



# GEOLOGICAL SOCIETY OF MINNESOTA

# NEWS

WINTER 2008  
VOLUME LXII NO. 4  
<http://www.gsmn.org>

## **REMINDER**

If the label on this newsletter has the date 10/1/08 your GSM membership has EXPIRED. This will be your last newsletter...unless you renew your membership now. With your support, GSM can continue to offer a fine lecture program, provide area schools with an invaluable resource through the Outreach Program, and introduce you to the pool of talented professionals in the field of geology. Please renew your membership! ...mail your check to GSM, PO Box 390555, Edina MN 55439-0555  
THANK YOU

## **WELCOME, NEW MEMBERS**

Truman and Love Anderson  
Mason Bulthuis  
Mariann Cannon  
Mavis Daffer  
Mary Davitt  
Laurence J. DeMark Family  
Jean Gorman  
Burton Grimes  
Megan H. Jones  
Ron & Karen Lamberg  
Sarah Mongin  
Stephen Naglak  
Tom Noack  
Jesse Parsons  
Kevin Pogatchnik Family  
Sandy Sackter  
James Stroebel  
Dale Trapp  
Jonathon Wells  
Michael Zazzera  
Keith Zilinski

\* \* \* \* \*

## **GSM Board for 2009**

Kathy Ahlers	Alan Smith
Dick Bottenberg	Ed Steffner
Paul Jansen	Sandy Steffner
Megan Jones	Harvey Thorleifson
Bently Preece	

We now have a "full" board, having been short one position for quite some time. Alan Smith agreed to fill that spot. Paul Jansen and Megan Jones agreed to fill the two spots being vacated by Kate Hintz and Gerry Paul, both whom have completed four years of service. Four years (two consecutive 2-year terms) is the maximum amount of time that a member may serve on the board, as allowed by the GSM By-laws. Thanks to these two people for their dedicated service to our organization.

Officers of the board will be voted on by the board at their next meeting.

Submitted by the Editor

## Happy IYPE!

### Do you know what this is?

(See Page 4)



The International Year of Planet Earth (IYPE) is underway, with events running from 2007 to 2009. The project aims to capture people's imagination with the exciting knowledge we possess about our planet, and to ensure that this knowledge is used to make the Earth a safer, healthier and wealthier place for our children and grandchildren.

Organizers of IYPE aim to ensure greater and more effective use by society of the knowledge accumulated by the world's 400,000 Earth scientists. The Year's ultimate goal of helping to build safer, healthier and wealthier societies around the globe is expressed in the Year's subtitle 'Earth science for Society'.

According to the IYPE web site (<http://www.yearofplanetearth.org/>), the International Year runs from January 2007 to December 2009, the central year of the triennium (2008) having been proclaimed by the UN General Assembly as the UN Year. The UN sees the Year as a contribution to their sustainable development targets as it promotes wise, sustainable use of Earth materials and encourages better planning and management to reduce risks for the world's inhabitants.

The IYPE logo was derived from a highly successful predecessor project in Germany. In 2002, the German Ministry of Education and Research instigated the *Jahr der Geowissenschaften*. The logo used in the national event formed the basis of the IYPE logo, by permission of the German Ministry. The logo consists of an inner red circle representing the solid Earth, then the biosphere in green and the hydrosphere in dark blue, above which is the pale blue atmosphere, all constituents of the Earth System.

IYPE is a joint initiative of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Union of Geological Sciences (IUGS). Twelve founding partners, 26 associate partners and a growing number of international partner organizations from all continents and representing all major geoscientific communities in the world have embarked on this initiative. The Year also has the full political support of 191 UN countries. By the end of 2007, National Committees were established in 70 countries and regions in the world.

The IYPE Science Programme consists of 10 broad, societally relevant and multidisciplinary themes: health, climate, groundwater, ocean, soils, deep Earth, megacities, hazards, resources, and life. Brochures on each of these themes are available in hard copy, and can be downloaded from the website.

OneGeology has become a centerpiece of IYPE. The project, which you can read about in the November 2008 issue of *Discover Magazine*, is an initiative of the geological surveys of the world. Its aim is to create dynamic geological map data of the world available via the web. This will create a focus for accessing geological information for everyone.

