GSM NEWS

GEOLOGICAL SOCIETY OF MINNESOTA
SPRING 2004 ● VOLUME LVIII NO. 1 ● www.geo.umn.edu/orgs/gsm

Donors aid GSM outreach

The Geological Society of Minnesota has received two significant donations in support of its public outreach and education efforts.

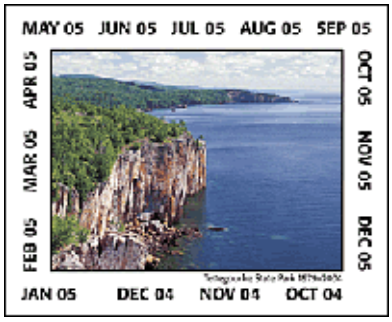
Long-time GSM members and activists Nora and Don Mattsson thoughtfully provided a $1,500 donation, their second major gift to the Society in as many years. The Mattssons placed no restrictions on their gift, so it will go into the general treasury in support of the entire range of GSM outreach, education and lecture programs.

In addition, the GSM received $338.03 in November from State Representative Matt Entenza of St. Paul in support of the Society's in-school educational programs. Entenza, the DFL leader in the Minnesota House fo Representatives, donates the pay supplement he receives from his leadership role to charitable organizations. The GSM shared Entenza's monthly donation with two other environmental education groups, which explains the odd amount.

The GSM has teamed up with geology graduate students from the University of Minnesota, Macalester College, and Carleton College to offer hands-on geological classroom presentations and science fair exhibits for schools and organizations in the Metro and Northfield areas. Teachers receive curriculum materials and rock samples for use after the talks. To request presentations contact Program Director Bill Farquhar at bfarquhar16@hotmail.com

State Park permits highlight geological features for 2004-05

Minnesota State Parks vehicle permits for 2004 and 2005 feature some of the state's oldest and newest geological features.



Minnesota's 2004 State Park vehicle permit depicts Palisade Head in Tettegouche State Park. *MN DNR*

The 2004 permit shows Palisade Head and Shovel Point in Tettegouche State Park. Tettegouche encompasses 9,300 acres on Lake Superior's North Shore.

The park is located on the Mid-Continent Rift, where basaltic lava flows formed as North America almost split 1.1 billion years ago. Subsequent erosion and tilting created the cliffs of Palisade Head and Shovel Point. The park also includes the High Falls of the Baptism River.

The 2005 permit will carry an image of the double waterfall of Minneopa Creek, centerpiece of the 2,000-acre Minneopa State Park near Mankato. Minneopa, the state's third-oldest park, celebrates its centennial in 2005.

The park is in the valley created by the Glacial River Warren as it drained Lake Agassiz. After the River Warren drained away, Minneopa Creek carved a gorge through the sandstone and dolomite bedrock. Variations in hardness of rock layers created the unique double falls.

MGS issues report on Crookston slump

The Minnesota Geological Survey has issued a report describing the geologic processes leading to the riverbank collapse at Crookston last fall. The full report is reprinted in this newsletter. It is on the MGS website at www.geo.umn.edu/mgs. Paper copies can be requested from MGS Map Sales at 612-627-4780, ext. 238.

The report describes the slumps as a naturally reoccurring process related to river erosion and the presence of clay deposits throughout the Red River Valley. It recommends identifying vulnerable sites through additional geological mapping of at-risk areas and making the information more widely available.


A land slump near Crookston (MGS Photo)

GSM NEWS

Editor: Tom Smalec
952-432-3563
e-mail: tsmalec@hotmail.com

Reporter: Katy Paul
952-829-7807
e-mail: kpaul@fs.com

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 News, c/o Tom Smalec, 797 Newell Drive, Apple Valley, MN 55124, or to the e-mail listed above.

