GEOLOGICAL SOCIETY OF MINNESOTA

NEWS

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http://www.geo.umn.edu/orgs/gsm/

"One of the Ely greenstone's strangest characteristics is the presence of large ellipsoidal shapes in the body of the rock, like eggs embedded in aspic. Geologists know that this ellipsoidal structure is typical of lava flows that solidify under water, so we have strong reason to believe that the greenstone began its existence on the floor of some long-departed Minnesota Sea."

~ Minnesota's Rocks and Waters: A Geological Story, University of Minnesota Press, **1954**
[Do you think they meant 'pillow lava'? –Ed.]

Kimball Memorial Banquet
Monday, May 5, 2003

*****LOCATION NOT YET DETERMINED*****

LOCATION TO BE ANNOUNCED AT THE LECTURES OR CALL STEVE ERICKSON 651-501-9851 IN APRIL, FOR THE LOCATION

Dinner 5PM, Program 7PM

Topic: Role of Minerals in the Cultural History of Minnesota

Speaker: Mark Jirsa, MSc
Minnesota Geological Survey

2003 BOARD OF DIRECTORS

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GEO QUIZ

1.Which sea is a back-arc basin?
a) Sea of Cortez, b) Sea of Galilee, c) Sea of Azov, d) Sea of Japan.
2.Where is earth's crust the thinnest?
a) Continental Margins, b) Mid-Ocean ridges, c) Volcanic provinces, d) Impact craters.
3.Which element is strongly concentrated in the earth's crust?
a) Thorium, b) Oxygen, c) Silicon, d) Platinum
4.What is the most common mineral in the earth's crust?
a)Quartz, b)Illite, c)Olivine, d)Feldspar
5.What is the most abundant rock on earth?
a)Granite, b)Basalt, c)Shale, d)Limestone
6.What is the largest of earth's lithospheric plates?
a)Pacific, b)African, c)Eurasian, d)Indian-Australian
7.What is the waste rock around an orebody called?
a)Groundmass, b)Graywacke, c)Gangue, d)Grit

(answers are listed on page 7)

Announcements

May 5 – Kimball Memorial Banquet
Location not yet determined.

Reminder:
The remaining lectures in the 2002-2003 series will be held in the Electrical Engineering & Computer Science Bldg. (EE Comp Sci) Room 3-210, just a few steps N.E. of Amundson Hall.

LABS will be held at the Minnesota Geological Survey office: 2642 University Ave. W., Saint Paul.

GSM *NEWS*
Editor: Katy Paul
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Reporter: Tom Smalec

The purpose of this newsletter is to inform members and friends of the activities of the Geological Society of Minnesota. GSM *NEWS* is published four times a year: February 15, May 15, August 15, and November 15. GSM *NEWS* welcomes unsolicited Geology and Earth Science related articles and photographs. Deadline for article submission is three weeks before the date of publication. Send all material for GSM *NEWS to:* GSM c/o Katy Paul, 6901 West 84th St., #351, Bloomington, MN 55438, phone/e-mail listed above.

Send all GSM membership dues, change of address cards, and renewals to the GSM Membership Chair: Gail Marshall, 12232 Allen Drive, Burnsville, MN 55337 phone 952-894-2961. Membership levels are: $10 Full-Time Students; $20 Individuals,

Notes from the Board...

As the incoming president, I thank outgoing president Steve Erickson for his hard work and dedication during 2002. I am counting on his advice during the coming year as I attempt to live up to the high standards he and previous presidents have established. I also thank those outgoing board members for their service. They are: Katy Paul, William Robbins, Gail Marshall, and Steve Erickson. I am pleased to report that all of these will remain active in GSM . We welcome a number of new or returning board members: Cindy Demers, Marlys Lowe, Bill Farquhar, Ken Barklind, and Tom Smalec.

One of the main ways we reach the public at large occurs during the Minnesota State Fair. I doubt we have ever counted the number of people who visit our booth in the Education Building, but it must be hundreds per day! The booth is crucial to our program, and must be maintained and strengthened.

One of our goals this year is to update the booth, and we are very grateful to Don and Nora Mattson for donating $1000 to help jump-start this project! If any members have ideas on how the booth can be made better, (more informative, more eye-catching, and more interesting) please contact me or Tom Schoenecker, who presently chairs the State Fair committee.

