



THE GEOLOGICAL SOCIETY OF MINNESOTA

News

*Volunteer
opportunities,
field trips,
lectures, and
public service,
since 1938*



GSM President, Dave Wilhelm

From the President's Desk...

This is the second Newsletter compiled by our new editors: [Theresa Tweet](#) and [Mark Ryan](#). I can't wait to read it. Thanks to both of you, and to continuing editors [Harvey Thorleifson](#) and [Rich Lively](#), for extending the long tradition of our Newsletter, which both informs us and records our history.

After the lengthy inter-semester break, we have resumed our 2014-2015 lecture series. It continues to be a great series. Thanks to [Steve Erickson](#) for planning it. The full schedule appears on our website (gsmn.org). Note that approximately two weeks prior to each lecture (as soon as we get the information), our webmaster [Alan Smith](#) posts an abstract and presenter credentials for the upcoming lecture. All our lectures and labs are free and open to the general public, so feel free to invite family or friends when topics are presented that you feel might interest them. Note that we also have an interesting lab scheduled for the last Saturday of February; it is described elsewhere in this issue. If you have an idea for a lecture or lab, or know of a possible presenter, contact Steve with the information. Steve will soon start creating the 2015-2016 schedule, so now is a great time to send him suggestions.

As many of you are aware, we postponed a lecture in November due to icy weather. This prompted us to formalize a bad weather policy: If the weather forecast indicates questionable weather, we are committed to posting whether we will cancel, postpone, or proceed by **3 PM the day of the lecture**, usually sooner and, if at all possible, the night before. [Bill Robbins](#) will send e-mail notice to members as soon as we decide. So, check our web site and/or your e-mail in case of questionable weather. And a reminder that the doors of all University of Minnesota buildings now lock promptly at 7 PM, so do try to arrive prior to that time. To accommodate late arrivers, Steve or another member has been checking the doors every five minutes until 7:15 or so. If you arrive late and the doors are locked, please wait a few minutes until someone lets you in.

As I reported in November's Newsletter, [Sandy Steffner](#) very successfully completed her term as the State Fair Planning Chairperson. I want to once again thank Sandy for the great effort she put into planning and managing our State Fair booth over the past few years. Just a few weeks ago, new Board member [Dan Japuntich](#) volunteered to take over for Sandy in that position. Thanks, Dan, for stepping up to fill this vital role in our Society, as the State Fair has been a great source of new members, and an important way we put a public face to our Society. Although it is a bit early to be thinking of the State Fair during the depths of winter, Dan with Sandy's assistance will start planning next month. Be sure to respond when Dan reaches out in early summer to fill volunteer shifts.

I continue to maintain the Video Library. The library has just expanded by a considerable

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amount (over 40%), as **Randy Strobel** and **Joanie Furlong** have just donated 75 new titles. A big thank you, Randy & Joanie. I will start bringing the new DVDs to lectures just as soon as I have prepped them for rental. And I will soon enter them into the online catalog on our web site.

Field trips: Elsewhere in this issue, **Maria DeLaundreau** concludes her report of the great field trip Randy and Joanie led in August to western North Dakota. Thanks, Maria. Plans are now well underway for a week-long field trip that Randy and Joanie are leading to southern Nevada next month. Around 20 GSM members have signed up for this trip, and we are all looking forward to experiencing the many natural sights and activities that this part of our country has to offer. Thanks to Randy and Joanie for planning and leading these trips.

We are always looking for new field trip ideas. Is there some place of geological interest that you would like to visit, or have visited and would like to share with other members? Contact me and I'll put you in touch with someone who has experience organizing our field trips. Local field trips can be as short as a few hours, and often we can recruit a professional geologist as the technical leader.

As in the past, I encourage you to visit our web site (gsmn.org). It includes a wealth of information about our organization and about geology in general. A feature of our web site I would like to emphasize again is our page of Geological Links, to which you can navigate from the list on the left side of the home page. We have recently added a number of items to the Links page. One new one is to the Fresh Water Society and its Moos Family Speaker Series, which has videos of over a dozen of their past seminars on

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GSM News

Officers:

Dave Wilhelm, President
 Mary Helen Inskip, Treasurer
 Rebecca Galkiewicz, Secretary

Board Members: Deb Preece; Ruth Jensen; John Jensen; John Grams; Mark Ryan; Roger Benepe; and Dan Japuntich

Editors: Theresa Tweet; Mark Ryan; Katy Paul; Harvey Thorleifson; Rich Lively

The Geological Society of Minnesota is a 501(c)3 nonprofit organization. The purpose of this newsletter is to inform members and friends of activities of interest to the Geological Society of Minnesota.