CHANGE OF ADDRESS & NEW MEMBERSHIPS

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. ***See form on Page 7.***

Membership Levels:
$10 Full-Time Students
$20 Individuals $30 Families

From the President... Paul Martin

Lecture series ramps up

We're about midway through our annual lecture series, and everything seems to be going as well as can be expected in this snowy winter.

I'm sorry that some of you had trouble finding out where the January 26 lecture was going to be. We did not find out until late Thursday, just four days before the Monday lecture, what room we would have. We put the information on the web site and on the telephone hot line that night.

In the future, if you have any doubt about whether a lecture will occur, or where it will be, call the GSM hot line, (612) 724-2101. You can also check our website, www.geo.umn.edu/orgs/gsm.

The general policy of GSM is that we do not postpone or cancel lectures for weather reasons. Exceptions will be if the University of Minnesota is closed (my recollection is that has only happened once in the last 20 years), or if our lecturer cannot come and we can find no substitute.

On the 26th, our lecturer Keith Brugger was not able to drive down from Morris, due to the dangerous snow conditions, but Steve Erickson, chair of the Program Committee, was able to arrange a substitute. Christian Teyssier presented the lecture on divergent plate margins that he was unable to give us in early November. Steve will arrange a date later in the semester when Keith can come to give his lecture on "Landscapes of Alpine Glaciation."

I don't know if you all have checked the GSM calendar, but during the nine weeks from February 23 through April 19, we have seven lectures or tours or demonstrations scheduled. So give fair warning to your spouse, partner or family that you will be busy most Monday evenings during that period. And two weeks after April 19, the annual "Kimball Memorial Banquet" will be held on Monday, May 3 at the Old Country Buffet on University Avenue in Fridley. Please mark your calendars.

On behalf of the society I have thanked Nora and Don Mattsson for their second very generous donation, which is described in this issue. I'm sure they would welcome calls from other members also.

The GSM board and committees will be dealing with several issues during the coming months, and I want to let members know about two of these in case anyone would like to give advice as what we should do or should not do.

1. What to do about the video library? How do we organize a circulation system more appealing to members? What are the pluses and minuses of switching to DVD format?

2. A member has suggested another way we could promote geology among school kids is to become involved in school science fairs. Are there members willing to get involved by serving as judges, or by organizing special awards for such projects, etc.?

Please let me or other board members know if you have advice about or interest in helping with either of these questions.

New school standards strengthen geology

Proposed new learning standards for Minnesota schoolchildren will give them their first taste of geology as early as the second grade, but more detailed study of how our planet behaves won't come until eighth grade and high school.

The new standards were proposed by the state Education Department in December, part of a larger package covering physical sciences and social studies. The Legislature must approve the standards before they are applied to the state's public schools, and debate is already under way at the State Capitol.

Most of the discussion surrounds the highly controversial social studies standards, but the science standards have also come in for criticism from people who dispute the scientific validity of evolution. Some science teachers fear the fact-oriented rules leave little time for labs and experiments. Statewide testing tied to the standards will start in 2006.

To weigh in on the adoption of the standards, contact:

Sen. Steve Kelly, DFL-Hopkins, Chair of the Senate Education Committee at 205 State Capitol, St. Paul, MN 55155; (651) 297-8065 or sen.steve.kelley@senate.mn.

Rep. Barb Sykora, R-Excelsior, Chair of the House Education Policy Committee, 403 SOB, St. Paul, MN 55155; (651) 296-4315; or rep.barb.sykora@house.mn

To find out who your legislators are, go to www.leg.state.mn.us or call (651) 296-2146.

Minnesota Academic Standards in Science
"Earth Structure & Processes"

GRADE 2:

The student will recognize basic Earth materials.

1. The student will observe and describe rocks, soils, water and air.

GRADE 4:

The student will investigate the impact humans have on the environment.

1. The student will identify and investigate environmental issues and potential solutions.

GRADE 5:

The student will explore the structures and functions of Earth systems.

