Fall 2016 *Promoting public interest and educational support in the geological sciences* Volume 70, No. 3

The Geological Society of Minnesota News

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

GSM President, Dick Bottenberg

From the President's Desk…

It's early August and time to send out the fall newsletter? I guess that's Minnesota!

The end of August means State Fair in Minnesota, and as GSM has done for decades, we are staffing our booth in the Education Building. Thanks to Dan Japuntich for once again organizing this major GSM activity (my favorite). Our booth is a significant means for recruiting new GSM members, as well as a way to educate fairgoers on GSM's activities and on Minnesota geology in general. Thanks in advance to each of you who are volunteering for one or more four-hour shifts. Everyone is encouraged to stop by our booth and say hi while you are at the fair, especially if you have not seen our booth in recent years.

This summer's field trip series has been educational and hands on. The most recent was a trip to Hill Annex State park. See the first two of three articles, in this newsletter, for further details.

The GSM Marker Committee is making progress surveying Minnesota's geological markers. But as Becky Galkiewicz says in her article in this newsletter, "we're making progress but we need more volunteers. Please check the Marker Homepage on the GSM Web Site and find some lonely markers that need to be visited. You'll learn about Minnesota's geological history at the same time".

Monday, September 12 marks the start of our lecture and lab series for the coming year. The lecture series for the coming year is provided elsewhere in this newsletter. The Fall Banquet will be held at the U Garden Restaurant, the same place that gave us great service for our last several banquets. Go to our website for specifics.

Just prior to the lecture, we will conduct our **Annual Meeting**, during which we will nominate and elect new members to our Board of Directors. We are looking for **two new Board members** prior to our Annual Meeting. Being a Board member does not take a great deal of your time (four meetings per year), and is a great way to give back to GSM and to have your ideas for our Society made known. Minutes for previous Board meetings are on our web site, as well as the dates for the next few upcoming meetings (usually the second Thursdays of February, May, August, and November). If you think you might be interested, contact Theresa Tweet (phoenix8185@gmail.com), and she'll explain what is involved.

Minnehaha Falls Marker Project/Request for Donations: I am very excited to report that after 3 meetings with the Minneapolis Park Board staff and a presentation to the Minneapolis Park Board on 3 August we have an agreed upon approach. The plan is to first design and install a new, large 4.5 foot by 2.5 foot interpretive marker that depicts the overall Minnehaha Falls geology. This marker was requested by the Park Board staff, will

Upper photograph: Mark Ryan, Shadow Falls Bluffs, 2009.

Inside this issue:

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from the GSM archives: Field trip to a Red Wing Pottery Clay Pit, May 1942.

be designed by Carrie Jennings and will use graphics and state of the art laminate construction (similar to the Split Rock laminate marker). It will be located between the Sea Salt Restaurant and Minnehaha Falls. Once installed, the GSM will then work with the Minnehaha Falls Park staff to determine the best way to replace the 13 markers that were erected in 1969, 10 of which have been removed by vandals (only 5 of the 13 are geologic, however we intend to work with the Falls Park staff to develop a total replacement solution).

The GSM Board approved and committed to cover the costs, as necessary, to design, procure and install the new, large 4.5 foot by 2.5 foot interpretive marker. With regards to funding, $3000 in donations have been received from 2 GSM members. Another **$2000 matching pledge** from a GSM member has also been received. Costs are anticipated to be around $6000. Please contact Mary Helen Inskeep if you are interested in donating to this effort, or just send her a check. Remember, up to $2000 will be matched!

Finally, all members are invited to attend our board meetings. The remaining meetings this year are 11 August and 3 November. Also, thanks to Dave Wilhelm. Much of the content herein appeared in last fall's newsletter, is still relevant and it's hard to write it any better!

Dick Bottenberg

GSM News

Officers:
Dick Bottenberg, President
Theresa Tweet, Vice President
Mary Helen Inskeep, Treasurer
Rebecca Galkiewicz, Secretary

Board Members: Kate Clover, John Jensen; Ruth Jensen; Mark Ryan; and Dan Japuntich

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

Web Site: *www.gsmn.org*

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 GSM Members!