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

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

Membership dues are: \$10 Full-time students; \$20 Individuals; \$30

Families

GSM News is published four times a year: **February 15, May 15, August 15, and November 15.** Deadline for article submission is the first of the month, before the date of publication.

Newsletter contributions welcomed

Of interest to our GSM enthusiasts: While out and about enjoying your vacation time – when you visit a site that you find interesting, please consider sharing your experiences with us by writing up a few words and sending it to Theresa Tweet at phoenix8185@gmail.com. Thank you in advance!

New Members!

Doug Plunkett, Stillwater
 Susan & Ross Williford, Minneapolis
 Jason Korf, Standfield
 Christina Cauley, Hilo, HI
 Joy Gerdes, St. Paul
 Mary Harrington, Minneapolis
 Darrell Ayers

from the archives: Walking the edge of the Merritt Mine, Cuyuna Range, 1940.



various subjects such as fracking, groundwater reserves, water & agriculture, and their most recent on sediment in the Minnesota River. Check out their list of topics to see if there are any whose in-depth analysis interests you.

Finally, I'd like to invite any members who are interested to one of our Board meetings. The next meeting is scheduled for **May 14**; see our website for all scheduled dates. We typically meet between 7:00 & 9:00 PM at the Minnesota Geological Survey building (*New Location*: 2609 Territorial Road in St. Paul, just west of Hwy 280). So attending a Board meeting provides a bonus: a chance to see the new Survey building. These meetings are open to all members of GSM. If you have a topic you would like the Board to consider, contact me about getting it on the agenda.

GSM President, Dave Wilhelm

GSM Board Membership

The GSM Board consists of members who have a special interest in advancing the goals of our society, which include lectures, field trips, and community outreach. The Board currently has ten members, listed below. Our bylaws limit the terms of Board members to four years. We do that to encourage a turnover of perspectives and ideas. The Board typically meets quarterly, with meeting dates scheduled for the second Thursdays of February, May, August, and November. However, the Board will schedule a different date when conflicts arise. We typically meet between 7:00 & 9:00 PM at the Minnesota Geological Survey building, its new location is at 2609 W. Territorial Rd. St. Paul, MN 55114.

Board meetings are open to all members of GSM. So, whether you are a new member of GSM or have been a member for many years, if Board membership is something that might interest you, or you are just curious to see what our Board does and how it works. We encourage you to attend a meeting. Additionally, if you have a topic you would like the Board to consider, contact Dave Wilhelm at dewilhelm53@msn.com about getting it on the agenda.

Current GSM Board membership:

Dave Wilhelm (President)	John Jensen
Mary Helen Inskeep (Treasurer)	Ruth Jensen
John Grams	Deb Preece
Roger Benepe	Mark Ryan
Becky Galkiewicz (Secretary)	Dan Japuntich

Also, the GSM is currently looking for people to fill a couple of slots on various committees. Both the Video Library and Field Trip positions have openings. These are not Board positions and are just waiting for the right volunteers!

!!!!COME JOIN US!!!!

At the GSM 2015 Spring Banquet and Silent Auction

May 4th from 5:00pm - 8:45 pm.

GSM members, friends and others – the next Spring Banquet and Silent Auction is on **May 4th**, from 5:00 pm- 8:45 pm at the **U Garden Restaurant** (2725 University Ave. SE, Minneapolis, MN 55414; 612-3788-1255, <http://www.ugardenrestaurant.com>), near the east Bank of the U of MN campus. This will be at the same location as our first lecture and Annual Meeting of 2015. The restaurant is on the north side of University Ave SE, east of 27th Ave SE. There is parking available at the back of the restaurant.

No reservation is needed for dinners off of the menu, or the buffet which is priced at \$10.95 + tax & tip. To make payment easy, we encourage everyone to plan on using cash as the restaurant does not accept checks.

Both the dinner and sales will begin at 5:00pm. Sales and payments will stop promptly at 6:45 for announcements and guest speaker. Silent auction bidding will begin at 8:00 and finish at approximately 8:45.

Additionally, if you think that you have more than your share of Rocks, Minerals and Geology paraphernalia gracing your home and feel that it is time to share them with others, consider donating them to the Silent Auction. Simply contact phoenix8185@gmail.com.

Holiday Celebration - 2014

The Geological Society of Minnesota brought 2014 to a close on December 13th, at a Holiday event that was held at the home of long-standing members Ed and Sandy Steffner. This year saw the largest group in attendance to date, welcoming members and GSM enthusiasts from all over the metro area. More than just a time for good food and conversation, it's an opportunity for sharing thoughts, gathering new ideas, and planning for the future of the organization. Thanks again Ed and Sandy for a wonderful evening!

Exciting News!

