GEOLOGICAL SOCIETY OF MINNESOTA

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INSIDE…

International Year of Planet Earth

The International Union of Geological Sciences (IUGS) proposed the International Year of Planet Earth in 2001. This proposal was immediately endorsed by UNESCO's Earth Science Division, and later, by the joint UNESCO-IUGS International Geoscience Program. The main objective of the International Year is to demonstrate the great potential of the Earth sciences to lay the foundations of a safer, healthier and wealthier society.

To achieve maximum political impact, the IUGS-UNESCO team aims to have the International Year proclaimed through the UN system, targeting 2006 as the Year itself. Its ambitious programs – more than can be accomplished in 12 months – will begin in 2005 and culminate in 2007.

The International Year will support research projects within the following broad themes: Groundwater, Hazards, Earth and Health, Climate, Resources, Megacities, Deep Earth, Ocean, and Soils. These themes have been chosen for their societal impact, their potential for outreach, as well as their multidisciplinary nature and high scientific potential.

Want to learn more? Go to: <http://www.esfs.org>

Announcements

The remaining 2004-2005 Lecture Series will be held in the same lecture hall as last fall: CS-230 ■

April 25 5pm

Kimball Memorial Banquet

*****NEW LOCATION*****

Grand City Buffet
9812 Highway 7, St. Louis Park
952-912-0888

Speaker: Lesley Perg, U of Minn

Subject: Death Valley, California

GSM *NEWS*
Editor: xxxxxxxxx
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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.
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Send all GSM membership dues, change of address cards, and renewals to the GSM Membership Chair
Membership levels are: $10 Full-Time Students; $20 Individuals, $30 Families

President's Letter

The guard has changed…
I want to start out by thanking all of the members that have helped me so far and the ones that will help me in countless ways in the future.

The first half of the year's lectures has been excellent. The attendance has been fantastic. The start of the second half is going very well. The lectures that remain sound like they will also be superb.

The topics for the 2005 - 2006 lecture series will follow on the general theme of parks, but with a twist. We will be looking at parks and areas around the world and beyond, (just like Buzz Lightyear).

The Kimball Memorial Banquet will be April 25th 2005. The location has now changed. It will not be at the Old Country Buffet in Fridley. The new location is The Grand City Buffet in St. Louis Park. (See the Announcements Box, upper left). The reason for the change is the room is much better.

The best to Paul Martin in his retirement. He has not left us totally; he is now in charge of the video library.

Good-bye for now, hope to see you at the next lecture.

Roger Benepe, President

GAS HYDRATES: RESOURCE OR HAZARD?

At relatively low temperatures and high pressures, some light natural gases can combine with water to create crystalline substances resembling ice. These solid compounds are called clathrate hydrates of gas, or “gas hydrates”. The trapped gas can be methane, butane, propane, ethane or a number of other light natural gases. The hydrates that contain hydrocarbons, such as methane, will burn.

Methane hydrate is located in great volume all over the world, mostly on continental margins in the ocean or in permafrost in the Arctic, where the cold sea or land temperatures and extensive pressures hold them stable. Such gas hydrates store a tremendous amount of methane, which if liberated, could supply bountiful energy or disturb global climate. Because methane is about 10 times more powerful a greenhouse gas than carbon dioxide, its release over the millennia could have contributed to global climate change. Each cubic meter of methane hydrate is the equivalent of 160-180 cubic meters of methane gas. Blowouts of marine gas hydrates in the geologic past may have released enough methane to drive up global temperatures. Now, geoscientists are studying gas hydrates to devise methods for extracting the gas to use it as an alternative energy source.

Studies began in the US with the Methane Hydrate Research and Development Act of 2000, which authorized the expenditure of $43 million over five years for basic and applied research to identify, explore, assess and develop methane hydrates as a source of energy. Many other countries are also interested in the energy resource potential of gas hydrates. Japan, Canada, India and others have established large gas hydrate research and development projects. In 1995, Japan established the first large-scale national gas hydrate research program, which now plays a leading role in worldwide gas hydrate research.