Karen Westphall; St. Paul

Wolfgang Bielefeld; New Hope

Carl and Mary Kay Bruibler; St. Peter

GSM Board Membership

The GSM Board consists of members who have a special interest in advancing the goals of our society, including lectures, field trips, and community outreach. The Board currently has nine members. Our bylaws limit the terms of Board members to four years, to encourage a turnover of perspectives and ideas. The Board typically meets quarterly, on the second Thursdays of February, May, August, and November, or a different date if conflicts arise. We typically meet from 7 to 9 PM at the Minnesota Geological Survey 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. And, if you have a topic you would like the Board to consider, please contact Theresa Tweet at phoenix8185@gmail.com.

GSM Geology Markers

Summer is a great time to get out and travel. So, GSM members are visiting geology markers around Minnesota, taking pictures and checking the GPS coordinates. Vlad Zvikovic visited the markers in the Brainerd Lakes area; Theresa Tweet found the Lake Pepin marker; Joanie Furlong and Randy Strobel went to Reads Landing; Lee Kaphingst has visited about a dozen sites; Dan Japuntich and Dorothy Edelman went on a fishing trip to the Lakes area and found some markers there.

Becky and Bob Galkiewicz located the Mankato and Ripley Esker markers and, while up north for the GSM Iron Range field trip, found the marker at McCarthy Beach State Park. On the same field trip, Gratia Reynolds and Dave Wilhelm found the marker in Hibbing's Bennett Park. Ed Steffen and Dick Bottenberg are working with the Minneapolis Park Board on reinstalling the Minnehaha Falls markers that have disappeared due to vandalism over the years.

Sometimes we don't find markers listed in our records, perhaps due to vandalism or reconstructions of roads or parks. The tremendous work done over the past 60 years to install these markers deserves to be known, in part through an accurate list. So, we're making progress, but we need more volunteers! Please check the Marker page on the GSM Web Site, and find some lonely markers that need to be visited. You'll learn about Minnesota's geological history at the same time.

Submitted by the GSM Marker Committee
Rebecca Galkiewicz

Member Spotlight – Rita Childs

How long have you been a GSM member?

I have been a member for over 30 years. I joined in the 1980s after visiting the GSM booth at the State Fair.

How did you get interested in geology?

I first became interested in geology when I took the Physical Geology course with Peter Hudleston at the University of Minnesota. This was the first time I learned about Plate Tectonics which I found fascinating. The best part of the course was taking a field trip to look at the rocks along the Mississippi River. I graduated from the University of Minnesota and got a teaching license to teach grade 7 to 12 Biology and Junior High Science. My first teaching job was eighth grade Earth Science. I had to learn more about Earth Science, so I took a Minnesota Geology Compleat Scholar course at the University of Minnesota with Howard Mooers. We took many field trips covering different parts of Minnesota, and

Rita Childs in Skagway

I loved learning about reading Earth's story in the rocks. I discovered that I enjoyed teaching Earth Science. When I teach High School Earth and Space, I approach it with learning about Minnesota's geologic history through the rocks. Students sign up for the elective course because they want to learn Astronomy. I tell them they have to understand Earth history first. Some of them end up liking it more than they thought they would. My love for geology has slowly rubbed off on my friends and family.

What do you dig about the GSM?

I dig finding rocks with an interesting geologic story and learning about the current research that is being done. I love going on the field trips around the area. I especially like how the field trips are off the beaten path, such as pulling up alongside a county road and walking into the woods. It is just cool to explore all of the hidden places in the area that help to tell the geologic history. I also enjoy having a beer with other GSM members. They are a fun and interesting group. They share a love of geology even though many of their careers aren't directly related to geology.