For more information, please visit <http://www.yearofplanetearth.org/>.

**Submitted by:** Harvey Thorleifson Ph.D., P.Geo., D.Sc., Director, Minnesota Geological Survey; State Geologist of Minnesota; Professor, Department of Geology and Geophysics; University of Minnesota; 2642 University Ave W, St Paul, MN 55114-1057 USA; Telephone 612-627-4780 ext 224; Fax 612-627-4778; thorleif@umn.edu

#### GSM NEWS

**Editor:** Judy Hamilton  
**Production Mgr:** Katy Paul

Geological Society of Minnesota is a 501(c)3 nonprofit organization. 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 the first of the month, before the date of publication. Send all material for *GSM NEWS* to the address below.

#### OFFICERS:

Ly Preece, *President*  
Dick Bottenberg, *Vice President*  
Ed Steffner, *Treasurer*  
Gerry Paul, *Secretary*

Directors in addition to the officers listed above: Kathy Ahlers; Kate Hintz; Sandy Steffner; Harvey Thorleifson.

Send all GSM membership dues, change of address cards, and renewals to:

GSM Membership Chair  
P.O. Box 390555  
Edina MN 55439-0555

Membership levels are \$10 Full-Time Students;  
\$20 Individuals; \$30 Families



### State Fair Thank You

Although the fair is but a memory now, we need to thank those folks who gave of their time and money (entrance fee) to help us staff our 2008 booth. In the picture above, two of our volunteers, Vern Schaaf and Gerry Paul discuss some of our rocks with a couple of young visitors with pickles on their heads. We also want to thank Rosie O'Donovan for her donation toward the purchase of a new, lighter table for the booth and Kate Hintz for donating new magnifying glasses. Listed below are the volunteers who worked the booth from August 21 through September 1:

- |                   |                      |                   |                     |                   |
|-------------------|----------------------|-------------------|---------------------|-------------------|
| Dave Wilson       | Jim Nye              | Pat Hanauer       | Bill Robbins (2x)   | Tom Burt          |
| Ken Barklind      | Janet Hopper (2x)    | Paul Bondhus      | Lisa Peters         | Dave Wilhelm      |
| Katy Paul         | Jean Doyle           | Roger Benepe      | David Peters        | Dick Heglund (3x) |
| Judy Hamilton     | Tom Casey            | John Maronde (2x) | Gerry Paul          | Jerry Mundt       |
| Sandy Steffner    | Bently Preece        | Joan Furlong      | Kate Hintz          | Jim Stroebel (2x) |
| Ed Steffner       | Debra Preece         | Randy Strobel     | Vern Schaaf         | Michael Coleman   |
| Doug Zbikowski    | Mary Caine           | Tom Noerenberg    | Lee Kaphinst        | Jerry Shirmers    |
| Conrad Zbikowski  | Dianne Pierce        | Cindy Schneider   | Steve Erickson (2x) | David Schaaf      |
| John Ernst        | Harlin Finney        | Patsy Huberty     | Marty Collier       | Fran Corcoran     |
| Ken Holmbeck      | Mark Ryan (2x)       | Pat Ryan          | Diane Lentsch       | Dan Japuntich     |
| Sharon Casey      | Tom Schoenecker (2x) | Elaine Handelman  | Alan Smith          | Dave Broberg      |
| John Delaundreau  | Nancy Halverson      | Steve Heimer      | Kay Smith           | Barb Broberg      |
| Maria Delaundreau | Galen O'Connor       | Paul Martin       | Don Swensrud        | Nancy Weins       |
| Dick Bottenberg   |                      |                   |                     |                   |

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The newsletter staff invites everyone to submit articles for publication in the News regarding geology or any other earth science subject. Photographs are welcome also. Your contribution should be sent to Judy Hamilton, e-mail address [hamfrog@aol.com](mailto:hamfrog@aol.com). You will note the newsletter is published four times a year on February 15, May 15, August 15, and November 15. Submission deadline is the first of the month before the date of publication. Thanks in advance.