Another vital part of what we do is the popular series of lectures and labs between October and May each year. These are in addition to the three or four field trips which we organize annually.

The success of these programs over the last two decades, and more, is due in large part to the work of Rick Uthe. Rick takes ideas and topics suggested by board members and forms them into a very coherent organized series of lectures. Kudos to Rick, and thanks to the board for recognizing how vital he has been to GSM. As many of you know, the 2002 board voted to give Rick an honorary lifetime membership. At our January 13 meeting, a certificate was presented to Rick, which said in part : "We are grateful for the vital work which he has done for us during the last twenty-plus years, and hope he will continue to be an active member in the future." Thanks Rick for all you do!

~Paul Martin, President

Southern Minnesota Well Water Turns Black

Wells throughout southeastern Minnesota and adjacent areas of Wisconsin and Iowa suddenly began producing black water in early November, 2002 -- an effect that may be related to a Richter 7.9 earthquake in Alaska on November 3.

While no shaking was felt by people in the region, well drillers and environmental monitors interviewed by the Mankato Free Press blamed the water change on manganese released from the area's sandstone, limestone and dolomite bedrock by waves from the Alaskan tremor. One well-driller quoted by the newspaper said a similar effect occurred in the region following the historic Good Friday Alaska quake of 1964, adding that the Good Friday quake also caused some wells in the Owatonna-Waseca area to dry up and old wells to start flowing again.

Val W. Chandler, Acting Director of the Minnesota Geological Survey, said quakes of magnitude 8 or higher are well known to cause changes in groundwater thousands of miles from the epicenter.

"Unusually large earthquakes produce very low-frequency oscillations or waves that travel world-wide at the earth's surface, and these waves can essentially squeeze aquifers like a sponge as they pass through," Chandler explained. "Distance from the epicenter and the intervening structure of the crust and mantle may also play a role in focusing this very low frequency energy, so that the effects may not necessarily be evenly observed."

Reports of discolored water in the Mankato area were in fact spotty and inconsistent. While in some localities all the wells were affected, in other areas the discoloration was found in only a few wells. Black water was reported across a wide swath of southeastern Minnesota, northeastern Iowa and southwestern Wisconsin, but not in the Twin Cities area.

Mankato-area residents said they normally do not see any effects in their wells from major California quakes, and Chandler said that was because California earthquakes aren't as strong as those in Alaska.

"Magnitude and total energy released is probably the major factor," Chandler said. "At least part of the reason that no water well effects have been observed in association with California quakes is that (thankfully) no magnitude 8 events have occurred there in recent history."

State officials recommended that people not drink the discolored water or give it to livestock. Well experts said allowing taps to run for a day or two usually cleared the black water from home and farm systems. ♦

-Tom Smalec

Institute on Lake Superior Geology

49th Annual Meeting

May 7 - 11, 2003

The Institute on Lake Superior Geology is a non-profit professional society with the objectives of providing a forum for exchange of geological ideas and scientific data and promoting better understanding of the geology of the Lake Superior region. The 49th Annual Meeting will be held in Iron Mountain, Michigan. A two-day technical session will be held between pre- and post-meeting field trips. Geology students and interested non-professionals are welcome to attend. For information on registration, costs, field trip topics, and more, go to: www.ilsgeology.org Or contact Laurel Woodruff, U.S. Geological Survey at woodruff@usgs.gov

NEW GSM ROCK AND MINERAL COLLECTIONS

The GSM is excited to announce it has two new additions to its growing family of rock and mineral collections: the *St. Louis County, Minnesota Bedrock Collection*, and the *Ashland County, Wisconsin Bedrock Collection*. These collections are perfect for the beginner or the veteran looking for hands-on material.

The *Ashland County, Wisconsin Bedrock Collection* contains six rock specimens from outcrops in the county. It includes a fine example of an intrusive breccia, and beautiful black gabbro

Banded jasper, and the infamous Ely Greenstone are just two examples of the six specimens included in the *St. Louis County, Minnesota Bedrock Collection*.

Both collections are packaged with a descriptive key in a handsome, six-compartment polystyrene box.

Other rock and mineral collections available both to members and non-members are the *Stearns County, Minnesota Granite Collection*, and the *Common Minnesota Minerals #1 Collection*.