Gas recovery from hydrates is challenging because the gas is in a solid form, and because hydrates are widely dispersed in hostile Arctic and deep marine environments. Proposed methods of gas recovery from hydrates generally deal with melting them, by heating the reservoir, or by decreasing the pressure. Oil and gas companies have known that gas hydrates in the seafloor are a potential hazard to offshore oil drilling activities, especially as they move into deeper waters that have thicker beds of hydrates. Since conventional drilling activities could heat and destabilize any hydrate beds, extractions from beneath the sea would require different methods, not yet developed.

Although individual gas hydrate researchers focus on issues ranging from gas hydrates as a potential energy resource to gas hydrates as a potential geologic hazard and agent of global climate change, ongoing hydrate research programs will significantly contribute to our understanding of the technical challenges that must be overcome to turn this potentially enormous storehouse of gas into a producible energy resource.

-Excerpted from GEO Times Magazine, Nov. 2004 issue

Yosemite National Park

"This one noble park is big enough and rich enough for a whole life of study and aesthetic enjoyment….none can escape its charms."

John Muir

When I told my daughters that again this year we are visiting Yosemite National Park and that it's my fantasy trip, they thought me a bit "quirky". I used to laugh at those who go through a National Park in a day or two; they see the big picture and that's enough for them. After a lifetime of playing in or near Yosemite, I too now breeze through in a couple of days. Instead of hiking down the trail with my family as in the past, I now limp over to the picnic table and appreciate this magnificence in a different way.

I know or refresh my memory of the trees and plants, and the wild flowers. I savor the majestic mountains and waterfalls, all about us, and the clues that tell a richer story in the imagination. The ocean floor in slow, slow motion over millions of years was jammed under the edge of the continent. Here and there on the way up the foothills, I noticed some black shiny rock. This must be the ancient seabed.

We entered the Yosemite Park Valley amidst grand, monumental, grey rocks all around. How did they get here? As the slab of ocean floor descended, the rock melted in pulses, some came to the surface as volcanoes, and others crystallized slowly under the surface. In more recent times, these Sierra Mountains were raised and are still rising, such that the surface was weathered off and the granite underneath was sculpted by glaciers and decorated by streams and immense waterfalls. The surface pleases us with flowers in the spring, and lush forests of Ponderosa and Sugar Pine in the Valley. "Why are they called Sugar Pine," MX asked? I liked when Macy's curiosity is sparked-----I answered that the Indians and Settlers used to chew the sweet sap from these trees as chewing gum.

I examined the crystalline nature of the different granites, each with an individual fingerprint and age of it's own. So this trip is one of sensual beauty and also one of the imagination. Would I like to return to the past and hike with a string of little complainers behind? Of course, but now that remains in my rich memories. On this short trip to Yosemite Park, I understood more of what I was seeing, a trip of discovery. MX and I both enjoyed refreshing our eyes.

~Robert Gunville

Developments in geological mapping

By Harvey Thorleifson, Minnesota Geological Survey Director

At the Minnesota Geological Survey and our partner agencies, geologic mapping is one of our key activities, and in fact mapping is a core activity for all geoscience. In the 1980s, we witnessed the final days of the paper map era. In the 1990s, we learned how to make a paper map with a computer. And in the current decade, we are shedding the constraints that paper maps imposed on us, and implementing digital, interactive, and 3D geological information systems.

All geological mapping agencies are now shouldering the huge task of vector digitizing and reconciling legacy geological maps, while multiple generations of legends are being made accessible in a consistent and categorized format. Regional 3D geological models that integrate soils and geology, surficial and bedrock geology, as well as onshore and offshore are increasingly in demand as the information, technology, and protocols to build them progress, and the needs for such models intensify. Applications such as regional ground water modeling require digitizing, reconciliation, and assembly of a digital elevation model, bathymetry, offshore geology, soils, surficial geology, all public domain drillhole, geophysical, and geochemical data, bedrock maps, and existing stratigraphic models typically expressed as structure contours.