**Field Trip September 13**  
The Mid-continent Rift System - St. Croix Valley Area

The Mid-continent Rift formed (how it formed is still a matter of some debate) 1100 million years ago (MYA) or 1.1 billion years ago. For whatever reason (hot spot or plume?) the continent, such as it was, was being pulled apart and was nearly successful at forming a new ocean basin.

The rift showed up and was identified on gravity high and magnetic maps when technology became available after World War II. The rift is evident on these maps starting in Canada, down through Lake Superior, across the Twin Cities through Iowa into Nebraska. (In the TC area, it has been filled in with glacial debris.)

September 13 was a sold-out bus trip (56 passengers) to rock exposures that tell the part of the story of MRS at Interstate Park on the St. Croix River and Robinson's Park on the Kettle River. This trip had two dynamic leaders--Tony Runkel and Terry Boerboom from the Geological Survey.

We looked at the famous potholes on the Minnesota side (better than Wisconsin's pot holes!) and learned they were formed relatively recently—at the end of the last glaciation when water overtopped ancestral Lake Duluth and torrents scoured out an ancient river channel forming eddies and trapping sand, pebbles, cobbles and boulders that spun in the torrents and reamed out the potholes in the underlying basalt. There is still some discussion about how long it takes these pot holes to form.

On the Wisconsin side, we hiked to an exposure of Mill Street conglomerate—we saw an overgrown hillside that was actually the preserved edge of an island with basalt sea cliffs and rocky seashore. During the Cambrian, North America (MN) was part of Laurentia and most of the continent was under a shallow sea (which accounts for the sedimentary rocks in SE Minnesota.) During this time, what is now Interstate Park had resistant ridges of Precambrian rock and therefore stood out as islands in this shallow sea. This particular exposure is a rare example of a Cambrian rocky shoreline and one of the few places in North America where Upper Cambrian conglomerate lies unconformably on Precambrian rocks.

For lunch, we headed up to Robinson Park, the site of an inactive sandstone quarry on the Kettle River to examine the mysterious sink holes in Pine County. We had learned earlier that classic sink holes occur in karst (limestone) terranes like those found in SE Minnesota so these in Pine County sandstone have seemed mysterious.

It began to rain when we arrived at the park. We shared the picnic shelter with some hardy motorcyclists and studied the cartoon representations and maps as long as we could. Those with rain gear headed out to see examples of the bedding planes exposed at the surface and to see 1 billion year-old wave patterns preserved in the sandstone. (Some recent research has shown the sandstone to be much older than 545 million years as originally thought and may be more in the range of 1 billion years old.)

We scrambled over chunks of stone to enter into a sinkhole/cave. The theory is that although the terrane is not truly karst (limestone) this terrane functions in somewhat the same way—the cracks in the sandstone permit water at the surface to penetrate deep into the body of the rocks and is sometimes called “pseudokarst”. The sandstone boulders fill the cracks and prevent them from closing with sediment cuz they are scoured clean each time it rains. This causes springs to gush when it rains. This was demonstrated clearly on this rainy day. Smiles.

It was pointed out that it is important to protect this kind of permeable terrane because pollutants travel rapidly through the ground. The challenges come because most regulatory bodies are now familiar with classic karst—however this cannot be classified as classic karst.

For me, this was a great trip. Special thanks to our truly fearless leaders Tony and Terry who lead us out into the wet and who returned to the bus soaked to the bone. In true field geologist fashion their enthusiasm never flagged—they allowed (encouraged) us to enjoy the trip despite the rain. And those who did not care to brave the rain spent time socializing on the bus. I dare say a good time was had by all.

Submitted by Diane Lentsch

The picture on page 2 is a pothole at Taylors Falls which has been pumped out so visitors can see the depth.

## **Field Trip October 4**

### Duluth Area

This trip was a typical unruly car caravan trip of 42 people in about 17 cars. The weather was a mild fall day (sunny and dry!) and the colors were beginning.

The trip was lead by Jim Miller (who recently was awarded a tenured teaching position at UMD—Yay Jim! Lucky students!) We assembled at the Moose Lake agate museum and were met by Don Delgreco, agate center supervisor and GSM town meeting attendee. On display are many gorgeous samples of the Minnesota state rock, the semi-precious Lake Superior Agate—which formed in the basalt of the Mid-continent Rift System (MRS).