The price of each collection is $10 for GSM members and $15 for non-members. (Shipping and tax are included.)

If you would like to own one or all of these collections, send your order along with a check payable to the GSM to:

Geological Society of MN
c/o Bruce Goetteman
16125 Delarma Drive
Carver, MN 55315

If you have questions, Bruce can be reached by phone at this number: (952) 448-5422. Or e-mail at: bjgoetteman@worldnet.att.net

WOMEN IN GEOLOGY: Florence Bascom

Although Florence Bascom (1862-1945) was known as "the first woman geologist" in this country, she was the second woman to earn a Ph.D. in geology in the United States. (Mary Holmes earned a Ph.D. in geology from the University of Michigan in 1888). Bascom was the first woman hired by the U.S. Geological Survey (1896), the first woman to present a paper before the Geological Society of Washington (1901), the first woman elected to the Council of the Geological Society of America (elected in 1924; no other woman was elected until after 1945), and the first woman officer of the GSA (vice president in 1930). She was an associate editor of the *American Geologist* (1896-1905) and a four-starred geologist in the first edition of *American Men and Women of Science* (1906), which meant that her colleagues regarded her as among the country's hundred leading geologists. After joining the Bryn Mawr College faculty, Bascom founded the college's geology department. This site became the locus of training for the most accomplished female geologists of the early 20th century.

Bascom was an expert in crystallography, mineralogy, and petrography. Trained by leaders in metamorphism and crystallography including Roland Irving and Charles Van Hise (University of Wisconsin), George Huntington Williams (Johns Hopkins), and Victor Goldschmidt (Heidelberg, Germany), she worked in these fields during their infancy. Her earliest contribution was her dissertation, in which she showed petrographically that rocks previously considered sediments were metamorphosed lava flows (Aldrich, 1990; Bascom, 1893). An expert on crystalline rocks of the Appalachian Piedmont, she published more than 40 research papers, including USGS Bulletins and Folios. Additionally, she published research on Piedmont geomorphology, particularly the provenance of surficial deposits. ♦

* * * LIVING SILVER * * *

Mercury is a naturally occurring element that is present throughout the environment. The Latin name for mercury, "hydrargyrum," from which its chemical symbol Hg comes, means water-silver. English speakers used to call it quicksilver, or living silver. The medieval alchemists felt that mercury must have some excess of spirit that could be tamed for their great work of turning base metal into gold. Today when we think of mercury, fever thermometers, blood pressure monitors, or dental work come to mind for many of us. What we may not realize, however, is that this silvery, toxic metal is present in hundreds of other consumer products, from electrical equipment to cosmetics. Human activity can release some of that mercury into the air, water and soil. Every time we discard these products in the general waste stream, we risk needlessly releasing mercury into the environment with serious consequences for people and wildlife.

Mercury is a cumulative poison and powerful neurotoxin that can cause irreversible harm to the brain and nervous system, and permanent damage to the kidneys and brain. Symptoms of mercury poisoning include trembling, loosening of teeth, loss of co-ordination, slurred speech, irritability, loss of memory, depression, anxiety and other personality changes. Mercury intoxication often produces a psychotic state resulting in hyper-excitability. The expression "Mad as a Hatter" originates from the hat-makers of the 19th century who were chronically exposed to mercury compounds used in making felt and beaver hats. A complicated set of processes was needed to turn the fur into a finished hat. Finishing processes included steaming the hat to shape, and ironing it. Hatters working in poorly ventilated workshops would breathe in the mercury compounds and accumulate the metal in their bodies.

In the 20th century, mercury was added to products to stop things from growing. Mercury was commonly added to exterior house paint until the late 1990's to keep mold from growing on the paint. Mercury is added at even higher levels to marine paint for ships. The object is to keep barnacles off the hull. The solvents used in these paints continues to "out-gas" for many months, and are very good at carrying mercury into the body via the respiratory tract. Mercury is also used in gas ranges and refrigerators, steam irons with automatic shut-offs, headlights of automobiles, laptop computer screens, fluorescent bulbs, portable phones, and even some brands of tennis shoes.

When products containing mercury are discarded, they often wind up being incinerated. The mercury they contain is released into the atmosphere and eventually falls back to earth to contaminate our lakes, rivers and streams. It only takes about one gram (the mercury content of 87, 4-foot fluorescent lamps) of airborne mercury deposited each year into a 25-acre lake to contaminate the fish to a level that is unsafe to eat. In the U.S., coal-fired power plants are the biggest source of mercury emissions to the air.