1. The student will recognize the natural processes that cause rocks to break down into smaller pieces and eventually into soil.
2. The student will investigate the formation, composition and properties of soil.
3. The student will describe how waves, wind, water and ice shape and reshape the Earth's surface.
4. The student will describe the impact of floods, tornadoes, earthquakes and volcanoes on the Earth.
5. The student will explore the interaction of the lithosphere, atmosphere, biosphere, hydrosphere and space.

GRADE 8:

The student will identify Earth's composition, structure and processes.

1. The student will explain how earthquakes, volcanoes, sea-floor spreading and mountain building are evidence of the movement of crustal plates.
2. The student will describe how features on the Earth's surface are created and constantly changing through a combination of slow and rapid processes of weathering, erosion, sediment deposition, landslides, volcanic eruptions and earthquakes.
3. The student will describe the various processes and interactions of the rock cycle.
4. The student will interpret successive layers of sedimentary rocks and their fossils to document the age and history of the Earth.
5. The student will recognize that constructive and destructive Earth processes can affect the evidence of Earth's history.
6. The student will classify and identify rocks and minerals using characteristics including but not limited to density, hardness and streak.

The student will investigate the impact humans have on the environment.

1. The student will identify and research an environmental issue and evaluate its impact.

GRADE 9–12

The student will understand that the interactions of the atmosphere, biosphere, lithosphere, hydrosphere and space have resulted in ongoing change of the Earth system over geologic time.

1. The student will identify the internal and external sources of energy for the Earth.
2. The student will apply the laws of thermodynamics to explain the cycling of materials and transfer of energy in the Earth system.
3. The student will illustrate how biological processes have played significant roles in determining the character of the atmosphere, biosphere, hydrosphere and lithosphere over time.
4. The student will use the theory of plate tectonics to analyze relationships among earthquakes, volcanoes, mountains fossil deposits, rock layers and ocean features.
5. The student will describe how glaciers, gravity, wind, temperature changes, waves and rivers cause weathering and erosion.
6. The student will describe the rock cycle and compare and contrast the processes responsible for the formation of igneous, sedimentary and metamorphic rocks.
7. The student will use evidence found in fossils, rock layers, ice cores, radiometric dating and globally gathered data to explain how Earth has changed over short and long periods of time.

The student will investigate the impact humans have on the environment.

1. The student will identify and research an environmental issue and evaluate its impact.

- Minnesota Department of Education

UNIVERSITY OF MINNESOTA
Minnesota Geological Survey

Riverbank collapse in northwestern Minnesota: an overview of vulnerable earth materials

Summary

The slumping along the Red River and its tributaries in northwestern Minnesota, such as the 2003 incident at Crookston, is a natural result of river erosion and the presence of slump-prone clay deposits. The best defense against the loss of property and infrastructure is to identify vulnerable sites and avoid building in these areas. A better awareness of the problem can be gained through geological mapping of at-risk areas and making the information widely available.

Introduction

Bank-failure problems are caused by gravity acting on earth materials resting on a slope. In the case of failure, gravitational forces exceed the forces holding the sediment together. Failures can take several forms depending on sediment type, sediment layering, and moisture content. Red River Valley bank failures are typically the result of slumping (Figs. 1 and 2; Baracos and Render, 1982; Baracos and Kingerski, 1998; Schwert, 2003) in which a block of earth moves downward along a curved failure plane, commonly with a backward rotation of the slump block. The fundamental reason why deposits in this area rupture and sag is because they consist of clay rather than sand, silt, or gravel.

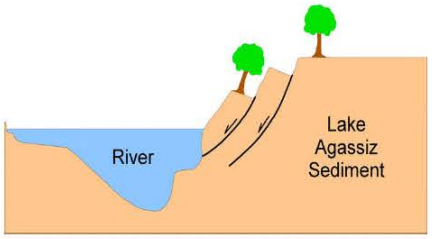


Figure 1. Diagram showing rotational slumping on a curved failure plane (modified from Schwert, 2003).

