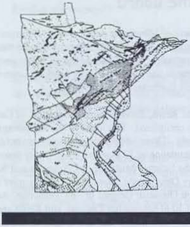


GEOLOGICAL SOCIETY OF MINNESOTA

NEWS

SUMMER 2001
VOLUME LV NO. 2
http://www.geo.umn.edu/orgs/gsm/

Happy the man whose lot is to know the secrets of the earth.

~Euripides (480 - 405 BC)

New UM Lab Will Shake Up World of Quake Engineering

The University of Minnesota will be shaking up the world of earthquake engineering research with a major new facility to test the earthquake resistance of buildings.

The UM Regents have approved $2.2 million to design and prepare a site for a building to house the Multi-Axial Subassemblage Testing (MAST) system, which will be one of the world's largest devices for simulating the stresses that seismic waves put on buildings. Dr. Catherine French, who conducted the tour of the UM Geomechanics and Structural Engineering Labs for GSM members earlier this year, is the principal investigator on the project. The building will be located on newly acquired property at 2525 4th St. SE.

The MAST will have 10 hydraulic cylinders. The eight largest will be capable of delivering 880,000 pounds of force in both horizontal directions while simultaneously delivering 1.3 million pounds of force vertically.

"No other facility will come close in terms of capacity to simulate earthquake forces," Arturo Schultz, an associate professor of civil engineering and investigator for the project, said in a UM news release.

The MAST facility is being built with a four-year, $6.5 million grant awarded to the University by the National Science Foundation's George E. Brown Jr. Network for Earthquake Engineering Simulation (NEES) program. Through NEES, the new UM facility will be part of nationwide network of about a dozen facilities connected via the Internet. That will allow researchers at any NEES network facility to participate in experiments at any other NEES facility via computer linkups. The network is expected to be operating by 2004.

Continued on page 3

Calendar

♦**June 1, 2, 3:** Great American Gem Show & Sale, State Fair Grounds St. Paul, Minnesota

♦**June 12 - June 21** Utah Field Trip

♦**Sept. 24, 2000** Annual Fall Meeting

♦**Oct. 8, 2001** First lecture of the 2001/2002 Lecture Series: ***Forming and Finding Earth's Hidden Treasures.*** Watch for complete lecture schedule in the next edition of GSM *News*.

GSM *NEWS*
Editor: Katy Paul
952-829-7807
e-mail: kpaul@fs.com

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, $30 Families~

News from the Board...

The Geological Society of Minnesota needs a video librarian to carry on the work that Alex Lowe has performed for quite some time now. At each lecture, this volunteer would handle the activities associated with providing videotapes and CD's to library users. If interested and willing, please call Bill Robbins, 651-733-9894.

The 2000-2001 lecture series, *Earth Dynamics: Basic and Catastrophic* has been successfully completed. The lectures had an average attendance of 55 people. Three laboratory sessions were held, each having an average attendance of 32 people. Kristi Curry Rogers, Assistant Curator at the Science Museum of Minnesota and Ray Rogers, PhD, Geology Department, Macalester College gave the third and final laboratory on Dinosaur Origins in The Triassic of Argentina. This lab was on April 30 at Macalester College, and Kristi and Ray chose to donate their honorarium for this lab to the Thomas Lepp Fund, a fund that helps provide money for students to travel on geology field trips. Thomas Lepp was the founder of the geology department at Macalester College.

The new Show and Exhibits (State Fair) chair is Tom Schoenecker. I wish to thank Judy Hamilton for her long and effective tenure as the former Show and Exhibits (State Fair) chair. Judy chose to retire from that position at the same time she retired from her day job.

Ken Barklind is making permanent name tags for GSM members. These may help to learn and remember names. If you wish such a tag, please provide your name to Ken.

The field trip season is rapidly approaching, with the first field trip on Saturday May 19, happening about the time you read this. Field trips are described on the back page of this issue, except for the long field trip to eastern Utah. This long trip begins on Tuesday, June 12th ending on Thursday, June 21st and is being led by Rick Uthe, 763-522-5029 and Walt Blowers, 651-645-3553. Call either of them if you wish to go on this long field trip.

~Bill Robbins, President

In case you haven't taken a look at the GSM web-site recently, you really should. Our Web-Meister, Alan Smith, has done a fantastic job of installing Joan Kain's research project: BROWNSTONE BUILDINGS OF MINNEAPOLIS. If you haven't seen the Brownstone project on our web-site, you are missing out on an excellent opportunity for an unforgettable armchair field trip. The address of our web-site is listed on the front cover of the newsletter (in case you don't have it memorized). Once you get there, just click on the box labeled *Brownstone*, and off you go. Allow plenty of time for your trip--there's a lot to see! Great job, Alan! And Congratulations to Joan Kain for her interesting discoveries. ***~Editor***

Continued from page 1

The NEES project aims to end reliance on isolated physical experiments and move earthquake engineering research into investigations based on integrated physical models, databases and model-based simulation.