In the geological map of the future, outliers will be stacked on top of the underlying material as they are in reality, so that the polygons can be lifted up to see what lies below, according to the predictions and observations of the mapper. New stratigraphic modeling, particularly required for unconsolidated deposits in many of our regions, requires benchmark information from cored holes logged by geologists as well as geophysical surveys, such that these high-quality results may be extrapolated laterally using drill hole data, commonly large quantities of water well data of varying resolution and reliability.

Much effort is required to adequately georeference drillhole data in three dimensions, and to parse large numbers of unique lithological descriptions into attributes and defined terminology. Stratigraphic modeling methods ideally use all available data and an approach that permits judgment in the acceptance or rejection of data, while interpolation and extrapolation must be guided by insights into the history and processes responsible for the deposits.

Three-dimensional models can be captured as the extent of each stratum and a grid of elevations that together make up predicted stratigraphy profiles conveying expert opinion on interpolation and extrapolation from the data points, including the best available prediction of what lies below areas from which we have no data.

Reconciliation of mapping with that of neighboring jurisdictions is a critical step, as is balancing subjective definition of strata with more objective geostatistical approaches to characterizing the heterogeneous physical properties of each stratum. Rapid progress in 3D approaches is readily achievable in undeformed sedimentary strata, while deformed strata as well as igneous and metamorphic terrane require a separate set of approaches.

Continued on page 6

SUMMER FIELD TRIP - - ANNOUNCEMENT #2
GEOLOGY OF THE CENTRAL ROCKY MOUNTAINS
5 JUNE - 17 JUNE, 2005

Two pre-trip meetings for this two-week field trip to South Dakota's Badlands and Black Hills and Wyoming's Powder River Basin and Bighorn Mountains will be held on Saturday, 12 March, 2005, and on Saturday, 30 April, 2005, at the home of Marlys Lowe, 2206 Caroline Lane, South Saint Paul, Minnesota. Each pre-trip meeting will begin at 6:30 P.M.

The March meeting will include an introduction to the trip, a slide presentation, and a detailed list, at nominal cost, of suggested motels and campgrounds. A field trip guidebook, at nominal cost, also may be ordered; attendees at the first pre-trip meeting on 12 March may view a copy of it and place an order for the guidebook. The duplicated guidebooks will be distributed at the second pre-trip meeting on 30 April.
Trip participants use private automobiles and stay at motels or campgrounds of their choice. Participants may enter or leave the field trip whenever they wish. Most days include several stops, with picnic lunch brought by participants. Several partial days (just a couple of field stops) and transit days are included. Other minor costs include park entrance and park tour fees. There are no other costs besides lodging/camping and automobile expenses.

Attendance is not required at either pre-trip meeting for trip participants. If you plan on joining us for the field trip but cannot attend either or both of the pre-trip meetings, or if you need directions to the location of the pre-trip meetings, please contact field-trip leader Rick Uthe at uthex001@umn.edu or at 952/544-1677.

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Developments in Geological Mapping, *continued from page 5*

Increasingly, databases of observations and measurements are being retained alongside the interpreted model, and models are being assigned varying confidence levels such that the result is seen not as an end but a means for prioritizing new mapping based on confidence and priority. Geochemical and geophysical mapping will more and more be quantitatively integrated with depictions of lithology, stratigraphy, and structure. Modeling such as ground water and thermal modeling based on 3D geological models is a way to stimulate the organization of input information, and to set priorities for new mapping, monitoring, and research on methods and processes, rather than being an activity that must await the perfection of inputs.

