nelson, Galen O'Connor, Doug Zbikowski
Membership Chair and Information: Fran Corcoran 724-2101

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



Judy Hamilton
1439 Sargent Avenue
Saint Paul, MN 55105



FIRST CLASS

PLEASE FORWARD

Geological Survey of Minnesota
2642 University Ave.
St. Paul, MN 55104

This Season's Color: Pulsar Pink