"Typically, we like to test large-scale pieces of buildings to understand how those structures will behave in earthquakes," French said in a UM news release. "If they fail, we can then develop ways to retrofit existing buildings to prepare them for earthquakes. Also, we want to test new materials and construction methods to codify how structural engineers might make use of our findings in new buildings."

~ Tom Smalec

♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦

3M PROVIDES GRANT TO GSM

As part of the 3M GIVES (Grants Initiated by Volunteer Service) program, the 3M Foundation has donated $200 to the Geological Society of Minnesota on behalf of WILLIAM ROBBINS, in recognition of his commitment to the community and for his volunteer service.

William Robbins has donated more than 25 hours to improving life in our communities. As a volunteer, he has worked on GSM Field Trips and in the State Fair Booth. He is currently serving a second term as President of GSM.⊗

[Congratulations Bill! And Thanks for all your hard work. *~Editor*]

FIELD TRIP IDEA

Planning your spring/summer field trips and adventures? Here's an idea for a fun trip that is sure to bring delight.

Even though I was born and raised in Central Wisconsin, I discovered a "treasure" there last fall, that I never knew existed. And what a delight it is! If you enjoy the discovery of new sights, moderate hikes, nature, and geological wonders, I encourage you to take a drive over to the Sauk City, Wisconsin area and visit the Natural Bridge State Park.

An easy walk from the visitor parking lot, if you angle to the left at the fork in the path, around the first bend you come face to face with a huge natural sandstone arch. It is very large, and very spectacular. (If you can't make the Utah mega-field trip, this is the next best thing.) If the arch is all you care to see, the walk in and back out to your car wouldn't take more than 30 minutes. But there are hiking trails, with boardwalks and steps, that are very manageable and well maintained. So stay awhile and hike the trails.

The park is open mid-April through mid-October. It is located on County Hwy C, just west of Hwy 12 (turn west off Hwy 12 just opposite the Badger Army Ammunition Plant, south of Baraboo), and 15 miles NW of Sauk City. There is a pay box in the parking lot for the park permit ($3 or $4 as I recall). The park makes a great weekend adventure destination.

~Katy Paul

TOPOGRAPHIC MAPPING

Prior to 1879, topographic and geologic mapping of the U.S. (and territories) had been done by private geologists, topographers, and explorers. In 1879, Congress established the USGS and charged it with the task of "classification of the public lands." The result is a series of more than 54,000 maps that cover in detail the entire area of the 48 contiguous states and Hawaii.

Most of the early USGS mapping activities took place in the vast, largely uninhabited Western U.S. These early mapping pioneers faced extreme challenges. Travel was arduous and slow. Many locations could only be reached by mule pack train. Furthermore, surveying and mapping instruments were crude by today's standards. Most maps were made using a classic mapping technique called planetable surveying.

Planetable surveying took great skill and, depending on the mapping site, equal daring. Carrying a planetable--essentially a portable drawing board on a tripod with a sighting device--the topographer would climb to the area's best vantage point and carefully plot on the map those features that could be seen and measured in the field. The result was a planimetric map which presented a two dimensional view of the land--an example is a road map.

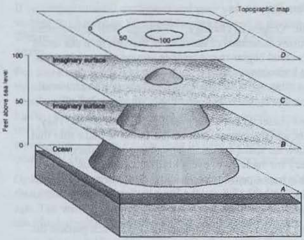
One of the most widely used of all maps is the topographic map. A topographic map is a two-dimensional representation of a three-dimensional land surface. It differs from a planimetric map because it uses contour lines to portray the shape and elevation of the land. Most topographic maps depict many of the features common to planimetric maps, such as bodies of water, roads, mountains, political boundaries, buildings, and names of specific locations. The wide range of information provided by topographic maps make them useful to both professional and recreational map users.

Two of the earth's surface's three dimensions are easily represented on a two-dimensional piece of paper. Length and width are easily transferred from the real world to the map, by using a scale factor, or ratio. For example, a scale of 1:24,000 means that one unit (i.e. inch, centimeter, foot) on the map represents 24,000 of the same units on the earth's surface. (i.e. one inch on the map represents 24,000 inches, or 2,000 feet, on the ground.)