Next stop was Thomson Dam where we examined graywackes and slates that had been originally deposited 1.85 billion years ago as mud stones and shales on what was then the edge of the continent. They were metamorphosed by the mountain building event of the Penokean Orogeny. We saw where these slates were cut by diabase dikes related to the rifting at about 1.1 billion years ago. From here, the trip became a progression through time.

Next stop, we tramped through farmers woods to see the number one lava flow (“the bottom of the pile” of flows that poured out for 23 million years) of the North Shore Volcanic group. Jim pointed out the contact where the basalt meets the Nopeming sandstone.

We drove up the lesser known part of Skyline drive and crossed over the Ely Peak basalts and noted where the Duluth Complex (the Layered Series gabbros) group begins.

Lunch was at Thomson Hill overlooking Duluth Harbor and St. Louis River estuary. Here we saw examples of inclusions of anorthosite in the basalt. Further into Duluth we stopped at the 57<sup>th</sup> St. Quarry (now abandoned) and examined samples of uncommon gabbroic anorthosite which is a variation of gabbro containing >70% plagioclase. Some of us also found unaltered olivine crystals.

From here, we attempted to get to Radio Tower Hill and the caravan arrived in bits and pieces. We saw contacts between gabbro and basalt indicating the top of the Duluth Complex. We also learned that all along the North Shore, the resistant ridges (or points) are held up by diabase sills while the bays are where the more easily erodible flow tops are.

We stopped below the Duluth Medical Clinic and saw what looked like pillow basalt structures but were actually “toe-lobes” formed by surges at the distal part of a flow. Here some of the amygdules were filled with white agate—banded but no color from mineral staining.

Last stop was near Leif Erickson Park on the shore. There are outcrops of crossbedded sandstone that is colored purple and green. This sandstone is actually made up of basalt fragments like those found on Hawaiian beaches today and represent a prolonged hiatus in volcanic activity.

Special thanks to GSM members Bill Robbins, Doug Zbikowski and Diane Lentsch who organized the September and October trips.

Submitted by Diane Lentsch

Field Trips  
Mid-Continent Rift

St. Croix Valley Area



Walkway at Taylors Falls – potholes



The group studies metamorphosed basalt Flow in Interstate Park at Taylors Falls



Tony Runkel and Terry Boerboom discuss the Mid-continent Rift in a shelter at Robinson Park--out of the rain.

Duluth Area



Agate Museum at Moose Lake State Park



Overlook on Skyline Parkway - Duluth



Jim Miller explains a vesicular amygdaloidal basalt exposed beneath the Duluth Medical Clinic.

Photographs submitted by Roger Knutson,  
Katy Paul, and Ed Steffner

## Abstracts for Winter/Spring Lectures

Submitted by Steve Erickson

We have received a couple of abstracts for our lectures in the winter/spring sessions. The first is from Mark Jirsa of the Minnesota Geological Survey, who will speak **January 26, 2009**. The second is from Terry Boerboom, also from the Survey. His lecture is on **February 23, 2009**.

### **Geologic Mapping in the BWCA: What the Forest Fires Revealed**

Mark Jirsa, Minnesota Geological Survey

Many parts of the Boundary Waters Canoe Area Wilderness experienced a megastorm in 1999 that resulted in large tracts of downed and tangled trees. As a result, geologic mapping of inland areas was almost impossible for many years. Controlled burns and wild fires in some of the devastated areas—including the 2006 Cavity Lake fire and the 2007 Ham Lake fire—laid bare many outcrops that once were deeply concealed in forest, lichen, and moss. The wild fires, totaling more than 100,000 acres, were the largest in Minnesota history since 1894. This talk describes geologic mapping conducted after the fires—an effort to take advantage of the time-sensitive opportunity for recording details about outcrops revealed in the burns. The mapping was funded in part by the U.S. Geological Survey through the STATEMAP Element of the National Geologic Mapping Program.