Current activity is progressing from paper maps to digital models, from plan view maps to comprehensive drillhole, geochemical, and geophysical databases, as well as to 3D models, and from static to dynamic models. Pressing user requirements demand that our work rapidly advance along this progression, in order to adequately serve the urgent needs of our society.■

EARTHCACHING

Geocaching is an outdoors phenomenon that is growing rapidly worldwide. Geocaching is an adventure game for Global Positioning System (GPS) users. It involves the creation and placement by players of caches containing a logbook and often other items and the subsequent searching for and locating of these caches by other players. Currently, there are 98,909 caches hidden within the United States and about 500,000 players. Caches are also hidden in over 200 other countries.

The details of each geocache, or the "cache notes," are recorded on a database-driven Web site, www.geocaching.com. Hunting for a geocache can be an individual pursuit or, more commonly, a group or family affair. Some players use the game as a way to travel to unusual places in the country or to see features that are not marked on tourist maps. Some sites require access by four-wheel drive vehicles and many by hiking. The Geological Society of America (GSA) is involved in setting up some earth science education geocaches, called *Earthcaches*, in association with the U.S. National Park Service, Forest Service, and other agencies and organizations.

As the name implies, Earthcaches are meant for learning about Earth. This includes geological phenomena (fossils, minerals, faults, folds, resources) and geographical features (glacial features, waterfalls, etc.). Already, there are some great GSA Earthcaches in Australia, the United States, and Canada, and some are under development in Germany and Norway.

Earthcaches are a type of "virtual" geocache—that is, they do not involve the creation of physical containers hidden at sites, but rather, Earthcache visitors learn about Earth through the cache notes when they visit the site. Unlike "traditional" caches, the visitors do not leave or remove items from a cache. Some Earthcaches may be established at places where geocachers can log their visits in a book at a visitors' center. All visitors to Earthcaches will be encouraged to log their visits on the Web site.

So, how do you develop an Earthcache? First, read the guidelines at www.earthcache.org. The most important guideline is that the cache must really teach the visitor something wonderful about our planet. Check out some of the excellent Earthcaches, like "The Rocks that Grew" Earthcache or the "WoolShed Creek" Earthcache to see how others have written the accompanying notes. Then complete the online submittal form. The Earthcache team will make a decision on the value of the cache, and if it meets the standards, it is submitted to Geocaching.com to undergo the normal geocache approval process. At this stage, around 60% of submitted Earthcaches have been approved and listed.

If you would like to work on setting up Earthcaches in your area and would like to discuss these with the Earthcache Team, contact Gary Lewis, glewis@geosociety.org, or Wesley Massey, wmassey@geosociety.org.

~Exerpted from Geology Today Magazine, Jan 2005

Geological Time gets a New Period

Geologists have added a new period to their official calendar of Earth's history - the Ediacaran Period. (pronounced eedee-AH-karen). It ranges from approximately 620 to 542 million years before the present. It officially becomes part of the Proterozoic Era, just before the Cambrian Period, when multi-celled life forms started to take hold on Earth.

Though long called the Ediacaran by many U.S. geoscientists, the same period was called the Vendian in Russia and the Upper Sinian in China. The Ediacaran became an official geological period when it was ratified in March 2004 by the International Union of Geological Sciences (IUGS) and announced on May 13, 2004, the first new such period declared in 120 years.

The word “Ediacaran” comes from the Ediacara Hills in the Flinders mountain range of South Australia. The name is of Australian Aboriginal origin and refers to a place where water is present. The Enorama Creek section of Flinders was designated the "boundary stratotype" for the Ediacaran. A boundary stratotype is a rock sequence and level that is defined and used as the standard comparison for all other rock sequences of its age.

Ediacaran fauna fossils have been found in dozens of outcrops on all continents. Many of the best known Ediacaran creatures appear to be immobile blobs, disks, fronds, and mattress-like shapes that have no obvious relationship to later forms. Especially important deposits have been found in the White Sea area of Russia, in southwestern Africa, in northwestern Canada, and in eastern Newfoundland. .

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