NOTES FROM THE PAST

The following appeared in the GSM News March, 1945

Dr. Theil has just finished his third course of lectures to our Society. The first was on Dynamic or Elementary Geology; the second on Historical Geology, and third and last, on the Geology of Minnesota. We cannot help but attribute much of the growth and stability of our society to Dr. Thiel, and these lecture courses. This is evidenced by the fact that our attendance during the last course has

averaged almost 90. We have more members, no debts and a comfortable balance in the treasury. It is unusual too, that in giving so many lectures, we have still to hear a single word of criticism from a single person, and on the other hand, praise and high compliment are too abundant to mention. We have rejoiced also in Dr. Thiel's elevation to Head of the Department of Geology at the University of Minnesota, and perhaps selfishly, look forward to his giving us a course on something, or, in fact, anything next year. It is in order for some of us to take a minute or two and write just a short note to Dr. Thiel, to express our appreciation. We take this opportunity of collectively communicating to him our sincere appreciation of his great ability and his graciousness in being so generous of his time and patience.

GSM Archives at the Minnesota Historical Society

Last year, we reported that GSM archives had been placed in the Minnesota Historical Society (MNHS) collection. Five boxes of items such as newsletters, minutes, programs, and photos that had previously been stored at the Minnesota Geological Survey went to a new home at MNHS. This collection, which tells the history of our organization, was assembled through the work of many GSM members over many years. Now, Duane Swanson, Curator of Manuscripts, reports that GSM records have been cataloged, as you can now see: **http://www2.mnhs.org/library/findaids/00089.xml**

Theresa Tweet

GSM Field Trips and Tours

We have had three excursions over the summer. On June 10, we toured the **Eagle Lake Observatory**, which included a lecture on Mars and opportunities to view the sun, the moon, and planets. We had a large turnout. Elsewhere in this issue, Deborah Naffziger reports on this tour.

On June 26 (delayed by one day due to tropical weather), Greg Brick led us on an interesting tour through the **Bruce Vento Nature Sanctuary**, followed by an overlook of Swede Hollow from the taproom of Flat Earth Brewery. See Dave Eckmann's article in this issue.

Just recently, July 21 through 24, about 30 GSM members participated in a four day tour of sites and facilities on the **Mesabi Iron Range**, including the Minnesota Discovery Center, the DNR Drill Core Library, Hill Annex Mine State Park, and Soudan Underground Mine State Park. We learned a lot about the geology, history, and technology of mining in Minnesota. Please watch for a report in a future newsletter.

As of August 1, we have no concrete plans for additional field trips this year. I do plan to schedule another tour this fall of the St. Anthony Falls Lab, assuming sufficient interest. Beyond that, the following are a few of the field trip ideas I have received but as of yet have no "champion" (organizer): Wildlife Science Center; Pipestone National Monument; trip to Chicago to visit museums; local glacial history; a trip led by Jim Miller; Mark Jirsa on the effect of the Sudbury impact on Minnesota; the Canadian North Shore of Lake Superior; trip to intercept the 2017 total solar eclipse. E-mail any other suggestions you might have to me at dewilhelm53@msn.com.

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? Local field trips can be as short as a few hours, others might encompass a weekend, and still others might take most or all of a week. Often we can recruit a professional geologist as the technical leader. But a field trip also requires an organizer to handling planning, communication, and logistics. For short, local field trips, this does not involve a great deal of work. Trips that span more than one day and involve significant travel obviously require more planning. Having organized last year's Keweenaw trip and this year's Iron Range trip, and having worked with Randy and Joanie on some of their trips, I have a good deal of experience, and will give you the assistance you need. So, consider organizing a field trip as a way to give back to GSM.

Dave Wilhelm

Tour of Eagle Lake Observatory

It was a hot and sticky evening on June 10th as GSM members went west to **Baylor Regional Park** just north of Norwood. Eagle Lake Observatory consists of two observatory domes and a classroom on a hill in the park. It is one of five observatories operated by the Minnesota Astronomical Society (http://www.mnastro.org/), and the one dedicated for public outreach.