The forest fires exposed Archean, Paleoproterozoic, and Mesoproterozoic rocks, and a diversity of well displayed contact relationships. Archean greenstone-granite terrane of the Wawa subprovince of Superior Province is represented by a succession of metavolcanic rocks (ca 2700 Ma) intruded by the Saganaga Tonalite (ca 2689 Ma). The tonalite is capped by the oldest paleosaprolite (ancient “soil” horizon) known in Minnesota, and a thick sequence of fragmental rocks. The makeup of paleosaprolites can be used as an indicator of early Earth environments, and some work is on-going in this regard. The Archean rocks are unconformably overlain by Paleoproterozoic sedimentary strata of the Animikie Group (ca 1870-1830 Ma), which includes the Gunflint Iron Formation. The stratigraphic top of the iron-formation is marked by a major unconformity and what is inferred to be ejecta from a meteorite impact that occurred near Sudbury Ontario ca. 1850 Ma. Of the 174 known and scientifically verified terrestrial impacts, the Sudbury event was the second largest and fourth oldest ([www.unb.ca/passc/ImpactDatabase](http://www.unb.ca/passc/ImpactDatabase)). Remnants of an ejecta blanket from the Sudbury event have recently been identified in Ontario, Michigan, and here in Minnesota on the Gunflint Trail and along the Mesabi Iron Range. Mesoproterozoic rifting is manifest in hypabyssal dikes and sills of the Logan intrusions (ca 1115 Ma), and several phases of the Duluth Complex (ca 1100 Ma), emplaced into both Archean and Paleoproterozoic rocks.

A preliminary geologic map of the Cavity Lake fire area was released by MGS as Open-File 08-05, available on the MGS website ( [www.geo.umn.edu/mgs](http://www.geo.umn.edu/mgs) ), under “Released Documents.” Details about the Sudbury Impact layer are still emerging, but preliminary information for the lay-audience can be found on the MGS website; in the December 2008 issue of ASTRONOMY magazine; and page 5 in the Summer 2008 edition of Wilderness News (a publication of the Quetico Superior Foundation, [www.queticosuperior.org/wildernessnews](http://www.queticosuperior.org/wildernessnews) ).

### **Granites of the St. Cloud area and east-central Minnesota**

Terry Boerboom, Minnesota Geologic Survey

The granitic rocks of the St. Cloud area and east-central Minnesota have long been a source of both building materials and geologic wonder. Quarrying for dimension stone began in the St. Cloud district in the late 1800's and peaked in the 1930's, when there were at least 18 different quarry companies operating in the area. Currently, there are 5 dimension stone quarries and at least 4 crushed-rock aggregate quarries active in east-central Minnesota, all in granitic rocks.

In an area that extends at least 100 miles northeast-southwest from the near Mille Lacs Lake to beyond southern Stearns County, there are at least 15 different granitoid intrusions that form a semi-continuous mass known as the East-Central Minnesota batholith. These granitic rocks were classically considered to be older than 1,800 Ma, and to have been emplaced during the Penokean orogeny. However recent exhaustive geochronologic studies have shown that nearly all of the intrusions are between 1,772 and 1,799 Ma in age. This age coincides with deformation and metamorphism associated with the Yavapai Orogeny. The Yavapai orogenic belt crosses southern Minnesota into Wisconsin, but also affected crustal rocks to the north, in east-central Minnesota, at the same time the ECMB was emplaced.

This lecture will summarize both the cultural/quarry history of the granites in the St. Cloud area, and look at geologic reinterpretations based on the results of recent geochronological studies.

**What is the Geological Society of America?**

James Hall, James D. Dana, and Alexander Winchell founded GSA in Ithica, New York in 1888. As a descendent of the American Association for the Advancement of Science, GSA is the first enduring society for the geosciences in America. GSA was formed in recognition of the rapid growth of geology as a science, and the need for a forum dedicated to this new area of scientific inquiry. Its founders envisioned the Society disseminating results of geologic studies and conducting meetings for the presentation and discussion of geologic research. These activities remain the core of GSA's contemporary mission. The Society moved to its current home in Boulder, Colorado, in 1967, where its operations and headquarters staff of about 60 people are housed. Their website is [www.geosociety.org](http://www.geosociety.org).



P.O.Box 390555  
Edina MN 55439-0555

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