The third dimension on a topographic map, height (or elevation) is shown using contour lines, or elevation contours. A contour line connects all points on the map having the same elevation above sea level. Contours are lines drawn where the land surface intersects with imaginary horizontal planes. (See illustration, page 5) An index contour is drawn thicker and darker than the other contour lines, and is labeled with its elevation. The contour interval is the vertical difference in elevation between adjacent contour lines, and is stated in the lower margin of the map. Most topographic maps use the smallest contour interval that will allow easy readability and provide as much detail as possible.

The best known USGS maps are those of the 1:24,000 scale quadrangle series, or 7-1/2 minute quadrangle maps. A quadrangle is a section of the Earth's surface that is bounded by lines of latitude on the north and south, and by lines of longitude on the east and west. A 7-1/2 minute topographic map represents an area that measures 7-1/2 minutes of latitude by 7-1/2 minutes of longitude, and it is usually named after the most prominent feature in the quadrangle.⊗

MORE ABOUT MAPS...



↑ To Create a Topographic Map, contour lines are drawn where the land surface intersects with imaginary horizontal planes. In this example, a contour interval of 50 feet was selected to construct a topographic map of an island.

GEOLOGIC MAPS

Geologic maps are not like other maps. Geologic maps, like all maps, are designed to show where things are. But, whereas the maps we know best show the distribution of roads or rivers or county boundaries, a geologic map shows the distribution of geologic features, including different kinds of rocks and faults. A geologic map is usually printed on top of a regular map (called a base map) to help you locate yourself on the map. The base map is printed with light colors, so it doesn't interfere with seeing the geologic features on the map. The geology is represented by colors, lines, and special symbols unique to geologic maps. Understanding these features will allow you to understand much of the geology shown in almost any standard geologic map.

To learn more about Geologic Maps, and how to understand their symbols, visit the US Geological Survey web-site at:

<http://wrgis.wr.usgs.gov/docs/parks/gmap/gmap1.html>

The U.S. Geological Survey (USGS) produced its first topographic map in 1879, the same year it was established. Today, more than 100 years and millions of map copies later, topographic mapping is still a central activity for the USGS.

Producing an accurate topographic map is a long and complex process. It can take five years from the identification of a mapping requirement to the printing of a large-scale map like one of the USGS 7.5 minute 1:24,000-scale quadrangle maps. Today the process begins with aerial photography.

The use of aerial photographs for mapping was pioneered in the 1930's, when the USGS assisted the Tennessee Valley Authority in mapping its area of responsibility. This project was the first full-scale test of the use of aerial photographs in creating maps.

Today, most photographs are obtained from flights flown in a north-south direction along carefully determined flight lines. It takes 10 precisely positioned aerial photographs to provide the stereoscopic coverage needed for each 7.5 minute quadrangle map. Flights are flown at a consistent altitude above the terrain. The sky must be clear with the Sun at the proper angle for the type of ground being photographed.

Even seasonal factors must be considered. It is best to take the photos when leaves are off the trees so that terrain features are more clearly visible.~

How Did Geology Get Started? - Part II

Chas Brennecke

In our Spring issue we started a series on the "Origins of Geology." We began with an enormous cloud of gas and dust in interstellar space, many thousands of times more massive than our entire solar system is today. We showed how this cloud begins to concentrate around a proto-star, and how the star gradually accumulates enough hydrogen to begin to turn some of it into helium. While the star is minding its own business setting up its atomic furnaces, the rest of the material nearby in the cloud begins to do some accumulating of its own, and that's where we left off.

The materials that go into making up a proto-planet do not come graded, sized and sorted. They do not come at regularly scheduled intervals, and there is no clerk-of-the-works to make sure that each load is well-chosen and fits properly into the space available. They come when the nudges of gravity from other bodies move them; they are made up of every kind of material you can imagine. Mostly it's dust, gases, pebbles, big rocks, possibly some chunks of pure metals blasted out of an exploding star. The size distribution probably follows the Poisson distribution: a very small number of big chunks and many, many tiny particles, most too small to see.

One very important thing to remember about this assemblage of materials is that each particle the new planet collects carries with it two things: mass and angular momentum. There is a conservation rule that applies to both mass and angular momentum: you can't get rid of them except by radiating them off—and planets are not given the mechanism it takes to do that.

Although this process of pulling in new material is still going on, the most important part of it was probably accomplished the first 500 hundred million years after it started. What did it look like at the end of those years?

Superficially, the earth probably looked a lot like Venus does today. The rotation axis was perpendicular to the orbital plane. Rotation was quite slow, if there was any at all. In-falling particles struck the earth from all directions, and therefore there was no net rotative force to push it one way or another. Earth probably rotated once for each orbit, just as Venus does.

In 500 million years, a good deal of the gravitational energy of the in-falling material had been concentrated in the center. Heavy materials, particularly iron, had formed a solid core at the center. Around the solid core there was probably a layer of liquid iron, with a consistency about that of water.