[Alex Dolabi](#), a student from Macalester, was interested in doing an Internship with the Geological Society of Minnesota, in collaboration with Macalester's faculty, staff, and resources. As of Friday, January 30th, we were able to make the internship a reality. Most of you

haven't met him yet, but I have had the pleasure of talking with him on a number of occasions as Alex has been doing classroom presentations in the GSM Outreach program since last year and I have heard nothing but good things about him.

The aim of Alex's internship will be to develop formal presentations / power-points of various topics (i.e. rock cycle to geologic time to field techniques, etc.), for students and for different events (science fair; community events). Additionally, he could develop handouts and other learning tools for our own future use. In addition, Alex would be working alongside Raymond Rogers and Jeff Thole to complete these goals. So from now until early May, Alex will be fine tuning his skills in research, curriculum, technology and education.

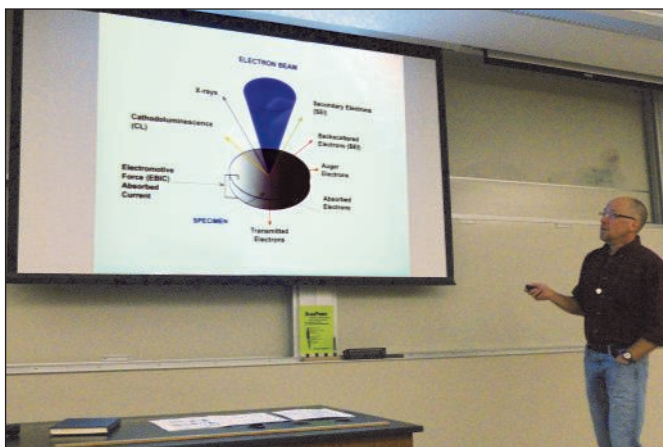
Thank you to David Wilhelm, our GSM president, as well as the rest of the Board members for their quick, efficient, and overwhelming vote of confidence in this internship. Also, thanks to Jeff Thole and Ray Rogers for helping to put this internship into place.

Welcome aboard Alex – and now the work can begin!

Theresa Tweet

GSM Lab

The next GSM Laboratory is titled **CSI Mineralogy – Using Electrons and X-rays to Investigate Geologic Unknowns**, and will be conducted by **Jeff Thole** of Macalester College. It will be held **Saturday, February 28** from 10:00 AM to 12:00 PM at the Olin-Rice Science Center on the Macalester College campus. See the GSM web site (gsmn.org) for directions. As with all GSM labs and lectures, it is free and open to the public.



This lab will use a Scanning Electron Microscope (SEM), Energy-Dispersive X-ray Spectroscopy (EDS), and X-ray Diffraction (XRD) to characterize unknown samples that will be supplied to Jeff. We also plan to have thin-

section mineral samples available for viewing through polarizing optical microscopes, and 3D samples like sand and microfossils for viewing through stereoscopes.

Jeff has asked us to provide him beforehand some samples to analyze during the lab. *So if you have an unknown geological specimen or gem you would like analyzed, or a known specimen that you feel might stump Jeff, here is your opportunity.* Bring your specimen(s) to the GSM lecture on February 23 and Steve Erickson will make them available to Jeff for the lab the following Saturday. Here are guidelines for the specimens:

SEM/EDS: Samples for SEM analysis to identify mineral chemistry should be small (~ less than 1 cm in width) or we should be able to take a small chip off a larger sample. Samples can be very small (if visible, we can analyze it). It is best if we can coat non-conductive samples (most minerals that are not metallic) with carbon but this is not necessary. Coating with carbon allows the acquisition of a 'clean' image but will also discolor the sample. Generally this is not a concern if the small piece is considered 'expendable'. Gems and jewelry are also good candidates for analysis and would not be coated for obvious reasons.

X-ray Diffraction: Mineral samples are ground to a fine powder (destructive). Again, only a very small sample is needed. A good size to shoot for would be the size of ladybug or down to about 1/2 that size. Larger is better. Mixtures (for example, fine-grained, multi-mineralic rocks like basalts) are harder to identify. Generally the XRD is used to identify individual minerals.

Notes From the Past:

From the FALL-WINTER 1964 Newsletter

ANNUAL PICNIC

Our annual picnic was held on Sunday, August 2, at the home of Mr. and Mrs. Harry Sommers on the St. Croix in North Hudson. About 60 members came to enjoy the generous hospitality of our gracious hosts.

Mrs. Linda Bennit, sister of Mrs. Sommers, gave a talk entitled "Following the Mississippi to the Gulf". It was based on the trip she and Mr. Bennit took in their cabin truck which they call "The Turtle". She described in interesting detail the numerous dams built along the river and the changing width of the channel at various distances; she also told about the difficulty they had in reaching a most distant point through the delta to the Gulf. Having been Geological Society members for many years, they were particularly alert to the geologic features of this challenging trip and were able to transfer some of their interest and enthusiasm to the group.