The larger dome houses three large pedestals and a 20" Obsession telescope. The Visual platform contains a Celestron 14" Schmidt-Cassegrain (SCT) that collects 2,500 times the light of the human eye. An SCT is a catadioptric telescope that uses both glass lenses and mirrors to focus the image. The platform also contains a Stellarvue 152mm refractor, which is very good for planets. It also contains a TeleVue 102mm refractor fitted with a Coronado Hydrogen-Alpha filter that provides fantastic views of solar prominences, faculae, and sunspots. An imaging platform contains another Celestron 14" SCT

that is equipped with an Astrovid StellaCam 3, which is used to project higher power planetary and solar images onto a monitor. It also contains a Takahashi TOA-130mm refractor equipped with a StellaCam II

Larger dome with three large pedestals and 20" Obsession telescope

camera that provides wide-field images. Finally, there is a TeleVue 76mm refractor fitted with a Coronado Hydrogen-Alpha solar filter that is used both visually and for imaging. The Meade LX200 Platform contains a Meade 16" F/10 Schmidt-Cassegrain that is GPS capable. It is the longest focal length telescope at Eagle Lake Observatory, affording excellent views of both planets and deep-sky objects. Also mated to this telescope is a TeleVue NP101 refractor. This dome also houses the club's 20" Obsession Dobsonian-style telescope that is used visually. It has the largest aperture of any telescope at the observatory. It is equipped with Argo Navis and StellarCat systems that enable it to have Go-To and tracking capabilities. This telescope is on wheels and is rolled out onto the concrete pad whenever it is used.

The smaller dome, which opened in 2014, is called the Sylvia A. Casby Observatory. It contains an 8" TMB refractor, which may be the finest instrument at the observatory to use on planets. Also on this platform is a 12" Takahashi Mewlon Dall-Kirkham telescope, which is a very rare and exotic instrument. It is a special type of catadioptric telescope, designed to maintain sharp stellar images all the way to the edges of the field. This platform also houses a Stellarvue 102mm refractor. The entire platform sits on an AstroPhysics 3600 GTO mount, perhaps the gold standard today in observatory mounts. The remaining building is called the Hot Spot Classroom. It has enough room for 80 persons, and is used for presentations and other educational activities. This building, thankfully, also has air-conditioning! All the buildings are well maintained. The club is active in keeping their complex in good shape.

Steve Baranski and Mark Job had opened the larger dome and aimed the 76mm refractor at the sun. It had a filter on, and it was fun to see the sunspots. Then they aimed their instruments at the moon. It was amazing to see the clear sharp detail, even during daylight. You would think astronomy is a nighttime pastime, but there is good viewing in daylight as well. Mars wouldn't appear until later, as the sun went lower in the sky and eventually set. The instrument in the smaller dome was also eventually aimed at the moon, and people got good views there. People milled around and visited and the Astronomy Club members were happy to answer any questions people had. The light hazy clouds were not an impediment to the instruments, which was a surprise.

Members view through multiple telescopes simultaneously

Suresh Sreenivasan was in charge of the Sylvia Casby dome. These telescopes are on an electronic mount, but it still took two people to maneuver it around, get the dome opened, and so forth. But the views of Mars and Jupiter were well worth it. The talk was on the *Rocky History of Mars* by Dave Falkner, program director for Eagle Lake Observatory, and a NASA Solar System Ambassador. He is one of a group of volunteers nationwide who talk about space exploration and what's going on with NASA. Dave Falkner is the author of a book, *The Mythology of the Night Sky*.

First we viewed a video about the Minnesota Astronomical Society, which detailed their observatories and the club's various activities. Then Dave gave his talk on the geology of Mars, and what we have learned through the 3 orbiting missions and the 3 surface missions. The premise for these missions is that life might once have existed on Mars, and might still exist there now, and the research is geared toward exploring Mars' geology to test this hypothesis.

He detailed the journeys of the Mars Exploration

Rovers—Spirit and Opportunity. Originally the expectation was that these rovers would have an effective life of 90 days. Scientists expected the solar panels would become coated with dust. However, they happily discovered that Martian dust devils periodically swept the solar panels clean, so the rovers continued operating for many years, sending back much more information than the designers ever expected. Opportunity is still operating on the Red Planet.

NASA's Mars Science Laboratory probe, named Curiosity, is also still operating. It has managed to wander a good way from its landing site. It explored Gale Crater and found impact detrius. It crossed Yellowknife Bay, possibly an old water channel because mudstones and clay minerals were found there. There were tilted sandstones, delta formations and sediment deposits at the bottom of the lake in the center of the crater.