Clays are present in northwestern Minnesota because the Red River Valley is the floor of ancient Glacial Lake Agassiz—a large lake that formed at the edge of a retreating Ice-Age glacier (Clayton and Moran, 1982; Fenton and others, 1983). Both glacial and lake sediments were deposited and these clays are exposed along the rivers of the Red River Valley (Schwert, 2003). Riverbanks particularly vulnerable to slumping are those that consist of an upper, relatively competent layer of sediment called the Sherack Formation resting on more easily deformable clays of the Huot and Brenna Formations (Harris and others, 1974).

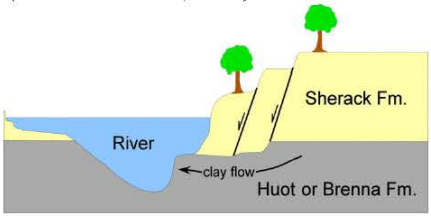


Figure 2. Diagram showing vertical movement of slump blocks as viscous clay flows in response to stress (modified from Schwert, 2003).

Slump-prone Deposits

The Sherack Formation (Fig. 3; Harris and others, 1974) is the surface sediment in most of the Red River Valley. It was deposited offshore in Lake Agassiz and consists of laminated clay, sand, and silt about 25 to 30 feet thick. The Sherack Formation is clayey in the central Red River Valley; it thins and becomes sandier towards the eastern and western margins of the lake plain. The Sherack Fm. is about 8 to 10 feet thick in the Crookston area. Depending on location, the Sherack Formation overlies either the Huot, the Falconer (a lateral equivalent of the Huot), or the Brenna Formation, or older deposits (Arndt, 1977). It forms a compact relatively competent surface layer, but is subject to block failure if the underlying clay is exposed (Fig. 2).

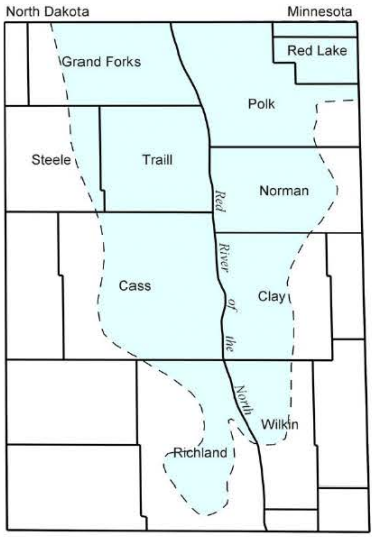


Figure 3. Approximate area where the Sherack Formation is present.

The Brenna Formation (Fig. 4; Harris and others, 1974) was also deposited offshore in Lake Agassiz. The Brenna is 60 to 95 percent clay (Arndt, 1977) that has a high natural water content, very low shear strength, and flows when subjected to stress. It is present north and south of the Edinburg moraine, which marks the southern extent of the Huot Formation (Fig. 4; Arndt, 1977). Brenna is overlain by the Sherack Formation and isolated river deposits. It overlies the Falconer Formation north of the Edinburg moraine and older Lake Agassiz sediments south of the moraine. It is not present in the Crookston area, but is responsible for bank-stability problems elsewhere.

The Huot Formation (Fig. 4; Harris and others, 1974) is a glacial sediment that consists of unbedded slightly pebbly clay. The Huot underlies the Sherack Formation in the Crookston area and is exposed at the surface in the Edinburg moraine. It overlies older Lake Agassiz sediment. It was deposited along the margin of a glacier that moved south in the Red River lowland to the Shelly, Minnesota area, formed the Edinburg moraine, and then retreated. The Huot is extremely clayey for glacial sediment—62-84 percent clay (Arndt, 1977). The glacial ice that deposited it flowed into Lake Agassiz,