As usual, it was a delightful afternoon for our members, who expressed their appreciation of the cordiality of our hosts and the excellent sweet corn from their home garden.

Montana - North Dakota Field Trip; Part 1: "Natural Geology"

Part 2: "Industrial Geology"

The fossil fuels in North Dakota are a key part of their economy. During the August trip, we got to learn more about the natural gas, oil and coal operations around the state. North Dakotans were excited to share this part of their livelihoods with us to show us how they meet their own standards for safety and environmental responsibility. In the process, they were incredibly proud to tell us about how they fuel America and contribute to the economy and reduce our dependence on foreign energy.

The Little Knife Gas Plant reminded me very strongly of being in an organic chemistry class. This mood was set right away. We were ushered into a welcoming room with bright flowers, cookies galore, orange juice and coffee. As we settled down, our tour guides introduced themselves and shared some basic information about the plant and then gave us a lesson on petrochemicals, diagramming their chemical structures and discussing their uses. We were told that methane and ethane are the primary components of natural gas, but it does not come out of the ground ready to ship to consumers. This plant's job is to take what comes out of the ground and refine it into the natural gas we can use in our homes.

The gas is transported to the plant via pipeline. Engineers and technicians carefully watch pressure valves. Changes in pressure might indicate a leak in the pipeline or a build-up of gunk that needs to be cleaned out. The pipeline is regularly scoured by a device called a "pig."

From there, processing the natural gas is exactly what I did in organic chemistry, except that the distillation tubes are distillation towers. The gas goes through



Diane with the "pig".

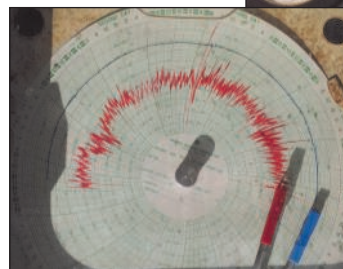


Maria in front of distillation towers.

cycles of heating to different temperatures and cooling to separate the ingredients, because each has unique points at which it turns into a solid, liquid or gas, enabling the purification of the natural gas.



Pressure gauges were located



Pressure gauges were everywhere

throughout the plant to help engineers and technicians monitor the operation so if anything goes wrong they can shut down the plant quickly if needed. They also had numerous emergency shut off valves, some for different parts of the process and some that shut down the whole plant. In case you were wondering, in the event of an emergency all gas is funneled to different release points where it is burned.

Working with a flammable gas can be dangerous, but they have everything under control and are able to safely produce

throughout the plant to help engineers and technicians monitor the operation so if anything goes wrong they can shut



I tried to find as many emergency buttons as possible.



After all the emergency buttons suggested this place could be really dangerous in the event of an emergency it was nice to find the emergency preparedness plan.

natural gas for consumers. Thanks for the gas and the tour!

Oil was also on our agenda. The night before driving around the North Dakotan countryside to look for oil pads I was admiring the sunset. In the darkening twilight you could see where the sun had gone down behind the hills. Then I realized I was facing east. My "sunset" was a flare from an oil pad.

The next day we drove and I began to appreciate just how many oil pads were in the area. Everywhere we looked there was an oil pad or something related. We found oil pads that were being drilled with many staff on site. At pads that had been drilled recently, the crude



This is an oil pad with new wells that were still highly pressurized. The nodding donkeys are in place, but not operational yet; the natural gas flare burns 24/7.

oil was still pressurized and coming up without the assistance of "nodding donkeys," which older sites need to bring the oil to the surface. Flares burned brightly on most of the oil pads. At the natural gas refinery we learned that oil drilling companies do not always consider salvaging the natural gas that comes up with

the oil to be economical, so instead of selling it to a refinery they simply burn it on the oil pad. Laws will be going into effect requiring them to capture it.

We got to see trucks transporting crude oil from the pads everywhere. We learned more about where it was being taken at the Bakken Oil Express transfer facility. Trucks pulled in and were lined up along the road, each with a red placard with a small flame over the numbers "1267," a sign indicating the presence of crude oil. The truckers emptied the oil into huge containers, big enough to hold over a train load of crude. From there, the crude was loaded into trains, with 2 buffer cars between the engine and the first car of oil. The trains with an average of 105 oil cars then left the facility to deliver the crude to refineries, the final step before the oil is sold at gas stations.

Our tour guide told us their mission at this site is to bring in and ship out as much oil as possible in the shortest amount of time possible. Their greatest obstacle was the shortage of trains to transport fuel. Trucks were lined up along the road because they simply did not have room at the facility at that time to house the oil until more trains came. The amount of crude passing through was amazing.