Just as today, the next layer was the mantle, refractory rocks like basalt—good insulation against loss of heat to the outside. Finally, there was probably a quite different crust than we are used to seeing today: thinner, weaker, more subject to rupture from below, and probably unable to bear the weight of mountains. And no sedimentary rocks, no sand, no dirt.

It was one enormous seething, bubbling, storming, changing mess. Remember that the iron core was created out of unsorted junk, trash and other unusable odds and ends. Different metals react differently with iron, and they are working under tremendous pressures and temperatures. The temperature at the center is roughly the same as at the surface of the sun. That solid core (whatever "solid" is like at that temperature and pressure) is probably composed of thousands of different fractions of iron and its friends, each wrestling with the other for the privilege of being closest to the center. The constant turnover gives rise to huge internal gyres, pressure differentials, and mass movement both on the inside of the core and the intersection with the liquid iron outer core.

Just hang on! In September I will show you how we have to turn the entire mess on its head and make it even messier and more difficult to understand. I promise, you will never again be bored with the concept of plate tectonics!

A ROAD LESS TRAVELED

If you enjoy mineral specimens and your vacation plans take you to the southern Illinois region, consider visiting the American Fluorite Museum located in the town of Rosiclare. Fluorspar, or fluorite is the Illinois State Mineral. Mineral collectors will find the good citizens of the area are eager to show their wares.

For those unfamiliar with this mineral, fluorspar crystals are usually cubes, as in salt, and it is one of the most beautiful of all minerals. None other varies so widely in shades and tints of many colors: white, amethyst (most common), blues from light azure to ultramarine, purple, yellow, red, brown and even black—depending upon the iron, manganese or other impurities present. Some varieties glow in an invisible ultraviolet light, and hence the term "fluorescent". This mineral is point 4 on the Mohs scale; consequently, it mars too easily to be used for jewelry. Mineral crystal vendors exploit its distinctive octahedral cleavage and cleave "diamonds" from the natural occurring cubes.

Geologists believe the Illinois fluorite deposits formed when hot water containing fluorine and other dissolved chemicals rose from deep in the earth during the Jurassic Period, about 150 to 200 million years ago. The water flowed through northeast-trending faults and fractures in limestones laid down earlier in the Mississippian Period, about 330 million years ago.

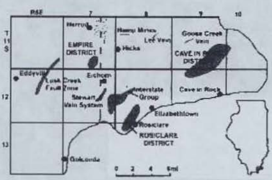
When the hot brines reached the calcium-rich Mississippian rocks, the temperature and other conditions were just right for crystallizing fluorite along the walls of the faults and in flat-lying layers parallel to the beds of limestone. These host rocks dissolved and were replaced with the fluorite.

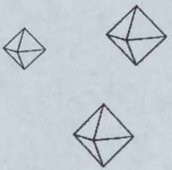
In Illinois, fluorite was mined almost exclusively in Hardin and Pope Counties. The main production came from fissure-vein deposits in the Rosiclare district, and stratiform (bedding plane) deposits in the Cave in Rock district (see map below). Other areas in the two counties yielded smaller amounts of the mineral.

A reliable contact for mineral crystal specimens in the town of Rosiclare is Gary Cowsert. Directions to his residence are freely given at the filling station located at the crossroad just before entering Rosiclare. Arrangements for open pit fluorspar mine tours can be made by contacting Don Hastie, owner of Hastie Mining, whose offices are in Rosiclare, Illinois.

Finally, to those interested in Geology, it may be difficult to avoid visiting a town with a name like Cave-in-Rock. Besides the obvious, this town boasts the last of its kind free ferry transport across the Ohio River into the State of Kentucky. This crossing is made even more exhilarating if both your pockets and the trunk of your vehicle are filled with rocks.

~Bruce Goetteman





ONE-DAY FIELD TRIPS COMING UP...DON'T MISS THEM!

May 19 - **Southernmost Exposures of Lavas and Sediments in the Midcontinent Rift**

Interstate Park, WI to Clam Falls, WI

July 28 - **Geology of the Mid-Minnesota River Valley**

St. Peter & Mankato area

Aug. 18 - **Geology of the Lower St Croix Valley**

River Falls to Stillwater

Watch your mail box for details. Flyers will be mailed to all members prior to each field trip. Flyers will contain meeting locations and times, as well as more information about the destinations, leaders, and points of interest we will visit.

~MARK YOUR CALENDARS~

C/O Katy Paul
6901 West 84th Street
Bloomington MN 55438

FIRST CLASS MAIL

10/1/01
Steve ERICKSON
9393 Turnberry Alcove
Woodbury, MN 55125