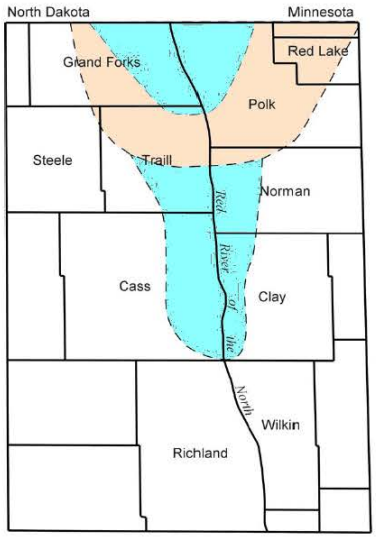


Figure 4. Approximate area where the Huot (brown) and Brenna (blue) Formations are present beneath the Sherack Formation. The depicted Huot extent makes up the Edinburg moraine.

eroding and redepositing lake sediment. The clay has a high natural water content, very low shear strength, and flows when subjected to stress. The Huot is the unit responsible for bank instability problems in the Crookston area.

Slump-prone Areas

These sediments have been eroded by the rivers that flow across the Lake Agassiz clay plain. When a river valley erodes through the Sherack it exposes the underlying clay of the Huot or Brenna Formation and a potential slump situation is created. Various processes affect the actual mechanism of failure in vulnerable deposits. For example, cracks that form in the surface sediment from normal wetting and drying cycles create planes of weakness in the Sherack Formation. These cracks tend to form parallel to river valleys as the sediment settles near the valley wall. As gravity acts on the sediment blocks it stresses the underlying clay. If the resulting shear stress exceeds the shear strength of the underlying clay, the block slides down the failure plane towards the river. Human activity can exacerbate this process. Houses and roads built too close to the river bank create additional loading on the blocks, increasing the risk of bank failure.

These conditions are present throughout the Red River Valley from Lake Winnipeg to south of Fargo (Arndt and Moran, 1974; Baracos and Render, 1982; Baracos and Kingerski, 1998; Schwert, 2003). The Huot Formation is present in the Edinburg moraine and it underlies the Sherack Formation in the Red Lake River valley. It's distribution in the area extending north of the moraine to the Canadian border has not yet been mapped. The Brenna Formation is present north and south of the Edinburg moraine where it underlies the Sherack Formation. The bank failure scenario is the same whether it is the Huot or the Brenna Formation underling the Sherack Formation.

Where we locate our houses, businesses, and roads is important economically, environmentally, and emotionally. The losses suffered by individuals and government through natural disasters are tremendous, and not always avoidable. However, development of enhanced guidelines supported by required information such as more detailed geological mapping will help us avoid future losses.

Recommended References

Arndt, B. Michael, 1977, Stratigraphy of offshore sediment Lake Agassiz—North Dakota: North Dakota Geological Survey, Report of Investigation No. 60, 58 p.

Arndt, B. Michael and Moran, S. R., 1974, Physical data for land-use planning Cass County, North Dakota and Clay County, Minnesota: North Dakota Geological Survey (in cooperation with the Minnesota Geological Survey), Report of Investigations RI-54, 16 p., map scale 1:250,000.

Baracos, A. and Render, F. W., 1982, Field trip guidebook trip 7—Environmental geology of the Winnipeg area: Geological Association of Canada and Mineralogical Association of Canada, Joint Meeting, Winnipeg, Manitoba, May, 20, 1982, 22 p.

Baracos, Andrew and Kingerski, Don, 1998, Geological and geotechnical engineering for urban development of Winnipeg, Manitoba, *in* P. F. Karrow and O. L. White, eds., Urban geology of Canadian cities, Geological Association of Canada Special Paper 42, pp. 171-190.

Clayton, Lee and Moran, S. R., 1982, Chronology of Late Wisconsinan glaciation in middle North America: Quaternary Science Reviews, vol. 1, pp. 55-82.