In general, mercury produces toxicity by forming complexes or 'ligands' with organic compounds. These modified biological molecules lose their ability to function properly, and result in malfunction or death of the affected cells. The most common groups involved in ligand formation are oxygen, sulfur, and nitrogen. When metals bind to these groups they may inactivate important enzyme systems, or affect protein structure. Mercury competes with other molecules for sulfur and can usually 'steal' sulfur out of other molecular structures, in effect killing them. If it can't steal sulfur, mercury will bond to the sulfur atom the best it can. This usually prevents the molecule from performing its function. Sulfur is part of our blood cells as well as many other proteins and enzymes. Mercury is almost completely absorbed into the blood and distributed to all tissues including the brain; it also readily passes through the placenta to the fetus and fetal brain. Antibodies contain sulfur and are therefore attacked by mercury – thereby destroying the body's natural disease defense system.

The most effective way to dispose of mercury is through reclamation. To learn more about safe handling of mercury and how to recycle mercury-containing products, visit the following websites: <www.epa.gov/mercury/>;< www.mercurypolicy.org/>; <www.pca.state.mn.us/publications>.

This is the text of another new geological marker erected in 2002
Located in Nobles County, 19 miles W. of Worthington on westbound I90 at the Adrian Rest Stop.

GEOLOGY OF THE ADRIAN AREA

The landscape along Interstate 90 between Austin and Adrian varies from a flat to a gently rolling plain. This topography was shaped beneath a thick lobe of glacial ice. About 14,000 years ago, glacial ice advancing through the Manitoba region followed the lowlands of the Red River valley and the Minnesota River valley and reached south into central Iowa. At its maximum, the ice lobe's western margin deposited glacial sediment (clay, silt, sand, gravel, and boulders) as it melted, producing a broad belt of low hills called a moraine, which extends to the northwest and upon which this rest stop was built. Streams to the east of this moraine drain into the Mississippi River system, whereas streams to the west, like Kanaranzi Creek just south of here, drain into the Missouri River system. Thus, the moraine is now a drainage divide.

Farther westward and just north of Luverne, there is a bedrock upland called Blue Mound. Blue Mound can appear bluish from a distance, but it is actually composed of a reddish-pink-to-whitish rock called quartzite. One theory for the bluish appearance is that it is caused by the lichens that cover the quartzite outcrops. This quartzite formed from a quartz sand whose grains, over time, were cemented by silica and partially recrystallized, making a solid, hard rock that is resistant to erosion. The color shades of the quartzite are due to iron oxides that exist as thin films around and between the quartz grains. The quartzite of Blue Mound has probably been a high point on the landscape for much of the time since its formation 1.7 billion years ago. It was an island when shallow seas covered this area 97 million years ago. The surrounding rocks contain fossils of animals that lived in these waters: sharks, turtles, sponges, and even mosasaurs—large fish-eating lizards related to the modern monitor lizard.

The area west of here was also glaciated, but much earlier—at least a half million years ago. Blue Mound was not high enough to escape the great thickness of ice that covered this region at that time. The hard quartzite bears the scratches left by those passing glaciers.

Erected by the Geological Society of Minnesota in partnership with the
Minnesota Department of Transportation and the Minnesota Geological Survey
****2002 ****

☺ ☺ ☺ *WORMS WITH A COPPER SMILE* ☺☺☺

The rare mineral atacamite--$Cu_2(OH)_3Cl$--is named after the Atacama Desert in Chile, one of the few places where it is found. A team of U.S. and Austrian scientists has now found another source: the teethlike jaws of the marine bloodworm *Glycera dibranchiata.*

The discovery by research associate Helga C. Lichtenegger of the department of chemistry and biochemistry at the University of California, Santa Barbara, and co-workers, adds to the relatively short list of about 70 minerals that animals make to form structures such as shells, teeth, and bones. Atacamite is the first of these biominerals known to contain copper [*Science,* 298, 389 (2002)].

Lichtenegger and her colleagues used a combination of X-ray diffraction, electron microscopy, and other techniques to determine the chemical composition and mechanical properties of the worm's jaws. The carnivorous worm uses the hard, sharp-tipped structures to bite and inject venom into its prey.