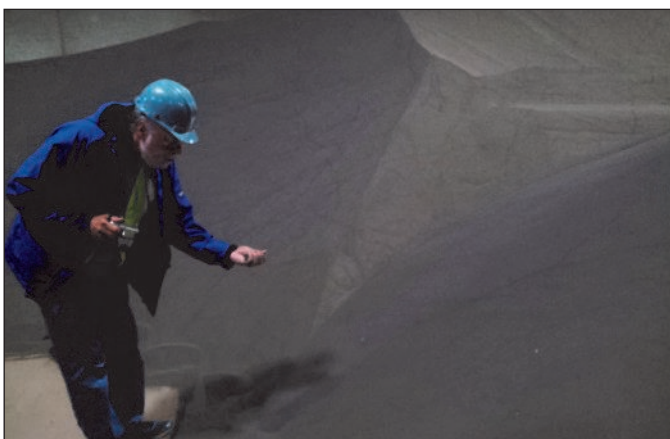
Many of the trucks we saw were hauling crude, but many were carrying related material. We passed trucks carrying water and sand to and from oil pads for fracking purposes. Trucks could go to places set up like gas stations to fill up their tanks with water. Other sites allowed trucks to dump waste water. We got to go to a frack sand transfer location to learn more about the materials in this practice.

Our tour guide at the frack sand site impressed upon us the need for discretion. The frack sand industry is fraught with secrets, leading to the need for us to take pictures only of the sand itself - no other pictures in the building and definitely none of the packaging. The first secret we learned isn't really a secret but that frack "sand" often isn't really sand. The high quality sand at



Frack sand in three different particle sizes. We got to touch them to feel the difference and to feel how clean the sand is. Sure enough, there was none of the normal sand dust on my hand after I put the ceramic frack sand back.

this site is actually a collection of tiny and perfectly spherical pieces of ceramic. Our guide listed advantages to using ceramic rather than natural sand: less dust, resulting in increased safety for workers; and increased porosity, allowing more oil to flow between the pieces. The ceramic sand gets to this facility by rail and leaves by trucks, out to the oil fields, but first they put it in a huge pile, one of the few things we could get a picture of.



Dave touching the huge pile of frack sand.

The last fossil fuel we learned about was coal. It had been brought up before in the “natural geology” part of our trip when we saw bands of the low-energy and therefore low-quality lignite coal. We went to the Freedom Mine where we got to see the coal being extracted from the earth. The mine is a huge open pit. They had to blast off the top rock layers to get at the coal. From far away the pits looked so big the trucks within them looked like toys. We got closer to the trucks and I realized the trucks were actually big enough to squish the 15-passenger van we were in without noticing.

It was amazing to watch them work. They had a huge dragline that scooped the coal that was powered like a vacuum cleaner, with a huge power cord that didn’t go to an outlet but got its energy directly from the power plant. This is because it required a 23,000 volt power



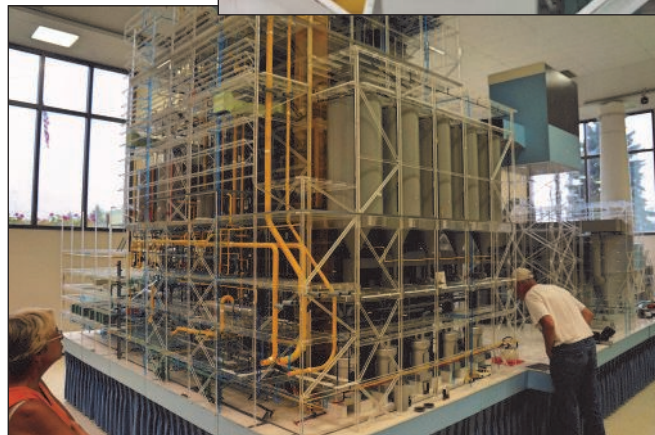
Group photo at the Freedom Mine.

supply. The machine had two operators, one to work the bucket and another to move the machine and keep a careful eye out so they didn’t crush their power cord. The dragline filled the enormous dump trucks in only 3 scoops, the equivalent of 4 Chevy Suburbans or 800,000 softballs. The dragline weighed 13 million pounds and was still capable of “walking” around the mine to get its next scoop. The top speed on this machine was 1/10 of a mile per hour. They were quick to point out this coal is still low enough quality that it wasn’t worth shipping. Instead they put in a coal power plant on the adjacent property and set up a conveyor belt to transport the coal.

This is another place that asked for discretion with photos, but the mine did approve a group picture.

The coal power plant was very interesting. We got to see a scale model of the plant to learn where the coal comes in, where it goes to be burned, and all of the other functions of the plant. I particularly enjoyed the examples of how pipes in the plant burst. Fun fact: some broke because of shotguns fired to clean out the pipes.