The chronology for Mars seems to be that at 4 billion years ago (Gya), water was abundant and flowed freely over the surface, with oceans, lakes, rivers, etc. The water was fresh H_2O and neutral in Ph—so ideal for formation of life. Between 4-3 Gya, the water slowly evaporated. Mars' early core was molten, and the planet had a magnetic field to protect it from the solar winds. As Mars aged, the core solidified and the magnetic field dissipated. Now Mars is scoured by the solar winds with no protection and a thin CO_2 atmosphere. By 3 Gya, the martian atmosphere still contained oxygen and hydrogen, but since then those elements have escaped, leaving the heavier CO_2. Now, Mars' poles have water ice as well as CO_2 ice, and that may be where the best chances for finding life are. NASA has no polar missions planned, although the Japanese space agency (JAXA) is considering it.

Once the talk was over, we went outside, to await sunset and more viewing. Dave was later cajoled into giving a few details of his talk on Pluto—which was the backup if the skies were overcast. Pluto is a planetoid of surprises that nobody expected. There are ice mountains 11,000 feet high—and on a small planet that's very high in proportion. Pluto is smaller than our moon, has 2-3 rings, and 5 moons discovered so far (Charon, Hydra, Nix, Kerberos and Styx). Charon, Pluto's largest moon, is 1/8 the mass of its' primary, making the Pluto system a "binary" system. Pluto, like the planet Uranus, rotates perpendicular to its orbital path. Pluto's moons also revolve around the planet in a bullseye pattern. Pluto contains ices of water, nitrogen, methane and CO_2. Nitrogen ice flows like glaciers. There are layers of atmosphere: methane, ethylene and hydrogen and tholines—complex hydrocarbons. The planet is active—ice flows and convects on and under the surface. There are ice volcanoes—pockets of nitrogen ice spew out over water ice.

Once the sun had set, the telescopes were aimed at Jupiter, then Mars and then at various stars. We saw Jupiter and its four Galilean moons, and there was even a view that resolved the Jovian atmosphere. Mars showed the colors of its terrain. Mizar in Ursa Major is a visible binary (and was used as an eye test by many native tribes) but is better seen through a telescope. Castor in Gemini was resolved into a fine binary. Unfortunately, the mosquitoes came out with dusk, and so many of us left before becoming too much of a meal for the insects. It was a fine evening, and I would highly recommend you check out the Minnesota Astronomical Society and their activities throughout the year. It makes a good family outing.

Deborah Naffziger

Bruce Vento Sanctuary: Caves and More

On Sunday, June 26, 50 GSM members toured caves and geology at the Bruce Vento Nature Sanctuary near downtown St. Paul, with added stops at Trout River Tunnel and Flat Earth Brewery. The tour had been postponed from the previous day due to the tropical heat and storm potential.

GSM Member Greg Brick, PhD and author of *Subterranean Twin Cities,* led the tour. As we walked through the sanctuary, he delved into the geology, and the colorful human history associated with the region.

The Stratigraphy: Key to understanding the geology of the bluffs along the Mississippi River is the soft St. Peter Sandstone, above which is a thin layer of Glenwood Shale, and a thicker layer of Platteville Limestone. The limestone was quarried for building material, and was more recently used for crushed stone. After its removal, the underlying softer sandstone is subjected to much faster erosion.

Limestone quarry slabs overlying the St. Peter Sandstone

North Star Brewery Cave: The cave was dug in the 1850's, and used for lagering. It is fed by a cold water spring, which provides natural cooling at 48° (great for beer!). Jacob Schmidt got his start in the beer business here. Railroads were routed along the flats in the vicinity of the cave. This made the area a prime site for a migrant worker camp.