Fenton, M. M., Moran, S. R., Teller J. T., and Clayton, Lee, 1983, Quaternary stratigraphy and history in the southern part of the Lake Agassiz basin, *in* J. T. Teller and Lee Clayton, eds., *Glacial Lake Agassiz:* Geological Association of Canada Special Paper 26, pp. 49-74.

Harris, K. L., Moran, S. R., and Clayton, Lee, 1974, Late Quaternary stratigraphic nomenclature, Red River Valley, North Dakota and Minnesota: North Dakota Geological Survey Miscellaneous Series 52, 47 p.

Schwert, D.P., 2003, A geologist's perspective on the Red River of the North: history, geography, and planning/ management issues. Proceedings 1st International Water Conference, Red River Basin Institute, Moorhead, MN.

Some useful websites

-Minnesota Geological Survey:
www.geo.umn.edu/mgs

-Environmental problems in the Fargo, ND area:
www.ndsu.nodak.edu/fargo_geology/

-General discussion of various forms of mass movement:
www.landau-forte.org.uk/geography/geomorphic.htm

-General discussion of various forms of mass movement:
www3.interscience.wiley.com:8100/legacy/college/skinner/0471152285/ppt/ch13.ppt

Minnesota Geological Survey
University of Minnesota
2642 University Avenue
St. Paul, MN 55114

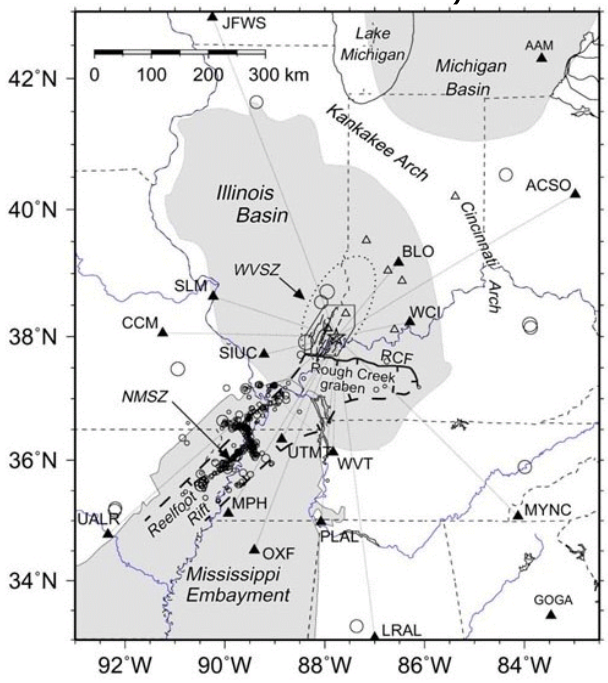
612-627-4780
www.geo.umn.edu/mgs
mgs@umn.edu
K.L. Harris, 2003

Ready to rumble?

Mid-continent fault reawakens, rattles Indiana

New research from Columbia University suggests that ancient fault lines in Indiana have been re-activated and may be the cause of recent earthquakes.

On June 18, 2002, a magnitude 5.0 earthquake occurred in southern Indiana, followed by a 1.2 magnitude aftershock on June 25. Dr. Won-Young Kim, a seismologist with the Lamont-Doherty Earth Observatory at Columbia University, reported findings suggesting that an ancient fault line dating back to the Precambrian era (4.6 billion to 570 million years ago) has been reactivated and was the likely cause of the 2002 earthquakes.



Location of the Wabash Valley Seismic Zone (WVSZ). The New Madrid Seismic Zone (NMSZ) lies to the southwest. Triangles mark seismographs that observed the June 2002 quakes.

Through analysis of high-quality broadband waveform data from the June 18 earthquake, Kim determined that the earthquake's epicenter occurred at a depth of 18 km (11.2 miles) below ground level, deeper than most earthquakes in stable continental regions. By combining this location with the June 25 aftershock, which occurred at 20 km depth, Kim suggests that the earthquakes can be attributed to a steeply dipping fault, known as the Caborn Fault, associated with a rift system once responsible for the breakup of an ancient supercontinent.