It was really helpful to see the model so we could see exactly how the coal and energy travelled through the plant. The equipment was so large it was often

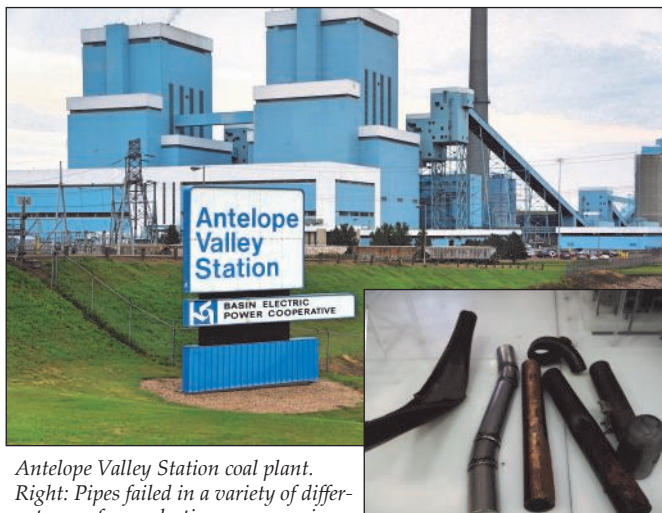


This part of the model shows where the coal is burned. Right: Scale model of power plant with Roxy and Dan. Can you see where the coal is burned?

impossible to see the whole thing on the tour. We did get to see the conveyor belt delivering coal to the plant. From there coal went to the burner, smoke went to scrubbers and the electricity went out to communities as far away as central Minnesota.

The Dakota Gasification Company’s Great Plains

Synfuels Plant was nestled in with the coal mine and power plant. Here they take lignite and turn it into natural gas and the use the byproducts to create other items for sale, including sulphur and nitrogen fertilizers,



Antelope Valley Station coal plant. Right: Pipes failed in a variety of different ways from eclectic causes ranging from high pressure to shotgun bullets.

phenols that are used to make the resins that hold together plywood, liquid nitrogen, krypton and xenon, naphtha and more. It was really interesting to learn about the complicated chemistry involved and to see the innovation of the company in trying to not waste any byproduct.

All of the employees were extremely proud of the work their companies were doing to provide valuable products to our country. Bumper stickers and signs proclaimed "If it weren't for the Bakken, we'd be walkin'", "Fueling American energy and jobs", and "American oil now to save America's future". They are seizing the opportunities the geology of the area gave them and were kind enough to share what they were doing with their tours and products.

Thanks for a great trip!

Maria Delaundreau

Saint Anthony Falls Lab Field Trip 10 December, 2014

First there is the fast flowing flume under the bridge as you walk to the University of Minnesota Saint Anthony Falls Laboratory. Then, as you peer over a side wall, a small stream meanders through a wetland that is dotted with PVC pipes. Beyond this is the roar of the Falls itself. That's the introduction to one of the most unusual facilities on the banks of Minnesota's Mississippi River, the Saint Anthony Falls Lab.

Funded by the Works Progress Administration, the Saint Anthony Falls Lab was dedicated in 1938. Its original mission was to research hydraulic and river engineering. Pictures on the walls of the main hall show the facility

when it was first built. PhD student Abby Tomasek led 11 of us through the labyrinth that the Laboratory has become, explaining different projects, and answering questions. Do microbes make more lipids if they "swim" harder or lie passively about? Microbes are grown in a great, long tank in a tall room with windows that have the premier view of the river and city beyond, and they are thriving!



What happens when large storms force the water piled up against barrier islands to flow over the island? A massive tank with a laser measuring device sliding overhead on a huge rail system models the action. This machine, unique to the lab, is accurate to within millimeters. Another massive tank contains a delta system -- green, blue, and brown streaks reveal the deposition of sediments under different conditions. Yet another "tank", half a basketball court in size, is underlain with hydraulics that can change the shape of the bottom.

A flume, empty now, reveals the instruments for measuring the flow of the Mississippi. In the basement, the walls of raw Platteville limestone expose the original quarry from which the first building was constructed (it was flooded for much of last spring). No longer confined to river research, the Lab now investigates other "fluids" - oceans, wind (there is a wind tunnel), oil flowing through rock (and hence a source of funding), and water passing through almost anything, (Abby's project explores removing nitrogen from water and soil).

There were plenty of other questions and not enough time. We met students, staff, faculty, and visiting faculty. Abby managed to lead us back out of the maze the building has become. The tour gave us a better understanding of the work being done in the St. Anthony Falls Laboratory, and we were all grateful for the opportunity to visit the unique facility.

Dave Wilhelm will arrange three additional one-hour tours of the Lab over the next two months, at various days of the week and times of day. Each tour can accommodate 12 persons. The tours are entirely indoors and accessible. E-mail will be sent to GSM members when specifics become known.