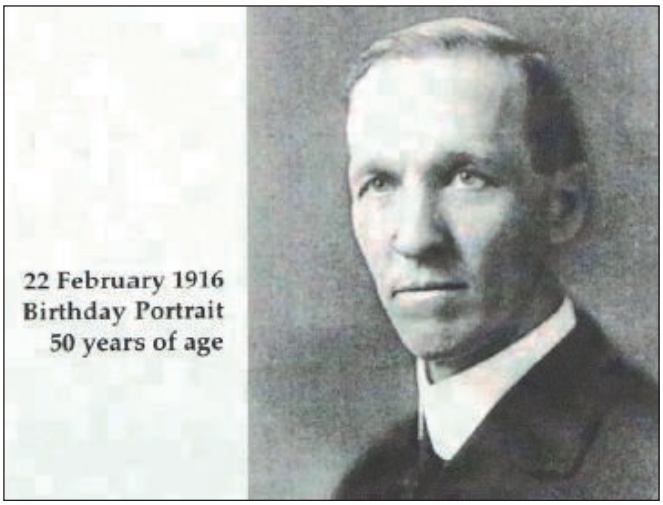
North Star Brewery Cave

Dayton's Bluff Cave: This natural cave was open as late as the 1960's. Natural falling of the overlying rock is responsible for much of the "sealing" of the caves in this area. This cave contains Native American petroglyphs, and is hydrologically connected to Carver's Cave.

The Sand Castles: These are naturally weathered pinnacles or hoodoos in the St. Peter Sandstone. They formed after the harder limestone cap overlying them had been removed.

The Sand Castles

Historical Interlude: Frederick Sardeson (1866-1958) was a geologist who spent much of his career in Minnesota. He was an avid collector, amassing a collection of over 100,000 fossils. He was very careful in recording the fossil location in the strata, and did pioneering work on the St. Peter Sandstone, which is an Ordovician beach deposit from a continental sheet of sand, running over to Chicago, and down to St. Louis. Sardeson was dismissed from the University of Minnesota partly for political reasons, and partly because of his temperament. He never achieved the recognition he might have for his contributions.



Weiss, Malcolm P. (2000). Bulletin No. 48. Frederick William Sardeson, Geologist 1866-1958. Minnesota Geological Survey. Retrieved from the University of Minnesota Digital Conservancy, http://hdl.handle.net/11299/57075.

Carver's Cave: Known to the Native Americans as Wakan-Tipi, the European discovery of the cave was made in 1766 by Jonathan Carver. Although the cave is now closed, a small opening has recently developed, allowing for a glimpse inside. Steel doors have raised the water level within the cave. Groundwater piping formed the cave by washing away the sand grains from the sandstone. A spring at the back of the cave, which is ~ 100 feet long, flows at 40 gallons per minute.

St Paul's Underground River: Trout Brook Tunnel runs from Lake McCarrons in Roseville to the Mississippi River. The stream was originally covered by the railroads, and now provides the drainage for the Lowertown area of St. Paul. We looked down from above on an open section of the tunnel. Although little water was running through at the time, the tunnels can be quite dangerous during rainstorms.

Flat Earth Brewery: Overlooking Swede Hollow, the Flat Earth Brewery taproom has a panoramic view over the valley. Now a forested green space, the valley floor was the streambed for Lake Phalen. Formerly part of the Hamm's Brewery, Flat Earth Brewery overlies deep cellars that were converted to a Cold War fallout shelter during the Cuban Missile Crisis.

The field trip ended with a visit to the Flat Earth taproom which serves many specially crafted beverages.

David Eckmann

MEMBERSHIP RENEWAL REMINDER

Our fall membership renewal is on the horizon. Everybody will be up for renewal this fall when the new lecture series starts. Renew by mail or wait until the lecture series starts and renew in person. The membership year begins September 1. For those newly joining after April 1 and before September 1, membership will be good through September 2017. (New members joining between April 1 and August 31 get those months free!) If you wish to mail in your dues please include the information below.

Membership renewal September 1, 2016 to September 1, 2017

Name(s): _____

Address: _____

Phone: _____ E-mail(s): _____

Please make check payable to: **GSM**

Please mail to: Geological Society of Minnesota
P.O. Box 390555
Edina, MN 55439-0555

Membership Levels

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( ) Individual---------- $20

( ) Family ---------- $30

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