"Old continental crust contains a billion-year record of past tectonic activity. This area was once as seismically active as the Gulf of California is today," said Won-Young Kim. "The reactivation of this fault may be due to the forces that are moving the North American Plate over the Earth's mantle. The depth of this earthquake suggests that these forces are quite large, even though they are far away from present plate boundaries."

The June 2002 earthquake is one of the largest seismic events instrumentally recorded for the Wabash Valley Seismic Zone, which extends from Indiana through southeastern Illinois to western Kentucky. It is considered a source of strong earthquakes, with evidence of prehistoric quakes of up to magnitude 7.5. The Wabash Valley system is probably the best documented fault system in the eastern U.S. due to past petroleum exploration, yet the seismology is poorly understood. It is known that many of the Wabash Valley faults extend into rocks from the Precambrian era, to at least 7 km depth.

Kim's research is the first to directly correlate an earthquake with one of the known faults in the Wabash Valley Fault System. His findings suggest that the strike-slip faulting on the Caborn Fault was happening on a near vertical fault plane at 18 km depth, indicating that ancient buried faults associated with a possible Precambrian rift system are being reactivated by contemporary compressive stress.

"We don't yet understand how faults are reactivated, but it appears that some pre-existing faults are more likely to break than others. The study of this sequence should help us to determine the likelihood of future occurrences. More research on these anomalous quakes is required," said Kim.

- Columbia University News Release

International commission abolishes the Tertiary

The International Commission on Stratigraphy has abolished the Tertiary, the time from 65 million to 1.8 million years ago. It lent its name to the K-T (Cretaceous-Tertiary) boundary, where scientists found evidence of an asteroid impact that may have killed off the dinosaurs.

Commission officials say "Tertiary" was never well-defined. They will require geologists to refer to the Paleogene for the early part of the period and Neogene for a the later part. The boundary layer is now tagged the K-P.

The name Tertiary is an artifact of an archaic system of dividing Earth history into four periods: Primary, Secondary, Tertiary and Quaternary.

The commission is frowning upon Quarternary as well, but the label is in such widespread use among climatologists and others studying glaciation and climate swings that it may well survive. Geologists should be referring to the Pleistocene for the time from 1.8 million to 10,000 years ago, and the Holocene for recent time up to the present.

Glaciologists slide back to U of M

The annual Midwestern Glaciology Meeting returns to the University of Minnesota March 25-26.

The MGM provides an informal forum for the presentation and discussion of current research. Talks will be approximately 15 minutes. Researchers of all ice-related subjects are welcome.

The registration deadline is March 1. You can register on the Minnesota Geological Survey website at www.geo.umn.edu/mgs/announce.html. For information contact Carrie Jennings Patterson at carrie@umn.edu or (612) 627-4780 ext. 220.

Friends of the Pleistocene meet

The 50th annual Midwest Friends of the Pleistocene field conference is set for June 4-6 at St. John's University near Collegeville.

The $100 registration fee includes a field trip guidebook, two breakfasts, two lunches, a banquet on Saturday night, field trip refreshments and bus transportation on Saturday and Sunday. Accommodations are available.

For more information, visit www.geo.umn.edu/mgs/fop.html or contact Alan Knaeble of the MGS at knaeb001@umn.edu or (612) 627-4780 ext. 210.

ILSG marks 50 years, seeks historic pics

The 50th Annual Institute on Lake Superior Geology (ILSG) will be held on May 4-9 at the Radisson Hotel in Duluth.

The meeting will also include activities marking the 50th anniversary of the Department of Geological Sciences at the University of Minnesota-Duluth.