Mary Kay Arthur

ROCKFEST 2014: Glacial Geology and Agate Hunt

Contributed by Association for Women Geoscientists Minnesota Chapter (AWG-MN)

The first annual AWG-MN RockFest took place on September 27, 2014 in Scandia, MN. The popular event was complete with a glacial geology field trip, a hunt for Lake Superior agates, followed by a delicious homemade lunch at one of Minnesota’s treasured historical museums provided by our very own AWG-MN president, Christina Morrison.

Over 50 participants enjoyed the exclusive opportunity to visit an area sand and gravel mine in Scandia, MN to explore glacial geology up-close. Christina Morrison, with Barton Sand & Gravel Co., provided background



information about the gravel mining operations and discussed the high-quality esker deposit that has been providing the area a reliable source of construction aggregates for decades. Since the esker deposit is dominated by glacial material that advanced from the Lake Superior region, the deposit has the potential to produce Lake Superior agates, Minnesota’s state gem.



According to the Minnesota Department of Natural Resources, the Lake Superior agate differs from other agates found around the world in its rich red, orange, and yellow coloring. This color scheme is caused by the oxidation of iron. Iron leached from rocks provided the pigment that gives the gemstone its beautiful array of color. The concentration of iron and the amount of oxidation determine the color within or between an agate’s bands.



After participants had an opportunity to visit the mine and hunt for agates, the group returned to Gammelgården Museum in Scandia for lunch. The coordination of efforts for this most successful event would not have been possible without the dedication of members of the current and past Board of AWG-MN. Special thanks to Cheryl Sorensen, Michelle Waters, Jessica Hayson, Marian Kramer and Beth Wenell for contributing significant time and effort into making the event possible.



A broad range of praises were received from participants that included folks from the Minnesota Geological Survey, University of Minnesota, area scientists, agate enthusiasts and families that brought out our next generation of geoscientists!

AWG-MN looks forward to continuing with a tradition of RockFest in the Fall of 2015!

If you would like more information on the Association for Women Geoscientists Minnesota Chapter – check out our site at <http://www.awgmn.org/>

THE GREAT BRAZILIAN GOLD RUSH OF 1979 - 1986

From: *Rock Chatter*, February 2014
Via: *Gem Cutters News*, June 2014

At a recent meeting of the Rock & Mineral Club of Lower Bucks County, the club was treated to an illustrated talk by member Juan Proaño about one of the most unusual and dramatic exploits in the history of mining. It occurred in the remote, relatively unpopulated and undeveloped state of Pará, Brazil.



In 1979, a local rancher named Genésio Ferreira da Silva spotted a yellow stone in a stream near Serra Pelada ("Bald Mountain"). The stone was taken to the nearby town of Marabá, where it was determined to be a gold nugget, and a good-sized one at that. Word of the "find" spread like wild fire and overnight the rush was on. Within a week, a thousand "garimpeiros" (peasant miners) descended on the site, carving up the foothills of Serra Pelada into thousands of individual claims measuring 2 X 3 meters each (7 X 10 feet). Within a month, the hordes had swollen to 10,000. Within a year 100,000 to 200,000 men and boys were methodically digging and transporting the gravel containing the gold.

It was all manual labor, no machinery what-so-ever. Every bit of gravel was dug out by hand tools, loaded into cloth sacks weighing 100 pounds each and carried to the surface on the backs of half-naked, mudcaked "bearers", in long processions resembling chains of human "ants." At the surface, the gravel was washed and the gold separated by panning or sluicing by the claim-owners. It was then amalgamated by the use of mercury, then melted and cast into bars.

The gold bars were purchased at the site by government agents – then flown out by aircraft. The waste rock and gravel was dumped on heaps at the surface, and over time these grew to enormous size, towering over the vast 200 foot deep pit below. Operations ceased in 1986, when the miners hit the water table, and the lower level of the pit flooded.

The operation, though crude, was highly successful in terms of gold output. No one knows exactly how much gold was extracted, but it was certainly in excess of 44.5 metric tons, worth about a half a billion dollars in the 1980's. The gold was taxed by the government at the time it was purchased from the claim owners. In order to avoid the taxation, much of the output was smuggled out and exported from the country, and never reported. Taking this into account, some say the total production of Serra Pelada was close to 360 metric tons. Nevertheless, it was the richest single gold find of the 20th century. Many peasants became millionaires over-night if they were lucky enough to find a good-sized nugget.

However, there was a human price involved. Since there were absolutely no safety precautions taken, there was wide-spread death and injury among the miners. The miners also tolerated miserable living conditions. Mercury from the amalgamation process poisoned the drinking water, as did the complete lack of sanitation. Crime was rampant. Unlucky miners often reversed their fortunes by killing and robbing the lucky ones. It is said that there were 60 to 80 murders per month at the peak of operation.