The tip region of the jaws contains layers of polycrystalline atacamite fibrils dispersed in a protein matrix, the researchers find. The fibrils which align with the jaw's outer contour. They are concentrated toward the center of the tip, while the base region is devoid of fibrils. The hardness and stiffness of the jaw increases from the base to the tip and from the surface to the interior, which correlates with the increasing degree of mineralization.

Cross-sectional maps of copper and chloride concentration confirm the elemental distribution in the jaw and show that the Cu-Cl ratio is higher than that found in atacamite, suggesting that free copper ions are present. Copper is known to cross-link polymers and protein scaffolds, the researchers point out, and the excess copper in the worm's jaw could be playing that role.

The jaw's impressive structural stability and resistance to abrasion approaches that of human tooth enamel, the team notes--even though atacamite makes up only 4% of the worm's jaw, while hydroxyapatite, $Ca_5(PO_4)_3OH$, makes up 96% of tooth enamel. This toughness is needed to protect the jaw from wear and tear as the worm burrows through gritty marine sediment where it may chomp indiscriminately on bits of gravel.

G. dibranchiata appears to exhibit strict chemical control to consistently produce only atacamite, rather than any of the other three known $Cu_2(OH)_3Cl$ polymorphs. The selectivity for copper rather than other elements such as calcium, silicon, and iron commonly found in biominerals suggests that copper may play an additional role, such as activation of the worm's venom during injection, the researchers say.

"The marriage of protein with copper mineral as well as with copper ions is an intriguing concept per se, but may serve as a design prototype for new materials that need to be hard, lightweight, and durable," the researchers write. ●

[Answers to the GeoQuiz on cover: 1. Sea of Japan, 2. Mid-Ocean ridges, 3. Thorium, 4. Feldspar, 5. Basalt, 6. Pacific, 7. Gangue]

COMPLEAT SCHOLAR WEEKEND OPPORTUNITIES 2003

WHAT'S THIS ROCK? NORTH SHORE GEOLOGICAL HISTORY

May 2-4, 2003 Jim Miller, PhD. Geology, senior geologist with the Minnesota Geological Survey.
$325 fee includes two nights lodging, all meals and refreshments. Weekend begins Friday at 7 p.m. and concludes on Sunday at 1 p.m., Cascade Lodge, 3719 W. Highway 61, Lutsen, MN

♦Using rustic, but comfortable, Cascade Lodge as our home base for a series of field trips to several sites along the North Shore of Lake Superior, we will examine volcanic rocks that tell the dramatic story of spectacular lava eruptions that spilled across a vast barren landscape over a billion years ago. We will also investigate sediments and landforms created by enormous continental glaciers that have intermittently filled the Lake Superior basin over the past two million years. You'll leave this weekend course with useful information about North Shore geology, whether you've taken formal geology courses, or just want to be a more informed rock collector. ♦

WILDFLOWERS OF NORTHEASTERN MINNESOTA

May 16-18, 2003 Roberta Sladky, M.S., former director of the U of M College of Biological Sciences greenhouse and current manager of Como Park Conservatory in St. Paul.
$265 fee includes two nights lodging, all meals and refreshments. Weekend begins Friday at 7 p.m. and concludes on Sunday at 3 p.m., Cloquet Forestry Center, 175 University Rd., Cloquet, MN

♦This wildflower weekend will include an evening slide-illustrated lecture, a full-day field trip to Jay Cooke State Park, several hikes on the grounds of Cloquet Forestry Center, and a Sunday hike (site to be determined). In combination with scenic bodies of water, the landscape where the St. Louis River flows into Lake Superior is exceptionally beautiful, particularly in May. Wildflowers that carpet the woodland floor during spring include white trout lily, bloodroot, trillium, bellwort, bluebead lily, spring beauty, and Canada mayflower. Prior to the weekend, registrants will receive a list of suggested wildflower guides and information about appropriate clothing, footwear, and supplies for the weekend. Participants will need an annual or daily MN State Park vehicle permit for the Saturday trip to Jay Cooke State Park ♦

For in-depth descriptions and to register online: **www.cce.umn.edu/scholars**
Call **612-625-7777** to register by phone and to receive a newsletter.

Geological Society of Minnesota 1938

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