As part of the 50th anniversary celebration, a CD of photos of the first 50 years of ILSG and related geologic activities in the Lake Superior region is being compiled. Anyone willing to contribute photos is encouraged to contact either Bill Cannon at wcannon@usgs.gov or Gene Laberge at laberge@northnet.net before sending photos. Submitters should provide a brief explanation of the occasion and who is in the photo. The deadline is March 15, 2004. Credits will be included for the photographers. The CD will be distributed to all registrants.

Scheduled activities include a special session on the "History of Geological Investigations in the Lake Superior Region" from 8 a.m. to Noon Thursday, May 6. Another special session from 1 to 5 p.m. Friday, May 7, will highlight UMD's contributions to Lake Superior geology and other areas of geology.

For more complete meeting information, see the official 2004 ILSG website at www.ilsg2004.org.

Geological Society of Minnesota
c/o Gail Marshall, Membership
12232 Allen Drive
Burnsville, MN 55337

Membership Renewal – October 1, 2003 to September 30, 2004

☐ $10 Student ☐ $20 Individual ☐ $30 Family

☐ $50 Sustaining ☐ $100 Supporting ☐ $250+ Guarantor

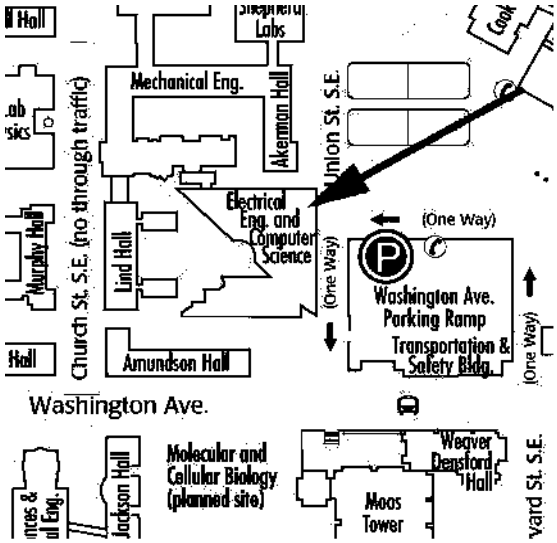
NAME _____
(As you would like it to appear in the GSM Directory:)

ADDRESS _____ PHONE (_____)_____

_____ZIP_____ E-MAIL _____

Lecture Room Set

The GSM Winter Lecture series has returned to Room 3-210 in the Electrical Engineering Building on the U of M Minneapolis campus for the remainder of the 2004 series. For a current schedule, see the GSM website.



Four field trips being planned

The GSM Field Trip Committee is working on tentative plans for four fields trips around Minnesota this summer. GSM members will receive individual mailings as the date, time and itinerary for each trip is worked out. The tentative list of summer field trips includes visits to the granite quarries near St. Cloud, the Big Stone Lake-Lake Traverse Area and continental divide near Ortonville, the Soudan Mine and Iron Range, and the Dalles of the St. Croix near Taylors Falls.

2004-5 lectures focus on national parks

The GSM's 2004-2005 Winter Lecture Series will focus on the outstanding geological features of the great national parks of the U.S. and Canada. The lectures will highlight the "must-see" features for the inquisitive geo-tourist as well as major geological processes and events represented by the landforms preserved in the parks. A full schedule of lecture dates, topics and presenters will be published this summer.

Bush budget offers Bell Museum $100K

A $100,000 grant to the University of Minnesota's James Ford Bell Museum of Natural History is included in the budget proposal President Bush submitted to Congress in February. The funding, like another $100,000 provided in the budget bill passed by Congress earlier, will help the museum design exhibits for the new Bell Museum to be built on the UM St. Paul campus.

GSM NEWS
c/o Tom Smalec
797 Newell Drive
Apple Valley, MN 55124

FIRST CLASS MAIL

MEMBERSHIP RENEWAL

CHECK THE DATE ON THE LABEL

With your membership 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. Flip this page for the renewal form.