The gold at Serra Palada lay in loose gravel in a metamorphosed sedimentary deposit known as "greenstone belts." These belts were folded into layers millions of years ago. The gravel was easily extracted by pick and shovel. In dry weather, transportation to the surface in sacks by the "bearers" was difficult, but possible. However, during the rainy season it was practically impossible, as everything turned to mud. Despite this, the human "conveyor belt" continued, the mud-covered "bearers" looking even more like ants.

There were an unusually large number of jumbo sized nuggets, some reaching the size of baseballs or even footballs. Most giant nuggets were sawed into pieces to make them more manageable, but one attaché-case sized giant survived. It weighed 62.3 kilos (137 pounds) and was purchased by the government for 1.25 million dollars. It proved to be 80% pure gold. Most Serra Pelada gold is naturally alloyed with other precious metals, like silver, platinum or palladium.

Serra Pelada's final chapter has not been written. The huge waste dumps are known to contain much finely disseminated gold not recovered by panning and sluicing of the 1980's. With modern techniques it can be recovered, and its value, some say, may exceed that of the original gold rush of 1979-1986.

Lee Tori

MGS has moved

Things are changing at Minnesota Geological Survey (MGS). Most important, several highly capable new members of staff have joined in recent months, including Quaternary, Paleozoic, and Precambrian geologists.

The MGS team – now more than 40 people – is more focused than ever on groundwater-related information products, supported by strategic research – in particular, of course, the County Geologic Atlas program that now is the core of the MGS role. This is all being done in close coordination with partners.

In addition to the ongoing contributions of more experienced staff, the role of new staff, development of new partnerships, increased focus on groundwater, and greatly accelerated production of County Atlases, the big thing on the MGS radar recently has been a move – one block north – to a whole new building.

Since the 1980s, MGS has been occupying a U building at 2642 University Avenue West, which gradually became partially vacant, in need of repair, and in demand for train-station-related development. So, MGS moved, with most of the moving taking place just before and just after MLK weekend in January.

The Survey can now be found at 2609 West Territorial Road, St Paul MN 55114. While Berry runs north from the old Survey building, beside KSTP, MGS is slightly east of Berry, on the north side of Territorial, at the



intersection with Westgate. The Survey is at the corner, in a red-trimmed building. Topographic map and MGS publication sales continue to be available. Ample free parking is available at the front door. New phone numbers are on the web site - <http://www.mngs.umn.edu/>. Please come visit!

Institute on Lake Superior Geology (ILSG)

In May, 2014, about a dozen members of the GSM attended the ILSG conference in Hibbing, MN. For more information on their upcoming meeting and other opportunities with the ILSG, please check out their website and read further...

About ILSG:

The Institute on Lake Superior Geology (<http://lakesuperiorgeology.org/index.html>) is a non-profit professional society with the objectives of providing a forum for exchange of geological ideas and scientific data and promoting better understanding of the geology of the Lake Superior region. The major activity of the Institute is an Annual Meeting (<http://www.lakesuperiorgeology.org/meetinghistory.html>) with geological field trips and technical presentations.

The 61st annual Institute on Lake Superior Geology meeting will take place Tuesday, May 19th to Sunday, May 24th, 2015 at the Best Western Plus Hotel and Conference Centre in Dryden, Ontario (<http://lakesuperiorgeology.org/Dryden2015/index.html>).

The 1.5 day technical session will be held on Thursday, May 21st and the morning of Friday, May 22nd. Pre-meeting and post-meeting field trips are scheduled in half-day, full-day and two day formats covering a wide range of topics highlighting the geology of western Superior Province.

An expression of interest is requested from potential attendees. The link to the questionnaire is provided below: http://lakesuperiorgeology.org/Dryden2015/ILSG_form.html

Full registration for the meeting will be available mid-February. Registration will be available through an Eventbrite Space which will allow for easy registration and payment via credit card. Any questions regarding the meeting and the registration process can be directed to co-chairs Pete Hinz (pete.hinz@ontario.ca) or Robert Cundari (robert.cundari@ontario.ca).

Another Move Coming Up – U Geology!

Having been established by Professor Winchell – Governor Dayton’s uncle who is commemorated by a monument at the west end of Franklin Bridge and the trail extending along the river – in 1872, the Department, from which the Bell Museum and Minnesota Geological Survey branched, has occupied Pillsbury Hall since it was built in 1887 – thus the second oldest building on campus. Geology – now named Earth Sciences – presently is distributed among several buildings. The Legislature has, however, not only funded the new Physics building, but also a renovation of the Tate Laboratory of Physics, to which Geology will move in a couple of years.



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- Lab Core
- Office
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